BLM

UNITED STATES DEPARTMENT OF THE INTERIOR
BUREAU OF LAND MANAGEMENT

Finding of No Significant Impact
Environmental Assessment
DOI-BLM-UT-C010-2015-0015-EA

August 2015

COVE FORT II GEOTHERMAL EXPLORATION PROJECT

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FINDING OF NO SIGNIFICANT IMPACT
Environmental Assessment
Cove Fort II Geothermal Exploration Project
DOI-BLM-UT-C010-2015-0015-EA

This unsigned finding of no significant impact (FONSI) and the attached environmental assessment (EA) (DOI-BLM-UT-C010-2015-0015-EA) for the Cove Fort II Geothermal Utilization Plan are available for public review and comment for 30 days beginning on the date the EA is posted on BLM's Environmental Notification Bulletin Board.

Based on the analysis of potential environmental impacts in the attached EA and consideration of the significance criteria in 40 Code of Federal Regulations (CFR) 1508.27, I have determined that with required and proposed mitigating measures, the proposed geothermal project would not result in significant impacts on the human environment. An environmental impact statement is not required.

The decision to approve or deny the project with a signed FONSI will be released to the public after consideration of public comments and completion of the EA.

Authorized Officer	Date

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CHAPTER 1. PURPOSE AND NEED

1.1. Introduction

This environmental assessment (EA) has been prepared to disclose and analyze the environmental consequences of the Enel Cove Fort, LLC (Enel) proposal to drill six full-scale geothermal exploration wells with supporting delivery pipelines and access roads on U.S. Bureau of Land Management (BLM) and U.S. Forest Service (USFS) lands. This proposal would be an expansion of the existing Cove Fort I geothermal project in Millard and Beaver Counties, Utah. This current proposal is referred to as the Cove Fort II geothermal exploration project.

This EA is a site-specific analysis of potential impacts that could result from the implementation of a proposed action or alternatives to the proposed action. The EA assists the BLM and USFS in project planning and ensuring compliance with the National Environmental Policy Act (NEPA), and in making a determination as to whether any "significant" impacts could result from the analyzed actions. "Significance" is defined by NEPA and is found in 40 Code of Federal Regulations (CFR) 1508.27. An EA provides evidence for determining whether to prepare an environmental impact statement (EIS) or a finding of no significant impact (FONSI). If the decision maker determines that this project has non-mitigable "significant" impacts following the analysis in the EA, then an EIS would be prepared for the project. If not, a decision record (DR) would be signed for the EA approving the selected alternative. The DR, including a FONSI statement, documents the reasons why implementation of the selected alternative would not result in "significant" environmental effects beyond those already addressed in the *Cedar, Beaver, Garfield, Antimony Record of Decision/Resource Management Plan* (CBGA RMP; BLM 1986) and the *Fishlake National Forest Land and Resource Management Plan* (Forest Plan; USFS 1986).

1.2. Background

In March 2015, Enel submitted a *Plan of Utilization for Geothermal Development on Federal Leases UTU-85605 and 81048* (hereafter the Geothermal Utilization Plan) (Appendix A) to the BLM Cedar City Field Office (FO). The proposed project area is 1,805.06 acres and encompasses both private and federal geothermal leases held by Enel. It is located immediately north and northeast of the already existing Cove Fort I project. The proposed Cove Fort II project is approximately 3.0 miles south of Cove Fort, Utah, approximately 2.7 miles south of Interstate 70 (I-70), and 2 miles east of Interstate 15 (I-15) in Beaver and Millard Counties, Utah (Figure 1.1).

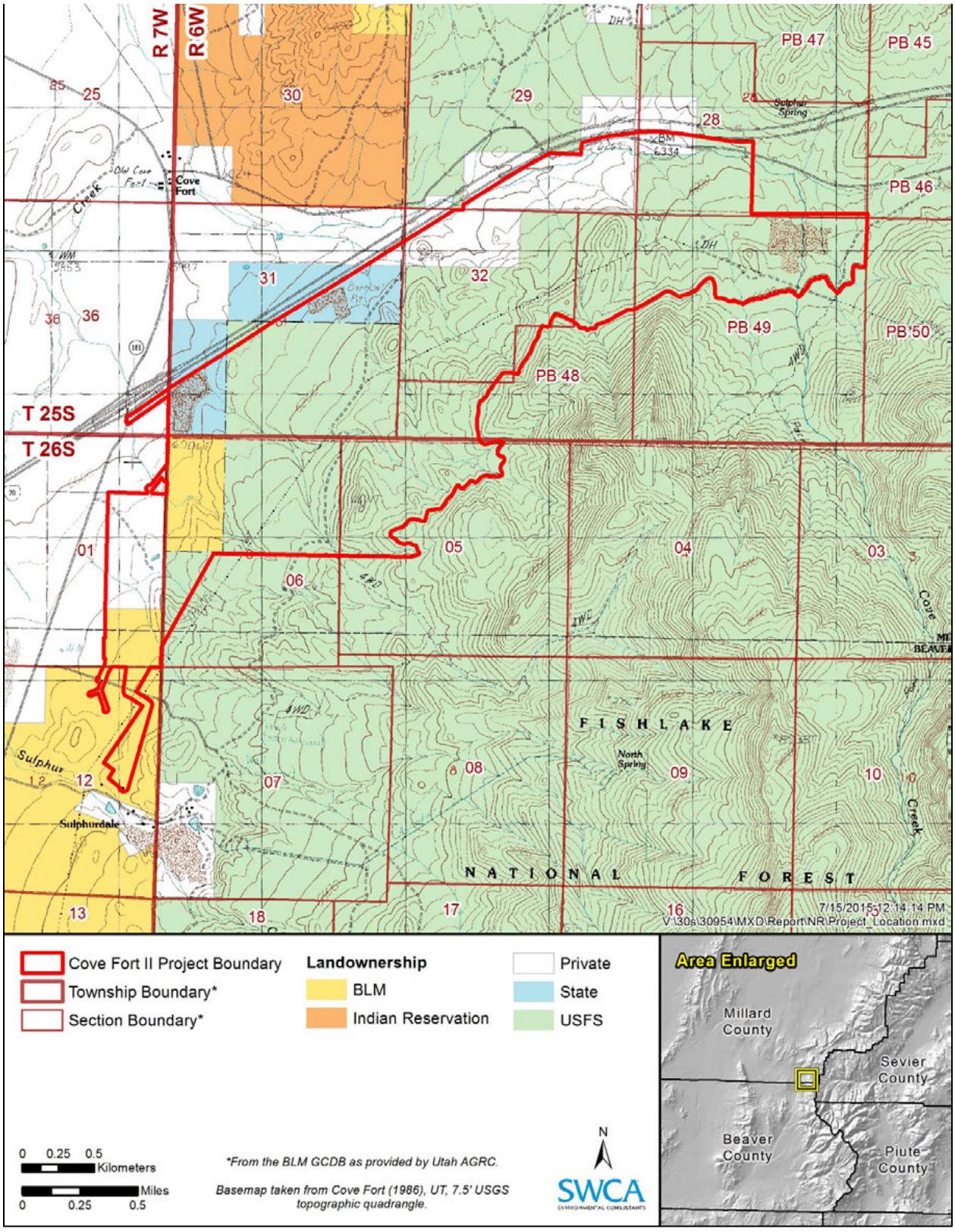

Figure 1.1. Project location map.

Enel is proposing to drill six full-scale geothermal exploration wells throughout 2016–2017, to evaluate the geothermal resource within Enel's existing lease area. Roads needed to access the wells would be maintained or constructed. One full-scale exploration well would be drilled in spring 2016, to be later used as a production well, should the project be developed. An additional two production wells would be drilled in summer and fall 2016. This would be followed by three additional wells, two production wells, and one injection well in 2017. There are three additional wells, designated as contingency wells, which would only be drilled if the results of the first three to six exploration wells are different than anticipated. Upon successful completion and testing of the capabilities of the geothermal resource, a binary cycle geothermal power plant and associated system would be constructed on land leased from the State of Utah School and Institutional Trust Lands Administration beginning in fall 2017, achieving commercial operations by the end of 2018. The power plant would generate an estimated net 20–22 megawatts (MW) of power.

Federal geothermal leases require that the lessee explore the leased lands until there is production of geothermal resources in commercial quantities. Enel's purpose of and need for the proposed project is to produce and commercially use the geothermal resources under those portions of its federal geothermal leases in the project area. Enel's specific objectives for the proposed project are to construct and operate a power plant with pipelines, wells, access roads, and associated facilities to deliver the electrical power to an existing PacifiCorp 138-kilovolt (kV) transmission line and on to customer service areas for a profit. Enel has filed the required Geothermal Utilization Plan with the BLM.

1.3. Purpose of and Need for the Proposed Action

The purpose of the federal action is to respond to Enel's proposal to drill six geothermal exploration wells with associated facilities, pipeline delivery systems, and access roads on USFS and BLM lands in Millard and Beaver Counties, Utah. The need for the action is the BLM's regulatory duty to respond to the applicant's proposal to exercise valid existing rights by developing its federal leases UTU-85605 and 81048, consistent with the leases' terms and conditions. The Proposed Action would use a renewable energy source (geothermal heat) and would have fewer emissions than natural gas, petroleum, or coal-fired power plants; it is therefore considered a lower-impact, more sustainable energy source than that derived from fossil fuels.

BLM has the responsibility to manage operations on lands leased for geothermal resources under the terms of the Geothermal Steam Act of 1970 and its implementing regulations (43 CFR 3200); therefore, they are the lead agency for this environmental review. BLM must respond to a plan of operation for drilling or to a Geothermal Utilization Plan by a geothermal lessee and either approve or deny the plans. Approval of the utilization and drilling plans would grant Enel the right to drill additional wells, and to install and operate geothermal fluid pipelines and associated facilities on the federal geothermal leases in the project area.

The USFS, Fish Lake National Forest is the surface management agency responsible for portions of the public lands in the project area. The Geothermal Steam Act of 1970 and its implementing regulations require that BLM consult with the agency that manages the surface lands of a geothermal lease before approving any operations proposed on that lease. The USFS is participating with the BLM in the preparation of this EA as a cooperating agency. The USFS's purpose is to comply with the requirements of the Geothermal Steam Act to participate as the surface management agency in the BLM consultation process. The USFS must also comply with the NEPA requirements to review and comment on matters that address or relate to its areas of legal jurisdiction and/or area of special expertise. Consistent with the requirements of NEPA, this EA also would serve to assist the USFS in its consultation capacity with the BLM.

1.4. Conformance with Land Use Plans

The Proposed Action affects areas managed by the BLM and the USFS. The BLM's Cedar City FO manages portions of the area based on decisions in the CBGA RMP approved on October 1, 1986 (BLM 1986). The Proposed Action is consistent with the terms, conditions, and decision in that plan. It is consistent with Minerals Section, Objective A (1) and Rationale C (1) to:

> Provide maximum leasing opportunities for oil, gas, and geothermal exploration and development by utilizing the least restrictive leasing categories necessary to adequately protect sensitive resources. (BLM 1986)

The USFS-administered area is managed by the Beaver Ranger District of the Fishlake National Forest. The Proposed Action is subject to the Forest Plan approved in 1986. The Proposed Action is consistent with the management direction contained in Chapter 4 of the Forest Plan (USFS 1986:IV-1 to IV-160) and associated amendments, as required by the National Forest Management Act of 1976 (16 United States Code [USC] 1600–1687). Directions related to geothermal operations and developments are given on pages IV-5 and IV-37 of the Forest Plan. Briefly, the Forest Plan allows for mineral exploration and development as consistent with the management of surface resources, and as protective of surface resources and environmental quality.

1.5. Relationships to Statutes, Regulations, and Other Plans

The proposed project would be conducted in part on lands that were leased by the BLM to Enel under the Geothermal Steam Act of 1970. This act states that geothermal leases convey the “exclusive right and privilege to drill for, extract, produce, remove, utilize, sell, and dispose of geothermal steam and associated geothermal resources” on these leased lands. To maintain this right, the lessee must “diligently explore the leased lands for geothermal resources until there is production in commercial quantities” applicable to each of these leases. The lessee must pay annual rentals to the federal government, and has to expend increasing dollars until the production of geothermal resources in commercial quantities is achieved.

Energy production by geothermal resources on BLM land is regulated by 43 CFR 3000, 3200, and 3280. These regulations establish procedures for processing leases, right-of-way (ROW) agreements, geothermal unit agreements, and geothermal permits for activities relating to geothermal resource energy production. The Proposed Action is consistent with the Geothermal Steam Act of 1970 and with other federal laws and regulations, including the promotion of renewable energy under the Energy Policy Act of 2005 (42 USC 15801 et seq.). BLM’s regulations have been updated to comply with this law.

The Proposed Action is consistent with local plans. The *Millard County General Plan* supports the use and development of natural resources and associated industries and businesses in a responsible manner and in locations that contribute to the economic and social wellbeing of county residents (Millard County 1998). According to the Zoning Ordinance of Beaver County, the project area is in the Multiple Use District (Beaver County 1993). Drilling for geothermal resources is a conditional use in this district and would require a conditional use permit.

The Proposed Action and its analysis in this document also conform with and meet the requirements of other statutes, regulations, plans, programs, and policies of affiliated tribes, other federal agencies, and state and local governments to the extent practicable, including the following:

1.5.1. Federal Statutes and Regulations

- 36 CFR 800 (Protection of Historic Properties)
- 43 CFR 3260 (Geothermal Drilling Operations - General)
- The American Indian Religious Freedom Act of 1978, as amended (42 USC 1996)
- The Archaeological Resources Protection Act of 1979, as amended (16 USC 470aa et seq.)
- The Clean Air Act of 1970, as amended (42 USC 7401 et seq.)
- The Clean Water Act of 1977, as amended (33 USC 1251 et seq.)
- The Endangered Species Act of 1973 (ESA), as amended (16 USC 1531 et seq.)
- Executive Order 12898 of February 11, 1994 (Federal Actions To Address Environmental Justice in Minority Populations and Low-Income Populations)
- Executive Order 13112 of February 3, 1999 (Invasive Species)
- Executive Order 13175 of November 6, 2000 (Consultation and Coordination With Indian Tribal Governments)
- Executive Order 13186 of January 10, 2001 (Responsibilities of Federal Agencies To Protect Migratory Birds)
- The Federal Land Policy and Management Act of 1976, as amended (43 USC 1701 et seq.)
- NEPA (43 USC 4321 et seq.)
- 54 USC 300101, commonly known as Section 1 of the National Historic Preservation Act (NHPA), Public Law No. 89-665, as amended by Public Law No. 96-515
- The Native American Graves Protection and Repatriation Act of 1990, as amended (25 USC 3001 et seq.) and 43 CFR 10 (Native American Graves Protection and Repatriation Regulations)
- U.S. Fish and Wildlife Service (USFWS) Bald and Golden Eagle Protection Act, as amended (16 USC 668 et seq.)
- *Birds of Conservation Concern 2008* (USFWS 2008)
- *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin and Muck 2002)
- *Best Management Practices for Raptors and Their Associated Habitat in Utah, August 2006* (BLM 2006)

1.5.2. State Statutes and Regulations

- Utah Noxious Weed Act (Rule R68-9)

1.6. Identification of Issues

1.6.1. Scoping Process

The BLM began the issue identification process by conducting internal scoping with an interdisciplinary (ID) team of BLM resource specialists in consultation with USFS specialists. The proposed project was posted to the Environmental Notification Bulletin Board (ENBB) on February 12, 2015. A public notice was published in the *Richfield Reaper* on February 25, 2015. A hardcopy of the scoping letter was mailed to the Fishlake National Forest's mailing list on March 5, 2015. Comment letters were received from the Paiute Indian Tribe of Utah, the Hopi Tribe, and the Utah Public Lands Policy Coordinating Office (Appendix B). A complete list of consultation is provided in Chapter 5 (Consultation and Coordination).

1.6.2. Issues

Appendix C of this EA (ID Team Checklist) contains a checklist of all resources and issues considered, including some of the common supplemental authorities that provide procedural or substantive responsibilities relevant to identifying issues for analysis in the NEPA process. As a result of the information and documentation contained in Appendix C, those resources or issues that are identified in the checklist as "Not Impacted" by the Proposed Action or "Not Present" at the project area are not discussed further in this EA. However, the following resources or issues were either identified as "Potentially Impacted" in the ID Team Checklist or were included because they were analyzed in the *Cove Fort/Sulphurdale Geothermal Utilization Plan Environmental Assessment* (2012 EA; BLM 2012a), and require further analysis in the EA:

- **Air quality and greenhouse gases (GHGs):** How would drilling geothermal wells and constructing, operating, and maintaining the power plant with its associated facilities and access roads affect air quality and GHG emissions? For example, emissions of dust, hydrocarbons, and GHGs could result from equipment during construction of the plant site, road construction and repairs, well drilling, etc.
- **Cultural resources:** How would drilling geothermal wells and constructing, operating, and maintaining the power plant with its associated facilities and access roads affect cultural resources? For example, project-related surface disturbance could affect cultural resources determined eligible for the National Register of Historic Places (NRHP) (see SWCA 2014a, 2015a).
- **Livestock grazing:** How would drilling geothermal wells and constructing, operating, and maintaining the power plant with its associated facilities and access roads affect livestock grazing? For example, livestock could be impacted by collision with vehicles and have difficulty accessing water sources.
- **Geology/Soils:** Would drilling geothermal wells and fluid injection induce seismic reactions? How would drilling geothermal wells and constructing, operating, and maintaining the power plant with its associated facilities and access roads affect soils? For example, the proposed project could result in direct impacts to soils, including soil compaction and loss of topsoil and its productivity.
- **Vegetation:** How would drilling geothermal wells and constructing, operating, and maintaining the power plant with its associated facilities and access roads plant affect vegetation? For example, surface disturbance caused by drilling and construction activities could result in loss of vegetation. Construction and drilling activities could also spread existing noxious weed populations. There are no known special status plant species with the potential to occur in the project area (see SWCA 2014b, 2015b).
- **Water resources:** How would drilling geothermal wells and constructing, operating, and maintaining the power plant with its associated facilities and access roads affect water resources? For example, there could be drawdown of the geothermal reservoir or other aquifers to provide water for drilling, construction, and operation.
- **Wildlife (excluding threatened and endangered species):** How would drilling geothermal wells and constructing, operating, and maintaining the power plant with its associated facilities and access roads affect wildlife? For example, human activity and surface disturbance could cause direct mortality to individuals, impede daily activities, displace individuals from normal habitat, or disrupt normal breeding behavior and breeding success. The project area is within crucial winter habitat for mule deer and substantial winter habitat for Rocky Mountain elk (*Cervus elaphus nelsoni*) (see SWCA 2014b, 2015b).

- **Special status animal species and migratory birds:** How would drilling geothermal wells and constructing, operating, and maintaining the power plant with its associated facilities and access roads affect special status animal species and migratory birds? For example, the project area may provide habitat for BLM sensitive species or USFS management indicator species. Human activity and surface disturbance could cause direct mortality to individuals, impede daily activities, displace individuals from normal habitat, or disrupt behavior. Human activity and surface disturbance could cause direct mortality to migratory birds and impede daily activities, displace individuals from normal habitat, or disrupt normal breeding behavior and reduce breeding success (see SWCA 2014b, 2015b).

CHAPTER 2. DESCRIPTION OF ALTERNATIVES

2.1. Introduction

The *BLM National Environmental Policy Act Handbook H-1790-1* (BLM NEPA Handbook; BLM 2008) indicates that incorporation by reference may be used to reduce paperwork and redundant analysis in the NEPA process. Incorporation by reference means referring to "other available documents that cover similar issues, effects and/or resources" as those considered in the NEPA analysis currently being prepared (BLM 2008). When incorporating by reference, a brief summary of relevant portions of these documents is used, rather than repeating the entire document. This EA incorporates by reference information from the 2012 EA (BLM 2012a). In the chapters that follow, applicable information from the 2012 EA is summarized and cited rather than repeated in detail. New information specific to the analyses for the Cove Fort II geothermal exploration is also provided.

In March 2007, Enel acquired a non-generating geothermal plant near Cove Fort, Utah (Enel 2015). The geothermal plant was constructed in three phases by Mother Earth Industries with commercial operations at the plant beginning in 1985. Mother Earth Industries sold the plant to the city of Provo, Utah, and Utah Municipal Power Authority in 1992. Recurrent Resources purchased the facility in 2003 and closed the plant shortly after the sale (BLM 2012a). After acquiring the plant, Enel constructed a new 20-MW binary cycle geothermal power plant (the Cove Fort I project) at the site, along with an electrical substation, 138-kV power line, well field motor control center (MCC), and a surface conveyance pipeline system. The old geothermal plant was removed in 2011 (BLM 2012a). A more detailed history of the original geothermal plant and associated geothermal leases is provided in Section 2.1 of the 2012 EA.

Enel is proposing to further evaluate and develop the geothermal resource within geothermal leases UTU-81048 and UTU-85605, which are adjacent to the Cove Fort I geothermal plant. This EA analyzes the potential effects of implementing the Proposed Action and the No Action Alternative. The No Action Alternative is considered and analyzed to provide a baseline against which to compare the impacts of the Proposed Action. No other alternatives were brought forward for detailed analysis (see section 2.4 for further details and rationale concerning alternatives eliminated from detailed analysis).

2.2. Proposed Action

2.2.1. Project Elements

The Proposed Action would consist of the following elements:

- Drilling of six geothermal exploration wells (46-31, 41-5, 13-32, 78-1, 37-28, 51-32; Figure 2.1) to evaluate the geothermal resource
- Drilling of three additional contingency wells (74-32, 75-31, 77-1; see Figure 2.1), only if the results of the first six exploration wells are different than anticipated
- Construction of access roads
- Construction of a binary cycle geothermal power plant and ancillary buildings
- Construction of an associated geothermal fluid pipeline gathering system
- Development of a transmission line

Details for each project element are provided in Enel's 2015 Geothermal Utilization Plan (see Appendix A; Enel 2015). Well testing, fire suppression, water requirements, employment, and reclamation and decommissioning are also discussed in the Geothermal Utilization Plan. A brief summary of the Proposed Action is provided below.

The geothermal pipeline gathering system would be constructed in an 80-foot corridor. Within this corridor, 50 feet would be reclaimed (on the expansion loop side of the gathering system) and 30 feet (on the other side of the pipeline) would remain disturbed for development of adjacent access roads. The reclaimed area would be a temporary disturbance and the adjacent road area would be a permanent disturbance.

The first exploration well (well 46-31) would be drilled in spring 2016 and would later be used as a production well if the project is approved. Two production wells would be drilled in summer and fall 2016 (wells 41-5 and 13-32, respectively). An injection well (well 78-1) would be drilled beginning in spring 2017. Two additional production wells would follow in 2017 (wells 37-28 and 51-32). See Figure 2.1 for proposed well locations. Upon successful testing of the capabilities of the geothermal resource, the power plant would be constructed beginning in the fall of 2017, with commercial operations expected to start by the end of 2018.

Construction of access roads for wells 46-31 and 41-5 would occur in fall 2015. The road to 46-31 would also serve as the main access road to the project. The access road for 13-32 would be constructed in summer 2016. Because of the federal lease stipulation that limits construction within crucial big game winter range from December 1 through April 15, additional access roads for the wells to be drilled in 2017 would be constructed before December 1, 2016. This would provide adequate time to drill three wells in 2017. If the roads are not built in 2016, they would be completed after April 15, 2017.

The drilling of each geothermal exploration well would require the construction of a well pad, followed by temporary occupancy by a drill rig with ancillary equipment. Each well pad would consist of a 300 × 300–foot pad. Construction of each well pad (including cuts, fills, and stockpiles) would result in an estimated disturbance area of 2 acres. A general well pad layout is provided as Exhibit 4 in Enel's Geothermal Utilization Plan (see Appendix A). Water used for drilling and construction would be obtained from either existing water rights held by Enel for the Cove Fort I project or private wells. A temporary surface water line would be used to convey water to the project area and removed once drilling and construction were completed.

Enel's drilling program for a well provides specifications on anticipated formations, mud system, potential water intervals, casing, cementing, and other standards. Surface and other casings would be set with cement to prevent migration of borehole fluids and contamination of any fresh water aquifers penetrated by the borehole and to isolate potential permeable zones. Each well would be drilled with a combination of drilling fluids to maintain borehole pressures, and the mud weight would be monitored to ensure proper weighting of the drilling fluid for anticipated borehole pressures. The borehole fluids would contain bentonitic clays, chemical additives, and a weighting material, which in essence is a heavy, fluid suspension called a drilling mud. The drilling mud would control borehole fluid migration either from the borehole into the bedrock or from the bedrock into the borehole, and would provide a lubricant for drilling. This heavy suspension builds mudcake (or filtrate) on the borehole, and minor quantities of this filtrate may penetrate a minimal distance into the bedrock, depending on the porosity and permeability of the strata. The result of this co-mingling of drilling fluids and groundwater, if present, is unavoidable but does not contaminate the natural water quality in aquifers. Air, fresh water, weighted mud, or salt-saturated drill fluids could be used. Drip pans and all other necessary equipment would be in place to handle the mud-based drilling fluids. All fluids from the borehole would be discharged into the reserve pit and contained in that pit.

Access roads would be constructed as shown on Figures 2.1 through 2.4. The injection pipeline would be approximately 2.5 miles long and would have a relief pond installed at the lowest elevation point along the pipeline. The pond would allow for drainage of the upper portion of the injection line in the event of a plant upset condition during winter months when the line would need to be drained to prevent freezing and internal corrosion.

Enel is currently working with PacifiCorp (the local utility) to determine the best route for construction of a transmission line to transmit power from the new power plant. Four transmission line options are being considered:

- **Option A:** A 2.5-mile-long transmission line would run southwest from the new power plant to a new substation adjacent to the existing Tushar Substation at Cove Fort I. The new substation would tie into the Cove Fort I transmission line to use a point of interconnect defined by the current interconnect agreement for Cove Fort I.
- **Option B:** A 2.5-mile-long transmission line would run southwest from the new power plant to the existing Tushar Substation at Cove Fort I. A new substation would not be required because the transmission line would tie into a spare slot at the Tushar Substation. New equipment on already disturbed land would be necessary, as well as a new interconnect agreement.
- **Option C:** A 0.49-mile long transmission line would run south from the new power plant to tie into an existing 138-kV transmission line approximately 0.5 mile away. A new substation would be required on approximately 1 acre of land, and a new interconnect agreement would be needed.
- **Option D:** A 0.34-mile-long transmission line would run south from the new power plant to tie into an existing 345-kV transmission line approximately 0.5 mile away. A new substation would be required on approximately 1 acre of land and a new interconnect agreement would be needed.

The corridor for the transmission line would depend on the design and height of the transmission poles.

Figures 2.1 through 2.4 show the Proposed Action elements with Options A through D, respectively. The well pad, plant site, gathering system, access roads, MCC, and relief pond are the same for all four options.

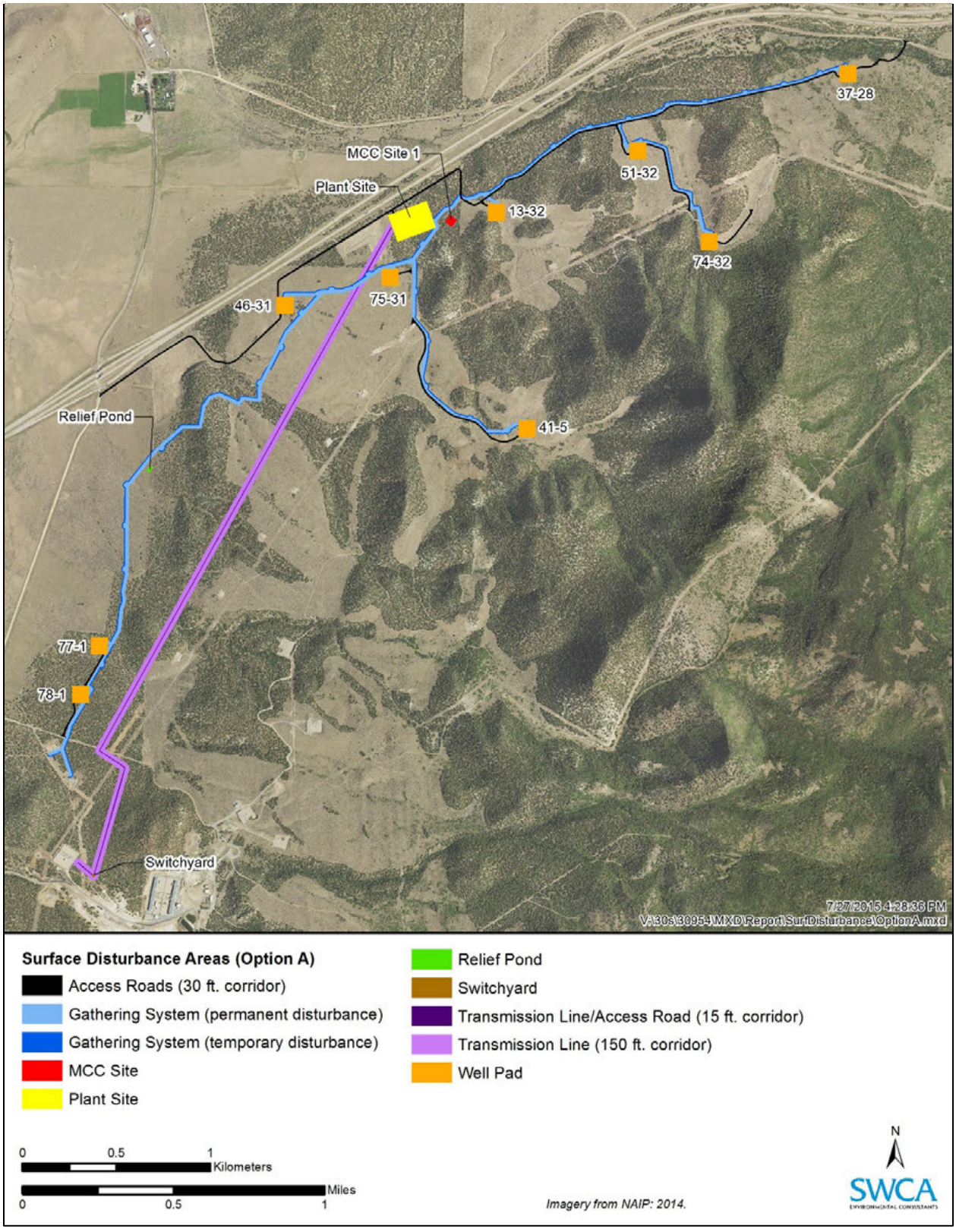

Figure 2.1. Proposed Action (Option A) project elements.

