FINAL ENVIRONMENTAL ASSESSMENT

Gradient Resources, Inc.
Patua Geothermal Project
Phase II
Geothermal Unit N-85168X

DOI-BLM-NV-C010-2011-0501-EA

U.S. Department of the Interior
Bureau of Land Management
Carson City District
Stillwater Field Office
5665 Morgan Mill Road
Carson City, NV 89701
775-885-6000

April 2012
It is the mission of the Bureau of Land Management to sustain the health, diversity, and productivity of the public lands for the use and enjoyment of present and future generations.
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<tbody>
<tr>
<td>°F</td>
<td>Degrees Fahrenheit</td>
</tr>
<tr>
<td>ACC</td>
<td>Air-cooled condensers</td>
</tr>
<tr>
<td>ACSR</td>
<td>Aluminum conductor steel reinforced</td>
</tr>
<tr>
<td>AUMs</td>
<td>Animal unit months</td>
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<tr>
<td>BLM</td>
<td>Bureau of Land Management</td>
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<tr>
<td>BMP</td>
<td>Best Management Practices</td>
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<td>BOPE</td>
<td>Blowout Prevention Equipment</td>
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<td>BWPC</td>
<td>Bureau of Water Pollution Control</td>
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<td>CAPP</td>
<td>Chemical Accident Prevention Program</td>
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<td>CCDO</td>
<td>Carson City District Office</td>
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<tr>
<td>cfs</td>
<td>Cubic feet per second</td>
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<tr>
<td>CO</td>
<td>Carbon monoxide</td>
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<tr>
<td>DCS</td>
<td>Data collection system</td>
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<td>DOI</td>
<td>Department of the Interior</td>
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<td>EA</td>
<td>Environmental Assessment</td>
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<td>EP</td>
<td>Eagle-Picher</td>
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<td>FLPMA</td>
<td>Federal Land Policy and Management Act</td>
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<td>GDP</td>
<td>Geothermal Drilling Permit</td>
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<tr>
<td>GHG</td>
<td>Greenhouse gas</td>
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<tr>
<td>gpm</td>
<td>Gallons per minute</td>
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<td>Gradient Resources, Inc.</td>
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<tr>
<td>H₂S</td>
<td>Hydrogen sulfide</td>
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<td>HDD</td>
<td>Horizontal directional drilling</td>
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<td>HF</td>
<td>H-frame</td>
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<td>HMI</td>
<td>Human machine interface</td>
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<td>IDT</td>
<td>Interdisciplinary team</td>
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<td>kV</td>
<td>Kilovolts</td>
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<td>kW</td>
<td>Kilowatt</td>
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<td>Los Angeles Department of Water and Power</td>
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<td>LBAO</td>
<td>Lahontan Basin Area Office</td>
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<tr>
<td>MCC</td>
<td>Motor control center</td>
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<td>MDBM</td>
<td>Mount Diablo Base and Meridian</td>
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<td>MMPA</td>
<td>Mining and Mineral Policy Act</td>
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<tr>
<td>mph</td>
<td>Miles per hour</td>
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<td>MW</td>
<td>Megawatt</td>
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<tr>
<td>NAC</td>
<td>Nevada Administrative Code</td>
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<td>NCG</td>
<td>Non-condensable gas</td>
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<td>NESC</td>
<td>National Electrical Safety Code</td>
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<td>NNHP</td>
<td>Nevada Natural Heritage Program</td>
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<tr>
<td>NO₂</td>
<td>Nitrogen dioxide</td>
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<td>NRS</td>
<td>Nevada Revised Statutes</td>
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<tr>
<td>O₃</td>
<td>Ozone</td>
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<tr>
<td>OHV</td>
<td>Off-highway vehicle</td>
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<td>ORC</td>
<td>Organic Rankine Cycle</td>
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<td>Pb</td>
<td>Lead</td>
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<tr>
<td>PCDI</td>
<td>Pacific Direct Current Intertie</td>
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<tr>
<td>PDC</td>
<td>Power distribution center</td>
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<tr>
<td>PLC</td>
<td>Programmable logic controller</td>
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<tr>
<td>PM₁₀</td>
<td>Particulate matter smaller than 10 microns in aerodynamic diameter</td>
</tr>
<tr>
<td>ppm</td>
<td>Parts per million</td>
</tr>
<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>RCRA</td>
<td>Resource Conservation and Recovery Act</td>
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<tr>
<td>ROW</td>
<td>Right of way</td>
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<tr>
<td>rpm</td>
<td>Revolutions per minute</td>
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<tr>
<td>SAD</td>
<td>Surface Area Disturbance</td>
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<td>SCADA</td>
<td>Supervisory control and data acquisition</td>
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<td>SHPO</td>
<td>State Historic Preservation Office</td>
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<tr>
<td>SO₂</td>
<td>Sulfur dioxide</td>
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<td>SPCC</td>
<td>Spill Prevention, Control, and Countermeasure</td>
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<tr>
<td>SRF</td>
<td>Strength reduction factors</td>
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<td>SWPPP</td>
<td>Stormwater Pollution Prevention Plan</td>
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<tr>
<td>TCID</td>
<td>Truckee-Carson Irrigation District</td>
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<td>TCP</td>
<td>Traditional Cultural Property</td>
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<tr>
<td>TGH</td>
<td>Temperature gradient hole</td>
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<tr>
<td>TESC</td>
<td>Threatened, endangered, sensitive, and candidate</td>
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<td>TSCA</td>
<td>Toxic Substances Control Act</td>
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<td>UIC</td>
<td>Underground Injection Control</td>
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<tr>
<td>US</td>
<td>United States</td>
</tr>
<tr>
<td>USE</td>
<td>Utilities system enclosure</td>
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<tr>
<td>USFS</td>
<td>US Forest Service</td>
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<td>USFWS</td>
<td>US Fish and Wildlife Service</td>
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<td>USGS</td>
<td>US Geological Survey</td>
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<tr>
<td>UTM</td>
<td>Universal Transverse Mercator</td>
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<tr>
<td>V</td>
<td>Volts</td>
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<tr>
<td>VOC</td>
<td>Volatile organic compounds</td>
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<tr>
<td>VRM</td>
<td>Visual resource management</td>
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<td>WRC</td>
<td>Wildlife Resource Consultants</td>
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<td>WCRM</td>
<td>Western Cultural Resources Management, Inc.</td>
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1: Introduction

1.1 Introduction

1.1.1 PROJECT BACKGROUND

Gradient Resources Inc., (GRI) has obtained the rights to federal geothermal leases issued by the Department of the Interior (DOI), Bureau of Land Management (BLM) for NVN-76139, NVN-77739, NVN-75005, and NVN-85705, which comprise portions of the Patua Geothermal Project Phase II (project). The latter two leases are located within the Patua Geothermal Unit NVN-85168X (Unit). In addition, GRI has agreements with private landowners for the rights to the geothermal resources associated with the majority of the private lands within the Unit. The lease areas are located in Churchill and Lyon Counties, Nevada. The BLM manages the subsurface geothermal resources underlying the federal leases in the project area. The BLM and the Bureau of Reclamation, Lahontan Basin Area Office (Reclamation) are surface management agencies.

GRI prepared geothermal Utilization and Operations Plans for the project. These plans were submitted to the Carson City District Office, Stillwater Field Office (CCDO), and the Lahontan Basin Area Office (LBAO) of Reclamation for review in January 2011. The plans were finalized in March 2011. GRI is proposing to design, construct, and operate geothermal well pads and wells, geothermal fluid pipelines, and associated access roads on lands that are managed by the BLM and Reclamation. New geothermal fluid pipelines would either utilize previously approved geothermal pipeline corridors or they would be connected to previously approved geothermal fluid pipelines within the Unit in order to supplement the nominal 60 megawatt (MW) net geothermal power generation facility described in the Patua Geothermal Project, Geothermal Unit NVN-85168X, Environmental Assessment, DOI-BLM-NV-C010-2010-0016-EA (October 2010) (Patua Phase I project). In the event that a geothermal resource is identified that is capable of supporting an additional geothermal power generation facility, a new nominal 60 MW net power plant would be constructed either adjacent to the approved Patua Phase I project power plant, or in Section 29, T20N R26E. The new power plant would be similar to the power plant for Patua Phase I project and for either option, would be located on privately owned land. If the power plant were to be located in Section 29, it would require the construction of approximately 2.31 miles of new 120 kV transmission line in order to connect to the transmission system approved in the Patua Phase I project. GRI anticipates that construction activities could begin early 2012 and could be completed by mid-2013.

This Environmental Assessment (EA) analyzes the proposed project pursuant to the national Reclamation/BLM Interagency Agreement, December 1982 and the analysis is jointly prepared between BLM and Reclamation pursuant to the National Environmental Policy Act (NEPA). Reclamation will review the analysis for construction of the project components on Reclamation-managed lands. BLM oversees approval of the geothermal Utilization and Operations Plans (geothermal facilities on Reclamation-managed lands) in consultation with Reclamation. Each agency would determine the terms and conditions under which it would authorize the geothermal
facilities based on this analysis, if the project is authorized. Elements of the project on private lands are included in this analysis as they are considered connected actions under NEPA.

### 1.1.2 Project Location

The project is located approximately 7 miles east of Fernley, Nevada, in Lyon and Churchill Counties. The project site is accessible from Alternate 50 (Alt 50) to the north and south. The project location is shown in Figure 1.1-1.

The proposed well pads, geothermal fluid pipelines, access roads, power plant options, and transmission line would be located on lands managed by Reclamation, BLM, and on private lands. The project area is shown in Figure 1.1-2. The geothermal leases within the Patua Unit are shown in Figure 1.1-3. The locations of the well pads are tentative, and pending the results of surveys, ongoing drilling, science, and engineering analyses, their locations could be slightly altered.

Geothermal drilling on Reclamation lands would occur within T20N, R26E, Sections 28, 30, and 32, Mount Diablo Base and Meridian (MDBM). Drilling on BLM lands would occur in T19N, R26E, Section 6.

### 1.2 Purpose and Need

The purpose of the proposed action is to develop a portion of the geothermal resources on the geothermal leases in the southwest area of the Patua Geothermal Unit in order to produce electricity. The need for the project is to meet the requirements of the National Energy Policy Act of 2005, the BLM’s implementation strategy titled *BLM Implementation of the National Energy Policy*, and other federal policies that encourage the use of alternative and renewable energy.


The DOI policy, consistent with Section 2 of the MMPA and sections 102(a)(7), (8), and (12) of FLPMA, is to encourage the development of mineral resources, including geothermal resources, on public lands. The Secretary of the Interior has the authority and responsibility to lease public lands and certain other federal lands, for geothermal development. Under the terms of the Geothermal Steam Act (and the National Energy Policy Act) and it’s implementing regulations, the BLM must respond to the plans and programs submitted by the lessee (or unit operator) and either approve, require modification, or deny these applications.

### 1.3 Land Use Plan Conformance Statement

The proposed action as described is in conformance with the Carson City District Office Consolidated Resource Management Plan, page MIN-1 “…encourages the development of federal mineral resources and reclamation of disturbed lands.”
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Figure 1.1-2: Project Area, Elements, and Land Ownership
Figure 1.1-3: Geothermal Leases
1.4 Relationship to Laws, Regulations, Policies and Plans

The proposed action is consistent with federal laws and regulations; other plans, programs, and policies of other federal agencies; and state and local government, to the extent practical within federal law, regulation, and policy.

Specific approvals and permits would be required for constructing, operating, and maintaining the proposed geothermal project. Table 1.4-1 lists the federal, state, and local permits, policies, and actions that may be required.

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<tr>
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<tr>
<td>BLM, CCDO Stillwater Field Office</td>
<td>Geothermal Drilling Permits (GDP), and issuance of a Commercial Use Permit and Facilities Construction Permit (for the well field on Federal land)</td>
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<td>Cultural Resource Permit pursuant to the American Indian Religious Freedom Act</td>
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<td>Cultural resource use permits: survey/recordation permit</td>
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<td>Facility Construction Permit</td>
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<td>Geothermal Drilling Permit (GDP)</td>
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<td>Nevada Department of Conservation and Natural Resources, Division of Water Resources (NDWR)</td>
<td>Application for Permit to Appropriate the Public Waters of the State of Nevada Request for Waiver for Temporary Use of Groundwater for Oil and Gas or Geothermal Exploration</td>
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<td>Nevada Department of Transportation</td>
<td>Occupancy and/or Encroachment Permits</td>
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<td>NDEP- Bureau of Air Pollution Control, Nevada Chemical Accident Prevention Program</td>
<td>Class II Air Quality Operating Permit (if applicable); Permit to Construct Surface Area Disturbance Permit</td>
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<td>NDEP – Bureau of Water Pollution Control</td>
<td>Onsite Sewage Disposal Permit Underground Injection Control Permit for Class V Wells Use of Water to Explore for Minerals Temporary Discharge Permit Stormwater general permits for construction (NVR 100000), National Pollutant Discharge Elimination System (NPDES) Temporary Working in Waters Permit</td>
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<td>NDEP-Bureau of Safe Drinking Water</td>
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<td>Geothermal Project Area Permit State Well Permit Geothermal Injection Well Permit</td>
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### Table 1.4-1 (Continued): Potential Regulatory Permits and Approvals for the Patua Phase II Geothermal Project

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<td>Nevada State Historic Preservation Office</td>
<td>Review of Cultural Resource Evaluation in Compliance with Section 106 of the Historic Preservation Act in accordance with Programmatic Agreement for NHPA compliance between BLM, Reclamation, and SHPO</td>
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<tr>
<td>Public Utilities Commission of Nevada</td>
<td>Utility Environmental Protection Act Permit</td>
</tr>
<tr>
<td>State Fire Marshall</td>
<td>Hazardous Materials Permit; Building Construction Approval</td>
</tr>
<tr>
<td><strong>Local</strong></td>
<td></td>
</tr>
<tr>
<td>City of Fernley Planning Department</td>
<td>Planning Design Review and Special Use Permit</td>
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<tr>
<td>City of Fernley Building Department</td>
<td>Civil Plan Review</td>
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<td></td>
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<td>Churchill County</td>
<td>Building Permit</td>
</tr>
<tr>
<td></td>
<td>Special Use Permit</td>
</tr>
</tbody>
</table>
2: Proposed Action and Alternatives

2.1 Proposed Action

GRI is proposing to design, construct, and operate geothermal well pads and wells, geothermal fluid pipelines, and their associated access roads. These facilities would be connected to the previously proposed geothermal power plant for the Patua Phase I project or to a new nominal 60MW net geothermal power generation facility, to be located on one of two privately owned sections of land within the Unit. The power plant could be located adjacent to the existing Patua Phase I power plant, or in Section 29, T20N R26E. The elements of the proposed action include:

- **Reclamation-managed lands**
  - Drill 3 new temperature gradient holes (TGHs) (no vegetation removal required)
  - Construct 14 new well pads and drill multiple wells (57 acres disturbance)
  - Construct approximately 10.5 miles of geothermal fluid pipeline and access roads (159 acres of temporary disturbance and 159 acres of permanent disturbance)
  - Construction of 1.51 miles of new transmission line if a power plant is built south of Alt 50 (18.3 acres disturbance, assuming a 100-foot corridor)

- **BLM-managed lands**
  - Drill 1 new TGH (no vegetation removal required)
  - Construct five new well pads and drill multiple wells (22 acres disturbance)
  - Construct approximately 2.2 miles of geothermal fluid pipeline and new access road (40 acres of temporary disturbance and 40 acres of permanent disturbance)

- **Private land**
  - Construct approximately 1.1 miles of new access road and geothermal fluid pipeline (33 acres of temporary disturbance and 33 acres of permanent disturbance)
  - Construct nominal 60 MW net geothermal power generation facility and generation substation (29 acres permanent disturbance)
  - Construction of 0.8 miles of new transmission line if a power plant is built south of Alt 50 (9.7 acres permanent disturbance, assuming a 100-foot corridor plus 32 acres of temporary disturbance for staging)

The project area is shown in Figure 1.1-2. The total area of disturbance for the project would not exceed approximately 620 acres. Table 2.1-1 and 2.1-2 list the estimated total disturbance areas by component and land management/ownership. This amount of estimated disturbance in Table 2.1-1 and 2.1-2 is much greater than what will likely occur, as generous disturbance corridors for roads and pipelines have been assumed. A 300 foot wide corridor has been assumed for the pipeline and
## Table 2.1-1: Disturbance Acreages by Land Management/Ownership for the Access Roads, Well Pads, Pipeline, and Power Plant

<table>
<thead>
<tr>
<th>Land Management</th>
<th>Access Roads/ Pipeline (acres)</th>
<th>Well Pads (acres)</th>
<th>Power Plant/ Substation (acres)</th>
<th>Temporary Disturbance (acres)</th>
<th>Total Calculated (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reclamation-Managed Lands</td>
<td>159</td>
<td>57</td>
<td>0</td>
<td>7 for jack and bore (^1) 159 for access roads and pipelines</td>
<td>382</td>
</tr>
<tr>
<td>BLM-Managed Lands</td>
<td>40</td>
<td>22</td>
<td>0</td>
<td>40 acres for access roads and pipelines</td>
<td>102</td>
</tr>
<tr>
<td>Private Lands</td>
<td>33</td>
<td>0</td>
<td>29</td>
<td>32 (^2) for staging 33 for access roads and pipelines</td>
<td>127</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>232</strong></td>
<td><strong>79</strong></td>
<td><strong>29</strong></td>
<td><strong>271</strong></td>
<td><strong>611</strong></td>
</tr>
</tbody>
</table>

**NOTE:**

1. For jack and bore drilling methods 1 acre of disturbance per crossing site is assumed. At least 5 sites would be crossed via jack and bore including the Alt 50 undercrossing, the three Truckee Canal crossings, and the Union Pacific Railroad undercrossing. Up to two additional crossing are proposed by jack and bore including the Hazen Drain crossing.

2. For a temporary laydown/staging area adjacent to the power plant as shown in Figure 1.1-2.

**SOURCE:** GRI 2011b

## Table 2.1-2: Estimated Temporary and Permanent Disturbance for the Transmission Line Option

<table>
<thead>
<tr>
<th>Land Management</th>
<th>Permanent Disturbance (acres)</th>
<th>Temporary Disturbance (^1) (acres)</th>
<th>Total Calculated (acres)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reclamation-Managed Lands</td>
<td>3.7 - Access Roads</td>
<td>0</td>
<td>3.7</td>
</tr>
<tr>
<td></td>
<td>0.04 - Line Support Structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Private Lands</td>
<td>2.0 - Access Roads</td>
<td>3.0</td>
<td>5.0</td>
</tr>
<tr>
<td></td>
<td>0.024 - Line Support Structures</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>5.76</strong></td>
<td><strong>3</strong></td>
<td><strong>8.7</strong></td>
</tr>
</tbody>
</table>

**NOTE:**

1. The transmission line corridors would be a maximum width of 100 feet wide over the entire transmission line route. Work could occur anywhere within this corridor, including off-road access, lying down of poles, etc. The temporary disturbance calculation estimates only those areas within the corridor where vegetation and habitat would be removed; however, a larger area would be utilized.
roadways across the entire project area. This corridor has been assumed in order to accommodate some expansion joints and turnouts, which could have a maximum width of 300 feet (assuming 150 feet would be temporary disturbance and 150 feet of permanent disturbance). In most locations, the width of permanent disturbance of pipeline and roads would only be an estimated 30 feet and temporary disturbance would be considerably less than 300 feet. Therefore, the total project disturbance will likely be significantly less than 620 acres.

Upon completion of the analysis and decision, GRI would begin development of the proposed project components. Development would begin with well field development, including access roads, well pads, and wells. The second stage of development would include construction of the power plant and transmission line (if necessary), and associated piping. Once construction is finalized, utilization, and power generation would begin. This EA also addresses decommissioning of the project.

2.1.1 DEVELOPMENT
Well Field Development
Access Roads
Description
The federal geothermal leases obtained by GRI include the right to construct and use roads and other facilities necessary or reasonably convenient to the development of the geothermal resource. Existing access roads would be used to the greatest extent feasible.

The project area would generally be accessed from Alt 50 onto Farm District Road, Jersey Lane, and California Road and then into a network of existing unpaved, unnamed roads. New access roads would need to be constructed from the existing roads to the well pad sites on Reclamation- and BLM-managed lands as part of the well field development. Additional access roads would also be constructed on the private lands. The construction corridor for the geothermal fluid supply and injection pipelines would be wide enough to accommodate vehicles for pipeline inspection and maintenance. All roads would be constructed within the existing project area as shown in Figure 1.1-2.

Design of new roads on Reclamation-managed lands would follow the guidelines for roads and access ways as specified in The Gold Book (BLM and USFS 2007). Additionally, pipeline crossings and railroad undercrossings will be designed to the Federal, State, County or City standards and/or guidelines for construction near these facilities and as required by right of way (ROW) agreements.

Construction
New access roads within the well field would be constructed to approximately 30 feet wide by clearing brush, grubbing, and grading the surface to construct a roadway; gravel may be added where required. This 30 foot corridor will include a 15 foot zone designated for the access road, as well as a 15 foot zone designated for a temporary pipeline to be used during well testing operations to transport geothermal fluids from one well to another. Existing unpaved roads would require improvement and application of a gravel base to support traffic during periods of rainfall or snow. Construction would be performed in accordance with the Gold Book (BLM and USFS
2: PROPOSED ACTION AND ALTERNATIVES

2007) standards. Access roads are shown in Figure 1.1-3. All access roads will require typical improvements and maintenance to facilitate construction and operations traffic. Any suitable topsoil would be stockpiled in a designated, previously disturbed area and covered to prevent loss. Fill material would be obtained from well pad construction. The need for additional fill material is unlikely, but would be determined on a case-by-case basis. If additional base rock or other earth materials are needed for road construction, suitable material would be obtained from a permitted gravel operation (N-86320) and/or off-site commercial sources. Typically, grades would not exceed 8 percent. Where greater gradients up to 16 percent are deemed necessary, prior approval from the surface management agency (Reclamation or BLM) would be obtained. Access roads would typically be constructed with not less than a 2 percent crown. Turnouts would be located at approximately 1,000 foot intervals or they would be intervisible (within sight of each other), whichever is the lesser.

Road drainage would be facilitated on an as needed basis by the incorporation of drainage dips, in-sloping or out-sloping, crowning, utilization of natural topography, ditches, and/or culverts. If during construction, it is determined that culverts or drainage crossings are required, they would be designed for a minimum 25-year storm frequency.

All vehicle traffic associated with the project would be restricted to the designated access roads. Speed limits of 10 to 30 mph would be observed on all unpaved roads in the project area in order to minimize generation of airborne dust. In order to minimize the effects of wind erosion, access roads and other disturbed areas would be watered on an as needed basis.

GRI would use a privately-owned bridge in order to cross the Truckee Canal in Section 30 (Figure 1.1-3), provided access approval is granted from Reclamation and the bridge owners. Alternatively, the site would be accessed from Highway 95 onto Mull Lane then across Desert Shadows Lane, which runs just south of the Truckee Canal. Access routes are shown in Figure 2.1-1. GRI will review the specific load rating for the bridge and assess any construction equipment that is planned to utilize the bridge. Prior to dispatching any heavy loads across the bridge, GRI will submit to Reclamation a correspondence detailing the traverse(s), reason for traverse(s), type of heavy vehicle(s), and estimated load(s) in order to obtain permission to use the bridge.

GRI may also need to use short portions of the operations and maintenance roads that are currently used to access the Truckee Canal laterals (shown in Figure 1.1-2 and access routes are shown in Figure 2.1-1). GRI would obtain permission from Reclamation for use of these road segments. Once a plan has been submitted for upgrading these road segments to AASHTO U80 and canal design standards, Reclamation would review and approve final design.

**TGHs**

**Description**

GRI would drill 4 new TGHs. The approximated location of the TGHs is shown in Figure 1.1-2. Locations may be adjusted to the well pads or surrounding surveyed areas depending on site conditions. The final location for the TGHs will be identified in the Notice of Intent as required under 43 CFR Subpart 3250. Three of the TGHs would be located on Reclamation-managed land and one TGH would be located on BLM-managed lands in Section 6. The TGHs are wells that are used to identify and analyze subsurface temperature conditions. The TGHs would not produce
Figure 2.1-1: Access Routes to the Project Area
geothermal fluids, and would be used exclusively for determining temperature gradients (change in temperature with depth).

The TGHs would be approximately 1,000 feet deep. Well diameter and casing would be as follows:

- 12.25 inches for the first 20 feet for the placement of conductor, with 9.625 inch casing
- 8.5 inches to 500 feet depth with 7 inch casing 6.125 inches from 500 to 1,000 feet depth with 2.375 inch tubing

**Drilling**

No well pad or vegetation clearing is required for drilling of the TGHs. A truck mounted rig is moved to the site. The exact location of the well would be in a location where no vegetation clearing would be required. A steel mud pit/tank and a 12 foot round water tank would be set up on the site. The four TGH sites would be located beside existing access roads to minimize environmental impacts. The well would be drilled using a bentonite gel-based mud to circulate the drill hole cuttings to the surface. The well would be fitted with blowout prevention equipment (BOPE) of industry standard and will consist of a 3,000 lbs double gate ram preventer or equivalent design. A water-filled cap tubing would be run into the hole to total depth and hung just above the bottom of the well. The tubing would be allowed to equilibrate with formation mixtures to run temperature surveys.

Water for drilling would be trucked to the site. The area around the drill rig, mud tank and water tank would be fenced with a standard three strand barbed wire fence, using metal T post once the drilling is complete. Sanitary facilities would be provided while drilling. Drilling would take approximately a week per well. Drilling would occur 24 hours per day, 7 day per week by a crew of about ten or less.

Within one year of construction, GRI would plug and abandon the TGHs in accordance with BLM standards and guidelines. Any site reclamation would be performed and fencing removed.

**Well Pads**

**Description**

GRI is proposing to construct a total of 19 new well pads, with 14 new well pads on Reclamation-managed lands (on BLM leases within the Unit) and 5 new well pads on BLM-managed lands. The township and range, section number, and approximate Universal Transverse Mercator (UTM) coordinates for the center of each well pad and road area are shown in Table 2.1-3. These locations may be adjusted or realigned within the project area, based on results of drilling. The new well pads proposed within Sections 28 and 30, on Reclamation-managed lands, are all within the Unit on lease NVN-085705. The new well pads proposed within Section 32, on Reclamation-managed lands, are within lease NVN-76139. The new well pads proposed within Section 6, on BLM-managed lands, are within lease NVN-77739.

New well pads would be approximately 350 feet by 500 feet in size to accommodate two or more wells, as necessary. Wells 16-28, 32-32, 37-32, and 87-32 will be approximately 350 by 350 feet in size due to resource constraints. Each well pad would have a reserve pit for containment and temporary storage of drill cuttings, waste drilling mud, and storm water runoff from the
constructed pad. The reserve pit would be 200 feet by 60 feet and an average of 10 feet deep with a capacity of an estimated 900,000 gallons. No hazardous materials would be placed into the reserve pits. Geothermal fluid produced from the well during flow testing would also drain to the reserve pit. Drilling fluid and cuttings will be sampled per the requirements of Federal, State and Local laws and disposed of in the prescribed manner.

The reserve pits and impoundments on well pads containing liquids as well as around drill rigs (as previously described) would be excluded from wildlife access by fencing, netting, or covering at all times when not in active use, in accordance with the Gold Book (BLM and USFS 2007) standards as shown in Figure 2.1-2. The fencing would be used to prevent access by persons, wildlife, or livestock. The fencing design would address hydrologic criteria, would be designed to protect wildlife and livestock, and to provide security. Fencing would not impact drainages as no well pads would be located within drainages or ephemeral washes.

The layout of a typical well pad is shown in Figure 2.1-3. Well pad facilities and equipment needed for the development phase include a drill rig and ancillary equipment, such as generators, support trailers, and well testing equipment. Assuming a line shaft type pump is used for the production wells, the production well pads would require:

- A step-down transformer (12 kilovolts (kV) to 4,160 volts (V)),
- A power distribution center (PDC), which houses the motor control equipment,
- A utilities system enclosure (USE), which houses other auxiliary systems, and
- A building, approximately 400 square feet in size, to house the equipment.

The building would contain all electrical, instrumentation, and control equipment required to power and monitor the production well pump. The building would contain the auxiliary equipment (i.e., lubrication, cooling water, etc.) required to support the production well pump. Required electric power will be delivered to the well pad via cables typically installed in steel conduit or cable trays constructed on the pipe supports adjacent to the pipeline; in some locations they will be direct buried along the pipeline route.

**Construction**

Site preparation for the geothermal well pads consists of standard grading practices, including clearing and grubbing the native ground surface, as needed, and then constructing a nearly level well pad. The pad would have a minor slope to the excavated reserve pit in order to direct surface water. Each well pad is covered with compacted gravel to protect the pad surface from erosion and to provide a sufficient base for vehicular traffic and drill rig foundation. Based on the existing topography at each well pad location, grading would consist of varying, but minor degrees of cut and fills, and would be performed in general accordance with local standards and The Gold Book (BLM and USFS 2007). Any suitable topsoil would be stockpiled on site for later use during restoration. Fill material would be obtained from well pad construction. The need for additional fill material is unlikely, but would be determined on a case-by-case basis. If additional base rock or other earth materials are needed for road or well pad construction or maintenance, they would be obtained locally from one of the following sources:
Figure 2.1-2: Gold Book Construction Standards for Fencing

SOURCE: BLM 2007 AND USFS 2007
The gravel operation within the Unit located east of Black Butte, in Section 24, T20N, R26E, MDBM, permitted separately under the jurisdiction of the Winnemucca District of the BLM (N-86320), and through a Special Use Permit from Churchill County (Figure 1.1-3)

- Local commercial sources

The estimated not to exceed acreage of disturbance for construction of the well pads is shown in Table 2.1-1.

