Chapter 2 – Proposed Action and Alternatives

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CHAPTER 2 – PROPOSED ACTION AND ALTERNATIVES

2.1 Introduction

Chapter 2 describes the Proposed Action to accommodate the Proponent's proposal to construct, operate, and maintain a 345kV transmission line and ancillary facilities. Also presented are (1) the Project description, (2) alternatives to the Proposed Action, (3) a summary comparison of alternatives, and (4) the preferred alternative(s). This chapter is organized in the following sections:

- 2.2 – Proposed Action: describes the Proponent's Proposed Action.
- 2.3 – Project Description: describes the typical characteristics of the transmission line and ancillary facilities and anticipated construction activities, including regulatory requirements, standard operating procedures, and BMPs (including design features, and mitigation measures to be implemented to minimize potentially significant impacts).
- 2.4 – Alternatives: describes transmission line alternative route locations that could accommodate the 345kV transmission line evaluated in this EIS, including the alternative of taking no action.
- 2.5 – Alternatives Reviewed but Eliminated from Further Consideration: describes alternatives considered but eliminated from detailed study and discusses the reasons for their elimination.
- 2.6 – Summary Comparison of Alternatives: summarizes the results of the process of screening and comparing the alternative routes and identifies the Environmentally Preferred Alternative.

2.2 Proposed Action

The Proponent is proposing to construct, operate, and maintain a 345kV transmission line from the existing Sigurd Substation in Sevier County, Utah, located approximately 6 miles northeast of the community of Richfield, Utah, to the existing Red Butte Substation, located west of State Route (SR) 18 and the community of Central in Washington County, Utah (Figure 2-1). The needs stated in Chapter 1 (Section 1.2.1) would be met by the Proponent's Proposed Action. Typical characteristics of the transmission line and ancillary facilities and anticipated construction activities, including BMPs and mitigation measures agreed to by the Proponent, are presented in Section 2.3. Alternatives are discussed in Section 2.4 and Maps 2-1 and 2-2. The Project area, shown as a bold, dotted line on the maps, represents the study area of the Proponent's initial feasibility study to identify general corridors where transmission lines could be sited and constructed (documented in the *Draft Report, Corridor Study Sigurd to Red Butte Transmission Line, Southwest Utah* [GeoEngineers 2007]; described in Section 2.4.1.1).

To facilitate screening and comparison of the transmission line alternative routes, the Project area was divided into two segments: a northern segment from the existing Sigurd Substation to the South Black Mountains area and a southern segment from the South Black Mountains area to the existing Red Butte Substation near Central, Utah (Maps 2-1 and 2-2).

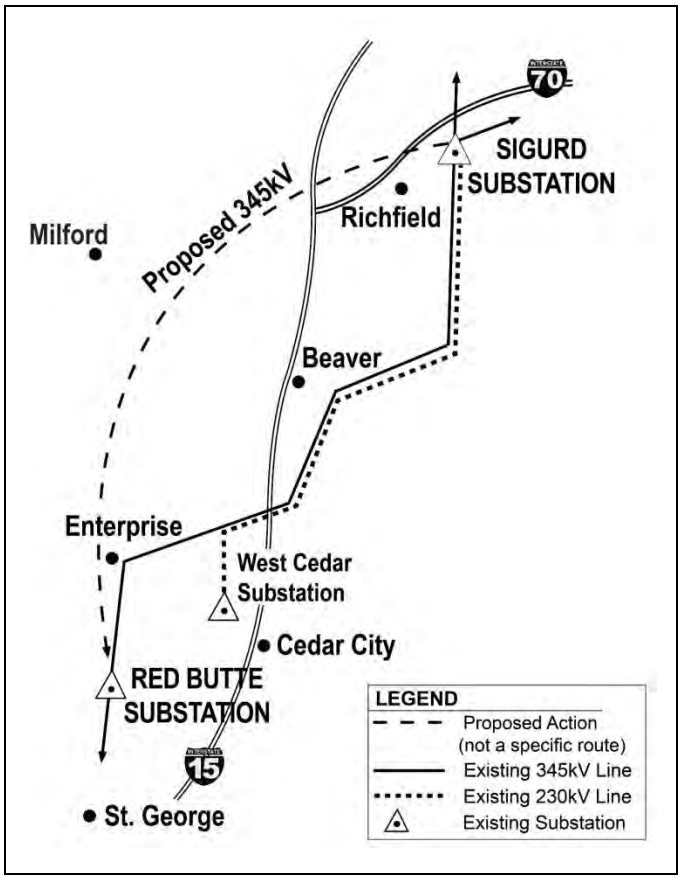

Figure 2-1 Schematic Diagram of the Project

2.2.1 Substations

New substation equipment would be needed at the terminus points to interconnect the proposed transmission line with the existing Sigurd and Red Butte substations.

At the existing Sigurd Substation, new 345kV circuit breakers, a shunt reactor, high-voltage switches, bus supports, and other equipment would be installed along with all associated site preparation, fencing, foundations, oil spill containment, steel substation structures, bus work, protection and control, and metering. The new Sigurd to Red Butte No. 2 – 345kV transmission line will enter the Sigurd 345kV yard from the north and terminate in the currently unused Bay 1 position. All substation additions made for this project will be avian-safe and located within the existing perimeter fence line.

At the existing Red Butte Substation, which was recently expanded to accommodate this Project and other transmission lines, new 345kV and 138kV circuit breakers, high-voltage switches, bus supports, a shunt reactor, a series capacitor, a shunt capacitor, and other equipment would be installed, along with all associated site preparation, foundations, oil spill containment, steel substation structures, bus work, protection and control, and metering. All improvements to the substation to accommodate the Project would be avian-safe and made within the expanded portion of the substation. The substation is located on property administered by USFS and leased by the Proponent.

2.3 Project Description

The following sections provide descriptions of the typical characteristics of a 345kV transmission line and ancillary facilities and descriptions of the anticipated construction activities, including BMPs from land use plans and design features that are part of the Proponent's Project description.

MAP 2-1
NORTHERN ALTERNATIVE ROUTES
SIGURD SUBSTATION TO
SOUTH BLACK MOUNTAINS

ALTERNATIVE ROUTES

- N 1 - Environmentally Preferred Alternative
- N 2
- N 3
- N 4
- N 5
- N 6 - Proponent's Proposed Action
- Southern Alternatives

GENERAL REFERENCE FEATURES

- Project Area
- Link Number
- Link Node
- Bureau of Land Management
- Indian Reservation
- National Park Service
- Private
- State of Utah Trust Lands
- State Park
- U.S. Forest Service
- Substation
- 500kV +/- DC Transmission Line
- 345kV Transmission Line
- 230 to 287kV Transmission Line
- 138 to 161kV Transmission Line
- Pipeline
- County
- Interstate & U.S. Highway
- State Highway
- Railroad
- Lake or Reservoir

SOURCES:
Transportation: Streetmap 50K to 250K, 2008
Land Jurisdiction: BLM State Office Utah, 2008
POWERmap, powermap.platts.com

NOTES:
Substation locations are schematic and do not necessarily represent precise locations.

0 2.5 5 10 15 20 Miles

May 2011

DRAFT EIS

SIGURD TO RED BUTTE NO. 2
345kV TRANSMISSION PROJECT

NATIONAL SYSTEM OF PUBLIC LANDS

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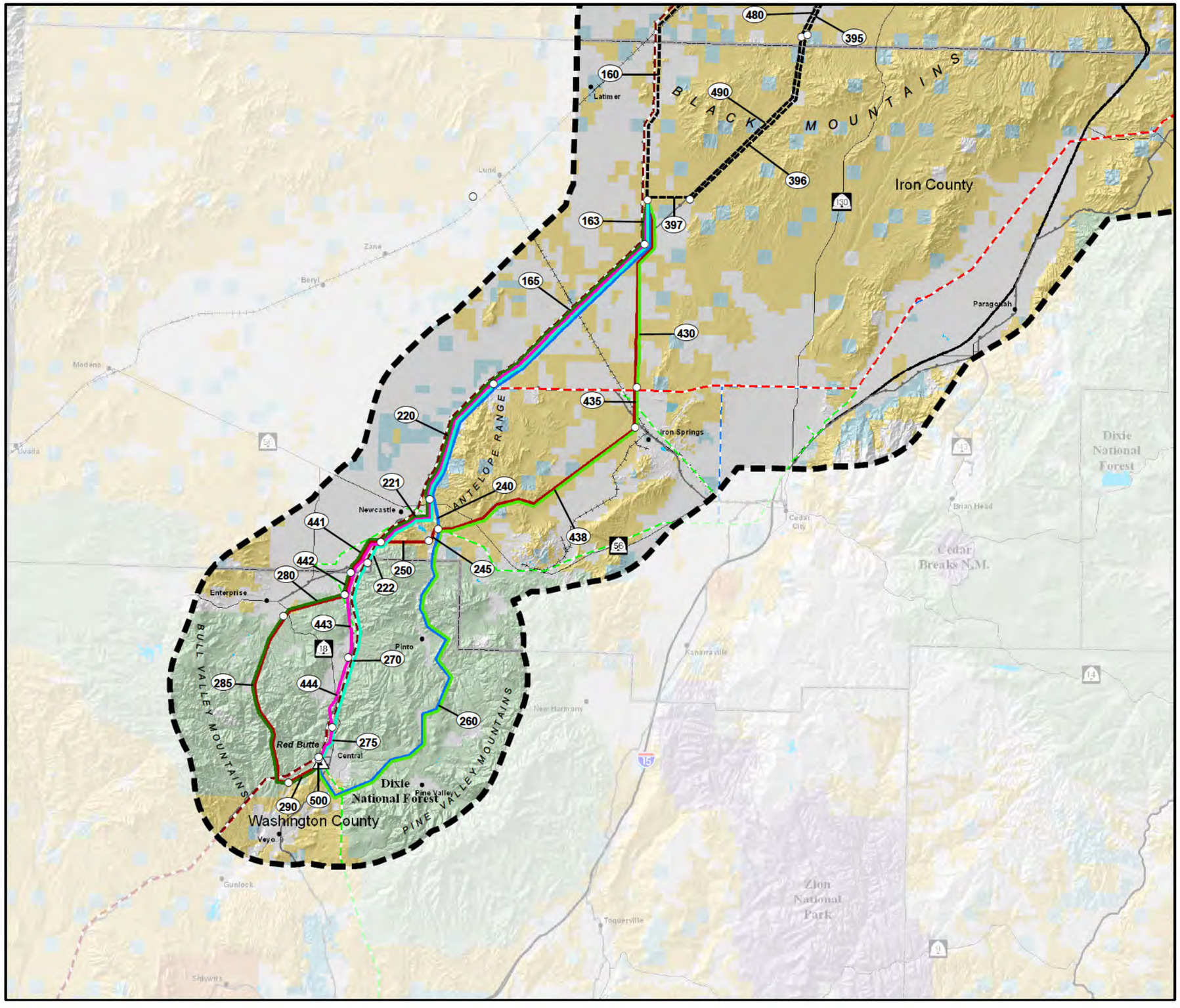

MAP 2-2
SOUTHERN ALTERNATIVE ROUTES SOUTH BLACK MOUNTAINS TO RED BUTTE SUBSTATION

ALTERNATIVE ROUTES

- S 1
- S 2 - Environmentally Preferred Alternative
- S 3
- S 4
- S 5 - Proponent's Proposed Action
- S 6
- Northern Alternatives

GENERAL REFERENCE FEATURES

- Project Area
- Link Number
- Link Node
- Bureau of Land Management
- Indian Reservation
- National Park Service
- Private
- State of Utah Trust Lands
- State Park
- U.S. Forest Service
- Substation
- 500kV +/- DC Transmission Line
- 345kV Transmission Line
- 230 to 287kV Transmission Line
- 138 to 161kV Transmission Line
- Pipeline
- County
- Interstate & U.S. Highway
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- Lake or Reservoir

SOURCES:
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NOTES:
Substation locations are schematic and do not necessarily represent precise locations.

0 2.5 5 10 15 20 Miles

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345kV TRANSMISSION PROJECT

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2.3.1 Overhead Transmission Line and Ancillary Facilities

As proposed, approximately 160 miles of 345kV overhead transmission line would be constructed for the Project. The typical design characteristics of the 345kV transmission line are presented in Table 2-1, which is followed by descriptions of the tower structures, foundations, conductors, insulators and associated hardware, overhead ground wire, and regeneration facilities.

TABLE 2-1
TYPICAL DESIGN CHARACTERISTICS OF THE 345KV TRANSMISSION LINE

Feature	Description
Line length (approximate miles)	160 to 170
Types of structures	Tangent, steel-pole H-frame structures; angle/deadend, four-legged, steel-lattice structures; three-pole structures (typical)
Structure height	Typically 80 to 140 feet
Span length	Typically 800 to 1,200 feet
Structures per mile	5 to 7
Right-of-way width	150 feet
Land Temporarily Disturbed	
Structure work area	150 x 200 feet per structure
Wire-pulling sites	150 x 750 feet per 2 to 4 miles
Wire-tensioning sites	150 x 750 feet per 2 to 4 miles
Wire-splicing sites	100 x 100 feet per 2 miles
Construction yards	Approximately one 12- to 20-acre site every 40 to 50 miles on private and/or public land (locations to be determined)
Concrete batch plant	One 5-acre site (location to be determined)
Access Roads (improve existing, spur, and new)	Improve existing, spur and new roads would be a minimum of 14 feet wide (total distance to be determined)
Land Permanently Required	
Structure base	See Table 2-2 and Table 2-3
Communication regenerator station	100-foot x 100-foot plot with a 75-foot x 75-foot fenced area and a 12-foot x 32-foot building (one station every 55 miles)
Access Roads (improve existing, spur, and new)	Improved existing, spur, and new roads would be a minimum of 14 feet wide (total distance to be determined)
Electrical Properties	
Nominal voltage	345kV AC line-to-line
Capacity	600 MW
Circuit configuration	Single-circuit with three phases per structure, two subconductors per phase
Minimum ground clearance of conductor	30 feet minimum per PacifiCorp's standard practice

2.3.1.1 Tower Structures

The transmission line circuit would predominately be supported by single-circuit, steel-pole H-frame structures at tangent locations. Some H-frame or angle structures may include down guys for additional stability. Structures located at points where the line terminates or changes direction abruptly (angles/deadends) would be lattice steel or three-pole structures. Both the tangent and angle/deadend structures (Figure 2-2) typically would be 80 to 140 feet in height aboveground. Spacing between structures typically would be between 800 and 1,200 feet (or five to seven structures per mile). In some situations, taller structures or longer spans could be required.

In some cases, alternative structure types would be used in response to specific design needs. These other potential alternative structures, which would be used only when conditions warrant, are shown in Appendix B. The design of both typical and alterative structures could vary depending on engineering requirements and/or mitigation prescribed. For example, some alternative H-frame or angle structures may include down guys for additional stability. The exact height of each structure would be governed by topography and safety requirements for conductor clearance.

2.3.1.2 Typical Structure Foundations

Depending on soil and structure type, the foundations would be installed either on drilled pier foundations or directly imbedded. Each structure location would be evaluated individually during final engineering design to determine the exact foundation dimensions. Typical foundation parameters for primary structures are given below in Tables 2-2 and 2-3. While the actual foundation footprint would vary depending on the structure type, for the purposes of analysis it is assumed the short-term disturbance associated with the construction of each tower would be approximately 150 feet by 200 feet, or 0.69 acres.