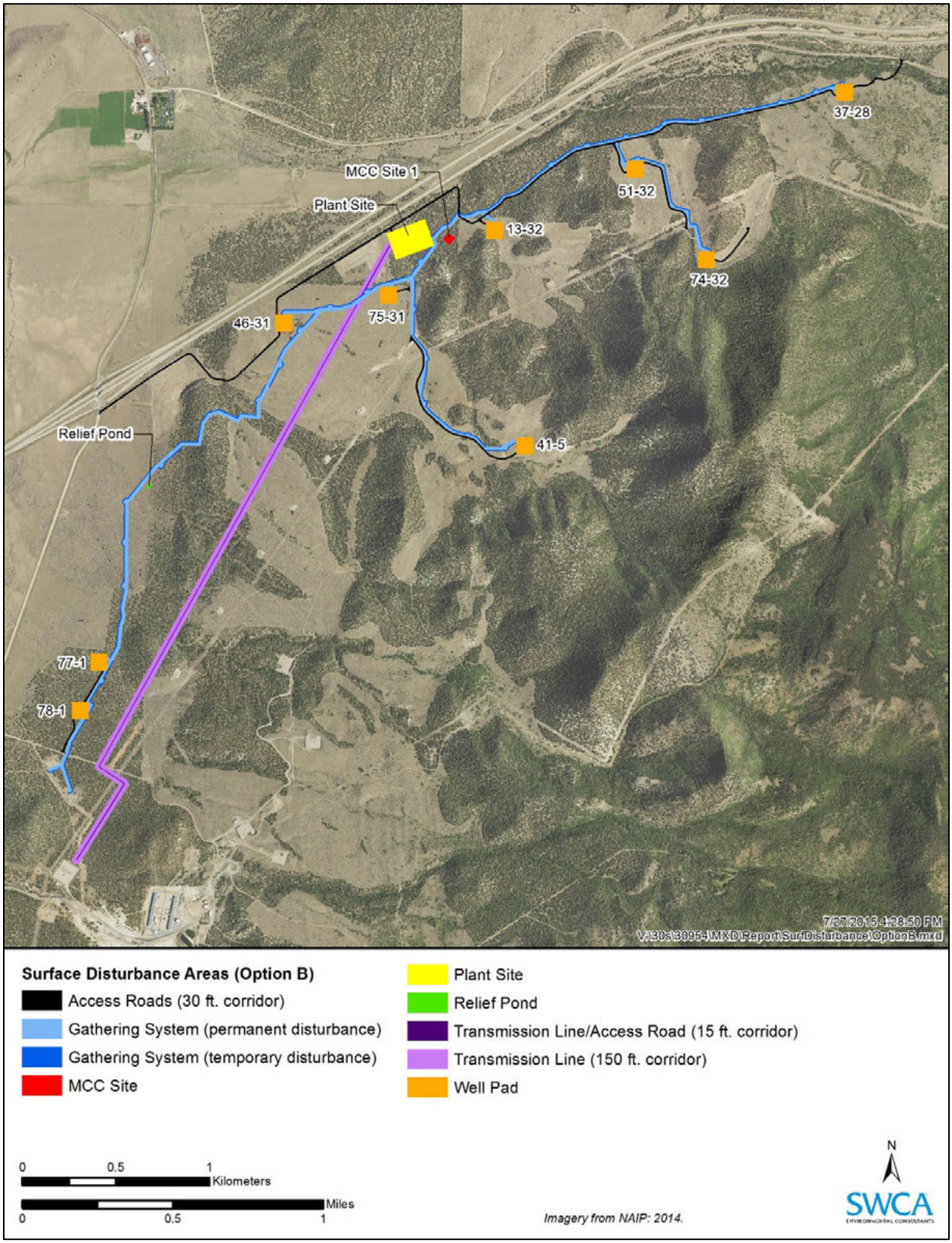

Figure 2.2. Proposed Action (Option B) project elements.

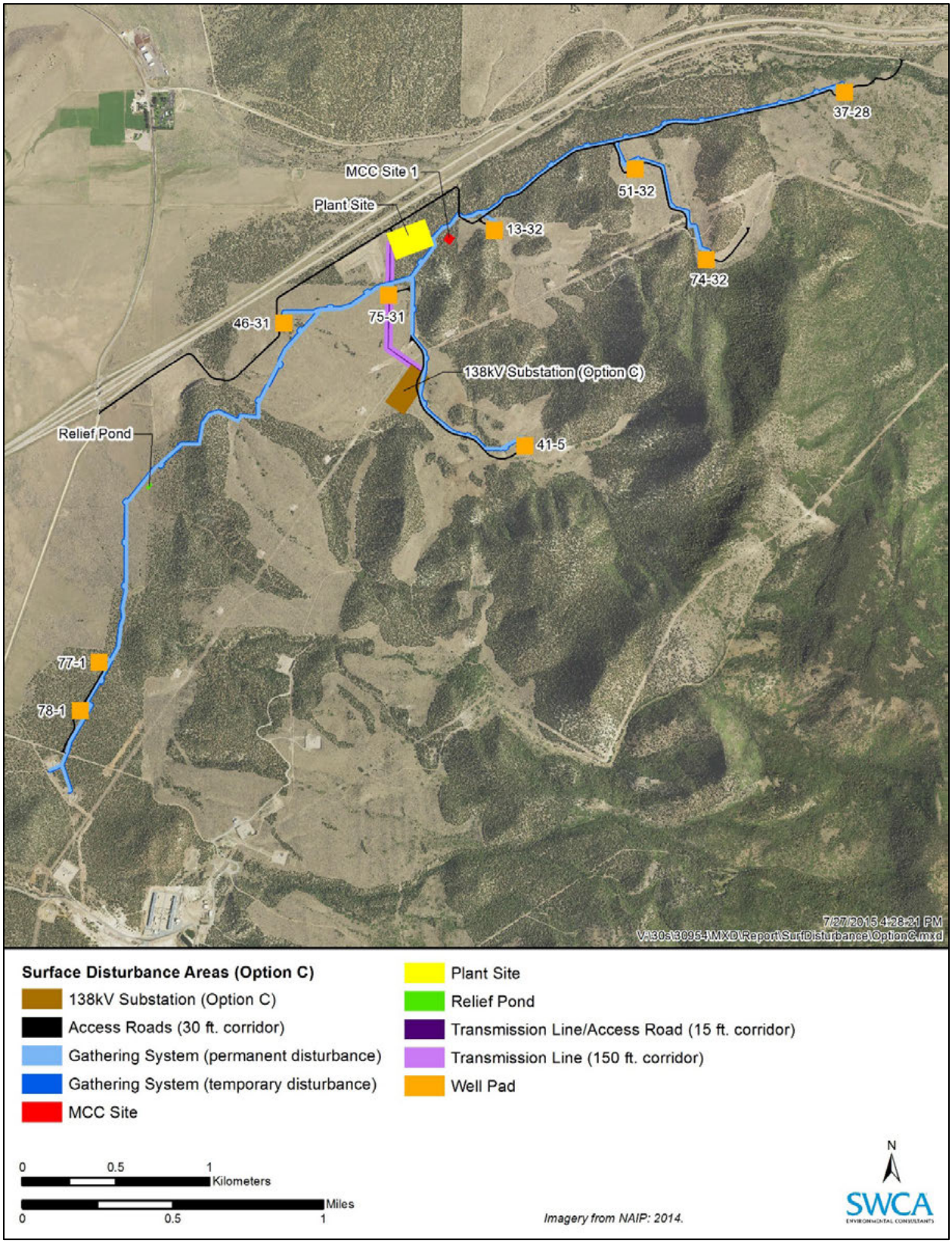

Figure 2.3. Proposed Action (Option C) project elements.

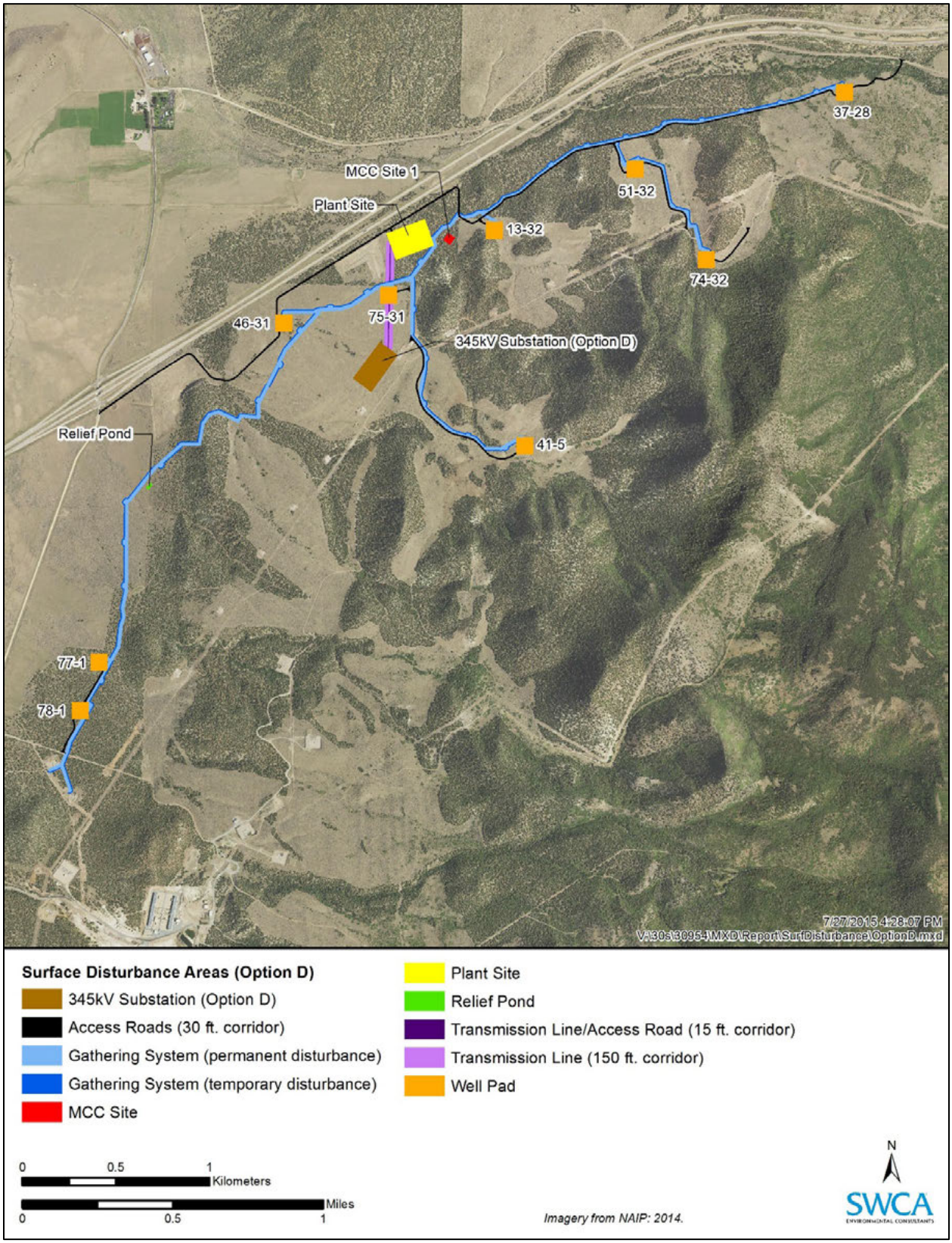

Figure 2.4. Proposed Action (Option D) project elements.

2.2.2. Surface Disturbance Summary

Table 2.1 provides a summary of project surface disturbance for all Proposed Action elements for each transmission line option.

Table 2.1. Project Surface Disturbance in Acres

Project Element	Option A	Option B	Option C	Option D
Well pad (300 x 300–foot block)	18.60	18.60	18.60	18.60
Plant site	8.11	8.11	8.11	8.11
Gathering system (temporary disturbance)	13.94	13.94	13.94	13.94
Gathering system (permanent disturbance)	35.53	35.53	35.53	35.53
Access roads (30-foot corridor)	17.52	17.52	17.52	17.52
MCC	0.52	0.52	0.52	0.52
Relief pond	0.16	0.16	0.16	0.16
Switchyard (Option A)	0.06	N/A	N/A	N/A
138-kV substation (Option C)	N/A	N/A	6.54	N/A
345-kV substation (Option D)	N/A	N/A	N/A	7.36
Transmission line (150-foot corridor)	40.82	38.59	6.16	4.29
Transmission line access road (15-foot corridor)	4.49	4.26	0.71	0.49
Total	139.74	137.22	107.78	106.52

N/A = not applicable

Total surface disturbance under the Proposed Action would range from 106.52 to 139.74 acres, depending on which transmission line option is chosen. Of all the elements except for the transmission line, the gathering system (permanent disturbance) (35.53 acres), well pads (18.60 acres), and access roads (17.52 acres) would create the largest areas of surface disturbance. Of the four transmission line options, Option A would create the most surface disturbance and Option D would create the least surface disturbance.

Tables 2.2 provides a summary of project surface disturbance by landownership for the Proposed Action.

Table 2.2. Project Surface Disturbance by Landownership

Proposed Action Option	Bureau of Land Management	U.S. Forest Service	State	Private	Total
Option A	29.84	71.01	19.54	19.35	139.74
Option B	27.32	71.01	19.54	19.35	137.22
Option C	11.63	57.96	18.84	19.35	107.78
Option D	11.63	56.70	18.84	19.35	106.52

All four options have approximately the same amount of surface disturbance on state and private lands. In addition, under all four options, most of the surface disturbance occurs on USFS land. Options A and B have larger quantities of surface disturbance on BLM and USFS lands than Options C and D.

2.2.3. Design Features

Design features are specific means, measures, or practices that make up the Proposed Action (BLM 2008). Standard operating procedures, stipulations, and best management practices are typically considered design features. A detailed list of design features is in Appendix D.

Drilling activities, surface disturbance, and reclamation would be in accordance with the following: the description of proposed surface operations plan for each well site submitted by Enel, the geothermal drilling permit applications; applicable stipulations and conditions described in geothermal leases UTU-81048 and UTU-085605; applicable leasing stipulations of the CBGA RMP; and applicable BLM best management practices, standard lease terms, and standard operating procedures.

All Enel and drilling contractor personnel would be informed of Enel's policy regarding degradation of the environment and would be held accountable for adhering to the design features or environmental protection standards listed in the sections below and in Appendix D.

2.2.3.1. ACCESS

Well field access roads would be designated for administrative use only; at the direction of the BLM or USFS, they would be signed and/or gated to restrict public use.

2.2.3.2. SOIL AND WATER RESOURCES

Proactive measures would be taken to avoid contamination of soil and water resources from drilling process chemicals, petroleum products, or other materials. The drilling contractor would be required to prepare an on-site spill prevention and countermeasure control plan and would immediately report any spills to the Enel representative overseeing drilling operations. The Enel representative would then contact the appropriate regulatory authority for spills of a reportable nature.

To prevent soil erosion, well sites would be disturbed only to the extent required to provide safe drilling rig setup and safe employee working conditions. Because each well pad would disturb an area greater than 1 acre, a stormwater pollution prevention plan (SWPPP) and associated notice of intent would be filed with the Utah Division of Water Quality for all well pads and access roads associated with the project. Final soil stabilization would be achieved upon completion of interim reclamation.

Steel casings would be cemented to below surface water and groundwater zones to prevent surface water and groundwater pollution from well drilling and testing. Wells would also be cased and cemented to prevent contamination of groundwater by geothermal fluids.

Fugitive dust would be controlled through surface application of water.

2.2.3.3. WILDLIFE AND VEGETATION RESOURCES

Surface disturbance would be limited to minimize direct impacts to wildlife, wildlife habitat, and vegetation.

As stipulated in the lease, surface use of the project area would be limited to operation and maintenance of production facilities from December 1 through April 15. Modification of this stipulation would be requested from the USFS. During times of substantial snowfall (snowfall significant enough to drive the elk and deer down into the project area to forage), Enel would limit operational use of access roads by reducing the number of well readings to once daily.

Vehicle travel on unpaved roads would be limited to a maximum of 30 miles per hour to protect wildlife and to reduce fugitive dust.

Off-site terrestrial habitat restoration and enhancement would be completed to compensate for direct disturbance of crucial and substantial winter habitats for deer and elk, respectively. Enel owns a parcel of land south of the project area (Figure 2.5) that could be used for this purpose. Up to 132 acres are available for restoration activities. Enel is also willing to place a conservation easement on these 132 acres to protect this area in perpetuity. A conservation easement would designate a qualified land conservation organization (e.g., The Nature Conservancy) or a government entity to oversee the appropriate exercise of rights regarding the easement and the conservation purpose for which it was established. Enel would fund all restoration and enhancement projects to agency specifications and would follow all agency requirements as outlined in a memorandum of understanding that would be executed following the signing of the decision record. Alternatively, Enel could conduct vegetation treatments on BLM-administered land, subject to further NEPA analysis, if necessary.

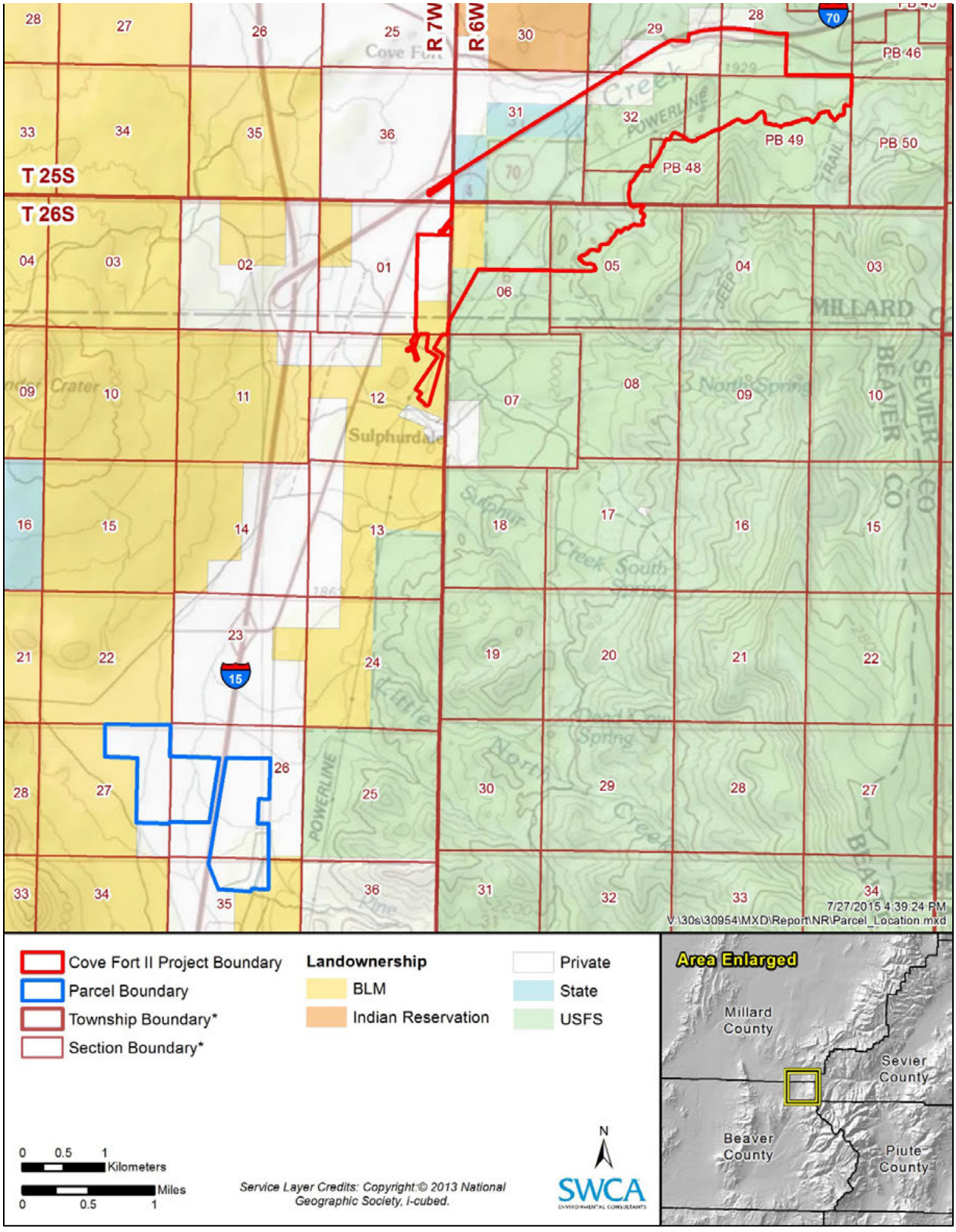

Figure 2.5. Parcel location for potential off-site habitat restoration and enhancement.

During the life of the project and until the site is released from liability for reclamation, well pads and access roads would be inspected for noxious weeds. If noxious weeds are found, the authorized state or federal agent would be notified, and the weeds would be treated following a program approved by the BLM and USFS to eliminate further spreading. Treatment would continue until the weeds have been eradicated.

Construction and drilling equipment would be washed before entering the project area to avoid the introduction or spread of non-native or invasive species.

2.2.3.4. CULTURAL RESOURCES

All well pads would be located outside of any culturally significant areas identified in the *2014 Class III Cultural Resources Inventory of the Cove Fort II Geothermal Exploration Project in Millard County, Utah* and the *Addendum Report: Class III Cultural Resources Inventory of the Cove Fort II Geothermal Exploration Project in Millard County, Utah* (SWCA 2014a, 2015a). However, elements of the Proposed Action (e.g., access road, gathering system) would adversely impact five archaeological sites, which would require additional archaeological mitigation. These impacts are analyzed in Chapter 4 of this EA. A historic properties treatment plan (HPTP)—*A Historic Properties Treatment Plan for Archaeological Sites in the Cove Fort II Geothermal Exploration Project Area, Millard and Beaver Counties, Utah* (SWCA 2015c)—has been developed to mitigate potential adverse effects to these five sites. Treatment measures in the HPTP include site mapping and documentation, archaeological testing and possible block excavation in the disturbance corridor, artifact collection, and interpretation of treatment results as they apply to research questions developed for prehistoric sites in the area (SWCA 2015c). Protection measures for all historic properties in the project area would include identifying allowable travel areas; identifying areas to be avoided during construction, maintenance, and operation; barricading/fencing sites within or immediately adjacent to the overall project area, but outside the proposed disturbance areas; and preventing site looting through periodic monitoring by the BLM and Enel and through environmental training provided to all project employees. If any unexpected cultural resources are discovered during construction or reclamation activities, operations would be suspended near the discovery, and the BLM or appropriate entity would be promptly notified.

2.2.3.5. FIRE PREVENTION

The work site would be maintained in an orderly manner during drilling operations. Fire extinguishers would be available on-site and around the drilling rig. Water used for drilling would also be available for firefighting. Fire-suppression equipment would be available for any wildfires caused by construction or related activities. In the event of a wildfire, the Richfield Interagency Fire Center would be notified (435-896-8404). All drilling-related activities would comply with any area fire restrictions in place during drilling activities.

2.2.3.6. WASTE DISPOSAL

Reserve pits would be located on cut portions of drilling pads to collect drilling cuttings. Pits would be fenced, flagged, and maintained in good condition. If a pit is completely dry (drilling fluids have evaporated), it would be either permanently fenced or properly reclaimed during interim reclamation if not needed for operations.

Solid waste materials (trash) would be deposited at an authorized landfill by a disposal contractor. All personnel would use portable chemical sanitary facilities, maintained by a local contractor.

2.2.3.7. PUBLIC HEALTH AND SAFETY

Public health and safety would be protected through instructions to work crews and contractors regarding compliance with federal, state, county, and Occupational Safety & Health Administration regulations.

2.2.3.8. ENVIRONMENTAL MONITORING

Regular, routine visual inspections of drilling sites and access roads would be conducted by plant operational personnel to quickly detect and correct any problems.

Drilling fluid and cuttings would be monitored with visual inspections by drilling personnel and the well-site geologist.

Enel would develop a groundwater monitoring program and would work with the Utah Division of Water Quality, USFS, and BLM to develop the program and to correct any problems identified through monitoring.

2.3. No Action Alternative

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed activities and associated disturbances for the Cove Fort II geothermal exploration project would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed.

Under the Geothermal Steam Act of 1970, the project proponent has the statutory right to enter and conduct exploration and development activities on current leases, subject to applicable laws and regulations. FLPMA of October 21, 1976, directed the Secretary of the Interior to take any action necessary by regulation or otherwise to prevent undue and unnecessary degradation of the public lands. With respect to surface disturbances associated with geothermal leases, the Secretary of the Interior has implemented the 43 CFR 3200 regulations to accomplish this mandate. Undue and unnecessary degradation is currently defined in the regulations as a failure to comply with the performance standards of 43 CFR 3200, a failure to follow the terms and conditions of an approved plan of operations, a failure to comply with other state and federal laws related to environmental protection and the protection of cultural resources, and a failure to demonstrate that the operations are reasonably incident to exploration or processing operations.

The No Action Alternative could be chosen if activities under the Proposed Action would result in undue and unnecessary degradation of public lands. The Proposed Action could also be revised so that exploration could be completed without causing undue or unnecessary degradation.

2.4. Alternatives Considered but Eliminated from Further Analysis

For an EA where there are no unresolved conflicts concerning alternative uses of available resources, only the Proposed Action requires consideration (BLM 2008). Other alternatives do not need to be analyzed. In this EA, no unresolved conflicts with respect to alternative uses have been identified, and only the Proposed Action and No Action Alternative are considered.

Alternative locations for geothermal wells and pipelines were considered during identification of the well sites and pipeline alignments shown on Figure 2.1. The chosen locations were designed to avoid resource conflicts.

A proposal to use existing roads as much as possible for needed access was also considered. This proposal was not evaluated further because an existing PacifiCorp transmission line and its ROW are within or adjacent to the existing roads, and Enel's proposed operational use would be incompatible with the use established for the transmission line ROW.

In addition, a different access road layout was initially considered during project planning. This access road layout was eliminated from further analysis when it became clear that it unnecessarily fragmented big game crucial and substantial winter habitat. The presence of vehicles on this particular access road layout could have further stressed big game during already difficult winter months. The current access road layout was developed to mitigate these potential effects.

CHAPTER 3. AFFECTED ENVIRONMENT AND ENVIRONMENTAL CONSEQUENCES

3.1. Introduction

The affected environment of the Proposed Action and No Action Alternative was considered and analyzed by a BLM ID team in consultation with USFS specialists and documented in the ID team checklist. The ID team checklist indicates which resources of concern are either not present in the project area or would not be impacted to a degree that requires detailed analysis. This chapter describes the existing environment of the area that would be affected by the No Action Alternative or the Proposed Action, and discloses the potential effects of these alternatives. The environmental data used to describe the affected environment and to predict environmental effects that could result from the No Action Alternative or the Proposed Action were collected from agency geospatial datasets and from field surveys. A level of uncertainty is associated with any dataset in terms of predicting outcomes, especially when natural systems are involved. The predictions described in this analysis are intended to allow comparison of alternatives, as well as to provide a method to determine whether activities proposed by the applicant would be expected to comply with applicable federal, state, and local regulations.

3.2. General Setting

The project area is approximately 1.0 mile southeast of Cove Fort, Utah, immediately south of I-70, and approximately 2 miles east of I-15 in Beaver and Millard Counties, Utah. It is northeast of the ghost town of Sulphurdale, within and extending west of the Fishlake National Forest. It is in a narrow, unnamed, north–south-trending valley between Cinder Crater to the west and the Tushar Mountains to the east, in the western end of the Tushar Volcanic Subdivision of the Basin and Range-Colorado Plateau Physiographic Province Transition Zone. This physiographic region is partly characterized by known and potential geothermal resources, including the project area. The geothermal system is one of the largest thermal anomalies in the western United States (Ross & Moore 1985).

The land in the project area slopes, for the most part, gently from east to the west. Elevation ranges from approximately 6,040 feet on the western-most edge of the project area to approximately 7,200 feet on the east. The average growing season in Beaver County is 106 days, and the mean temperature is 47 degrees Fahrenheit. Average annual precipitation in Beaver Valley is 11.65 inches. An existing 345-kV power line and associated ROW owned by PacifiCorp runs roughly southwest to northeast across the project area. There are 6.73 miles of existing USFS roads in the project area.

3.3. Air Quality

3.3.1. Affected Environment

3.3.1.1. AIR QUALITY STANDARDS AND CURRENT CONDITIONS

The U.S. Environmental Protection Agency (EPA) has established National Ambient Air Quality Standards (NAAQS) to limit the amount of air pollutants considered harmful to public health and the environment. Standards have been set for six criteria pollutants: carbon monoxide, lead, nitrogen dioxide, ozone, sulfur dioxide, and particulate (solid) matter (PM). Areas that do not comply with NAAQS requirements for criteria pollutants are considered nonattainment areas. A particular geographic region may be designated an attainment area for some pollutants and a nonattainment area for others. Both Millard and Beaver Counties are currently in attainment with the NAAQS (Utah Division of Air Quality [DAQ] 2013a).

In addition to the six criteria pollutants, the EPA also regulates 187 hazardous air pollutants (HAPs; also known as toxic air pollutants) that are known or suspected to cause cancer or other serious health effects. Examples of HAPs include benzene, perchloroethylene, methylene chloride, asbestos, mercury, and lead. HAPs are regulated through Maximum Achievable Control Standards (MACT standards), which are individual emission standards developed for a particular stationary industrial source category. Each MACT standard applies to major sources in the industrial source category; major sources are those that emit more than 10 tons per year of a single HAP or 25 tons per year of any combination of HAPs (EPA 2013). The MACT standard for reciprocating internal combustion engines (40 CFR 63 Subpart ZZZZ) may apply to the Proposed Action because of the diesel-fired generators proposed for the geothermal plant. The EPA also regulates HAPs from mobile sources such as highway vehicles and non-road equipment; at least six rules or control programs have been promulgated to reduce these emissions.

An emissions inventory is a summary of criteria pollutant and HAP emissions for a particular source during a given time period. The most recent emissions inventories available for Millard and Beaver Counties are from 2011 and are summarized in Table 3.1.

Table 3.1. 2011 Emission Inventories for Millard and Beaver Counties

Pollutant	Millard County Emissions (tons per year)	Beaver County Emissions (tons per year)
Carbon monoxide	35,525.31	13,876.11
Nitrous oxides	33,160.33	2,078.78
PM_{10}	7,269.87	2,654.91
$PM_{2.5}$	1,889.21	435.75
Sulfur oxides	5,084.95	75.43
Volatile organic compounds	51,878.47	26,490.32
HAPs	209.83	0

Source: DAQ (2011a).

Note: PM_{10} = PM between 2.5 and 10 micrometers in diameter, and $PM_{2.5}$ = PM less than 2.5 micrometers in diameter.

The criteria pollutant point sources in Millard County are the Leamington Cement Plant, Cricket Mountain Plant, Intermountain Generation Station, Kern River Gas Transmission Company's Fillmore Compressor Station, and the Delta Mill. The criteria pollutant point sources in Beaver County are the Circle Four Farms Feedmill, Dairy Farmers of America - Cheese & Condensed Milk Processing Plant, the Marble Mine, Kern River Gas Transmission Company's Milford Compressor Station, the Milford Quarry, and Quality Crushing's crushing and screening operations (DAQ 2011b).

The existing Cove Fort I geothermal plant has a valid DAQ approval order (DAQE-AN145520001-12; DAQ 2013b) that permits the following equipment: the geothermal power plant and associated activities, two diesel generator engines, one emergency diesel engine for fire pumps, an Ormat energy converter, two fuel storage tanks, two pentane storage tanks, and three diesel generator engine fuel storage tanks. Emissions from the Cove Fort I plant include carbon monoxide, nitrous oxides, PM, sulfur oxides, volatile organic compounds, and HAPs.