<table>
<thead>
<tr>
<th>Kettleman Number</th>
<th>Lease #</th>
<th>Township/Range</th>
<th>Section Number</th>
<th>UTM Coordinates (NAD 83)</th>
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<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>E (X)</td>
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<tr>
<td><strong>Proposed Well Pads on Reclamation-Managed Lands</strong></td>
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<td>321531.5</td>
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<tr>
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<td>20N/26E</td>
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<td>322180.5</td>
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<td>NVN-85705</td>
<td>20N/26E</td>
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<td>32, NW ¼ of the SW ¼</td>
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<td>32-32</td>
<td>NVN-076139</td>
<td>20N/26E</td>
<td>32, NW ¼ of the NW ¼</td>
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<td>37-32</td>
<td>NVN-076139</td>
<td>20N/26E</td>
<td>32, SE ¼ of the SW ¼</td>
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<td>52-32</td>
<td>NVN-076139</td>
<td>20N/26E</td>
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<td>87-32</td>
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<td>14-6</td>
<td>NVN-077739</td>
<td>19N/26E</td>
<td>6, SW ¼ of the NW ¼</td>
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<td>22-6</td>
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<td>58-6</td>
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</table>
Figure 2.1-3: Layout of a Typical Well Pad

Notes: S: surrounded by perimeter berm and sloped to drain toward reserve pit with the exception of the laydown area for the drill rig which must be level.

Rig Laydown Area:

Note: Final well pad layout will be provided by drilling contractor
Production and Injection Wells

Description

The project would require drilling of several production and injection wells. GRI has identified tentative well pad locations, as shown in Figure 1.1-2, although well pads may be adjusted or realigned within the overall project area. Multiple wells may be drilled per pad.

Based on the anticipated geothermal resource temperature of approximately 325°F, it is estimated that approximately 41,500 gallons per minute (gpm) of geothermal fluid production would be required to support a nominal 60 MW net of electricity generation. Based on an expected individual production well flow rate of approximately 2,000 gpm and allowing for back-up wells, up to 23 individual production wells could be required to support the nominal 60 MW net power plant.

Each production well would be outfitted with a well pump (line shaft or electric submersible) and its necessary electrical and control systems. The well flow rates, pressures, and temperatures would be continuously monitored in the power plant control room. The operators would be able to shut-in a well and shut-down each pump in the event of problems. The specific size and configuration of the well pump support facilities would vary depending upon the specific well pump type and manufacturer selected.

Geothermal fluid injection wells are a necessary component to the efficient and sustainable utilization of the geothermal resource. Injection wells are strategically placed in order to provide resource recharge, support reservoir pressure, and to ensure that injected geothermal fluids are not directly reproduced. Although unlikely, injection wells may be located on the same well pad as production wells; however, their depths would be significantly different from those of the production wells. A typical injection well pad has a sump and one to three injection wells. Each injection wellhead assembly consists of a set of shut in valves and monitoring instrumentation; the entire assembly can be on the order of 10 to 12 feet high.

The number and location of injection wells is a function of various resource variables that are not known at this time; therefore the number and location of injection wells cannot yet be defined. Injection wells, however, would only be drilled within the 19 well pads currently addressed in this EA and presented in the project’s Utilization Plan. These well pads would be sufficient to accommodate all production and injection wells. Injection pipeline would follow the production pipeline routes also identified in this EA and the project’s Utilization Plan.

Drilling

The geothermal drilling and testing operations would be conducted in accordance with federal, state, and local requirements. Prior to beginning drilling, a GDP would be submitted to the BLM and Reclamation for each well in addition to the appropriate permits required by NDOM and NDEP. GDPS would be submitted for each well and would contain specific information regarding hole size, casing requirements, wellhead design, drilling fluids, cementing, directional drilling, blowout prevention equipment (BOPE), and testing. After permitting requirements have been satisfied, GRI would give at least 24 hours notification to the appropriate contacts at BLM and NDOM prior to spudding the wells, setting casing, drill stem testing, or well testing operations.
The production wells are each designed to reach total depths of 7,000 to 10,000 feet. A typical 10,000 foot deep hole drilled by a standard rotary drill rig requires approximately 65 days to complete, drilling on a 24 hours per day, 7 days per week basis. Drill crews would work in two shifts per day, consisting of five people per shift.

During drilling, the top of the drill rig mast could be as much as 178 feet above the ground surface, and the rig floor could be 20 to 30 feet above the ground surface. Figure 2.1-4 shows an example drill rig.

All wells would be cased to a depth below the lowest groundwater aquifer to prevent commingling of fluids, in compliance with appropriate sections of the NRS 534A.010 through NRS 534A.090 and all other applicable local, state, and federal regulations. A data collection system would be implemented during drilling to gather information about the hydrologic aquifers encountered during drilling, in accordance with lease stipulations; specifically, “Special Stipulation for Water Resources,” which requires a hydrologic monitoring program be implemented and submitted to BLM.

Compressed air may be added to the drilling mud to reduce the weight of the drilling fluids in the hole and assist in carrying the cuttings to the surface. The air, any drilling mud, rock cuttings, and any reservoir fluids brought to the surface would be diverted through the separator/rock muffler.

![Figure 2.1-4: Typical Production Well Drill Rig](SOURCE: GRI 2010)
to separate and discharge the air and water vapor to the air and the drilling mud and cuttings to the reserve pit.

Each production well may need to be worked over or redrilled if mechanical or other problems that prevent proper completion of the well in the targeted geothermal reservoir are encountered while drilling or setting casing, or if the well does not exhibit the anticipated permeability, productivity, or injectivity. 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 moving the rig over a few feet on the same well pad and drilling a new well bore through new conductor casing. Well workovers or redrilling may take place during production and utilization.

In order to maintain maximum sump capacities for future drilling and testing operations, GRI may choose to separate the drill cuttings from the drill mud prior to their disposal in the sump. These cuttings may then be used by GRI as fill material for road repair and pad construction, or removed and disposed. Cuttings from test wells would be tested by a certified lab for hazardous wastes. Using the federally mandated Toxicity Characteristics and Leaching Profile testing methods, each sample would be tested for heavy metals, volatile, and semi-volatile organic properties. If the samples are considered toxic, they would not be used and would be disposed at a landfill that accepts hazardous wastes.

**Well and Reservoir Testing**

GRI plans to conduct two types of well tests on completed wells: rig tests and long-term stratum/reservoir tests. A rig test involves flowing the geothermal well for several hours with the drilling rig still in place to identify the temperature and pressure and determine that the wellhead pressure has stabilized, and that no additional drilling is needed. During a rig test, the well flows from the blooie line (the line from the wellhead) to a vertical atmospheric separator (also called a silencer or a muffler). After the rig test, the well is shut in, and the rig and BOPE are removed from the well.

Long-term flow tests are conducted after the drilling rig has been moved off the well site and testing equipment has been set up adjacent to the wellhead. GRI would discharge geothermal fluid from long-term pumping tests to the reserve pit at the well pad being drilled or convey the fluid to other well pads approved for this purpose through the temporary pipelines placed in the roads, as previously described. The reserve pits would be constructed to impede infiltration of fluids to groundwater. GRI would inject the remaining fluids in accordance with NDOM permits and requirements.

The primary objective is to maximize the ultimate recovery of geothermal fluids with minimum waste, minimum adverse effects on the reservoir, and to establish the mechanical and physical conditions of the wellbore and the connectivity of the producing formations. GRI would use flow tests to evaluate these conditions, by moving formation fluids to adjacent wellbores and monitoring all relevant field-wide wellbores for pressure deviations. This will be accomplished by running a temporary pipeline, immediately adjacent to the access road, and transferring fluids using a high pressure pump and recording pressure deviations on all wellheads. The duration of the long-term tests is dependent on the flow of the wellbore and the duration required for equilibrium, but is typically between 15 and 90 days. During testing, the wellhead pressure and
temperature as well as the flow rates of steam and water are recorded in order to calculate the productivity of the well.

**Shut-In and Well Maintenance**

Upon completion of well testing the well test equipment would be dismantled and either stored on the pad until needed at the next well, or it would be removed from the site. A pressure gauge would be placed on one of the wing valves for occasional pressure checks. Wellheads would be maintained on a regular basis.

**Well Completion**

Production wells are drilled to permit the hot brine to be pumped from the geothermal resource. Pumps would be installed within the production wells at appropriate depths. Pumps would consist of electrical motors, multi-stage pumps, oil seals, subsurface instrumentation, and electrical cable. Surface equipment at the wellhead will consist of variable speed drives, controllers, and transformers. Injection wells are drilled to allow the cooled geothermal brine to be injected back into the geothermal resource.

**Well Abandonment and Pad Reclamation**

Final site reclamation would be conducted on the well pads and access roads when it is determined that the well pads would no longer be used for exploration, utilization, or any other purposes. During operations, interim reclamation would be conducted for the well pad areas no longer needed for operation or maintenance. The actual areas of the well pads that would undergo interim reclamation would be determined on a case-by-case basis and would be a function of the number of well heads and the configuration of pipelines and other required well facilities on each individual pad. All reclamation would be conducted in general accordance with The Gold Book (BLM and USFS 2007). A final plan for site reclamation and abandonment will be prepared by GRI and approved by the BLM and Reclamation prior to implementation.

Native soil material and organic matter (topsoil) salvaged from site preparation operations would be reused as a top-dressing on berms and other areas requiring revegetation to the extent practical. Any topsoil stockpiles would be located on previously disturbed areas, such as portions of well pads, and would be situated so that wind and water erosion of the piles are minimized and the reclamation potential of the soil is maintained. Other erosion control measures may include surface seeding and moisture conditioning. Native topsoil generally contains native seeds and microorganisms essential for nutrient cycling and when reused should blend well with the adjacent undisturbed landscape. Any seed mix to be used for reclamation purposes would be developed by an experienced botanist in coordination with the BLM and Reclamation and would ultimately be based on seed availability and quality. Reseeding would not be undertaken in areas where soil conditions are inappropriate, or where the adjacent undisturbed land surface has little or no vegetation, as determined in coordination with a qualified biologist.

If any wells are determined to not have commercial potential, they may continue to be used for data collection or may be abandoned in conformance with the well abandonment requirements of the BLM and NDOM. Abandonment typically involves plugging the well bore with cement sufficient to ensure that fluids would not move across into different aquifers.
Source and Consumption Rate of Water During Development

Water for drilling and construction could be obtained from one or a combination of the following sources:

- On-site water wells: Applications could be submitted to the NDWR for approval to drill one or more water wells for dust control and soil compaction purposes during construction of the proposed geothermal well pads and access roads.
- Water purchased from private parties: Numerous private parties have been identified in the area that have water available for sale on existing water rights.

If obtained from on-site sources, water wells would be temporary, drilled by a licensed water well driller, and plugged and abandoned in accordance with Nevada Administrative Code (NAC) 534.420.

One portable water tank holding at least 10,000 gallons would be maintained in the project area during construction. Additional water trucks would also be used to transport water to the site and would be used to water roads.

The amount of water required for drilling purposes would vary depending on many factors (hole diameter, hole depth, hole duration, mud requirements, etc.). Up to 20,000 gallons per day of water is required for production and injection well drilling.

Water requirements for well pad, access road, pipeline, and power plant construction, and dust control would average substantially less than that required for drilling. Dust control would be performed on an as needed basis during construction and maintenance operations to adequately suppress dust. More water would be required during hot and dry summer months than cold and wet winter months.

The amount of water required for soil compaction during construction of the well pads and access roads cannot be reasonably estimated at this time. Generally speaking, water required for soil compaction is a function of in situ soil moisture content, required compaction percentage, weather conditions during compaction, and other factors that are unknown at this time. GRI will comply with all applicable Federal, state and local soil compaction requirements.

Generation System Development

Collection and Injection System Piping

Description

General Description. The collection and injection system piping would be located on both Reclamation- and BLM-managed lands and private lands. The pipeline would also need to cross other ROWs/corridors including under the Truckee Canal, under Alt 50, and under the Union Pacific Railroad. An estimated 10.8 miles (159 acres of temporary disturbance and 159 acres of permanent disturbance) of pipeline would be installed on Reclamation-managed lands, approximately 2.1 miles (40 acres of temporary disturbance and 40 acres of permanent disturbance) of pipeline would be installed on BLM-managed lands, and approximately 1.1 miles (33 acres of temporary disturbance and 33 acres of permanent disturbance) would be constructed on private lands.
2: PROPOSED ACTION AND ALTERNATIVES

The geothermal fluid pipelines would transport the hot geothermal fluids from the production wells to the power plant and transport the cooler geothermal fluids from the power plant to the injection wells. The proposed construction corridor width is 300 feet to accommodate pipeline widths, expansion joints, and the access road. The final width would be approximately 80 feet (15 feet for pipelines, 15 feet for roads, and 50 feet for expansion joints) but could be as much as 155 feet. The well field piping would consist of nominal 16- to 42-inch-diameter, seamless, carbon steel pipe. The piping would have 2 to 3 inches of insulation with a protective aluminum sheath to minimize thermal losses and for personnel protection. The color of the outer layer would be selected to blend with the surrounding area. The pipeline would be placed above ground, except for sections along road crossings, where the pipeline would be installed underground. Schematics of the typical pipeline footings are presented in Figure 2.1-5, which shows the diameter range and depth for the different types of footings.

The pipeline would be designed to minimize the number of thermal expansion loops, thereby requiring less piping and disturbing less area. Electrical cable in cable trays would be routed along pipelines to the production wells, to power the production well pumps. Fiber optic cable would also be installed in the cable tray system to support production well field communications and control to the master control data collection system (DCS).

The geothermal fluid pipelines would be designed to minimize failures. Special design considerations would be given to the strategic placement of thermal expansion loops and anchor supports, sufficient corrosion allowances and the installation of safety control systems. In the event of over-pressurization, the operators would trim the production wells to reduce the pressure. In the unlikely event of sudden under-pressurization, indicating a major leak or pipe rupture, the operators would shut-in the production wells, until the necessary repairs can be made. A check valve system would be installed to prevent back flow from the injection system.

When it becomes necessary, each expansion loop would be designed to accommodate its unique set of criteria; an example of a horizontal expansion loop is shown in Figure 2.1-6. Although the figure depicts a typical expansion loop to be approximately 30 feet by 30 feet, expansion loops could be as large as 50 feet by 50 feet (Figure 2.1-6). The pipeline would be designed to minimize the number of thermal expansion loops, thereby requiring less piping and disturbing less area. The pipelines would be primarily above ground with supports placed at approximately 30 feet on center; however, certain sections of the pipeline could be buried underground in order to cross under roadways, including Alt 50, and under canals. Support foundations would consist of prefabricated concrete spread footings, founded as recommended by the project geotechnical engineer during construction. A plan view of a pipeline corridor showing production pipeline, expansion joints, the road, and injection pipeline is presented in Figure 2.1-7.

**ROW Crossings.** The proposed pipelines must cross linear features of the landscape, such as the Truckee Canal, Hazen Drain, laterals, Alt 50, and the Union Pacific Railroad. ROWs for these features in the project area are shown in Figure 2.1-8. Special considerations will need to be taken into account for the site specific design of each of these crossings. In each case, GRI must obtain approval from the relevant agency or owner prior to commencing construction of the crossing.
Figure 2.1-5: Typical Geothermal Fluid Pipeline Supports
Figure 2.1-6: Typical Horizontal Expansion Loops

Figure 2.1-7: Plan View of Pipeline, Road, and Expansion Joint Corridor
Figure 2.1-8: Existing ROWs in the Project Area

- **Legend**:
  - Yellow: Option 1 Proposed Power Plant
  - Orange: Option 2 Proposed Power Plant
  - Purple: Union Pacific Railroad Road 40ft ROW (Project Area Only)
  - Purple: Highway Alt 50 23ft ROW (Project Area Only)
  - Green: Kinder Morgan Gas Pipeline
  - Pink: Existing 500 kV Transmission Line
  - Cyan: Truckee Canal
  - Light Blue: Lawns
  - Red: Hazen Drain
  - Orange: Major Surface Disturbance Identified by Aerial Image (9/28/2006)
  - Green: Diatomite Mine Access Road
  - Yellow: NDOT Materials Mine
  - Red: Proposed Geothermal Fluid Pipeline Corridors Including Proposed Access Roads
  - Orange: Option 2 Transmission Line (and Access Road)
  - Gray: Highways
  - Yellow: Option 2 Interconnection Point (To permitted Patua interconnection line)
  - Green: Proposed Tongue Well
  - Red: Proposed Tongue Pad

- **Notes**:
  - Hazen Mine: Major surface disturbance identified by aerial image (9/26/2006). The limits of the mining resource are currently under investigation.


- **Map Scale**: 1:50,000

Patua Geothermal Project – Phase II

2-19
The pipeline would cross beneath the Truckee Canal, Hazen Drain, Alt 50 and Union Pacific Railroad. The Truckee Canal and Hazen Drain crossings would require approval from Reclamation; the Alt 50 crossing would require approval from the Nevada Department of Transportation (NDOT); and, the railroad crossing would require approval from the Union Pacific Railroad. The proposed pipelines would also cross over a Kinder Morgan gas pipeline and under Los Angeles Department of Water and Power (LADWP) high voltage DC transmission line.

**Truckee Canal Undercrossings.** The geothermal pipelines would cross the Truckee Canal in three locations (see Figure 2.1-8 and Figure 1.1-2). The Truckee Canal would be crossed underground, in a tunnel below the canal. Geotechnical investigations would be conducted to assess the feasibility of the crossings and the crossings would meet Reclamation’s Engineering and Operations and Maintenance Guidelines for canal crossings. The geotechnical evaluation and final design of an underground crossing would be reviewed and approved by Reclamation.

**Alt 50 Undercrossing and Union Pacific Railroad Undercrossings.** The geothermal pipelines would cross Alt 50 in two locations (see Figure 1.1-2) and the Union Pacific Railroad in one location. The pipeline would be installed in a tunnel underneath each of these features.

**Hazen Drain and Lateral Crossing.** The geothermal pipelines would cross beneath the Hazen Drain in Section 28, T20N, R26E using a jack and bore technique as described for the Union Pacific Railroad undercrossing. In Section 32, T20N, R26E, the geothermal pipeline would cross two separate laterals connected to the Truckee Canal. The crossing would be made either over or beneath the laterals. A typical pipeline support would be installed outside of the toe of the lateral canal embankment and the pipeline would span the lateral. The lateral may also be crossed using an expansion loop (Figure 2.1-6). Alternatively, the pipeline would be installed beneath the laterals.

**Mining Operations.** Three separate mining operations are currently located within the proposed project lease area as shown in Figure 1.1-2. A gravel mine is located in Section 30, a diatomaceous earth mine is located in Section 6, and an NDOT materials recovery site is located in Section 32. The gravel operations within Section 30 may include expansion in the future due to the potential for sizeable gravel deposits within the Section. Well pad locations were determined in coordination with Reclamation as shown in the project figures; however, if well pads need to be re-sited, GRI would work with Reclamation to conduct a gravel exploration program to determine the extent of the mineral resource and future mining operations. If deposits are found project features would be sited to accommodate future mining activities. The diatomaceous earth mining operations do not intersect with the proposed project facilities. The operation of the mine is not anticipated to be affected by project construction or operations and no modifications or special considerations for the construction of project pipelines would be necessary.

NDOT operates a materials site in Section 32 (Figure 2.1-8). The pipeline would be constructed within the materials site area. GRI would obtain permission from NDOT prior to construction of the pipeline through this area.

**Other Crossings.** The pipeline would also cross a Kinder Morgan underground gas pipeline as shown in Figure 2.1-8. The exact location of the underground gas pipeline will be identified during the field survey. The geothermal pipeline foundations would avoid the underground pipeline. The
geothermal pipeline would be installed above the ground surface. Kinder Morgan would be informed of the crossing and the pipeline design in the project area to ensure that future maintenance of both pipelines is feasible and safe.

The pipelines would also cross under the LADWP high voltage DC transmission line (Figure 1.1-2) in five locations. Where the pipeline crosses adjacent access roads for the transmission line, the pipeline would be installed under the roads.

**Construction**

**Pipeline**

Construction of the above ground portions of the pipeline could require temporary ground disturbance in areas beneath pipeline alignments during construction, including where the pipeline crosses roads. Permanent disturbed areas beneath the pipeline would only consist of areas where pipe supports and their foundations would be located.

Individual foundations for geothermal pipeline supports would be designed by the project geotechnical engineer. Foundations would be excavated to a suitable depth and their construction, including width and depth would be determined on a case by case basis and would generally consist of conventional spread footings or drilled shafts as required by local soil conditions. Waste material would be stockpiled and utilized for further grading activities.

Where pipelines cross roads, the pipe sections would be outfitted with a pipe sleeve and buried in an excavated trench. Pipe support foundations would be excavated approximately every 30 feet along the pipeline alignment and would comply with the recommendations of the project geotechnical engineer. Foundation excavations can be accomplished with very little surface disturbance along the route. Grading of the pipeline access roads, as necessary, may be required in certain areas for ease of maintenance during operations. The Truckee Canal would be completed as a jack and bore or HDD installation, and Alt 50, Union Pacific Railroad, and the Hazen Drain crossings will be completed as a jack and bore installation, described below.

Native soil material and organic matter (topsoil) would be salvaged during construction of the pipelines and roads and stockpiled along the right of way. The piles would be covered or otherwise protected to minimize wind and water erosion. Other erosion control measures may include surface seeding and moisture conditioning. Native topsoil generally contains native seeds and microorganisms essential for nutrient cycling and when reused should blend well with the adjacent undisturbed landscape. Any seed mix to be used for reclamation purposes would be developed by an experienced botanist in coordination with the BLM and Reclamation and would ultimately be based on seed availability and quality. Reseeding would not be undertaken in areas where soil conditions are inappropriate, or where the adjacent undisturbed land surface has little or no vegetation, as determined in coordination with a qualified biologist.

During construction, pipe sections would be delivered and placed along the pipeline corridor until they are ready to be lifted into place. A small crane would be used to lift the pipe sections onto the pipe supports and pipe jacks so they can be welded into place. A Fire Plan would be prepared and approved by Reclamation and BLM prior to construction of the pipeline. Electric power and instrumentation cables would either be installed in steel conduit or cable trays constructed on the
pipe supports, adjacent to the pipeline, or would be buried along the pipeline route. The estimated total acreage of disturbance for construction of the collection and injection system piping is shown in Table 2.1-1.

**ROW Crossings and Geotechnical Investigations**

*Geotechnical Investigations.* Geotechnical investigations would be performed to develop geotechnical design recommendations for the ROW crossings under the Truckee Canal. The results of the investigations would address, but are not limited to, the following:

- Geologic hazards
- Seismic design criteria
- Corrosion potential
- Structural backfill requirements
- Slope stability and shoring alternative, as appropriate
- Site drainage and erosion control requirement
- Potential construction problems

The investigations would include researching published geologic maps and fault hazard reports to establish the presence of any documented geologic hazards at the site. Existing geotechnical reports for the project in the area would be reviewed, as available. Exploration activities would include drilling two test borings at each crossing (crossings are shown in Figure 1.1-2) to adequately reveal soil and groundwater conditions. One boring would be located on each side of the canal at each crossing. All borings would be set back from the toe of the existing embankment by 15 feet or more. An all-terrain drill rig would be used. Borings would be drilled to a depth of 35 feet, using an 8-in-diameter hollow-stem auger. Soil samples would also be taken and would be sampled with a two-inch-outside diameter split-spoon sampler driven by a standard 140 pound drive hammer with a 30-inch stroke. Sample intervals would be every two feet from the bottom of the canal to 25 feet below the bottom of the canal. A total of 12 to 13 samples would be taken from each 2-inch diameter hole. All borings would be backfilled with two-sack cement grout. Larger diameter in-place samples would be taken if compressible or expansive soils are present. Material encountered during exploration would be logged in the field by a geotechnical engineer. The groundwater level would be measured in each boring after the level reaches equilibrium.

*Truckee Canal.* The final design for the canal undercrossing would be submitted to Reclamation for review and approval after GRI completes the geotechnical evaluation. Recommendations from the geotechnical studies would be implemented. GRI has proposed two (2) options to complete the Truckee Canal Crossing:

1. Option 1 – Underground by jack and bore installation
2. Option 2 – Underground by horizontal directional drilling (HDD)

The appropriate option would be determined after completion of geotechnical evaluations. Each method is briefly described below – all would be located on previously surveyed and disturbed areas.
Option 1. The jack and bore installation would be completed by first constructing an entry pit on one side of the canal and a receiving pit on the other side (Figure 2.1-9). The depth of the...
bore hole would be determined through the completion of a geotechnical evaluation. A boring machine would then be used to drill a bore hole from the entry pit, beneath the highway, to the receiving pit. Drill mud would be used during drilling and pullback to lubricate the hole and prevent collapse/swelling; any excess mud would be removed via a vacuum system. Casing would be attached to a pulling head and pulled back through the drilled hole. Grades and curvature radii would be monitored via a tracking system.

Option 2. HDD is a technology commonly used for pipeline crossings under watercourses and other surface features that cannot be reasonably crossed above-ground. HDD is a method of trenchless drilling. There are four main steps of the HDD process, demonstrated in Figure 2.1-10, which include:

- Site analysis and planning
- Drilling of initial hole
- Reaming of the hole
- Pulling pipe back through the hole

Site analysis and planning initially involves review of existing geological data and/or geotechnical evaluation of the subsurface at the location of the undercrossing. The review process would evaluate whether HDD is appropriate for the specification location. In the case that HDD is not suitable for the location, a more traditional jack and bore technology may be more appropriate. Based on initial review and on Reclamation’s Engineering and Operations and Maintenance Guidelines, the location of drilling path, including entry and exit points, would be determined.

Surface disturbance associated with HDD would include clearing and grading of the entry and exit sites. Typical equipment required at the entry point for HDD would include a directional drilling rig, generator(s), drill pipe and pipe racks, a water pump as well as a drilling mud pump and handling system. At the exit point for HDD, typical equipment required would include a mud containment tank, cuttings settlement tank, pipe used for the pipeline, pipe racks, rollers and pipe handling equipment, a boom truck or crane, as well as welding, coating and testing equipment. Access to a water source would also be required during HDD activities.

Alt 50, Union Pacific Railroad, and Hazen Drain. Alt 50, the Union Pacific Railroad, and Hazen Drain would be undercrossed using a jack-and-bore method. A jack and bore would be completed by first constructing an entry pit on one side of the linear feature and a receiving pit on the other side. A boring machine would then be used to drill a bore hole from the entry pit, beneath the highway, to the receiving pit. Drill mud would be used during drilling and pullback to lubricate the hole and prevent collapse/swelling; any excess mud would be removed via a vacuum system. Casing would be attached to a pulling head and pulled back through the drilled hole. Grades and curvature radii would be monitored via a tracking system. The depth of the bore hole would be determined through the completion of a geotechnical evaluation, performed in accordance with Nevada Department of Transportation (NDOT) or other applicable specifications (depending on the feature). The bore hole diameter would be sufficient to contain the geothermal fluid pipeline.
All State, local and OSHA rules as well as NDOT specifications would be adhered to for excavated pits and work done within the pits. All underground utilities would be located by the contractor before any work would begin to ensure that the bore will sufficiently clear existing utilities and structures. All drain inlets or other drainage flow lines would be protected with the appropriate erosion and sediment control measures (i.e. silt fence, straw wattles, straw bales, geo-fabric).

_Lateral Crossings._ In Section 32, T20N, R26E, the geothermal pipeline would cross two separate laterals connected to the Truckee Canal. Two (2) options are proposed for the lateral crossings:
Option 1. Consists of crossing under the laterals and would involve the construction of a trench spanning each lateral’s width and access pathways on either side. Geothermal fluid pipelines would be installed inside of the trenches and subsequently backfilled according to Reclamations standards as well as the project geotechnical engineer’s recommendations. Pipelines would resurface at a distance sufficient to allow vehicular access along each side of the laterals. The installation would occur when the lateral has no water in it.

Option 2. Consists of constructing a vertical expansion joint over each lateral’s width and access pathways on either side. Geothermal fluid pipelines would be constructed to a height sufficient to allow Reclamation equipment to pass beneath.

Mining Operations. Construction of the pipeline in the areas of mining operations would be performed above ground using the same methods as previously described for above-ground portions.

Other Crossings. Kinder Morgan has prepared a “Guidelines for Design and Construction near Kinder Morgan Operated Facilities” that would be incorporated into the design of the three locations where the geothermal pipeline would cross the Kinder Morgan pipeline. GRI would provide Kinder Morgan a set of drawings for review showing the proposed design of the facilities in the vicinity of the Kinder Morgan ROW.

Roadways would be crossed underground. The pipeline would be installed by trenching through the road and placement of the section of pipeline underground. Note that Alt 50 would be crossed using a jack and bore method. The smaller roadways within the project area may require temporary closure to construct the crossings. Temporary blockage of some roadways may occur during construction; however, construction of the pipeline crossings would be completed quickly (usually in less than a day) and alternative routes around the construction areas would be available. GRI would prepare a Traffic Management Plan for review and approval by Lyon and/or Churchill County and Reclamation prior to construction. The plan would identify road closures and alternative routes.