TABLE 2-2
TYPICAL STRUCTURE TYPE FOUNDATIONS

Structure Type	Number of Foundations	Foundation Diameter (feet)	Foundation Depth (feet)	Maximum Area of All Foundations (square feet)
Single-circuit H-frame tangent structure (for angles 0 to 5 degrees)	2	4 to 5	20 to 30	39.3
Single-circuit lattice steel DS-24 deadend structure (for angles 10 to 35 degrees)	4	4 to 5	20 to 30	79.5
Single-circuit lattice steel DS-25 deadend structure (for angles 35 to 90 degrees)	4	4 to 5	20 to 30	79.5
Single-circuit 3-pole running angle structure (for angles 5 to 10 degrees)	3	8 to 12	25 to 50	339.0

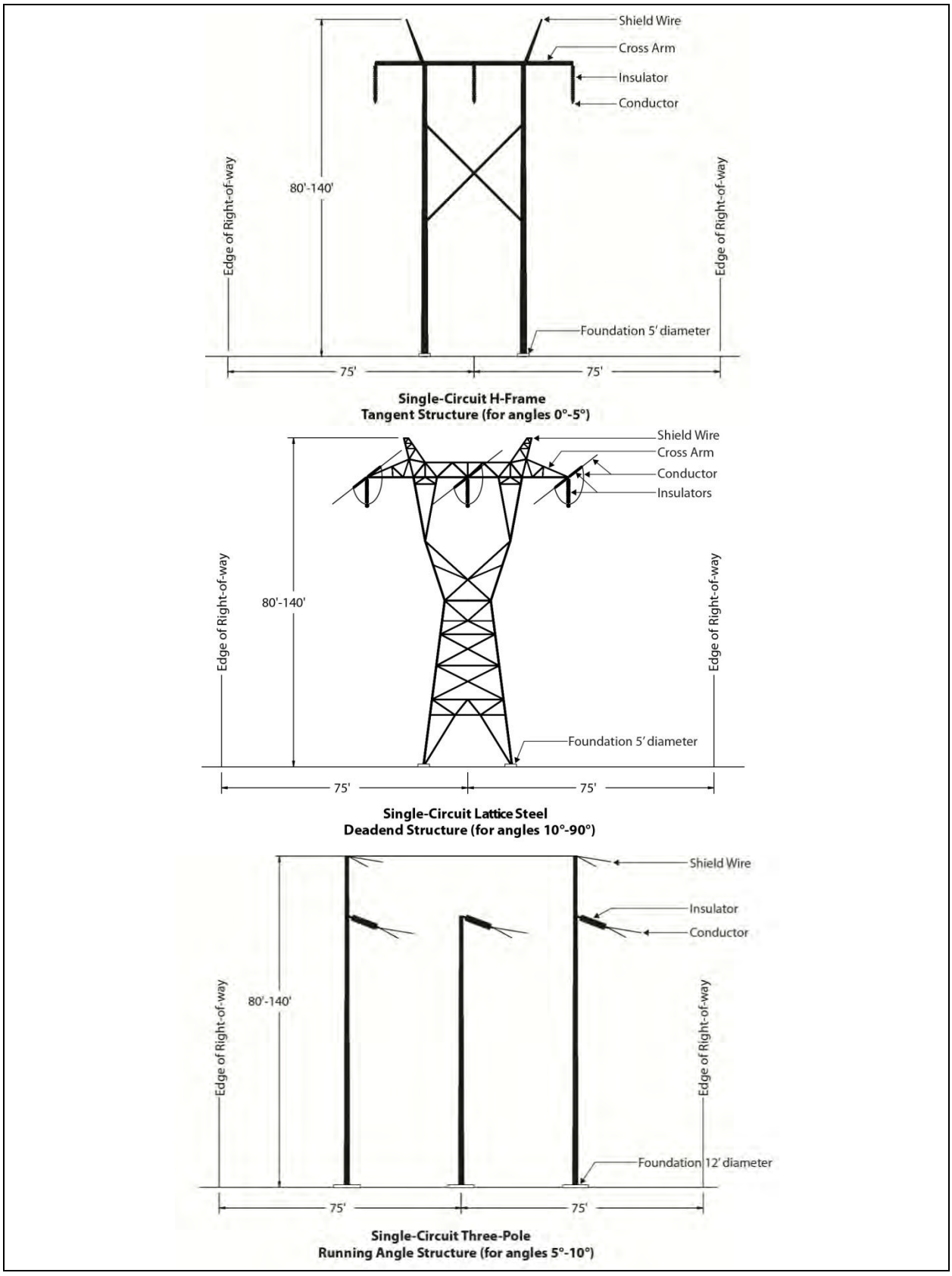

Figure 2-2 Typical Structures

TABLE 2-3
ALTERNATIVE STRUCTURE TYPES

Structure Type	Number of Foundations	Foundation Diameter (feet)	Foundation Depth (feet)	Maximum Area of All Foundations (square feet)
Single-circuit H-frame deadend structure (for angles 0 to 15 degrees)	2	4 to 5	20 to 30	39.3
Single-circuit H-frame running angle structure with down guys (for angles 0 to 15 degrees)	2	2 to 4	15 to 25	25.1
Single-circuit H-frame deadend structure with down guys (for angles 5 to 15 degrees)	2	2 to 4	20 to 30	25.1
Single-circuit three-pole running angle structure with down guys (for angles 5 to 10 degrees)	3	4 to 8	20 to 45	150.9
Single-circuit three-pole deadend structure with down guys (for angles 30 to 90 degrees)	3	4 to 8	25 to 50	150.9
Single-circuit mono-pole tangent structure (for angles 0 to 5 degrees)	1	5 to 10	20 to 30	78.5
Single-circuit mono-pole deadend structure (for angles 5 to 90 degrees)	1	6 to 12	30 to 40	113.0
Double-circuit mono-pole tangent structure (for angles 0 to 5 degrees)	1	6 to 10	25 to 50	78.5
Double-circuit mono-pole deadend structure (for angles 5 to 90 degrees)	1	6 to 12	30 to 50	113.0

2.3.1.3 Conductors

The 345kV single-circuit structures would consist of three phases with a double-conductor bundle (i.e., two subconductors) per phase installed in a vertical configuration with 18-inch spacing between subconductors. Each conductor would consist of outer aluminum strands with a stranded steel-reinforced core (i.e., aluminum conductor steel reinforced [ACSR]).

Minimum conductor height aboveground for the 345kV line would be based on National Electrical Safety Code (NESC) requirements and the Proponent's own standards. Based on Avian Power Line Interaction Committee (APLIC) recommendations (Edison Electric Institute and APLIC 2006), adequate spacing between conductors would be implemented. In addition, shield wires would be located at the top of every structure along with an overhead optical ground wire (OPGW), which would be used for line-operation communications.

Insulators and Associated Hardware

The assemblies of insulators are designed to maintain electrical clearances between the conductors, the structure, and the ground. Single-circuit H-frame tangent structures, typical three-pole running angle structures, and lattice angle/deadend 345kV structures would have three I-shaped string insulators suspended from the structure, while deadend insulators will be oriented parallel to the conductors (refer to Figures B-1 to B-9). Other structures would have either V-shaped or I-shaped insulators.

Overhead Ground Wire

The overhead ground wire shields the 345kV transmission line from direct lightning strikes. Each transmission structure will have two lightning protection overhead ground wires installed on the peak of the structure. One of the overhead ground wires will be a shield wire composed of extra-high-strength steel wire with a diameter of 0.495 inch and a weight of 0.517 pound per foot. The second overhead ground wire will be a fiber core OPGW for communication purposes constructed of aluminum and steel that carries 48 glass fibers in its core. The OPGW's will have a diameter of 0.465 inch and a weight of 0.290 pound per foot. Current from lightning strikes will be transferred through the ground wires and structures into the ground.

Grounding

Ground rods will be installed next to the structure foundations and will be bonded to the structure. Lattice towers (single-circuit angle or deadend structures) will have four grounds installed per structure, and H-frame and steel-pole structures will have two grounds installed per structure. After the ground rods have been installed, the grounding will be tested to determine the resistance to ground. If resistance to ground for each transmission structure is not acceptable with the use of ground rods, counterpoise will be installed to lower the resistance. Counterpoise consists of a bare copper-clad or galvanized-steel cable buried to a depth of 12 inches in noncultivated land and 19 inches in cultivated land, and extends away from one or more legs of the structure approximately 200 feet within the right-of-way. Conductive objects, including metal fences, metal buildings, and other metal objects, would be properly grounded per PacifiCorp Transmission Construction Standard TD-310, upon receipt of a request from a property owner (after proper investigation has been completed).

Induced Currents on Adjacent Facilities

AC transmission lines have the potential to induce currents on adjacent metallic structures, such as transmission lines, railroads, pipelines, fences, or structures that are parallel to, cross, or are adjacent to the transmission line. Induced currents on these facilities occur to some degree during steady-state operating conditions and during a fault condition on the transmission line. For example, during a direct lighting strike to the conductor on the transmission line, the insulators may flash over, causing a fault condition on the line, and current would flow down the structure through the grounding system (i.e., ground rod or counterpoise) and into the ground. The magnitude of the effects of the AC-induced currents on adjacent facilities is highly dependent on the magnitude of the current flows in the transmission line, the proximity of the adjacent facility to the line, and the distance (length) for which the two facilities parallel one another in proximity.

The methods and equipment needed to mitigate these conditions would be determined through electrical studies of the specific situation. Grounding actions (if needed) would take care of the majority of induced-current effects on metallic facilities adjacent to the line by shunting the induced currents to ground through ground rods, ground mats, and other grounding systems, thus reducing the step-and-touch potential person may experience when touching a metallic object near the line (i.e., reduce electric shock potential).

In the case of a longer parallel facility, such as a pipeline parallel to the transmission line over many miles, additional electrical studies could be undertaken to (1) identify any additional mitigation measures (more than the standard grounding practices) that would need to be implemented to prevent damaging currents from flowing onto the parallel facility and (2) prevent electrical shock to a person that may come

in contact with the parallel facility. Some of the typical mitigation measures that could be considered for implementation, depending on the degree of mitigation needed, can include the following (National Association of Corrosion Engineers International 2003):

- Fault shields: shallow grounding conductors connected to the affected structure adjacent to overhead electrical transmission towers, poles, substations, etc. They are intended to provide localized protection to the structure and pipeline coating during a fault event from a nearby electric transmission power system.

- Lumped grounding: localized conductor or conductors connected to the affected structure at strategic locations (e.g., at discontinuities). They are intended to protect the structure from both steady-state and fault AC conditions.

- Gradient control wires: a continuous and long-grounding conductor or conductors installed horizontally and parallel to a structure (e.g., pipeline section) at strategic lengths and connected at regular intervals. These are intended to provide protection to the structure and pipeline coating during steady-state and fault AC conditions from nearby electric transmission power systems.

- Gradient control mats: used for aboveground components of a pipeline system, these are buried ground mats bonded to the structure and are used to reduce electrical step-and-touch voltages in areas where people may come in contact with a structure subject to hazardous potentials.

Permanent mats bonded to the structure may be used at valves, metallic vents, cathodic protection test stations, and other aboveground metallic and nonmetallic appurtenances where electrical contact with the affected structure is possible. In these cases, there is no "standard" solution that would solve these issues every time. Instead, each case must be studied to determine a series of parameters, including (1) the magnitude of the induced currents and the most appropriate mitigation given the ground resistivity, distance paralleled, steady-state and fault AC currents, and fault clearing times expected on the transmission line and (2) the distance between the line and the pipeline. If the electrical studies indicate a need to install cathodic protection devices on a parallel pipeline facility, a distribution supply line interconnection may be needed to provide power to the cathodic protection equipment.

During final design of the transmission line segments, appropriate electrical studies would be conducted to identify (1) the issues associated with paralleling other facilities and (2) the types of equipment that would need to be installed (if any) to mitigate the effects of the induced currents.

Other Electrical Hardware

In addition to the conductors, insulators, and overhead shield wires, other associated hardware would be installed on the structure as part of the insulator assembly to support the conductors and shield wires. This hardware would include fasteners, clamps, shackles, links, plates, and various other hardware pieces composed mostly of galvanized steel and aluminum. To the extent possible, electrical hardware will be specified as "corona-free" in order to reduce the effects of audible noise and electrical stress caused by corona in high voltage applications.

A grounding system would be installed at the base of each transmission structure that would consist of copper ground rods embedded into the ground in immediate proximity to the structure foundation and connected to the structure by a buried copper cable. When the resistance to ground for each transmission structure would be greater than 15 ohms with the use of ground rods, counterpoise would be installed to lower the resistance to 15 ohms or less (PacifiCorp Standard TD300). Counterpoise consists of a bare

copper-clad or galvanized-steel cable buried a minimum of 12 inches deep, extending away from the structures (from one or more legs of the structure) for approximately 200 feet in the right-of-way.

Other Nonelectrical Hardware

Other hardware not associated with the transmission of electricity may be installed as part of the Project. This hardware may include aerial marker spheres or aircraft warning lighting, as required for the conductors or structures per FAA regulations. Structure proximity to airports and structure height are the determinants of whether FAA regulations would apply based on an assessment of wire/tower strike risk. The Proponent does not anticipate structure lighting would be required because proposed structures are less than 200 feet tall and are not near airports that require structure lighting.

The use of down guys (i.e., guy wires or cables anchoring structures to the ground) on transmission lines allows three-pole structures to be used for modest to sharp line angles for running-angle structures. These structures do not terminate the conductors and shield wires as on a more standard deadend structure, but allow the conductors and shield wires to remain contiguous through the structure. Since most of the mechanical loads imparted to structures with down guys are transferred to the guy anchors rather than directly to the structure and its foundation, the use of running angles structures with down guys will usually reduce the size of footings, but will often result in an increase in overall structure footprint, and in some cases may exceed the typical 150-feet right-of-way width.

2.3.2 Substations

New substation equipment would be needed at the terminus points to interconnect the transmission line with the existing Sigurd and Red Butte substations, as described in Section 2.2.1. Table 2-4 summarizes the typical design characteristics of a 345/138kV substation expansion.

TABLE 2-4
TYPICAL DESIGN CHARACTERISTICS OF THE 345/138KV SUBSTATION EXPANSION

Feature	Description
Site size (approximate)	No site expansion required at the Sigurd or Red Butte Substations
Equipment	Shunt reactors, series reactors, series capacitors, station switches, voltage and current sensing devices, power transformers, power circuit breakers
Access road ▪ Width ▪ Road surface ▪ Grading	Existing access roads would be used
Fire protection facilities	Existing fire protection facilities would be expanded to include new equipment
Substation grounding	According to applicable codes
Land temporarily disturbed	A 20-foot-wide buffer zone along the perimeter of the substation expansion area estimated to be less than 1 acre
Voltage	345/138kV and below

2.3.3 Access Roads

Construction of the transmission line, substation upgrades, and ancillary facilities (e.g., staging areas, pulling and tensioning sites, etc.) would require vehicle, truck, and crane access to each new structure site

for construction crews, materials, and equipment. Existing roads, existing roads that may require improvements, and new access roads may be used for the Project. To the extent possible, existing roads would be used in their present condition without improvements. In areas where improvements are required or deemed to be in the best interest of the Project for future use, the roads would be graded and/or graveled to provide a smooth all-weather travel surface. Access on the right-of-way, other than in specific areas, would require a road with a minimum width of 14 feet (travel surface). In some cases, new roads that must be graded for access along steep slopes (side-hill roads) may exceed this width depending on the amount of displaced soil. These roads typically go directly from structure to structure, except on hillsides, ridgebacks, rock-outcrop areas, wash crossings, treed areas, or in areas where sensitive environmental resources can be avoided. In such cases, the road would follow suitable topography from structure to structure and would be built in areas that generally cause the least amount of overall disturbance, which may be outside the right-of-way.

2.3.4 Communication Systems

Reliable and secure communications for system control and monitoring of the transmission line is imperative to maintain the operational integrity of the transmission line and of the overall interconnected system. Primary communications for relaying and control would be provided via optical fibers in an OPGW shield wire, which would be installed on the transmission lines. Each transmission structure would have two lightning protection shield wires installed on the peaks of each of the structures. One of the shield wires would be composed of extra-high-strength steel wire with a diameter of 0.495 inch and a weight of 0.517 pound per foot. The second shield wire would be an OPGW constructed of aluminum and steel that carries 48 glass fibers in its core. The OPGWs would have a diameter of 0.465 inch and a weight of 0.290 pound per foot. The optical fibers inside the OPGW shield wires would facilitate data transfer between the Proponent's facilities along the fiber path. The data transferred are required for system control and monitoring. A second communications path would be provided via the Proponent's existing microwave system. No new microwave sites are anticipated for the Project. Updated microwave equipment may be installed at existing sites and at the substations.

2.3.4.1 Fiber Optic Regeneration Sites

As the data signal passes through the optical fibers in the OPGW, the signal degrades with distance. Consequently, signal regeneration stations (regeneration stations/sites) are required to amplify the signals if the distance between substations or regeneration sites exceeds 55 miles. Three regeneration sites would be required.