Regional haze refers to haze that impairs visibility in all directions over a large area. In the 1990 Clean Air Act amendments, U.S. Congress established requirements to address regional haze visibility impairment, giving the EPA authority to establish visibility transport commissions and promulgate regulations to address regional haze (Air Quality Board 2011). The EPA's regional haze regulations affect only Class I national parks and wilderness areas. Utah has five Class I areas (all national parks), all of which are outside Millard and Beaver Counties (EPA 2012). The closest Class I area is Capitol Reef National Park, which is approximately 60 miles west of the project area.

3.3.1.2. CLIMATE CHANGE

Global warming refers to the ongoing rise in global average temperature near the Earth's surface. It is caused mostly by increasing concentrations of GHGs in the atmosphere, and it is changing climate patterns. Climate change refers to any significant change in the measures of climate (e.g., temperature, precipitation, wind patterns) lasting for an extended period of time (EPA 2014a). In 2010, the National Research Council concluded that "Climate change is occurring, is caused largely by human activities, and poses significant risks for a broad range of human and natural systems" (National Research Council 2010).

In May 2014, the U.S. Global Change Research Program released the *Climate Change Impacts in the United States: The Third National Climate Assessment* (Assessment), a comprehensive report on climate change and its impacts in the United States (Melillo et al. 2014). In the Assessment, the Southwest region includes the states of Arizona, California, Colorado, Nevada, New Mexico, and Utah. According to the Assessment, the decade 2001–2010 was the warmest in the 110-year record for the Southwest region, with temperatures almost 2 degrees Fahrenheit higher than historic averages and with fewer cold air outbreaks and more heat waves. Regional annual average temperatures are projected to rise by 2.5–5.5 degrees Fahrenheit by 2041–2070, assuming continued growth in global emissions. Key climate change highlights for this region include the following, excerpted directly from the Assessment:

- Snowpack and streamflow amounts are projected to decline in parts of the Southwest, decreasing surface water supply reliability for cities, agriculture, and ecosystems.
- The Southwest produces more than half of the nation’s high-value specialty crops, which are irrigation-dependent and particularly vulnerable to extremes of moisture, cold, and heat. Reduced yields from increasing temperatures and increasing competition for scarce water supplies will displace jobs in some rural communities.
- Increased warming, drought, and insect outbreaks, all caused by or linked to climate change, have increased wildfires and impacts to people and ecosystems in the Southwest. Fire models project more wildfire and increased risks to communities across extensive areas.
- Flooding and erosion in coastal areas are already occurring even at existing sea levels and damaging some California coastal areas during storms and extreme high tides. Sea level rise is projected to increase as Earth continues to warm, resulting in major damage as wind-driven waves ride upon higher seas and reach farther inland.
- Projected regional temperature increases, combined with the way cities amplify heat, will pose increased threats and costs to public health in southwestern cities, which are home to more than 90% of the region’s population. Disruptions to urban electricity and water supplies will exacerbate these health problems. (Melillo et al. 2014)

In Utah, the average temperature from approximately 1997 to 2007 was higher than observed during any comparable period of the past century and was roughly 2 degrees Fahrenheit higher than the 100-year average. Utah is projected to warm more than the average for the entire planet and more than the coastal regions of the contiguous United States. The expected consequences of this warming are fewer frost days, longer growing seasons, and more heat waves. Ongoing GHG emissions at or above current levels would likely result in a decline in Utah’s mountain snowpack and in the threat of severe, prolonged, episodic drought (Blue Ribbon Advisory Council 2007).

Carbon dioxide (CO_2) is the primary GHG emitted through human activities that contributes to climate change (82% of total United States GHG emissions in 2012); it is followed by methane (9% of total 2012 emissions), nitrous oxide (6% of total 2012 emissions), and fluorinated gases (3% of total 2012 emissions) (EPA 2014b). The main human activity emitting CO_2 is the combustion of fossil fuels (coal, natural gas, and oil) for energy and transportation (EPA 2014c).

Electricity use, transportation, and residential/commercial/industrial fossil fuel combustion are Utah's principal GHG emission sources. The combustion of fossil fuels (natural gas, oil products, and coal) for electricity generation used in-state and for transportation accounted for 61% of Utah's gross 2005 GHG emissions (Center for Climate Strategies 2007).

3.3.2. Environmental Consequences

The analysis area for assessing effects to air quality and climate change is Millard and Beaver Counties. This area was chosen because it is a typical spatial boundary used to determine compliance with the NAAQS established in the Clean Air Act. A county is often selected to be the geographic area evaluated or designated as meeting or not meeting NAAQS (see section 3.3.1.1.). Impacts to air quality were analyzed with the following indicators:

- Potential for air quality impacts from fugitive dust
- Potential for air quality impacts from vehicle and heavy equipment emissions
- Potential for air quality impacts from well drilling and testing

3.3.2.1. PROPOSED ACTION

Air Quality Standards and Current Conditions

Before construction, Enel would file a notice of intent with the DAQ to obtain a permit (approval order) for the proposed geothermal operations. Enel would be required to adhere to all air quality standards set forth in the approval order. The approval order would also ensure that the analysis area would remain in attainment with NAAQS.

Under the Proposed Action, emissions would consist of fugitive dust from surface disturbance during construction and operations, combustion emissions from the use of vehicles and heavy equipment during construction and operations, and hydrogen sulfide (H_2S) and other emissions during well drilling and testing.

FUGITIVE DUST EMISSIONS

Emissions from surface disturbance during construction activities would consist of fugitive dust. Fugitive dust is defined as any PM that is generated or emitted from open air operations and does not pass through a stack or vent. Fugitive dust emissions would be generated from clearing, excavating, earth-moving, and grading activities associated with project construction and drilling, and with vehicle travel on dirt roads associated with construction and operations. Fugitive dust would be generated from a maximum of 139.74 acres of surface disturbance (depending on the transmission line option chosen), which is 7.7% of the 1,805.06-acre project area and 0.002% of the analysis area (Millard County is approximately 6,818 square miles or 4,363,520 acres in size; Beaver County is approximately 2,586 square miles or 1,655,040 acres in size) (Pioneer: Utah's Online Library 2014).

Fugitive dust emissions from construction and drilling activities would have short-term adverse effects to local air quality and would temporarily reduce visibility in and near the project area. These effects would

end at the completion of construction. Operations, maintenance, and interim reclamation activities could also create localized fugitive dust on a sporadic basis. The use of fugitive dust control methods such as the surface application of water on access roads and well pads would reduce emissions, and the reseeding of disturbed areas where possible would minimize long-term fugitive dust emissions. In addition, the Proposed Action would need to obtain an approval order from the DAQ, which would likely require Enel to minimize fugitive dust and adhere to a fugitive dust emission limitation. Therefore, PM emissions from the project are expected to be within NAAQS standards.

COMBUSTION EMISSIONS

Combustion emissions would result from construction equipment and vehicles (including drill rigs), as well as from power plant equipment such as turbine generator sets, the black start generator, and the fire pump (if needed). Equipment and vehicles would emit pollutants through fuel combustion. These pollutants would include criteria pollutants such as nitrous oxides, carbon monoxide, sulfur oxides, PM, CO_2, and HAPs such as benzene, xylene, and acetaldehyde.

Drill rigs for drilling geothermal wells would contain large bore diesel-powered engines. A maximum emissions scenario for large bore, stationary diesel engines based on estimated maximum daily fuel consumption at well pads was provided in the 2012 EA and is summarized in Table 3.2.

Table 3.2. Maximum Estimated Emissions from Large Bore Diesel Engines

Pollutant	Hourly (pounds/hour)	24-Hour (pounds/day)
Carbon monoxide	4.83	116.47
Nitrous oxides	18.27	438.49
PM_{10}	0.33	7.85
Sulfur oxides (as sulfur dioxide)	0.12	2.77
CO_2	942.08	22,609.95
Total organic compounds (as methane)	0.51	12.33

Source: BLM (2012a).

Emissions from the drill rig engines are expected to be lower than those presented in Table 3.2 because of variables in engine operating parameters (drilling operations and engine use are highly variable over 24-hour periods) (BLM 2012a). It is also unlikely that maximum daily fuel consumption would be consistently reached. Emissions from drill rigs would be localized and would have short-term adverse effects on local air quality that would end at the completion of drilling activities and would not affect most of the analysis area. The quality of air in and near the project area would be temporarily reduced by these emissions. Combustion emissions from other construction equipment and vehicles would also be localized and short term.

Emissions from power plant equipment would be permitted by the DAQ through an approval order, and therefore would not exceed NAAQS. The permit would likely establish limits on fuel consumption, generator engine operation, and the sulfur content of any fuel oil or diesel burned, and it would require recordkeeping. No emissions (e.g., HAPs such as pentane) are expected from the closed-loop system of the geothermal power plant because it is self-contained. However, minimal fugitive HAP emissions could occur during maintenance of the closed-loop system. In addition, negligible amounts of pentane could be unintentionally released to the atmosphere from faulty valve packing, flanges, or seals.

Cove Fort I's approval order provides its potential emissions of criteria and HAP pollutants. The power plant at Cove Fort I has a 20-MW net power output (BLM 2012a). Assuming that Cove Fort II would have similar emissions to Cove Fort I (based on its comparable design and estimated 20- to 22-MW net power output), changes to annual emissions in Millard and Beaver Counties can be estimated. Table 3.3 shows the estimated percentage increase to each county's 2011 emissions (see Table 3.1) from the Proposed Action.

Table 3.3. Estimated Percentage Increase to 2011 County Emissions from the Proposed Action (based on the Cove Fort I Potential to Emit)

Pollutant	Estimated Cove Fort II Potential to Emit (tons per year)*	Percentage Increase to 2011 County Emissions†	
		Millard County	Beaver County
Carbon monoxide	0.67	0.002	0.005
Nitrous oxides	5.53	0.017	0.266
PM_{10}	0.24	0.003	0.009
$PM_{2.5}$	0.11	0.006	0.025
Sulfur oxides	0.24	0.005	0.318
Volatile organic compounds	61.38	0.118	0.232
HAPs	0.20	0.095	20.0

* Data from DAQ (2013).

† Data in each county column assume that all emissions occur in that county only, which is unlikely. The percentage increase is therefore a conservative estimate.

Based on Table 3.3, total annual criteria pollutant and HAP emissions in either county would increase less than 0.4% with the addition of the new geothermal power plant, with the exception of HAP emissions for Beaver County, which would increase 20% (because Beaver County did not report any HAP emissions in 2011).

HYDROGEN SULFIDE AND OTHER EMISSIONS

Depending on the chemical composition of the geothermal resource, H_2S emissions could occur during well testing. If a well encounters a producible resource, H_2S could be released from the well during drilling, and vented with steam and non-condensable gases during flow testing. H_2S is known for its pungent odor and is extremely flammable and highly toxic (Occupational Safety & Health Administration 2015). Although there is no NAAQS standard for H_2S, when it is released to the atmosphere, it changes to sulfur dioxide (which is regulated under NAAQS).

Emissions of H_2S would be minimized through the use of properly weighted drilling mud, which should keep the well from flowing during drilling. Any H_2S entrained in the drilling mud would be returned with the drilling cuttings to the solid separation process and would likely be neutralized by the high pH of the system (BLM 2012a). H_2S data collection devices would be installed and operated during all phases of geothermal well drilling and testing. An H_2S abatement plan would be developed and implemented for long-term flow testing if H_2S abatement becomes necessary.

Based on the planned monitoring and abatement, H_2S emissions would be minimal during well drilling and testing. H_2S emissions would not occur during operations because of the closed binary system and the re-injection of geothermal fluids into the reservoir, which prevents air contact. No H_2S emissions would occur during decommissioning because the wells would be shut-in and plugged.

Other potential emissions during drilling could occur through releases of non-condensable gases during a loss of well control. Blow-out protection equipment would be installed on well heads during drilling operations to prevent such releases. Drill rigs would be equipped with alarms to detect unsafe levels of non-condensable gases. Based on the geothermal fluid chemistry in the Cove Fort I area, temporary releases of such gases in the Cove Fort II project area would not be expected to violate NAAQS.

Climate Change

Under the Proposed Action, no GHG emissions would occur from geothermal fluids because of the plant's closed-loop system (geothermal fluids would not be exposed to the atmosphere). Combustion emissions from construction and power plant equipment engines, as well as vehicle engines, would include GHGs such as CO_2, nitrous oxides, and methane. Emissions of steam from well testing would also include GHGs, primarily CO_2.

The term carbon dioxide equivalent (CO_2e) is used to describe different GHGs in a common unit. For any quantity and type of GHG, CO_2e represents the amount of CO_2 that would have the equivalent global warming impact (Brander 2012). Cove Fort I's approval order indicates that the plant's potential GHG emissions are 632 tons per year CO_2e. The Proposed Action's geothermal power plant would be expected to have similar CO_2e emissions based on its similar plant design and power output.

Table 4.2 of the 2012 EA compares geothermal power plant CO_2 emissions with CO_2 emissions from coal, petroleum, and natural gas power plants. The table indicates that natural gas power plants have 6.6 times more CO_2 emissions, petroleum power plants have 9.8 times more CO_2 emissions, and coal power plants have 10.5 times more CO_2 emissions than geothermal power plants. Based on these data, GHG emissions from the Proposed Action would likely be offset by the reduction in GHG emissions from the use of geothermal fluids rather than fossil fuels for power generation.

3.3.2.2. NO ACTION ALTERNATIVE

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed Cove Fort II disturbances would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed. If lease development occurs, associated impacts to air quality could occur that are similar to or greater than the Proposed Action. Current air pollutant and GHG emissions from nearby sources (e.g., Cove Fort I) would continue. No new emissions would occur in the project area from the Proposed Action.

3.4. Geology and Soils

3.4.1. Affected Environment

3.4.1.1. GEOLOGY

The geology of the Cove Fort and Sulphurdale area has been described in many reports (e.g., Ross and Moore 1985; Mabey and Budding 1987; Barker et al. 2002; Blackett et al. 2004; Kirby 2012; Rowley et al. 2013). In general, all authors agree that the area has been the site of repeated structural, intrusive, volcanic, and hydrothermal activity. Two major structural events have occurred in the area, the Sevier orogeny and basin and range extension. The Sevier orogeny was a massive mountain-building event that resulted in a series of folds, reverse faults, and thrust faults in the area. The basin and range extension event occurred after the Sevier orogeny and formed north-striking, normal faults that produced present-day topography west of the Tushar Mountains. Several of these basin and range extension faults are

present in the project area (Figure 3.1). At the surface, the trends of these faults are identified by local alignments of sulfur deposits, acid-altered alluvium, and gas seeps (Barker et al. 2002; Blackett et al. 2004). Between those two events was an episode of magmatism in which molten rock was released at the surface from deep in the Earth's mantle resulting in the placement of intrusive and extrusive volcanic rocks and tuffs throughout the area (Mabey and Budding 1987; Ross and Moore 1985; see Figure 3.1).

In more recent geologic history, low-permeability layers of colluvium and gravity-slide blocks shed from the northwest flank of the Tushar Mountains have capped portions of the geothermal system in the project area (Barker et al. 2002; Kirby 2012). Pre-volcanic basement rocks consist mainly of Paleozoic to Mesozoic limestones and sandstones that are exposed in a northeast-trending belt north of Cove Creek. At depth, these rocks host the modern geothermal system throughout the area, although carbonate units dominate the section (Barker et al. 2002). Recent volcanism—between 0.3 million and 1 million years ago— has been suggested as the heat source of the project area's geothermal resource (Ross and Moore 1985; Rowley et al. 2013).

Rowley et al. (2013) report that some of the most intense earthquake activity within the Intermountain Seismic Belt occurs where the Cove Fort transverse zone crosses the main range-front fault zone of the Tushar Mountains. This is corroborated by Mabey and Budding (1987), who note that the Cove Fort area has the highest instances of earthquake activity of any geothermal system in Utah, and that a concentration of epicenters has been located in and around the Cove Fort area. Mabey and Budding (1987) also note that previous studies of the Cove Fort geothermal area revealed that most monitored seismic events had focal depths of less than 5 kilometers, with the shallowest events clustered northeast of Cove Fort and the deeper events located farther north in the area of Dog Valley.

Based on a review of available reports, it seems clear that the project area is in an area that is both historically and presently seismically active.

3.4.1.2. SOILS

Soils data used for the project area are from the State Soil Geographic Dataset (Natural Resources Conservation Service 2015). The principle soil type found in the project area is the Ushar-Mosida-Etta soil complex. The general soil types encountered at the project area are as follows (in order of most common to least common):

- Ushar-Mosida-Etta complex: very deep, well-drained loamy soils that are hard, friable (i.e., crumbly), slightly plastic (i.e., have approximately 20%–35% clay), and calcareous (i.e., have a high pH and presence of calcium carbonate).
- Tatiyee-Rock Outcrop-Nielsen Family-Golsum-Condie complex: fine sandy loams with a weak medium granular structure that are soft, porous, and slightly effervescent.
- Ushar-Pharo-Mill Hollow complex: very cobbly or gravelly loams with fine and very-fine granular structures that are soft and friable, with many very-fine and fine roots.

Soil erosion potential in the project area is slight to moderate, depending on slope, but the overall weighted erosion potential for the project area is moderate (whole soil k-factor is 0.37 from a scale of 0.02–0.69). Slopes in the project area are generally shallow, and range between 0% and 20%. However, some areas of steeper slopes (i.e., greater than 40%) are also present throughout the project area, with the steepest slopes occurring near the southeast boundaries of the project area.

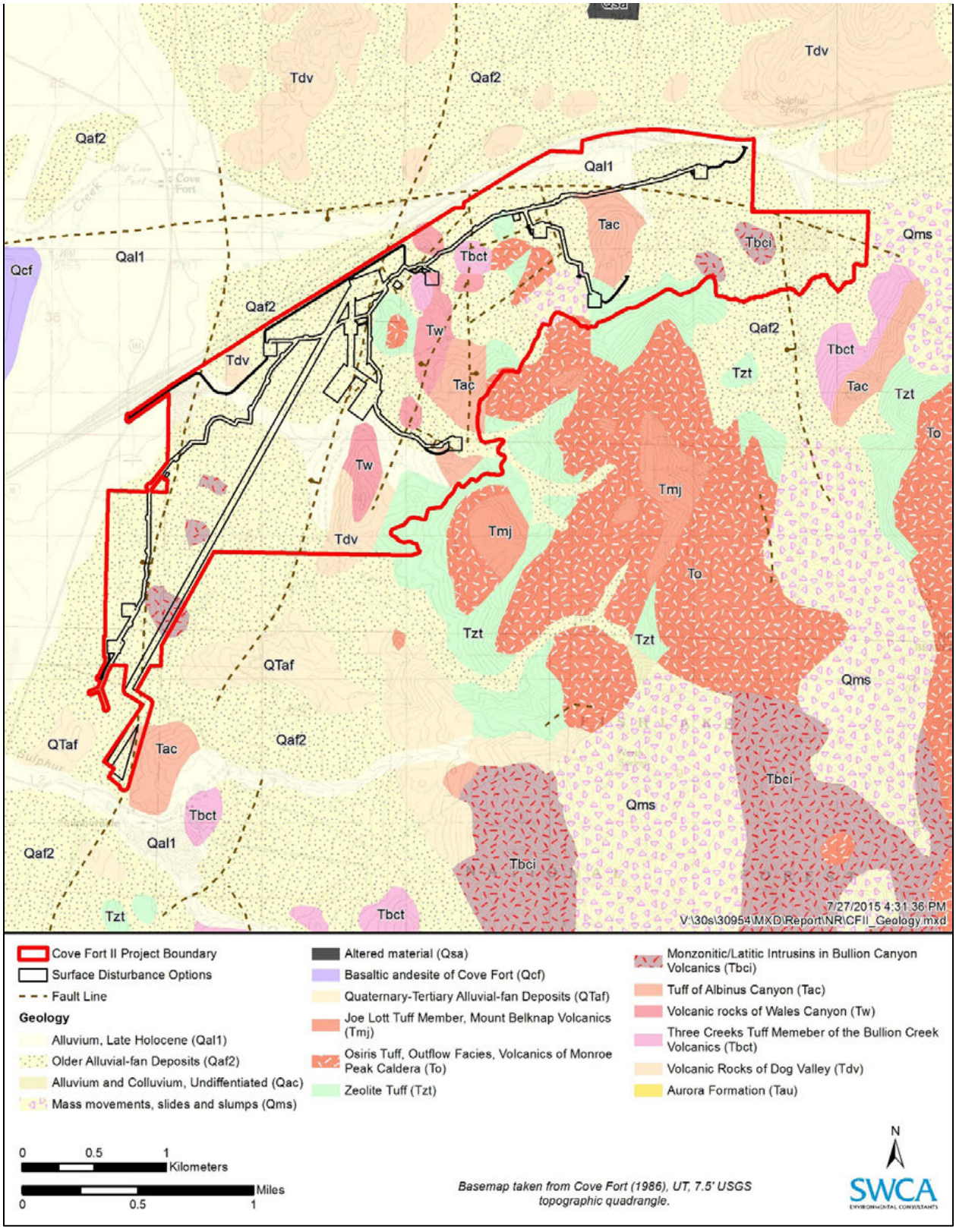

Figure 3.1. Bedrock geology in and around the project area. Sources: Ross and Moore (1985) and Hintze et al. (2003).

3.4.2. Environmental Consequences

The analysis area for geology and soils is the Bear Canyon and Sulphur Creek subwatersheds, because the project area falls within both subwatersheds and they provide clear topographical boundaries against which to measure impacts to geology and soils. Impacts to geology and soils were analyzed with the following indicators:

- Geology
  - Potential to increase seismic activity
- Soils
  - Acres of permanent and temporary impact
  - Potential change in soil functions, structure, and stability
  - Potential to increase sediment loads in receiving waters

3.4.2.1. PROPOSED ACTION

Geology and Soils

GEOLOGY

Geothermal operations usually take place in areas that are tectonically active, and seismic events typically take place in areas with high levels of tectonic activity, such as volcanic regions and fault zones. Some geothermal projects can cause induced seismicity because of changes in reservoir pore pressure due to production (removal) or re-injection of geothermal fluids. Injection-induced seismicity is associated with changes in stress or fluid pressure in the Earth's crust, which can accompany withdrawal or injection of fluids during geothermal operations (Cladouhos et al. 2010). Several factors affect whether injected fluids will induce seismicity, including the permeability of the strata surrounding the injection well, the injection pressure, and the distance between a fault and an injection well (Association of American State Geologists 2015).

The potential for the Proposed Action to increase seismic activity would be minimal for several reasons. First, the reservoir permeability at Cove Fort is such that all injection wells currently operate with no wellhead pressure (Smith 2015). Second, the planned injection wells are anticipated to be on a vacuum as well, meaning the geothermal fluid would be re-injected freely into the geothermal reservoir with no pressure (Enel 2015). Third, most seismic focal depths occur at approximately 3.0 miles, production wells would extend to depths of 0.7 mile, and re-injection wells would extend to depths of 1.1 miles (Enel 2015). Because both production and injection well depths would be much shallower than seismic focal depths, project activities are not expected to induce seismic activity. For the reasons listed above, the likelihood of increasing seismic activity is expected to be minimal.

SOILS

Direct impacts to soils would include changes in soil functions due to soil exposure from vegetation removal, mixing of soil horizons, potential loss of topsoil productivity, soil compaction, and increased susceptibility to wind and water erosion. Use of equipment for mechanical treatment of vegetation may compact soils, which would reduce soil infiltration rates, leading to increases in overland flow of water, erosion, and displacement of soil. Overall, the potential for successful reclamation is high in the project area, and there would not be a long-term loss of soil or soil fertility at the disturbed sites.

Each well pad would be stripped of vegetation and topsoil as part of construction, leading to localized increases in erosion potential. Most erosion in the project area would occur on steeper cut-and-fill slopes

and in areas where runoff is concentrated, such as within roadway ditches. However, these impacts would be reduced by rehabilitating disturbed lands and recontouring. Removed topsoil would be stockpiled for reclamation. Additional erosion mitigation measures would include reseeding and stabilizing unstable slopes, cut-and-fill areas, stockpiles, and other disturbances. Once production is established, well pads would be reduced in size, and this interim reclamation would restore part of the disturbed lands to natural conditions, to the extent practicable, with ongoing operations.

The loosening of earthen material and the removal of soil and vegetation would contribute sediment and total dissolved solids to the watershed. Most sediment eroded from the project area would be transported by surface runoff from precipitation, which includes winter snowfalls and summer storms. Threat of erosion from snowfall is low because snowfall is low in energy and does not rapidly create overland flow. Thunderstorms would be more likely to produce high energy (i.e., erosive) runoff, but these storms are infrequent in the project area. However, any increase in sediment load or total dissolved solids is anticipated to be relatively minor and localized due to mitigation measures, interim and final reclamation, and implementation of the SWPPP.

The potential for increased erosion and sedimentation would be greatest in the short term immediately after construction, when the disturbed soils are loose, and it would decline over time in areas where reclamation is implemented, and in other areas as natural stabilization occurs.

All transmission line options have identical permanent surface disturbance acreages for the following: access roads, MCC site, plant site, relief pond, and well pad (Table 3.4). In addition, all transmission line options would have the same 13.8 acres of soil disturbance for the pipeline gathering system (temporary disturbance). This area of disturbance would only be used for pipeline construction and would subsequently be reclaimed. Therefore, there are 92.0 acres of disturbance common to all transmission line options.

Table 3.4. Soil Disturbance Acreages Common to all Transmission Line Options

Disturbance Type	Acres of Disturbance	Permanent or Temporary
Access roads (30-foot corridor)	16.5	Permanent
Gathering system (permanent disturbance)	34.3	Permanent
Gathering system (temporary disturbance)	13.8	Temporary
MCC site	0.5	Permanent
Plant site	8.1	Permanent
Relief pond	0.2	Permanent
Well pad	18.6	Permanent
Total	**92.0**	

Option A

Option A would result in the disturbance of approximately 137.2 acres of soil from construction and operation activities and from vegetation treatment, as described in the Geothermal Utilization Plan. Of these 137.2 acres, 82.7 acres would be permanent, and 54.5 acres would be temporary.

Option B

Option B would result in the disturbance of approximately 134.7 acres of soil. Of these 134.7 acres, 82.4 acres would be permanent, and 52.3 acres would be temporary.

Option C

Option C would result in the disturbance of approximately 105.4 acres of soil. Of these 105.4 acres, 85.4 acres would be permanent, and 19.9 acres would be temporary.

Option D

Option D would result in the disturbance of approximately 104.1 acres. Of these 104.1 acres, 86.0 acres would be permanent disturbances, and 18.1 acres would be temporary disturbances.

3.4.2.2. NO ACTION ALTERNATIVE

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed Cove Fort II disturbances would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed. If lease development occurs, associated impacts to geology and soil resources could occur that are similar to or greater than the Proposed Action. Current geologic and soil conditions and classifications would persist. Potential seismic activity would continue as in the past. No impacts to soils such as compaction and topsoil disturbance would occur in the project area from the Proposed Action.

3.5. Water Resources

3.5.1. Affected Environment

3.5.1.1. SURFACE WATER

The project area is in the Cove Creek Watershed (Hydrologic Unit Code [HUC] 1603000705) and is divided by the Sulphur Creek subwatershed (HUC 160300070501) to the southwest and the Bear Canyon subwatershed (HUC 160300070502) to the northeast (Figure 3.2).

According to the National Hydrography Dataset (NHD), Cove Creek is the only perennial stream in the project area, located near the project area's eastern and northeastern boundaries (see Figure 3.2). Cove Creek intersects the project area for a total of 1.8 miles. NHD data identify Cove Creek as becoming primarily ephemeral after exiting the project area (see Figure 3.2), but Davis (2005) describes Cove Creek as being entirely ephemeral.

There are an additional 9.2 miles of intermittent streams in the project area. NHD data also identify one 0.3-acre pond and one spring or seep in the project area, although there are several more ponds and springs in adjacent areas (see Figure 3.2). These springs are used for livestock and wildlife purposes. Small pipelines connect two livestock watering troughs to the springs to the south of the project area.

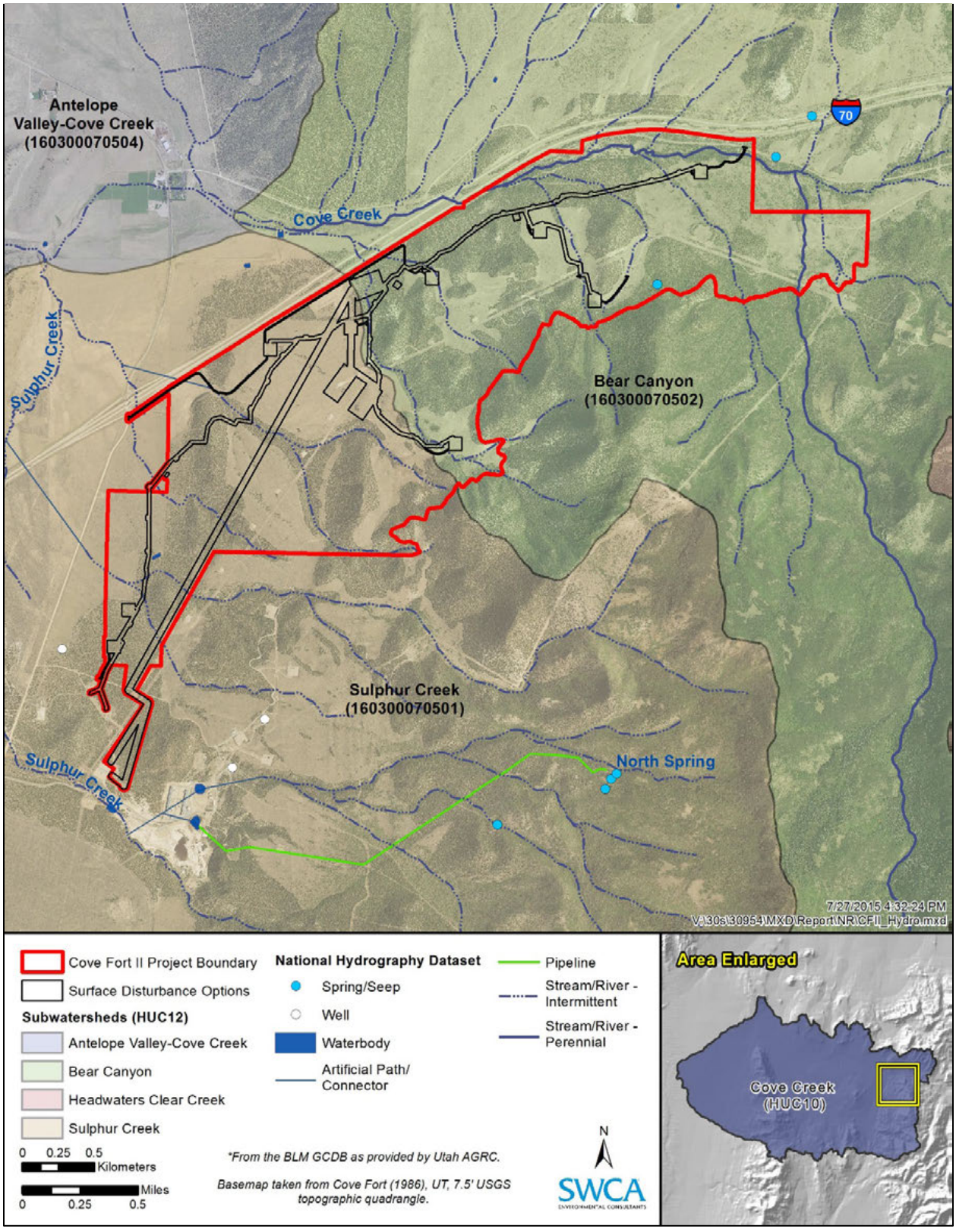

Figure 3.2. Hydrographic features in and around the project area.