Schedule

Construction of the geothermal piping system would occur simultaneously with construction on the well pad facilities. An estimated 9 to 10 months is required to construct the facilities in the pipeline corridor. Construction of the pipelines and the associated access roads requires approximately 30 workers over a period of approximately 11 to 12 months.

Power Plant and Generation Substation

Description

The project would either connect into the previously proposed nominal 60 MW net power plant, or, if a large enough resource is encountered and geothermal fluid can be conveyed, a new nominal 60 MW net power plant and substation would be constructed. If a new power plant must be constructed, it would be located entirely on privately-owned land within the Unit on Section 21 or Section 29 of T20N, R26E, MDBM. In either location, the power plant and substation would be sited to minimize environmental effects and would require an area of approximately 29 acres. The substation would connect to the 120 kV transmission line addressed in the approved Patua Phase I
EA, DOI-BLM-NV-C010-2010-0016-EA, either directly or through a new 2.31 mile transmission line if the power plant is constructed in Section 29. The capacity of the previously approved transmission line is adequate for transmission of power generated by both projects.

The power plant and substation would be engineered and constructed in accordance with applicable industry standards. The plant systems and equipment would be designed and selected for a commercial life of 30 years. An annual capacity factor of 90 percent or greater is expected and is a reasonable estimate, based on existing operations of binary geothermal power plants. The typical parts of the power plant are identified in Table 2.1-4.

GRI proposes to construct the power plant utilizing a binary power plant design. The power block is that portion of the plant that receives geothermal brine from the well field, converts the heat of the geothermal brine into electrical power, and pumps the brine back to the well field. This part of the plant would consist of up to six generation modules (Figure 2.1-11).

<table>
<thead>
<tr>
<th>Table 2.1-4: Power Block Components</th>
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<td>Component</td>
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<td>Gearboxes</td>
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<td>Electrical Generators</td>
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<td>Working Fluid Cycle Pumps (“Process Pumps”)</td>
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<tr>
<td>Air-cooled Condensers (ACC)</td>
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<tr>
<td>Geothermal Brine Injection Pumps</td>
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<td>Switchyard</td>
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**SOURCE:** GRI 2011a
The power plant design would include a closed-loop organic Rankine cycle (ORC). The ORC is a vapor power cycle utilizing an organic working fluid, typically a refrigerant, such as R-134A, or a hydrocarbon, such as isopentane. Each module would consist of preheaters and vaporizers (heat exchangers), turbine, gearbox, electrical generator, air-cooled condenser, working fluid cycle pump, and motor control center.

Geothermal brine enters the power plant at a high temperature. The total volumetric flow rate would be equally split six ways to supply each of the six modules with brine. Within each module, thermal energy (heat) is transferred from the geothermal brine to the working fluid via the preheater and vaporizer. Heated and vaporized working fluid then flows through a turbine, which converts the energy in the heated working fluid to shaft power. Working fluid then flows to the air-cooled condenser bank, where it is condensed into liquid form. Liquid working fluid then flows to a cycle pump, where it is pressurized prior to entering the preheater and vaporizer, repeating the cycle.

The geothermal brine is cooled as it flows through the preheater and vaporizer due to heat transfer to the working fluid. Cooled geothermal brine exits each of the six generation modules and enters a single injection header pipe. The brine flows through injection pumps and then exits the power block, flowing through the injection pipelines to the injection wells within the wellfield.
A schematic of a typical binary system is shown in Figure 2.1-12.

A Programmable Logic Controller (PLC) would be utilized, with a graphical touch screen Human Machine Interface (HMI) terminal located on the face of the control panel in the motor control center (MCC) section of each module. This system is used to automatically safely start, stop and control each system under steady state and changing conditions, provide a visual indication of operating status, alarms and faults, and monitor protective devices associated with the complete cycle process. A master control DCS would provide overall supervisory control, located in the control building, and equipped with the appropriate redundancy and uninterruptable power supply.

A typical module is depicted below in Figure 2.1-13.

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1 Figure shows a water-cooled system. GRI would not be using a water-cooled system, but would use an air-cooled system where there would be no water input to the cooling system.
Cooling Systems
An air cooling system would be utilized. Each generating module would have a bank of ACCs, which condense the working fluid exiting the turbine back into a liquid form using air as the cooling medium. ACC for each of the six generation modules would generally consist of twelve top-mounted fans. ACC would be of single pass, induced draft, air to working fluid design, with carbon steel tubes and aluminum fans. ACC fans would have cowlings for air direction and personnel safety. Fan drive motors would be rated appropriately for outdoor installation. An air-cooled system on a binary power plant would have virtually no water losses during normal operation, thus would not require a source of “make-up” water. Measures would be taken to ensure that noise levels from the ACCs would meet the requirements of Churchill County or the requirements of the City of Fernley should the alternate power plant in Section 29 be built. Noise near section 29 is already high due to proximity to Alt 50. Some residents live in proximity to the alternate plant site in Section 29.

Fire Protection System
A fire protection system would be incorporated with facility design and would include one (1) 300,000 gallon water storage tank, two (2) diesel powered pumps, water distribution piping, control panel, automatic valves, instrumentation and hydrants. Handheld fire extinguishers would also be located appropriately throughout the facility. Infrared flame detection sensors would be strategically placed, namely at locations adjacent to major equipment and hydrocarbon storage. When sensors detect flames, the valves in the zone of detection open until manually arrested. The fire water system would be utilized in outdoor areas for fire suppression and would be integrated with leak detection and audible alarm systems. Operations and maintenance facilities would also
be equipped with a separate waterless fire suppression system where protection of the MCC and other crucial electrical equipment is necessary. A waterless system would be selected to be safe for use where personnel may be located.

**Ancillary Buildings**

The power plant would also include ancillary buildings such as an electrical room, operations office, rest room, lunch room, etc. All buildings would be painted to blend in with the surroundings. Site drainage, including the plant finish grade, ditches, swales, and other drainage features would be designed to meet local weather conditions and the mean average rainfall. The drainage would be designed to ensure that there would be no storm water runoff that would affect nearby canals. The design would also incorporate containment for oil-filled equipment where required. This would allow runoff from the oil-filled equipment to be inspected to avoid contaminated discharge to a pond or local drainage. Appropriate oil separation and disposal measures would be taken as required prior to release of runoff to the surface drainage. Parking at the power plant site would be provided once the site is cleared and the fence is erected around the site.

**Substation**

**Description**

The Patua Geothermal Project – Phase II would include a substation, which serves the function of connecting the power plant electrical output to the utility’s electrical distribution system. At a minimum, the Phase II substation would include 12.47 kV switchgear and buswork, one (1) or two (2) generator setup transformers (12.47 kV /120 kV), an “A” frame or “H” frame with disconnect switches to isolate the transmission system from the power plant, and circuit breakers for system isolation. Additionally, an emergency diesel generator would be installed in the switchyard to allow for energizing certain plant loads without requiring use of power from the utility. The substation would also include metering, relaying for remote monitoring and operations, and communication devices as necessary.

**Construction**

Grading of the power plant and substation site would proceed after the plant layout has been finalized. Both of the proposed options for the location of a power plant have been surveyed for cultural and biological resources and all resources would be avoided. Prior to grading of the site, clearing and grubbing would take place. Topsoil would be stockpiled to aid in revegetation. An additional 16 acres of temporary staging area would be located adjacent to the power plant site within areas surveyed for cultural and biological resources.

The power plant would be built to balance cuts and fills to the extent feasible. Excess excavated material not required as fill would be disposed of or stockpiled. All equipment and building foundations would bear on native soil or structural fill. Compaction of the soils would be in accordance with the recommendations in the geotechnical report and the detailed civil design. All disturbed lands not required for plant operations would be revegetated upon completion of construction. All buildings, insulation jacketing, and visible structures would be painted to blend
in with the surroundings (usually “Desert Tan” or another, similar low-contrast color) in order to minimize the visual impacts in the area.

Grading design would be based on local topography as shown on topographic maps. Gravel where needed would be obtained from the existing permitted mining operation (BLM serial number N-86320) or commercial sources. All equipment would be brought to the project site on trucks. The power plant construction site would be accessed from Alt 50 directly onto the access roads around the site for the proposed power plant site in Section 21. If the alternate power plant site is used, it would be accessed via Jersey Lane onto Renewable Way then onto proposed access roads from Alt 50. No additional turnoff or new roads are anticipated.

The areas disturbed for construction that are no longer needed for operation would be reseeded with native grasses and forbs. Reseeding would not be undertaken in areas where soil conditions are inappropriate or where the adjacent undisturbed land surface has little or no vegetation, as determined in coordination with a qualified biologist.

The stockpiled top soils would also be spread on the area to aid in revegetation. Staging areas for construction of the power plant and substation would be located within areas previously surveyed for cultural and biological resources, where there are no resource conflicts. The staging areas would be on private land within Section 21 and/or Section 29.

**Distribution System Development**

**Transmission Line**

*Description*

If the option of a power plant and substation in Section 29 is used, approximately 2.31 miles of 120 kV transmission line would be constructed from the geothermal power plant and connected to the previously approved Patua Phase I project 120 kV transmission line in Section 21, T20N, R26E, MDBM. The new transmission line would be located on a combination of Reclamation and privately owned lands in Sections 21, 28, 29 and 32, T20N, R26E, MDBM; see Figure 1.2-2 for the location of the alternative power plant and transmission line location. The building of the transmission lines would be on the geothermal leases.

The proposed 120 kV transmission line would be a single-circuit transmission line consisting of wood H-frame tangent structures, wood three-pole angle structures, single-pole steel angle structures, or three-pole self-supporting steel structures. Appendix A shows the typical transmission structures.

The project would require 300 amps per phase for a typical output of 60 MW transmitted at 120 kV. The line conductor would likely be 556 kcmil 26/7 aluminum conductor steel reinforced (ACSR) or 795 kcmil 26/7 ACSR. This selection is common for this voltage level and limits energy losses and voltage drop to less than 1 percent under maximum load. The transmission line is considered a critical line without which the project energy sales would not be possible. Therefore, the line would be designed and constructed using National Electrical Safety Code (NESC) Grade B load factors and strength reduction factors (SRF).

The transmission line would meet NESC Rule 232 and Reclamation requirements for clearances to ground. NESC 120kV required ground clearance is approximately 20.5 feet, to which a margin for
design and construction variances is usually added for a design clearance of an estimated 24 feet. Required ground clearances may also increase for crossings over railroad and highway ROWs.

The line would be designed for providing the design clearance at a maximum operating temperature of 212°F, a typical temperature for ACSR conductor. The line would have additional capacity for potential future generation growth.

Two shield wires would be used for lightning protection. One of these shield wires would be a steel wire (3/8-inch EHS or similar) and the other may be a steel wire or optical ground wire, containing optical fibers for project use only (e.g., supervisory control and data acquisition (SCADA), protective relaying, controls and communications with Nevada Energy).

H-frame (HF) structures with two wood poles would be set about 14 feet apart in cross country sections. For a span of 800 feet, common for such construction, two 60 to 90 foot Class 1 Douglas fir poles would be sufficient for clearance and strength. Poles would be embedded approximately 10 feet into the soil with an above-grade height of approximately 50 to 80 feet. Special situations like crossing over hills, crossing roadways, and spanning topographic depressions would require a range of structure heights to achieve necessary clearances. The structure would use single polymer suspension insulators to support the 120kV conductors. Its cross arm would be wood and approximately 32 feet wide. Top bracing above the cross arm may be used for additional support of the arm on long spans.

Guyed, three wood pole structures would be used at angles in excess of about 5 to 10 degrees in the alignment (known as points of intersection). Additional easements would be required for these segments for driving anchors and guy installation.

Points of intersection can also be self-supporting, self-weathering steel structures mounted on concrete pier foundations in a similar 3-pole arrangement or as a single pole with stacked conductor positions. The pier foundation dimensions would be determined from physical loads at the structure base and geotechnical soil investigations. The piers would be 5 to 8 feet in diameter and 15 to 30 feet deep for the 3-pole option. For the single pole option, piers would be approximately 6 to 7 feet in diameter and 20 to 35 feet deep.

Transmission corridors for the proposed 120kV line would typically be 100 feet wide, with the line structures centered in the corridor. Determination of a corridor width depends on the nature of the land adjacent to the corridor, structure width, conductor blowout conditions, insulator articulation, and structure deflection. Although the minimum corridor width is approximately 100 feet, additional corridor area is required to accommodate guying where the alignment changes significantly in orientation. The transmission line would cross over both the railroad and highway. Higher ground clearances would be required for these crossings and would be constructed in accordance with NDOT and Union Pacific specifications.

Transmission structures would be designed with sufficient phase spacing to make it improbable that the wing span of the typical raptor could contact two phases, thus avoiding electrocution. HF structures are inherently safe for raptors, which would most likely perch on the tops of the poles high above the 120kV phases. If top arm bracing is not used another perching cross arm would be mounted or the insulator strings would be lengthened so that raptors cannot contact phase
conductors upon taking off. Anti-nesting and perch spikes approved by NDOW would be installed on the tops of structures where warranted.

**Construction**

The 2.31-mile transmission interconnection line connection to the proposed substation would be constructed by GRI contractors. The line would be constructed using trucks, wire line pullers, and cranes. A single two acre staging and construction management area would be sited adjacent to the transmission line on private land. There would be three or four portable trailer offices and locked storage containers for expensive and theft prone transmission line materials, such as copper grounding or aluminum hardware. The staging area on private land would avoid all cultural resources and wetland and riparian habitat. Construction activities would include minor clearing, access road improvement or construction, pole setting, framing of structures, pulling in new conductor, sagging the wires to specification, clipping in the wires at each attachment, punch list remediation, clean up, and project energizing. An estimated two conductor stringing and sagging sites would be required along the approximately 2.31 mile long transmission line.

Major construction equipment would include pickup trucks, lineman bucket trucks, a pole truck for delivering poles at sites, a crane, and auger truck for drilling pole holes, a fork lift, a puller and a wire tensioner for stringing new conductor, a rubber tired backhoe, and medium sized crawler tractors. Construction would take two to three months and require approximately two full time line crews of about six to eight persons in each crew. All construction activities would be directed by a project manager.

Staging for the transmission line would be located only within the currently surveyed areas, in areas clear of sensitive resources. The staging areas would be on private land in Section 21 and 29, allowing for a staging both to the north and south of Alt 50.

**Transmission Line Access Roads**

**Description**

Access roads for the transmission line would be required during construction and during operation for maintenance purposes and would be located immediately adjacent and parallel to the transmission line. Typical access roads would be approximately 30 feet wide. Existing roads would be used to the greatest extent feasible.

**Construction**

Design of any new roads on Reclamation-managed lands would follow the guidelines for roads and access ways as specified in the Gold Book (BLM and USFS 2007). Communications Facilities

**Description**

Communication facilities could consist of:

1. A dedicated land line telephone connection to the project site, with digital subscriber line (DSL) service if available. A fiber optic connection would be installed via the optical ground wire between the power plant substation and the planned new substation where the line would terminate for the SCADA system, control, protective relaying, and communications with NV Energy. Restricted access SCADA data on system
performance would be streamed to the Project Control Center at the power plant for monitoring. The communication channels and network setup for the project would be coordinated with NV Energy and would adhere to the cyber security requirements of the North American Electric Reliability Company (NERC).

2. In order to handle communications (command, control, voice, & internet) at 18 GHz Ethernet/T-1 speeds, GRI will arrange to have installed an 80 ft tall tower at the power plant that will communicate with a tower at the provider’s location. From that location, the signal would then be carried on the provider’s existing Fiber Optic Network to GRI’s centralized operations and maintenance facility that will be located off-site.

3. Fiber optic cable will also be installed in the cable tray system to support production well field communications and control to the master control data collection system (DCS). A master control DCS will provide overall supervisory control, located in the control building, and equipped with the appropriate redundancy and uninterruptable power supply. A typical module is depicted in Figure 2.1-17.

Construction

The communications facilities would be constructed along with the transmission line, as previously described.

2.1.2 UTILIZATION

Utilization Overview

This section describes well field and plant utilization, which includes a generalized description of the proposed facility operations. Utilization includes the use of the project components constructed during the development phase in order to generate and distribute electricity.

Utilization is divided into the following topics:

- Production: the withdrawal and transport of geothermal fluids from the well field
- Power Generation: the processes that occur within the power plant to generate electricity
- Injection: the return of cooled geothermal fluid back into the geothermal reservoir

Production

Based on the anticipated geothermal resource temperature of approximately 325 °F, it is estimated that approximately 41,500 gpm of geothermal fluid production would be required to support a nominal 60 MW net of electricity generation. Based on an expected individual production well flow rate of approximately 2,000 gpm and allowing for back-up wells, up to 23 individual production wells could be required to support a nominal 60 MW net of electricity generation.

Geothermal fluids would be pumped from the production wells through piping to the power plant. Well performance data would be electronically transmitted by telemetry to and monitored from the control room. The gathering system would be regulated and controlled inside the plant, primarily through the modulation of the production well pump and control valves at each well.
Each production well pump would be controlled individually by the control room operator through the DCS. In addition to the automatic and manual valving at the wells, flow at each well can be stopped from the control room by shutting down operation of the production well pumps.

**Power Generation**

Geothermal fluid would be supplied to the power plant from the production wells. The plant would operate 24 hours a day, 7 days a week. The hot geothermal fluid would be pumped from the production wells through pipelines to the tube side of the heat exchangers to heat the hydrocarbon working fluid, which turns the turbines. A diagram of a typical binary power plant is shown in Figure 2.1-16.

**Injection Rates**

The primary goal of an effective injection plan is to ensure the longevity and renewability of the geothermal resource. After the heat has been removed from the geothermal liquid, the liquid flows to the injection wells through the injection pipelines. Injection of the geothermal fluid would help maintain reservoir pressure and replenish the reservoir, thereby prolonging the commercial life of the geothermal resource.

At the current design stage, it cannot be determined how many injection wells would be needed for the project. Each injection well would have manual wellhead isolation valves and regulating valves which allow disposal of the fluids to individual injection wells as required to balance the well field. Temperature and pressure would be measured at each injection well.

During normal operations of an air-cooled facility, the produced geothermal fluid would be confined under pressure as it moves through the power plant and would be injected back into the geothermal reservoir without flashing to steam or being exposed to the atmosphere.

**Plant Start-up and Operating Procedures**

Prior to start up, the facility would be checked to insure all mechanical equipment is ready for operation and all valves and electrical equipment are properly aligned and in a ready to start position. Personnel and facility safety checks would be performed.

An automated startup sequence program would be executed by the plant controls system. During each step of the automated sequence, all plant variables and status are monitored by the control system. If any parameters exceed acceptable limits, the control system would either abort or hold the start sequence until all limits are corrected and in acceptable ranges.

The first plant startup activity includes starting the well field. The geothermal fluid system would be activated by starting one or more geothermal well pumps, routing the pumped fluid to the plant through the gathering system piping, bypassing power and production units, and routing the fluid to an injection well(s). The flow is initiated to warm up the system.

Motive fluid feed pumps are started and geothermal fluid starts circulating in the system. The geothermal bypass valve is gradually closed raising the heat in the system and building pressure in the vaporizer. When the vaporizer reaches the required minimum pressure and all systems are in the acceptable ranges, the system advances to the next step.
When all systems’ pressures and temperatures are at appropriate levels, the turbine valves start to open and the turbine starts to roll up to speed. When generator speed approaches synchronization speed of about 1800 revolutions per minute (rpm) the auto-synchronizer compares generator frequency and voltage with the grid and transmits correction signals to speed control and voltage control. When generator frequency, voltage, and phase angle are the same as the grid, the synchronizer energizes and connects the generator to the grid.

### Source and Consumption of Water During Utilization

The power plant would operate using geothermal fluids that are pumped from the reservoir, used in the plant operation, and then returned to the reservoir through injection wells. There would be no consumptive use of the geothermal resource and the fluids would not be released to the atmosphere.

Potable and domestic water sources would be required on a small scale to be used for the power generation facility office, maintenance, and fire protection, and would likely be provided by an onsite well or purchased.

The fire protection system would include one (1) 200,000 gallon water storage tank. Water would be obtained from an on-site well or purchased to fill the tank.

Bottled water or other potable water would be used for domestic drinking water purposes at the site. A septic system and associated leach field would be constructed for the bathroom facilities. Water would be sourced from on-site wells or would be purchased.

#### 2.1.3 Decommissioning

Decommissioning is the process by which the project is abandoned. Given the long-term duration of geothermal facility operations and changes in future site conditions, additional analysis may be necessary. In general, all project components lands would be decommissioned by removal of all surface components. Wells would be plugged and abandoned in accordance with NDOM requirements. Components would be recycled to the greatest extent feasible and all wastes would be properly disposed. Well pads, roads, and pipeline corridors would be recontoured and revegetated, as required by Reclamation, BLM, or NDOW. Some wells may be utilized for continued hydrologic observation even after their useful life.

#### 2.2 No Action Alternative

The No Action Alternative includes no action of any kind. The environment would remain the same as it currently exists. No geothermal exploration or development would occur. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the project description would occur. No impacts to the existing environment would occur as it would remain unchanged.

No other alternatives were assessed because there are no unresolved conflicts involving alternative uses of the resources (BLM NEPA Handbook H 1790-1, page IV-3).
2.3 Adopted Environmental Protection Measures

GRI would implement emergency plans for:

- Personnel Injuries
- Fire
- Spill or discharge contingencies (for drilling mud, geothermal fluid, lubricants, fuels, etc.)
- Hazardous gas control
- Drilling safety and action plans with contingencies for well blowouts

The purpose of these plans is to provide guidance to field personnel and management in the event of a field related emergency. The plans are intended to be comprehensive in that they describe the nature of various hazards or problems that might be encountered and specify appropriate preventive or anticipatory actions and equipment, as well as specific responses, notifications and follow up procedures that are required in the event of a field emergency. Emergencies such as accidents and injuries are covered, as are fire hazards management and risk assessment.

GRI would inform all personnel, as well as well drilling, testing, and supply contractors, of policies regarding protection and undue degradation of the environment. The Applicant Proposed Environmental Protection Measures are intended to minimize impacts from occurring as a result of project development and operations. Protection of the environment is also discussed in detail in Chapter 4, Environmental Consequences.

The specific environmental protection measures listed by activity or environmental resource area below are incorporated into the applicant’s proposed action as integral components of the proposed project. Refer to Appendix B for written confirmation of these environmental commitments.

Land Use and ROWs

- Pipeline segments would be constructed under unpaved roads to ensure access along existing roadways.
- A Traffic Management Plan would be prepared, approved by Lyon and/or Churchill Counties, as appropriate, and would be submitted to BLM and Reclamation prior to construction. The plan would then be implemented to minimize construction and operational impacts on other land uses such as mining activities and maintenance of the various irrigation facilities in the project area.
- The location of the well pads in Section 30 have been sited in coordination with Reclamation. GRI may also undertake a gravel exploration program that would be discussed with Reclamation if GRI were to need to move the pads and pipelines. Pads and roads would be sited within areas surveyed for cultural and biological resources.
- GRI would coordinate with NDOT and Union Pacific Railroad to obtain the appropriate approvals to construct the pipeline crossing under Alt 50 and under the railroad as well as the transmission line crossing over the highway and over the railroad, if a power plant is built in Section 29.
- GRI would coordinate with Kinder Morgan prior to any ground disturbance in Section 28 to ensure that the gas pipeline is properly marked and avoided.
GRI would coordinate with LADWP prior to constructing pipeline crossings across the corridor of the high-voltage DC transmission line in Sections 30 and 32.

GRI would coordinate with Reclamation and TCID for all Newlands Project feature crossings and would have a Reclamation Inspector onsite during Truckee Canal crossing construction. Crossing methods and procedures would be approved by Reclamation.

**Water Resources**

- Reserve pits would be constructed to prevent seepage of testing fluids into the underlying groundwater.
- Containment berms would be constructed around all hazardous material or potentially hazardous material storage areas. Off-pad stormwater is directed away from the well pads.
- BOPE would be maintained at the wellhead during drilling or work over operations to allow well shutdown if an uncontrolled flow of fluid or gas occurs.
- A cement and casing program for construction of any wells would be implemented to prevent water quality effects on groundwater during or after well installation. Borehole geophysics analyses (cement bond logs) would be conducted to document that well-casing cementing activities provide an effective seal, isolating the geothermal aquifer from shallow alluvial aquifers.
- GRI would obtain necessary permits for work in waters and/or groundwater discharge permits and would provide a Notice of Intent to NDEP prior to well pad construction.
- A hydrologic evaluation program will be implemented, which would be site specific and its intensity would be commensurate with the level of development drilling.
- When permanent new access roads must cross ephemeral washes, rolling dips would be installed. The rolling dips would be designed to accommodate flows from at least a 25-year storm event. Culverts may be used wherever rolling dips are not feasible.
- Site-specific designs for use of jack and bore or horizontal directional drilling methods (e.g., entry and exit sites, subsurface profiles) would be developed based on geotechnical surveys of local soils conditions at the proposed canal crossing. These designs would be prepared to identify how entry and exit points would be sited, depths of drilling, and how inadvertent releases of drilling fluids would be contained. Jack and bore or horizontal directional drilling progress would be continuously monitored by trained personnel.
- If trenching is used to cross the laterals, the trenching would be performed when there is no water is in the laterals. BMPs would be implemented to minimize any potential for runoff or contamination of the laterals and all debris would be cleaned from the lateral after construction, before water flows in the laterals. The area of trenching would be stabilized, as appropriate, to prevent sedimentation once water begins to flow within the lateral.
- BMPs to prevent release of fuels or other construction materials would be implemented, including GRI’s Stormwater Pollution Prevention Plan (SWPPP) and Spill Prevention, Control, and Countermeasure (SPCC) Plan, which would be prepared and submitted to the BLM and Reclamation for approval prior to construction.
Vegetation

- Reclamation of well pads and access roads would occur when it is determined that they would no longer be used for exploration, utilization, or any other purposes. During operations, interim reclamation would be conducted for the well pad areas no longer needed for operation or maintenance. All reclamation would be performed in accordance with the Gold Book (BLM and USFS 2007).

- Reclamation would be performed in accordance with lease stipulations. Reclamation would include re-contouring of disturbed areas to blend in with the surrounding topography and use of appropriate methods to seed with a diverse perennial seed mix. The seed mix used to reclaim disturbed areas would be certified weed free. The seed mix would be developed by an experienced botanist in coordination with the BLM, Reclamation, and/or NDOW and would be based on seed availability and quality. Reseeding would not be undertaken in areas where soil conditions are inappropriate or where the adjacent undisturbed land surface has little or no vegetation, as determined in coordination with a qualified biologist and BLM and Reclamation. Native soil material and organic matter (topsoil) salvaged from the site preparation operations would be reused as a top-dressing on berms and other areas requiring revegetation to the extent practical.

Invasive, Non-Native, and Noxious Species

- The potential to increase the spread of invasive, non-native, and noxious species would be minimized through the implementation of the Noxious Weed Abatement Plan, included in Appendix G to this EA for project construction, operation, and decommissioning.

Wildlife

- Willows and roosting habitat would be avoided to the greatest extent feasible. If willows or rock outcrops have to be removed, the vegetation would be inspected by a qualified biologist for bats just prior to removal. If a bat is found, the habitat would not be removed until the bat has left the area.

- Reserve pits would be appropriately fenced on three sides during active drilling and on all four sides when not in use to restrict access by people, wildlife and livestock.

Migratory Birds

- Anti-perch spikes would be installed on the top of cross-arms of the proposed transmission line alignment, if the option is exercised.

- Transmission structures would be designed with sufficient phase spacing to make it improbable that the wing span of the typical raptor can contact two phases, thus avoiding electrocution.

- If vegetation must be removed during the migratory bird nesting season (May 1 through September 15) surveys for nesting birds would be conducted by a qualified wildlife biologist within three weeks of the vegetation removal for any nesting habitat within 300 feet of the area of disturbance. If active nests are located within the area, GRI would consult with BLM/Reclamation to develop appropriate protection measures for
the nests. Such measures may include the establishment of buffers around the nest until the young have fledged or the nest has failed.

- To minimize impacts to migratory birds and other wildlife through habitat alteration well pads and roads would be recontoured and reseeded following completion of construction. Reseeding would not be undertaken in areas where soil conditions are inappropriate or where the adjacent undisturbed land surface has little or no vegetation, as determined in coordination with a qualified biologist.

- Topsoil would be salvaged and reused whenever possible and in a timely manner.

- During drilling, if the reserve pit contains oil-based contaminants (such as from runoff or drilling muds) the pits would be fitted with exclusion devices such as netting or floating balls, in accordance with lease stipulations.

Cultural Resources

- GRI would avoid cultural resource sites that are known to be eligible or potentially eligible for inclusion in the National Register of Historic Places through design, construction, and operation of the project, to the greatest extent feasible.

- An approximately 100-foot buffer zone would be established from the boundary of cultural sites and will be identified by placing flagging around eligible and potentially eligible cultural resource sites to help provide protection to the sites. Project equipment and facilities would not encroach into the established 100-foot buffer zone to the greatest extent feasible. Fencing would not be required where construction would need to occur within the 100 foot buffer; however, the following measure would be implemented to ensure protection of cultural resources:
  
  - Where the installation of project facilities could impact eligible or potentially eligible cultural sites(s), or must occur within the 100-foot buffer, GRI would retain a qualified archaeologist to serve as a cultural monitor during construction of the facility in order to avoid potential effects to the cultural site(s). The BLM would decide when cultural monitors would be necessary.