The primary siting criteria for a regeneration site located outside of a substation would be (1) adjacent to the transmission line right-of-way, (2) in proximity to existing low-voltage electric distribution lines that would power the facility, and (3) easily accessible by vehicle. A regeneration site may be housed in substation control houses where an existing substation is on the final transmission route; otherwise, land must be obtained. Where a new site is required, the typical site would be 100 feet by 100 feet, with a fenced area of 75 feet by 75 feet. A 12-foot by 32-foot by 9-foot-tall building or equipment concrete shelter would be placed on the site, and access roads to the site and power from the local electric distribution circuits would be required. An emergency generator with a 1,000-gallon liquid-petroleum gas fuel tank would be installed at the site inside the fenced area. Two diverse cable routes (aerial and/or buried) from the transmission right-of-way to the equipment shelter would be required. Figure 2-3 illustrates the plan arrangement of a typical regeneration site.

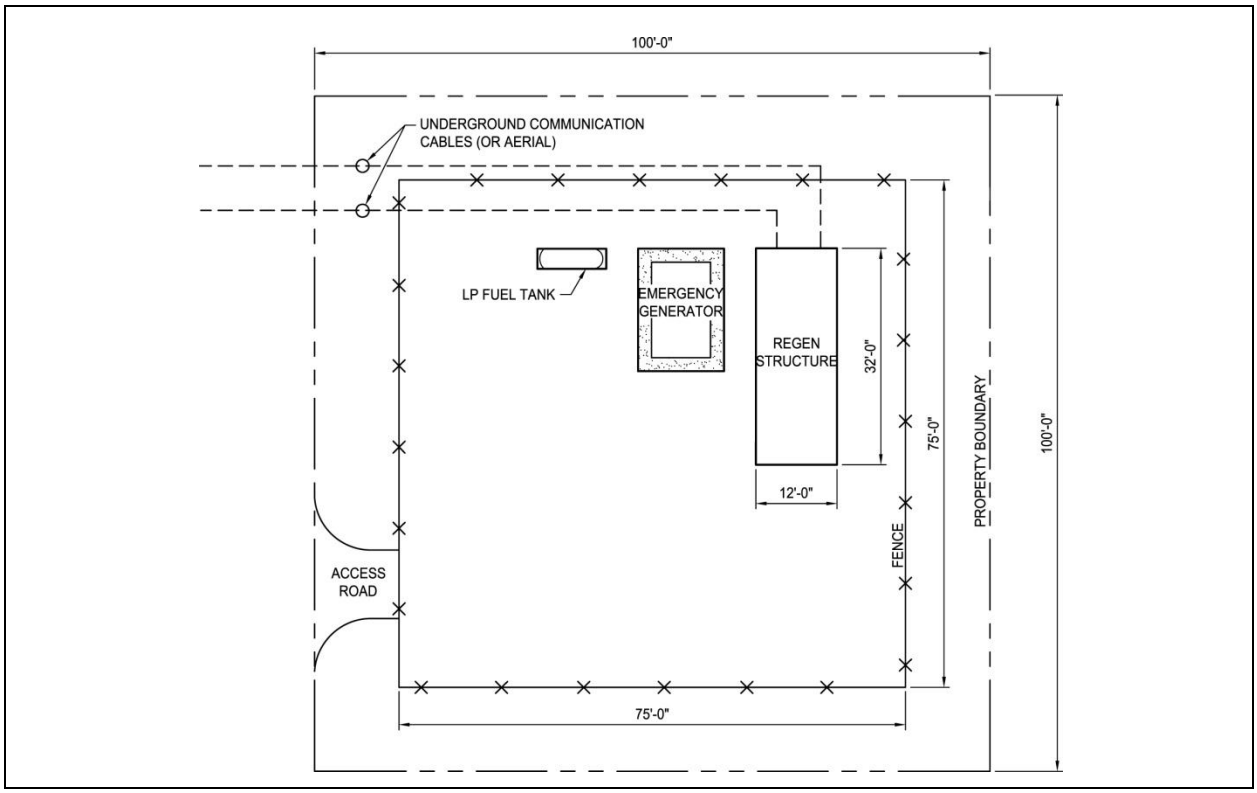

Figure 2-3 Typical Regenerator Site Layout

2.3.4.2 Communication Regenerator Station Distribution Supply Lines

Station service power would be required at each regeneration site. Station service power is provided from a local electric distribution line located in proximity to the regeneration site. The voltage of the distribution supply line is typically 12kV or lower and carried on wood poles. For all new sites, it would be necessary to extend the electric distribution line from a take-off point on the existing distribution line to the new site. The location and routing of the existing distribution lines to the new sites would be determined during the final design process.

2.3.4.3 Regeneration Site Maintenance

Regeneration site monitoring and control functions are performed remotely from the PacifiCorp central operations facilities located in Portland, Oregon. Unauthorized entry into regeneration sites is prevented with the provision of fencing and locked gates. Warning signs would be posted, entry to the operating facilities would be restricted to authorized personnel, and a remotely monitored security system would be installed. Several forms of security are planned for each of the locations, although the security arrangements at each of the regeneration sites may differ somewhat. Security measures may include (1) fire detection in the regeneration building via the remote monitoring system and alarms for forced entry and (2) a perimeter security system coupled with remote sensing infrared camera equipment in the fenced area of the station to provide visual observation/confirmation to the system operator of disturbances at the fence line.

Maintenance activities include equipment testing, equipment monitoring and repair, and emergency and routine procedures for service continuity and preventive maintenance. Regeneration sites would be visited every two to three months by one individual in a light truck to inspect the facilities. Annual maintenance would be performed by a two-man crew in a light truck over a two- to five-day period.

2.3.5 Construction

This section describes the typical construction specifications for the Project, including construction seasons, the right-of-way acquisition process, major construction activities, and standard mitigation measures (including design features, best management practices, mitigation measures, and operation and maintenance of the Project facilities). These specifications could be refined during detailed engineering and changes would be reflected in the Plan of Development (POD) for the Project, as needed. However, any refinements reflected in the POD would be bound by the outcomes of the impact analysis contained in this document, or else a supplemental NEPA review would be required.

The design, construction, operation, and maintenance of the Project would meet or exceed the requirements of the NESC, U.S. Department of Labor, OSHA standards, and the Proponent's requirements for safety and protection of landowners and their property. Typical design characteristics of the transmission lines and substations are summarized above in Section 2.3.1.

2.3.5.1 Construction Seasons

Construction would take place year-round as weather and conditions allow. The cost, and sometimes the quality, of construction can be affected by the construction season. While construction during the summer season may be preferred, there are issues that may require winter construction. Weather conditions typically prohibit high-elevation construction during winter months. Project schedule, financing, design, and/or material delivery may not fit within the summer season. Outages associated with interconnecting facilities cannot necessarily be taken at times convenient for construction (e.g., outages must be coordinated with peak-demand periods, outages scheduled for other projects). Environmental issues and soil conditions also may dictate construction of portions of the line during certain times of the year. Seasonal restrictions on construction activities would be implemented unless an exception is granted, in accordance with agency policy or land use plans, in certain areas to mitigate impacts on wildlife. The potential seasonal restrictions vary by species and are described in Table 2-5. Avoidance buffers and seasonal restrictions for nesting raptors are in accordance with the Utah Field Office Guidelines for Raptor Protection from Human and Land Use Disturbances (Romin and Muck 2002). Biological surveys would be conducted for sensitive species prior to the initiation of construction activities, as required. Data obtained through these surveys would be used to determine the specific geographic locations where buffers and seasonal restrictions would be implemented.

TABLE 2-5
SEASONAL RESTRICTIONS IN SENSITIVE HABITATS

Common Name	Scientific Name	Buffer/Habitat	Seasonal Restriction
Big Game			
Mule deer	*Odocoileus hemionus*	Crucial winter range	November 1– May 15
		Crucial summer range	May 1–June 15
Raptors and Migratory Birds			
Bald eagle	*Haliaeetus leucocephalus*	0.5 mile winter roost site with line of sight to work area	November 1–March 15
Bald eagle	*Haliaeetus leucocephalus*	0.25 mile winter roost site without line of sight to work area	November 1–March 15
Golden eagle	*Aquila chrysaetos*	0.5 mile from active nest	January 1–August 31
Ferruginous hawk	*Buteo regalis*	0.5 mile from active nest	March 1–August 1
Swainson's hawk	*Buteo swainsoni*	0.5 mile from active nest	March 1–August 31
Red-tailed hawk	*Buteo jamaicensis*	0.5 mile from active nest	March 15–August 15
Burrowing owl	*Athene cunicularia*	0.25 mile from active nest	March 1–August 31
Migratory birds	–	50-foot buffer on nest locations	Generally February 15–July 15
Special Status Species			
Utah prairie dog	*Cynomys parvidens*	Delineated occupied and unoccupied habitat	August 31 –April 1
Southwestern willow flycatcher	*Empidonax traillii extimus*	0.25 mile from occupied habitat	April 15–August 30
Greater sage-grouse	*Centrocercus urophasianus*	2 miles from active lek	March 1–May 31[1]
		Utah Division of Wildlife Resources (UDWR) brooding areas	April 1–September 1

NOTE: [1]Per UDWR 2010

2.3.5.2 Right-of-Way Acquisition Process

New permanent and temporary land rights are required for the transmission line facilities, such as the transmission line right-of-way, access roads, temporary work sites, and staging areas (e.g., right-of-way grant, easements, license agreement, and fee simple). Where the proposed transmission line would parallel an existing 46kV and 138kV transmission line, the right-of-way would be adjacent to, or overlap the existing right-of-way. The right-of-way width must be sufficient to accommodate "conductor blowout" due to wind (which is the swinging of the conductor midway between tower structures) and maintenance clearances at the tower sites. Figure 2-4 is a diagram illustrating a typical configuration of the right-of-way.

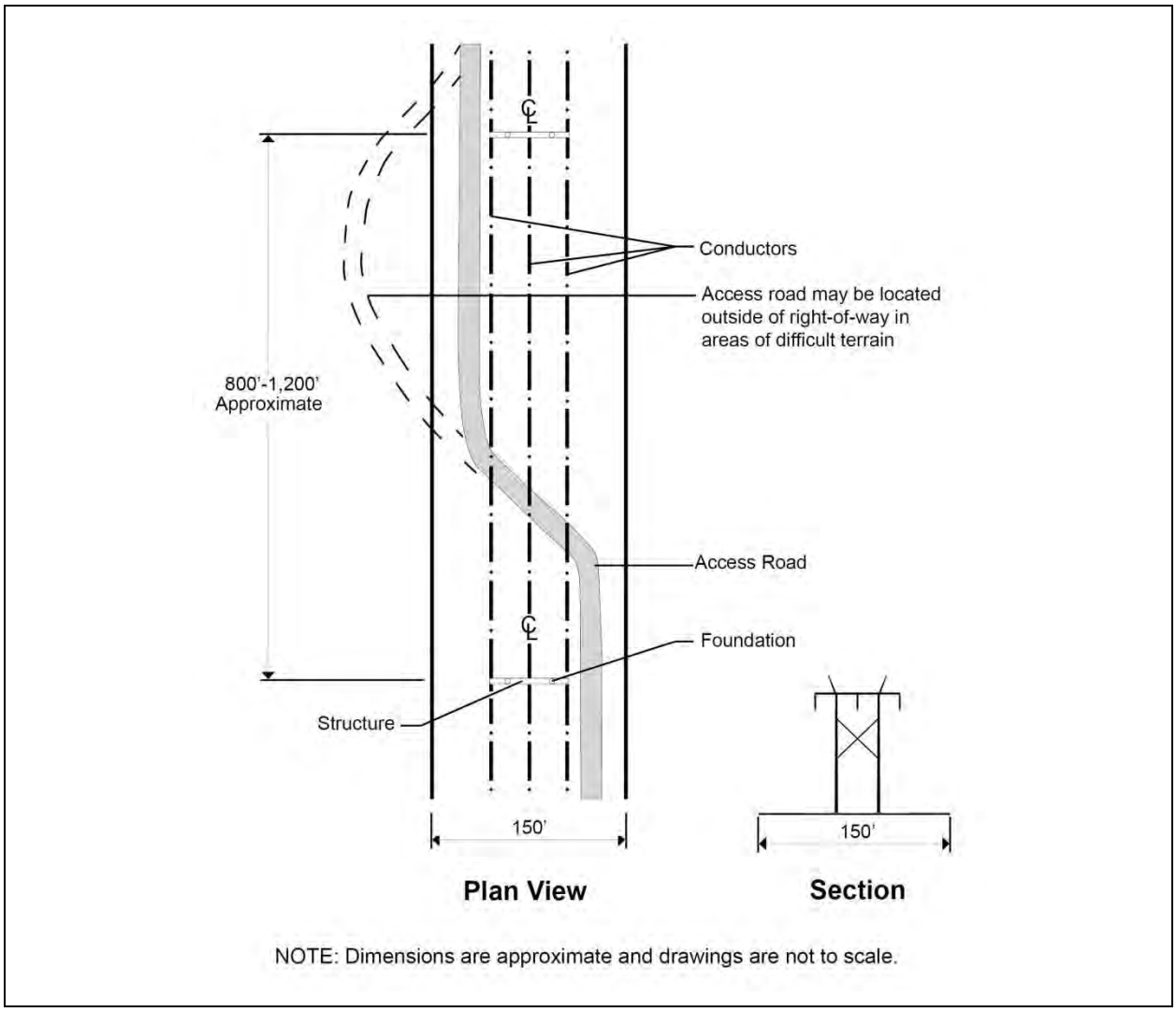

Figure 2-4 Typical Right-of-way Diagram

The preliminary right-of-way application, filed by the Proponent with the BLM and USFS, specified a 150-foot-wide right-of-way and duration of 50 years.

Additional right-of-way width may be required in areas where the proposed transmission line would turn at a sharp angle. Access roads may be located outside of the transmission line right-of-way in areas of difficult terrain. Access roads would be identified in the POD and approved by the BLM and USFS in their RODs and in the right-of-way grant and special-use authorization, to be issued by the BLM and USFS, respectively. Also, areas used temporarily (e.g., roads, staging areas, temporary work site, batch plant) may require a short-term right-of-way grant from BLM and a temporary use permit from USFS.

2.3.5.3 Construction Activities

Preconstruction meetings with each of the affected agencies would be conducted to introduce construction contractors (including the compliance inspection contractor [CIC]) and their field representatives and agency points of contact, as well as to review mitigation measures and construction schedules. As

construction proceeds, the construction engineer and/or agency inspectors would continue to monitor activities and right-of-way authorizations to ensure compliance or to initiate modifications, where necessary. In environmentally sensitive areas, an agency-approved environmental specialist with appropriate qualifications (e.g., biologist, archaeologist) would monitor construction activities to ensure compliance with specific protections and/or mitigation, as required. Any modifications to the POD would need to be approved by the BLM and USFS. The protocol for variances to the POD would be described in the POD.

The Proponent has incorporated standard mitigation measures, including BMPs and design features (e.g., altering the placement of access roads or towers, where practicable, to avoid identified sensitive habitat), associated with the construction, operation, and maintenance of the Project into the Project description to reduce or minimize potentially significant impacts on the environment. Standard mitigation measures would be applied to the entire Project and address specific environmental policies and regulatory requirements. Where warranted by environmental conditions, on a case-by-case basis, mitigation beyond these standard mitigation measures would be applied to reduce potential impacts at specific impact locations. These measures are referred to as selective (i.e., selectively committed) mitigation measures. Standard and selective mitigation measures to minimize potential impacts on environmental resources are presented in Tables 2-6 and 2-7, respectively. To reduce impacts associated with specific resource concerns (e.g., cultural, biological, visual resources), the selective mitigation measures would be reviewed and refined through the NEPA process and development of the POD (to be completed before the BLM and USFS RODs are signed or grant or permit issued).

The construction contractor(s) would adhere to the measures identified during the engineering/design phase, as well as those measures that address construction and reclamation activities. The CIC would be responsible for the oversight of the implementation of these measures to ensure the Proponent and the construction contractor(s) meet the intent of the mitigation.