3.5.1.2. GROUNDWATER

Deep drilling has shown that the thermal water table occurs at a depth of approximately 1,200 feet at the Cove Fort-Sulphurdale geothermal area (Barker et al. 2002). During the drilling of these geothermal wells, no overlying aquifers were encountered; however, cold springs discharge to the east, and perched aquifers are found to the west of the Cove Fort-Sulphurdale geothermal area (Barker et al. 2002; Bloomfield et al. 2001). In a regional groundwater report by Kirby (2012), Kirby suggests that perennial flows in Cove Creek would require shallow, near-surface, groundwater levels. Therefore, based on available information, it is unknown if a shallow aquifer is present beneath the project area. Lacking detailed information about the groundwater resources in the project area, the following discussion is presented to provide regional information about the groundwater resources in the Cove Fort area.

In the Cove Fort area, the non-geothermal aquifer consists of permeable basin-fill deposits and interbedded volcanics (Kirby 2012). These lowland (i.e., valley) aquifers in the Cove Fort area are bounded by mountain ranges consisting of relatively impermeable tertiary volcanic and intrusive rocks and bedrock (Kirby 2012). Sand and gravel beds within these basin-fill deposits are the primary aquifers, and are thicker and coarser near the mountains, but become thinner and finer grained under the central and western parts of the valley (Davis 2005). In lower parts of the valley, the aquifers are overlain by confining silt and clay beds, which produce artesian conditions; however, most of the non-geothermal aquifer in the Cove Fort area is unconfined (Kirby 2012).

In areas outside of the Cove Fort geothermal area, a drill hole to a depth of 750 feet may encounter three to as many as 12 water-saturated beds of sand and gravel that hydraulically act as one aquifer (Davis 2005). However, it appears that the potable groundwater aquifer and the geothermal aquifer do not strongly interact in the Cove Fort area (Kirby 2012). Groundwater movement is generally westward, away from the recharge areas in the mountains.

Non-geothermal groundwater quality is good in the Cove Fort area, with total dissolved solids (TDS) concentrations of less than 1,000 milligrams per liter; however, the quality becomes lower near geothermal systems (i.e., groundwater TDS concentrations can increase an order of magnitude near geothermal systems; Kirby 2012). Varying amounts of surface recharge and deeper inflow associated with the geothermal systems near Cove Fort likely control the chemical composition and temperature of groundwater in the principal aquifer (Kirby 2012). Kirby (2012) also notes that the regional water budget is largely unaffected by current rates of consumptive-use pumping and is instead likely driven by changes in recharge and discharge due to climatic flux.

3.5.2. Environmental Consequences

The analysis area for water resources is the two HUC12 subwatersheds that intersect the project area (Bear Canyon and Sulphur Creek). This analysis area was chosen because these subwatersheds represent a hydrologic system boundary for all surface water in the project area. This analysis area is also extensive enough to capture potential impacts to groundwater resources, which are much more heterogeneous in spatial extent than surface water resources. Impacts to water resources were analyzed with the following indicators:

- Surface water
  - Potential for surface water impacts from increased stormwater runoff
  - Potential for surface water contamination from releases of produced fluids (geothermal waters and drilling fluids) or spills of hazardous materials

- Groundwater
  - Potential for groundwater impacts from releases of produced fluids (geothermal waters and drilling fluids) or spills of hazardous materials
  - Potential groundwater depletion due to water use

3.5.2.1. PROPOSED ACTION

Surface Water

Stormwater runoff would likely increase slightly due to vegetation removal and soil compaction during excavation for facilities, road construction, and well pad construction. However, the SWPPP, engineering controls, interim reclamation, and final soil stabilization practices described in the Geothermal Utilization Plan would mitigate this impact. Therefore, stormwater runoff would not increase enough to be considered a significant impact to surface waters.

To prevent excess sediment from discharging to surface waters in the analysis area, a SWPPP and associated notice of intent would be filed with the Utah Division of Water Quality for all well pads and access roads associated with the project. The potential for excess sediment runoff from well pads to surface waters would be minimized because erosion control measures such as silt fencing, diversion ditches, water bars, temporary mulching and seeding, and application of gravel or riprap would be installed where necessary immediately after completion of construction activities to avoid erosion and runoff. The reserve pits, access roads, and portions of the well pads that are not needed for operations or operational facilities would be reclaimed as part of interim reclamation. Further prevention of sediment discharge to surface waters would be achieved with final soil stabilization. Therefore, potential surface water impacts due to excess sediment are expected to be minimal and localized to the project area. Effects to surface waters would not occur in areas upgradient of the project area.

The potential for surface water contamination from produced fluids generated at well sites would be minimized because releases of produced fluids would drain to the reserve pit deep enough to contain all produced fluids plus 2 feet of freeboard. Any excess produced fluids would be trucked to the Cove Fort I injection field for disposal, as described in the Geothermal Utilization Plan.

The potential for surface water contamination from accidental spills of hazardous materials would be mitigated by containment berms that would be constructed around any hazardous material storage areas. These berms are designed to contain the full volume of stored hazardous materials, including a safety factor, thereby preventing surface water contamination from accidental spills. Additionally, the fuel tank at each well pad would be surrounded by an earthen berm with an impermeable liner to contain accidental spills, and a spill prevention countermeasure control plan (SPCC) would be created and followed to ensure proper response and mitigation of any fuel spills.

Groundwater

The potential for groundwater impacts due to releases of produced fluids generated at well sites would be mitigated because releases of produced fluids would discharge to a reserve pit that would be lined with bentonite or with a 12-mil minimum thickness, nylon reinforced plastic liner material that would prevent seepage to groundwater. Also, as described in the Geothermal Utilization Plan, a grouting and casing program for construction of all wells would be implemented to prevent degradation of groundwater quality during and after well drilling. Surface and other casings would be set with cement to prevent migration of produced fluids and contamination of any non-geothermal aquifers penetrated by the borehole, as well as to isolate any potential zones (water, oil, gas, etc.) other than the geothermal resource.

The potential for groundwater impacts due to accidental spills of hazardous materials would be mitigated by preparation and adherence of a SPCC. The SPCC would ensure that impacts to groundwater from accidental spills of hazardous materials are properly responded to and mitigated for. In addition, the fuel tank at each well pad would be surrounded by an earthen berm with an impermeable liner to contain accidental spills and to prevent seepage to groundwater.

The potential for groundwater depletion due to water use for construction and facility operations is zero. Water needed during construction for dust control, road repairs, and well drilling would be trucked in from metered sales points within the local water district, or it would be obtained from authorized water diversions where associated water rights are held by Enel, as described in the Geothermal Utilization Plan. Water needed for facility operations (e.g., toilets) would be provided from the fire system water supply that comes from diversions mentioned above or would be trucked in. Drinking water would be provided in bottles by a local vendor.

The potential for groundwater depletion due to flow testing would be minimal. Flow testing would consist of extracting geothermal fluids from each well using pump rates of 700, 900, and 1,100 gallons per minute for 3 days each. Therefore, an estimated 11 million gallons of geothermal fluid may be withdrawn per well, totaling 70 million gallons (215 acre-feet) for all six exploration wells. Overall, the use of up to 215 acre-feet of water for testing would remove only a small amount compared with the likely overall geothermal reservoir, which is one of the largest thermal anomalies in the western United States, extending approximately 18 square miles (Rowley et al. 2013).

The potential for groundwater depletion due to energy production would be minimal. The production wells are estimated to provide approximately 14,000 gallons per minute total flow to the facility, which would then be 100% re-injected into a group of injection wells into the geothermal aquifer. The only time in which 100% of the geothermal fluids would not be re-injected, would be in the event of an over-pressurization or maintenance activities that require the power plant to be shut down. In this event, a bypass pond located at the power plant would be used.

Decommissioning of the project would involve the plugging of all wells, removal of the project components, and full reclamation of well pads and access roads to return the land to a condition approximate or equal to that which existed before the disturbance. Cessation of groundwater withdrawal and injection would return the geothermal reservoir to a condition approximate or equal to that which existed before the proposed operation. No irreversible or long-term effects to water resources would occur.

Transmission Line Options

OPTION A

There are no significant differences in surface water resources disturbances for Transmission Line Option A and other transmission line options.

OPTION B

There are no significant differences in water resources disturbances for Transmission Line Option B and other transmission line options.

OPTION C

There are no significant differences in water resources disturbances for Transmission Line Option C and other transmission line options.

OPTION D

There are no significant differences in water resources disturbances for Transmission Line Option D and other transmission line options.

3.5.2.2. NO ACTION ALTERNATIVE

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed Cove Fort II disturbances would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed. If lease development occurs, associated impacts to water resources could occur that are similar to or greater than the Proposed Action. Current hydrologic patterns, groundwater quality, and stormwater sediment discharges would continue. No effects to hydrologic or water quality would occur in the project area from the Proposed Action.

3.6. Vegetation

3.6.1. Affected Environment

The analysis area for vegetation is the Bear Canyon and Sulphur Creek subwatersheds, because the project area falls within both subwatersheds and they provide clear topographical boundaries against which to measure impacts to vegetation. There are 26 land cover types in the vegetation analysis area (see Table 3.5). The most prevalent Southwest Regional Gap Analysis Project (SWReGAP) land cover type in the vegetation analysis area is Colorado Plateau Pinyon-Juniper Woodland, which covers 18,015.8 acres or 41.8% of the analysis area. Other prevalent land cover types in the vegetation analysis area include Rocky Mountain Gambel Oak-Mixed Montane Shrubland (7,654.6 acres or 17.8%), Recently Chained Pinyon-Juniper Areas (4,331.9 acres or 10.0%), and Inter-Mountain Basins Big Sagebrush Shrubland (3,995.4 acres or 9.3%). Table 3.5 displays the acres of each land cover type in the vegetation analysis area, and Figure 3.3 shows the locations of these land cover types within the analysis area.

Table 3.5. Land Cover Types in Vegetation Analysis Area

SWReGAP Land Cover Types	Acres in Analysis Area	% of Analysis Area
Agriculture	1,470.3	3.4%
Colorado Plateau Mixed Low Sagebrush Shrubland	1.3	0.003%
Colorado Plateau Pinyon-Juniper Woodland	18,015.8	41.8%
Developed, Medium – High Intensity	557.3	1.3%
Developed, Open Space – Low Intensity	301.8	0.7%
Inter-Mountain Basins Big Sagebrush Shrubland	3,995.4	9.3%
Inter-Mountain Basins Cliff and Canyon	1.1	0.003%
Inter-Mountain Basins Montane Sagebrush Steppe	680.0	1.6%
Inter-Mountain Basins Mountain Mahogany Woodland and Shrubland	875.1	2.0%
Inter-Mountain Basins Semi-Desert Shrub Steppe	163.1	0.4%
Inter-Mountain West Aspen-Mixed Conifer Forest and Woodland Complex	1,163.3	2.7%
Invasive Annual Grassland	31.3	0.07%
Invasive Perennial Grassland	1.1	0.003%

Table 3.5. Land Cover Types in Vegetation Analysis Area

SWReGAP Land Cover Types	Acres in Analysis Area	% of Analysis Area
Recently Chained Pinyon-Juniper Areas	4,331.9	10.0%
Rocky Mountain Alpine-Montane Wet Meadow	14.7	0.03%
Rocky Mountain Aspen Forest and Woodland	648.5	1.5%
Rocky Mountain Bigtooth Maple Ravine Woodland	2.9	0.007%
Rocky Mountain Cliff and Canyon	258.8	0.6%
Rocky Mountain Gambel Oak-Mixed Montane Shrubland	7,654.6	17.8%
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	339.6	0.8%
Rocky Mountain Montane Dry-Mesic Mixed Conifer Forest and Woodland	1,040.0	2.4%
Rocky Mountain Montane Mesic Mixed Conifer Forest and Woodland	551.7	1.3%
Rocky Mountain Ponderosa Pine Woodland	106.5	0.2%
Rocky Mountain Subalpine Dry-Mesic Spruce-Fir Forest and Woodland	601.7	1.4%
Rocky Mountain Subalpine Mesic Spruce-Fir Forest and Woodland	237.4	0.6%
Southern Rocky Mountain Montane-Subalpine Grassland	61.6	0.1%
Total	**43,106.6**	**100%**

Source: SWReGAP (2001).

Three known special status plant species (e.g., threatened, endangered, and candidate species) have the potential to occur in the project area: Frisco clover (*Trifolium friscanum*), Frisco buckwheat (*Eriogonum soredium*), and Ostler's peppergrass (*Lepidium ostleri*) (see SWCA 2014b, 2015b). All three are candidates for listing under the ESA. Frisco clover is found in Millard and Beaver Counties on volcanic soils at a total of five sites statewide. All known sites are approximately 40–55 miles from the project area. It is very unlikely this species occurs in the project area because there are no volcanic soils and no known occurrences. Frisco buckwheat is known from the San Francisco Mountains in north-central Beaver County, and it is a narrow endemic restricted to soils derived from Ordovician limestone outcrops. It is unlikely this species occurs in the project area because there are no limestone outcrops and no known occurrences. Like Frisco buckwheat, Ostler's peppergrass is a narrow endemic restricted to soils derived from Ordovician limestone outcrops. It is very unlikely this species occurs in the extended area because there are no limestone outcrops and no known occurrences.

The USFS reports that populations of Scotch thistle (*Onopordum acanthium*), white top (*Cardaria draba*), and bull thistle (*Cirsium vulgare*) occur in the Cove Fort and Sulphurdale areas (Swenson 2014). These species may occur or spread into the project area. Scotch thistle and white top are listed on Utah's noxious weed list.

The four most prevalent land cover types in the vegetation analysis area, and the plant species associated with them, are described in the paragraphs below.

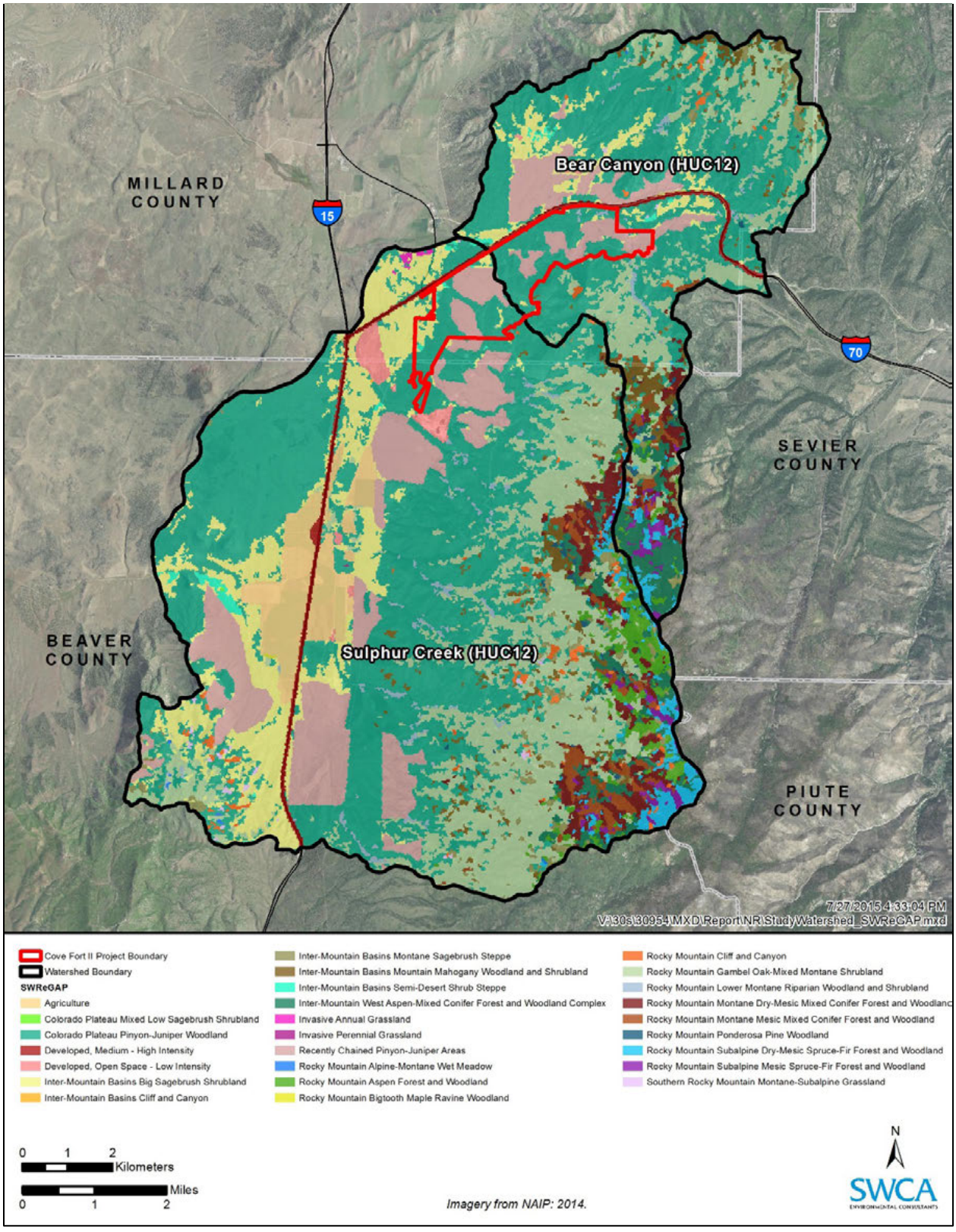

Figure 3.3. Land cover types in the vegetation analysis area.

3.6.1.1. COLORADO PLATEAU PINYON-JUNIPER WOODLAND

This land cover type is typically found at elevations ranging from approximately 4,900 to 8,000 feet. Pinyon pine (*Pinus edulis*) and/or Utah juniper (*Juniperus osteosperma*) dominate the tree canopy. Understory layers are variable and may be dominated by shrubs, graminoids, or be absent. Associated species include greenleaf manzanita (*Arctostaphylos patula*), Wyoming or basin big sagebrush (*Artemisia tridentata*), littleleaf mountain mahogany (*Cercocarpus intricatus*), alderleaf mountain mahogany (*Cercocarpus montanus*), blackbrush (*Coleogyne ramosissima*), Stansbury cliffrose (*Purshia stansburiana*), bitterbrush (*Purshia tridentata*), oak brush (*Quercus gambelii*), blue grama (*Bouteloua gracilis*), James' galleta (*Pleuraphis jamesii*), or muttongrass (*Poa fendleriana*) (SWReGAP 2001).

3.6.1.2. ROCKY MOUNTAIN GAMBEL OAK-MIXED MONTANE SHRUBLAND

This land cover type is most commonly found from approximately 6,500 to 9,500 feet in elevation, and is often situated above pinyon-juniper woodlands. The vegetation is typically dominated by oak brush alone or codominant with Saskatoon serviceberry (*Amelanchier alnifolia*), Utah serviceberry (*Amelanchier utahensis*), Wyoming or basin big sagebrush, alderleaf mountain mahogany, chokecherry (*Prunus virginiana*), Stansbury cliffrose, bitterbrush, New Mexico locust (*Robinia neomexicana*), mountain snowberry (*Symphoricarpos oreophilus*), or roundleaf snowberry (*Symphoricarpos rotundifolius*) (SWReGAP 2001). There may be inclusions of other mesic montane shrublands with oak brush absent or as a relatively minor component.

3.6.1.3. RECENTLY CHAINED PINYON-JUNIPER AREAS

This land cover type includes areas that have recently been chained to remove pinyon pine and juniper. Chaining is a mechanical treatment used to combat pinyon-juniper encroachment whereby a large chain is dragged between two pieces of heavy machinery. The chain pulls trees and other shrubs to the ground. The Recently Chained Pinyon-Juniper Areas land cover type in the vegetation analysis area has recovered post-chaining to resemble a sagebrush steppe vegetation community.

3.6.1.4. INTER-MOUNTAIN BASINS BIG SAGEBRUSH SHRUBLAND

This land cover type is typically found in broad basins between mountain ranges, plains, and foothills between 4,900 and 7,500 feet in elevation. These shrublands are dominated by Wyoming or basin big sagebrush. Scattered juniper (*Juniperus* spp.), greasewood (*Sarcobatus vermiculatus*), and saltbush (*Atriplex* spp.) may be present in some stands. Rubber rabbitbrush (*Ericameria nauseosa*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), bitterbrush, or mountain snowberry may codominate disturbed stands (SWReGAP 2001). Common graminoid species include Indian ricegrass (*Achnatherum hymenoides*), blue grama, thickspike wheatgrass (*Elymus lanceolatus*), Idaho fescue (*Festuca idahoensis*), needle and thread (*Hesperostipa comata*), basin wildrye (*Leymus cinereus*), James' galleta, western wheatgrass (*Pascopyrum smithii*), Sandberg bluegrass (*Poa secunda*), or bluebunch wheatgrass (*Pseudoroegneria spicata*) (SWReGAP 2001).

Plant species in the project area include species such as pinyon trees (*Pinus* spp.) and/or juniper trees (*Juniperus scopulorum*), large sagebrush shrubs (*Artemisia* spp.) interspersed with bunchgrasses, small poplar trees (*Populus* spp.), and Gambel oak (*Quercus gambelii*) (SWCA 2014b).

According to the NHD, Cove Creek is the only perennial stream in the project area. There are an additional 9.2 miles of intermittent streams in the project area, as well as one 0.3-acre pond and one spring or seep. The vegetation associated with these water features are not captured in the SWReGAP land cover data, except for the small patches of limited riparian land cover. The grass and forb

composition along the banks of the perennial stream and seep/spring is of hydrophilic species (SWCA 2014b).

3.6.2. Environmental Consequences

The analysis area for vegetation is the two HUC12 subwatersheds that intersect the project area (Bear Canyon and Sulphur Creek). This analysis area was chosen because the project area falls within both subwatersheds and they provide clear topographical boundaries against which to measure impacts to vegetation (see Section 3.6.1 for a complete description of the analysis area). Impacts to vegetation were analyzed with the following indicator:

- Acres of surface disturbance to specific land cover types as a percentage of total acres of each of these land cover types in the analysis area.

The potential for the spread of invasive and non-native species is addressed more qualitatively, using a 300-foot buffer around the project area that represents the area of potential impacts.

3.6.2.1. PROPOSED ACTION

Surface disturbance from drilling and construction activities associated with the Proposed Action would affect vegetation in the project area through direct removal. The land cover type that would experience the largest acreage of disturbance under all transmission line options would be Colorado Plateau Pinyon-Juniper Woodland because this is the most abundant land cover type in the project area. Other land cover types that would experience disturbance from drilling and construction activities under the Proposed Action include Inter-Mountain Basins Big Sagebrush Shrubland, Inter-Mountain Basins Semi-Desert Shrub Steppe, Recently Chained Pinyon-Juniper Areas, and Rocky Mountain Lower Montane Woodland and Shrubland. More detailed discussion of the specific acreages of land cover types affected under each transmission line option can be found in the sections below. Figure 3.4 shows the surface disturbance footprint of the project in relation to land cover types.

Indirect effects to vegetation could also occur from dust deposition from ground surfaces and equipment tailpipes as a result of vehicles driving on non-paved (dirt, gravel) roads and from construction activities. Dust deposition on leaves and other plant structures can cause plants to grow at slower rates and result in lower plant density over time. Leaf shaking by wind and leaching by rain can remove dust loads completely from plants at any time (Doley and Rossato 2010). Surface application of water to control fugitive dust would limit effects to vegetation. Expected dust deposition effects to vegetation would be restricted to the project footprint, a 300-foot buffer surrounding the project footprint, and areas adjacent to non-paved roads; although, dust deposition can vary widely depending on amounts produced and wind conditions. These effects would be short term and temporary, and would be reduced following construction activities.

Construction and drilling activities could spread existing noxious weed populations throughout areas adjacent to the access routes by seed transport in fill materials and on vehicles. Vehicles traveling on roads, both paved and non-paved, are conduits for seed dispersal. In addition, noxious weeds often prefer disturbed sites such as cleared areas for facilities construction (Hobbs and Huenneke 1992). If noxious weeds are introduced or spread, they can invade and outcompete existing vegetation.

During the life of the project and until the site is released from liability for reclamation, well pads and access roads would be inspected for noxious weeds. If found, the authorized state or federal agent would be notified, and the weeds would be treated following a program approved by the BLM and USFS to eliminate further spreading. Treatment would continue until the weeds have been eradicated. In addition, all equipment used for construction and drilling would be power washed before it arrives to the project area to remove any invasive, non-native weed seeds.

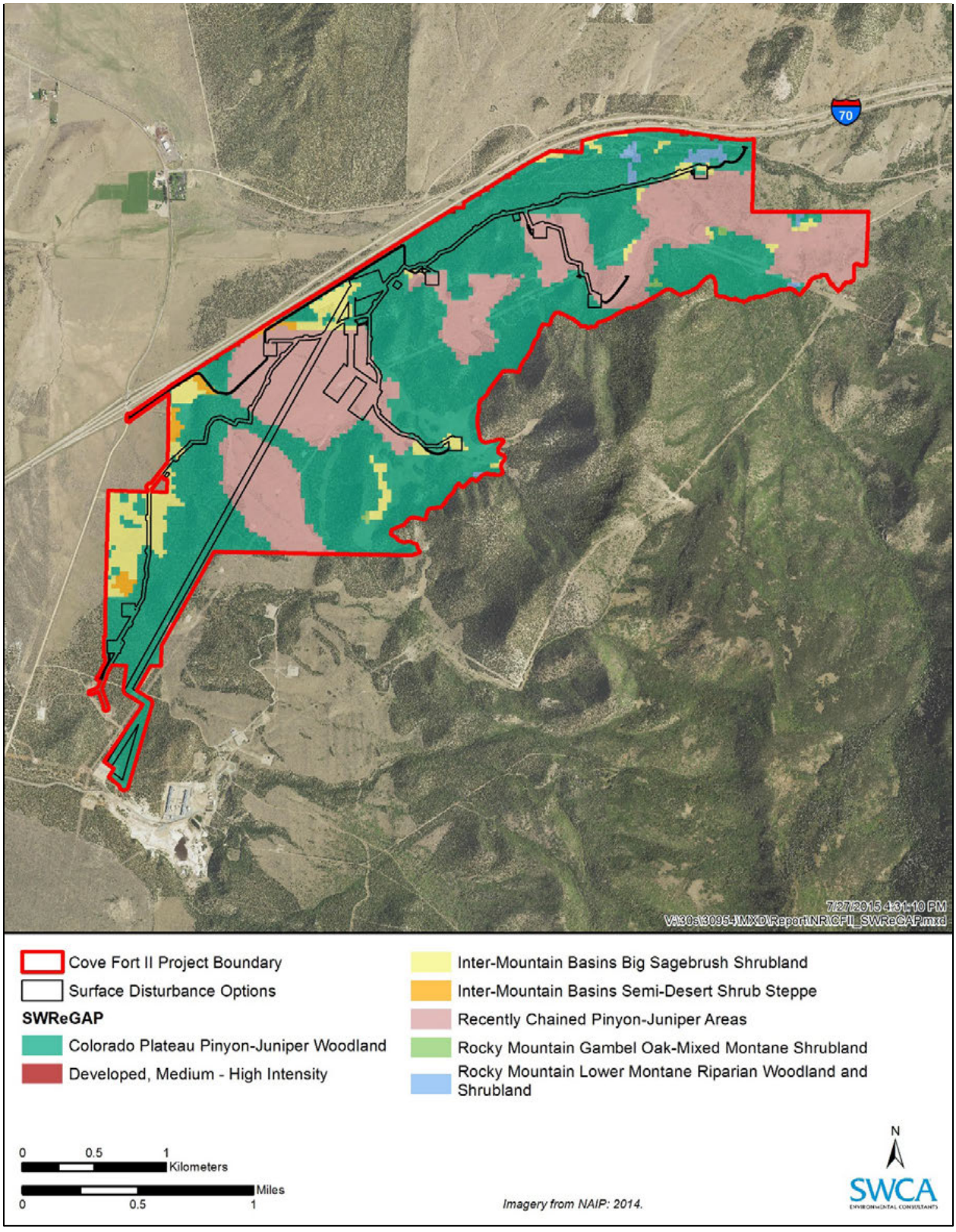

Figure 3.4. Surface disturbance options in relation to land cover types.

Option A

Option A would result in the disturbance of approximately 139.6 acres of vegetation due to construction, operation, and maintenance activities. Disturbance of 1379.6 acres of vegetation represents approximately 0.3% of the vegetation analysis area. Most of the surface disturbance would be permanent. However, a portion of the surface disturbance caused by the gathering system would be a temporary disturbance associated with pipeline construction and would be reclaimed. Much of the surface disturbance caused by the transmission line would also be temporary and associated with construction. However, details about how many poles, what type of poles, and how much vegetation clearing would be needed are not known at this time. Therefore, disturbance from the transmission line is identified as permanent disturbance in the analysis of the different options to provide a more conservative estimate of impacts. Table 3.6 provides the acres of each land cover type disturbed under Option A. The activity that would impact the most acres of vegetation under Option A would be the transmission line with a 150-foot corridor, which would impact approximately 40.8 acres. However, much of this disturbance would be temporary.

Table 3.6. Summary of Land Cover Type Disturbance under Option A

Land Cover Types	Acres Disturbed	% of Land Cover Type in Analysis Area
Colorado Plateau Pinyon-Juniper Woodland	83.4	0.5%
Inter-Mountain Basins Big Sagebrush Shrubland	14.6	0.4%
Inter-Mountain Basins Semi-Desert Shrub Steppe	1.0	0.6%
Recently Chained Pinyon-Juniper Areas	40.5	0.9%
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	0.1	0.03%
Total	**139.7**	**0.3%**

Option B

Option B would result in the disturbance of approximately 137.2 acres of vegetation due to construction, operation, and maintenance activities. Disturbance of 137.2 acres of vegetation represents approximately 0.3% of the vegetation analysis area. Table 3.7 provides the acres of each land cover type disturbed under Option B. The disturbance acres, as well as the dust deposition, noxious weeds, and special status species impacts under Option B, would the same as those under Option A, except for the transmission line disturbance acres. The activity that would impact the most acres of vegetation under Option B would be the transmission line with a 150-foot corridor, which would impact approximately 38.6 acres. However, much of this disturbance would be temporary.

Table 3.7. Summary of Land Cover Type Disturbance under Option B

Land Cover Types	Acres Disturbed	% of Land Cover Type in Analysis Area
Colorado Plateau Pinyon-Juniper Woodland	80.9	0.4%
Inter-Mountain Basins Big Sagebrush Shrubland	14.6	0.4%
Inter-Mountain Basins Semi-Desert Shrub Steppe	1.0	0.6%
Recently Chained Pinyon-Juniper Areas	40.5	0.9%
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	0.1	0.03%
Total	**137.2**	**0.3%**

Option C

Option C would result in the disturbance of approximately 107.8 acres of vegetation due to construction, operation, and maintenance activities. Disturbance of 107.8 acres of vegetation represents approximately 0.3% of the vegetation analysis area. Table 3.8 provides the acres of each land cover type disturbed under Option C. The disturbance acres, as well as the dust deposition, noxious weeds, and special status species impacts under Option C, would the same as those under Option A, except for the transmission line disturbance acres, the lack of a switchyard, and the addition of the 138-kV substation. The activity that would impact the most acres of vegetation under Option C would be the gathering system (permanent disturbance), which would impact approximately 35.5 acres.