- The project facilities would be operated in a manner consistent with the engineered design to prevent problems associated with the run-off that could affect adjacent cultural sites. This includes the use of BMPs to minimize off-site erosion and sedimentation.

- GRI would limit vehicle and equipment travel to existing and proposed access roads, well pads, construction areas, and gravel source areas and allowable travel areas would be clearly flagged and staff would be informed (before project commencement) to stay within the identified areas.

- Any unplanned 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 Field Manager, Stillwater Field Office, 5665 Morgan Mill Road, Carson City, 952 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 authorized officer.

Native American Religious Concerns
If human remains are identified during construction of any of the components of the proposed project, work within 300 feet of the discovery would be stopped and the remains would be protected from further exposure or damage. The coroner and Reclamation, NDOW, or SHPO (depending on land ownership) would be contacted. If the remains are determined to be Native American, the agencies would follow the procedures set forth in 43 Code of Federal Regulations (CFR) Part 10, Native American Graves Protection and Repatriation Regulations. Procedures for handling the discovery of human remains would follow Reclamation Manual Directives and Standards LND 07-01 (Inadvertent Discovery of Human Remains on Reclamation Lands) if remains are located on Reclamation-managed lands. If remains are found on private land, NRS 383 would be implemented with SHPO as the lead agency.

Minerals Resources

- Fill materials would be obtained from the permitted mine located east of Black Butte, in Section 24, T20N, R26E (assigned serial number N-86320) or purchased from commercial sources.
- GRI would coordinate with NDOT to obtain approval to construct the pipeline through the mine area in Section 32 in order to minimize effects to the existing operations.
- During the life of the geothermal facilities, all disturbed areas not needed for active support of production operations would undergo “interim” reclamation to minimize the environmental impacts of development on other resources and uses

Soils

- Any suitable topsoil would be stockpiled onsite for later use during restoration. Access roads would follow existing routes to the extent possible. In areas where new access roads must be constructed across slopes, erosion control measures would be installed as necessary, in accordance with Gold Book standards (BLM and USFS 2007).
- Erosion control measures, including but not limited to silt fencing, diversion ditches, water bars, temporary mulching and seeding, and application of gravel or rip rap, would be installed where necessary immediately after completion of construction activities to avoid erosion and runoff.
- Additional gravel would be laid down when ground conditions are wet enough to cause rutting or other noticeable surface deformation and severe compaction.
- An NDEP Bureau of Air Pollution Control SAD permit would be obtained and the BMPs identified in the permit would be implemented.
- Vehicle travel on unpaved roads would be limited to 30 mph.
- Any topsoil stockpiles would be located on previously disturbed areas, such as portions of well pads, and would be situated so that wind and water erosion of the piles are minimized and the reclamation potential of the soil is maintained. Other erosion control measures may include surface seeding and moisture conditioning.
- All new access roads would comply with the site drainage and runoff management plan to minimize erosion and off-site sedimentation.

Wastes, Hazardous or Solid

2: PROPOSED ACTION AND ALTERNATIVES
Containment berms would be constructed around all hazardous material or potentially hazardous material storage. Off-pad stormwater would be directed away from the well pads.

An emergency response plan would be implemented that includes contingencies for hazardous materials spills and disposals.

GRI would adhere to general geothermal lease stipulations for geothermal developers to address the potential impacts involved with transport, use, and disposal of hazardous materials, including the development and implementation of an emergency response plan.

GRI would comply with all local, state, and federal regulations regarding the use, transport, storage, and disposal of hazardous materials and wastes. Wastes considered hazardous by the State of Nevada would be transported and disposed of according to applicable federal, state, and local regulations.

GRI would prepare and implement a Hazardous Material Spill Prevention Plan to minimize impacts to the environment from hazardous materials.

Fueling and routine maintenance of equipment and vehicles would be performed off site or within designated areas with appropriate spill controls to minimize effects.

Drilling mud and fluid would be directed to reserve pits. At the conclusion of drilling and testing, the liquid portions of the containment basin contents would be evaporated, pumped back down the well, or removed and disposed off site in a facility authorized to receive such wastes. The remaining contents, typically consisting of non-toxic drilling mud and cuttings, would be tested as required by the Nevada BWPC. If non-toxic and as authorized by the BWPC, these materials would be spread and dried on the well site, mixed with soil and buried in the on-site reserve pit in conformance with the applicable requirements of the BWPC, Reclamation, and the BLM. Testing results and location of buried waste would be provided to Reclamation and BLM.

A blow-out prevention plan and BOPE would be implemented.

Operation of the geothermal facilities would comply with all local, state, and federal regulations regarding the use, transport, storage, and disposal of hazardous materials and wastes and therefore minimize impacts to the environment.

Air Quality

A SAD Air Quality Operating Permit would be obtained for the project and a plan for fugitive dust control would be implemented. The Fugitive Dust Control Plan would include dust suppression processes (e.g., watering access roads and well pads) to minimize localized increases in particulate matter concentrations. The plan would include the following measures.

**Fugitive Dust Source Controls:**

- During grading use water, as necessary, on disturbed areas in construction sites to control visible plumes
- Vehicle speeds would be minimized on exposed soils to 10 to 30 mph to reduce fugitive dust generation from vehicle traffic.
- Use effective measures to prevent run-off to roadways in construction areas adjacent to paved roadways. Ensure consistency with the project’s SWPPP.
Use wind erosion control techniques (such as windbreaks, water, and/or vegetation) where soils are disturbed in construction, access and maintenance routes, and materials stock pile areas.

**Mobile and Stationary Source Controls**
- Best available emissions control technologies would be used where available and practical.
- Plan construction scheduling to minimize vehicle trips.
- Dust emissions from venting steam would be reduced by injecting water into the blooie line.
- Diesel generators over 37 kW (50 horse power) would be diesel-fired units that are certified to meet the US Environmental Protection Agency’s (EPA) Tier II Emission Standards and are equipped with an exhaust particulate filter system.
- H₂S emissions would be minimized through the use of properly weighted drilling mud which is expected to keep the well from flowing during drilling. Data collection devices would be installed and operated during all phases of drilling and testing. An H₂S abatement plan would be developed and implemented during long-term flow-testing if it becomes apparent during drilling operations that H₂S abatement is necessary to minimize potential nuisance odors. Measures to reduce H₂S, if necessary, could include but are not limited to:
  - Reducing the number of wells venting simultaneously, as applicable
  - Implementing additional wellhead abatement measures, such as caustic injection between the flash tank and the portable silencer
  - All drill rigs would be equipped with alarms to detect unsafe levels of non-condensable gases (NCGs).

**Visual Resources**
- The power plant and pipeline would be painted a muted color to blend in with the existing landscape to the greatest extent feasible.
3: 
Affected Environment

3.1 Introduction

3.1.1 SCOPING AND ISSUE IDENTIFICATION

In accordance with NEPA, this document has been prepared with input from interested agencies, organizations, and individuals within the region. Potentially affected agencies and the tribes were contacted to solicit concerns to guide the development of the EA and the alternatives. The BLM’s interdisciplinary team (IDT) and Reclamation were consulted for specific resource concerns and information at a meeting held on April 12, 2011. Several other agencies have been consulted including Churchill County, the City of Fernley, NDOT, US Fish and Wildlife Service, NDEP, NDOW, and the Truckee-Carson Irrigation District (TCID). BLM sent scoping letters to Churchill County, Lyon County, and the City of Fernley on June 30, 2011. The project was also presented by GRI and the BLM at the Fernley Town Board Meeting on August 3, 2011.

The following issues to be addressed in the environmental assessment were identified during the IDT meeting: Air Quality, Cultural Resources; Invasive, Non-Native and Noxious Species; Migratory Birds; Native American Religious Concerns; Wastes; Water Quality; Lands and ROWs; Visual Resources; Soils, and Minerals.

The following issues were identified as not being present in the proposed project area: Areas of Critical Environmental Concern; Environmental Justice; Farm Lands; Forest and Rangelands; Human Health and Safety; Threatened and/or Endangered Species; Wetlands and Riparian Areas; Wild and Scenic Rivers; and Wilderness. No threatened and endangered species are known to occur in the project area or were identified during project surveys.

3.1.2 PROPOSED ACTION GENERAL SETTING

The project is located within the Basin and Range physiographic province at the northwestern edge of the Carson Desert. The elevation in the project area ranges from approximately 4,055 to 4,533 feet above mean sea level. Most of the project area is located in a valley north of the Virginia Range and south of the Hot Springs Mountains, but a small portion is situated in the foothills of the Virginia Range in Section 6 (Figure 1.1-2). The project area is generally rural but with visible development.

3.1.3 SUPPLEMENTAL AUTHORITIES

Appendix 1 of BLM’s NEPA Handbook (H-1790-1) identifies Supplemental Authorities that are subject to requirements specified by statute or executive order and must be considered in all BLM environmental documents. The elements are the various resources, such as air quality and biological resources that could be affected by Federal actions. The supplemental authorities are specified by statutes or executive orders additional to NEPA, such as the Clean Water Act and the Endangered Species Act that must be considered in all BLM environmental documents.

BLM and Reclamation specialists evaluated the potential applicability of the supplemental authorities and the potential impact of the Proposed Action on the resource elements. On the basis
of this evaluation, the BLM has determined the elements to be analyzed in detail in this EA. Table 3.1-1 summarizes the elements listed in Appendix 1 of the BLM’s NEPA Handbook and documents the BLM’s determination of which elements are relevant to the analysis in this EA. Each of the resource elements identified as present in Table 3.1-1 is described in this Affected Environment section and subsequently analyzed in Section 4: Environmental Consequences.

### 3.1.4 RESOURCES OR USES OTHER THAN SUPPLEMENTAL AUTHORITIES

Resources or uses presented in Table 3.1-2, which are not Supplemental Authorities as defined by BLM’s Handbook H-1790-1, are present in the area. BLM specialists have evaluated the potential impact of the Proposed Action on these resources and documented their findings in the table below. Resources or uses that may be affected by the Proposed Action are further described in this EA.

<table>
<thead>
<tr>
<th>Supplemental Authority</th>
<th>Not Present</th>
<th>Present/Not Affected</th>
<th>Present/May Be Affected</th>
<th>Section Discussed</th>
</tr>
</thead>
<tbody>
<tr>
<td>Air Quality</td>
<td></td>
<td>X</td>
<td></td>
<td>3.14, 4.14</td>
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<tr>
<td>Areas of Critical Environmental Concern</td>
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<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Cultural Resources</td>
<td></td>
<td>X</td>
<td></td>
<td>3.9, 4.9</td>
</tr>
<tr>
<td>Environmental Justice</td>
<td>X</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Farm Lands (prime or unique)</td>
<td>X</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Forests and Rangelands (Hazardous Fuel Reduction Act projects only)</td>
<td>X</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Floodplains</td>
<td>X</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Invasive, Non-Native, and Noxious Species</td>
<td>X</td>
<td></td>
<td></td>
<td>3.6; 4.6</td>
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<tr>
<td>Migratory Birds</td>
<td>X</td>
<td></td>
<td></td>
<td>3.8; 4.8</td>
</tr>
<tr>
<td>Native American Religious Concerns</td>
<td>X</td>
<td></td>
<td></td>
<td>3.10; 4.10</td>
</tr>
<tr>
<td>Threatened or Endangered Species</td>
<td>X</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Wastes, Hazardous or Solid</td>
<td>X</td>
<td></td>
<td></td>
<td>3.13; 4.13</td>
</tr>
<tr>
<td>Water Quality (Surface/Ground)</td>
<td>X</td>
<td></td>
<td></td>
<td>3.4; 4.4</td>
</tr>
<tr>
<td>Wetlands and Riparian Areas</td>
<td>X</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Wild and Scenic Rivers</td>
<td>X</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Wilderness</td>
<td>X</td>
<td></td>
<td></td>
<td>N/A</td>
</tr>
</tbody>
</table>

**SOURCE:** BLM and Bureau of Reclamation 2011
Table 3.1-2: Resources or Uses Other than Supplemental Authorities

<table>
<thead>
<tr>
<th>Resource or Uses</th>
<th>Present/Not Affected</th>
<th>Present/May Be Affected</th>
<th>Section of EA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Lands with Wilderness Characteristics</td>
<td>X</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Visual Resource Management</td>
<td>X</td>
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<td>3.15; 4.15</td>
</tr>
<tr>
<td>Recreation</td>
<td>X</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>BLM Sensitive Species</td>
<td>X</td>
<td></td>
<td>N/A</td>
</tr>
<tr>
<td>Lands/ ROWs</td>
<td>X</td>
<td></td>
<td>3.2; 4.2</td>
</tr>
<tr>
<td>Minerals</td>
<td>X</td>
<td></td>
<td>3.11; 4.11</td>
</tr>
<tr>
<td>Soils</td>
<td>X</td>
<td></td>
<td>3.12; 4.12</td>
</tr>
<tr>
<td>Livestock</td>
<td>X</td>
<td></td>
<td>3.3; 4.3</td>
</tr>
</tbody>
</table>

SOURCE: BLM and Bureau of Reclamation 2011

3.1.5 RESOURCES PRESENT AND BROUGHT FORWARD FOR ANALYSIS

The following resources are present in the area and are addressed in this EA.

- Lands and ROWs
- Livestock
- Water Quality
- Vegetation
- Invasive, Non-Native, Noxious Species
- Wildlife
- Migratory Birds
- Cultural Resources
- Native American Religious Concerns
- Renewable Energy
- Minerals
- Soils
- Wastes, Hazardous or Solid
- Air Quality
- Visual Resources (VRM)

The environmental setting for these resources is presented in Section 3.2 through 3.16.

3.2 Lands and ROWs

3.2.1 LAND USE AND ROWS

The project site is located in the west-central portion of Nevada in Lyon and Churchill Counties. Churchill County encompasses approximately 5,000 square miles, of which approximately 91 percent is publicly owned. Lyon County is approximately 2,000 square miles, of which 75 percent is publicly owned (Lyon County 2011).

The western portion of the project site is located within the City of Fernley. The City of Fernley in Lyon County is the only population center near the project area. The center of the City of Fernley is located approximately seven miles west of the project area, and had a population of approximately 8,500 people in 2000 (US Census Bureau 2011). Within the City of Fernley, the project is located on lands zoned as Rural Residential and General Industrial. Land Use
designations include Commercial, Open Space Reserve; Rural Residential; and Industrial, as shown in Figure 3.2-1.

Portions of the project area fall within geothermal lease NVN-085705, NVN-76139, and NVN-75005, administered by the BLM but located on land managed by Reclamation. Leases NVN-08575 and NVN-75005, along with the private land in the area, are part of the Patua Geothermal Unit (N-85168X). Geothermal lease NVN-77739 is located on land managed by the BLM. Leases NVN-76139 and NVN-77739 are not located within the Patua Geothermal Unit, but may be unitized in the future. Leases issued by BLM are shown in Figure 1.1-3.

The proposed project would be located on federal and private lands. The current uses of the land include:

- Livestock grazing
- Privately owned unoccupied/unutilized lands
- Utilities, railroad, and road ROWs
- Water conveyance in the Truckee Canal
- Mining operations

Numerous unpaved roads traverse the project area, including a well-developed two-lane road on the south side of the Truckee Canal. Two-trailer haul trucks regularly used this road as well as local vehicle traffic. Less frequently traveled roads are present throughout the project area, including the drainages in Section 6.

### 3.2.2 ROWS

Several ROWs are located within the project area as shown in Figure 2.1-5 and identified in Table 3.2-1.

### 3.2.3 RECREATION

The well field, access roads, geothermal pipeline, power plant, and transmission line would be located on BLM- and Reclamation-managed lands and private lands. Reclamation defines the activities that are authorized within its management boundaries. Reclamation lands are considered closed to off-highway vehicle (OHV) use, unless designated as open (43 Code of Federal Regulations (CFR) 420 and 43 CFR 423). BLM determines which activities are authorized within its management boundaries. BLM lands are considered open to OHV use, except for specific areas designated as closed areas (BLM 2011). The portion of the project area located on BLM managed lands (Section 6) is considered open to OHV use. The Reclamation-managed lands are considered closed to OHV use. The project area is not an area of high recreational use.
Figure 3.2-1: Land Zoning in the Project Area
### Table 3.2-1: ROWs and Existing Uses in the Project Area

<table>
<thead>
<tr>
<th>ROWs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Truckee Canal</td>
<td>The Truckee Canal is part of the Newlands Project managed by the TCID and was constructed between 1903 and 1906 (Bureau of Reclamation 2011). The Truckee Canal provides irrigation to agricultural lands and government agencies, supports wildlife communities, and transports water through the Newlands Project area. Water is carried from the Truckee River via the Derby Diversion Dam to the Lahontan Reservoir by the Truckee Canal. The amount of water diverted from the Truckee River is regulated by the Operating Criteria and Procedures for the canal. The Truckee Canal is approximately 80 feet wide by 13 feet deep in the project area.</td>
</tr>
<tr>
<td>Hazen Drain</td>
<td>The Hazen Drain is a part of the Newlands Project and was likely built between 1921 and 1926. The drain was constructed to be 10 feet deep and 9 feet wide at the base and to extend for one or more miles (Hardesty and Buhr 2001). Its purpose was to drain the high water table and alkaline salts that appeared to be stunting crop growth after the addition of Newlands irrigation water to an already high and fluctuating natural groundwater table in western Lahontan Valley. The Hazen Drain is still used by the TCID and appears well maintained. Cleanout berms up to 10 feet tall line both sides of a 10-20 foot wide, 8 to 10 foot deep trench.</td>
</tr>
<tr>
<td>Alt 50</td>
<td>Alt 50 is a portion of US Route 50, which is a transcontinental highway stretching from Sacramento, California in the west to Ocean City, Maryland on the east coast. In the project area, Alt 50 is a divided, two way highway, and approximately 150 feet wide from shoulder to shoulder. The Alt 50 ROW in the project area is 235 feet wide.</td>
</tr>
<tr>
<td>Union Pacific Railroad</td>
<td>The Union Pacific Railroad line is part of the Overland Route that connects Chicago and Oakland. Union Pacific operates 1,193 miles of track in Nevada. The major commodities hauled include coal, chemicals, aggregates, lumber, and consumer goods. The maximum ROW of the track is 400 feet.</td>
</tr>
<tr>
<td>500 kV Pacific DC Intertie (PDCI) Transmission Line</td>
<td>The PDCI transmission line transmits electricity from the Pacific Northwest to the Los Angeles area using high voltage direct current. The intertie originates near the Columbia River at the Celilo Converter Station on Bonneville Power Administration’s grid outside The Dalles, Oregon and is connected exclusively to the Sylmar Converter Station north of Los Angeles, which is owned by five utility companies and managed by LADWP. The transmission line crosses through the southwest quarters of Sections 30 and 32 in the project area.</td>
</tr>
<tr>
<td>Kinder Morgan Gas Pipeline</td>
<td>This ROW is for a natural gas pipeline located in Section 28.</td>
</tr>
<tr>
<td>Gravel Mining Operation in Section 30 (Hazemine)</td>
<td>This is a fine to coarse aggregate mine used for concrete. The limits of the mine in Section 30 are not defined. Approximately 234.5 acres of mining operation occur in Section 25 and 40.6 acres in Section 36 (JNT Solutions 2010).</td>
</tr>
</tbody>
</table>
Table 3.2-1 (Continued): ROWs in the Project Area

<table>
<thead>
<tr>
<th>ROWs</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>NDOT materials mining operation in Section 32</td>
<td>This site is an NDOT materials site issued by BLM in 1949 and is still active. It is approximately 70 acres in size and is presumably used for fill material by NDOT.</td>
</tr>
<tr>
<td>Eagle-Picher Minerals (EP) Inc. Diatomaceous Earth Mine in Section 6</td>
<td>EP Minerals has intermittently operated a mine in Section 6 T19N, R26E since the early 1970s. The mine was reactivated recently and will continue to operate on an intermittent basis in the future. The work includes mining from an existing diatomaceous earth pit. The pit is located in a valley in Section 6 and does not overlap any of the proposed well pad or pipeline routes.</td>
</tr>
<tr>
<td>Various Roads</td>
<td>Various access roads are found throughout the project area. These roads are either privately maintained, or maintained by Reclamation in the case of the canal roads.</td>
</tr>
</tbody>
</table>

3.3 Livestock

One grazing permit is located in the project area. This permit, located within the BLM managed Truckee-Virginia Allotment, is grazed by one rancher and includes access to all public lands within the allotment. The only portion of the project site located within this allotment is Section 6. The total acreage of grazing land within the entire allotment is 21,369 acres (with 43 acres within Section 6 in the project area) and the season of use is from November 1st through April 15th. The number of permitted livestock on a permit on public land is determined by how many animal unit months (AUMs) that land would support. An AUM is the amount of forage needed to sustain one mature cow, five sheep, or five goats for 1 month (BLM 2008). This lease is permitted for 993 AUM (Leary pers. comm. 2011). The lease area is shown in Figure 3.3-1. There are no grazing leases or permits located on the Reclamation-managed lands within the project area.

Private ranchers within agriculturally zoned districts may also have grazing activities on their properties, based on the zoning code within the County and/or the City of Fernley (Lyon County 2011, Churchill County 2010). The private lands in the project area are not currently used for grazing.
3.4 Water Resources

3.4.1 SURFACE WATER

The project is located within the Carson Desert and Fernley Area Watersheds. Surface waters in the project vicinity include the Truckee Canal, Hazen Drain, and two laterals, which are non-jurisdictional waterways. The Truckee River and the Carson River, the Traditionally Navigable Waters nearest to the lease area, are approximately 11.25 and 6.5 miles away, respectively, from the center of the project area.

The Truckee Canal is approximately 80 feet wide by 13 feet deep within the project area. The Truckee Canal provides irrigation to agricultural lands, supports wildlife communities, and transports water through the Newlands Project area. The Truckee Canal carries water from the Truckee River via the Derby Diversion Dam to the Lahontan Reservoir. The amount of water diverted from the Truckee River is regulated by the Operating Criteria and Procedures for the canal.

Water chemistry data for the Truckee Canal is expected to be similar to that in the Truckee River near the point of diversion for the canal. The Truckee River at Derby Dam where the Truckee Canal diverts from the Truckee River is 303(d)\(^2\) listed for temperature and turbidity (NDEP 2006). The Carson River where the Truckee Canal discharges at the Lahontan Reservoir is 303(d) listed for boron, iron, manganese, mercury in fish tissue, mercury in sediment, and molybdenum (NDEP 2006).

Other waterways in the project area include the Hazen Drain and two canal laterals that connect into the Truckee Canal in Section 32, as shown in Figure 1.1-2. The Hazen Drain is used by the TCID and is well maintained. The drain was constructed to be 10 feet deep and 9 feet wide at the base and to extend for one or more miles (Hardesty and Buhr 2001).

The Fernley Wildlife Management Area is located approximately 2 to 3 miles to the north of the project area, to the north of Alt 50. There is a hot spring and associated wetland complex 1.75 miles northwest of the lease area in T20N, R26E, Section 18, within the Fernley Wildlife Management Area. The hot springs were likely formed by the increase in water levels in the area as a result of the construction and operation of the Truckee Canal. This rise could have led to discharge of the thermal water at the surface as springs rather than in the subsurface at a depth controlled by the depth of the water table.

Several non-Corps jurisdictional drainages and ephemeral washes are found within the project area. Natural washes perform a diversity of hydrologic, biochemical, and geochemical functions that directly affect the integrity and functional condition of higher-order waters downstream.

\(^2\) Under section 303(d) of the 1972 Clean Water Act, states, territories, and authorized tribes are required to develop lists of impaired waters. These impaired waters do not meet water quality standards that states, territories, and authorized tribes have set for them, even after point sources of pollution have installed the minimum required levels of pollution control technology.
Ephemeral washes with characteristic plant communities control rates of sediment deposition and dissipate the energy associated with flood flows and habitat for some wildlife.

Surface waters, including canals, drains, laterals, ephemeral washes and (non-Corps jurisdictional) wetlands within the project area are shown in Figure 3.4-1.

3.4.2 GROUNDWATER AND DRINKING WATER

The project area lies within hydrographic areas, demarked as the Carson Desert (Basin 101) and Fernley (basin 76) Hydrographic Area. These two basins are hydrographically disconnected from each other. The watersheds are shown in Figure 3.4-1. Sources of groundwater recharge include precipitation, groundwater infiltration from the Truckee Canal and groundwater percolation associated with irrigation. The Carson River supplies water used within the Carson Desert (Basin 101).

Groundwater uses within 2 miles of the project area include:

- Irrigation
- Industrial use
- Domestic use
- Stock watering
- Commercial use
- Mining and milling

The closest existing groundwater wells and the use of the water for both Basin 76 and 101 are shown in Figure 3.4-2. While domestic, industrial, and municipal wells are found nearby, many of these wells may not currently be in use. None of the wells labeled as “municipal” in Figure 3.4-2 are currently in use.

Groundwater quality is expected to be similar to surface water quality and is influenced by the Truckee Canal and the geothermal resource in the area.

The federal Safe Drinking Water Act (SDWA) Amendments of 1996 required states to develop and implement Source Water Assessment Programs (SWAP) that analyze existing and potential threats to the quality of the public drinking water throughout the state. Source water is the groundwater or surface water that provides drinking water for public water system. The Nevada Division of Environmental Protection, Bureau of Safe Drinking Water (BSDW), is the agency with primacy for development and implementation of the state of Nevada SWAP program. Primacy designation by the federal Environmental Protection Agency (EPA) allows states to administer SWAP programs within their respective states. The 1996 amendments required the state of Nevada to delineate the areas that are sources of public drinking water, identify potential contaminant sources within the delineated area, assess the water systems’ susceptibility to contamination, and to inform the public of the results. While several municipal water sources are located approximately 5 miles to the north west of the project area (Figure 3.4-3), none are designated Source Waters. There are no source water protection areas within the project area (NDEP 2011).
Figure 3.4-1: Surface Water within the Project Vicinity

Legend:
- Red: Proposed Well Pad
- Orange: Option 2 Interconnection Point (To permitted Patua 1 transmission line)
- Green: Proposed TGH Well
- Yellow: Option 1 Proposed Power Plant
- Green: Option 2 Proposed Power Plant
- Teal: US Fish and Wildlife Service Designated Wetland
- Pink: Patua Hot Springs
- Purple: Proposed Geothermal Fluid Pipeline Corridors (Including Proposed Access Roads)
- Orange: Option 2 Transmission Line (and Access Roads)
- Blue: Existing 500 KV Transmission Line
- Pink: Truckee Canal Lateral
- Purple: Hazen Drain
- Blue: Carson River Drainage
- Black: Highway
- Yellow: Railroad
- Gray: County Boundary
- Gray: City of Fernley Boundary

Figure 3.4-2: Municipal Water Supply within the Project Region

LEGEND
- Proposed Well Pad
- Active Municipal Water Well
- Option 1 Proposed Power Plant
- Option 2 Proposed Power Plant
- Proposed Geothermal Fluid Pipeline Corridors (including Proposed Access Roads)
- Option 2 Transmission Line (and Access Roads)

Figure 3.4-3: Groundwater Wells within Two Miles of the Project Area
3.5 Vegetation

3.5.1 SURVEYS

A database query was conducted with the Nevada Natural Heritage Program (NNHP) and the US Fish and Wildlife Service (USFWS). Ground surveys were conducted May 2, 3, 4 and 31, 2011. The survey included Sections 6, 30, 32, and a portion of 29 and 21. A remaining portion of Section 21 was surveyed on June 28, 2011. Section 28 and the other portion of Section 21 were included in the surveys for the Patua I project, conducted in May and October 2009. The 2011 May survey was conducted at an optimum time of year for most native plant species identification in the area. Intensive searches were also conducted in noxious weed infested areas. A botanical report that provides additional descriptions of the survey methods is provided in Appendix D.

No threatened, endangered, sensitive, candidate, and watch-list (TESC) plant species were found during the surveys and no suitable habitat was identified. The 2011 May survey was conducted at an optimum time of year for most native plant species identification in the area. While the surveys of Sections 28 and portions of Section 21 are two years old, no special status plant species were identified in these areas, nor was potential habitat identified. These conditions have not changed in two years.