Geotechnical Investigation

A separate Application for Transportation and Utility Systems and Facilities on Federal Land (Standard Form 299) was submitted in September 2009 by the Proponent to BLM for a grant of a short-term right-of-way, and to the USFS for a special-use permit for temporary access to conduct a geotechnical investigation along the alternative routes of the Project. The geotechnical investigation was proposed to collect hydrogeologic and geotechnical soil properties and geophysical data to support the design of foundations and structures for the Project. The BLM reviewed and processed the application in accordance with all applicable federal laws and regulations.

A temporary right-of-way grant (UTU 83067-01) and a special-use permit (BEA160) for the geotechnical investigation were granted by BLM and USFS on September 7, 2010, and September 3, 2010, respectively. Geotechnical drilling was accomplished using a variety of conventional drilling methods, including hollow-stem augers, mud rotary, continuous diamond coring, air hammer (e.g., overburden drilling with eccentric bit or ODEX [under-reamer-type drilling]), sonic drilling technologies, or by cone penetration testing equipment, depending on the type of soil and rock expected within the completion depth of the boring. In environmentally or culturally sensitive areas, the geotechnical investigation was carried out by geophysical survey using refraction micro-tremor (ReMi) technique, a minimally invasive technology for collecting geophysical data from the ground surface. The geotechnical investigation is scheduled for completion in the summer of 2011. Additional geotechnical investigation activities may be required as part of the final engineering design.

Surveying the Centerline

The engineering survey would involve verifying and staking the centerline of the selected transmission line route, tower center hubs, right-of-way boundaries, access roads (where needed), spur roads to tower sites, and temporary work areas using existing roads or overland travel routes. Some engineering survey activities may begin as early as two years prior to the start of construction. Required cultural, paleontological, botanical, and biological resource surveys may begin once certain survey information is available. Depending on the route approved in the RODs, the centerline may be adjusted to accommodate engineering requirements and local modifications.

Access Roads

This section describes the types of access roads necessary to construct and operate the Project, design characteristics of new and improved access roads, types of access road construction to be implemented throughout the Project, as well as the methodology used to evaluate resource impacts for the environmental analysis.

Roads enable access to the right-of-way and tower sites for both construction and long-term maintenance of the transmission lines. Access roads must be sufficient to bear the weight and endure heavy construction vehicle use. All roads would be upgraded or constructed in accordance with the Proponent's published standards for road construction, or according to BLM (BLM Manual 9113), USFS, state, and/or local requirements for road construction, or private landowner agreements, to be outlined in the final POD. In the event PacifiCorp's published standards for road construction conflict with BLM, USFS, state, or local requirements, the Construction Contractor(s) will coordinate with the CIC (or appropriate land-management agency representative in areas where the CIC does not have authority) to resolve the conflicting standards. However, existing paved and unpaved highways and roads would be used, where possible, for the transportation of materials and equipment from the storage yards to the areas where they would be needed along the transmission line right-of-way. Private landowners and affected agencies would be consulted before road construction begins. Specific plans for the construction, rehabilitation, and/or maintenance of roads, including the locations of access roads, would be documented in the final POD.

Section 2.3.1.1 identifies an average typical transmission tower span of 800 to 1,200 feet. To limit the amount of new road construction for the Project, existing roads within 500 feet of the Project centerline are proposed to be used for access to the Project right-of-way and Project facilities, where practicable. Where existing roads could be used for construction, operation, and maintenance purposes, only spur roads to transmission tower sites may be needed. Beyond 500 feet from the Project centerline, constructing a new road from tower-to-tower would typically result in less ground disturbance than building spur roads from existing roads to each tower site or Project work area. The number of new spur roads would be held to a minimum, consistent with their intended use (e.g., structure construction or conductor stringing and tensioning). Some existing roads could require upgrading to meet the PacifiCorp, BLM, or USFS published standards for road construction. All existing roads would be left in a condition equal to, or better than, their condition prior to construction, in accordance with BLM, USFS, state, and/or local road standards or private landowner agreements.

Where required to meet the access needs of the Project, roads may be built as either temporary or permanent access. Where required for construction purposes only, or in temporary work areas (e.g., wire pulling and tensioning sites, concrete batch plants, etc.), temporary roads may be needed. Temporary roads serve the needs for Project access during the construction phase, but are not anticipated to be

TABLE 2-6
STANDARD MITIGATION MEASURES

	Standard Mitigation Measures	Application Phase			Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design and Engineering	Construction	Operation and Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
	Biological Resources												
1.	In construction areas where recontouring is not required, vegetation will be left in place wherever possible, and original contour will be maintained to avoid excessive root damage and allow for resprouting in accordance with the reclamation plan. Vegetation not consistent with minimum clearance distances between trees and transmission lines must be maintained for line safety and reliability (required by NERC Transmission Vegetation Management Program).	●	●				●			●		●	
2.	In construction areas (e.g., marshalling yards, tower site work areas, spur roads from existing access roads) where ground disturbance is significant or where recontouring is required, surface reclamation would occur as required by the landowner or land-management agency. The method of reclamation would normally consist of, but is not limited to, returning disturbed areas back to their natural contour, reseeding, installing cross drains for erosion control, placing water bars in the road, and filling ditches. All areas on BLM- or USFS-administered public lands that are disturbed as a part of the construction and/or maintenance of the proposed powerline will be seeded with a seed mixture appropriate for those areas. The BLM or USFS will prescribe a seed mixture that fits each range site. Seeding methods will typically include drill seeding, where practicable; however, the BLM or USFS may recommend broadcast seeding as an alternative method in some cases. Drill seeding will be performed during September through December 15 to maximize the chance of success. Where broadcast seeding is implemented, seed will be applied at 1.5 to 2 times the rate of drill		●				●			●		●	

TABLE 2-6
STANDARD MITIGATION MEASURES

	Standard Mitigation Measures	Application Phase			Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design and Engineering	Construction	Operation and Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
	seeding application, and the seed will be covered by a method such as harrowing or raking. A Reclamation, Revegetation, and Monitoring Framework Plan identifying reclamation stipulations would be developed and incorporated in the final POD, which would be approved by the BLM and USFS prior to the issuance of a right-of-way grant or special-use permit, respectively.												
3.	Special status species, threatened and endangered species, or other species of particular concern would be considered in accordance with management policies set forth by appropriate land-management agencies (e.g., BLM, USFS, FWS, UDWR, etc.). This would entail conducting surveys for plant and wildlife species of concern along the proposed transmission line route and associated facilities (e.g., access and spur roads, staging areas, etc.) as agreed upon by the agencies. In cases where such species are identified, appropriate action would be taken to avoid adverse impacts on the species and its habitat, which may include altering the placement of roads or towers, where practicable as approved by the landowner and CIC, as well as monitoring activities.	●	●						●	●			
4.	The Proponent designs and constructs all new or rebuilt transmission facilities to its raptor-safe design standards, including *Suggested Practices for Avian Protection on Power Lines; The State of the Art in 2006* (Edison Electric Institute and APLIC 2006); PacifiCorp's Bird Management Program Guidelines, updated June 2006; and PacifiCorp's substation guidelines. New substations or modified portions of the existing substations must incorporate animal protections in accordance with PacifiCorp standards.	●	●						●				

TABLE 2-6
STANDARD MITIGATION MEASURES

	Standard Mitigation Measures	Application Phase			Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design and Engineering	Construction	Operation and Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
5.	To prevent the spread of noxious/invasive weeds, a Noxious Weed Management Plan would be developed and incorporated into the final POD, which would be approved by the BLM and USFS prior to the issuance of a right-of-way grant or special-use permit, respectively.		●	●						●			
6.	Avoid temporary construction and maintenance activities during the migratory bird nesting season, typically between February 15 and July 15; however, dates may vary depending on species, current environmental conditions, results of preconstruction surveys, and approval by agency biologists or agency-approved environmental inspectors in coordination with agency biologists.		●	●		●			●				
7.	If temporary construction and maintenance activities could not be avoided in the primary nesting season for migratory birds, migratory bird and nest surveys would be performed.		●	●					●				
8.	Follow FWS guidelines for raptor protection during the breeding season.	●	●	●					●				
9.	Based on preconstruction surveys, state and federally designated sensitive plants and/or habitat would be flagged and structures would be placed to allow spanning of these features, where feasible, within the limits of standard structure design.	●	●							●			
	Cultural Resources												
10.	In consultation with appropriate land-management agencies and the SHPOs and in accordance with the Programmatic Agreement (to comply with Section 106 of the NHPA) entered into between the Proponent, BLM, USFS, and the State of Utah (Section 3.2.5), specific mitigation measures for cultural resources would be developed and implemented to mitigate any identified adverse impacts. These may include Project modifications to avoid adverse impacts, monitoring of	●	●										●

TABLE 2-6
STANDARD MITIGATION MEASURES

	Standard Mitigation Measures	Application Phase			Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design and Engineering	Construction	Operation and Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
	construction activities, and data recovery studies. Project modifications for avoidance would be the preferred method for preventing adverse effects to historic properties.												
	Design, Construction, Operation, and Maintenance												
11.	The Proponent would continue to follow studies performed on EMF research. The Proponent relies on the findings of public health specialists and international scientific organizations for guidelines regarding EMF.		●	●									
12.	Transmission line materials that have been designed and tested to minimize corona would be used. A bundle configuration and larger conductors would be used to limit audible noise, radio interference, and television interference due to corona. Tension would be maintained on all insulator assemblies to ensure positive contact between insulators, thereby avoiding sparking. Caution shall be exercised during construction to avoid scratching or nicking the conductor surface, which may provide points for corona to occur.	●	●										
13.	The Proponent would apply grounding or other methods where possible to eliminate problems of induced currents and voltages onto conductive objects sharing the same right-of-way, to meet the appropriate codes.		●	●									
14.	A Fire Protection Plan would be developed and incorporated into the POD, which would be approved by the BLM and USFS prior to the issuance of a right-of-way grant or special-use permit, respectively.		●	●									
15.	The transmission line would be patrolled regularly and properly maintained in compliance with applicable safety codes.			●									

TABLE 2-6
STANDARD MITIGATION MEASURES

	Standard Mitigation Measures	Application Phase			Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design and Engineering	Construction	Operation and Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
16.	During construction of the transmission line, the right-of-way would be free of nonbiodegradable debris. Slash would be left in place or disposed of in accordance with requirements of the land-management agency or landowner.		●	●			●						
	Earth Resources												
17.	In newly disturbed temporary work areas, the soil would be salvaged and distributed and contoured evenly over the surface of the disturbed area after construction completion. The soil surface would be left rough to help reduce potential wind erosion.		●				●						
18.	Grading would be minimized by driving overland within pre-designated work areas whenever possible.		●				●					●	
19.	In consultation with appropriate land-management agencies, specific mitigation measures for paleontological resources would be developed and implemented to mitigate any identified adverse impacts. These measures would include: ▪ preparation of a Paleontological Resources Treatment Plan; ▪ paleontological surveys; ▪ education of construction personnel; ▪ monitoring ground disturbance; ▪ curation; and ▪ deposition in a paleontological repository.		●					●					
	Land Use												
20.	On agricultural land, the right-of-way would be aligned, insofar as is practicable, to reduce the impact on farm operations and agricultural production.	●									●		
21.	The Proponent would respond to complaints of line-generated radio or television interference by investigating the complaints and			●							●		

TABLE 2-6
STANDARD MITIGATION MEASURES

	Standard Mitigation Measures	Application Phase			Effectiveness								
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		Design and Engineering	Construction	Operation and Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
	implementing appropriate mitigation measures where possible. The transmission lines would be patrolled by air or inspected on the ground on a periodic basis, in compliance with the Proponent's standards, so damaged insulators or other line materials that could cause interference are repaired or replaced.												
22.	Fences, gates, and walls would be replaced, repaired, or reclaimed to their original condition as required by the landowner or the land-management agency in the event they are removed, damaged, or destroyed by construction activities. Fences would be braced before cutting. Temporary gates or enclosures would be installed only with the permission of the landowner or the land-management agency and would be removed/reclaimed following construction. Cattle guards or permanent access gates would be installed where new permanent access roads cut through fences on BLM- and USFS-administered lands.		●	●							●		
23.	In cultivated agricultural areas, soil compacted by construction activities would be de-compacted. Construction activities would occur as practical to minimize impacts on agricultural operations.		●								●		
24.	Where work would occur on hazardous and contaminated sites, the Proponent must seek approval from the EPA. Work on contaminated sites must avoid remedial structures (e.g., capped areas, treatment, or monitoring wells, etc.) and workers must use adequate worker protection measures for working in contaminated areas.	●	●								●		

TABLE 2-6
STANDARD MITIGATION MEASURES

	Standard Mitigation Measures	Application Phase			Effectiveness								
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		Design and Engineering	Construction	Operation and Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
25.	Towers and/or conductors and/or shield wires would be marked with high-visibility devices (i.e., marker balls or other marking devices) where required by governmental agencies with jurisdiction (i.e., FAA). Tower heights would be less than 200 feet to avoid the need for aircraft obstruction lighting.	●	●	●									
	Multiple Resources												
26.	All construction vehicle movement outside the right-of-way normally would be restricted to pre-designated access, contractor-acquired access, or public roads.		●	●	●	●	●	●	●	●	●	●	●
27.	The spatial limits of construction activities would be predetermined with activity restricted to and confined within those limits. No paint or permanent discoloring agents indicating survey or construction limits would be applied to rocks, vegetation, structures, fences, etc.		●		●	●	●	●	●	●	●	●	●
28.	Prior to construction, the CIC would instruct all personnel on the protection of cultural, ecological, and other natural resources such as: (a) federal and state laws regarding antiquities and plants and wildlife, including collection and removal; (b) the importance of these resources; and (c) the purpose and necessity of protecting them.		●		●	●		●	●	●			●
29.	All requirements of those entities having jurisdiction over air quality matters would be adhered to. Any necessary dust control plans would be developed and permits for construction activities would be obtained. Open burning of construction trash would not be allowed, unless permitted by appropriate authorities.		●				●				●		
30.	Hazardous material would not be drained onto the ground or into streams or drainage areas. Totally enclosed containment would be provided for all trash. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially		●	●	●	●	●		●	●			

TABLE 2-6
STANDARD MITIGATION MEASURES

	Standard Mitigation Measures	Application Phase			Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design and Engineering	Construction	Operation and Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
	hazardous materials would be removed to a disposal facility authorized to accept such materials.												
	Visual Resources												
31.	Dull-galvanized steel for lattice towers and either dull-galvanized steel or self-weathering steel for H-frames, along with nonspecular conductors, would be used to reduce visual impacts.	●	●								●	●	
	Water Resources												
32.	Watering facilities (tanks, natural springs and/or developed springs, water lines, wells, etc.) would be repaired or replaced if they are damaged or destroyed by construction activities to their pre-disturbed condition as required by the landowner or land-management agency.		●		●	●							
33.	Refueling and storing potentially hazardous materials would not occur within a 100-foot radius of a water body, a 200-foot radius of all identified private water wells, and a 400-foot radius of all identified municipal or community water wells. Spill preventive and containment measures or practices would be incorporated as needed.		●	●	●	●							

TABLE 2-7
SELECTIVE MITIGATION MEASURES

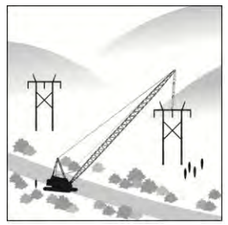
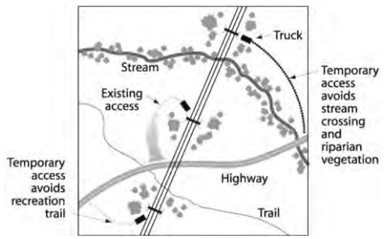
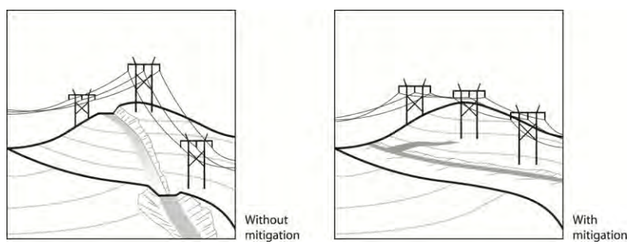
Mitigation Measure	Mitigation Examples	Mitigation Application Phase			Mitigation Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design And Engineering	Construction	Operation And Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
1. <u>Disturbance to Sensitive Soils and Vegetation</u> Existing access roads/trails would not be widened or otherwise upgraded for construction and maintenance in areas determined by the land-management agency, where soils and vegetation are particularly sensitive to disturbance, except in areas where repairs are necessary to make existing roads/trails passable and safe.		●			●	●	●			●	●	●	●
					Avoiding unnecessary access road upgrades would limit the amount of habitat disturbed or removed. In addition, the avoidance of road upgrades would not allow for vehicular traffic to increase significantly, thereby reducing the potential for indirect effects such as damage or loss of vegetation, spread of noxious weeds, harassment of wildlife, vandalism of cultural resources, and disturbance to sensitive land uses (e.g., parks, preservation, and recreation areas).								
2. <u>Sensitive Resources Avoidance</u> There would be no blading of new access roads in select areas of sensitive resources (e.g., perennial streams, riparian areas, trails) during construction (or maintenance). Existing crossings will be used at perennial streams, national recreational trails, and irrigation channels. Existing or overland access routes are to be used for construction and maintenance in these select areas. To minimize ground disturbance, overland routes must be flagged with easily seen markers, and the route must be approved in advance of use by the landowner or Authorized Officer.		●	●		●	●	●		●	●		●	●
					Mitigation Measure 2 is effective for the same reasons as Mitigation Measure 1. Minimizing ground-disturbing construction activities in the same vicinity as streams would limit disturbance to riparian areas and/or streambeds, therefore avoiding turbidity and sedimentation. In addition, it would limit land use conflicts with trails and/or disruption of sensitive views.								
3. <u>Minimize Slope Cut and Fill</u> The alignment of any new access roads or cross-country routes in designated areas would follow the landform contours where practicable to minimize ground disturbance and/or reduce scarring (visual contrast) of the landscape, providing that such alignment does not affect other resource values.		●					●			●		●	●
					Following the existing land contours and terrain, particularly in steep terrain, minimizes the cutting and filling of slopes, and ensures the form and line of the landscape is not visually interrupted. This results in reducing visual contrast between the exposed ground of the road and the surrounding environment. Also, water runoff is less likely to accelerate soil erosion (minimizing potential damage from rutting, drilling), which in turn protects adjacent vegetation.								