Table 3.8. Summary of Land Cover Type Disturbance under Option C

Land Cover Types	Acres Disturbed	% of Land Cover Type in Analysis Area
Colorado Plateau Pinyon-Juniper Woodland	56.0	0.3%
Inter-Mountain Basins Big Sagebrush Shrubland	12.7	0.3%
Inter-Mountain Basins Semi-Desert Shrub Steppe	1.0	0.6%
Recently Chained Pinyon-Juniper Areas	38.0	0.9%
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	0.1	0.03%
Total	**107.8**	**0.3%**

Option D

Option D would result in the disturbance of approximately 106.5 acres of vegetation due to construction, operation, and maintenance activities. Disturbance of 106.5 acres of vegetation represents approximately 0.2% of the vegetation analysis area. Table 3.9 includes the acres of each land cover type disturbed under Option D. The disturbance acres, as well as the dust deposition, noxious weeds, and special status species impacts under Option D, would the same as those under Option A, except for the transmission line disturbance acres, the lack of a switchyard, and the addition of the 345-kV substation. The activity that would impact the most acres of vegetation under Option D would be the gathering system (permanent disturbance), which would impact approximately 35.5 acres.

Table 3.9. Summary of Land Cover Type Disturbance under Option D

Land Cover Types	Acres Disturbed	% of Land Cover Type in Analysis Area
Colorado Plateau Pinyon-Juniper Woodland	55.8	0.3%
Inter-Mountain Basins Big Sagebrush Shrubland	12.7	0.3%
Inter-Mountain Basins Semi-Desert Shrub Steppe	1.0	0.6%
Recently Chained Pinyon-Juniper Areas	36.8	0.8%
Rocky Mountain Lower Montane Riparian Woodland and Shrubland	0.1	0.03%
Total	**106.5**	**0.2%**

3.6.2.2. NO ACTION ALTERNATIVE

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed Cove Fort II disturbances would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed. If lease development occurs, associated impacts to vegetation could occur that are similar to or greater than the Proposed Action. No vegetation would be affected by construction activities related to the proposed wells, power plant, transmission line, or related facilities. Effects to vegetation resources from other land uses in the project area would continue, similar to current conditions.

3.7. Wildlife

3.7.1. Affected Environment

SWCA performed a wildlife and botanical resource assessment of the project area in May 2014 (*Wildlife and Botanical Resource Assessment for the Potential Cove Fort II Geothermal Exploration Project, Millard County, Utah* [Resource Assessment; SWCA 2014b]). The Resource Assessment includes communication with appropriate agency personnel; a pre-field desktop review of land cover types, wildlife habitat, aerial photography, and special status species lists and occurrences; and a site visit (SWCA 2014b). An addendum to the Resource Assessment was completed in April 2015 to cover an expansion of the project area (*Addendum Report: Wildlife and Botanical Resource Assessment for the Cove Fort II Geothermal Exploration Project, Millard County, Utah* [Addendum Report; SWCA 2015b]).

This section is divided into four parts: a discussion of wildlife habitat types in the project area and associated common wildlife species (which include some migratory birds), a more-specific discussion of migratory birds, information on big game and big game habitat in the project area, and information on black bear (*Ursus americanus*) and black bear habitat in the project area.

3.7.1.1. HABITAT TYPES AND COMMON WILDLIFE

As part of the Resource Assessment and Addendum Report, SWReGAP land cover types were categorized into wildlife habitat types based on the dominant vegetation and vegetative structure (SWCA 2014b, 2015b). Five wildlife habitat types were identified in the project area. Table 3.10 describes each habitat type, common and observed species in each habitat type, and the acres of habitat type in the project area.

Table 3.10. Project Area Wildlife Habitat and Common Wildlife Species

Wildlife Habitat	Habitat Description	Project Area Acres	Common Wildlife Species	Additional Information
Pinyon-juniper woodland	Sparsely spaced overstory of pinyon trees (*Pinus* spp.) and/or juniper trees (*Juniperus scopulorum*) interspersed with shrub, grass, and forb species.	1,075.68	Pinyon jay* (*Gymnorhinus cyanocephalus*); black-throated gray warbler* (*Setophaga nigrescens*); western tanager* (*Piranga ludoviciana*); Cassin's finch (*Carpodacus cassinii*); Cooper's hawk (*Accipiter cooperi*)	Trees typically provide nesting habitat for birds and often provide high-quality wintering habitat for big game. Many trees in the project area are large enough to provide nesting habitat for raptors.
Sagebrush steppe	Large sagebrush shrubs (*Artemisia* spp.) interspersed with bunchgrasses.	704.71	Western meadowlark* (*Sturnella neglecta*), green-tailed towhee* (*Pipilo chlorurus*), mountain bluebird* (*Sialia currucoides*), sage sparrow (*Amphispiza belli*), and sage thrasher (*Oreoscoptes montanus*). Ground squirrel (*Spermophilus* sp.), deer mouse (*Peromyscus* sp.), American badger (*Taxidea taxus*), mule deer (*Odocoileus hemionus*), and Rocky Mountain elk (*Cervus elaphus nelsoni*)	Recently chained pinyon-juniper areas have recovered to resemble sagebrush steppe. Many wildlife species such as mule deer, elk, and birds that nest on sagebrush are often found in this habitat type. Some patches of this habitat type in the project area are somewhat degraded and of low wildlife habitat value.
Riparian	Streams and a spring/seep with patchy riparian habitat consisting of small trees.	12.76	Bullock's oriole* (*Icterus bullockii*), red-tailed hawk (*Buteo jamaicensis*), and yellow warbler (*Setophaga petechia*)	Trees could host migratory bird nests but are too small for large raptor nests.
Developed	Primarily consists of the I-70 road corridor	9.13	American robin* (*Turdus migratorius*), black-billed magpie* (*Pica pica*), European starling (*Sturnus vulgaris*), lesser goldfinch (*Spinus psaltria*), western kingbird* (*Tyrannus verticalis*), and common raven* (*Corvus corax*)	Habitat is of sufficient quality for generalist wildlife species (non-native bird species, some raptors, skunks, raccoons). Mule deer often use suburban habitat to forage; however, large linear features such as busy roadways can block big-game movement patterns and increase wildlife mortality.
Montane shrubland	Gambel oak overstory with a forb understory.	2.78	Blue-gray gnatcatcher* (*Polioptila caerulea*), chipping sparrow* (*Spizella passerina*), mourning dove* (*Zenaida macroura*), spotted towhee* (*Pipilo maculatus*), black-headed grosbeak (*Pheucticus melanocephalus*), dark-eyed junco (*Junco hyemalis*), lazuli bunting (*Passerina amoena*), and orange-crowned warbler (*Oreothlypis celata*)	Occurs in very small patches throughout the project area. Trees are often too small for raptor nesting but may provide nesting for smaller bird species. Mule deer use this habitat type for thermal cover.
Total		1,805.06		

*Species was observed during the field visits.

Most of the habitat in the project area consists of pinyon-juniper woodland (59.6%) and sagebrush steppe (39.0%).

3.7.1.2. MIGRATORY BIRDS

Migratory birds and raptors are protected under the Migratory Bird Treaty Act (MBTA) of 1918 (16 USC 703–712) and the Bald and Golden Eagle Protection Act (as amended in 1962). The MBTA prohibits taking or killing migratory birds and destroying their nests or eggs without a permit. The list of protected migratory birds includes raptors. Executive Order 13186 directs federal agencies taking actions that are likely to have a measurable adverse effect on migratory birds to undertake mitigation measures in support of the MBTA. In Utah, the *Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances* (Romin and Muck 2002) provides practices and guidelines for consistent raptor management approaches across the state.

Observed migratory bird species in the project area and those with potential to occur are listed as common wildlife species in Table 3.10. The types of habitats used by migratory birds in the project area are also shown in Table 3.10. Raptors observed in the project area during the first site visit consisted of two red-tailed hawks, one golden eagle, and an unknown Accipiter (either Cooper's hawk or sharp-shinned hawk [*Accipiter striatus*]) (SWCA 2014b). The red-tailed hawks were foraging in the southwest portion of the project area and were observed together, indicating they were a pair (due to the season) and suggesting there could be a nest in the vicinity. The golden eagle was observed soaring at a high altitude and was likely solely traveling through the airspace of the project area. The unknown Accipiter was observed crossing the Sigurd to Red Butte transmission line corridor and entering a thick patch of pinyon-juniper habitat (SWCA 2014b).

A raptor nest survey was conducted in 2012 for the Sigurd to Red Butte transmission line project, which was under construction in the project area at the time of the survey. Eight raptor nests were documented in the transmission line nest study area; however, all were located outside the Cove Fort II project area with the exception of one red-tailed hawk nest. The red-tailed hawk nest is located in a conifer tree in the project area (SWCA 2014b). In addition, there is potential for raptor nesting in the project area's pinyon-juniper and limited riparian habitats, and on transmission poles in the project area, which can provide high-quality nesting structure (SWCA 2014b). No nests were found to be active, and no new nests were detected during the Addendum Report site visit (SWCA 2015b).

3.7.1.3. BIG GAME

The project area contains habitat for mule deer and Rocky Mountain elk. Mule deer are part of the Cervidae family and are found in almost all of Utah, although they are less abundant in desert areas. The deer population in Utah has grown at an average rate of 1.6% over the past 20 years; the population estimate was 79% of the long-term management objective of 425,400 deer in 2013 (Utah Division of Wildlife Resources [DWR] 2014a). Mule deer eat a variety of plants, including browse, forbs, and grasses. They are especially reliant on shrubs for forage during critical winter months. Their habitat is usually characterized by areas of thick brush or trees interspersed with small openings. Mule deer habitat is classified into three main categories (winter, summer, and transitional) based on the season of use. The size and condition of mule deer populations are primarily determined by the quantity and quality of these habitats (DWR 2014a).

Loss and degradation of habitat are thought to be the key reasons for mule deer population declines in western North America over the last few decades. In many parts of Utah, crucial mule deer habitat is continuously being lost or severely fragmented because of human population expansion, development, and natural events (crucial mule deer habitat is defined as habitat essential to the life history requirements of mule deer). Other factors such as predation and disease are intensified with a reduction in habitat quality (DWR 2014a).

The project area is part of DWR Deer Herd Unit #22 (Beaver unit) (DWR 2012a). The target winter herd size (2006–2014) for the Beaver unit is 11,000 animals. The herd composition objective is to maintain a 3-year average post-season buck-to-doe ratio in accordance with the statewide plan (18–20 bucks per 100 does). Of the mule deer habitat within the Beaver unit, 34.5% (305,201 acres) is summer range and 65.5% (580,564 acres) is winter range (DWR 2012a). The condition of the mule deer winter range on this unit was classified as fair in 2003 (DWR 2012a). Limiting factors to achieving management objectives in the Beaver unit include crop depredation, winter and fawning habitat conditions, predation, highway mortality, and illegal harvesting. Working with private and federal agencies to maintain and protect critical and existing winter range from future losses is a key habitat management objective for the Beaver unit, as well as improving riparian areas in fawning habitat (DWR 2012a). The buck harvest trend decreased from a high of approximately 1,500 in 2000–2001 to approximately 600 in 2004–2005 (DWR 2012a). More recent data indicate that the total deer harvest on the Beaver unit in 2013 was 1,153 (Bernales et al. 2013). The post-season fawn ratio increased from a low of approximately 35 fawns per 100 does (2002–2003) to approximately 65 fawns per 100 does (2004–2005). More recent data indicate that the ratio has varied from a low of 46 to a high of 62 fawns per 100 does (2004–2013), with an average of 57 fawns per 100 does (Bernales et al. 2013). The post-season buck ratio on the Beaver unit decreased from a high of approximately 21 bucks per 100 does (1999–2000) to approximately 13 bucks per 100 does (2004–2005). More recent data indicate that the 3-year average from 2011 to 2013 was 17 bucks per 100 does (Bernales et al. 2013). Mule deer winter population estimates for the Beaver unit are shown in Table 3.11.

Table 3.11. Mule Deer Winter Population Estimates in the Beaver Unit

Year	Winter Population Estimate
2009	11,000
2010	10,900
2011	11,000
2012	15,000
2013	12,400

Source: Bernales et al. (2013).

As shown in Figure 3.5, the project area contains 16.89 acres of substantial summer habitat for mule deer in the northeastern-most corner (where the elevation is highest). Substantial habitat is habitat that is used by mule deer but is not crucial for population survival. Degradation or unavailability of substantial value habitat would not lead to significant declines in carrying capacity and/or numbers of mule deer (DWR 2014b). The remainder of the project area (1,788.17 acres) is designated as crucial winter habitat for mule deer. Mule deer migrate from the surrounding mountains to winter in the valley lowlands of the project area; loss of this habitat could impact deer populations (SWCA 2014b).

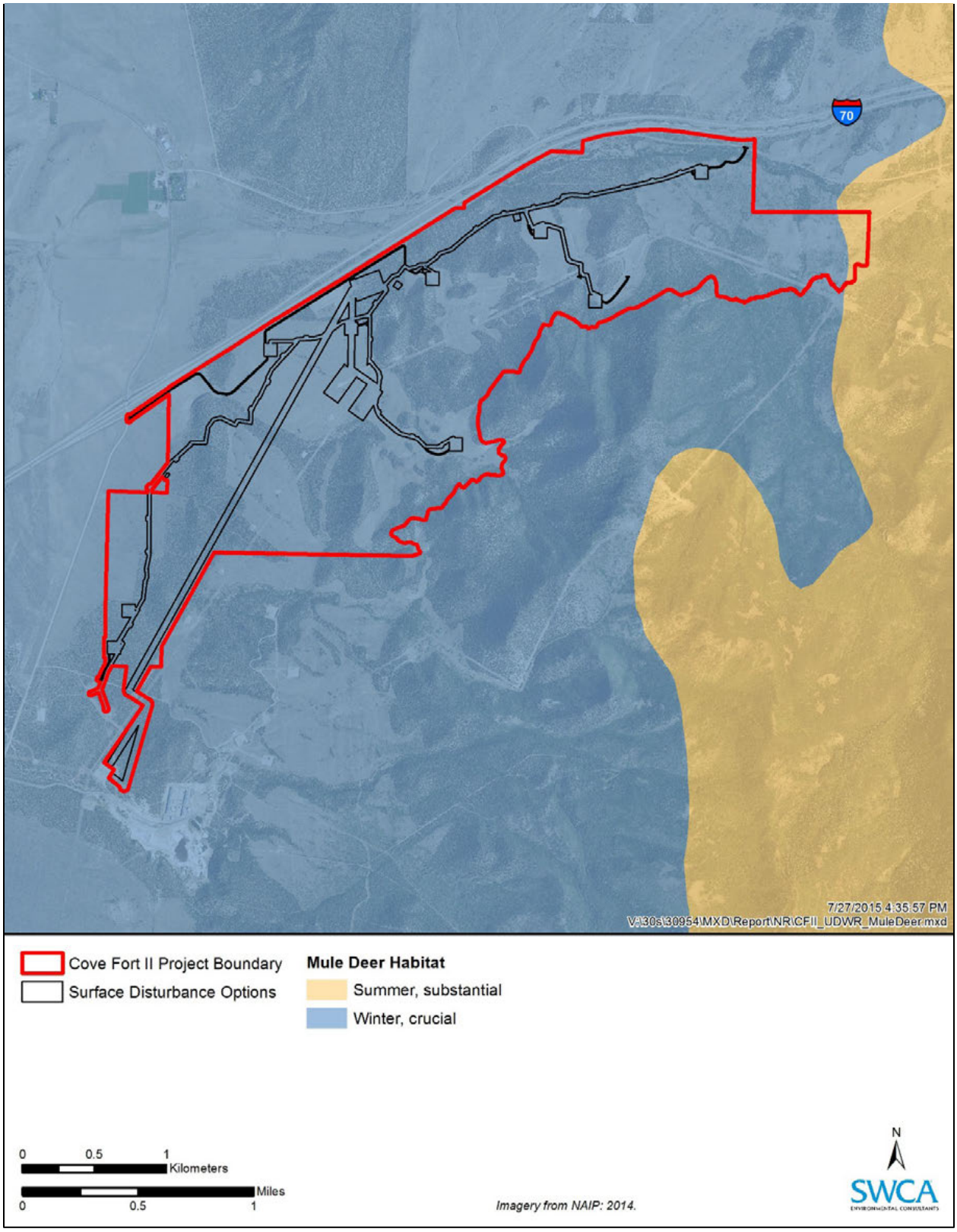

Figure 3.5. Substantial summer and crucial winter mule deer habitat in the project area.

Though there are six recognized subspecies of elk in North America; all of the elk in Utah are of the Rocky Mountain elk subspecies (*Cervus elaphus nelsoni*). On most of the management units in Utah, elk populations are at or near population objectives (DWR 2010). Elk are generalists and have a varied diet consisting of grasses, forbs, and shrubs. In Utah, elk live in a variety of habitat types including all of Utah's mountains and some of the low deserts. They prefer to spend summers at high elevations in aspen conifer forests and winters in mid- to low-elevation habitats with mountain shrub and sagebrush communities. Elk are closely tied to aspen habitats in Utah, which provide both forage and cover during summer and calving locations in spring. Habitat quality is a major factor in determining elk herd size and is important for healthy and productive elk herds. Crucial elk habitat is being lost or fragmented in many parts of Utah because of human expansion and development (DWR 2010).

The project area is part of DWR Elk Herd Unit #22 (Beaver unit) (DWR 2012b). The target winter herd size for the Beaver unit is 1,050 wintering elk. The objective for bull age structure is to maintain a 3-year average bull harvest age of 7.5–8.0 years for all hunt types. Of the elk habitat within the Beaver unit, 55.2% (280,500 acres) is summer range and 44.8% (227, 378 acres) is winter range (DWR 2012b). Limiting factors to achieving management objectives on the Beaver unit include crop depredation, highway mortality on I-70 and I-15, development, invasion by spruce-fir and pinyon-juniper on summer and winter ranges, and fencing that limits migration in travel corridors. Habitat management objectives include working with private and federal agencies to maintain and protect critical and existing winter range from future losses, maintaining and/or enhancing forage production through direct winter range improvements, and providing improved habitat security and escapement opportunities (DWR 2012b). Three habitat improvement project focus areas have been selected for habitat improvement projects; the Pine Creek Treatment area likely includes portions of the project area. The elk population on the Beaver unit has ranged from approximately 250 to 1,000 animals from 1993 to 2011 (DWR 2012b). From 1993 to 2011, the average age of harvest bulls ranged from approximately 6.0 to 7.9 (DWR 2012b). Total bull elk harvest on the Beaver unit was 188 in 2013. The 3-year average age of harvested bull elk on the Beaver unit from 2011 to 2013 was 6.7. The pre-season calf elk per 100 cow estimate for the Beaver unit was 53 in 2013 (Bernales et al. 2013). Elk winter population estimates for the Beaver unit are presented in Table 3.12.

Table 3.12. Elk Winter Population Estimates in the Beaver Unit

Year	Winter Population Estimate
2009	850
2010	1,100
2011	1,100
2012	1,150
2013	1,175

Source: Bernales et al. (2013).

The entire project area (1,805.06 acres) is designated as substantial winter habitat for elk (Figure 3.6). Elk probably forage on sagebrush in the project area and use the pinyon-juniper habitat for thermal cover. Elk tracks were noted on many of the project area roads during the Resource Assessment site visit (SWCA 2014b).

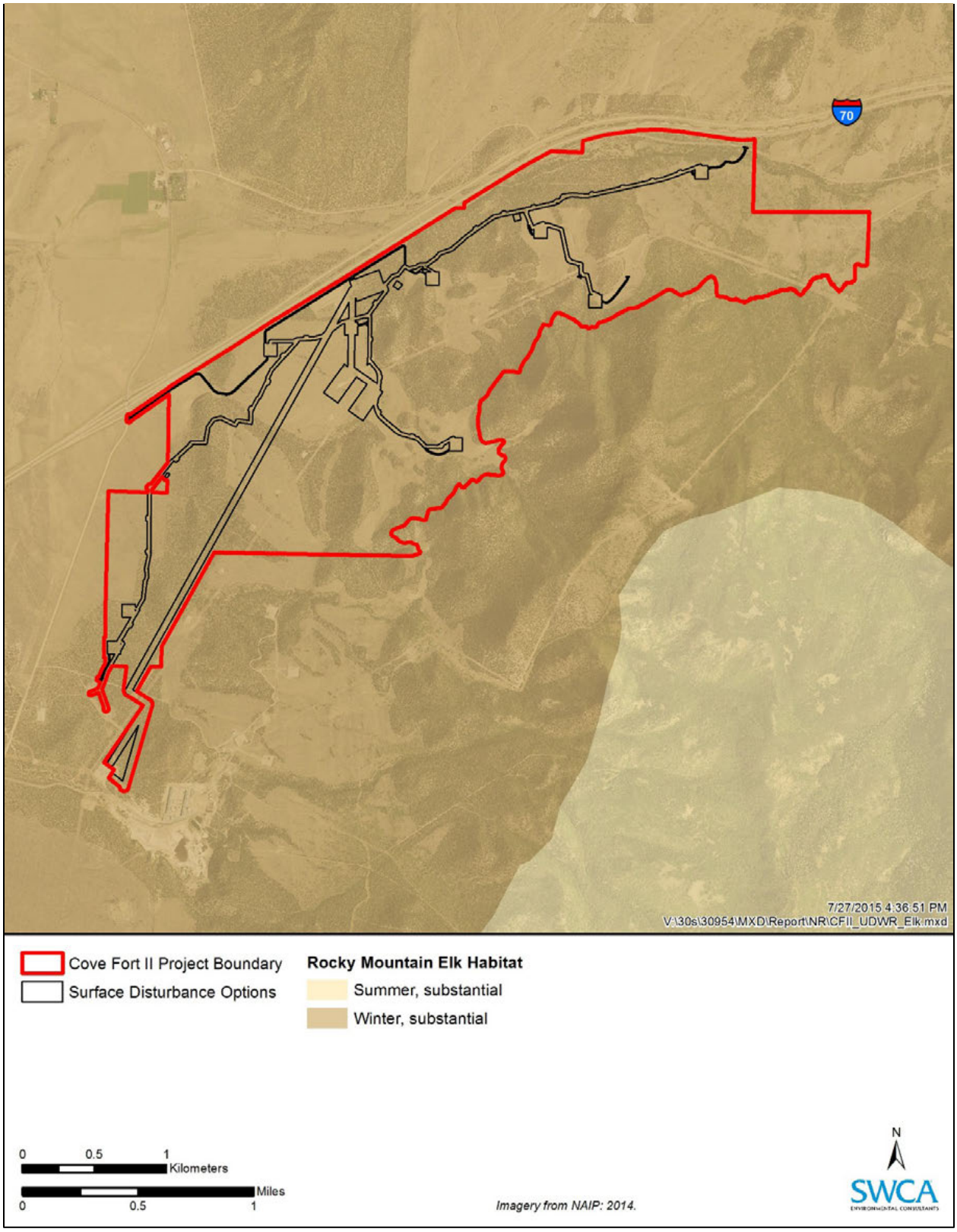

Figure 3.6. Substantial winter habitat for Rocky Mountain elk in the project area.

Section 3.2.6 of the 2012 EA provides additional information on big game, including a discussion of mule deer and elk migrations in the project area.

3.7.1.4. BLACK BEAR

The project area also contains habitat for black bear, which is present in much of the forested habitat of Utah. In central Utah, bears use low-elevation mountain brush habitats during summer and higher-elevation aspen and conifer habitats during spring and fall. High-quality black bear habitat in Utah consists of large interconnected blocks of land exhibiting high interspersions of aspen, mountain brush, and coniferous plant communities with a healthy herbaceous and shrub component (DWR 2011). Bears in central Utah have been found to prefer mesic, north-slope conifer patches as resting areas year-round. The species must drink water, and is often found near a water source. Black bears primarily den in excavated or naturally occurring chambers in hillsides, under rocks, trees, or shrubs. In central and southeastern Utah, they typically den in high-elevation conifer or aspen habitat (DWR 2011). Utah's black bear population appears to have increased since 1990, but may have recently stabilized (DWR 2011).

The black bear is omnivorous and eats a variety of foods, which allows for seasonal diet changes based on availability. In spring, the black bear diet is typically grasses and forbs. The summer diet adds increasingly more fruits, and the fall diet consists of a mixture of soft mast (fruits) and hard mast (nuts). In Utah, black bear research has found that vegetative matter is the most important diet item, followed by mast, insects, and animal matter. Bears in central and southeastern Utah forage on grasses and forbs in aspen, aspen-conifer, and mountain brush, in addition to riparian areas and low-elevation timbered canyon bottoms (DWR 2011).

More than half of the project area is year-long substantial habitat (958.0 acres) and 97.3 acres are year-long crucial habitat for black bear (Figure 3.7). The crucial habitat is around Cove Creek. There is no denning habitat in the project area (SWCA 2014b).

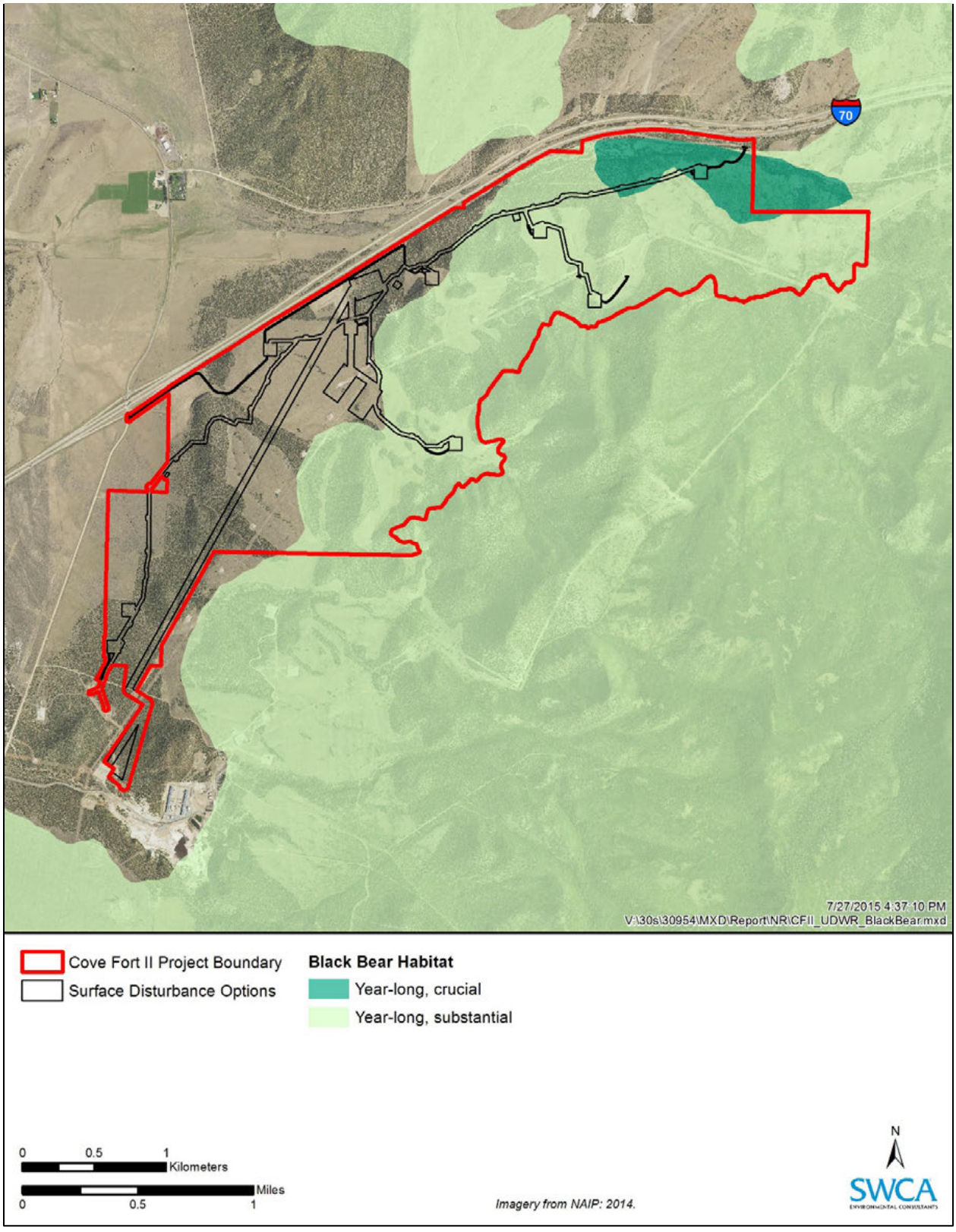

Figure 3.7. Crucial and substantial year-long habitat for black bear in the project area.

3.7.2. Environmental Consequences

The analysis area for common wildlife and migratory birds consists of the two HUC12 subwatersheds that surround the project area (Bear Canyon and Sulphur Creek). This analysis area was chosen because the subwatersheds represent a defined continuous area linked by common watercourses on which wildlife depend. The two subwatersheds comprise 43,106.6 acres.

The analyses areas for impacts to big game consist of the acres of big game or black bear substantial or crucial habitat (summer or winter, depending on the species and type of habitat present in the project area) within the Bear Canyon and Sulphur Creek subwatersheds. These analyses areas were chosen because these types of habitat are important to the health of big game and black bear populations and because subwatersheds represent a defined continuous area linked by common watercourses on which big game and black bear depend. The analyses areas are further described below:

- Mule deer: Acres of crucial winter habitat in the Bear Canyon and Sulphur Creek subwatersheds (comprising 31,720.3 acres)
- Elk: Acres of substantial winter habitat in the Bear Canyon and Sulphur Creek subwatersheds (comprising 21,796.4 acres)
- Black bear: Acres of crucial year-long habitat and acres of substantial year-long habitat in the Bear Canyon and Sulphur Creek subwatersheds (comprising 1,583.8 and 33,004.6 acres, respectively)

The high fencing along I-15 and I-70 restricts the migration of deer and elk from the Tushar Mountains to some of the substantial or crucial habitat for each species. Because of this restriction, the percentage of impacted habitat discussed below could be slightly underestimated. However, this would not substantially change the effects discussed in section 3.7.2.1.

Impacts to wildlife were analyzed with the following indicators:

- Potential for loss and degradation of habitat
- Potential for effects from human activity and noise
- Potential for effects on species' population health and viability

3.7.2.1. PROPOSED ACTION

Impacts from the Proposed Action on common wildlife species encountered in the project area would generally consist of 106.5–139.7 acres of habitat loss, depending on the transmission line option (0.2%–0.3% of the analysis area). Surface disturbance could result in the direct loss of habitat elements such as groundcover and trees, which could cause a decrease in available forage and cover for certain species (e.g., birds, mule deer) and an increase in predation on species such as the deer mouse.