3.5.2 PLANT HABITATS

Based on the Southwest Regional Gap Analysis Project, the Nevada Department of Wildlife’s Wildlife Action Plan (2006) characterized Nevada’s vegetative land cover into eight broad ecological system groups. The groups were linked with Key Habitat types, which are further refined into Ecological Systems characterized by plant communities or associations. Within the project area there are four Key Habitats:

- Intermountain Cold Desert Scrub
- Intermountain Rivers and Streams
- Marshes
- Disturbed

Intermountain Cold Desert Scrub is divided into the following Ecological Systems within the project area:

- Intermountain Basin Mixed Salt Desert Scrub (Sections 6, 30, and 32)
- Intermountain Basins Greasewood Flat (Section 21)

The majority of the project area consists of Intermountain Basins Mixed Salt Desert Scrub, which is dominated by greasewood (*Sarcobates vermiculatus*), four-wing saltbush (*Atriplex canescens*), and shadscale (*Atriplex confertifolia*). Additional species in the foothills of the Virginia range (i.e., Section 6) include Nevada ephedra (*Ephedra nevadensis*), budsage (*Artemisia spinescens*), and winterfat (*Krascheninnikovia lanata*). Most of the undisturbed portions of the project area had a dense understory of cheat grass (*Bromus tectorum*), likely in response to the very wet winter and spring.
Vegetative habitat surrounding the Truckee Canal and the lateral from the canal is most similar to Intermountain Rivers and Streams, of the Intermountain Stream Ecological System, although the waterways are man-made. This system is present within Sections 30 and 32. Within and near the project area, patches of mature cottonwood trees (*Populus fremontia*) grow along the Truckee Canal. Along the canal lateral in Section 32, a continuous band of smaller cottonwood trees and salt cedar (*Tamarix spp*) extend southwest and northeast of the project area from the main Truckee Canal to the houses in Ragtown Pass. An extensive patch (approximately 21 acres) of salt cedar and a few cottonwood and Russian olive (*Elaeagnus angustifolia*) trees are located in Section 29. No snags were noted either in or near the project area. The Marshes type habitat was found in Section 29 and supports similar species as around the canals and laterals, as well as an extensive patch of salt cedar and tall whitetop (*Lepidium latifolium*).

The disturbed habitat includes the gravel quarry within Section 30. The site is highly disturbed with numerous roads, pits, piles of gravel, and barren ground with a sparse covering of cheat grass and weedy forbs.

### 3.5.3 PLANT SPECIES

Plant species associated with each Key Habitat Type are presented in Table 3.6-1. Disturbed areas are not included as they have sparse vegetation cover. In the project area the disturbed areas also have cheat grass (*Bromus tectorum*).

<table>
<thead>
<tr>
<th>Key Habitat Type</th>
<th>Associated Species</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermountain Cold Desert Scrub</td>
<td>Shadscale (<em>Atriplex confertifolia</em>)</td>
</tr>
<tr>
<td></td>
<td>Greasewood (<em>Sarcobates vermiculatus</em>)</td>
</tr>
<tr>
<td></td>
<td>Torrey seablite (<em>Suaeda moquinii</em>)</td>
</tr>
<tr>
<td></td>
<td>Four-wing saltbush (<em>Atriplex canescens</em>)</td>
</tr>
<tr>
<td></td>
<td>Bailey’s greasewood (<em>Sarcobates vermiculatus var. baileyi</em>)</td>
</tr>
<tr>
<td></td>
<td>Nevada ephedra (<em>Ephedra nevadensis</em>)</td>
</tr>
<tr>
<td></td>
<td>Budsage (<em>Artemisia spinescens</em>)</td>
</tr>
<tr>
<td></td>
<td>Winterfat (<em>Krascheninnikovia lanata</em>)</td>
</tr>
<tr>
<td></td>
<td>Glandular indigo bush (<em>Psorothamnus polyadenius</em>)</td>
</tr>
<tr>
<td></td>
<td>Burrobrush (<em>Hymenoclea salsola var. salsola</em>)</td>
</tr>
<tr>
<td></td>
<td>Spiney hopsage (<em>Grayia spinosa</em>)</td>
</tr>
<tr>
<td>Intermountain Rivers and Streams and Marshes</td>
<td>Greasewood (<em>Sarcobates vermiculatus</em>)</td>
</tr>
<tr>
<td></td>
<td>Tall whitetop (<em>Lepidium latifolium</em>)</td>
</tr>
<tr>
<td></td>
<td>Saltgrass (<em>Distichlis spicata</em>)</td>
</tr>
</tbody>
</table>
Rubber rabbitbrush (*Chrysothamnus nauseosus*)

Creeping wildrye (*Leymus triticoides*)

Haloe斯顿 (*Halogeton glomerata*)

Fremont cottonwood (*Populus fremontii*)

Coyote willow (*Salix exigua*)

Chinese elm (*Ulmus parvifolia*)

Russian olive (*Elaeagnus angustifolia*)

**SOURCE:** Reynolds 2011; NDOW 2006

### 3.6 Invasive, Non-Native, and Noxious Species

The State of Nevada lists 47 noxious weed species that require control (Nevada Administrative Code 555.10; Nevada Department of Agriculture 2008). Three of these species were encountered in the project area during field surveys (described under Section 3.6.1). The species identified include tall whitetop, salt cedar, and Russian knapweed. Table 3.6-1 includes a description of the location and size of each of these invasive species. Figure 3.6-1 shows the locations of these invasive species.
Figure 3.6-1: Invasive, Non-Native, and Noxious Species Found in the Project Area
Table 3.6-1: Invasive, Non-Native, and Noxious Species Found in the Project Area

<table>
<thead>
<tr>
<th>Invasive, Non-Native, and Noxious Species Name</th>
<th>Description of Location</th>
<th>Size</th>
</tr>
</thead>
<tbody>
<tr>
<td>Tall whitetop (Lepidium latifolium)</td>
<td>Tall whitetop was encountered during the surveys in one seasonally wet area and along the Truckee Canal, frequently found as the dominant ground cover along the fringes of wetland habitats. Scattered individuals of tall whitetop extended out into the landscape on both banks of the Truckee Canal.</td>
<td>20.83 acres, 28.36 acres also infested with Salt Cedar, 18.65 acres also infest with Russian Knapweed</td>
</tr>
<tr>
<td>Salt cedar (Tamarisk ramosissima)</td>
<td>One salt cedar was documented in the northeast corner of Section 32, and a large infestation was documented just outside the project boundary in Section 25. Approximately 100 saltcedar/tamarisk trees were documented in the wetland area of Section 29. Additional salt cedar was identified in Section 28 in the May 2009 surveys for the Patua I project.</td>
<td>2.06 acres, 28.36 acres also infested with tall whitetop</td>
</tr>
<tr>
<td>Russian knapweed (Acroptilon repens)</td>
<td>Russian knapweed was encountered and documented in a seasonally wet drainage of Section 32, growing with tall whitetop under a canopy of Russian olive.</td>
<td>0.74 acres, 18.65 acres also infested with tall whitetop</td>
</tr>
</tbody>
</table>

SOURCE: Reynolds 2011

3.7 Wildlife

3.7.1 SURVEYS

The project area was surveyed for wildlife in Sections 30, 32, 6, and a portion of 29 and 21 on April 1, May 2-4, May 31, 2011, and July 1, 2011 by Wildlife Resource Consultants (WRC). WRC surveyed the remaining portion of Section 21 and all of Section 28 in June, July and October 2009. Database queries were conducted with the NNHP and the NDOW for special status wildlife species known to occur in or with the potential to occur in the project area. The May 3 survey continued until approximately 30 minutes after sunset and the May 4 survey began approximately 30 minutes before sunrise. Surveys were conducted on foot as well as by vehicle on all roads in and within one mile of the project area. Roads from which surveys were performed are depicted on the Hazen United States Geological Survey (USGS) 7.5 minute series topographic map. Unmapped roads were also driven. Additional information on the survey methods and results is presented in Appendix E.

3.7.2 WILDLIFE HABITATS

The project area is located between the western portion of the Hot Springs Mountains and the southern portion of the Forty Mile Desert. The elevation in the project area ranges from approximately 4,036 to 4,561 feet above mean sea level. Most of the project area is located in a valley north of the Virginia Range and south of the Hot Springs Mountains, but a small portion is
situated in the foothills of the Virginia Range in Section 6 (Wildlife Resource Consultants 2011). Within the project area, as previously discussed, there are four Key Habitats as defined by the NDOV Wildlife Action Plan (2006):

- Intermountain Cold Desert Scrub
- Intermountain Rivers and Streams
- Marshes
- Disturbed

The types of plant species found within these Key Habitats are discussed in Section 3.6.2.

**3.7.3 WILDLIFE**

Intermountain Cold Desert Scrub is divided into four Ecological Systems. The following two are present in the project area: Intermountain Basin Mixed Salt Desert Scrub and Intermountain Basins Greasewood Flat. Each of these wildlife habitats and the typical wildlife that they could support are detailed in Table 3.7-1. Note that disturbed areas are not included in the table as they contain sparse vegetation and ground disturbing activities that limit wildlife use. Intermountain Rivers and Streams is divided into five Ecological Systems with Intermountain Streams the most relevant to the waterways in the project area, although they are not naturally occurring.

Although infrequently observed, the most commonly recorded species of small mammals were the white-tailed antelope ground squirrel (*Ammospermophilus leucurus*) and the black tailed hare (*Lepus californicus*). Kangaroo rat (*Dipodomys ssp*) burrows were common in the valley portions of the project area. In addition, the remains of kangaroo rats (e.g., feet, tails, skull) were noted at the base of a long-eared owl roost and nest. Woodrat (*Neotoma ssp*) nests were relatively uncommon in the project area. They were recorded in the rocky outcrops in Section 6 and at the base of cottonwood trees in Section 32.

Coyote (*Canis latrans*) scat was noted throughout the project area. No active or inactive den sites were found. No kit fox (*Vulpes velox*) or kit fox sign (e.g., scat, burrows, tracks) or badger (*Taxidea taxus*) or badger sign (e.g., scat, burrows, tracks) were found. No federally threatened, endangered, or candidate species have potential to occur in the project area as documented through the USFWS letter dated April 1, 2011 (File No. 2011-SL-0178) (Appendix E); however, special status wildlife species are also defined as those protected by Nevada Revised Statute (NRS) 501, those designated as sensitive by the BLM, and those ranked by the State of Nevada as imperiled. Special status wildlife species that could occur within the project area are listed in Table 3.7-2. A list of wildlife species encountered during project surveys are presented in the Wildlife Reports in Appendix E. According to the March 21, 2011 NDOV letter regarding the proposed project, there are no known bighorn sheep, elk, mule deer, or pronghorn antelope in the vicinity of the Patua II project area, and there are no known greater sage-grouse distributions or lek sites in the vicinity of the Patua II project. Species of bats could occur in the Intermountain Basins Mixed Salt Desert Scrub including small-footed myotis (*Myotis ciliolabrum*), little brown bat (*Myotis lucifugus*), and western pipistrelle (*Pipistrellus hesperus*). Although bats forage over the shrubs found in the Mixed Salt Desert Scrub habitat, the plants in this habitat type do not provide suitable long-term night and day roosting.
### Table 3.7-1: Wildlife Species Assemblages by Key Habitat that Could Occur in the Project Area

<table>
<thead>
<tr>
<th>Key Habitat</th>
<th>Ecological System</th>
<th>Key Habitat Description</th>
<th>Species Assemblages</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intermountain Cold Desert Scrub</td>
<td>Intermountain Basin Mixed Salt Desert Scrub</td>
<td>Salt-tolerant shrubs dominated by shadscale or greasewood with Indian ricegrass common</td>
<td>▪ Loggerhead shrike&lt;br&gt;▪ Sage sparrow&lt;br&gt;▪ Brewer’s sparrow&lt;br&gt;▪ Sage thrasher&lt;br&gt;▪ Black-throated sparrow</td>
<td>Nesting, protection from predators, thermal cover</td>
</tr>
<tr>
<td></td>
<td>Intermountain Basins Greasewood Flat</td>
<td></td>
<td>▪ Burrowing owl&lt;br&gt;▪ Long-nosed leopard lizard&lt;br&gt;▪ Kit fox</td>
<td>Burrowing and denning habitat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Prairie falcon&lt;br&gt;▪ Pallid bat&lt;br&gt;▪ Desert horned lizard</td>
<td>Prey populations</td>
</tr>
<tr>
<td>Intermountain Rivers and Streams and Marshes</td>
<td>Intermountain Streams</td>
<td>Vegetation generally follows the saturation zone of the stream course. Dominant tree and shrub species in these systems may include cottonwood, aspen, alder, birch, willow, wild rose, and red-osier dogwood</td>
<td>▪ Northern Goshawk&lt;br&gt;▪ Swainson’s Hawk&lt;br&gt;▪ Black throated gray warbler</td>
<td>Breeding and foraging habitat</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>▪ Water shrew&lt;br&gt;▪ Mallard</td>
<td>Food source</td>
</tr>
</tbody>
</table>

**SOURCE:** Reynolds 2011; Fox 2011; NDOW 2006
### Table 3.7-2: Special Status Species that Could Occur in the Project Area

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Status</th>
</tr>
</thead>
<tbody>
<tr>
<td>Golden eagle</td>
<td><em>Aquila chrysaetos</em></td>
<td>BLM-state sensitive, Nevada State Protected</td>
</tr>
<tr>
<td>Prairie falcon</td>
<td><em>Falco mexicanus</em></td>
<td>BLM-state sensitive, Nevada State Protected</td>
</tr>
<tr>
<td>Swainson’s hawk</td>
<td><em>Buteo swainsoni</em></td>
<td>Nevada State Protected</td>
</tr>
<tr>
<td>Brewer’s sparrow</td>
<td><em>Spizella breweri</em></td>
<td>Nevada State Protected</td>
</tr>
<tr>
<td>Loggerhead shrike</td>
<td><em>Lanius ludovicianus</em></td>
<td>BLM-state sensitive, Nevada State Protected</td>
</tr>
<tr>
<td>Vesper sparrow</td>
<td><em>Poecetes gambineus</em></td>
<td>BLM-state sensitive, Nevada State Protected</td>
</tr>
<tr>
<td>Western burrowing owl</td>
<td><em>Athene cunicularia hypugaea</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Pallid bat</td>
<td><em>Antrozous pallidus</em></td>
<td>BLM-state sensitive, Nevada State Protected</td>
</tr>
<tr>
<td>California myotis</td>
<td><em>Myotis californicus</em></td>
<td>BLM-state sensitive, Nevada State Protected</td>
</tr>
<tr>
<td>Townsend’s big-eared bat</td>
<td><em>Corynorhinus townsendii</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Big brown bat</td>
<td><em>Eptesicus fuscus</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Spotted bat</td>
<td><em>Euderma maculatum</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Silver-haired bat</td>
<td><em>Lasionycteris noctivagans</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Small-footed myotis</td>
<td><em>Myotis ciliolabrum</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Long-eared myotis</td>
<td><em>Myotis evotis</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Little brown myotis</td>
<td><em>Myotis lucifugus</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Long-legged myotis</td>
<td><em>Myotis volans</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Yuma myotis</td>
<td><em>Myotis yumanensis</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Fringed myotis</td>
<td><em>Myotis thysanodes</em></td>
<td>BLM-state sensitive, Nevada State Protected</td>
</tr>
<tr>
<td>Western pipistrelle bat</td>
<td><em>Pipistrellus hesperus</em></td>
<td>BLM-state sensitive</td>
</tr>
<tr>
<td>Kit fox</td>
<td><em>Vulpes macrotis</em></td>
<td>Nevada State Protected</td>
</tr>
<tr>
<td>Nevada viceroy</td>
<td><em>Limenitis archippus</em></td>
<td>Nevada state-ranked</td>
</tr>
</tbody>
</table>

**SOURCE:** Fox 2011

sites. Potential day-roosting habitat in the project area is found in the isolated small rock outcrops in Section 6, the cottonwood trees along the Truckee Canal, and the cottonwood and tamarisk groves in Sections 29 and 32. Bats that day-roost outside the project area (e.g., in the cottonwood trees along the Truckee canal) likely forage in the project area. Bats were also detected in Section 28 during the 2009 surveys and would likely still occur in that area. There is no roosting habitat; however, in Section 28.
3.8 Migratory Birds

3.8.1 MIGRATORY BIRD POTENTIAL FOR OCCURRENCE

On January 11, 2001, President Clinton signed Executive Order 13186 (Land Bird Strategic Project) placing emphasis on conservation and management of migratory birds. The species are not protected under the Endangered Species Act, but most are protected under the Migratory Bird Treaty Act of 1918.

Vegetation in the project area is described based on the guidance of NDOW’s Nevada Wildlife Action Plan (2006). Intermountain Basins Greasewood Flat and Intermountain Basins Mixed Salt Desert Scrub occupy the majority of the project area. Intermountain Rivers and Streams and Marshes are also found near the Truckee Canal, the two laterals to the canal in Section 32 and in Section 29. The key habitats are described in more detail in Section 3.5 Vegetation and Section 3.7 Wildlife.

Migratory birds that could occur in the project area are listed in Table 3.8-1. The list includes USFWS species identified as Bird Species of Conservation Concern and Game Birds of Conservation Concern (USFWS 2008). The migratory bird nesting season is from May 1 through September 15.

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Habitat Association</th>
<th>Presence/Absence of Suitable Habitat</th>
<th>Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Snowy plover</td>
<td><em>Charadrius alexandrinus</em></td>
<td>Beaches, dry mud or salt flats, sandy shores of rivers, lakes and ponds.</td>
<td>Absent</td>
<td>-</td>
</tr>
<tr>
<td>Loggerhead shrike</td>
<td><em>Lanius ludovicianus</em></td>
<td>Open country with scattered trees and shrubs, savanna, desert scrub, and occasionally open woodland.</td>
<td>Potential Migratory/Breeding/Foraging Habitat</td>
<td>All sections</td>
</tr>
<tr>
<td>Golden eagle</td>
<td><em>Aquila chrysaetos</em></td>
<td>Generally open country, in prairies, arctic and alpine tundra, open wooded country, and barren areas, especially in hilly or mountainous regions.</td>
<td>Potential Migratory/Foraging Habitat</td>
<td>All sections</td>
</tr>
<tr>
<td>Burrowing owl</td>
<td><em>Athene cunicularia</em></td>
<td>Open dry shrub/steppe grasslands, agricultural and rangelands, and desert habitats associated with burrowing animals.</td>
<td>Potential Breeding/Foraging Habitat</td>
<td>All sections</td>
</tr>
<tr>
<td>Prairie falcon</td>
<td><em>Falco mexicanus</em></td>
<td>Primarily open situations, especially in mountainous areas, steppe, plains or prairies.</td>
<td>Potential Migratory/Foraging Habitat</td>
<td>All sections</td>
</tr>
</tbody>
</table>
Table 3.8-1 (Continued): Migratory Bird Species of Concern

<table>
<thead>
<tr>
<th>Common Name</th>
<th>Scientific Name</th>
<th>Habitat Association</th>
<th>Presence/Absence of Suitable Habitat</th>
<th>Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-eared owl</td>
<td><em>Asio otus</em></td>
<td>It nests in trees, often coniferous, using the old stick nests of other birds such as crows, ravens and magpies and various hawks.</td>
<td>Potential Breeding/Foraging/ Migrating</td>
<td>All Sections</td>
</tr>
</tbody>
</table>

**USFWS Game Birds of Conservation Concern**

<table>
<thead>
<tr>
<th>Bird Name</th>
<th>Scientific Name</th>
<th>Habitat Association</th>
<th>Presence/Use</th>
<th>Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mourning dove</td>
<td><em>Zeneida macroura</em></td>
<td>Open woodland, forest edge, cultivated lands with scattered trees and bushes, parks and suburban areas, arid and desert country and second growth</td>
<td>Potential Migratory/Breeding/ Foraging Habitat</td>
<td>All sections</td>
</tr>
<tr>
<td>Mallard</td>
<td><em>Anas platyrhynchos</em></td>
<td>Primarily shallow waters such as ponds, lakes, marshes and flooded fields</td>
<td>Potential Foraging</td>
<td>Section 30 and Section 32 near canal</td>
</tr>
<tr>
<td>Greater sage-grouse</td>
<td><em>(Centrocercus urophasianus)</em></td>
<td>Absent – no habitat</td>
<td></td>
<td>-</td>
</tr>
</tbody>
</table>

**SOURCE:** USFWS 2008; Fox 2011; Reynolds 2011

### 3.8.2 BIRDS OBSERVED ON-SITE

Three species of raptors, red-tailed hawk, Swainson’s hawk, and turkey vulture, were observed flying over the project area. The red-tailed hawk and Swainson’s hawk are nesting near the project area. The red-tailed hawk was observed incubating in a stick nest in a cottonwood tree or perched nearby during all survey days. During the May surveys, a pair of Swainson’s hawks was observed in a cottonwood tree that contained a stick nest. Some white-wash was present below the nest. No incubating behavior or prey remains were observed, but this species typically begins nesting activity later than other buteos.

A long-eared owl nest is present in the 23 acre salt cedar patch in Section 29. Five dead fledglings, two fledged owlets, and a single adult owl were observed in the vicinity of the platform nest.

Burrowing owls roost and nest in the abandoned burrows of ground-dwelling animals such as badgers, coyotes, and ground squirrels. Even if this diurnal owl is not directly observed, evidence of its nesting activity, including scat, pellets, feathers, insect prey remains, tracks, and burrows lined with other animals’ scat, is readily detected. While no burrowing owls or sign of their presence was noted in the project area, suitable foraging and nesting habitat is present in the project area.

As many as 30 species of passerines were observed in the project area. Sixteen of the 30 species recorded in the project area were documented only in the cottonwood and/or cottonwood and salt cedar groves. High species diversity is typically associated with riparian vegetation. Species
observed included those that were transient such as the black-throated gray warbler. Because riparian shrubs are removed as part of the Truckee Canal maintenance, it is unlikely any additional undetected passerine species would use the project area when water is present in the canal.

3.8.3 GOLDEN EAGLE

The Bald and Golden Eagle Protection Act (1940 as amended 1959, 1962, 1972, 1978) prohibits the take or possession of bald and golden eagles with limited exceptions. “Take,” as defined in the Eagle Act, 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 Eagle Act 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 that are essential for the continued viability of the site for breeding, feeding, or sheltering eagles.

BLM requires consideration and NEPA analysis of golden eagles and their habitat for all renewable energy projects (BLM Instruction Memorandum No. 2010-156). The USFWS released interim guidelines in February 2010 that recommends a four-mile survey radius. Potentially suitable foraging and nesting habitat for golden eagles is present in and within four miles of the project area. Therefore, vehicle surveys for golden eagles and/or their nests were performed from all mapped and unmapped roads within a four mile radius of the project area. Rock outcrops were scanned with binoculars for visual evidence of any nesting activity such as white wash and stick nests. Any sites with sign suggestive of nesting activity (e.g., stick structure, perched raptors, white wash) were examined more closely on foot to look for pellets, feathers, prey remains, or other evidence suggestive of nesting activity. A site’s potential suitability for nesting golden eagles was also evaluated (e.g., structure relief, height). Because the NDOW has a record for a golden eagle nest on Black Butte, which is situated less than 0.25 miles east of the project area (i.e., Section 21), this site was intensively surveyed on foot.

Within the four-mile survey radius of the project area, no adult or immature golden eagles were detected. While foraging habitat is present throughout the four-mile survey radius, no suitable nesting habitat of large rock outcrops or cliffs are present south of State Route 50. North of State Route 50, suitable nesting habitat is present only at Black Butte. Black Butte, a prominent hill at 4,700 feet in elevation, is approximately 0.25 miles east of the project area. Black Butte has large rock outcrops and bands of rimrock near its summit. The NDOW has a record for a golden eagle nest on Black Butte. This nest site was located and observed in 2010, but was inactive. This nest site was observed twice for two four-hour periods on April 1 and May 4, 2011, in accordance with USFWS 2010 Interim Golden Eagle Technical Guidance: Inventory and Monitoring Protocols, and
Other Recommendations in Support of Golden Eagle Management and Permit Issuance. No adult or immature golden eagles were observed. White wash was present in the nest vicinity but no pellets, prey remains, or feathers were present below the nest. The observed white wash could be from other raptor species or from ravens. The interior of the nest could not be readily viewed from above due to the steep rock, but could be partially seen from a position slightly above and to the east of the nest. No green vegetation or eggs were observed in the nest. This nest was determined to be inactive. As in 2010, several locations on the rimrock of Black Butte were marked with raptor white wash. Three of these locations had extensive white wash, which indicated roosting/perching over a long period of time. No golden eagle feathers or pellets were found at these locations. However, during a follow up wildlife survey on July 1, 2011, a golden eagle perch site with pellets, white wash, and feathers was identified on Black Butte, outside and east of the project area. An immature golden eagle was observed flying over the west facing slope of Black Butte and two adult golden eagles were observed in the vicinity of the inactive golden eagle nest. The nest on Black Butte was previously surveyed to protocol in 2011 and is inactive. Vehicle surveys for golden eagles and/or their nests were performed in 2011 within a four mile radius of the survey area and no nests were found and no golden eagles observed.

It should be noted that during surveys conducted in 2009, golden eagles were sighted in the project area, including two eagles perched on transmission towers near the Fernley Wildlife Management Area (approximately 2 miles north of the Patua II project area). Another adult was viewed soaring in the area in October 2009.

### 3.9 Cultural Resources

Cultural resources are protected primarily through the National Historic Preservation Act (NHPA) of 1966 and the regulations implementing Section 106 of that Act (36 CFR § 800), the Archaeological and Historic Preservation Act of 1974, and the Archaeological Resources Protection Act of 1979. Section 106 of the NHPA requires federal agencies to consider the effects of their actions on cultural resources that meet the criteria and are considered eligible for inclusion in the NRHP. These cultural resources are known as “historic properties.” Criteria for inclusion on the NRHP are provided in 36 CFR § 60.4. Section 101(d)(6)(A) of the NHPA allows properties of traditional religious and cultural importance to a tribe to be determined eligible for inclusion on the NRHP.

The area of potential effect (APE) for this project encompassed all proposed and existing well pads, proposed access roads, proposed pipeline ROWs, and the proposed transmission line route for the power plant option in Section 29. Prior to initiating fieldwork, Western Cultural Resources Management, Inc. (WCRM) conducted archival review at BLM CCDO, the BLM Winnemucca District Office, the Nevada State Museum, and on the Nevada Cultural Resources Information System (NVCRIS). WCRM also reviewed the General Land Office (GLO) plat database. The literature search determined that 11 inventories were previously conducted within 1 mile of the project area and 26 sites are located within or within 1 mile of the project area. Of the 26 sites, 12 are prehistoric (including two cave sites), 13 are historic, and one is multi-component. Four of the previously identified sites are located within the project area:

- The historic Hazen Drain (26Ch2307/CrNV-03-7539), which is identified as a Contributing Element to the Newlands Reclamation Project National Register District
### 3: AFFECTED ENVIRONMENT

- The historic Truckee Canal (26Ly917/CrNV-03-5228), which is identified as a Contributing Element to the Newlands Reclamation Project National Register District
- The historic Lincoln Highway (26Ly1248), which is eligible for the National Register of Historic Places
- The Southern Pacific Railroad (26Ly1434/CrNV-03-7537), which is eligible for the National Register of Historic Places

Field surveys followed the literature review. The survey area is shown in Figure 3.9-1. Field surveys were conducted for the project on March 19 to May 5, 2011, and May 24 to May 25, 2011. A portion of Section 21 was surveyed in 2009 for the Patua Phase I project. The surveys included traversing parallel transect lines generally oriented to cardinal directions with surveyors spaced intervals no more than 30 meters apart (per BLM and State guidelines). Isolated artifacts and features were noted, measured, and illustrated as appropriate.

The field surveys resulted in the discovery and recordation of 49 sites and 26 isolated finds. The four previously identified sites were re-examined and updated (included in the 49 sites). Seven of the 49 total sites are recommended eligible to the NRHP (Table 3.9-1), 36 are recommended not eligible, and six sites are recommended as non-contributing elements to their respective eligible sites (a segment of the Lincoln Highway and a segment of the Southern Pacific Railroad). The lack of preservation and poor overall physical integrity of most project sites affected their eligibility for NRHP listing.

The eligible aspects of the seven sites include ethnohistoric components and pre-contact components. Other than several roads, canals, and some graded areas, inventoried lands are relatively free of modern impacts.

| Table 3.9-1: Sites Recommended Eligible to the NRHP |
|---|---|
| **State Number** | **Site Type** |
| 26Ly2307 | Hazen Drain |
| 26Ly917 | Lahontan Reach of the Truckee Canal with associated features and debris |
| 26Ch3275 | Prehistoric lithic scatter and historic debris scatter |
| 26Ly1922 | Dispersed prehistoric lithic scatter and procurement area |
| 26Ly1926 | Prehistoric lithic testing and procurement area |
| 26Ly1931 | Prehistoric lithic scatter and procurement area |
| 26Ly1936 | Prehistoric lithic scatter |

**SOURCE:** WCRM 2011
Figure 3.9-1: Patua Phase II Geothermal Project Cultural Resources Survey Area
3.10 Native American Religious Concerns

The project area is located within the Lahontan basin sub-region of the Great Basin located within the Forty-mile Desert between the Hot Springs Mountains to the northeast and the Virginia Range to the southwest (WCRM 2011). Carson Lake, which is currently dry, and the Carson Sink are located to the southeast and east of the site, respectively. The Carson Desert is one of several adjacent basins that were once a part of a much larger basin containing pluvial Lake Lahontan. It is rimmed by the Hot Spring Mountains and the West Humboldt Range to the west, and the Cocoon Mountains, Lahontan Mountains, and Stillwater Range to the east.

Ethnographic information indicates that Northern Paiute occupied the study area. The Northern Paiute continue to have a presence in the project region today; their way of life is characterized by the concept of living in harmony with the natural environment. Rituals and ceremonies address the need to ensure that plants, animals, and physical elements flourish. The continued welfare of the people depends on these rituals and ceremonies being performed properly. The manner of performing the rituals and ceremonies, the places at which they are performed, and perhaps even the time of their performance are often prescribed.

Religious expression takes several primary forms including ceremonies, individual prayer, and use of power spots for vision questing, curing, and doctoring. The most frequent form of expression is the individual prayer. Prayers are made to the spirits and are especially important in connection with places where spirits may live or places regarded as power spots.