TABLE 2-7
SELECTIVE MITIGATION MEASURES

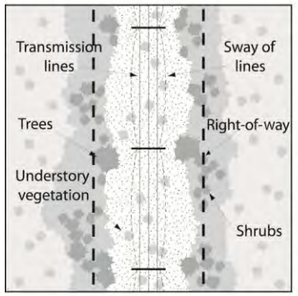
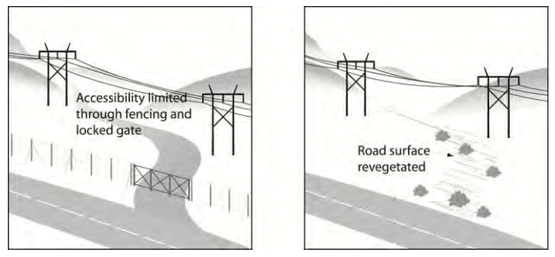
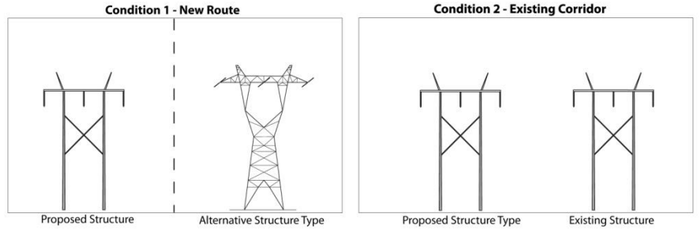
Mitigation Measure	Mitigation Examples	Mitigation Application Phase			Mitigation Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design And Engineering	Construction	Operation And Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
4. <u>Minimize Tree Clearing</u> Clearing of trees in and adjacent to the right-of-way would be minimized to limit disturbance to timber resources, reduce visual contrast, and protect raptor nesting habitat, to the extent practicable to satisfy conductor-clearance requirements (i.e., PacifiCorp Vegetation Management Standards). Trees and other vegetation would be removed selectively (e.g., edge feathering) to blend the edge of the right-of-way into adjacent vegetation patterns, as practicable and appropriate. Trees would be removed selectively in riparian habitats to protect biological resources, including raptor nesting habitat.			●						●		●	●	●
					Selectively removing vegetation (i.e., trees) within and along the edges of the right-of-way reduces disruption of habitat, minimizes removal of timber resources, and reduces the visual contrast between the right-of-way and the surrounding environment. Furthermore, "feathering" the edges of the right-of-way instead of cutting trees and vegetation in a straight line results in a more gradual modification to the environment.								
5. <u>Minimize New or Improved Accessibility</u> To limit new or improved access into the Project area, all new or improved access (e.g., blading, widening existing access) that would not be required for maintenance would be closed or rehabilitated using the most effective and least environmentally damaging methods, appropriate to that area and developed through consultation with the landowner or land-management agency. Methods for road closure or management include installing and locking gates, obstructing the path (e.g., earthen berms, boulders), revegetating the surface of the roadbed to make it less apparent, or restoring the road to its natural contour and vegetation.				●					●	●	●	●	
					Closing access roads where they are not needed after construction protects the resources in that area from further disturbance for the reasons described in Mitigation Measure 1.								
6. <u>Tower Design Modification</u> The tower design may be modified or an alternative tower type may be used to minimize visual contrast or to address site-specific constraints (e.g., terrain, airports, raptor perching etc.), if practical and consistent with PacifiCorp standards.			●						●		●	●	●
					Flexibility in designing the tower or use of different tower types would allow tower structures to be more adapted to specific site situations (i.e., Condition 1 – New Route, Condition 2 – Existing Corridor). For example, in areas where there are sensitive views and an existing corridor, the proposed line would parallel an existing line and match the type of tower used along the existing line and therefore minimize visual contrast or minimize poles with perching opportunities for aerial predators where sensitive grassland species occur.								

TABLE 2-7
SELECTIVE MITIGATION MEASURES

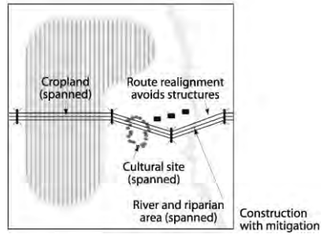
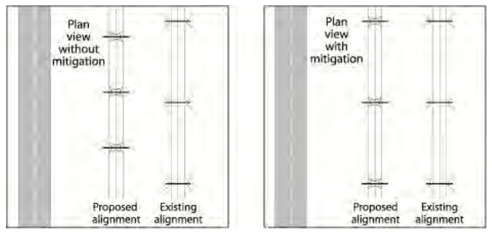
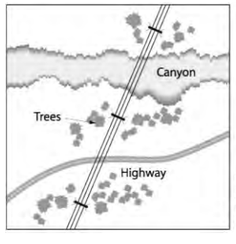
Mitigation Measure	Mitigation Examples	Mitigation Application Phase			Mitigation Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design And Engineering	Construction	Operation And Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
7. <u>Span and/or Avoid Sensitive Features</u> Within the limits of standard tower design and in conformance with engineering and PacifiCorp requirements, structures would be located to allow conductors to clearly span identified sensitive features. Structures would be placed so as to avoid sensitive features, including, but not limited to, wetlands, riparian areas, water courses, hazardous substance remediation, and cultural sites. Avoidance measures may include selective tower placement, spanning sensitive features, or realigning access routes.	 Construction with mitigation	●			●	●			●	●	●		●
					Flexibility in the placement of towers allows for sensitive features to be avoided. Realigning the towers along a route or realigning the route can result in avoiding or minimizing direct impacts on resources, such as cultural and biological resources, as well as land uses such as agriculture, parks, preservation, hazardous substance remediation, and recreation areas.								
8. <u>Match Transmission Line Spans</u> Standard tower design would be modified to correspond with spacing of existing transmission line structures of the same voltage, where feasible and within limits of standard tower design, to reduce visual contrast and/or potential operational conflicts. The normal span would be modified to correspond with existing towers, but not necessarily at every location.		●									●	●	●
					Matching tower spacing with existing parallel lines reduces the visual space occupied by the towers and minimizes the amount of contrast between the man-made structures and the landscape.								
9. <u>Maximum Span at Crossings</u> At highway, canyon, and trail crossings, towers would be placed at the maximum feasible distance from the crossing within limits of standard tower design and in conformance with engineering and PacifiCorp requirements to reduce visual impacts and potential impacts on recreation values and to increase safety at these locations.	 Towers placed maximum distance from canyon and highway crossings	●									●	●	●
					Placing towers at a maximum distance from major or sensitive crossings (i.e., roads and trails) would reduce visual impacts and potential safety hazards (i.e., vehicle collision with tower).								

TABLE 2-7
SELECTIVE MITIGATION MEASURES

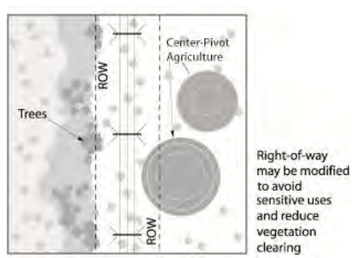
Mitigation Measure	Mitigation Examples	Mitigation Application Phase			Mitigation Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design And Engineering	Construction	Operation And Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
10. <u>Helicopter Construction</u> Helicopter placement of towers during construction and helicopter patrol and maintenance may be used where practicable to reduce surface impacts in environmental constraint areas or steep terrain locations.			●	●			●	●	●	●	●	●	●
Using helicopters to place towers in steep terrain or otherwise sensitive areas reduces land use and natural resource impacts as a result of construction activities. The decrease of ground disturbances would reduce the loss of vegetation, accelerated soil erosion, potential damage to cultural resources, and visual impacts.													
11. <u>Minimize Right-of-Way Clearing</u> Clearing of the right-of-way would be minimized to reduce visual contrast and avoid sensitive features including, but not limited to, land uses, biological resources, and cultural sites. In select areas, the right-of-way width may be modified (within the limits of PacifiCorp Vegetation Management Standards and standard tower design) to protect sensitive resources, but current land uses would be allowed to continue unabated, provided the use meets applicable standards.		●	●						●	●	●	●	●
Limiting the width of the area cleared in the right-of-way reduces the amount of vegetation (i.e., trees) removed at the edges of and within the right-of-way, minimizing the loss of habitat and reducing visual contrast between the cleared areas and the surrounding environment. In limited circumstances, the width of the right-of-way may be reduced to accommodate a land use (i.e., residential).													

TABLE 2-7
SELECTIVE MITIGATION MEASURES

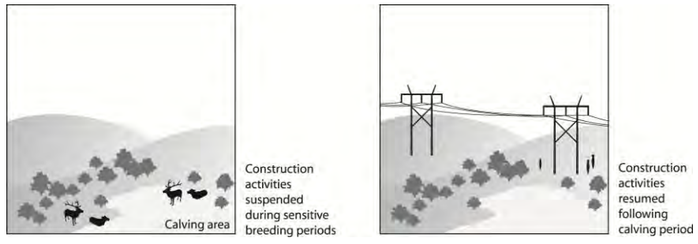
Mitigation Measure	Mitigation Examples	Mitigation Application Phase			Mitigation Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design And Engineering	Construction	Operation And Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
12. <u>Seasonal Wildlife Restrictions</u> To minimize disturbance to wildlife during sensitive periods, construction and maintenance activities would be restricted in designated areas after receiving clearance to proceed from a biological monitor as follows: *Big Game* ▪ No construction or maintenance activities within mule deer and elk winter ranges from November 1 to May 15 (UDWR 2010) ▪ No construction or maintenance activities within mule deer crucial summer/fall range from May 1 to June 15 (UDWR 2010) *Migratory Birds* ▪ Spatial buffers and seasonal restrictions for nesting raptors in accordance with FWS Utah Field Office Guidelines for Raptor Protection From Human and Land Use Disturbances (construction restrictions range from December 1 to September 30, depending on the species) (Romin and Muck 2002) ▪ No construction or maintenance activities within the BLM's recommendation of 50 feet from nesting (nonraptor) migratory birds from February 15 to July 15 (BLM 2011) *Southwestern willow flycatcher* ▪ No construction or maintenance activities in identified habitat for the Southwestern willow flycatcher from April 1 to August 30 (BLM 1999) *Utah prairie dog* ▪ Construction and maintenance activities would only occur in Utah prairie dog colonies between April 1 to September 30 (FWS 2010) *Sage Grouse* ▪ No construction or maintenance activities within 2.0 miles of a lek between March 1 and May 31 (UDWR 2009)			●	●				●				Restricting construction activities or maintenance during breeding or nesting periods eliminates potential disturbance of wildlife during these critical periods of their life cycles.

TABLE 2-7
SELECTIVE MITIGATION MEASURES

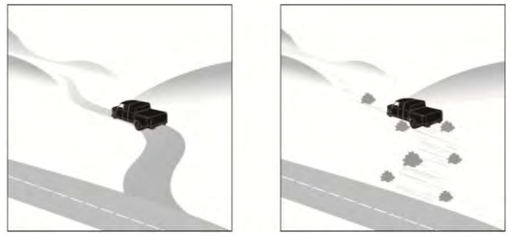
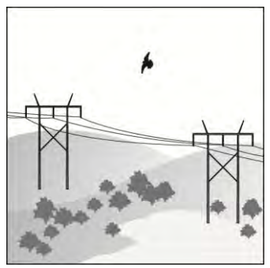
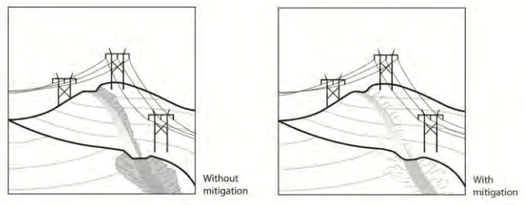
Mitigation Measure	Mitigation Examples	Mitigation Application Phase			Mitigation Effectiveness								
					Water Resources		Earth Resources		Biological Resources				
		Design And Engineering	Construction	Operation And Maintenance	Streams/Washes	Wetlands/Springs	Geology/Soils	Paleontology	Sensitive Wildlife Species	Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
13. <u>Overland Access</u> The Construction Contractor would use overland access to the greatest extent possible in areas where no grading would be needed to access work areas. Overland access would consist of drive-and-crush and/or clear-and-cut travel. Drive-and-crush is vehicular travel to access a site without significantly modifying the landscape. Vegetation is crushed but not cropped. Soil is compacted, but no surface soil is removed. Clear-and-cut is considered as brushing off (removal) of all vegetation to improve or provide suitable access for equipment. All vegetation is removed using aboveground cutting methods that leave the root crown intact. Prior to work beginning, overland access routes would be staked to a minimum width of 14 feet and as specified in the POD.			●	●			●		●		●	●	
Overland access would avoid or minimize the removal of surface soil and vegetation, reducing the potential for erosion and loss of habitat. In addition, avoiding the construction of a new road would reduce the potential for increased traffic and the associated indirect effects.													
14. <u>Flight Diverters</u> Shield wires, guy wires, and OPGW along portions of the transmission line that have a high potential for avian collisions would be marked with flight diverters or other BLM- or USFS-approved devices in accordance with agency requirements. Portions of the transmission line that cross through, or are adjacent to, waterfowl and general migratory pathways may be marked to reduce the risk of avian collisions. The specific segments to be marked would be determined in consultation with the appropriate agencies.			●	●					●				
Conductor markings on segments of the transmission lines that cross through, or are adjacent to, waterfowl and shorebird habitat would minimize the risk of avian collision.													