Effects on wildlife from human activity and noise during Proposed Action construction and operations would consist of auditory and visual disturbances to individual wildlife present in or near the project area, which could cause stress to individual animals. Some individuals would likely leave the immediate area, resulting in a temporary spatial redistribution of individuals or habitat-use patterns. Construction activity and noise would be a direct, short-term impact that would disappear at the completion of the project. However, some human activity and noise associated with geothermal plant operations would be present consistently and in the long term in the project area. Vehicle use associated with the Proposed Action (during construction and operations) would result in an increased risk of vehicle-animal collisions on project access roads and could cause stress to individual animals. Vehicle-animal collisions could cause injury or mortality to individual wildlife. This risk would be minimal because of the low level and

sporadic nature of anticipated vehicle use. In addition, prudent speed limits would be observed to protect wildlife. Geothermal well drilling would include the construction of reserve pits at each pad to contain drilling fluids; an injection pipeline relief pond would also be constructed. Reserve pits and the relief pond would present trapping hazards to wildlife. Big game and larger animals would be protected through the fencing of each reserve pit. In accordance with BLM's Gold Book standards (BLM 2007), three sides of the reserve pit would be fenced during drilling activities. The fourth side would be fenced upon completion of drilling.

Common wildlife species' population viability (e.g., American robin, ground squirrel) is unlikely to be affected because of the relatively small percentage of surface disturbance in the analysis area (0.2%–0.3%) and the ability of individuals to move into adjacent habitat as needed to avoid the disturbance.

For migratory birds, impacts could include a loss of habitat in the project area from surface disturbance and vegetation removal. Habitat loss would be limited because of the small amount of disturbance (106.5–139.7 acres, or 0.2%–0.3% of the analysis area). Impacts could also include the displacement of individual birds, the abandonment of nests during breeding seasons because of human activity and noise, a temporary relocation of prey from the project area because of human activity and noise, and potential mortality from vehicular collisions. Human activity and noise would be short term during construction activities, occurring sporadically, but would continue to occur after completion of the Proposed Action. Similar habitat for displaced prey or individual birds would be available in adjacent areas. As described in section 3.7.1.2, one red-tailed hawk nest is located in the project area. The potential for effects on individuals and on overall species' population health and viability would be minimal because stipulations required during pre-construction surveys for migratory birds would indicate their presence. If construction were to occur during the bird breeding season, bird nest clearance surveys would be completed. If construction were to occur during the raptor nesting season, nests would be first checked for signs of nesting activity. If any nests were occupied, appropriate seasonal and spatial protection buffers would be applied. In addition, the reseeding of disturbed areas with native seed would minimize some long-term migratory bird impacts by restoring vegetation.

Impacts to big game and black bear would be the same as those described for common wildlife above, along with the more specific impacts discussed in the following paragraphs.

All Proposed Action surface disturbances would occur in crucial winter habitat for mule deer. Project activities would create 106.5–139.7 acres of surface disturbance (depending on the transmission line option) in the 31,720.3-acre mule deer analysis area (Figure 3.8), resulting in a loss of 0.3%–0.4% of the total mule deer crucial winter habitat in the analysis area. In addition, 17.5 acres of access road and 49.5 acres of pipeline gathering system could impede deer movement and create new habitat fragmentation, especially with the constraint presented by the I-70 corridor to the west. If wildlife movement is impeded by pipelines, wildlife crossings would be provided to facilitate movement. Enel would meet on-site with agency wildlife biologists to determine appropriate locations for crossings that address wildlife needs and pipeline technical requirements. Habitat fragmentation has been reduced by moving the access road closer to I-70 as part of the project design. In addition, this transfers some of the geothermal plant operation traffic and activity from open areas (which typically provide higher quality forage for deer, especially during the winter) to less open, more juniper forested areas. The most recent mule deer population estimate for the Beaver unit (12,400 in 2013) is over the target herd size of 11,000 animals, but the post-season buck-to-doe ratio (2011-2013 average) of 17 is slightly under the target of 18–20 bucks per 100 does (see section 3.7.1.3.). The condition of the mule deer winter range on the Beaver unit was last classified as fair in 2003. Because winter and fawning habitat conditions are limiting factors to achieving management objectives in the Beaver deer herd unit and because mule deer migrate from surrounding mountains to winter in the project area, it is likely that loss of the crucial winter habitat and additional fragmentation in the project area would impact mule deer populations or affect their health.

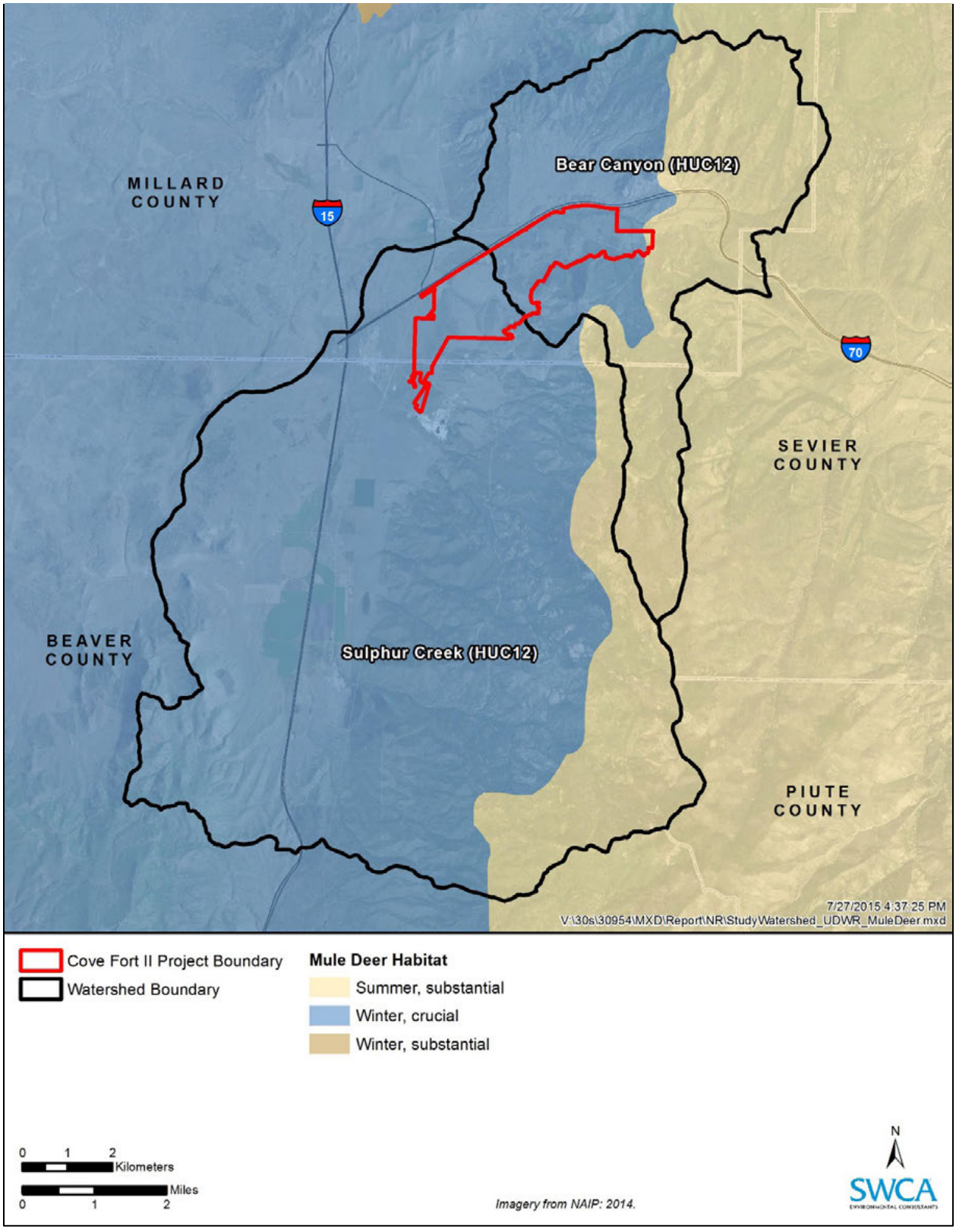

Figure 3.8. Mule deer habitat in the mule deer analysis area.

All Proposed Action surface disturbances would occur in substantial winter habitat for Rocky Mountain elk. Project activities would create 106.5–139.7 acres of surface disturbance in the 21,796.4-acre analysis area for elk (Figure 3.9); approximately 0.5%–0.6% of the total substantial winter elk habitat in the analysis area would be permanently removed. As discussed in section 3.7.1.3, substantial habitat is not crucial for population survival, and unavailability of this habitat is not likely to lead to significant declines in elk carrying capacity or population numbers. The 2013 elk winter population estimate in the Beaver unit (1,175) exceeded the target winter herd size of 1,050; although the objective for bull age structure was not met in 2013 (see section 3.7.1.3.).

Disturbance- and activity-related impacts to local herds of mule deer and Rocky Mountain elk would be mitigated. As noted in section 2.2.3, the Proposed Action includes several features designed to reduce potential effects to wildlife, specifically effects to crucial winter habitat and substantial winter habitat for mule deer and Rocky Mountain elk, respectively. These include the following:

- Locating the primary access road adjacent to the southern ROW boundary of I-70 to avoid open, higher quality winter range; reduce potential habitat fragmentation; and limit human activity in those areas.
- Limiting operational use of access roads during times of substantial snowfall that may drive foraging deer and elk into the project area. This limited use would include reducing the number of well readings to once daily.
- Completing off-site terrestrial habitat restoration and enhancement and other activities to compensate for direct disturbance of crucial and substantial winter habitats for deer and elk, respectively. Up to 132 acres could be restored/enhanced, and then protected by a conservation easement. Alternatively, vegetation treatments could be conducted on BLM-administered land, subject to further NEPA analysis, if necessary.

Surface disturbance from the Proposed Action would occur in 5.7 acres of year-long crucial black bear habitat under all transmission line options. This represents 0.4% of the year-long crucial habitat in the 1,583.8-acre analysis area for black bear (Figure 3.10). Surface disturbance would also occur in 26.5 acres of year-long substantial black bear habitat under all transmission line options, which represents 0.08% of the 33,004.6 acres of year-long substantial habitat in the Sulphur Creek and Bear Canyon subwatersheds. As discussed above, loss of substantial habitat is not likely to lead to declines in black bear carrying capacity or population numbers. The small quantity of disturbance in crucial habitat when compared with the total amount of crucial habitat available in the analysis area would not likely affect the overall health of the habitat.

Effects on big game and black bear from human activity and noise during Proposed Action construction and operations would consist of auditory and visual disturbances to individual animals present in or near the project area, which could cause stress to the individual. Some individuals would likely leave the immediate area, resulting in a temporary spatial redistribution of individuals or habitat-use patterns. The added stress would occur from physiological excitement as a result of the noise and human activity and could result in a change in food intake due to disruptions and extra exertion and movement to escape disruptions. Added stress could result in the depletion of energy stores in individual animals at the expense of growth and reproduction, and could limit an animal's ability to respond to adverse conditions such as bad weather or hunting. In addition, overall habitat changes could cause individuals to select suboptimal habitat. However, noise and activity impacts from geothermal plant operations would be reduced by a design feature that includes limiting use of access roads during substantial snowfall (section 2.2.3).

Pre-construction surveys would be completed for big game in winter. Construction activities would take place outside of winter (as defined by the 1986 Forest Plan for mule deer and elk) to reduce impacts on big game.

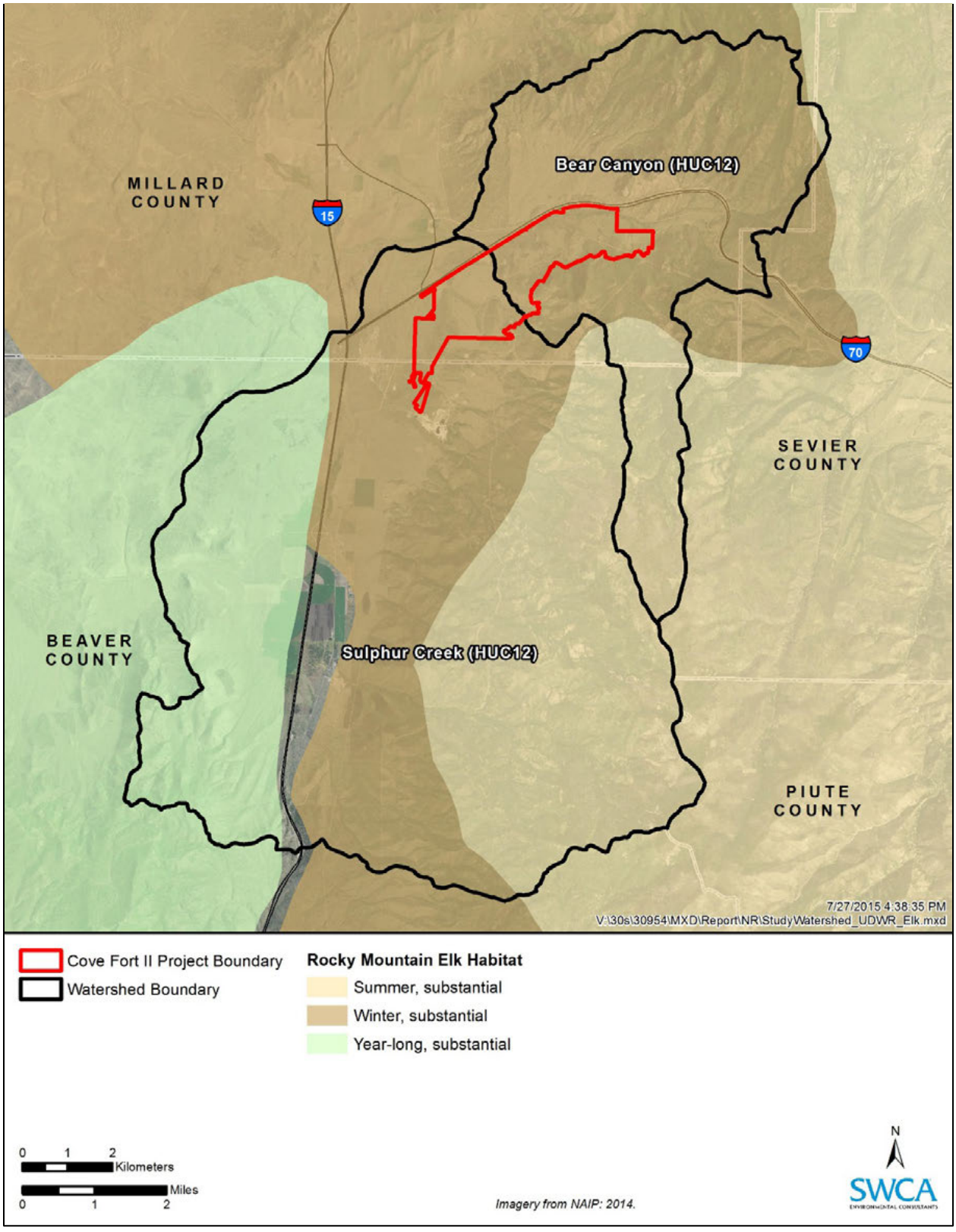

Figure 3.9. Rocky Mountain elk habitat in the elk analysis area.

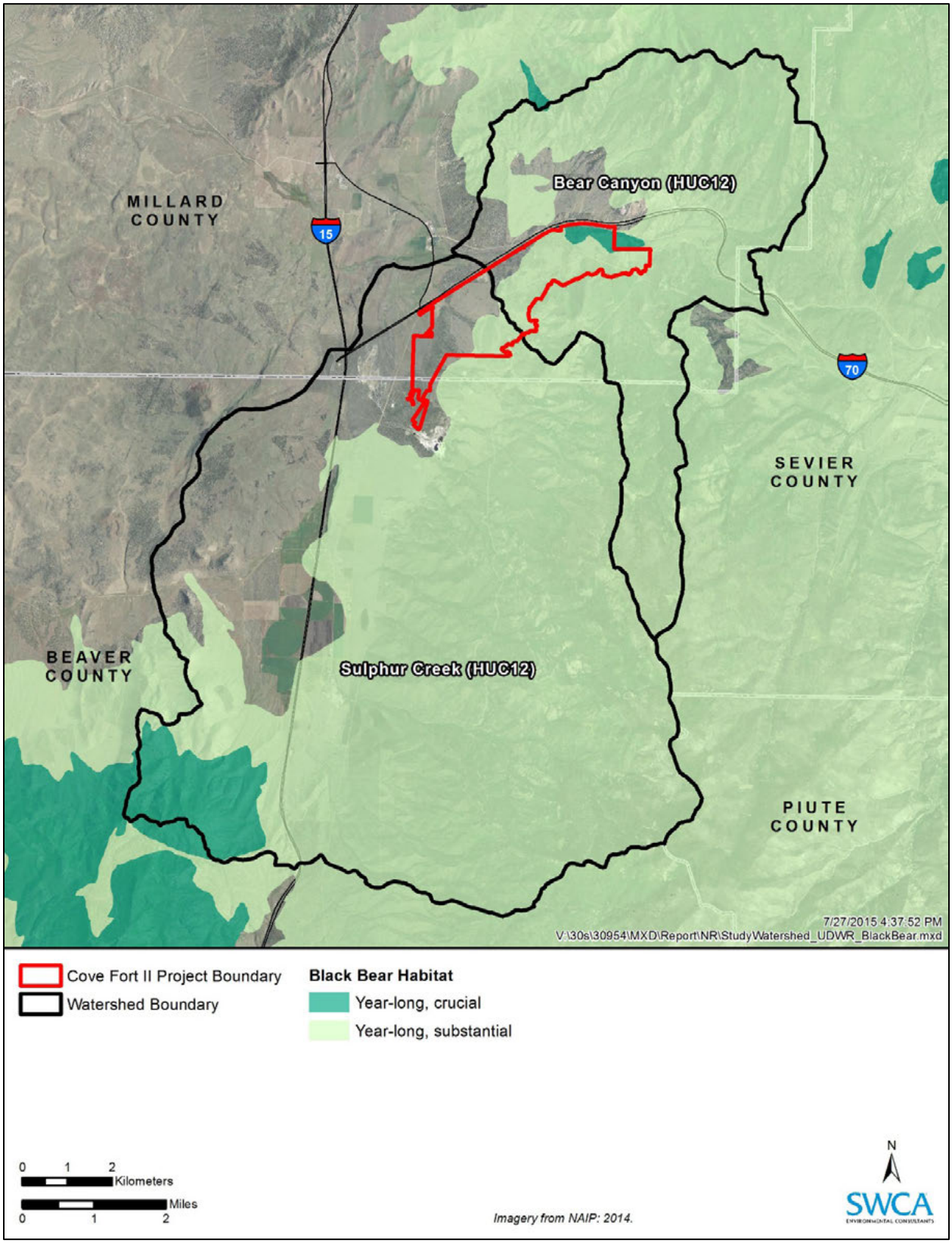

Figure 3.10. Black bear habitat in the black bear analysis area.

Tables 3.13–3.16 provide detailed breakdowns of the acres of impact to wildlife habitat under the four transmission line options for the Proposed Action. Most of the surface disturbance to wildlife habitat under Option A and the other options would be permanent. However, a portion of the surface disturbance caused by the gathering system would be a temporary disturbance associated with pipeline construction and would be reclaimed. Much of the surface disturbance caused by the transmission line would also be temporary and associated with construction. However, details about the number of poles, type of poles, and amount of vegetation removal are not known at this time. Therefore, disturbance from the transmission line is identified as permanent in the following analysis to provide a more conservative estimate of impacts.

Table 3.13. Acres of Wildlife Habitat Disturbance under the Proposed Action, Option A

Type of Wildlife Habitat	Acres of Habitat Disturbed (permanent/temporary disturbance)	% of Habitat Available in Analysis Area
Migratory birds (vegetation)	139.7 (125.8/13.9)	0.30%
Mule deer (crucial winter)	139.7 (125.8/13.9)	0.40%
Rocky Mountain elk (substantial winter)	139.7 (125.8/13.9)	0.60%
Black bear (year-long crucial)	5.7 (4.9/0.8)	0.40%
Black bear (year-long substantial)	26.5 (22.0/4.5)	0.08%

Table 3.14. Acres of Wildlife Habitat Disturbance under the Proposed Action, Option B

Type of Wildlife Habitat	Acres of Habitat Disturbed (permanent/temporary disturbance)	% of Habitat Available in Analysis Area
Migratory birds (vegetation)	137.2 (123.3/13.9)	0.30%
Mule deer (crucial winter)	137.2 (123.3/13.9)	0.40%
Rocky Mountain elk (substantial winter)	137.2 (123.3/13.9)	0.60%
Black bear (year-long crucial)	5.7 (4.9/0.8)	0.40%
Black bear (year-long substantial)	26.5 (22.0/4.5)	0.08%

Table 3.15. Acres of Wildlife Habitat Disturbance under the Proposed Action, Option C

Type of Wildlife Habitat	Acres of Habitat Disturbed (permanent/temporary disturbance)	% of Habitat Available in Analysis Area
Migratory birds (vegetation)	107.8 (93.9/13.9)	0.30%
Mule deer (crucial winter)	107.8 (93.9/13.9)	0.30%
Rocky Mountain elk (substantial winter)	107.8 (93.9/13.9)	0.50%
Black bear (year-long crucial)	5.7 (4.9/0.8)	0.40%
Black bear (year-long substantial)	26.5 (22.0/4.5)	0.08%

Table 3.16. Acres of Wildlife Habitat Disturbance under the Proposed Action, Option D

Type of Wildlife Habitat	Acres of Habitat Disturbed (permanent/temporary disturbance)	% of Habitat Available in Analysis Area
Migratory birds (vegetation)	106.5 (92.6/13.9)	0.20%
Mule deer (crucial winter)	106.5 (92.6/13.9)	0.30%
Rocky Mountain elk (substantial winter)	106.5 (92.6/13.9)	0.50%
Black bear (year-long crucial)	5.7 (4.9/0.8)	0.40%
Black bear (year-long substantial)	26.5 (22.0/4.5)	0.08%

3.7.2.2. NO ACTION ALTERNATIVE

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed Cove Fort II disturbances would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed. If lease development occurs, associated impacts to wildlife and wildlife habitat could occur that are similar to or greater than the Proposed Action. No wildlife habitat would be affected by construction activities related to the proposed wells, power plant, transmission line, or related facilities. However, 132 acres would not be restored or enhanced to augment crucial or substantial winter range habitat for the use of local deer and elk populations. Effects to wildlife resources from other land uses in the project area would continue similar to current conditions.

3.8. Special Status Species (including management indicator species)

3.8.1. Affected Environment

3.8.1.1. THREATENED, ENDANGERED, CANDIDATE, AND SENSITIVE SPECIES

Special status species are species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species that are protected under the ESA, species considered as candidates for such listing by the USFWS, BLM sensitive species, USFS sensitive species (identified by a regional forester; species for which population viability is a concern) (USFS 2005), species that are managed under a conservation agreement, and species that are state protected. The following sources were reviewed for wildlife data in Beaver and Millard counties:

- The USFWS Information, Planning, and Conservation System at http://ecos.fws.gov/ipac/wizard/chooseLocation!prepare.action (USFWS 2015)
- The Utah Conservation Data Center's Federally Listed Species by County (DWR 2012c)
- The Utah BLM Sensitive Species List (BLM 2012b)
- The USFS Region 4 Threatened, Endangered, and Sensitive Species List (USFS 2013)

Table 3.17 lists the special status wildlife species in Beaver and Millard Counties and an assessment of the potential for these species to occur in the project area. Habitat associations for each species can be found in Appendix C of the Addendum Report in the project record.

Table 3.17. Special Status Wildlife Species in Beaver and Millard Counties

Common Name (Species Name)	Status*	Potential for Occurrence in Project Area
Birds		
American white pelican (*Pelecanus erythrorhynchos*)	SPC; BLM	None. Habitat for this species is not present in the project area.
Bald eagle (*Haliaeetus leucocephalus*)	SPC; BLM; USFS	Moderate. This species can be found in pinyon-juniper and riparian habitats in the region in the winter. The limited riparian habitat in the project area is not mature enough to provide habitat for communal roosting. Individuals observed in the project area would likely be passing through while en route to higher quality foraging or roosting habitat.
Burrowing owl (*Athene cunicularia*)	SPC; BLM	Moderate. No prairie dog colonies were observed in the project area; however, isolated burrows could occur. The sagebrush vegetation of the project area could support burrowing owls.
California condor (*Gymnogyps californianus*)	S-ESA (Experimental population, nonessential)	Low. The habitat in the project area is not very open nor are there large cliffs. The project area is also at the northern edge of the species' distribution.
Ferruginous hawk (*Buteo regalis*)	SPC; BLM	Moderate. Although there are no known ferruginous hawk territories near the project area, the pinyon-juniper habitat of the project area could support nesting by this species. It could also use the project area to forage.
Greater sage-grouse (*Centrocercus urophasianus*)	S-ESA (C); BLM; USFS	Moderate. This species has been documented within a 2-mile radius of the project area, and the sagebrush habitat of the project area could support the species. However, the project area is not inside nor is it near a State of Utah sage-grouse management area (areas that encompass greater than 90% of the Utah aggregate population). Because of the species' high mobility, the project area would likely only be used by the species while in transit between higher quality habitat patches.
Lewis' woodpecker (*Melanerpes lewis*)	SPC; BLM	Low. The montane shrubland habitat in the project area could provide forage for the species in the form of acorns. Breeding habitat does not occur in the project area.
Long-billed curlew (*Numenius americanus*)	SPC; BLM	None. Habitat for this species is not present in the project area.
Northern goshawk (*Accipiter gentilis*)	CS; BLM; USFS	Low. This species would not breed in the summer in the project area, but could pass through it during migration and in the winter.
Short-eared owl (*Asio flammeus*)	SPC; BLM	Low. Although the species could be found in the project area's montane shrubland habitat, it would likely only be for foraging or roosting. Breeding habitat does not occur in the project area.
Three-toed woodpecker (*Picoides tridactylus*)	SPC, BLM, USFS	Low. This species would not breed in the summer in the project area, but could pass through it during migration and in the winter.
Yellow-billed cuckoo (*Coccyzus americanus*)	S-ESA (T), BLM, USFS	None. This species would not breed in the project area and would not likely pass through the area during migration.
Fish		
Bonneville cutthroat trout (*Oncorhynchus clarkii utah*)	CS; BLM; USFS	None. Habitat for this species is not present in the project area.
Southern leatherside chub (*Lepidomeda aliciae*)	CS; SPC; USFS	None. Habitat for this species is not present in the project area.
Mammals		
Big free-tailed bat (*Nyctinomops macrotis*)	SPC; BLM	Moderate. This species could forage in the limited riparian habitat of the project area; however, no roosting habitat is available.
Dark kangaroo mouse (*Microdipodops megacephalus*)	SPC	None. The project area does not occur within the species' distribution.

Table 3.17. Special Status Wildlife Species in Beaver and Millard Counties

Common Name (Species Name)	Status*	Potential for Occurrence in Project Area
Fringed myotis (*Myotis thysanodes*)	SPC; BLM	Moderate. This species could forage in the limited riparian habitat of the project area; however, no roosting habitat is available.
Kit fox (*Vulpes macrotis*)	SPC; BLM	None. Habitat for this species is not present in the project area.
Pygmy rabbit (*Brachylagus idahoensis*)	SPC; BLM; USFS	Low. Pygmy rabbit occurrences have not been documented in the area. In addition, most of the sagebrush habitat in the project area is not dense enough for this species.
Spotted bat (*Euderma maculatum*)	SPC, BLM, USFS	Moderate. This species could forage or roost in the project area.
Townsend's big-eared bat (*Corynorhinus townsendii*)	SPC, BLM, USFS	Moderate. This species could forage or roost in the project area
Utah prairie dog (*Cynomys parvidens*)	ESA (T)	None. The project area is not located in a Utah prairie dog recovery unit.
Insects and Mollusks		
Bifid duct pyrg (*Pyrgulopsis peculiaris*)	SPC	None. None of the six springs where the species has been documented are in or near the project area.
California floater (*Anodonta californiensis*)	SPC	None. Habitat for this species is not present in the project area.
Cloaked physa (*Physa megalochlamys*)	SPC	None. Habitat for this species is not present in the project area.
Hamlin Valley pyrg (*Pyrgulopsis hamlinensis*)	SPC	None. This species is not known to occur outside of one set of springs.
Longitudinal gland pyrg (*Pyrgulopsis anguina*)	SPC	None. Habitat for this species is not present in the project area.
Sub-globose snake pyrg (*Pyrgulopsis saxatilis*)	SPC	None. Habitat for this species is not present in the project area.
Amphibians		
Columbia spotted frog (*Rana luteiventris*)	CS; USFS	None. This species has not been documented near the project area.
Western toad (*Bufo boreas*)	SPC; BLM; USFS	Moderate. This species could occur in the limited riparian habitat of the project area and in areas associated with water sources.

* Status

S-ESA = Species listed under the ESA:

(E) = Endangered

(T) = Threatened

(C) = Candidate

CS = Conservation Agreement Species

SPC = DWR Wildlife Species of Concern

BLM = BLM Sensitive Species

USFS = Forest Service Sensitive Species

† Definitions of potential:

None = Habitat for this species does not occur.

Low = Habitat for this species is very low quality, but occurrences of this species cannot be completely discounted.

Moderate = This species could occur on this habitat, but the habitat is of moderate quality or would be used only occasionally for activities such as roosting and foraging.

High = This species or a sign indicating the presence of this species was seen; this species has been otherwise documented in this area (e.g., by the UNHP).

In summary, 31 special status species are listed in Beaver and Millard Counties. Of these 31 species, 16 have no potential to occur in the project area. Six special status species have a low potential to occur in the project area: California condor, Lewis' woodpecker, northern goshawk, short-eared owl, three-toed woodpecker, and pygmy rabbit. Nine have a moderate potential to occur in the project area: bald eagle, burrowing owl, ferruginous hawk, greater sage-grouse, big free-tailed bat, fringed myotis, spotted bat, Townsend's big-eared bat), and western toad. None of the species in Table 3.17 have a high potential to occur in the project area.

3.8.1.2. FISHLAKE NATIONAL FOREST MANAGEMENT INDICATOR SPECIES

In accordance with the National Forest Management Act of 1976, one of the goals of national forest land management plans is to provide for the diversity of plant and animal communities based on the suitability and capability of each individual forest. To assist in this goal, each national forest identifies (MIS), along with specific goals, objectives and standards for each species, in their national forest plan. An indicator species is essentially an organism whose status may provide insights into the health and integrity of the larger ecological system. USFS defines an MIS as a species, group of species, or species habitat element chosen to focus management attention for the purposes of resource production, population recovery, maintenance of population viability, or ecosystem diversity (USFS 2006). The monitoring of MIS can help forest managers understand the impacts of management activities on wildlife and vegetation.

The 1986 Forest Plan, as amended, establishes two categories of MIS for Fishlake National Forest: ecological indicator species (or guilds of species) and high interest species (USFS 1984). Three of the species guilds were eliminated and replaced with individual species in 2006 (USFS 2006).