Consultation with the Fallon Paiute-Shoshone Tribe (FPST) and Pyramid Lake Paiute Tribe (PLPT) was initiated with a letter sent to Wayne Burke, PLPT Tribal Chairman, and Alvin Moyle, FPST Tribal Chairman, on April 26, 2011, and included a description of the proposed project, a map of the project location, and an invitation for comments or feedback regarding the project. Formal face-to-face consultation was initiated through an in-person meeting held between Terri Knutson, BLM SWFO Field Manager, and the FPST Tribal Council on April 27, 2011. A field trip to the project location was attended by Jason Wright, BLM archaeologist, Amy Barnes, Reclamation archaeologist, Renee Kolvet and Tara Cannon, WCRM archaeologists, and Ray Stands, FPST cultural coordinator. A second in person meeting was held on May 25, 2011, between BLM cultural staff and the FPST cultural coordinator.

No traditional cultural properties (TCPs) have been identified by the Carson City BLM as occurring within the project area or that can be affected by project activities.

The American Indian Religious Freedom Act of 1978 also allows for access to sites of religious importance to Native Americans. The Native American Graves Protection and Repatriation Act of 1990 provides for the repatriation of human remains and funerary items to identified Native American descendants. In accordance with provisions of these acts, the BLM initiated consultation with the Fallon Paiute-Shoshone Tribe and the Pyramid Lake Tribe. The BLM is also consulting with federal, state, and local agencies, Tribal governments, and stakeholder groups (see Chapter 6 for a listing). The Native American coordination process included letters, phone calls, and on-site meetings.
3.11 Mineral Resources

The project area is located south-southwest of the Hot Springs Mountains. The area west of the Hot Springs Mountains is within the Leete Mining District, which is known for salt and borax mining and is approximately 11 miles north of the proposed project area. Metallic mineral deposits are confined to the northern Hot Springs Mountains. Hydrothermal mineral deposits produced and mined in the area include gold, silver, and mercury (cinnabar) (BLM 2006).

There are several active mining claims in the project area. Mining activities include:

- Open gravel pits in Section 30 (known as the Hazen Gravel Pit)
- Diatomaceous earth mining by EP Minerals, LLC in Section 6. (Hazen Mine Project)
- A materials site leased to NDOT in Section 32

The open gravel pits in Section 30 are on Reclamation property. A boundary to the mining operation has not been established in Section 30. Approximately 234.5 acres of the mining operations are located in Section 25 and 40.6 acres in Section 36 to the west of the project area (JNT Solutions 2010). The pits yield ASTM C33, which is fine to coarse aggregate for use in concrete.

The EP Minerals Hazen Mine Project has been in operation since the early 1970s. A Plan of Operations was submitted to the BLM in the early 1990s (no date) and was updated January 17, 2003. The operations include mining of diatomaceous earth from a pit in Section 6 (Figure 2.1-5). The mine was reactivated in 2003 and continues to be operated on an intermittent basis. The work includes mining ore from the existing pit with no further surface disturbance. EP Minerals also has ongoing mining activity in Sections 12, 18, and 9 in T19N R25E (EP Minerals 2003).

The materials site in Section 32 is a site leased by NDOT in 1949 that is still active. The leased area is approximately 70 acres and includes removal of soil material for fill at NDOT construction sites.

3.12 Soils

The project area includes several soil type associations, which are listed in Table 3.13-1 and shown on Figure 3.12-1.

| Table 3.12-1: Soils in the Project Area |
|------------------|-----------|-------------------|-----------------|-----------------|-------------------|
| Soil Type        | Landform  | Drainage Class    | Parent Material  | Frequency of Ponding | Project Component |
| Pirouette-Theon-Celeton (7039) | Plateaus, ridges, fan remnants, and drainage ways | Well drained | Residuum and colluviums derived from volcanic rocks | None | Well Field |
| Juva sandy loam (169), 0 to 2 percent slopes | Alluvial fans, inset fans | Well drained | Mixed alluvium | None | Well Field Transmission |
Table 3.13-1 *(Continued)*: Soils in the Project Area

<table>
<thead>
<tr>
<th>Soil Type</th>
<th>Landform</th>
<th>Drainage Class</th>
<th>Parent Material</th>
<th>Frequency of Ponding</th>
<th>Project Component</th>
</tr>
</thead>
<tbody>
<tr>
<td>Badland-Mazuma complex, 2 to 30 percent slopes (7220)</td>
<td>Lake terraces</td>
<td>Well drained</td>
<td>Mixed alluvium</td>
<td>None</td>
<td>Power Plant</td>
</tr>
<tr>
<td>Isolde-Parran-Appian association (7026)</td>
<td>Dunes, lake terraces, lake plains</td>
<td>Excessively drained, well drained, somewhat poorly drained (Parran)</td>
<td>Eolian deposits, mixed alluvium over lacustrine deposits, lacustrine deposits</td>
<td>None</td>
<td>Well Field Transmission</td>
</tr>
<tr>
<td>Tuffman-Bluewing-Labou association (7099)</td>
<td>Beach terraces, inset fans</td>
<td>Well drained, excessively drained</td>
<td>Alluvium derived from tufa and/or alluvium derived from volcanic rock, mixed alluvium, lacustrine deposits</td>
<td>None</td>
<td>Well Field Transmission</td>
</tr>
<tr>
<td>Biddleman-Mazuma-Weena association (7017)</td>
<td>Beach terraces, lake terraces, pediments</td>
<td>Well drained</td>
<td>Mixed alluvium, residuum derived from sedimentary rocks</td>
<td>None</td>
<td>Well Field Power Plant Transmission</td>
</tr>
<tr>
<td>Parran-Sondoa association (240)</td>
<td>Lake plains, stream terraces</td>
<td>Somewhat poorly drained (Parran), well drained</td>
<td>Lacustrine deposits, alluvium derived from mixed rocks over lacustrine deposits</td>
<td>None</td>
<td>Well Field Transmission</td>
</tr>
<tr>
<td>Theon-Singaste-Weena association (7036)</td>
<td>Hills</td>
<td>Well drained</td>
<td>Residuum and colluvium derived from volcanic rocks</td>
<td>None</td>
<td>Well Field</td>
</tr>
<tr>
<td>Badland-Mazuma complex, 2 to 30 percent slopes (7220)</td>
<td>Lake terraces</td>
<td>Well drained</td>
<td>Mixed alluvium</td>
<td>None</td>
<td>Power Plant</td>
</tr>
<tr>
<td>Gravel pits (156)</td>
<td>Beach plains</td>
<td>NA</td>
<td>NA</td>
<td>None</td>
<td>Well Field Transmission</td>
</tr>
</tbody>
</table>

*SOURCE: USDA 2011*
Figure 3.12-1: Soils in the Project Area

### Survey Area (10/7/2009)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>101</td>
<td>Isolde-Appian, clay substratum complex, 0 to 4 percent slopes</td>
</tr>
<tr>
<td>103</td>
<td>Appian fine sandy loam, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>107</td>
<td>Appian-Isolde complex, 0 to 4 percent slopes</td>
</tr>
<tr>
<td>112</td>
<td>Bango sandy loam, 2 to 4 percent slopes</td>
</tr>
<tr>
<td>114</td>
<td>Bango-Hawsley association</td>
</tr>
<tr>
<td>117</td>
<td>Bluewing gravelly loamy sand, 2 to 8 percent slopes</td>
</tr>
<tr>
<td>156</td>
<td>Gravel pits</td>
</tr>
<tr>
<td>157</td>
<td>Hawsley sand, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>164</td>
<td>Isolde fine sand, 4 to 15 percent slopes</td>
</tr>
<tr>
<td>165</td>
<td>Isolde-Appian, clay substratum complex, 0 to 15 percent slopes</td>
</tr>
<tr>
<td>166</td>
<td>Isolde-Appian complex, 0 to 15 percent slopes</td>
</tr>
<tr>
<td>169</td>
<td>Juva sandy loam, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>170</td>
<td>Juva sandy loam, 2 to 4 percent slopes</td>
</tr>
<tr>
<td>181</td>
<td>Parran silty clay, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>192</td>
<td>Playas</td>
</tr>
<tr>
<td>208</td>
<td>Stillwater clay loam, wet, 0 to 1 percent slopes</td>
</tr>
<tr>
<td>209</td>
<td>Swingler clay loam, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>210</td>
<td>Swingler clay loam, slightly saline, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>211</td>
<td>Swingler clay loam, strongly saline, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>212</td>
<td>Swingler sand, 0 to 4 percent slopes</td>
</tr>
<tr>
<td>213</td>
<td>Swingler sandy loam, 0 to 2 percent slopes</td>
</tr>
<tr>
<td>235</td>
<td>Pelic-Turupah complex, 0 to 1 percent slopes</td>
</tr>
<tr>
<td>240</td>
<td>Parran-Sondoa association</td>
</tr>
<tr>
<td>241</td>
<td>Theon very gravelly sandy loam, 8 to 30 percent slopes</td>
</tr>
<tr>
<td>7004</td>
<td>Pirouette-Theon-Weena association</td>
</tr>
<tr>
<td>7013</td>
<td>Hawsley loamy sand, 2 to 8 percent slopes</td>
</tr>
<tr>
<td>7017</td>
<td>Biddleman-Mazuma-Weena association</td>
</tr>
<tr>
<td>7018</td>
<td>Biddleman-Bluewing association</td>
</tr>
<tr>
<td>7019</td>
<td>Bluewing very gravelly sandy loam, 2 to 8 percent slopes, occasionally flooded</td>
</tr>
<tr>
<td>7023</td>
<td>Bango-Biddleman-Mazuma association</td>
</tr>
<tr>
<td>7026</td>
<td>Isolde-Parran-Appian association</td>
</tr>
<tr>
<td>7028</td>
<td>Cleaver-Weena-Hawsley association</td>
</tr>
<tr>
<td>7035</td>
<td>Pirouette-Cleaver-Weena association</td>
</tr>
<tr>
<td>7036</td>
<td>Theon-Singatse-Weena association</td>
</tr>
<tr>
<td>7037</td>
<td>Theon-Ceejay-Weena association</td>
</tr>
<tr>
<td>7038</td>
<td>Cleaver gravelly sandy loam 4 to 15 percent slopes</td>
</tr>
<tr>
<td>7039</td>
<td>Pirouette-Theon-Cleleton association</td>
</tr>
<tr>
<td>7042</td>
<td>Bango-Hawsley association</td>
</tr>
<tr>
<td>7099</td>
<td>Tuffman-Bluwing-Labou association</td>
</tr>
<tr>
<td>7220</td>
<td>Badland-Mazuma complex, 2 to 30 percent slopes</td>
</tr>
<tr>
<td>7221</td>
<td>Biddleman-Mazuma association, sodic</td>
</tr>
</tbody>
</table>

### Survey Area (9/28/2009)

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>792</td>
<td>Pirouette-Osobb-Rock outcrop association</td>
</tr>
<tr>
<td>825</td>
<td>Mine pits</td>
</tr>
<tr>
<td>7035</td>
<td>Pirouette-Cleaver-Weena association</td>
</tr>
<tr>
<td>7036</td>
<td>Theon-Singatse-Weena association</td>
</tr>
<tr>
<td>7037</td>
<td>Theon-Ceejay-Weena association</td>
</tr>
<tr>
<td>7038</td>
<td>Cleaver gravelly sandy loam 4 to 15 percent slopes</td>
</tr>
<tr>
<td>7039</td>
<td>Pirouette-Theon-Cleleton association</td>
</tr>
</tbody>
</table>

**Source:** NRCS/USDA 9/28/2009 and 10/7/2009
3.13 Wastes, Hazardous or Solid

The Resource Conservation and Recovery Act (RCRA) gave the EPA the authority to control hazardous waste from when it was created to its disposal and includes the generation, transportation, treatment, storage, and disposal of hazardous waste. Drilling fluids, produced water, and other wastes associated with the exploration, development, or production of crude oil, natural gas, or geothermal energy are exempt from RCRA Subtitle C.

No hazardous materials are known to be present in the project area. Three mining operations occur in Sections 30, 32, and 6. No hazardous materials are used for these mining operations other than motor fuels and diesel fuel. There is no evidence to suggest that hazardous material was stored for one or more years, disposed of, or released on the project area. One major highway, Alt 50, provides access to the site.

Solid waste facilities are located within Churchill County and neighboring Storey County. Both Russell Pass Landfill in Fallon, NV and Lockwood Regional Landfill, approximately 10 miles east of Reno, NV are Class 1 facilities and are permitted to accept more than 25,000 tons of solid waste (including construction and demolition debris, industrial and special waste, and drum management-liquid) daily (Sergent pers. comm. 2011).

3.14 Air Quality

The proposed project is located in the intermountain west, which tends to be dominated meteorologically by recurring high and low pressure systems. The closest city to the project site, Fernley, Nevada, experiences a high desert climate with hot summers and cold winters. Average mean temperatures are 72 degrees Fahrenheit in the summer and 34 degrees in the winter (Western Regional Climate Center 2011). Summer is often marked by stationary high-pressure systems that develop over the region. These systems augment clear-sky conditions but also can result in large-scale stagnation of underlying air when light wind conditions persist (Western Regional Climate Center 2011). Thunderstorms that develop in the afternoons, most often in summer, also generate dust. Dust storms can cause substantial decreases in air quality, and can severely reduce visibility. Levels of particulate matter in the air are elevated during and following dust storms. Vehicle travel on unpaved roads is another large contributor to fugitive dust emissions.

The State of Nevada is required to identify geographic areas that are not in compliance with federal and/or state air quality standards. The NDEP, Bureau of Air Quality Planning (BAQP), operates an ambient air quality monitoring network of gaseous and particulate pollutant monitors throughout rural Nevada. The state has ten air quality monitoring stations, the closest of which is located in Fernley, Nevada; the station is approximately seven miles west of the proposed project area (NDEP 2011). The project area is located within Lyon and Churchill Counties, which are in compliance with federal and state air quality standards. The project area is in attainment status for criteria pollutants, including nitrogen dioxide (NO₂), sulfur dioxide (SO₂), carbon monoxide (CO), particulate matter smaller than 10 microns in aerodynamic diameter (PM₁₀), particulate matter smaller than 2.5 microns in aerodynamic diameter (PM₂.₅), ozone (O₃), and lead (Pb) (BAQP 2007). Appendix F lists the ambient air quality standards applicable in Nevada. An air quality conformity
analysis is not required for the proposed project because there are no criteria pollutants with a non-attainment status within the air shed, per 40 CFR 93, Subpart B.

NDEP has also established an ambient air quality standard of 0.08 parts per million (ppm) or 112 micrograms per cubic meter for H2S. Nevada Administrative Code 445B.22097 provides the minimum standards of quality for Nevada ambient air.

The Final Mandatory Reporting of Greenhouse Gases Rule issued by the EPA, as signed on September 22, 2009, requires suppliers of fossil fuels or industrial greenhouse gases (GHG), manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions to submit annual reports to the EPA. NDEP also requires GHG emissions reporting; however, NDEP has exempted geothermal projects from GHG reporting (Nevada Revised Statutes (NRS) 445B.370 and NRS 704.7811).

### 3.15 Visual Resources

BLM utilizes a visual resource management (VRM) process to manage the quality of landscapes on public land and to evaluate the potential impacts to visual resources resulting from development activities. VRM class designations are determined by assessing the scenic value of the landscape, viewed sensitivity to the scenery, and the distance of the viewer to the subject landscape. These management classifications identify various permissible levels of landscape alteration, while protecting the overall visual quality of the region. They are divided into four levels (Class I, II, III, and IV). Class I is the most restrictive and Class IV is the least restrictive in terms of changes that are allowed to the characteristic landscape (BLM 1986).

The project area is located within an area that does not currently have a VRM classification. The project area is considered an Interim Class III until a final VRM class is determined. The objective of Class III management is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Sensitive receptors in the lease area include people recreating in the area, motorists on Alt 50, and nearby residents. Residences are located approximately 800 feet to the west and southeast of the project site.
4: Environmental Consequences

4.1 Introduction

This section describes the effects of the proposed project on the environmental resources identified and described in Section 3: Affected Environment.

4.2 Land Use and ROWs

4.2.1 PROPOSED ACTION

Land Use and ROWs

The proposed TGHs, access roads, well pads, and pipelines would be located within the BLM geothermal lease area and would be subject to compliance with the conditions of the BLM geothermal leases. Although the lease area may contain existing valid surface uses (such as easements, ROWs, and range improvements), these uses are largely nonexclusive, so compatible rights can be granted.

The geothermal leases include several stipulations pertaining to use of the land. The lease stipulations are included in Appendix G. The leases include a no occupancy requirement “within 650 feet (horizontal measurement) of any surface water bodies, riparian areas, wetlands, playas or 100-year floodplains to protect the integrity of these resources. Pads have been sited to be at least 650 feet from the Truckee Canal and the laterals.

Another lease stipulation requires no surface occupancy within 500 feet on either side of the centerline of any and all roads or highways within the lease area. All well pads would be more than 500 feet from the centerline of public roads and highways. Uses of the land in the project area are limited, but include mining operations in Section 6, Section 30, and Section 32. Use of these mines is discussed below and in Section 4.13 Minerals. Maintenance activities associated with the various ROWs (discussed below) in the project area occur periodically. The construction, operation, and decommissioning of the proposed project would have minimal impacts on existing lands uses.

ROWs

Several ROWs occur within the project area as identified in Table 3.2-1. The timing of geotechnical investigations would be coordinated with Reclamation to ensure no conflicts with ongoing activities. Geotechnical studies would be short-term in duration and result in very limited ground disturbance and therefore, would not impact the Truckee Canal ROW.

A Traffic Management Plan would be prepared, approved by the BLM and Reclamation, and implemented by GRI to minimize project impacts on other land uses, including mining activities and maintenance of the various irrigation facilities in the project area. Diatomaceous earth operations in Section 6 are minimal and would occur occasionally (EP Minerals 2003). The access road into the diatomite mine in Section 6 identified in the EP Minerals Plan of Operations would not be used by GRI.
Reclamation has indicated that additional gravel mining operations may occur in the future in Section 30. GRI has sited the well pads and pipelines in Section 30 in coordination with Reclamation. GRI may also opt to perform a gravel exploration program to help Reclamation determine the extent of the mining and the access needs if GRI chooses to move the well pads or pipelines within Section 30.

GRI would obtain permission from Reclamation for use of short portions of operations and maintenance roads. Once a plan has been submitted for upgrading these road segments to AASHTO U80 and canal design standards, Reclamation would review and approve final design.

GRI would coordinate with NDOT and Union Pacific Railroad and obtain the appropriate permits to construct the pipeline undercrossing under Alt 50 and the railroad as well as the transmission line crossing over the highway and under the railroad, if a power plant is built in Section 29. Design and construction approvals would be obtained for the construction of project pipelines under the Truckee Canal and over the two laterals in Section 32.

Pipelines would be constructed under unpaved and other roads in the project area, including service roads for the 500 kV transmission line, so as not to block access. Temporary blockage of some roadways may occur during construction; however, construction of the pipeline crossings would be completed quickly (usually in less than a day) and alternative routes around the construction areas would be available.

GRI would coordinate with Kinder Morgan prior to construction near the gas pipeline located in Section 28. The Transportation Research Board recommends a setback of 25 feet from gas and hazardous liquid lines to water wells and 50 feet from structures. The TGH proposed to be drilled in Section 28 would be located at least 50 feet from the Kinder Morgan pipeline. The well pads would be located more than 50 feet from the pipeline. A small section of road would need to be constructed over the Kinder Morgan Pipeline. GRI would coordinate with Kinder Morgan prior to any ground disturbance in Section 28 to ensure that the gas pipeline is properly marked and avoided, and that all requirements specified by Kinder Morgan are met for construction in the vicinity of the gas pipeline. Operation of the project would not inhibit the maintenance of the pipeline.

The project construction, operation, and decommissioning would have minimal impacts on ROWs with the proper coordination and approvals.

**Recreation**

OHV activities are allowed in Section 6 in the project area. The project could have minor impacts on OHV use as the well pads and pipeline would occupy a very small fraction (39 acres) of the total amount of OHV use in the area. Impacts from project construction, operation, and decommissioning would be negligible.

**4.2.2 NO ACTION ALTERNATIVE**

The No Action Alternative would result in no geothermal exploration or development activities in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the project description would occur. No impacts to land uses would occur under the No Action Alternative.
4.3 Livestock

4.3.1 PROPOSED ACTION

The project site is located within the Truckee-Virginia Allotment, which currently includes one grazing permit. The grazing permit authorizes the permittee to graze livestock anywhere within the 21,369 acres of public land within the allotment from November 1st through April 15th. There is currently no grazing in areas outside of Section 6.

Approximately 97 acres of land within the Allotment would be in use for construction of the well pads, pipeline, and access roads, which is less than 1 percent of the total grazing allotment. The potential impacts related to construction would be temporary (part of one season) and would occur at the edge of the grazing allotment. Construction would likely occur during the dry season, when cattle grazing is not permitted (April 16th through October 31st). If some overlap in construction and grazing occurs, livestock would likely avoid the immediate areas of construction. Livestock would likely access the entire area once construction is complete but would not graze on the 97 acres used for project facilities. Permanent loss of grazing habitat would be limited to the area of the well pads, pipelines, and access roads. Cattle would be able to cross access roads. The project would not compromise livestock access to available water sources if the area were to be used for grazing in the future. Maintenance vehicles would access the wells pads periodically along the access roads. Vehicles would travel at low speeds to minimize potential for injury to cattle, were access to occur during the permitted grazing season and cattle were in the area.

Decommissioning would include the removal of project facilities and associated structures. Decommissioning and restoration would return the 97 acres of previously disturbed areas within the grazing allotment to land that could potentially be utilized again for livestock grazing. The impacts during decommissioning would be similar to those of construction.

4.3.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the project description would occur.

4.4 Water Resources

4.4.1 PROPOSED ACTION

Surface Water

Surface waters would not be impacted by geotechnical investigations as the bore holes would be located away from surface waters and would be minimally invasive. The 8-inch diameter holes (one per side of the canal per crossing) would be filled and potential for erosion or other impacts to surface waters would be minimal. Soil sample areas would be two inches in diameter would also be filled after completion of test. TGH drilling would not impact surface waters. All fluids would be contained in the mud tank (which would be used if the pad and reserve pit are not yet built) and properly disposed of off-site. TGHs would be located away from existing surface waterways. Surface water runoff during construction would increase slightly at the well pads due to vegetation removal and soil compaction. Once the pads are constructed, surface water runoff is
minimized as all stormwater, any potential drilling muds and fluid spills, and storage tanks containment areas would drain to the reserve pit. The reserve pit would be clay-lined to prevent seepage of geothermal or other fluids into the underlying groundwater. Containment berms would be constructed around all hazardous material or potentially hazardous material storage areas. Accidental releases of any spilled hazardous materials at the well pad would therefore not affect surface water. Off-pad stormwater would be directed away from the well pads.

Blowouts have the potential to release water pollutants to the surrounding environment. BOPE would minimize the risk of impacts related to uncontrolled release of geothermal fluids. BOPE would be maintained at the wellhead to allow well shutdown if an uncontrolled flow of fluid or gas occurs. Blowouts are extremely rare and unlikely to occur.

The geothermal lease stipulates no surface occupancy or ground disturbance within 650 feet from “water bodies” (including drainages/ephemeral washes as shown in Figure 3.4-1). No pads would be constructed within drainages or ephemeral washes or within 650 feet of water bodies including the Truckee Canal or the canal laterals.

The geothermal pipelines would be constructed under the Truckee Canal and Hazen Drain, and over or under the two laterals in Section 32. If the crossings are to be made above ground, appropriate best management practices would be implemented to ensure that no materials, debris, or waste falls into the laterals during construction. The undercrossing of the canal would be constructed in accordance with the recommendations presented in the geotechnical evaluations and as approved by Reclamation and following Reclamation’s Engineering and O&M Guidelines for Crossings, Bureau of Reclamation Water Conveyance Facilities (Canals, Pipelines, and Similar Facilities) (Bureau of Reclamation 2008).

The crossing of the Truckee Canal would be implemented following the procedures and meet Reclamation’s Engineering and Operations and Maintenance Guidelines to ensure the protection of water quality within the canal. The laterals would be crossed either through trenching or expansion loops over the canals. If trenching is used to construct the lateral crossings, the trenching would be performed when there is no water in the laterals. Best management practices would be implemented to minimize any potential for runoff or contamination of the laterals and all debris would be cleaned from the lateral after construction, before water flows in the laterals. The area of trenching would be stabilized, as appropriate, to prevent sedimentation once water begins to flow within the lateral. Embankments would be compacted to Reclamation standards.

The project access roads may also cross seasonal drainages as identified in Figure 3.4-1. When permanent new access roads must cross ephemeral washes, rolling dips would be installed. The rolling dips would be designed to accommodate flows from at least a 25-year storm event. Culverts may be used wherever rolling dips are not feasible. The implementation of these design features would minimize impacts to drainages in the project area.

Operation of the well pads, pipelines, power plant and transmission line would not have an additional potential for impacts to surface water or water quality. No additional ground disturbance would occur during project operation other than occasional maintenance at the well pads which would have no impacts on water quality.
Decommissioning activities would include capping wells and reclaiming the area. No other activities that could degrade water quality would occur, other than use of construction equipment and vehicles. There is a low risk of fuel spills from use of construction equipment and vehicles; however, spill control and containment measures would minimize risks to water quality. The risk of impacts to water quality would be minimal.

**Groundwater**

Geotechnical investigations would have no impacts on groundwater. Groundwater levels would be assessed during the investigations. The 8-inch-diameter holes would be filled with cement grout after testing to ensure that they do not provide a conduit to groundwater.

Approximately 20,000 gallons per day of water is required for drilling. A 10,000 gallon water truck would be available for dust suppression. Less water would be required for construction. An estimated 34 acre-feet of water would be required for project construction. This amount of water is small compared to other industrial and agricultural uses in the area. The water would be obtained from on-site water wells. Applications would be submitted to the NDWR for approval to drill one or more water wells for dust control and soil compaction purposes during construction of the proposed geothermal well pads and access roads. Alternatively, water would be purchased from private parties as numerous private parties have been identified in the area that have water available for sale on existing water rights.

Short-term flow testing (rig tests) would result in the permanent loss of some geothermal reservoir fluid. An estimated 2,000 gpm of flow is expected for each well and each well would be flowed for several hours. An estimated 1 million gallons or more of geothermal fluid may be withdrawn per well during rig tests, which is a small amount compared with the likely overall geothermal reservoir volume. The geothermal fluid would be withdrawn from a depth of 7,000 to 10,000 feet, and would not result in a drawdown of the groundwater aquifer, which is much shallower (on the order of hundreds of feet deep). Water from rig tests would be directed to the reserve pits where it would evaporate, or be directed through temporary pipelines to other wells where it would be injected. Reserve pits would be lined with clay to prevent percolation and contamination of groundwater.

Long-term testing, which can last up to 90 days, would likely include injection of withdrawn fluid and therefore would result in much less loss of geothermal fluid. In accordance with lease stipulations, GRI would prepare and submit a Hydrologic Baseline Data Collection Plan for approval by the BLM and/or Reclamation, prior to drilling. The plan would be implemented during drilling and project operation.

The operation of the project would have no impacts on ground or surface water hydrology. GRI is proposing a binary plant, where all of the geothermal fluid is returned to the geothermal reservoir. With an air-cooled system, all fluids would be returned to the reservoir and no additional groundwater would be needed. In accordance with lease stipulations, GRI would prepare and submit a Hydrologic Baseline Data Collection Plan for approval by BLM and/or Reclamation prior to drilling. The plan would be implemented during drilling and project operation.

The project would also comply with all requirements of the Underground Injection Control Program and permits to ensure that groundwater is not impacted.
Drinking Water and Other Well Water Supplies

The project area is not located within any source water areas as defined by NDEP (NDEP 2011). Several groundwater wells, including domestic and two municipal wells are located within two miles of the project area as shown in Figure 3.4-2. Geothermal fluid can have a higher concentration of dissolved solids than groundwater. To ensure that groundwater wells are not contaminated, a cementing and casing program for construction of TGH and geothermal production wells would be implemented during or after well installation. Borehole geophysics analyses (cement bond logs) would be conducted to document that well-casing grouting activities provide an effective seal, isolating the geothermal aquifer from shallow alluvial aquifiers that support the surrounding wells and therefore minimizing potential impacts on groundwater users. None of the existing wells are located on proposed well pads and the project would not inhibit access to or use of any existing wells. BMPs to prevent release of fuels or other construction materials would be implemented, including GRI’s Stormwater Pollution Prevention Plan (SWPPP) and Spill Prevention, Control, and Countermeasure (SPCC) Plan, which would be prepared and submitted to the BLM and Reclamation prior to construction. Implementation of these plans would ensure that drinking water and other groundwater wells and supplies are not contaminated.

Decommissioning would involve the plugging of the wells and removal of the project components. Cessation of withdrawal and injection would allow the geothermal reservoir to return to natural conditions. No effects to groundwater would occur.

4.4.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the project description would occur. No impacts to surface water or groundwater quality or quantity would occur.

4.5 Vegetation

4.5.1 PROPOSED ACTION

Completion of the proposed geotechnical investigations, and construction of the TGHs, well field, power plant, and associated features would require permanent and temporary disturbance of up to approximately 620 acres of which 574 to 620 acres would be within Intermountain Cold Desert Scrub habitat (depending upon which power plant option is exercised).