TABLE 2-7
SELECTIVE MITIGATION MEASURES

Mitigation Measure	Mitigation Examples	Mitigation Application Phase			Mitigation Effectiveness								
		Design And Engineering	Construction	Operation And Maintenance	Water Resources: Streams/Washes	Water Resources: Wetlands/Springs	Earth Resources: Geology/Soils	Earth Resources: Paleontology	Biological Resources: Sensitive Wildlife Species	Biological Resources: Sensitive Plant Species	Land Use	Visual Resources	Cultural Resources
15. <u>Limit Accessibility in Sensitive Habitats</u> Where feasible, access roads that traverse sensitive habitats (e.g., crucial winter range) would be gated or otherwise blocked to limit public access.			●	●					●		●		
Mitigation Measure 15 is effective for the same reasons as Mitigation Measure 12. Limiting access to sensitive areas would reduce the potential for indirect effects associated with increased traffic.													
16. <u>Blend Road Cuts or Grading</u> Soil amendments, mineral emulsions, or asphalt emulsions (i.e., Permeon™ or approved equal) would be applied, or grading techniques such as slope rounding and slope scarification would be used to blend road and pad cuts into the landscape in areas of steep terrain where grading is necessary, in rocky areas, or where soil color would create strong landscape contrasts.		●	●									●	●
Similar to Mitigation Measure 3, the implementation of grading techniques (i.e., slope rounding and slope scarification) would reduce the visual contrast between exposed ground and the surrounding environment. The application of this mitigation would be determined in the field, during or after construction, by the CIC and BLM or USFS Authorized Officers.													

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necessary for operation and maintenance purposes. On completion of construction activities, temporary access roads would be reclaimed according to the procedures specified in the final POD. Conversely, where required for construction, operation, and maintenance purposes, or where landowners or land-management agencies require, access roads would be constructed for permanent use.

All new and improved access roads, temporary or permanent, would be built with a travel-surface width of a minimum of 14 feet, depending on site-specific conditions and as specified in the final POD. Turnout areas and curves would require a wider surface. It is anticipated turnout areas (100 feet long by 10 feet wide) will be required for every 1,000 feet of new access road during the construction phase of the Project. On completion of construction, these turnout areas would be reclaimed according to the procedures specified in the final POD.

New roads that must be graded for access along steep slopes (side-hill roads) could exceed a 14-foot width, with the total disturbed width varying depending on the amount of displaced soil. In addition, roads may be routed around specific areas due to topography or to avoid sensitive resources. Helicopters may be used for structure placement in limited areas where there are environmental constraints (i.e., where access is difficult due to rough terrain), or where it is economically practical; however, access roads to each structure location would be required. Typically, an improved ditch drainage system will not be required for new or improved access roads.

Erosion- and sedimentation-control measures such as water bars, culverts, sediment basins, or perimeter control would be installed for new and improved roads as required to minimize erosion during, and subsequent to, construction of the Project. These features would be constructed in accordance with the Proponent's standards (PacifiCorp TA 503 and TA 504), as approved by the agencies and included in the final POD. To the maximum extent possible, drainages would be crossed at grade. Where such crossings are not feasible, culverts may be constructed (some of which may be temporary).

To reduce permanent Project disturbance where operation and maintenance access will be required, temporary road construction methods (i.e., overland drive-and-crush; clear-and-cut) may be implemented where feasible. Overland drive-and-crush is vehicular travel to access a site without significantly modifying the landscape. Vegetation is crushed but not cropped, thereby minimizing disturbance to root mass and organics in the soil. Soil may be compacted but no surface soil is removed. Overland clear-and-cut is the removal of all vegetation at or near ground level to improve or provide suitable access for equipment. All vegetation is removed using aboveground cutting methods that leave the root crown intact. Soil is compacted but no surface soil is removed.

Construction of new and improved access roads would potentially generate excessive dust during the construction process, as well during pass-through Project access use. Appropriate dust-control measures would be implemented at locations along the route, as needed, based on state and/or county requirements. Methods to minimize dust and erosion control associated with existing and new access also would be approved by the agencies and provided in the final POD.

In certain areas, it could be necessary to close roads after construction to restrict future access for general and undesired use. Such areas would be identified through negotiations with the landowner or land-management agency. Methods for road closure or management may include implementing physical barriers, such as locking gates, obstructing the path with earthen berms or boulders, ripping the road bed, or depositing construction material on the road surface, in a manner consistent with reclamation practices to be identified in the final POD. Closed access routes would have to be reopened where right-of-access is impeded for maintenance and emergency restoration repairs.

Access Levels

To support environmental analysis, five types of access were identified and the amount of ground disturbance associated with each type of access was estimated (Table 2-8). This information was combined with slope data to provide an estimate of the potential ground disturbance that could result from utilizing existing access roads, upgrading existing roads, or constructing new roads.

Access levels have been organized numerically, beginning with the access level of least disturbance. Existing roads suitable for Project construction access were mapped (see Map Volume [MV]-1, Volume II), and areas of the Project alternatives within 500 feet of these roads were designated as Level 1. Existing roads requiring improvements were also mapped, and areas of Project alternatives within 500 feet of these roads were designated as Level 2. Areas of Project alternatives greater than 500 feet from existing roads were designated as Levels 3, 4, and 5, dependent on slope conditions, as described in Table 2-8. In addition, access levels were combined with vegetation data to identify areas of potential temporary disturbance, thus minimizing impacts on environmental resources as a result of Project construction.

TABLE 2-8
GROUND DISTURBANCE/ACCESS TYPES

Access Levels	Description	Estimated Disturbance per Mile (acres)
Type 1	**Use existing roads** Existing roads would be used if they are located within 500 feet of the identified Project centerline, were paved or graded gravel roads with a travel surface at least 14 feet wide, and were approved for use by the applicable right-of-way holder. Typically, construction of spur roads would be required to access each of the towers. Approximately five spur roads per mile would be required, with a total disturbance of width of 16 feet and length dependent upon distance from the Project centerline and slope. Estimated disturbance associated with this access level assumes 0.5 mile of spur roads would be required for each mile of transmission line route.	1.0
Type 2	**Improve existing roads** Existing roads within 500 feet of the Project centerline would be improved if they do not meet Proponent, BLM, or USFS standards to accommodate the vehicles and traffic flows necessary to construct the Project. This would include single- and two-track roads typically used by recreational vehicles and/or agricultural equipment, but not for regular commercial traffic. This assessment assumes, for existing roads requiring improvements to meet Proponent, BLM, and USFS standards for road construction, 6 feet of improvement width will be required. In addition to road improvements, construction of spur roads would be required to access each of the towers. Approximately five spur roads per mile would be required, with a total disturbance width of 16 feet and length dependent upon distance from the Project centerline and slope. Estimated disturbance associated with this access level assumes 0.5 mile of spur roads would be required for each mile of transmission line route.	1.7

TABLE 2-8
GROUND DISTURBANCE/ACCESS TYPES

Access Levels	Description	Estimated Disturbance per Mile (acres)
Type 3	**Construct new access, flat to rolling terrain (0 to 8 percent slopes)** New access roads constructed on flat- to-rolling terrain would not require switchbacks. Approximately 1.0 mile of new road with periodic pullouts would be required for each 1.0 mile of transmission line in flat-to-rolling terrain and would be constructed at a minimum of 14 feet in width. However, in areas where environmentally sensitive features occur (e.g., archaeological sites, biological or paleontological resources, etc.), up to 1.5 miles of new roads with periodic pullouts may be required to avoid sensitive resources.	2.5
Type 4	**Construct new access, rolling terrain (8 to 15 percent slopes)** It is anticipated new access roads constructed on moderately steep, rolling terrain would require occasional switchbacks to accommodate construction vehicles. Approximately 1.5 miles of new road with periodic pullouts would be required for each 1.0 mile of transmission line in rolling terrain and would be constructed at a minimum of 14 feet in width, plus disturbance for slope cut and fill, where necessary.	4.5
Type 5	**Construct new access, steep terrain (greater than 15 percent slopes)** New access roads constructed in steep terrain would require a substantial number of switchbacks to accommodate construction vehicles. Approximately 2.0 miles of new road with periodic pullouts would be required for each 1.0 mile of transmission line in steep terrain and would be constructed at a minimum of 14 feet in width, plus disturbance for slope cut and fill.	7.3

Tower/Site Clearing

Clearing of natural vegetation would be required for construction purposes (access, spur roads, and structure sites), clearances for electrical safety, long-term maintenance, and reliability of the transmission line. In or adjacent to the right-of-way, mature vegetation would be removed under or near the conductors to provide adequate electrical clearance as required by NESC and DOE. Clearing activities would be in compliance with the Proponent's Vegetation Management Specification Manual and the Standard FAC-003-1 Transmission Vegetation Management Program.

Typical Structure Site and Work Area

At each structure site, work areas are required to facilitate the safe operation of equipment and construction operations. In typical work areas in flat terrain, an area 150 feet by 200 feet of temporary disturbance would be required for equipment and construction tasks. In that work area, the permanent disturbance associated with the structure footings would be up to 40 feet by 40 feet. The work area would be cleared of vegetation only to the extent needed. Access in the work area would be overland travel with minimal grading required in the work site. After construction, all temporary work areas would be restored.

Specific structure sites and work areas would be identified in the POD once a final route has been determined.

Structure Site and Work Areas in Steep or Rough Terrain

At each structure site in rough and steep terrain, work areas required would vary depending on the site conditions. Work areas may be larger and permanent structure sites may require additional clearing and grading to accommodate crane pads used by construction and maintenance crews. Extensive grading along steep slopes would be required to accommodate some tower sites. Any crane pads developed for construction would be left in place. Removed topsoil would be replaced and seeded.

Structure Foundation Installation

Excavations for structure foundations would made using power equipment or blasting techniques, where required. Where the site conditions permit, a vehicle- mounted power auger or backhoe would be used to excavate the foundation holes. In rocky areas, the foundation holes could be excavated by drilling and blasting or special rock anchors could be installed. In extremely sandy areas, soil stabilization by water or a gelling agent could be used during excavation. The CIC and the BLM or USFS would be notified in advance of any required blasting so the area can be cleared. A blasting plan would be developed and incorporated into the final POD.

H-frame tangent structures would be used predominantly. The poles would be directly embedded into excavated holes at a depth based on geological data resulting from the geotechnical investigations. If soils were determined unsuitable for direct embedment, a drilled pier could be required with the depth and diameter of the pier excavation determined from the geotechnical investigation.

For lattice towers, footings would be cast in place by placing reinforcing steel and a tower stub into the foundation hole, positioning the stub, and encasing it in concrete. Spoil material would be used for fill where suitable or disposed, as specified in the POD. The excavation and installation of the foundation would require access to the site by a power auger or drill, a crane, material trucks, and concrete trucks using the access roads.

Drilled pier foundations would be used for tubular steel structures.

Foundation holes left open or unguarded would be covered to protect the public and wildlife. If practical, fencing could be used. Soil removed from foundation holes would be stockpiled on the work area. These piles would be used to backfill holes, and the remainder with topsoil spread on top would be distributed over the work area.

Structure Assembly and Erection

H-frame tangent structure and single-pole material would be hauled to the structure location via flatbed truck and assembled onsite. The entire structure would be framed on the ground and erected as one unit using a crane (Figure 2-5).

Lattice-frame-structure material would be assembled on site or preassembled of convenient size and weight in the staging areas. These subsection assemblies and associated hardware would be shipped to each structure site by truck. The subsections would be assembled at the site and hoisted into place by a large crane and then fastened together to form a complete structure.

If drilled-pier foundations are necessary, H-frame and single-pole structures would be fastened to foundations using appropriately sized anchor bolts.

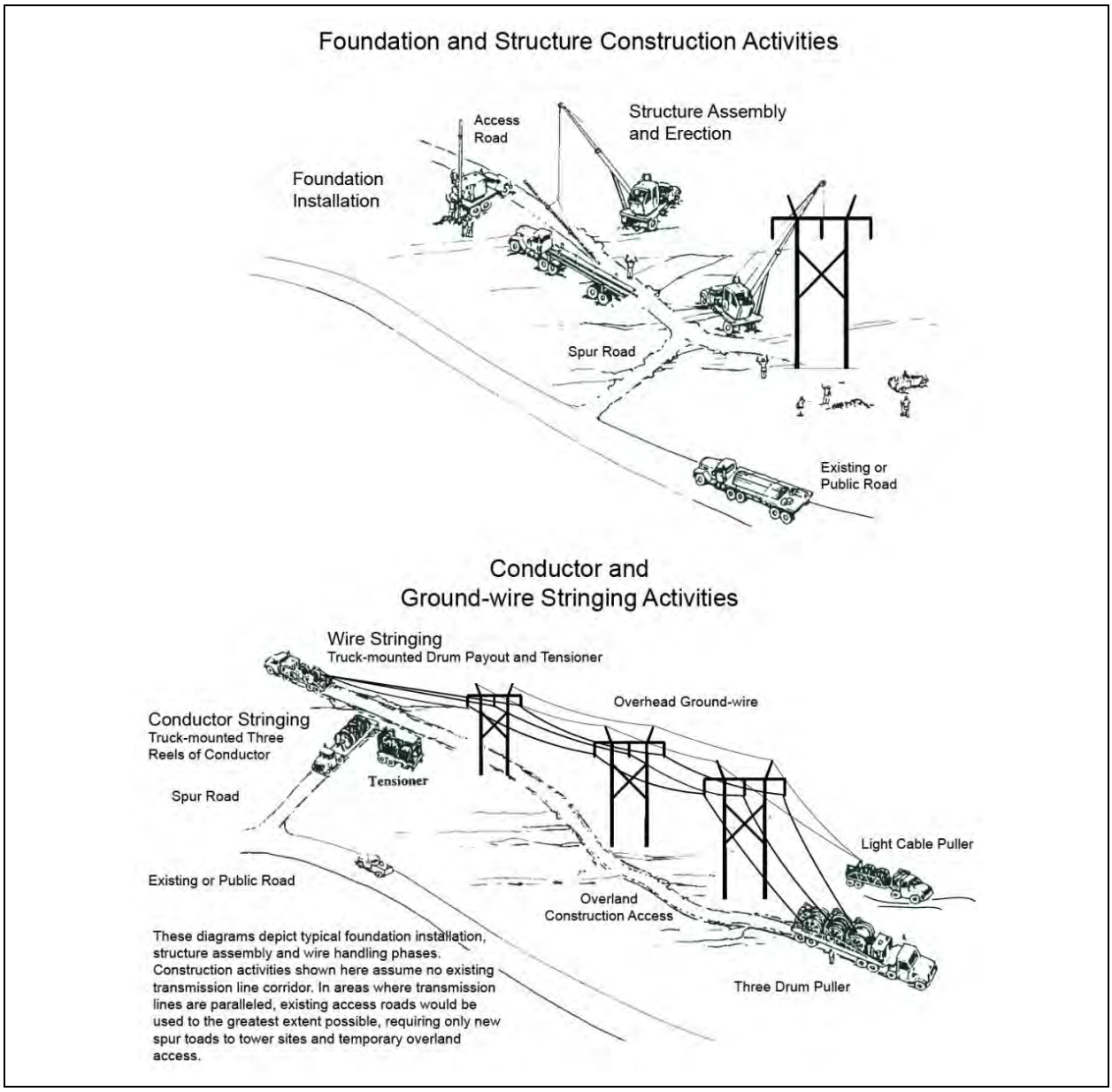

Figure 2-5 Typical Construction Activities

Equipment Staging

Construction would begin with the establishment of staging areas, which would be required for storing materials, construction equipment, and vehicles. Additionally, concrete batch plants, if needed, would be sited at staging areas, as would some of the required fly yards for helicopter operations, if any. Staging areas would be located near each end of the transmission line right-of-way and approximately every 40 to 50 miles along the route. Each staging area would occupy approximately 12 to 20 acres.

The staging areas would serve as field offices, reporting locations for workers, parking space for vehicles, and equipment, sites for material storage, and stations for equipment maintenance. Facilities would be fenced and their gates locked. Security guards would be stationed where needed. Locations of staging

areas would be determined following discussion with the land-management agency or negotiations with landowners. In some areas, the staging area may need to be scraped by a bulldozer and a temporary layer of rock laid to provide an all-weather surface. Unless otherwise directed by the landowner or land-management agency, the rock would be removed from the staging area on completion of construction, and the area would be restored as approved by the agencies and identified in the POD.

In locating staging areas, the preference would be to select relatively level areas with easy existing access to minimize site grading and new road construction. The staging areas would be located on private land to the extent possible and in previously disturbed areas or in areas of minimal vegetative cover, where possible.