Ecological Indicator Species

The current list of MIS ecological indicator species for Fishlake National Forest consists of the following:

- Northern goshawk
- Hairy woodpecker (*Picoides villosus*), western bluebird (*Sialia mexicana*), mountain bluebird
- MacGillivray's warbler (*Geothlypis tolmiei*), yellow warbler (*Setophaga petechia*), Lincoln's sparrow (*Melospiza lincolnii*), song sparrow (*Melospiza melodia*), Brewer's sparrow (*Spizella breweri*), vesper sparrow (*Pooecetes gramineus*), sage thrasher
- Aquatic macroinvertebrates
- Resident trout (includes brown trout [*Salmo trutta*], brook trout [*Salvelinus fontinalis*], cutthroat trout [*Oncorhynchus clarkii*], rainbow trout [*Oncorhynchus mykiss*], and lake trout [*Salvelinus namaycush*])

Of the birds listed as ecological indicator species, the mountain bluebird was observed in the sagebrush steppe habitat of the project area during field visits (see section 3.7.1.1., Table 3.10). In addition, the sage sparrow is expected to be a common wildlife species in the sagebrush steppe habitat of the project area, and the yellow warbler is expected to be a common wildlife species in the limited riparian habitat of the project area. The northern goshawk has a low occurrence potential in the project area (see Table 3.17). The project area could have habitat for aquatic macroinvertebrates and resident trout; additional detail is provided in section 3.8.2.1.

High Interest Species

The current list of MIS high interest species for Fishlake National Forest consists of the following:

- Rocky Mountain elk
- Mule deer
- Bonneville cutthroat trout
- Rydberg's milkvetch (*Astragalus perianus*)

As discussed in section 3.7.3.1., elk and mule deer both have habitat in the project area. It is unlikely that Bonneville cutthroat trout exist in the project area because Cove Creek has not been identified as potential or occupied habitat (see section 3.8.2.1.). Rydberg's milkvetch is also not likely to have habitat in the project area (see section 3.8.2.1.).

The Bonneville cutthroat trout can be found in a number of habitat types, ranging from high-elevation mountain streams and lakes to low-elevation grassland streams. The species requires a functional stream riparian zone, which provides structure, cover, shade, and bank stability (DWR 2015). Bonneville cutthroat trout are thought to grow and survive better in clear, cool water with complex instream habitat conditions, although they have been found in marginal habitat conditions with turbid water, warmer temperatures, and fine sediments (USFWS 2001).

Bonneville cutthroat trout habitat within the species' range is divided into five geographically and hydrologically distinct areas, known as geographic units. The overall status of the species has improved in every geographic unit since the 1970s (USFWS 2001). The project area is located in the Southern Bonneville Geographic Unit, which is characterized by relatively small, fragmented streams draining mountain ranges isolated by desert valleys. A 2001 status review for the species describes potential and occupied habitat, as well as the status and distribution of Bonneville cutthroat trout populations, in each geographic unit.

The Rydberg's milkvetch is endemic to Utah in Beaver, Garfield, Iron, Kane, Piute, and Sevier Counties. Its habitat consists of alpine or montane sites in tundra and spruce-fir communities on tertiary igneous gravels, between 7,000 and 11,400 feet of elevation, July through September (Utah Native Plant Society. 2003–2015). The plant was listed as threatened by the USFWS in 1978 but was delisted in 1989 (the species was listed prematurely before being fully surveyed) (USFWS 1989). However, it is still considered a rare plant in Utah (Utah Native Plant Society 2003–2015).

3.8.2. Environmental Consequences

The analysis area for special status species consists of the two HUC12 subwatersheds that surround the project area (Bear Canyon and Sulphur Creek). This analysis area was chosen because the subwatersheds represent a defined continuous area linked by common watercourses on which special status species depend. The two subwatersheds comprise 43,106.6 acres.

Impacts to special status species were analyzed with the following indicators:

- Potential for loss of habitat
- Potential for effects on species' population health and viability
- Potential for effects from human activity and noise

3.8.2.1. PROPOSED ACTION

None of the species in Table 3.17 of section 3.8.1.1 have a high potential to occur in the project area. Six special status species have a low potential to occur in the project area: California condor, Lewis' woodpecker, northern goshawk, short-eared owl, three-toed woodpecker, and pygmy rabbit. Out of these six, the California condor is the only federally listed species (a non-essential experimental population, which is a USFWS designation that allows more flexibility in the management of the species), and it is unlikely to be impacted by the Proposed Action due to its low occurrence potential and the location of the project area at the northern edge of the species' distribution. The remaining five species are also not likely to be impacted by the Proposed Action because of their low occurrence potential.

Nine special status species have a moderate potential to occur in the project area: bald eagle (winter only), burrowing owl, ferruginous hawk, greater sage-grouse, big free-tailed bat (foraging only), fringed myotis (foraging only), spotted bat, Townsend's big-eared bat, and western toad. None of these species are listed under the ESA, with the exception of greater sage-grouse, which is a candidate species. Because of the high mobility of greater sage-grouse, the project area would likely only be used by the species while in transit between higher quality habitat patches. In addition, the project area is not inside, nor is it near, a State of Utah sage-grouse management area (areas that encompass greater than 90% of the Utah aggregate population).

Effects on the nine special status species from human activity and noise during Proposed Action construction and operations would consist of auditory and visual disturbances, which would cause stress to any individual animals present in or near the project area. Some individuals would likely leave the immediate area, resulting in a temporary spatial redistribution of individuals or habitat-use patterns. Birds may abandon nests during breeding seasons. Construction activity and noise would be a direct, short-term impact that would disappear at the completion of the project. However, some human activity and noise associated with geothermal plant operations would be present consistently and in the long term in the project area. Similar habitat for displaced animals would be available in adjacent areas. Vehicle use associated with the Proposed Action (during construction and operations) would result in an increased risk of vehicle-animal collisions on project access roads and could cause stress to individual animals. Vehicle-animal collisions could cause injury or mortality to individuals. This risk would be minimal because of the low level and sporadic nature of anticipated vehicle use and the moderate occurrence potential of the nine special status species. In addition, prudent speed limits would be observed to protect special status species. Geothermal well drilling would include the construction of reserve pits at each pad to contain drilling fluids; an injection pipeline relief pond would also be constructed. Reserve pits and the relief pond would present trapping hazards to wildlife. Larger animals would be protected through the fencing of each reserve pit. In addition, all pits and ponds would have escape ramps functional at reasonably anticipated water levels. In accordance with BLM's Gold Book standards (BLM 2007), three sides of the reserve pit would be fenced during drilling activities. The fourth side would be fenced upon completion of drilling. Pre-construction surveys for migratory birds and raptor nests would limit impacts for those special status species that are migratory birds (bald eagle, burrowing owl, ferruginous hawk). Based on the moderate (rather than high) occurrence potential and pre-construction surveys for migratory birds and raptor nests, human and activity impacts to the nine special status species would not affect the overall population health or viability of any species.

Effects on special status species would consist of those described in section 3.8.2 for common wildlife, as well as the more detailed impacts discussed in the following paragraphs.

Option A

Surface disturbance under Option A would cause a loss of some habitat for the nine special status species with a moderate occurrence potential. Surface disturbance would impact three of the five habitat types in the project area: pinyon-juniper woodland (83.4 acres), sagebrush steppe habitat (56.1 acres), and riparian (0.1 acre). The direct disturbance of 83.4 acres of the pinyon-juniper woodland habitat type would result in an approximately 0.5% loss of the 18,015.8 total acres of this habitat type within the analysis area; this would affect special status species, such as the bald eagle (winter only), ferruginous hawk, and spotted bat, that rely on it for food, forage, or cover. There would also be direct disturbance of 56.1 acres of the sagebrush steppe habitat type under Option A, which is approximately 0.7% of the available 8,490.4 acres of this habitat type in the analysis area. This would affect special status species such as the burrowing owl, ferruginous hawk, spotted bat, and greater sage-grouse. Direct disturbance to 0.1 acre of the riparian habitat type would result in an approximately 0.03% loss of the 339.6 total acres of this habitat type in the analysis area. Special status species relying on this habitat type include the spotted bat, Townsend's big-eared bat, bald eagle (winter only), big free-tailed bat (foraging only), fringed myotis (foraging only), and western toad (breeding). Based on the less than 0.8% habitat loss for each habitat type and the moderate (rather than high) occurrence potential, impacts to the nine special status species would not affect the overall population health or viability of any species.

Option B

Surface disturbance under Option B would also cause a loss of some habitat for the nine special status species with a moderate occurrence potential. Surface disturbance would impact three of the five habitat types in the project area: pinyon-juniper woodland (80.9 acres), sagebrush steppe habitat (56.1 acres), and riparian (0.1 acre). The direct disturbance of 80.9 acres of the pinyon-juniper woodland habitat type would result in an approximately 0.4% loss of the 18,015.8 total acres of this habitat type within the analysis area for special status species that rely on it for food, forage, or cover. This includes the bald eagle (winter only), ferruginous hawk, and spotted bat. The surface disturbance to sagebrush steppe and riparian habitats would be the same as described under Option A. Based on the less than 0.8% habitat loss for each habitat type and the moderate (rather than high) occurrence potential, impacts to the nine special status species would not affect the overall population health or viability of any species.

Option C

Surface disturbance under Option C would also cause a loss of some habitat for the nine special status species with a moderate occurrence potential. Surface disturbance would impact three of the five habitat types in the project area: pinyon-juniper woodland (56.0 acres), sagebrush steppe habitat (51.6 acres), and riparian (0.1 acre). The direct disturbance of 56.0 acres of the pinyon-juniper woodland habitat type would result in an approximately 0.3% loss of the 18,015.8 total acres of this habitat type within the analysis area for special status species that rely on it for food, forage, or cover. This includes the bald eagle (winter only), ferruginous hawk, and spotted bat. There would also be direct disturbance of 51.6 acres of the sagebrush steppe habitat type under Option C, which is approximately 0.6% of the available 8,490.4 acres of this habitat type in the analysis area. This would affect special status species such as the burrowing owl, ferruginous hawk, spotted bat, and greater sage-grouse. Surface disturbance to riparian habitat would be the same as described under Option A. Based on the less than 0.7% habitat loss for each habitat type and the moderate (rather than high) occurrence potential, impacts to the nine special status species would not affect the overall population health or viability of any species.

Option D

Surface disturbance under Option D would cause a loss of some habitat for the nine special status species with a moderate occurrence potential. Surface disturbance would impact three of the five habitat types in the project area: Pinyon-Juniper Woodland (55.8 acres), Sagebrush Steppe habitat (50.4 acres), and Riparian (0.1 acre). The direct disturbance of 55.8 acres of the Pinyon-Juniper Woodland habitat type would result in an approximately 0.3% loss of the 18,015.8 total acres of this habitat type within the analysis area for special status species that rely on it for food, forage, or cover. This includes the bald eagle (winter only), ferruginous hawk, and spotted bat. There would also be direct disturbance of 50.4 acres of the Sagebrush Steppe habitat type under Option D, which is approximately 0.6% of the available 8,490.4 acres of this habitat type in the analysis area. This would affect special status species such as the burrowing owl, ferruginous hawk, spotted bat, and greater sage-grouse. Surface disturbance to Riparian habitat would be the same as described under Option A. Based on the less than 0.7% habitat loss for each habitat type and the moderate (rather than high) occurrence potential, impacts to the nine special status species would not affect the overall population health or viability of any species.

Fishlake National Forest Management Indicator Species

The MIS species for the Fishlake National Forest consist of the northern goshawk, hairy woodpecker, western bluebird, mountain bluebird, MacGillivray's warbler, yellow warbler, Lincoln’s sparrow, song sparrow, Brewer’s sparrow, vesper sparrow, sage thrasher, aquatic macroinvertebrates, resident trout, elk, mule deer, the Bonneville cutthroat trout, and Rydberg’s milkvetch.

All of the MIS bird species are migratory; impacts from the Proposed Action on migratory birds are discussed in section 3.7.2. Impacts from the Proposed Action on elk and mule deer are described in Section 3.7.2. Potential effects to aquatic macroinvertebrates, Bonneville cutthroat trout, and Rydberg’s milkvetch are discussed below.

As discussed in section 3.5.1.1, Cove Creek is the only perennial stream in the project area (intersecting the project area for 1.8 miles). Cove Creek becomes primarily or entirely ephemeral after exiting the project area (see section 3.5.1.1). An additional 9.3 miles of intermittent streams, one 0.6-acre pond, and one spring or seep are also present in the project area. These areas have the potential to be habitat for aquatic macroinvertebrates and possibly resident trout. Impacts to surface water from the Proposed Action include a slight increase in surface water runoff volume during excavation for facilities and during construction of roads and well pads, and a potential for increased sediment discharge to streams (see the Surface Water subsection of section 3.5.2.1). Increased sediment discharge would have the most potential to impact aquatic macroinvertebrates and any resident trout. Project activities are expected to cross intermittent streams 23 times and Cove Creek once. To prevent excess sediment from discharging to these streams, a SWPPP and associated notice of intent will be filed with the Utah Division of Water Quality and implemented for all well pads and access roads associated with the project. Further prevention of sediment discharge to streams would be achieved through final soil stabilization. These preventative measures would likely limit impacts to aquatic macroinvertebrates and any resident trout.

In the Southern Bonneville Geographic Unit’s Beaver River drainage (the location of the project area), the Bonneville cutthroat trout occupied 16.1–18.6 miles of habitat (almost 95% of the estimated suitable stream habitat in the drainage). Cove Creek was not listed as potential or occupied habitat. Based on this information and the preventative measures discussed above to limit impacts to surface waters, the Proposed Action is not likely to impact the Bonneville cutthroat trout.

Based on the project area’s elevation range of 5,988–6,657 feet, the Rydberg’s milkvetch is not likely to be present in the project area, and therefore would not be impacted by the Proposed Action.

In general, implementation of the required and recommended actions discussed in the Resource Assessment would reduce impacts to special status species and MIS (SWCA 2015b). In addition, revegetation of disturbed areas with an agency-approved mixture of compatible grasses, forbs, shrubs, and trees would also reduce impacts. Seed mixes would contain an agency-approved diverse mixture of species to control erosion and to provide forage for wildlife species.

3.8.2.2. NO ACTION ALTERNATIVE

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed Cove Fort II disturbances would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed. If lease development occurs, associated impacts to special status species could occur that are similar to or greater than the Proposed Action. No new impacts to special status species would occur in the project area from the Proposed Action.

3.9. Livestock Grazing

3.9.1. Affected Environment

The analysis area for livestock grazing consists of the two grazing allotments intersected by the project area. These grazing allotments are the Pine Creek/Indian Creek Allotment and the Pine Creek-Sulphur Allotment. On BLM lands, the project would be within the Pine Creek/Indian Creek Allotment. The portions of the project on USFS-administered lands would be within the Pine Creek-Sulphur Allotment. Details on allotment size and ownership, number of animal unit months (AUMs), season of use, kind of livestock, and number of permittees for each of the allotments are provided in Table 3.18. Figure 3.11 provides the location of the two grazing allotments intersected by the project area. Cattle generally graze on the BLM allotment at lower elevations and then move east onto the USFS allotment during the summer months.

Table 3.18. Livestock Grazing Allotments Intersected by the Project Area

Allotment	Size (acres)	Number of Permittees	Season of Use	Kind of Livestock	Total AUMs
Pine Creek/Indian Creek	10,123 BLM 45 state 2,538 private **12,706 Total**	4	May 16–June 15	Cattle	135
Pine Creek-Sulphur	29,892 USFS 321 private **30,213 Total**	5	June 16–September 30	Cattle	2,796

Source: Hamilton (2015).

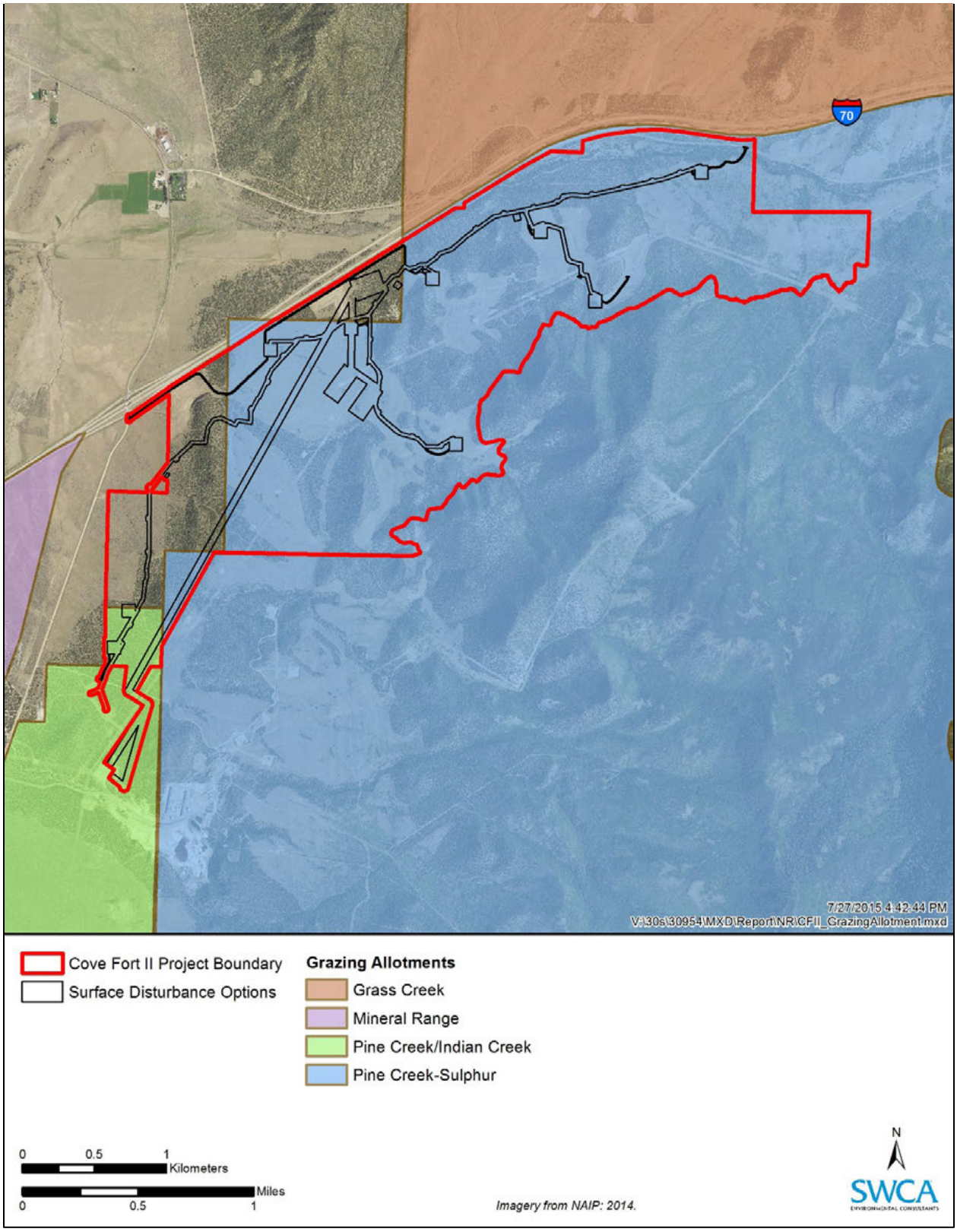

Figure 3.11. Livestock grazing allotments intersected by the project area.

3.9.2. Environmental Consequences

The analysis area for livestock grazing is the Pine Creek/Indian Creek Allotment and the Pine Creek-Sulphur Allotment, which contain 42,919.0 acres combined. This analysis area was chosen because impacts to livestock grazing from the project would occur entirely within this area (see section 3.9 [Livestock Grazing] for a complete description of the analysis area). There are approximately 72.3 acres of the Pine Creek/Indian Creek Allotment in the project area, and approximately 1,458.6 acres of the Pine Creek-Sulphur Allotment in the project area. Impacts to livestock grazing were analyzed with the following indicators:

- Acres of surface disturbance in the grazing allotments as a percentage of the total acres available in the allotments, as well as the
- Potential impacts to AUMs resulting from the acres disturbed by the project to specific land cover types as a percentage of total acres of each these land cover types in the analysis area

The potential for the spread of invasive and non-native species was addressed more qualitatively, using a 300-foot buffer around the project footprint that represents the area of potential impacts.

3.9.2.1. PROPOSED ACTION

Cattle would avoid areas of surface disturbance during construction of the power plant, substation, transmission line, geothermal fluid pipelines, and ancillary facilities. Because the season of use of each allotment is from 1 to 3.5 months, interaction of the project construction and drilling with cattle would be minimal because portions of the project would be built during the months that grazing is not occurring. Long-term loss of grazing would be limited to the sites occupied by project structures for the life of the project. This long-term loss would vary among the different transmission line options. The sections below provide a more detailed description of the varying acreages of long-term impacts to acres available to grazing among the different transmission line options. No reductions in grazing (AUMs) would be necessary under any of the transmission line options.

Under all transmission line options, surface pipelines could be a barrier to movement of cattle and could interfere with use of the affected allotments. Pipelines could also block livestock access to water. BLM experience with cattle grazing near the Blundell geothermal plant (Mineral Mountains, Beaver County) shows that cattle will graze around pipelines if under- or over-passes are provided. Enel has committed to install wildlife crossings at key points along the pipeline if such mitigation is considered important for local wildlife and cattle. This would reduce fragmentation of range and minimize effects to grazing cattle. Maintenance and operational vehicles could collide with livestock. Because project-related vehicles would travel at 30 miles per hour or less, and because cattle are on the affected lands for only 1 to 3.5 months per year, the number of cattle hit by vehicles would likely be few.

Option A

Under Option A, approximately 24.6 acres of the Pine Creek/Indian Creek Allotment and 81.6 acres of the Pine Creek-Sulphur Allotment would be affected by surface disturbance caused by construction activities. Therefore, there would be a total of 106.3 acres of surface disturbance in the two grazing allotments. This represents 0.2% of the grazing analysis area. Most of the surface disturbance would be permanent. However, a portion of the surface disturbance caused by the gathering system would be a temporary disturbance associated with pipeline construction and would be reclaimed. Much of the surface disturbance caused by the transmission line would also be a temporary disturbance associated with construction. However, details about how many poles, what type of poles, and how much vegetation clearing would be needed are not known at this time.

Option B

Under Option B, approximately 22.1 acres of the Pine Creek/Indian Creek Allotment and 81.6 acres of the Pine Creek-Sulphur Allotment would be affected by surface disturbance caused by construction activities. Therefore, there would be a total of 103.7 acres of surface disturbance in grazing allotments. This represents 0.2% of the grazing analysis area.

Option C

Under Option C, approximately 9.1 acres of the Pine Creek/Indian Creek Allotment and 68.8 acres of the Pine Creek-Sulphur Allotment would be affected by surface disturbance caused by construction activities. Therefore, there would be a total of 77.9 acres of surface disturbance in grazing allotments. This represents 0.2% of the grazing analysis area.

Option D

Under Option D, approximately 9.1 acres of the Pine Creek/Indian Creek Allotment and 67.5 acres of the Pine Creek-Sulphur Allotment would be affected by surface disturbance caused by construction activities. Therefore, there would be a total of 76.7 acres of surface disturbance in grazing allotments. This represents 0.2% of the grazing analysis area.

3.9.2.2. NO ACTION ALTERNATIVE

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed Cove Fort II disturbances would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed. If lease development occurred, there could be associated impacts to livestock grazing that may be similar to or more than the Proposed Action. No new impacts to livestock grazing would occur in the project area from the Proposed Action.

3.10. Cultural Resources

3.10.1. Affected Environment

Cultural resources include archaeological resources, which are the material remains of past human activity. Archaeological resources can be either prehistoric or historic in age (i.e., dating to either before or after the time of Euro-American settlement), and they include artifacts (portable objects of human manufacture); features such as firepits, houses, and other types of structures; rock art; and archaeological sites where any of the above may be found. Cultural resources can also include other types of places that are important to the heritage of contemporary peoples (e.g., traditional cultural properties).

Cultural resources are protected primarily through the 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 are listed on or eligible for the NRHP. Such cultural resources are known as “historic properties.” Criteria for NRHP eligibility 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 the NRHP.

The project area for the Proposed Action is a block area that encompasses the proposed geothermal exploration wells, additional contingency wells, access roads, binary cycle geothermal power plant, geothermal fluid pipeline gathering system, and transmission line options (see Figure 2.1– 2.4). This project area is configured to account for direct effects to historic properties and represents the area of potential effect for cultural resources as defined through consultation pursuant to NHPA Section 106.

3.10.2. Previously Conducted Inventories and Recorded Sites

A records search indicates that at least 20 Class III cultural resource inventories that extend into the project area have been conducted. The goals of these inventories were to locate, record, and evaluate all cultural resources within their respective inventory areas and identify those cultural resources that are eligible for the NRHP (i.e., historic properties).

The most relevant previous inventories are large-scale inventories conducted in support of revegetation treatments (Leonard and Killpack 1982), prescribed burns (Jensen 2002), mining development (Nielson and Hall 1988), transmission lines (Yentsch et al. 2012), and the recent (2014) inventory for the Cove Fort II project (SWCA 2014a). These inventories, and other smaller inventories, cover a significant portion of the project area. An inventory of previously unsurveyed portions of the project area was conducted in 2015. The results of the 2015 inventory are as yet preliminary pending agency review, but they are presented in the following section.

From the previous inventories, 33 archaeological sites have been recorded in the project area. These sites include historic roads, a historic transmission line, and prehistoric sites that are mostly small to moderately sized lithic scatters. One historic road dates to before 1902, and the remaining historic roads and transmission line date to before 1962. Prehistoric sites with artifacts that can be dated to a time period are dated to the Archaic and Formative (Fremont) periods; however, most the prehistoric sites cannot be assigned to a specific time period. Artifacts identified at the prehistoric sites consist mainly of obsidian and chert lithic debitage, with projectile points, chipped stone tools, ground stone, and Fremont pottery fragments also present. Of the 33 archaeological sites previously recorded in the project area, 10 sites have been determined eligible for the NRHP (Table 3.19).

SWCA conducted an intensive-level Class III inventory in 2015 of portions of the project area outside of previously surveyed areas. Agency review of the report on this inventory is pending, but the preliminary results of the inventory are discussed here. The inventory resulted in the documentation of 14 sites. Eight previously recorded sites (42BE1179, 42BE2649, 42MD722, 42MD723, 42MD830, 42MD1425, 42MD2531, 42MD3767) were revisited, and updated documentation of these sites was prepared. Six newly identified sites (42MD3801–42MD3805, and 42MD3808) were also documented. Newly documented sites consist of small to moderately sized prehistoric lithic scatters. Of the six newly identified sites, two (42MD3801 and 42MD3805) are recommended eligible for the NRHP under Criterion D for their potential to contribute important information to the understanding of the prehistory of the area (see Table 3.19).

Table 3.19. NRHP-Eligible Sites in the Project Area

Site Number	NRHP Eligibility Criteria	Description	Time Period
42BE1179	A and D	Prehistoric campsite and historic artifact scatter	Archaic, Fremont
42MD1425	A and D	Road	Pre-1870 to Present
42BE2649*	D	Prehistoric lithic scatter	Unknown Prehistoric
42MD477	D	Prehistoric lithic scatter and historic artifact scatter/dump	Archaic
42MD719	D	Prehistoric lithic scatter	Paleoindian
42MD722	D	Prehistoric lithic scatter	Unknown Aboriginal
42MD723†	D	Prehistoric lithic scatter	Unknown Prehistoric
42MD2526	D	Prehistoric artifact scatter	Archaic
42MD2527	D	Prehistoric lithic scatter and historic artifact scatter/dump	Fremont, 1900–1960
42MD2529	D	Prehistoric lithic scatter	Unknown Prehistoric
42MD2531	D	Prehistoric artifact scatter and feature	Archaic, Fremont
42MD3801†	D	Prehistoric lithic scatter	Unknown Prehistoric
42MD3805†	D	Prehistoric lithic scatter and historic isolate	Archaic

*Site has been destroyed and is now recommended not eligible for the NRHP pending agency review and determination.

†Site is recommended eligible for the NRHP pending agency review and determination.

Sites 42BE1179 and 42BE2649 were included in the HPTP for the Cove Fort I project (Yentsch 2013), and 42BE1179 was also included in the HPTP for the Sigurd to Red Butte No. 2 345-kV transmission project (Yentsch et al. 2013). Results of these treatment efforts are as yet unreported. Based on field observations in 2015, the treatment proposed for these sites was implemented, and construction of the elements of Cove Fort I project and Sigurd to Red Butte transmission project within the sites is completed. Because of the impacts to these sites from mitigation efforts and project construction, 42BE2649 and the prehistoric component of 42BE1179 are recommended not eligible for the NRHP. The historic component of 42BE1179 is recommended to remain eligible for the NRHP under Criterion A.

Sites 42MD722, 42MD1425, and 42MD2531 were previously determined eligible for the NRHP, and SWCA recommends that the sites remain eligible. Site 42MD723 was previously determined not eligible for the NRHP; however, SWCA recommends this site as eligible. Site 42MD830 was previously determined not eligible for the NRHP; however, because SWCA did not re-locate the site and cannot confirm whether or not the site has been destroyed, SWCA cannot evaluate it for NRHP eligibility, and therefore the site remains not eligible. Site 42MD3767 was previously determined not eligible for the NRHP, and SWCA recommends that the site remain not eligible.

3.10.3. Environmental Consequences

Of the 39 archaeological sites identified in the project area, 13 were either determined or recommended as eligible for the NRHP (see Table 3.19). Six of the eligible sites are not located in the proposed disturbance corridor and would not be impacted by the proposed project. Two of the eligible sites (42BE1179 and 42MD1425) located in the disturbance corridor would not be adversely impacted by the

proposed project. Five sites (42MD722, 42MD723, 42MD2531, 42MD3801, and 42MD3805) are located in the disturbance corridor and could be affected by the proposed project. Details of the seven eligible sites in the disturbance corridor and potential effects are noted below.

Site 42BE1179 is a prehistoric campsite and historic artifact scatter that was previously determined eligible for the NRHP under Criteria A and D. The prehistoric component of the site was impacted by implementation of two HPTPs (Yentsch 2013; Yentsch et al. 2013) as well as the construction of the Cove Fort I project and the Sigurd to Red Butte No. 2 345-kV transmission project and is now recommended not eligible for the NRHP. The historic component of 42BE1179 was also impacted by previous mitigation efforts and project construction but retains integrity of location and association and is recommended to remain eligible for the NRHP under Criterion A. It is recommended that the Proposed Action would have no adverse impact on the historic component of 42BE1179.

Site 42MD1425 is a historic road that has been previously determined eligible for the NRHP under Criteria A and D. The site could be impacted by construction of an access road that would connect to the site. It is recommended that anticipated impacts to the site would not impact the characteristics of the sites that make it eligible for the NRHP; therefore, the Proposed Action would not adversely affect 42MD1425.

Site 42MD722 is a large (56.02 acres) prehistoric lithic scatter that would be impacted by construction of the gathering system and adjacent access road. The gathering system disturbance corridor would be 100 feet wide and would represent both permanent and temporary surface disturbance. The access road disturbance corridor would be 30 feet wide and would be immediately adjacent to the gathering system within the site boundary. The gathering system would result in 3.83 acres of surface disturbance, and the access road would result in 1.78 acres of surface disturbance in the site boundary.

Site 42MD723 is a small (1.5 acres) prehistoric lithic scatter that would be impacted by construction of the gathering system and adjacent access road. The gathering system disturbance corridor would be 100 feet wide and would represent both permanent and temporary surface disturbance. The access road disturbance corridor would be 30 feet wide and would be immediately adjacent to the gathering system within the site boundary. The gathering system would result in 0.43 acre of surface disturbance, and the access road would result in 0.25 acre of surface disturbance in the site boundary.