Jack and bore drilling methods would require the disturbance of up to one acre of temporary habitat disturbance per crossing, for crossing of features such as the Truckee Canal, Hazen Drain, Alt 50, and the Union Pacific Railroad, to construct the drilling pits, which is included in the total estimated maximum disturbance of 620 acres. These crossing would be within desert scrub habitat and would not impact wetland or riparian vegetation. The pipeline crossings of the laterals in Section 32 would require the removal of some vegetation including cottonwood and (an estimated 0.01 acres per crossing for two crossings). Salt cedar is an invasive species and removal would have beneficial impacts on the laterals (salt cedar transpires considerable amounts of water) and surrounding vegetation. Removal of some cottonwood would not have adverse effects because
vegetation is often removed during maintenance of the laterals. Measures to ensure that any
nesting birds are not affected are included in Section 4.9 Migratory Birds.

The project could require the removal of some vegetation in Section 29 if this power plant option is
exercised. This area is currently highly disturbed with invasive, non-native, and noxious species
including salt cedar and tall whitetop.

Impacts to vegetation would be minimized by reseeding all areas of access roads and well pads
not required for subsequent energy production using a BLM-approved native seed mixture.
Reseeding would not be undertaken in areas where soil conditions are inappropriate or where the
adjacent undisturbed land surface has little or no vegetation, as determined in coordination with a
qualified biologist. Topsoil would be salvaged whenever possible and reused in a timely manner.
All reclamation would be performed in accordance with the Gold Book (BLM and USFS 2007) and
lease stipulations. Native soil material and organic matter (topsoil) salvaged from the site
preparation operations would be reused as a top-dressing on berms and other areas requiring
revegetation to the extent practical.

Impacts from decommissioning and restoration would be similar to those expected during
construction. A small amount of vegetation may need to be cleared to facilitate the removal of
access roads, the power plant, and pipelines (i.e., such as for staging areas). Disturbed areas would
be revegetated as required by Reclamation and BLM and impacts would be minimal.

4.5.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the
project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other
activities described in the proposed action would occur. Vegetation would remain unchanged.

4.6 Invasive, Non-Native, and Noxious Species

4.6.1 PROPOSED ACTION

Construction and implementation of the proposed project has the potential to increase the spread
of invasive, non-native, and noxious species. 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 also could be introduced by construction equipment brought to
the project from infested areas or by the use of seed mixtures or mulching materials containing
weed seeds.

The potential to increase the spread of invasive, non-native, and noxious species would be
minimized through the implementation of the Noxious Weed Abatement Plan, included in
Appendix H of this EA. The plan includes implementing a combination of cultural, mechanical,
and chemical controls.

Cultural controls include seeding areas devoid of vegetation, using weed-free mulches, and using
machinery and equipment that are not contaminated with weed seeds. Interim seeding of
stockpiles or other disturbed areas with aggressive annual species such as rye or barley wheat
would be used to control the spread of weeds. Mechanical control methods that physically destroy
the weed include hand pulling, cultivating, mowing, and root plowing. Chemical methods include use of herbicides.

The plan also includes methods to address the specific infestations of tall whitetop, salt cedar, and Russian knapweed. These species would be treated where encountered in the construction area. Effects from the spread of invasive, non-native, and noxious species would be minimal with implementation of the Noxious Weed Abatement Plan (Appendix H).

Impacts from decommissioning would be similar to those expected during construction. Some ground disturbance would be required during the removal of the access roads, power plant, pipeline, and transmission line. Disturbed areas would be revegetated with a weed-free mix, as required by Reclamation and the BLM. The Noxious Weed Abatement Plan would be updated and implemented to reduce the potential spread of invasive, non-native, and noxious species that may occur in the area at that time. Impacts would be minimal.

4.6.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the project description would occur.

4.7 Wildlife

4.7.1 PROPOSED ACTION

The project area supports limited habitat for many Great Basin wildlife species and has the low diversity of wildlife species typical of desert scrub and greasewood flats. Direct impacts to wildlife species could result from mortality or injury from equipment during project construction. Vehicles would not travel off-road, which would reduce the likelihood of mortality.

Species of bats including small-footed myotis (Myotis ciliolabrum), little brown bat (Myotis lucifugus), and western pipistrelle (Pipistrellus hesperus) could occur in the project area. Roosting habitat in the project area is found in the isolated small rock outcrops in Section 6, the cottonwood trees along the Truckee Canal, and the cottonwood and tamarisk groves in Sections 29 and 32. Bats could be affected by the removal of the trees. Rock outcrops and trees along the laterals and in Section 29 would be checked prior to construction to ensure no roosting bats are present in order to avoid direct effects to roosting bats. If roosting bats are present, construction would not commence until the bats have left the area. Similar roosting habitat is found in the surrounding areas and effects are expected to be minimal.

A special status butterfly species, the Nevada viceroy (Lemenitis archippus) could also occur in willows (which are the host plant for its larvae) in the understory of the cotton wood and salt cedar groves in Section 29 and 32 and where willows are present along the Truckee Canal. Willow habitat would be avoided to the greatest extent feasible during construction. If willows have to be removed, such as for the construction of the pipeline crossings, the vegetation would be inspected by a qualified biologist for bats and Nevada viceroy just prior to removal. If bats or viceroy larvae are found, the willows would not be removed until the bat has left the area or the viceroy larvae have transformed or have been relocated.
Indirect effects to wildlife during construction could include loss of approximately 620 acres of foraging and breeding habitat (including 271 acres of temporary disturbance), which could result in reduced breeding success for species that are sensitive to human activity. Effective habitat loss from disturbance may encompass a larger area for some species because they would avoid areas of human activity and presence. Noise, human presence, and heavy equipment during construction would likely temporarily displace wildlife that may be present in or near the project area. Some mortality or reduced breeding success of common species, such as lizards and rodents, would have minimal impacts to populations due to the abundance of these species in the area. Fences would be designed for wildlife and livestock protection in accordance with Gold Book standards (BLM and USFS 2007).

Indirect effects to bats from construction could also occur. The area for these project facilities could be used as foraging habitat by bats that roost in the cliffs to the east or near the canal to the south. Bats are nocturnal and forage at night. Construction would only occur during the day, thus human disturbance during foraging would be minimized. Drilling would generate noise and could occur 24 hours per day, and could displace any foraging bats from the immediate vicinity of the drill rig. While the project would result in the loss of 620 acres of potential foraging habitat, and a nominal amount of roosting habitat in isolated rock outcrops in Section 6 and tamarisk and cottonwood trees in Section 29 and 32, bats could utilize the abundant unaffected surrounding habitat.

Impacts would be temporary and short term for the duration of the proposed construction and drilling activities. Wildlife would be able to return to the disturbed areas upon completion of ground-disturbing activities. No population-level impacts to wildlife species are expected as a result of project construction. Because wildlife would likely return to the area after construction is complete and because similar habitat is available near the project area, impacts to wildlife from construction activities are expected to be minor.

Operation of a complete geothermal project, including well pads, access roads, pipelines, power plant and transmission line typically occupies a small percent of a productive geothermal area. Direct impacts are limited after construction is complete; however, long-term indirect impacts could still occur due to permanent habitat loss, as well as from habitat fragmentation from these features and with interactions with humans.

The project components would be located mostly within desert scrub and greasewood flat communities. The project is located adjacent to Alt 50 on a regional scale. Alt 50 acts as a barrier to wildlife movement. There are several existing mining operations in the area. The geothermal well field, pipelines, roads, power plant, and transmission line in the area would permanently disturb approximately 340 acres. The overall availability of adjacent, similar habitat is over 23,000 acres. Large amounts of similar open landscape to the north and to the south of the project area is available for wildlife, including foothills supporting bat roosting habitat in the Virginia range to the south and Black Butte to the north east. An increased “edge effect” of project development would be minimal, given it is already bordered by a wildlife movement bounding feature.

Given the relative homogeneity of the habitat in the area, and the mobility of many of the common wildlife species found in the area (i.e., raptors, bats, coyotes, and rabbits), isolation of populations or species is expected to be minimal. Open space can be found between the project components. Roads are relatively narrow (i.e., 30 feet wide) and unpaved, and can be easily crossed by small
4: ENVIRONMENTAL CONSEQUENCES

animals such as nocturnal and diurnal rodents. Pipelines are built at least several inches to a few feet above the ground surface so that small animals can pass underneath. Traffic on the roads during operation would be relatively infrequent. Fencing would be limited to isolated areas within well pads and would not inhibit wildlife movement. Under normal circumstances, access would be once per day to each well pad. Although an increase in mortality of wildlife from vehicles could occur, vehicle speeds will naturally be reduced on dirt roads, thus reducing potential animal-vehicle collisions. Thus, overall effects to wildlife and wildlife populations in the area would be minimal.

Changes in vegetative composition and changes to the type, quality, and amount of foraging habitat can also impact wildlife species. Impacts to vegetation composition would be minimized through the implementation of reclamation of disturbed areas and long-term implementation of the Noxious Weed Abatement Plan (Appendix H). Some vegetation would be permanently lost for the project components; however, given the availability of similar habitat in the area, the loss would be minimal.

Human presence and built features would persist as part of project development; however, wildlife would be expected to become acclimated to the project facilities and intermittent human presence and would re-inhabit some areas. Permanent loss of habitat would not be considered adverse due to the relatively small size and area that the project features would disturb compared with the availability of similar habitat in the project area. The area is also very close to existing disturbances such as US Alt 50, the railroad, and several mining operations.

Impacts from decommissioning would be similar to those expected during construction of the project facilities. Removal of infrastructure would temporarily disrupt habitat; however, disturbed areas would be revegetated such that the areas would return to the dominant vegetation types for the habitat in the area. Impacts would be temporary and would have limited effects on wildlife.

4.7.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the proposed action would occur. No impacts to wildlife would occur.

4.8 Migratory Birds

4.8.1 PROPOSED ACTION

Migratory Birds

Project construction and operation could have direct and indirect impacts to migratory birds and their life requisites, as summarized in Table 4.8-1. Clearing of vegetation during the avian nesting season could lead to the loss of nests, eggs, and/or young. Nesting birds were identified during surveys in the project area, including two pairs of red-tailed hawk in Section 32 and a long-eared owl nest in the 23 acre tamarisk patch in Section 29. Refer to the Wildlife Reports in Appendix E. To avoid impacts to nesting birds, vegetation would be cleared for construction of the project facilities prior to the nesting season (May 1 through September 15). If vegetation must be removed during the migratory bird nesting season, surveys for nesting birds would be conducted by a qualified wildlife biologist within three weeks of the vegetation removal for any nesting habitat.
Within 300 feet of the area of disturbance. If active nests are located within the area, GRI will consult with BLM/Reclamation to develop appropriate protection measures for the nests. Such measures may include the establishment of buffers around the nest until the young have fledged or the nest has failed.

Impacts to migratory birds’ could also occur during drilling if the reserve pit contains oil-based contaminants (from pad runoff), as migratory birds may use the pits for bathing and loafing. Ingestion of oil and contaminants or coating of the birds’ feathers could cause mortality to migratory birds. During drilling, if the reserve pit contains oil-based contaminants (such as from runoff or drilling muds) the pits would be fitted with exclusion devises such as netting or floating balls, in accordance with lease stipulations.

Indirect effects to migratory birds during construction could include loss of approximately 620 acres of foraging and breeding habitat. Effects due to loss of habitat would be minimal because large tracts of similar habitat are adjacent to the project area. More than 23,000 acres of undisturbed, similar habitat is located within a 2-mile radius of the project area. Migratory birds are mobile and can forage over large distances, such that the temporary loss of 620 acres of habitat during construction and 340 acres of permanent habitat loss should have minimal impacts on breeding and foraging.

To further minimize impacts to breeding and foraging habitat due to habitat alteration well pads and roads no longer being utilized would be recontoured and reseeded following completion of construction. Reseeding would not be undertaken in areas where soil conditions are inappropriate or where the adjacent undisturbed land surface has little or no vegetation, as determined in coordination with a qualified biologist. Topsoil would be salvaged and reused whenever possible and in a timely manner.

| Table 4.8-1: Summary of Effects to Migratory Birds |
|---|---|---|
| Phase | Type of Effect | Effects | Life Requisite Effects |
| Construction | Direct | Physical disturbance to nesting birds, if present | Breeding |
| | | Exposure to chemical constituents in reserve pits | Health and life of the bird |
| | Indirect | Temporary loss of habitat through ground disturbance | Breeding, foraging, and protection from predators |
| | | Construction noise | Breeding and foraging |
| Operation | Direct | Electrocution from contact between transmission lines | Migration |
| | Indirect | Permanent loss of habitat | Breeding and foraging |
| | | Operational noise | Breeding and foraging |
Construction, human activity, and increased noise in the project area from construction and drilling could temporarily displace migratory birds from the project area. However, large tracts of similar habitat are found adjacent to the project area, and some less sensitive species of migratory birds would likely return to the area after construction (Delong et. al. 2004).

The project could potentially include the construction of a new 2.31 mile long transmission line. Transmission structures would be designed with sufficient phase spacing to make it improbable that the wing span of the typical raptor can contact two phases, thus avoiding the potential for bird electrocution. HF structures are inherently safe for raptors, which would most likely perch on the tops of the poles, high above the 120kV phases. If top arm bracing is not used another perching cross arm would be mounted or the insulator strings would be lengthened so that raptors cannot contact phase conductors upon taking off. Anti-nesting and perch spikes would be installed on the tops of structures where warranted to minimize effects to raptors.

Noise during operation of the project could permanently displace avian species, affecting their migration and foraging behavior. However, large tracts of similar habitat are found adjacent to the project areas (over 23,000 acres within a 2-mile radius of the project area), and migratory birds would likely return to the area after construction. Migratory birds are also very mobile predators that can forage over several square miles in a day.

Impacts from decommissioning would be similar to those expected during construction. Some ground disturbance would be required for the removal of the access roads, power plant, pipeline, and transmission line. Disturbed areas would be revegetated with a weed-free mix and well pads and roads would be recontoured. Temporary effects to migratory birds would occur due to noise and human presence. Measures used during project construction, such as conducting nesting surveys for work performed in the avian breeding season, would be implemented to ensure that decommissioning impacts are minimal.

**Golden Eagle**

No loss of rock outcrop golden eagle nesting habitat, (e.g., Black Butte, Little Butte) would occur as a result of the project. An inactive golden eagle nest is located on Black Butte, approximately 4,118 feet from the closest part of the project area (the power plant option in Section 21). Although this nest has been inactive for the past five years, it is possible that golden eagles could reoccupy this site or construct an alternate nest at another location on Black Butte or within this territory.

Impacts to nesting golden eagles (which could include nest site abandonment and mortality to eggs and/or young from human activity, mechanical activity, and noise) depend on the source or type of disturbance and the distance between the disturbance and the nest (Richardson and Miller 1997). Researchers have recommended variable quantitative buffer zones between active golden eagle nests and variable sources of disturbance (e.g., noise, visual, pedestrian, vehicle). Suggested buffer zones range from a minimum of 656 feet to 5,280 feet (Call 1979; Craig 1995; Suter and Jones 1981; Holmes et al. 1993; Richardson and Miller 1997). It has also been recommended that the size of buffer zones should be developed based on a combination of buffer zone and viewshed (Camp et al. 1997) and/or should consider the prior history of disturbance to individual raptors (Stalmaster and Newman 1978).
A portion of the power plant site would be located within 4,118 feet of Black Butte; however, no other project features would be located within one mile of Black Butte. The power plant would be a permanent facility; therefore, buffer zones could not be implemented. The documented nest is outside the viewshed of these project features because it is located on the south-facing slope of Black Butte and is oriented to the east with a portion of the mountain obscuring the view to the west, where the project is located. This location reduces potential visual disturbance from the project on nesting golden eagles if they return to the site. Moreover, the lack of activity at this nest for the past five years suggests it might no longer be functional.

Because the project consists of a permanent facility and operation, it is unlikely that golden eagles would construct a nest on the west-facing slope of Black Butte. However, if eagles did construct a nest, it would be assumed that they habituated to the proposed project and were undisturbed by the human presence. Patua Phase II project is not expected to physically limit nesting habitat on Black Butte due to distance, location of nesting habitat, and the lack of evidence of impacts from existing activities. Additionally, none of the rock outcrops on the west-facing slope of Black Butte located above the survey area provide suitable nesting habitat for golden eagles (i.e., outcrops are jumbled, lack steep faces, and are low angle).

Activities associated with the project, including human presence, mechanical activity, and noise, could decrease golden eagle foraging efficiency and disrupt typical behavior patterns as golden eagles were observed in the project area. Golden eagles may alter their behavior by avoiding affected portions of the project area during construction and operation. This displacement could result in a spatial redistribution of individuals or habitat-use patterns. However, the project does not limit or affect the surrounding environment and golden eagles would have comparable foraging opportunities within these areas.

Construction and operation of the well field, power plant, potential transmission line, and associated facilities would temporarily and permanently disturb up to approximately 620 acres of habitat. This disturbance would result in the removal of vegetation and alteration of habitat needed by golden eagle prey species. Black-tailed hares and cottontails are the primary prey species of golden eagles (Kockert et al. 2002). Both species occupy the project area and the surrounding environment. Golden eagles that occur in and near the project could prey on the rabbits and rodents within the project area. Impacts to golden eagle prey habitat are likely to be minimal because the affected area represents a 2.8 percent (620 acres out of 23,000 acres) of the habitat within a 2-mile radius of the project area. The habitat that would be disturbed or removed is not unique or limiting in the landscape nor does it provide a known prey concentration. Golden eagles should have comparable foraging opportunities within the surrounding areas.

Golden eagle prey species could also be subject to individual mortality or behavioral changes during project construction and operation. Direct mortality of prey species could occur as a result of vehicle collisions. However, speeds are naturally slower on dirt roads, reducing the likelihood of prey fatalities. Moreover, rabbits are primarily active late in the afternoon and early evening, and vehicle traffic associated with the project would occur during the day. Golden eagles are known to feed on road-killed wildlife such as black-tailed hares. Eagles flushed from a carcass could be at risk of collision with vehicles. However, the slower vehicle speed due to the dirt roads should provide sufficient time for eagles to become airborne and for vehicles to slow and avoid
hitting the birds. In comparison to the cumulative risk of vehicle collisions in the surrounding area, including within the Alt 50 corridor, the risk of collisions caused by the proposed activities would be minimal. Because project activities would occur during the day, disturbance and behavioral changes to prey species active at night would not occur.

4.8.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the proposed action would occur. No impacts to migratory birds would occur.

4.9 Cultural Resources

4.9.1 PROPOSED ACTION

Seven archaeological resources were recommended as eligible for listing in the National Register of Historic Places (NRHP). The potential for the project to impact each site is addressed in Table 4.9-1.

The project pipelines would cross the Southern Pacific Railroad in Section 28, which was determined to be a non-contributing element to the eligible site. The crossing would be made underground and therefore would not affect the railroad. Because the Hazen Drain and Truckee Canal would be crossed underground, impacts would be avoided.

<table>
<thead>
<tr>
<th>State Number</th>
<th>Site Type</th>
<th>Impacts</th>
</tr>
</thead>
<tbody>
<tr>
<td>26Ch2307</td>
<td>Hazen Drain</td>
<td>The site would be avoided.</td>
</tr>
<tr>
<td>26Ly917</td>
<td>Truckee Canal with associated features</td>
<td>The site would be avoided.</td>
</tr>
<tr>
<td>26Ch3275</td>
<td>Prehistoric lithic scatter and historic debris scatter</td>
<td>This site would be avoided.</td>
</tr>
<tr>
<td>26Ly1922</td>
<td>Dispersed prehistoric lithic scatter and procurement area</td>
<td>This site would be avoided; however, ground disturbance could occur within 30 meters of the site potentially impacting the site.</td>
</tr>
<tr>
<td>26Ly1926</td>
<td>Prehistoric lithic testing and procurement area</td>
<td>This site would be avoided; however, ground disturbance could occur within 30 meters of the site potentially impacting the site.</td>
</tr>
<tr>
<td>26Ly1931</td>
<td>Prehistoric lithic scatter and procurement area</td>
<td>This site would be avoided.</td>
</tr>
<tr>
<td>26Ly1936</td>
<td>Prehistoric lithic scatter</td>
<td>This site would be avoided.</td>
</tr>
</tbody>
</table>
All prehistoric sites can be avoided in accordance with the State Protocol Agreement between the Bureau of Land Management and the Nevada State Historic Preservation Office for Implementing the National Historic Preservation Act, 2009, Appendix H, Sections A and B, as described in Table 4.9-1. TGHs would be sited to avoid all cultural and historic resources by at least 30 meters. However, some construction may occur within 30 meters of site BC-53. In order to prevent inadvertent alteration of the site and to avoid adverse effects to this site, an archeological monitor would be on-site during construction of well pads 37-32 and 16-32. The allowable travel areas would be clearly flagged and staff would be informed (before project commencement) to stay within the identified areas and that any effects on, defacement of, or removal and/or disturbance of archaeological, historical, or sacred material is prohibited and subject to disciplinary action.

Project construction also has the potential to affect undiscovered or subsurface resources. If subsurface cultural resources are found during construction, all work in the vicinity of the resource would cease and GRI would notify the BLM and Reclamation immediately. GRI would implement those appropriate measures requested by the BLM and Reclamation to protect the resource until it could be adequately evaluated by the permitted archaeologist, and the BLM or Reclamation archaeologist, if necessary. The following measures would be implemented:

- GRI would avoid cultural resource sites that are known to be eligible or potentially eligible for inclusion in the National Register of Historic Places through design, construction, and operation of the project, to the greatest extent feasible.

- An approximately 100-foot buffer zone would be established from the boundary of cultural sites and will be identified by placing flagging around eligible and potentially eligible cultural resource sites to help provide protection to the sites. Project equipment and facilities would not encroach into the established 100-foot buffer zone to the greatest extent feasible. Fencing would not be required where construction would need to occur within the 100 foot buffer; however, the following measure would be implemented to ensure protection of cultural resources:

- Where the installation of project facilities could impact eligible or potentially eligible cultural sites(s), or must occur within the 100 foot buffer, GRI would retain a qualified archaeologist to serve as a cultural monitor during construction of the facility in order to avoid potential effects to the cultural site(s). The BLM would decide when cultural monitors would be necessary.

- The project facilities would be operated in a manner consistent with the engineered design to prevent problems associated with the run-off that could affect adjacent cultural sites. This includes the use of BMPs to minimize off-site erosion and sedimentation.

- GRI would limit vehicle and equipment travel to existing and proposed access roads, well pads, construction areas, and gravel source areas and allowable travel areas would be clearly flagged and staff would be informed (before project commencement) to stay within the identified areas.

- Any unplanned 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 Field Manager, Stillwater Field Office, 5665 Morgan Mill Road, Carson City, 952 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 authorized officer.

Only previously disturbed areas would be disturbed during decommissioning. Effects to cultural sites would be mitigated during construction or avoided. Decommissioning would not impact cultural resources.

4.9.2 NO ACTION ALTERNATIVE
The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the proposed action would occur. No impacts to cultural resources would occur.

4.10 Native American Religious Concerns

4.10.1 PROPOSED ACTION
Consultation on the Patua Geothermal project between the BLM and federally recognized Native American tribes is ongoing. Native Americans religious and spiritual concerns could be affected if project construction disturbed Native American artifacts, remains, or traditional cultural practices. No TCPs or traditional uses would be impacted by implementation of the project. All archaeological sites can and would be avoided through project design. If human remains are identified during construction of any of the components of the proposed project, work within 300 feet of the discovery would be stopped and the remains would be protected from further exposure or damage. The coroner and Reclamation, BLM, or SHPO (depending on land ownership) would be contacted. If the remains are determined to be Native American, the agencies would follow the procedures set forth in 43 CFR Part 10, Native American Graves Protection and Repatriation Regulations. Procedures for handling the discovery of human remains would follow Reclamation Manual Directives and Standards LND 07-01 (Inadvertent Discovery of Human Remains on Reclamation Lands) if remains are located on Reclamation-managed lands. If remains are found on private land, NRS 383 would be implemented with SHPO as the lead agency.

Avoidance of any cultural resources found and implementation of protection measures in the unlikely event that human remains are discovered would minimize effects to Native American concerns. Decommissioning is not expected to have effects on Native American Religious Concerns as all sites would be avoided and GRI would coordinate with tribes to avoid effects on Native American practices.

4.10.2 NO ACTION ALTERNATIVE
The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the proposed action would occur. No impacts to Native American remains, cultural artifacts, or other resources of Native American religious significance would occur as the project area would remain unchanged. There would be no effect on Native American practices with the No Action Alternative.
4.11 Mineral Resources

4.11.1 PROPOSED ACTION

Construction of the proposed project would require the use of fill material for well pads, the power plant foundation pad, access roads, and laydown areas, among other uses. Native soil and rock material were found to be suitable as fill for previous well pad construction; therefore, the need for fill material from other sources would be unlikely, but would be determined on a case-by-case basis. Alternatively, fill material will be obtained from a permitted gravel operation (assigned serial number N-86320), located east of Black Butte, in Section 24, T20N, R26E, MDBM, or an off-site commercial source.

The Leete Mining District is located 11 miles north of the project area. Project construction and operation would have no effects on this mining area. The recovery of other mineral resources, such as those shown on Figure 3.11-1, would not be substantially affected by implementation of the proposed project. The project would not overlap with or inhibit the access to the mining operations in Section 6. The proposed project pipeline is currently sited to be constructed through the NDOT materials site in Section 32. The pipeline would occupy approximately 1 acre of the 70-acre lease (1.4 percent). The area proposed for the pipeline does not appear to have been mined. GRI would coordinate with NDOT to obtain approval to construct the pipeline through the mine area in order to minimize effects to the existing operations.

The Hazen Mine, a fine to coarse aggregate mine used for concrete, is located in Section 30 and the limits of the mine are undefined. Well pads have been sited in coordination with Reclamation to minimize impacts to mining and access to the mineral resource. GRI may perform a gravel exploration program in coordination with Reclamation to determine the extents of the mining operation in Section 30 if well pads in this Section need to be re-sited.

During the life of the geothermal facilities, all disturbed areas not needed for active support of production operations would undergo “interim” reclamation to minimize the environmental impacts of development on other resources and uses. At final abandonment, well location, production facilities, and access roads must undergo “final” reclamation so that the character and productivity of the land is restored. The Applicant would cease use of the geothermal resource during decommissioning or final reclamation. Given the long-term nature of geothermal facility operations and changes in the future site conditions, additional analysis may be necessary prior to final reclamation. For interim reclamation, effects on mineral resources would be minimal.

Decommissioning would include some ground disturbance for the removal of the access roads, power plant, pipeline, and transmission line. Decommissioning would not impact existing mining operations.

4.11.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the proposed action would occur. No impacts to mineral resources would occur.
4.12 Soils

4.12.1 PROPOSED ACTION

On-site soils at the proposed well pad and access road locations have the highest potential for erosion from wind. Construction of the well field, power plant, access roads, and transmission line would disturb a maximum of approximately 620 acres. The removal of ground cover during construction of project components would increase the potential for erosion by wind through exposure of denuded surfaces. To minimize the effects of wind erosion, access roads and other disturbed areas would be watered on an as-needed basis.

An NDEP SAD permit would be obtained by GRI prior to commencing construction. Erosion and loss of soil productivity would be minimized by implementing BMPs during construction of the project components. BMPs would include, but not be limited to, covering exposed topsoil, watering unpaved access roads, and limiting vehicle speeds on unpaved access roads to 30 mph.

A SWPPP for construction activities would be submitted to NDEP in support of an application for a Stormwater General Permit prior to initiating project construction. The SWPPP would include BMPs that would be followed to reduce soil erosion within the project area.

Soil erosion could also occur from exposure of denuded soils during rain events. However, low levels of precipitation and a lack of year-round surface water in the project area (other than canals) would minimize the potential for runoff erosion. A site drainage and runoff management plan would be prepared and implemented prior to construction. To control surface water runoff, well pads would be constructed with a reserve pit and a series of berms, trenches, and sediment traps. In addition, erosion control measures including, but not limited to, silt fencing, diversion ditches, water bars, temporary mulching and seeding, and application of gravel or rip-rap, would be installed where necessary immediately after completion of construction activities to avoid erosion and runoff. Only certified weed-free materials would be used for erosion control.

All new access roads would comply with the site drainage and runoff management plan to minimize erosion and off-site sedimentation. Access roads would follow existing contours to the maximum extent possible. In areas where new access roads must be constructed across slopes, erosion control measures would be installed as necessary, in accordance with Gold Book standards (BLM and USFS 2007) and standard construction BMPs. Additional gravel would be laid down when ground conditions are wet enough to cause rutting or other noticeable surface deformation and severe compaction. Effects from erosion during construction of the well field and power plant would be minimal due to implementation of BMPs.

Operation of the proposed facilities would include routine inspections and minor repairs. Maintenance and inspection activities are not anticipated to require any ground disturbance, vegetation removal (with the exception of routine trimming), or soil stockpiling. Accordingly, an increase in soil erosion or the loss of topsoil would be minimized during operation or maintenance activities associated with the project.