Detailed maps would be developed to show proposed locations of staging areas once they are identified during the design phase.

Conductor Installation

Conductors, insulators, hardware, and stringing sheaves would be delivered to each tower site for installation. The towers and poles would be rigged with insulator strings and stringing sheaves at each shield wire and conductor position (Figure 2-5); however, some structures could be erected with insulators and travelers already installed. For public protection during wire installation, guard structures would be erected over highways, railroads, powerlines, structures, and other obstacles. Guard structures consist of H-frame poles and aerial equipment placed on either side of an obstacle. These structures prevent shield wire, conductors, or equipment from falling on an obstacle.

Equipment for erecting guard structures includes augers, line trucks, pole trailers, and small cranes. Guard structures may not be required for small roads or may be accommodated by line trucks. On such occasions, other safety measures such as barriers, flagmen, or other traffic control would be used.

Sites for tensioning and pulling equipment measure approximately 150 feet by 750 feet every 2 to 4 miles. However, when construction occurs in steep and rough terrain, these sites may require larger, less symmetrical pulling and tensioning areas. Likewise, sites for tensioning and pulling equipment on either side of a large angle structure may be off the right-of-way. A short-term right-of-way grant (BLM) or temporary use permit (USFS) would be obtained for these sites, as needed.

A pilot line would be pulled (strung) from tower to tower (or pole to pole) by helicopter, truck, or four-wheel-drive vehicle and threaded through the stringing sheaves at each structure. A stronger line that is larger in diameter would then be attached to the pilot line and strung. This is called the pulling line. This process is repeated until the shield wire and conductor are pulled through all sheaves. Shield wire and conductor would be strung using powered pulling equipment at one end and powered braking or tensioning equipment at the other end.

Sites for tensioning equipment and pulling equipment are areas approximately 150 feet by 700 feet. However, when construction occurs in the steep and rough terrain, these sites may require larger, less symmetrical pulling and tensioning areas. Once a final route has been determined, pulling and tensioning sites would be identified in the POD.

Ground Rod Installation

As a part of standard construction practices, prior to wire installation tower-footing resistance along the route would be measured. Where the resistance to remote earth for each transmission tower would be greater than 15 ohms, counterpoise (grounds) would be installed within the right-of-way to lower the resistance to 15 ohms or less.

Cleaning Up and Reclaiming Affected Land Areas

Right-of-way construction sites, material storage yards, and access roads would be kept orderly. Refuse and trash would be removed from the sites and disposed of in an approved landfill. In remote areas, trash and refuse would be removed to a construction staging area until proper disposal can be facilitated. No open burning of construction trash would occur without appropriate approval.

The right-of-way would be reclaimed through methods described in the reclamation plan, as specified in the POD. All practical means would be made to reclaim the land to its original contour and natural drainage patterns. Revegetation activities along the right-of-way would conform to the Proponent's vegetation management standards as approved by the agencies. Reclamation seed mixture would conform to BLM or USFS requirements and approval.

2.3.6 Operation and Maintenance

The design, construction, operation, and maintenance of the Project would meet or exceed the requirements of the NESC, U.S. Department of Labor, OSHA standards, and the Proponent's requirements for safety and protection of landowners and their property. The transmission lines would be protected with power circuit breakers and line relay protection equipment. If a conductor fails, power would be automatically removed from the line. Lightning protection would be provided through overhead ground wires.

All buildings, fences, and other structures with metal surfaces located within 200 feet from the centerline of the right-of-way would be grounded as needed. Residential buildings located 200 feet from the centerline would not require grounding. Other structures beyond 200 feet would be determined by the NESC to be grounded. All metal irrigation systems that parallel transmission lines for a distance of 1,000 feet or more and within 100 feet from centerline would be grounded. If grounding were required outside the right-of-way, a right-of-way grant (BLM) or temporary use permit (USFS) would be obtained, as needed.

2.3.6.1 Plan of Development

Following the selection of the preferred route, the BLM requires a final POD for the development and implementation of the Project. The POD details the methods and procedures that would be used in construction of the Project. The POD includes instructions to contractors, construction crews, agency personnel, resource inspectors, and monitors for construction, operation, and maintenance of the Project. The POD also contains a project description, resource protection, mitigation measures; specifies environmental compliance field activities; provides a description of construction and operation activities; specifies land use and access requirements; and provides mapping to facilitate avoidance of sensitive resources. In addition, the following implementation documents would be appendices to the POD and

describe the mitigation measures and environmental protection measures the Proponent and its construction contractor(s) will follow during construction, operation, and maintenance of the Project.

BLM and USFS expect that selective mitigation measures and other specific stipulations and methods identified in the POD will be implemented as needed over the entire length of the Project regardless of jurisdiction. It should be noted that BLM and USFS do not have the authority enforce mitigation measures on state and private land.

Traffic and Transportation Management Plan

The Traffic and Transportation Management Plan addresses regulatory compliance, traffic management practices, levels of right-of-way access, and mitigation measures to help reduce impacts related to transportation and the construction of temporary and long-term access within the vicinity of the Project. The purpose of the plan is to provide the BLM, USFS, and other public agencies; the CIC; and the Construction Contractor(s) with a description of the type of access associated with the construction, operation, and maintenance of the Project and make evident the potential impacts that could be created by construction and operation of the Project. The goal of the plan is to ensure impacts from construction of the transmission line and any associated access are kept to a minimum through the use of management practices and mitigation measures described throughout the plan. These practices and measures are intended to mitigate the effects of transportation on environmental resources, roads, traffic, travel, and road safety.

Stormwater Pollution Prevention Plan

In compliance with criteria in the EPA CWA, all construction site operators engaged in clearing, grading, and excavating activities that disturb one acre or more must obtain a NPDES permit for stormwater discharges (CFR, Title 40, Parts 122 and 123). NPDES permits (also called Construction General Permits) are issued by EPA or similar authorized state entity (issued by Utah Department of Environmental Quality) following submittal of a NOI for construction activities and preparation of a Stormwater Pollution Prevention Plan (SWPPP) that describes how erosion and sediment transport will be minimized to adjacent waterbodies. Measures to ensure that construction activities comply with state and EPA requirements for stormwater management to be incorporated into the SWPPP are outlined in the plan. The Construction Contractor(s) will be responsible for developing a SWPPP and obtaining coverage under the NPDES General Permit by filing a NOI and appropriate fee with the Utah Department of Environmental Quality in accordance with NOI instructions.

Spill Prevention, Containment, and Countermeasures Plan

The Spill Prevention, Containment, and Countermeasures Plan Framework for the Project will provide preventive procedural actions, standard mitigation measures, and other specific stipulations and methods to minimize the environmental impact associated with spills or releases of fuel, lubricant, or hazardous materials, during construction and refueling activities and during special refueling activities within 100 feet of waterbodies, wetland boundaries, or within municipal watersheds.

Historic Properties Treatment Plan

The Historic Properties Treatment Plan is confidential. As identified in the Programmatic Agreement, the Historic Properties Treatment Plan will provide information on the following:

- A brief description of the proposed action
- A list of the properties where data recovery is to be carried out
- A list of properties that will require archaeological monitoring during construction
- An archaeological construction monitoring plan
- Research questions to be addressed
- Methods to be used during fieldwork for data recovery
- A cultural resource unanticipated discovery plan
- Methods to be used during analysis
- Reporting and curation of artifacts
- Schedule for the submission of progress reports
- Recommendations for treatment of cultural resources during operation and maintenance of the Project
- Qualifications of consultants employed to undertake the work
- Training protocols for contractors

Blasting Plan Framework

The Blasting Plan Framework outlines methods to mitigate risks and potential impacts associated with blasting procedures that may be required for construction of the Project. Also included is a preliminary outline for the Blasting Plan to be prepared by the Construction Contractor(s) and submitted to the Proponent, if blasting is required. If blasting is to occur on federal lands, the Proponent will submit the Blasting Plan to the BLM and USFS for final review and approval. Once completed, the Blasting Plan will provide construction crews, the CIC, and environmental monitors with Project-specific information concerning blasting procedures, including the safe use and storage of explosives. The objective of the Blasting Plan is to prevent adverse impacts on human health and safety, property, and the environment that could potentially result from the use of explosives during Project construction.

Plant and Wildlife Species Conservation Measures Plan

The purpose of the Plant and Wildlife Species Conservation Measures Plan is to assist the BLM, USFS, and project personnel in meeting their obligations to protect biological resources during the planning, design, and implementation of the Project. The plan includes information on (1) regulatory requirements and agency concerns pertaining to biological resources and (2) specific mitigation measures designed to reduce Project-related impacts on biological resources. The plan provides information on anticipated impacts on plant and wildlife resources associated with the Project and identifies the mitigation measures, stipulations, protocols, and/or techniques required to reduce these impacts. The plan is not intended to provide comprehensive, location-specific restrictions within the Project area.

Erosion, Dust Control, and Air Quality Plan

This Erosion, Dust Control, and Air Quality Plan addresses regulatory compliance, environmental concerns, mitigation recommendations, and monitoring to ensure impacts associated with construction activities are minimized as they relate to soil conservation and air quality. This plan provides measures to

be used by the BLM, USFS, CIC, and the Construction Contractor(s) to ensure protection of the soils and air quality that will be affected by the Project. The plan is to be implemented during the construction, operation, and maintenance phases of the Project. These measures are intended to address (1) soil erosion and sedimentation, and (2) minimize dust and emissions from construction-related activities. The plan describes a number of mitigation measures that can be used to achieve these goals. Determination of the appropriate control measures to use in a particular area will depend on a variety of factors, including weather conditions, selected construction techniques, site characteristics, extent of area to be disturbed, and other factors.

Hazardous Materials Management Plan

The Hazardous Materials Management Plan Framework is intended to reduce the risks associated with the use, storage, transportation, production, and disposal of hazardous materials (including hazardous substances and wastes). The plan will identify Project-specific mitigation measures and other specific stipulations and methods to address spill prevention, response, and clean-up procedures for the Project. This document provides a template for the development of a detailed Hazardous Materials Management Plan to be developed by the Construction Contractor(s).

The Hazardous Materials Management Plan will clearly identify which legal requirements apply to specific types of hazardous materials and will identify standard mitigation practices, which, although not legally required, will be followed to reduce risks associated with hazardous materials. Nothing in this plan framework or in the Hazardous Materials Management Plan (once developed by the Construction Contractor(s)) shall be construed as an admission regarding the legal applicability of requirements or practices to any particular class of hazardous material.

Emergency Preparedness and Response Plan

The Emergency Preparedness and Response Plan Framework is intended to provide an overview of methods to be implemented if the need for emergency management is imminent. This document discusses the existing support structure, chain of command, and emergency communications protocols to be used as a guide for an Emergency Preparedness and Response Plan to be completed by the Proponent's Construction Contractor(s) and approved by the BLM and USFS. Emergency response procedures will be implemented for the following potential events, or similar events:

- Downed transmission lines, structures, or equipment failure
- Fires
- Sudden loss of power
- Natural disasters
- Serious personal injury

The purpose of an Emergency Preparedness and Response Plan is to provide clear procedures and information to enable the Proponent, the Construction Contractor(s), the CIC, and the BLM Project Manager to prepare for and effectively respond to emergency situations. The primary objective of this plan is to prevent adverse impacts on human health and safety, property, and the environment that could potentially occur as a result of the construction, operation, and maintenance of Project.

Noxious Weed Management Plan

The format and content of the Noxious Weed Management Plan is based on the principles and procedures outlined in the BLM Integrated Weed Management Manual 9015 and Forest Service Noxious Weed Management Manual 2080. The Plan includes a discussion on (1) the plan purpose and goals and objectives, (2) the noxious weed inventory, (3) management practices, (4) monitoring, and (5) the use of pesticides/herbicides.

The Utah Department of Agriculture and Food has identified noxious weeds that occur within the state of Utah. Some of these noxious weeds have the potential to occur on the Project right-of-way. The Noxious Weed Management Plan provides methods to control the potential occurrence of noxious weeds during and following construction of the Project. It is the responsibility of the Proponent and/or the Construction Contractor(s), working with the CIC and BLM and USFS Project Manager, to ensure noxious weeds are identified and controlled during construction operation, and maintenance of Project facilities and all federal, state, county, and other local requirements are satisfied.

Fire Protection Plan

The Fire Protection Plan details measures that will be implemented to (1) reduce the risk of starting a fire, and (2) to suppress a fire in the event one does occur within the construction area during Project construction, operation, and maintenance. The risk of fire danger during construction of a transmission line is related largely to the use of vehicles and other motorized equipment operating off roadways, the handling and use of explosive materials and flammable liquids, and welding.

The purpose of the plan is to outline responsibilities, notification procedures, fire prevention measures and precautions, fire suppression equipment, initial response procedures, and post-fire rehabilitation strategies related to the Project. The goal is to minimize the risk of Project-related fires and, in case of fire, provide for immediate suppression within the construction area.

Stream, Wetland, Well, and Spring Protection Plan

The purpose of the Stream, Wetland, Well, and Spring Protection Plan is to provide measures to protect these resources from potential impacts during construction, operation, and maintenance activities. This plan incorporates mitigation measures contained in the Project. The plan is intended for use as a guide to determine the appropriate site-specific measures to be implemented during construction activities. The goals of the plan are to:

- Control Project-related erosion and sedimentation into streams and wetlands and minimize disturbance and erosion of streambeds and banks.
- Protect springs and wells in the Project area from impacts due to blasting and hazardous materials contamination.

Paleontological Resources Treatment Plan

The purpose of the Paleontological Resources Treatment Plan (PRTP) is to assist the BLM and USFS in planning and design efforts for the Project as it relates to paleontological resource issues. The PRTP describes in detail the specific mitigation measures needed to avoid or reduce Project-related impacts on paleontological resources, wherever feasible. The plan provides important background and contextual

information useful for the paleontological resources mitigation program. The logistics, procedures, and methods outlined in this PRTP ensure compliance with federal and state regulations (BLM 2009a, 2008c, 1998, and 36 CFR 261.9i). The PRTP is a work plan for all of the paleontological-related activities that may ensue during the course of development of the Project. It is not the intent of the PRTP to present a comprehensive list of sites with discussions of all significant taxa found from the vicinity of the Project area. The PRTP offers a research-oriented framework and accompanying logistical guidelines to ensure significant nonrenewable paleontological resources unearthed by development of the Project will be managed appropriately and in a timely manner, thereby effectively mitigating adverse impacts on these fossil resources.

Reclamation, Revegetation, and Monitoring Plan

The Reclamation, Revegetation, and Monitoring Framework Plan is developed based on the principles and procedures established by the BLM and USFS. The plan is applicable to the construction of Project facilities, transmission structures, permanent and temporary access roads, staging areas, tension and pulling stages, and other work areas associated with the Project on lands managed by federal and cooperating agencies (e.g., State of Utah). Requirements for reclamation, revegetation, and monitoring on private lands will be negotiated between the Proponent and the affected landowner. The intent of this plan is to provide a framework for reclamation treatments to be applied to the Project on identification of construction-related disturbance, prevent unnecessary degradation of the environment during construction, rehabilitate temporary use areas, and reclaim disturbed areas such that these areas are ecologically functional and visually compatible with the surrounding environment to the greatest extent practicable.

The POD and supporting plans would be finalized and incorporated into the ROD and BLM right-of-way grant and USFS special-use permit for the Project, if approved. The final POD and other supporting documents containing details of Project construction and operation may be found in the BLM's project administrative record, which is housed at the BLM Cedar City Field Office.

2.3.6.2 Construction Workforce

Table 2-9 shows the estimated number of workers and types of equipment required to construct the proposed transmission line. The Project would consist of several phases of construction at various locations. Regular field meetings would be held with the CIC and environmental monitors to review the process and its implementation.