Site 42MD2531 is a very large (190.21 acres) prehistoric artifact scatter that would be impacted by construction of the gathering system, access road, and relief pond. The gathering system would result in 4.73 acres of surface disturbance, the access road would result in 1.49 acres of surface disturbance, and the relief pond would result in 0.16 acre of surface disturbance within the site boundary.

Site 42MD3805 is a moderately sized (13.70 acres) lithic scatter that would be impacted by construction of the gathering system, access road, and plant site. The gathering system would result in 2.73 acres of surface disturbance in the site boundary. The access road would tie into an existing county road in the site boundary, resulting in 0.04 acre of surface disturbance. The plant site would result in 4.61 acres of surface disturbance within the site boundary.

3.10.3.1. OPTION A

The transmission line route within the transmission line study corridor for Options A and B is undetermined. In addition to the Proposed Action impacts just discussed, construction of Option A would impact 42MD2531 and potentially impact 42MD3801. The entire width of the study corridor is within the site boundary of 42MD2531. Impacts to 42MD2531 would result in approximately 8 acres of surface disturbance within a 150-foot corridor through the site.

Site 42MD3801 is a small (0.68 acre) prehistoric lithic scatter that could be impacted by construction of the transmission line and associated access road, depending on the placement of the transmission line within the study corridor. The site could be avoided if the transmission line corridor is placed outside of the site boundary. If the site is not avoided, the transmission line could result in up to 0.61 acre of surface disturbance in the site boundary.

3.10.3.2. OPTION B

The impacts of the transmission line Option B would be the same as those described for Option A.

3.10.3.3. OPTION C

Construction of Option C and its associated substation would not impact any NRHP-eligible sites.

3.10.3.4. OPTION D

Construction of Option D and its associated substation would not impact any NRHP-eligible sites.

3.10.3.5. SUMMARY

BLM Cedar City FO has determined that the Proposed Action would adversely impact 42MD722 and 42MD2531, and these sites would require additional archaeological mitigation. Based on the results of the 2015 inventory, it is recommended that the proposed project would adversely impact 42MD3805 and potentially adversely impact 42MD3801 and 42MD723, and these sites would also require additional archaeological mitigation. A HPTP has been developed to mitigate potential adverse effects to these five sites. The HPTP is included in Appendix E. Treatment measures include site mapping and documentation, archaeological testing and possible block excavation in the disturbance corridor, artifact collection, and interpretation of treatment results as they apply to research questions developed for prehistoric sites in the area.

Therefore, pending agency review of the 2015 inventory, this undertaking would have an adverse effect on at least three sites (42MD722, 42MD2531, and 42MD3805), with potential for an adverse effect on two additional sites (42MD723 and 42MD3801). Mitigation for these sites and any other adversely affected sites would take place before the BLM issues a notice to proceed for construction of the Proposed Action.

Protection measures for all historic properties in the project area would include identifying allowable travel areas; identifying areas to be avoided during construction, maintenance, and operation; and preventing site looting through periodic monitoring by the BLM and Enel and through environmental training provided to all project employees. All of these measures would be used to prevent adverse effects to known or unknown historic properties.

3.10.4. No Action Alternative

Under the No Action Alternative, the existing Cove Fort I geothermal plant and associated facilities would continue to operate. The proposed Cove Fort II disturbances would not be allowed to occur on BLM and USFS lands. Development could still occur due to lease rights, but locations or stipulations could be changed. If lease development occurs, associated impacts to cultural resources could occur that are similar to or greater than the Proposed Action. The six eligible cultural resource sites in the project area would not be adversely affected by the proposed project, and mitigation would not be required.

CHAPTER 4. CUMULATIVE IMPACTS ANALYSIS

4.1. Introduction

As defined in 40 CFR 1508.7 (CEQ regulations for implementing NEPA), a *cumulative impact* is an impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions (RFFAs), regardless of which agency (federal or non-federal) or person undertakes such actions. Cumulative impacts may result from individually minor but collectively significant actions occurring over a period of time.

4.2. Analysis Areas

The geographic extent of cumulative impacts may vary by the type of resource and resource issues and by the type of potential impact. The timeframes, or temporal boundaries, for those impacts may also vary by resource and resource issue. Spatial and temporal cumulative impact analysis areas (CIAAs) have been developed for each resource and are listed in Table 4.1. The temporal boundary was chosen because it is a reasonable timeframe within which to predict RFFAs.

Table 4.1. Cumulative Impacts Analysis Areas by Resource

Resource	CIAA	Rationale	Total CIAA Acreage	Temporal Boundary
Air quality and climate change	Millard and Beaver Counties	This CIAA was chosen because county boundaries are typically spatial boundaries used to determine compliance with NAAQS.	6,018,560	20–30 years
Soils	Bear Canyon and Sulphur Creek subwatersheds	This CIAA was chosen because the project area falls within both subwatersheds and they provide clear topographical boundaries against which to measure cumulative impacts to soils.	43,107	20–30 years
Water Resources	Bear Canyon and Sulphur Creek subwatersheds	This CIAA was chosen because these subwatersheds represent a hydrologic system boundary for all surface water in the project area.	43,107	20–30 years
Vegetation	Bear Canyon and Sulphur Creek subwatersheds	This CIAA was chosen because the project area falls within both subwatersheds and they provide clear topographical boundaries against which to measure cumulative impacts to vegetation.	43,107	20–30 years
Wildlife	Bear Canyon and Sulphur Creek subwatersheds	This analysis area was chosen because the subwatersheds represent a defined continuous area linked by common watercourses on which wildlife depend.	43,107	20–30 years
Big game: mule deer	Crucial winter habitat in the Bear Canyon and Sulphur Creek subwatersheds	This CIAA was chosen because these types of habitats are essential to the health of the big game populations, and subwatersheds represent a defined continuous area linked by common watercourses on which big game depend.	31,720	20–30 years

Table 4.1. Cumulative Impacts Analysis Areas by Resource

Resource	CIAA	Rationale	Total CIAA Acreage	Temporal Boundary
Big game: Rocky Mountain elk	Substantial winter habitat in the Bear Canyon and Sulphur Creek subwatersheds	This CIAA was chosen because these types of habitats are essential to the health of the big game populations, and subwatersheds represent a defined continuous area linked by common watercourses on which big game depend.	21,796	20–30 years
Black bear	Substantial year-long habitat in the Bear Canyon and Sulphur Creek subwatersheds	This CIAA was chosen because these types of habitats are essential to the health of bear populations, and subwatersheds represent a defined continuous area linked by common watercourses on which bear depend.	33,005	20–30 years
Special Status Species	Bear Canyon and Sulphur Creek subwatersheds	This analysis area was chosen because the subwatersheds represent a defined continuous area linked by common watercourses on which special status species depend.	43,107	20–30 years
Livestock grazing	Pine Creek/Indian Creek and Pine Creek-Sulphur grazing Allotments	This CIAA was chosen because the project area falls within both allotments and it represents continuous livestock grazing management areas.	1,531	20–30 years
Cultural resources	Bear Canyon and Sulphur Creek subwatersheds	Much of human cultural and behavioral variation is conditioned by the natural environment. Accordingly, archaeological, historical, and cultural sites within a defined natural habitat are often the product of a singular settlement system. This CIAA was chosen because it is a defined natural habitat, and impacts to cultural resources in one part of that habitat can affect a broader understanding of the interrelationships between sites in the habitat area as a whole.	43,107	20-30 years

4.3. Past, Present, and Reasonably Foreseeable Future Actions

4.3.1. Past and Present Actions Summary

Past and present actions within the air quality CIAA generally include the development of facilities such as cement and lime plants, a power plant, compressor stations, a feed mill, a dairy processing plant, a quarry, a mine, and a crushing and screening operation. In addition, the development of small cities such as Beaver, Delta, and Fillmore has occurred, along with associated housing, support systems, and infrastructure. Other development within the CIAAs includes the existing Cove Fort I project, transmission lines, roadways (including I-15 and I-70), industrial development, and agricultural development.

4.3.2. Reasonably Foreseeable Future Actions Summary

RFFAs are decisions, funding, or formal proposals that are either existing or are highly probable, based on known opportunities or trends. Known RFFAs occurring in the CIAAs on BLM and USFS lands include a variety of vegetation management and restoration projects, Energy Gateway South and Transwest Express transmission line construction, two generation tie line construction projects, greater sage-grouse management activities, the Indian Creek Fuels Reduction Project, burial of an overhead power line (Fishlake Basin), guzzler maintenance, one proposed oil and gas exploration project, reopening of a gravel pit, mining expansion and development, and road work.

4.4. Cumulative Effects by Resource

Cumulative impacts organized by resource issue category are described below.

4.4.1. Air Quality

Past and present actions in the air quality and climate change CIAAs are described in section 4.3.1. Most past and present action emissions (that are still occurring) come from the point sources described in section 3.3.1 (e.g., Intermountain Generation Station, Fillmore Compressor Station, Circle Four Farms Feedmill, and Milford Quarry) and from Cove Fort I. Some emissions also occur from small cities, residences, mobile vehicles on roads, wildfires, non-road mobile sources such as locomotives, and agricultural burning in the CIAAs.

RFFAs in the air quality and climate change CIAAs are described in section 4.3.2. Most RFFA emissions are expected to come from projects that impact vegetation, including prescribed burning and transmission line construction.

The Proposed Action would add cumulatively to the air pollutant emissions in the air quality CIAA through emissions of fugitive dust, criteria and HAP pollutants, and volatile organic compounds. Emissions from construction activities (e.g., fugitive dust from surface disturbance, combustion emissions, hydrogen sulfide emissions from well drilling and testing) would be temporary and localized. Emissions from geothermal plant operations would not exceed NAAQS, would be permitted through a DAQ approval order, and would be small in comparison to the total emissions occurring in the air quality CIAA (generally less than a 0.4% increase; see Table 3.2). Over the long-term, the Proposed Action could contribute to a positive cumulative impact on air quality by reducing the need for electrical generation from fossil fuels such as coal, oil, and natural gas.

With regard to climate change, the Proposed Action would add to current GHG emissions. However, GHG emissions from the Proposed Action would be offset by the reduction in GHG emissions from the use of geothermal fluids rather than fossil fuels for power generation.

4.4.2. Geology and Soils

The CIAA for geology and soils is the Bear Canyon and Sulphur Creek subwatersheds, because the project area falls within both subwatersheds and they provide clear topographical boundaries against which to measure cumulative impacts to geology and soils. Past and ongoing surface disturbance in the geology and soils CIAA includes the existing Cove Fort I project, transmission lines, roadways (I-15 and I-70), industrial development, and agricultural development.

Geothermal energy exploration, development, and utilization would have minor cumulative impacts on geology (by induced seismicity) and soil (by compaction and erosion) when combined with other development projects and land uses such as livestock grazing. The Proposed Action would disturb a maximum of 137.2 acres of soils in the CIAA.

Cumulative impacts in the CIAA from development outside of the project area include 859.1 acres of developed land cover and 1,470.3 acres of agricultural land. Both of these land cover types impact soils through compaction, erosion, and top soil degradation. This past and present surface disturbance affecting soils totals approximately 2,329.4 acres, which represents 5.4% of the geology and soils CIAA.

Stipulations that limit placement of projects in steeply sloped areas and other measures that address stormwater runoff and fugitive dust, reclamation, and revegetation would limit cumulative erosion-related impacts. The probability for successful reclamation in the project area is high, and there would not be a long-term cumulative loss of soil productivity. Removal of mature pinyon and juniper trees on disturbed areas and establishment of grasses, forbs, and shrubs would reduce overland flow of water and soil erosion in the CIAA.

4.4.3. Water Resources

The CIAA for water resources is the two HUC12 subwatersheds that intersect the Project Area (Bear Canyon and Sulphur Creek). This analysis area was chosen because these subwatersheds represent a hydrologic system boundary for all surface water in the project area. This analysis area is also extensive enough to capture potential impacts to groundwater resources, which are much more heterogeneous in spatial extent than surface water resources. Past and ongoing water resources disturbance in the water resources CIAA includes the existing Cove Fort I project, transmission lines, roadways (I-15 and I-70), industrial development, and agricultural development.

Cumulative impacts in the CIAA from development outside of the project area include 859.1 acres of developed land cover and 1,470.3 acres of agricultural land. Both of these land cover types impact surface water resources through increased surface and sediment runoff, changes to water chemistry from increased fertilizer-derived nutrient loads and increased loads of metals, oils and grease, and other anthropogenically derived surface water contaminants. Groundwater and surface water are also affected by these land covers through withdrawals and consumptive use. This past and present disturbance likely has greater impacts affecting water resources (especially surface water resources) than the current Proposed Action based on the total acreages of disturbance (i.e., 2,329.4 acres of past and present impacts versus 137.2 acres from the Proposed Action).

With implementation of committed and required measures, the risk of impacts to surface water or groundwater quality from the Proposed Action would be minimal. Perennial surface water would not be affected. There are no known aquifers above the geothermal reservoir in the proposed well field, and with required drilling measures, there would be no impact on groundwater quality if unknown aquifers are present.

Well testing (also known as flow testing) would require the consumption of relatively small amounts of geothermal fluids. Over all, the use of up to 215 acre-feet of geothermal fluids for flow testing would be a negligible withdrawal as compared with the likely overall geothermal reservoir, which is one of the largest geothermal anomalies in the western United States, extending approximately 18 square miles (Rowley et al. 2013). New major water-consumptive industries are not anticipated near the project area in the foreseeable future. Therefore, there would be no noticeable net loss in available water.

The Proposed Action could result in a minor drawdown of the Cove Fort-Sulphurdale geothermal reservoir during well drilling and testing of the project. No other present or RFFA projects would use this reservoir; therefore, there would be no incremental impacts on the reservoir.

There would be no cumulative depletion of geothermal water because the closed-system geothermal power plant would be air cooled, and geothermal water would not be directly consumed, except for incidental losses, during operation.

4.4.4. Vegetation

The CIAA for vegetation is the Bear Canyon and Sulphur Creek subwatersheds, because the project area falls within both subwatersheds, and they provide clear topographical boundaries against which to measure cumulative impacts to vegetation. Past and ongoing surface disturbance in the vegetation CIAA includes the existing Cove Fort I project, transmission lines, roadways (I-15 and I-70), industrial development, and agricultural development. There are 859.1 acres of the vegetation CIAA identified as Developed, Medium – High Intensity or Developed, Open Space – Low Intensity land cover types. There are also 1,470.3 acres of the vegetation CIAA identified as Agriculture land cover type. This past and present surface disturbance affecting vegetation totals approximately 2,329.4 acres, which represents 5.4% of the vegetation CIAA. RFFAs in the vegetation CIAA that would likely affect vegetation include greater sage-grouse management activities undertaken by the BLM and the USFS. The Indian Creek Fuels Reduction Project would also occur in and near the vegetation CIAA. However, specific acreages and locations of vegetation treatments and other surface disturbance related to sage-grouse management and Indian Creek Fuels Reduction Project activities are not known at this time. The vegetation treatment and prescribed burning activities associated with these projects would generally result in a reduction in the risk to vegetation from wildland fires, the removal of pinyon-juniper in areas of encroachment, and the restoration of sagebrush-related land cover types.

The Proposed Action would add cumulatively to the approximately 2,329.4 acres of surface disturbance from past, present, and RFFAs described in sections 4.3.1 and 4.3.2. Surface disturbance from the Proposed Action would add cumulatively to impacts in the CIAA through vegetation removal and the potential to spread noxious weeds. Table 4.2 provides the acres of cumulative surface disturbance to vegetation under each transmission line option.

Table 4.2. Acres of Cumulative Disturbance to Vegetation under Transmission Line Options

Transmission Line Option	Acres Disturbed	% Increase from Acres Disturbed by Past, Present, and RFFAs in CIAA
Option A	139.7	6.0%
Option B	137.2	5.9%
Option C	107.8	4.6%
Option D	106.5	4.6%

4.4.5. Wildlife

The wildlife CIAA is the Bear Canyon and Sulphur Creek subwatersheds. Past, present, and RFFA activities could adversely affect wildlife habitat, contribute to wildlife fragmentation, disrupt seasonal patterns or migration routes, displace individual wildlife species, increase collisions between wildlife and vehicles, and potentially impact the health of individual animals through stress. These impacts could affect all wildlife, including big game and migratory birds.

Traffic, noise, and increased human activity in the project area during construction activities would create a short-term cumulative impact on wildlife in the wildlife CIAA. A long-term cumulative impact would also be created by the presence of human activity and noise associated with the completed geothermal plant and a permanent loss of habitat. The severity of the cumulative impacts would depend on factors such as the sensitivity of the species affected, seasonal intensity of use, type of project activity, and physical parameters (e.g., topography, forage, and cover availability).

There are 1,470.3 acres of Agriculture land cover type, 473.0 acres of Developed, Medium – High Intensity land cover type, and 301.8 acres of Developed, Open Space – Low Intensity land cover type in mule deer crucial winter habitat in the wildlife CIAA. Therefore, there is a total of approximately 2,245.1 acres of surface disturbance in mule deer crucial winter habitat in the CIAA from past and present actions. In Rocky Mountain elk substantial winter habitat in the wildlife CIAA, there are 344.5 acres of Agriculture land cover type, 405.6 acres of Developed, Medium – High Intensity land cover type, and 291.1 acres of Developed, Open Space – Low Intensity land cover type. This is a total of approximately 1,041.2 acres of surface disturbance in Rocky Mountain elk habitat in the CIAA from past and present actions. Likewise, there are 404.9 acres of Agriculture land cover type, 258.9 acres of Developed, Medium – High Intensity land cover type, and 48.0 acres of Developed, Open Space – Low Intensity land cover type in black bear substantial year-long habitat in the wildlife CIAA. This is a total of approximately 711.8 acres of surface disturbance in black bear substantial year-long habitat in the CIAA from past and present activities. There are no agriculture or developed land cover types in the black bear crucial year-long habitat in the project area; therefore, this type of habitat is not included in the following analysis.

RFFAs in the vegetation CIAA that would likely affect wildlife habitat include greater sage-grouse management activities undertaken by the BLM and the USFS. The Indian Creek Fuels Reduction Project would also occur in and near the wildlife CIAA. However, specific acreages and locations of vegetation treatments and other surface disturbance related to sage-grouse management and Indian Creek Fuels Reduction Project activities are not known at this time.

Changes to habitat and habitat loss can be estimated through quantities of surface disturbance. Tables 4.3–4.6 provide the acres of cumulative disturbance to wildlife habitat under the Proposed Action with each transmission line option. The percentage addition to surface disturbance in mule deer crucial winter habitat caused by past, present, and RFFAs ranges from 4.7% to 6.2%. The total acres of mule deer crucial winter habitat impacted by the Proposed Action and past, present, and RFFAs combined would range from 7.4% to 7.5% of the total acres of the habitat type in the wildlife CIAA.

The percentage addition to surface disturbance in Rocky Mountain elk substantial winter habitat caused by past, present, and RFFAs ranges from 10.2% to 13.4% among the options. The total acres of Rocky Mountain elk substantial winter habitat impacted by the Proposed Action and past, present, and RFFAs combined would range from 5.3% to 5.4% of the total acres of the habitat type in the wildlife CIAA.

The percentage addition to surface disturbance in black bear substantial year-long habitat caused by past, present, and RFFAs would be 3.7% for all the options. The total acres of black bear substantial year-long

habitat impacted by the Proposed Action and past, present, and RFFAs combined would be 2.2% of the total acres of the habitat type in the wildlife CIAA. The 5.7 acres of disturbance in black bear crucial year-long habitat would be new disturbance for all transmission line options because there are currently no disturbed land cover types in this habitat type. The disturbance of 5.7 acres of black bear crucial year-long habitat represents 0.4% of the total acres of this habitat type in the wildlife CIAA.

Table 4.3. Acres of Cumulative Disturbance to Wildlife Habitat under the Proposed Action, Option A

Habitat Type	Acres of Disturbance from the Proposed Action, Option A	Acres of Disturbance from Past, Present, and RFFAs	% Addition to Acres Disturbed by Past, Present, and RFFAs in CIAA
Mule deer crucial winter	139.7	2,245.1	6.2%
Rocky Mountain elk substantial winter	139.7	1,041.2	13.4%
Black bear substantial year-long	26.5	711.8	3.7%

Table 4.4. Acres of Cumulative Disturbance to Wildlife Habitat under the Proposed Action, Option B

Habitat Type	Acres of Disturbance from the Proposed Action, Option B	Acres of Disturbance from Past, Present, and RFFAs	% Addition to Acres Disturbed by Past, Present, and RFFAs in CIAA
Mule deer crucial winter	137.2	2,245.1	6.1%
Rocky Mountain elk substantial winter	137.2	1,041.2	13.2%
Black bear substantial year-long	26.5	711.8	3.7%

Table 4.5. Acres of Cumulative Disturbance to Wildlife Habitat under the Proposed Action, Option C

Habitat Type	Acres of Disturbance from the Proposed Action, Option C	Acres of Disturbance from Past, Present, and RFFAs	% Addition to Acres Disturbed by Past, Present, and RFFAs in CIAA
Mule deer crucial winter	107.8	2,245.1	4.8%
Rocky Mountain elk substantial winter	107.8	1,041.2	10.4%
Black bear substantial year-long	26.5	711.8	3.7%

Table 4.6. Acres of Cumulative Disturbance to Wildlife Habitat under the Proposed Action, Option D

Habitat Type	Acres of Disturbance from the Proposed Action, Option D	Acres of Disturbance from Past, Present, and RFFAs	% Addition to Acres Disturbed by Past, Present, and RFFAs in CIAA
Mule deer crucial winter	106.5	2,245.1	4.7%
Rocky Mountain elk substantial winter	106.5	1,041.2	10.2%
Black bear substantial year-long	26.5	711.8	3.7%

4.4.6. Special Status Species (including management indicator species)

The special status species CIAA is the Bear Canyon and Sulphur Creek subwatersheds. Past, present, and RFFA activities would adversely affect special status species habitat, contribute to wildlife fragmentation, disrupt seasonal patterns or migration routes, displace individual species, increase collisions between wildlife and vehicles, and potentially impact the health of individual animals through stress. These impacts could affect all special status species.

Cumulative impacts to special status species would generally be the same as those described in section 4.4.5. However, special status species would be more susceptible to impacts because of their sensitivity to disturbance, declining population numbers, and ongoing habitat losses.

There are 1,470.3 acres of Agriculture land cover type, 557.2 acres of Developed, Medium – High Intensity land cover type, and 301.8 acres of Developed, Open Space – Low Intensity land cover type in in the special status species CIAA. Therefore, there is a total of approximately 2,329.3 acres of surface disturbance from past and present actions in the CIAA. RFFAs in the vegetation CIAA that would likely affect special status species habitat include greater sage-grouse management activities undertaken by the BLM and the USFS. The Indian Creek Fuels Reduction Project would also occur in and near the special status species CIAA. However, specific acreages and locations of vegetation treatments and other surface disturbance related to sage-grouse management and Indian Creek Fuels Reduction Project activities are not known at this time.

Surface disturbance under the Proposed Action would consist of approximately 106.5–139.7 acres (depending on the transmission line option), which is 0.2%–0.3% of the CIAA. This constitutes a 4.6%–6.0% addition to the 2,329.3 acres of past and present surface disturbance in the special status species CIAA.

4.4.7. Livestock Grazing

The CIAA for livestock grazing consists of the two grazing allotments intersected by the project area. These grazing allotments are the Pine Creek/Indian Creek Allotment and the Pine Creek-Sulphur Allotment. There are 36.7 acres of Developed, Open Space – Low Intensity land cover type in the Pine Creek/Indian Creek Allotment, and 72.0 acres of this land cover type in the Pine Creek-Sulphur Allotment. There are 80.8 acres of Developed, Medium – High Intensity in the Pine Creek-Sulphur Allotment. There are also 13.5 acres and 3.0 acres of Agriculture land cover type in the Pine Cree/Indian Creek and Pine Creek-Sulphur Allotments, respectively. Therefore, there are approximately 206.0 acres of surface disturbance from past and present land use in the grazing CIAA. RFFAs in the grazing CIAA that could affect forage for grazing include greater sage-grouse management activities undertaken by the BLM and the USFS. The Indian Creek Fuels Reduction Project would also occur in and near the grazing CIAA. However, specific acreages and locations of vegetation treatments and other surface disturbance related to sage-grouse management and Indian Creek Project activities are not known at this time.

4.4.8. Cultural Resources

Disturbances from geothermal drilling and utilization, combined with the proposed vegetation treatment, could uncover or destroy cultural resources. However, the proposed stipulations and mitigation measures addressing cultural resources would limit the potential impacts. Known historic properties in the project area would be mitigated for adverse effects or avoided. Known historic properties avoided by the Proposed Action that cannot be avoided by future projects could be mitigated for adverse effects through recovery of the data that contributes to the site's eligibility.

Reasonably foreseeable projects identified at this time on lands managed by BLM Cedar City FO and Fishlake National Forest include transmission power line development, vegetation restoration and management, and mining development. The historic properties in the project area do not have characteristics that would be sensitive to indirect effects from reasonably foreseeable projects in the region. Therefore, there would be only a small incremental impact to cultural resources from the Proposed Action.

CHAPTER 5. CONSULTATION AND COORDINATION

5.1. Introduction

This chapter provides information on the consultation and coordination that occurred during the NEPA process. The results of consultation efforts are described in section 5.2.

5.2. Persons, Groups, and Agencies Consulted

The BLM conducted internal scoping on the Proposed Action and completed an ID team checklist in consultation with USFS specialists on April 25, 2015. The proposed project was posted to the ENBB on February 12, 2015. A public notice was published in the *Richfield Reaper* on February 25, 2015. A scoping letter was mailed to the Fishlake National Forest's mailing list on March 5, 2015. Comment letters were received from the entities listed in Table 5.1.

Table 5.1. Persons, Agencies, and Organizations Consulted

Name	Purpose & Authorities for Consultation and Coordination	Findings & Conclusions
Paiute Indian Tribe of Utah	Consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1996) and Section 106 of the NHPA of 1966 (36 CFR 800)	The Paiute Tribe requested that the BLM create a provision that protects geothermal resources beneath the Kanosh Band Indian Reservation from drainage by the proposed geothermal development, or require an agreement between Enel and the Kanosh Band for possible cooperative plan of development and shared royalty payments. The Paiute Tribe also requested that the BLM ensure that cultural resources encountered during the proposed project are protected in place and left undisturbed. The Paiute Tribe also requested that the BLM require the developer to employ a tribal monitor during all construction involving land disturbance to protect cultural resources. Consultation with the Paiute Tribe took place on 4/7/2015. If it is not possible to avoid all cultural resources, the tribe would like to be consulted during the development of the HPTP.
Hopi Tribe	Consultation as required by the American Indian Religious Freedom Act of 1978 (42 USC 1996) and Section 106 of the NHPA of 1966 (36 CFR 800)	The Hopi Tribe requested that the BLM and USFS provide the Hopi Tribe with copies of the preliminary cultural survey, draft EA, and any proposed treatment plans for review and comment.
Utah State Historic Preservation Office (SHPO)	Consultation for undertakings as required by 54 USC 302105.	Consultation with the SHPO is ongoing.

Table 5.1. Persons, Agencies, and Organizations Consulted

Name	Purpose & Authorities for Consultation and Coordination	Findings & Conclusions
Utah Public Lands Policy Coordinating Office (PLPCO)	Informal consultation with PLPCO as the agency that coordinates responses to land management decisions in the state on behalf of state land management agencies.	PLPCO requested that the BLM prohibit any project construction/development from December 1 to April 15 to protect crucial winter habitat for mule deer. PLPCO also requested that BLM and USFS should require off-site compensatory mitigation at a ratio of 4 acres restored to every 1 acre disturbed for any unavoidable and long-term surface impacts to crucial wildlife habitats. Mitigation alternatives could include habitat restoration, prescribed fire, or other compensatory mitigation arrangements identified to improve access or conserve important wildlife habitat values.

5.3. List of Preparers

Tables 5-2, 5-3, and 5-4 identify BLM and USFS staff and consultants used in the preparation of the EA.

Table 5.2. BLM Staff Used in the Preparation of this Environmental Assessment

Name	Position	Role
Edward Ginouves	Geologist	Interdisciplinary team lead; geology
Dan Fletcher	Rangeland management specialist	Air quality, livestock grazing, soils, water resources, vegetation
Jamie Palmer	Archaeologist	Cultural resources
Jeffrey Reese	Range management specialist	Special status plant species
Sheri Whitfield	Wildlife biologist	Wildlife and special status animal species

Table 5.3. USFS Staff Used in the Preparation of this Environmental Assessment

Name	Position	Role
Rob Hamilton	Minerals program manager	USFS team lead, air quality, geology
Sean Kelly	Wildlife biologist	Wildlife, fish, and special status animal species
Robert Leonard	Archaeologist	Cultural and historical resources
Adam Solt	Hydrologist	Hydrology and soils
Reggie Swenson	Rangeland management, specialist	Rangeland, vegetation, invasive species, and noxious weeds
Doug Robison	District recreation staff	Recreation, wilderness, and visual resources
Dave Tait	Botanist	Special status plant species
Steve Flinders	Wildlife biologist	Wildlife, fish, and special status animal species

Table 5.4. SWCA Environmental Consultants Staff Used in the Preparation of this Environmental Assessment

Name	Position	Role
Tom Hale	Project manager and NEPA oversight	Review of all sections
Gretchen Semerad	NEPA writer	Air quality, wildlife, and special status species
Jeremy Eyre	NEPA writer	Vegetation and livestock grazing
Johnny Christensen	Water resources specialist	Geology, soils, and water resources
Sarah Creer	Cultural resources specialist	Cultural resources, treatment plan, and cultural resources report addendum
Sarah Baer	Cultural resources specialist	Cultural resources, treatment plan, and cultural resources report addendum
Thomas Sharp	Biologist	Biological resources report addendum

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CHAPTER 7. ABBREVIATIONS

BLM	Bureau of Land Management
CO_2	Carbon dioxide
CO_2e	carbon dioxide equivalent
CBGA	Cedar, Beaver, Garfield, Antimony
CFR	Code of Federal Regulations
DAQ	Utah Division of Air Quality
DR	decision record
DWR	Utah Division of Wildlife Resources
EA	environmental assessment
EIS	environmental impact statement
ENBB	Environmental Notification Bulletin Board
Enel	Enel Cove Fort, LLC
EPA	U.S. Environmental Protection Agency
ESA	Endangered Species Act
Forest Plan	Fishlake National Forest Land and Resource Management Plan
FO	field office
FONSI	findings of no significant impact
GHG	greenhouse gas
HAP	hazardous air pollutant
HPTP	historic properties treatment plan
H_2S	hydrogen sulfide
HUC	Hydrologic Unit Code
ID	interdisciplinary
I-15	Interstate 15
I-70	Interstate 70
kV	kilovolt
MACT	Maximum Achievable Control Standards
MCC	motor control center
MW	megawatt
NAAQS	National Ambient Air Quality Standards
NHD	National Hydrography Dataset
NEPA	National Environmental Policy Act
NHPA	National Historic Preservation Act
NRHP	National Register of Historic Places
PM	particulate matter
RMP	resource management plan
ROW	right-of-way
SPCC	spill prevention countermeasure control plan
SWCA	SWCA Environmental Consultants
SWPPP	stormwater pollution prevention plan
SWReGAP	Southwest Regional Gap Analysis Project
TDS	total dissolved solids
USC	United States Code
USFS	U.S. Forest Service
USFWS	U.S. Fish and Wildlife Service