Decommissioning and restoration would involve removal of the project elements. Natural habitat would be restored after the removal of geothermal facilities. Restoration would involve recontouring and recreating, to the extent feasible, natural forms similar to the original landscape.
Any soils that could be contaminated from exposure to geothermal fluid or other operational fluids would be tested and properly disposed. Soils would be revegetated, minimizing impacts.

### 4.12.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road building, pad construction, or other activities described in the proposed action would occur. No impacts to soils would occur.

### 4.13 Wastes, Hazardous or Solid

#### 4.13.1 PROPOSED ACTION

Project construction and operation would involve limited hazardous material use and waste generation. These materials would include, but would not be limited to, drilling additives and mud, diesel fuel, lubricants, solvents, oil, and equipment/vehicle emissions. Non-hazardous materials would include drilling muds, packaging, geothermal fluids, etc.

The transport, use, or disposal of hazardous materials could affect workers, the public, and the environment through accidental spills or emissions. GRI would adhere to general geothermal lease stipulations for geothermal developers to address the potential impacts involved with transport, use, and disposal of hazardous materials, including the development and implementation of an emergency response plan. GRI would comply with all local, state, and federal regulations regarding the use, transport, storage, and disposal of hazardous materials and wastes. GRI would prepare and implement a Hazardous Material Spill Prevention Plan to prevent impacts to the environment from hazardous materials. Management procedures would include fueling and routine maintenance of equipment and vehicles would be performed off site or within designated areas with appropriate spill controls to minimize effects. Wastes considered hazardous by the State of Nevada would be transported and disposed of according to applicable federal, state, and local regulations. Hazardous wastes in the area are processed at the US Ecology Beatty RCRA/Toxic Substances Control Act (TSCA) Treatment, Storage, and Disposal Facility, located in Beatty, NV.

Drilling mud and fluid would be directed to reserve pits or the steel reserve pit/tank for TGH drilling. At the conclusion of drilling and testing, the liquid portions of the containment basin contents would be evaporated, pumped back down the well, or removed and disposed of off-site in a facility authorized to receive such wastes, as determined after testing of the materials. Both Russell Pass Landfill and Lockwood Regional Landfill are permitted to accept solid waste. These landfills are located approximately 35 miles southeast and 35 miles west of the project area. The remaining reserve pit contents, typically consisting of non-toxic drilling mud and cuttings, would be tested as required by the Nevada BWPC. If non-toxic, and if authorized by the BWPC, these materials would be spread and dried on the well pad site, mixed with soil and buried in the on-site reserve pit in conformance with the applicable requirements of the BWPC, the BLM, and Reclamation. Testing results and location of buried waste would be provided to Reclamation and BLM. Toxic materials would be disposed of at an appropriate facility. The proposed project is not expected to result in impacts related to hazardous materials or waste.
Well blowouts and pipeline failures are rare occurrences during well drilling and operations. These activities have the potential to result in the release of toxic drilling additives and fluids, as well as hydrogen sulfide gas (see section 4.14 Air Quality for more information on hydrogen sulfide) from the geothermal resource. Blowouts may also result in the surface release of geothermal fluids and steam containing trace amounts of heavy metals, acids, mineral deposits, and other pollutants. GRI has and would implement a blow-out prevention plan. The implementation of BOPE and the blowout plan would avoid impacts to the environment related to accidental release of fluids.

Operation of the project would include periodic use of hazardous materials for maintenance. Quantities would be small as would the likelihood of upset. Solid and hazardous wastes would be disposed of at the Beatty RCRA/TSCA facility (or another permitted facility). Operation of the geothermal facilities would comply with all local, state, and federal regulations regarding the use, transport, storage, and disposal of hazardous materials and wastes and, therefore, impacts on the environment would be minimized.

Impacts from decommissioning would be similar to construction in terms of transport of materials. Power plant, pipeline, transmission line, and well head parts would be recycled to the greatest extent feasible. Other wastes would be disposed of at an appropriate landfill to accept the particular type of waste (i.e., hazardous vs. non-hazardous). Impacts would be minimal.

**4.13.2 NO ACTION ALTERNATIVE**

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the proposed action would occur. No impacts to or from wastes or other hazardous materials would occur.

**4.14 Air Quality**

**4.14.1 PROPOSED ACTION**

Air emissions from the proposed action would be primarily attributed to the following air pollution sources:

- Fugitive dust from earth moving, grading, and drilling
- Combustion emissions, including diesel exhaust emissions from heavy equipment and the drill rigs
- H₂S emissions from well drilling and testing
- GHGs emissions from project vehicles and equipment

**Fugitive Dust**

The primary pollutant of concern during construction activities for the project would be particulates in the form of fugitive dust. Fugitive dust emissions would be generated by ground-disturbing activities related to transport of workers and equipment to the site, access road and well pad construction.
Air quality impacts from the construction activities would be localized and temporary. Up to 19 well pads would be constructed. Particulate concentrations in the vicinity of the project would increase on a short term basis. Construction when winds exceed approximately 9 miles per hour could further increase particulate matter emissions; however, a plan for fugitive dust control would be required under the SAD Air Quality Operating Permit. The Fugitive Dust Control Plan would include dust suppression processes (e.g., watering disturbed areas) to minimize localized increases in particulate matter concentrations. These measures would minimize fugitive dust emissions during construction.

Air drilling could be a source of particulate matter. The particulate matter originates from well bore cuttings removed with the compressed air and steam. Well testing would also be a source of particulate matter originating from the well with the steam. Well drilling would produce condensate, rock and sulfur solids, and particulate matter that would collect in a tank. Particulate matter emissions from venting steam would be reduced by injecting water into the blooie line. Particulate matter would be entrained in the fluid steam and flow to the reserve pit.

Fugitive dust generation during operation of the proposed project would be limited to periodic vehicle emissions from maintenance work and would be minimal. Particulate and fugitive dust emissions during decommissioning of the well pads, power plant, and transmission line would result primarily from ground-disturbing activities related to vehicle travel and earthwork. Dust control BMPs utilized for construction would also be utilized during decommissioning activities in order to reduce impacts. Decommissioning of the geothermal and ancillary facilities and restoration of the disturbed areas would result in minor impacts to air quality.

**Combustion Emissions**

Diesel combustion emissions would be emitted from the construction equipment and any diesel-fueled vehicles used to access the project site, and from equipment used for drilling. Combustion emissions of criteria air pollutants (NO₂, SO₂, CO, and PM₁₀), criteria air pollutant precursors (volatile organic compounds (VOCs)) and air toxics (small quantities of diesel PM, acetaldehyde, benzene, and formaldehyde) would be released from the diesel engines during site construction.

Combustion emissions would also be emitted from large bore diesel-powered engine(s) on the drill rig. Table 4.14-1 presents a worst-case emissions scenario for large bore, stationary diesel engines based on estimated maximum daily fuel consumption during drilling. Because of the variables in operating parameters of the engines, emissions are expected to be considerably lower than in the worst-case scenario. Drilling operations and engine use are highly variable over 24-hour periods. It is unlikely that maximum daily fuel consumption would be reached at any given point in time. Additional generators and pumps may be required for the project, but these small sources are not expected to have any sizeable impact on emissions. Diesel engines that meet US EPA Tier II Diesel Standard Emissions for any diesel engines over 37 kilowatts (kW) (50 horse power) in size would be used to reduce emissions.

Combustion emissions would be localized and temporary, with particulate and gaseous criteria pollutant concentrations in the vicinity of the proposed project increasing on a short-term basis. Because of the low background criteria pollutant concentrations in the area and the limited nature of the drilling activities, none of the activities are expected to exceed either federal or state ambient...
Table 4.14-1: Estimated Emissions from Large Bore Diesel Engines

<table>
<thead>
<tr>
<th>Air Pollutant</th>
<th>Emission Factor 4 (lbs/mmBTU)</th>
<th>Maximum Estimated Emissions</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Hourly (lbs/hr)</td>
</tr>
<tr>
<td>Carbon Monoxide (CO)</td>
<td>0.085</td>
<td>4.83</td>
</tr>
<tr>
<td>Carbon Dioxide (CO₂)</td>
<td>165.00</td>
<td>942.08</td>
</tr>
<tr>
<td>Total Organic Compounds (as Methane (CH₄))</td>
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<td>0.51</td>
</tr>
<tr>
<td>Oxides of Nitrogen (NOₓ)</td>
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<td>18.27</td>
</tr>
<tr>
<td>Particulate Matter &lt; 10 microns (PM₁₀)</td>
<td>0.0573</td>
<td>0.33</td>
</tr>
<tr>
<td>Oxides of Sulfur (as Sulfur Dioxide (SO₂))</td>
<td>0.0202</td>
<td>0.12</td>
</tr>
</tbody>
</table>

**SOURCE:** EPA 1996

Air quality standards (Appendix E). A Traffic Management Plan would be prepared for the project that maintains traffic flow and helps to minimize trips and delays that could result in increased combustion emissions.

Combustion emissions associated with project construction would cause a negligible effect on air quality.

**Hydrogen Sulfide and Other Emissions**

H₂S emissions may occur during well drilling and testing, depending on the chemical composition of the geothermal resource. H₂S can be released from a well during drilling, and would be vented with the geothermal fluid that flashes to steam and non-condensable gases released during flow-testing (if the well encounters a commercial resource). H₂S is a colorless, non-condensable gas with a characteristic “rotten egg” odor. H₂S can pose a threat to human health at high concentrations. Nuisance odor is of primary public concern, since this distinctive odor can be easily detected at concentrations far below levels of health concern. The closest residences are within approximately 800 feet from the project site; a distance over which odors would dissipate. H₂S is typically encountered during the production zone drilling phase. There is no federal air quality standard for H₂S. Nevada has adopted an hourly ambient air quality standard of 112 µg/m³ for H₂S (0.08 ppm) (BAQP 2007). Emissions would be minimized through the use of properly weighted drilling mud, which is expected to keep the well from flowing during drilling. H₂S gas that may be entrained in the drilling mud and return with the drilling cuttings to the solid separation process is expected to be neutralized by the high pH of the mud system. Data collection devices would be installed and operated during all phases of drilling and testing. An H₂S abatement plan would be developed

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3 Values based on the assumption that a maximum of 1000 gallons of low sulfur (0.02%) diesel oil fuel would be used, and that the average heating value of the fuel is 19,300 BTU per pound of fuel with a density of 7.1 pounds per gallon.

4 Source: US EPA 1996.
and implemented during long-term flow-testing if it becomes apparent during drilling operations that H₂S abatement is necessary to minimize potential nuisance odors. With monitoring and abatement, H₂S emissions would be minimal.

H₂S emissions would be minor during the operations phase of the project. The power plant would be a binary system and the geothermal fluid would be injected back into the reservoir without coming into contact with air. There will be no emissions of H₂S during normal operation. No H₂S emissions would occur as a result of decommissioning, as the wells would be shut-in and plugged.

Other potential emissions during drilling are unlikely but could include releases of NCGs during a loss of well control. Blow-out protection equipment would be installed on well heads during drilling operations to prevent such events from happening and drill rigs would be equipped with alarms to detect unsafe levels of H₂S and other NCGs. Anticipated geothermal fluid chemistry is such that temporary releases of geothermal air emissions should not cause violations of Nevada air quality standards.

**GHG Emissions**

There are no federal regulations governing the emissions of GHGs during project construction. The Final Mandatory Reporting of Greenhouse Gases Rule issued by the EPA, as signed on September 22, 2009, requires suppliers of fossil fuels or industrial GHGs, manufacturers of vehicles and engines, and facilities that emit 25,000 metric tons or more per year of GHG emissions to submit annual reports to the EPA. The NDEP also requires GHG emissions reporting; however, NDEP has exempted geothermal projects from GHG reporting.

The diesel engines used to power construction equipment and drill rigs would generate CO₂ and small amounts of methane. Emissions of steam during well testing would also include GHGs, primarily in the form of CO₂. However, the amount of fossil fuel powered GHG emissions that would be off-set by the proposed facility would more than compensate for the CO₂ emissions from the proposed project construction vehicle and drill rig emissions. A comparison between geothermal and fossil fuel CO₂ emissions from electrical generation is shown in Table 4.15-2. Emissions reported in the table are weighted average values for all geothermal capacity. Impacts of climate change on the project would not generate or exacerbate impacts from the project. Air emissions and dust generation would be limited during the lifespan of the project. Operation of the project would not have impacts to surface waters. The project could use groundwater although the effects from global warming on groundwater are unknown. Nevada is expected to experience wetter winters and more arid summers as a result of temperature increases.

| Table 4.15-2: Geothermal vs. Fossil Fuel CO₂ Emissions for Electrical Generation |
|---------------------------------|----------------|-------------|--------------|
| Emissions (pounds CO₂ per kilowatt hour) | Geothermal | Coal | Petroleum | Natural Gas |
| 0.20 | 2.095 | 1.969 | 1.321 |

**SOURCE:** Bloomfield et al. 2003

Decommissioning would result in minor emissions associated with construction equipment. These emissions would be minimal.
4.14.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the proposed action would occur. No impacts to air quality would occur.

4.15 Visual Resources

4.15.1 PROPOSED ACTION

The proposed action would be consistent with the Class III VRM established for the BLM-managed lands in the project area. The objective of Class III is to partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.

Construction and drilling would introduce heavy equipment and drill rigs up to 178 feet tall to the area. Topography is relatively flat for much of the project area; however, several wells would be constructed in Section 6, which is in the foothills of the Virginia range. Mining operations occur within, to the west, and to the south of the project area and maintenance vehicles often travel along the Truckee Canal roads. Presence of construction equipment would be temporary and not out of character for the area. Impacts or alterations to the visual character of the area would be minor.

After construction, the visibility of the well pads would be limited, as the well equipment has a low profile and the scrub habitat would conceal well pads and well heads at distances. The injection and production pipelines would be installed above ground, but would follow the contour of the land and would be painted to blend in with the land. The presence of the pipeline would cause some alteration of the landscape, but much of the existing character would be maintained. The general area, mostly north of Alt 50, is currently being developed for geothermal energy production. If a power plant were to be built to the south of Alt 50 in Section 29, it would be highly visible from the highway; however, it would be at a lower elevation than the highway, partially screening views of the facility. Views of the Virginia Range to the south would maintain their character. The project could include a new transmission line; however, existing transmission systems are located in the project area, including the PDCI 500 kV line to the south and north of Alt 50. The addition of the new 2.5 mile transmission line would not alter the existing character of the landscape.

Residences are located approximately 800 feet to the west and southeast of the project site. Residences may have views of the geothermal pipeline and power plant; however, the area is currently under development for geothermal resources. The visual impact of the project would not be inconsistent with other activities that affect the local views of the area, including the surrounding mining operations, maintenance of the canals, and agricultural operations in the area. Impacts to visual resources would consistent with the Class III VRM prescriptions.

Decommissioning would include the removal of the project facilities and restoration to the pre-built environment. Decommissioning would have similar impacts as construction, which would be temporary and would not alter the visual character of the area. The area would be reclaimed and revegetated after decommissioning, which would have a positive impact on the visual character of the area.
4.15.2 NO ACTION ALTERNATIVE

The No Action Alternative would result in no geothermal exploration or development in the project area. No ground-disturbing earthwork, drilling, road-building, pad construction, or other activities described in the proposed action would occur. No impacts to visual resources would occur.
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5: Cumulative Effects

5.1 Introduction

Cumulative impacts are defined by the Council on Environmental Quality (CEQ) 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.”

The following discussion evaluates the potential impacts of the Proposed Action when taken in combination with the potential impacts of known past, present, and reasonably foreseeable future actions in the analysis area. Unless otherwise identified below, the analysis area for cumulative impact consideration is the same as the analysis area for the resource impacts identified in Section 4.

5.2 Past, Present, and Reasonable Foreseeable Future Actions

5.2.1 PAST AND PRESENT ACTIONS

Current land use activities in the vicinity of the project include existing geothermal exploration activities by GRI and construction of the Patua Phase I project, including well pads and pipelines, a transmission line, and power plant. Other activities in the project area include the mining activities in Section 6, Section 32, and Section 30. Farming occurs to the east of the project area towards Ragtown Pass. OHV use as well as illegal uses may also occur in the project area.

5.2.2 REASONABLY FORESEEABLE FUTURE ACTIONS

Reasonably foreseeable future actions constitute those actions that are known or could reasonably be anticipated to occur within the study area, within a time frame that could coincide with the expected impacts of the Proposed Action. Lyon County, Churchill County, and the City of Fernley were consulted for a list of future projects in the project area. No additional projects were identified.

For the Proposed Action, the time frame for potential future actions is assumed to be the duration of the lease, or approximately 30 years. Future activities are anticipated to include all current land use activities (i.e., grazing, current geothermal energy exploration, OHV use, and maintenance and use of the Truckee Canal and laterals, farming, and mining), as well as future geothermal development. Several other leases within the Patua Unit could also be subject to geothermal development in the future.

Additional mining of the sand and aggregate deposit in Section 30 is expected to occur in the future.
5.3 Cumulative Impacts for the Proposed Action

5.3.1 LANDS
The Proposed Action is consistent with BLM land use planning for the area. The project would not inhibit the maintenance or operation of the Truckee Canal or the canal laterals or impact the water quality within the canal with protection measures described in this EA. GRI may perform a gravel exploration program in coordination with Reclamation to determine the extents of the mining operation in Section 30 if well pads in this section need to be re-sited.

5.3.2 LIVESTOCK
The Proposed Action would potentially remove some grazing land in the area. The proposed project’s contribution of a permanent loss of 39 acres of grazing land is negligible. The mining activities associated with the EP Minerals diatomite mine in Section 6 removes some acreage; however the aggregate total loss of grazing land is still negligible.

Weed propagation from increased OHV use could indirectly reduce grazing efficiency and human disturbance could also impact livestock grazing. Implementation of the Noxious Weed Abatement Plan would reduce and improve the existing weed propagation issues, minimizing effects. Human disturbance after construction is mostly associated with maintenance activities, which would occur on a periodic basis. OHV use may increase in the area; which can propagate weeds; however, most of the access roads are existing unpaved roads, so the project does not increase access to the majority of the allotment. Implementation of the Noxious Weed Abatement Plan may offset impacts of improved access by reducing the number of weeds that OHVs encounter along the improved roads.

5.3.3 WATER RESOURCES
When combined with other current and potential future area activities, such as other geothermal development, there would be an increased potential for impacts to surface water and groundwater quality. Potential impacts to surface and groundwater quality during project construction would be minimized through the use of BMPs. Well pad would have containment and stormwater protection measures would be implemented. Wells would be cased to minimize the potential for localized impacts to groundwater. The Patua Phase I project implements the same measures. Construction of other geothermal development in the area is unlikely to overlap in the construction timeframe, but would be located at enough distance to not impact the same areas as the proposed project.

Other geothermal projects that could be developed in the area (i.e., on the Hazen leases) would also use pumping and injection techniques to manage the reservoir. These projects would be expected to have minimal effects on surface waters for the same reasons as stated for GRI’s project.

5.3.4 VEGETATION AND INVASIVE, NON-NATIVE, AND NOXIOUS SPECIES
The proposed project could result in the temporary and permanent removal of up to 620 acres of vegetation. The upland vegetation habitat types are very common in the area. The marsh habitat that would be affected is of low quality because it is highly disturbed with invasive, non-native, and noxious species. Other projects, particularly other geothermal development, could result in
the loss of desert scrub and similar habitat in the area; however, over 23,000 acres of similar habitat (e.g., scrub, wetland, and salt scrub) are located adjacent to the project area. The project’s contribution of a loss of 620 acres would be minimal. The Patua Phase I project is resulting in the loss of a maximum of 137 acres of vegetation/habitat. A cumulative loss of 777 acres is still minimal compared with the 23,000 acres of similar habitat in the overall area (an estimated 3 percent).

The proposed project could increase illegal OHV usage by improving existing roads. OHV use could in turn increase the spread of invasive, non-native, and noxious species. Other projects, including ongoing mining activities and canal maintenance could spread invasive, non-native, and noxious species if proper measures are not taken. GRI would implement a Noxious Weed Abatement Plan to help reduce invasive plants in the project construction areas.

5.3.5 WILDLIFE AND MIGRATORY BIRDS

The project would have minimal impacts on wildlife due to the nature of the project and the incorporation of environmental protection measures. However, there could be negligible residual impacts from habitat loss and fragmentation.

The proposed project is generally adjacent to existing linear landscape-dividing features and, as such, is part of the existing edge environment (i.e., migration across the environment is limited by the landscape-dividing feature). The Patua Phase I project is located to the north of Alt 50, but also along an edge environment. The minor extension of the edge environment to the south would overall be minimal or negligible compared with the availability of similar habitat in the area (over 23,000 acres).

Impacts to migratory birds and wildlife from existing uses such as the railroad track, Alt 50, the Truckee Canal, various mining operations, and existing transmission lines, would continue into the future. The wildlife that inhabits the project area is acclimated to these features. Additional noise and human presence due to the Patua Phase I project would have similar effects. Increased human presence in the area would be minimal, even considering development of the Patua Phase I project. Operation of two power plants between the two projects would only require about 30 additional workers. Noise impacts would generally push wildlife further to the north and south; however, abundant undeveloped habitat is available to the north and south.

Cumulative impacts to golden eagle are not expected. Most of the Patua Phase II project is greater than one mile from the inactive nest on Black Butte and no other active nests were found within a four mile radius of the project area. The Phase II project would result in greater loss of foraging habitat; however, a loss of 777 acres out of a surrounding 23,000 acres would be minimal.

5.3.6 CULTURAL RESOURCES AND NATIVE AMERICAN RELIGIOUS CONCERNS

The proposed action has the potential to affect cultural resources if a significant site is damaged or destroyed; however protection measures included in the project would minimize the likelihood of effects (through avoiding known resources where possible, and implementing data recovery or other measures as recommended by the SHPO for effects to resources that cannot be avoided). Other projects and activities in the region are not expected to aggregate this impact, as the
potential impact is localized and physically separated from other possible or current development. Cumulative impacts to cultural resources and Native American concerns are not expected.

5.3.7 MINERALS

All fill material would be obtained from a permitted gravel operation (N-86320). The proposed action would not inhibit the ability for other geothermal leases to be explored or developed and the resource is expected to be able to support development of the Patua Phase I and Phase II projects. GRI may perform a gravel exploration program in coordination with Reclamation to determine the extents of the mining operation in Section 30 if well pads in this section need to be re-sited.

5.3.8 SOILS

The contribution of the proposed action to soil erosion would be minimized through the use of the BMPs. Compounded levels of erosion to soils would be minimal because erosion prevention practices are common for all development, including mining activities in Sections 30, and 6. Increased illegal OHV use could increase dust generation and cause soil disturbance; however, much of this activity currently exists. Use of the improved roads instead of undisturbed earth would minimize some effects. The use of improved roads could; however, increase access to other undisturbed areas. The overall illegal OHV use on undisturbed lands in the area would probably not change markedly.

5.3.9 WASTES, HAZARDOUS OR SOLID

Solid waste and hazardous materials would be transported, stored, and used as part of the proposed action. When combined with other area activities, the increase in the total volume of wastes handled would result in an increased risk of spill or other release of waste materials to the environment. Implementation of the BMP’s described in Section 4.15 would minimize the potential for wastes and hazardous materials to be released to the environment.

5.3.10 AIR QUALITY

Construction of the proposed project would result in fugitive dust emissions, combustion emissions, H2S emissions, and GHG emissions. With the implementation of protection measures identified in Section 4.15, emissions are expected to comply with federal and state ambient air quality standards.

Fugitive dust in the region has raised PM10 levels above standards. Dust is generated by existing activities such as traffic on Alt 50 and other roads, OHV usage in the area, farming in the region, and mining activities. The proposed action includes several dust suppression measures to minimize the proposed project’s potential contribution to air quality impacts.

5.3.11 VISUAL RESOURCES

The proposed project would introduce additional disturbance and industrialization in the project area. The project would add geothermal well pads, pipelines, and potentially a power plant and transmission line to the area south of Alt 50, which would have a cumulative effect with the currently permitted development of the Patua Phase I project to the north of Alt 50. However, the
area is currently disturbed with agricultural operations, a large existing transmission line, the railroad, the highway, and several mining operations. The cumulative impacts of development would result in further disturbance of the character of the area immediately surrounding the highway; however, the overall visual character of the mountains in the distance, Black Butte, and other features would remain intact. Cumulative impacts would not be considerably adverse.
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6.1 Agencies and Individuals Contacted

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<thead>
<tr>
<th>Organization</th>
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<tbody>
<tr>
<td>US Army Corps of Engineers</td>
<td>Sacramento District Office</td>
</tr>
<tr>
<td>Public Utilities Commission of Nevada</td>
<td>Garrett Weir</td>
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<tr>
<td>Nevada State Fire Marshall</td>
<td>Ginny Capucci, and Fred Pascual</td>
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<tr>
<td>Nevada Division of Water Resources</td>
<td>Hamilton Reed</td>
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<tr>
<td>Nevada Division of Minerals</td>
<td>Lowell Price</td>
</tr>
<tr>
<td>NDEP, Bureau of Air Pollution Control</td>
<td>Randy Phillips</td>
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<tr>
<td>NDEP, Bureau of Water Pollution Control UIC Program</td>
<td>Russ Land</td>
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<tr>
<td>Bureau of Health Protective Services, Health Division</td>
<td>Judy Newberg</td>
</tr>
<tr>
<td>Union Pacific Railroad</td>
<td>John S. Hertzler</td>
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<tr>
<td>Nevada Department of Transportation</td>
<td>Halana V. Salazar</td>
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<tr>
<td>Nevada Department of Wildlife</td>
<td>Pat Kelly, Timothy Herrick</td>
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<tr>
<td>Nevada Bureau of Waste Management</td>
<td>Valerie Kauffman</td>
</tr>
<tr>
<td>Churchill County</td>
<td>Eleanor Lockwood; Mischa Stojicevic</td>
</tr>
<tr>
<td>City of Fernley</td>
<td>Melinda Bauer; Sherry Whalen</td>
</tr>
<tr>
<td>US Fish and Wildlife Service</td>
<td>Jill Ralston</td>
</tr>
<tr>
<td>Nevada Natural Heritage Program</td>
<td>Eric Miskow</td>
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</tbody>
</table>

6.2 List of Preparers

6.2.1 LEAD AGENCIES

<table>
<thead>
<tr>
<th>Name</th>
<th>Agency</th>
<th>Project Expertise</th>
</tr>
</thead>
<tbody>
<tr>
<td>Carla James</td>
<td>BLM</td>
<td>Project Manager</td>
</tr>
<tr>
<td>David Parker</td>
<td>BLM</td>
<td>Assistant Project Manager</td>
</tr>
<tr>
<td>Steve “Chip” Kramer</td>
<td>BLM</td>
<td>Planning and Environmental Coordinator</td>
</tr>
<tr>
<td>Coreen Francis</td>
<td>BLM</td>
<td>Staff Supervisor Stillwater Field Office</td>
</tr>
<tr>
<td>John Wilson</td>
<td>BLM</td>
<td>Migratory Birds, Threatened and Endangered Species</td>
</tr>
</tbody>
</table>
### 6.2.2 CONSULTANTS

<table>
<thead>
<tr>
<th>Name</th>
<th>Company</th>
<th>Role</th>
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</thead>
<tbody>
<tr>
<td>Laurie McClanahan Hietter</td>
<td>Panorama Environmental, Inc.</td>
<td>Project Director</td>
</tr>
<tr>
<td>Tania Treis</td>
<td>Panorama Environmental, Inc.</td>
<td>Project Manager; Technical Analysis</td>
</tr>
<tr>
<td>Aaron Lui</td>
<td>Panorama Environmental, Inc.</td>
<td>GIS/Technical Analysis</td>
</tr>
<tr>
<td>Corey Fong</td>
<td>Panorama Environmental, Inc.</td>
<td>GIS/Technical Analysis</td>
</tr>
<tr>
<td>Sue Fox</td>
<td>Wildlife Resources Consultants</td>
<td>Wildlife and Migration Birds</td>
</tr>
<tr>
<td>Joan Reynolds</td>
<td>Botanical consultant</td>
<td>Botanical and Invasive, Non-Native, and Noxious Species</td>
</tr>
<tr>
<td>Ed Stoner and Tara Cannon</td>
<td>WRCM, Inc.</td>
<td>Cultural Resources Surveys and Analysis</td>
</tr>
</tbody>
</table>

### 6.2.3 TRIBES CONTACTED

<table>
<thead>
<tr>
<th>Organization</th>
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<tbody>
<tr>
<td>Fallon Paiute-Shoshone Tribe</td>
<td>Alvin Moyle, Chariman</td>
</tr>
<tr>
<td>Pyramid Lake Paiute</td>
<td>Mervin Wright, Jr., Chair</td>
</tr>
</tbody>
</table>
References


BLM and Bureau of Reclamation 2011. List of Supplemental Authorities and Resources other than Supplemental Authorities Provided by BLM and Reclamation.


7: REFERENCES

______. 2010. Personal communication between Stefanie Smith and Assessor’s Office Staff. April 21, 2010.


______. 2006. Nevada’s Final 2006 303(d) Impaired Waters List.

NRCS / USDA (Natural Resources Conservation Service, United States Department of Agriculture) 2009. Fort Worth, Texas, Soil Survey Geographic Database for Fallon-Fernley Area, Nevada, Parts of Churchill, Lyon, Storey and Washoe Counties GIS dataset.


7: REFERENCES


APPENDIX B:
Written Confirmation of Protection Measures
APPENDIX C:
Army Corps of Engineers Wetland Verification