TABLE 2-9
ESTIMATED PERSONNEL AND EQUIPMENT FOR CONSTRUCTION

Activity	Equipment Type	Quantity of Equipment	No. of People
Survey	Pickup truck	3	6
Support equipment	4 x 4 pickup	3	8 to 16
	1-ton mechanic service truck	2	
	Equipment fuel truck	2	
	5-ton truck tractor	1	
	40-ton lowboy rig	2	
	45-ton cherry picker	2	
	10-ton forklift	2	
	4,000-gallon water truck	2	

TABLE 2-9
ESTIMATED PERSONNEL AND EQUIPMENT FOR CONSTRUCTION

Activity	Equipment Type	Quantity of Equipment	No. of People
Road maintenance, building, and restoration equipment	4 x 4 pickup	2	12 to 24
	D8 crawler tractor	1	
	4,000-gallon 6 x 6 water truck	2	
	Self-propelled water wagon	2	
	Road grader	2	
	Backhoe	2	
Guard pole equipment	4 x 4 pickup	2	5 to 10
	Flatbed boom truck	1	
	Auger truck	2	
Foundation installation	4 x 4 pickup	4	30 to 48
	Crewcab pickup	2	
	Air compressor	4	
	25-ton flatbed boom truck	2	
	15-ton flatbed boom truck	4 to 8	
	Rock drill	2 to 4	
	Excavator	3	
	Auger truck	3	
	10-cubic-yard dump truck	2	
	1.5-cubic-yard front-end loader	2	
	Backhoe	2	
	Concrete mixing truck	2 to 8	
	18-ton crane	2	
	30-ton crane	2	
Yard and material hauling equipment	4 x 4 pickup	2	10
	10-ton forklift	3	
	8-ton forklift	2	
	4-ton forklift	2	
	22-ton crane	1	
	6 x 4 truck tractor	1	
	15-ton flatbed boom truck	2	
Structure assembly and erection	4 x 4 pickup	2	40 to 60
	Crewcab pickup	2	
	100-ton hydraulic crane	2	
	70-ton hydraulic crane	1	
	D-8 crawler tractor	2	
	Air compressor	2	
	4 x 4 flatbed truck	2	
Wire stringing and ground cleanup equipment	120-ton crane	2	20 to 48
	30-ton crane	2	
	19-ton crane	2	
	6 x 6 truck tractor	2	
	2-ton truck	2	
	5-ton truck	2	
	Auger truck	1	
	Backhoe	2	
	High-reach boom truck	2	
	15-ton flatbed boom truck	1	
	Pickup truck	4	

TABLE 2-9
ESTIMATED PERSONNEL AND EQUIPMENT FOR CONSTRUCTION

Activity	Equipment Type	Quantity of Equipment	No. of People
	4 x 4 pickup	2	
	Crewcab pickup	2	
Wire installation	Wire reel trailer	6	25
	Diesel tractor	2	
	3-drum pulling machine	3	
	Single-drum puller (large)	1	
	Double bull-wheel tension machine (heavy)	3	
	Sagging equipment (D-8 cat, tracked)	2	
	Helicopter and fly ropes	1	
	Carryall	4	
	Static wire reel trailer	2	
	Air compressor	1	
OPGW installation	OPGW splicing trailer	2	6
	OPGW bucket truck	2	
SOURCE: Pike Engineers 2010			

2.3.6.3 Maintenance

The transmission lines would be patrolled three times per year for maintenance: twice by helicopter and once by driving patrol. Overflight line maintenance by helicopter would be critical during the spring and the fall of each year dependent on weather conditions, helicopter availability, and statutory requirements of the states served by the Proponent. The spring and fall overflight maintenance activities are conducted to identify conditions that pose an immediate hazard to the public or employees, or that risk immediate loss of supply or damage to the electrical system to get those conditions resolved prior to peak demand in the summer and winter months. The Proponent's employees are trained and adhere to PacifiCorp bird management policies and avian protection plans for all maintenance activities. Overflight maintenance activities would be conducted at a frequency, duration, and speed that would not result in disturbance to avian species or nests. Significant cultural resources would be avoided for the life of the Project, which would require coordination between the Proponent and the agencies.

Monitoring and maintenance would be done using approved or existing access roads. When access to the tower/pole locations needs improvement, a tracked bulldozer or other heavy equipment would be used after notifying the BLM or USFS Authorized Officer. As needed, maintenance crews would be required to re-scarify and reclaim to pre-existing conditions any newly disturbed areas outside of the permanent access road. Any closed access roads would be secured at the conclusion of maintenance activities.

2.3.6.4 Emergency Maintenance

The implementation of routine operation and maintenance activities on the transmission line would minimize the need for most emergency repairs; however, emergency maintenance activities are often necessary to repair natural hazard, fire, or man-caused damages to a line. In the event of an emergency, the Proponent would notify the BLM or USFS Authorized Officer and respond as quickly as possible to restore power. The necessary equipment required for emergency repairs would be similar to that needed for regular maintenance. However, on occasion, additional equipment could be required. Although

restoration of the line would have priority, an effort would be made to protect crops, plants, wildlife, and resources of importance. Reclamation procedures following completion of repair work would be similar to those prescribed for construction and would be provided in the POD.

2.3.6.5 Decommissioning

At the end of the useful life of the transmission line (projected to be about 50 years), if the facilities were no longer required, the transmission lines and associated facilities would be decommissioned. Subsequently, a plan for dismantling and removing conductors, insulators, concrete pads, and hardware from the right-of-way would be developed and approved by the permitting agencies. Tower and pole structures would be removed and foundations broken off at least 2 feet below ground surface. All permanent disturbances would be restored in accordance with a Termination and Reclamation Plan approved by the BLM or USFS Authorized Officer.

2.4 Alternatives

A number of transmission line alternative routes were identified for detailed study in the EIS. This section summarizes the process used to identify the alternative routes (Section 2.4.1) and provides a general description of the alternatives (Section 2.4.2). Transmission line alternative routes reviewed but eliminated from detailed study are discussed in Section 2.5.

2.4.1 Process

Each step in the process used to identify the alternative routes is shown in Figure 2-6.

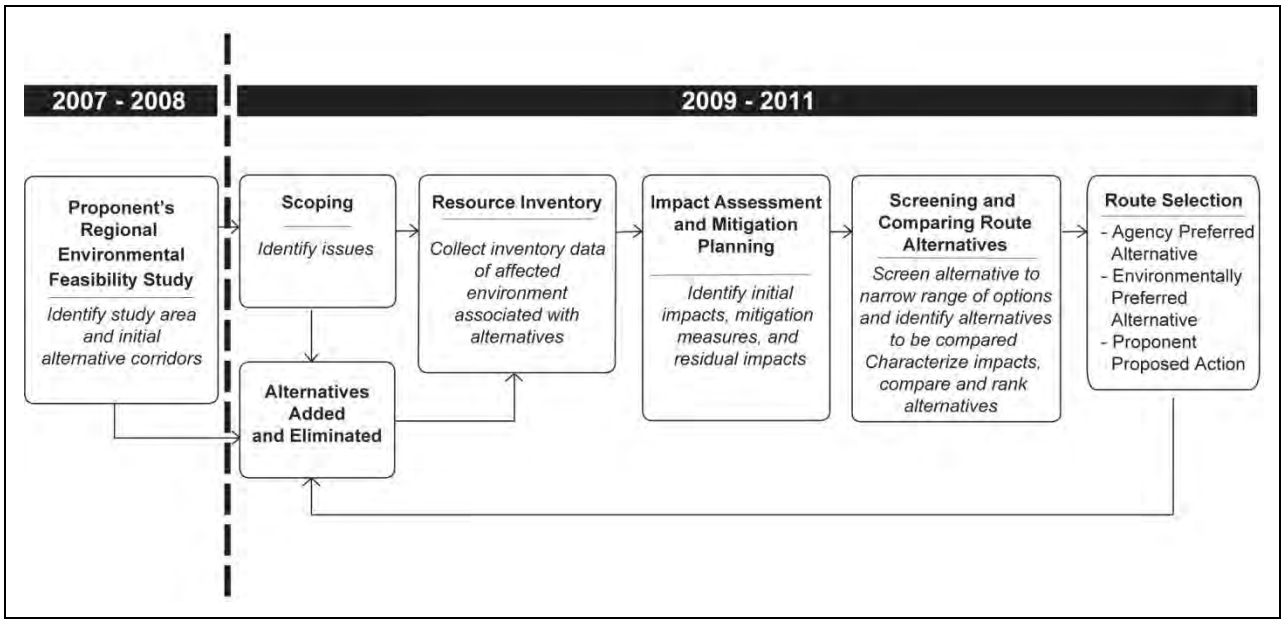

Figure 2-6 Environmental Study Process

2.4.1.1 Proponent's Feasibility Study

In 2007, the Proponent prepared a regional environmental feasibility study to identify general corridors where transmission lines could be sited and constructed. The results of the study were documented in the *Draft Report, Corridor Study Sigurd to Red Butte Transmission Line, Southwest Utah* (GeoEngineers 2007).

The feasibility study included a large regional area from the existing Sigurd Substation (at the northern end) and the existing Red Butte Substation (at the southern end) (Map 1-2). Alternative routes were identified using the following criteria:

- Use existing utility corridor containing:
  - Overhead transmission line (parallel 138kV or smaller)
  - Underground pipeline
  - Both
- Parallel existing linear facilities, including:
  - Pipelines (most preferred)
  - Lower-voltage transmission lines (115kV, 138kV)
  - 230kV transmission lines
  - 345kV transmission lines (least preferred)
  - Combined
- Planning criteria for line separation:
  - Miles of parallel facility conditions
  - Route mileage
- Identify new overland route if the criteria described above cannot be achieved (e.g., based on topography, avoidance of sensitive resources and land use, engineering constraints, etc.)

These criteria, in concert with identification of environmental opportunities for and constraints on routing a transmission line, were the basis for identifying the preliminary alternative routes that were submitted in the preliminary application requesting a grant of right-of-way from the BLM and for a special use permit from the USFS in December 2008.

2.4.1.2 Scoping

The Proposed Action, the purpose and need for the Project, Project description, and preliminary alternative routes that could accommodate the Proponent's Proposed Action were reviewed by the public and the agencies through the scoping process (Chapter 5). The scoping process and results are documented in the *Sigurd to Red Butte No. 2 – 345kV Transmission Line Project EIS Scoping Report* (BLM 2010a), which is available on the BLM project website and at the three BLM field offices and two national forests participating in preparation of the EIS. As a result of issues identified during agency and public scoping, the preliminary routes were refined to establish the network of transmission line alternative routes to be studied.

2.4.1.3 Resource Inventory

The Proposed Action and alternative routes were inventoried to establish a baseline of existing environmental conditions and data. Environmental issues identified during resource inventory were used to determine the level of the analyses and were considered in developing criteria for assessing impacts of the Project facilities.

2.4.1.4 Impact Assessment and Mitigation Planning

The Proposed Action and alternative routes were assessed to identify the potential effects (referred to as initial impacts) on the environment that would result from the construction, operation, and maintenance of the Project. Where warranted, selective mitigation measures (described in Section 2.3.5.3) were recommended to mitigate potential impacts. Table 2-7 provides a list of the selective mitigation measures, a general description of each measure's effectiveness, and the resources for which each measure might be employed. The impacts remaining after selective mitigation was applied are referred to as residual impacts. Figure 2-7 provides an overview of the process applied for impact assessment and mitigation planning.

2.4.1.5 Screening and Comparing Alternatives

Through a systematic analysis, as shown in Figure 2-7, the alternative routes were screened and compared to narrow the number of alternative routes (as described below) and determine the most environmentally acceptable routes to be addressed in the Draft EIS.

All alternative routes reviewed are shown in Map 2-3. To facilitate the screening and comparison process, the alternatives in the two segments of the Project area (i.e., the northern area [Sigurd Substation to South Black Mountains] and southern area [South Black Mountains to Red Butte Substation]) were reviewed (screened) at three levels (Figure 2-8): local (Level 1), subregional (Level 2), and regional (Level 3). The Level 1 and Level 2 screenings were conducted after public scoping and prior to preparation of the EIS. The Level 3 analysis is presented in this EIS.

Through the screening process, alternative routes defined by individual links or combinations of different links were compared against each other based on inventory data and siting criteria. In addition to the siting criteria described in Section 2.4.1.1 (i.e., used in the feasibility study), the additional planning criteria were used in the screening process, including the following:

- Meeting purpose and need for project
- System planning and reliability
- Meeting national and regional planning standards
- Cost
- Access
- Route length
- Right-of-way limitations and restrictions
- Engineering and operations
- Safety
- Project scheduling – in-service date

The comparison of alternative routes at these three screening levels resulted in the identification of preferred pathways between two common endpoints for each level of screening. A summary of the results of the comparison of alternatives is presented in Section 2.6.

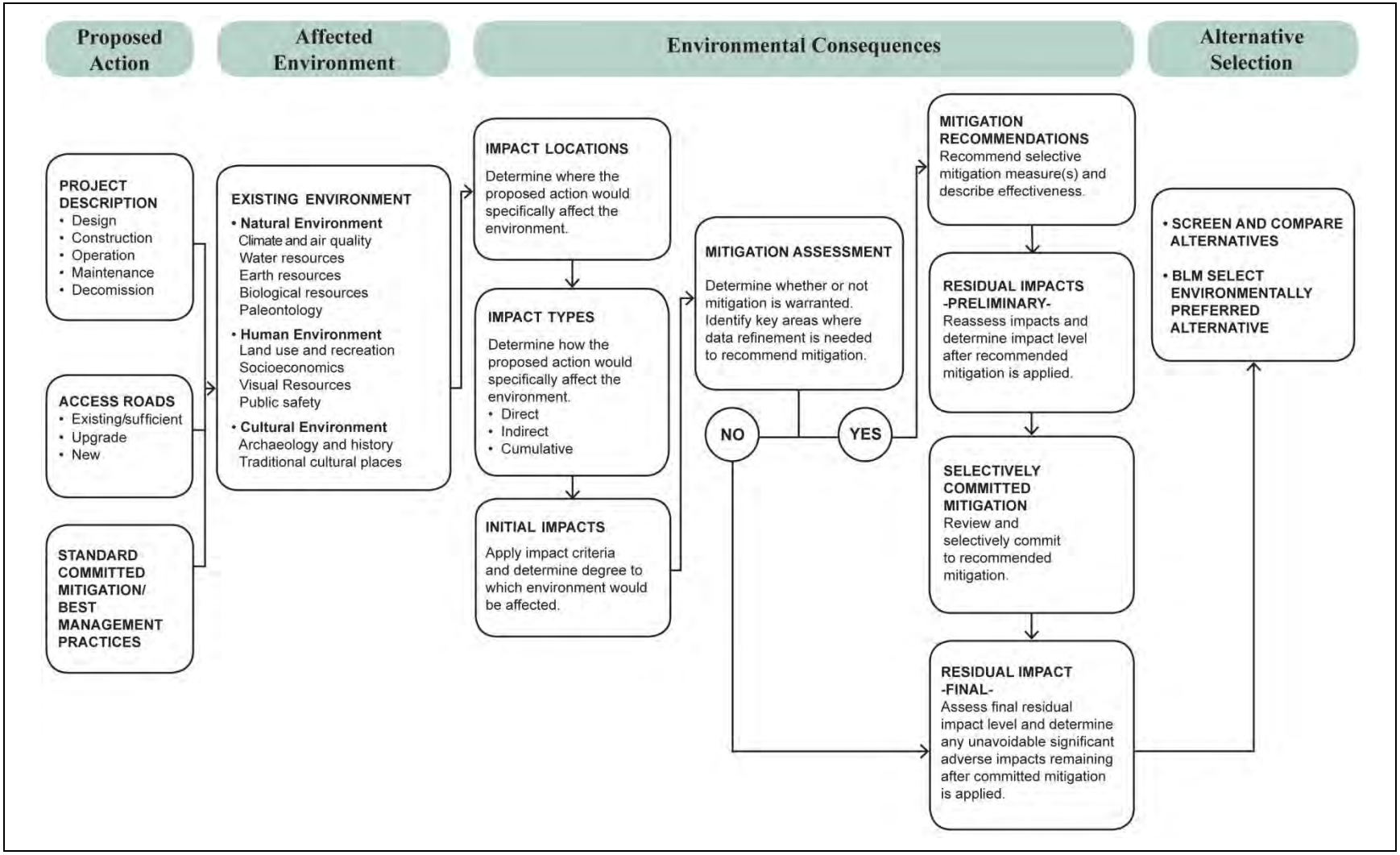

Figure 2-7 Impact Assessment and Mitigation Planning Process

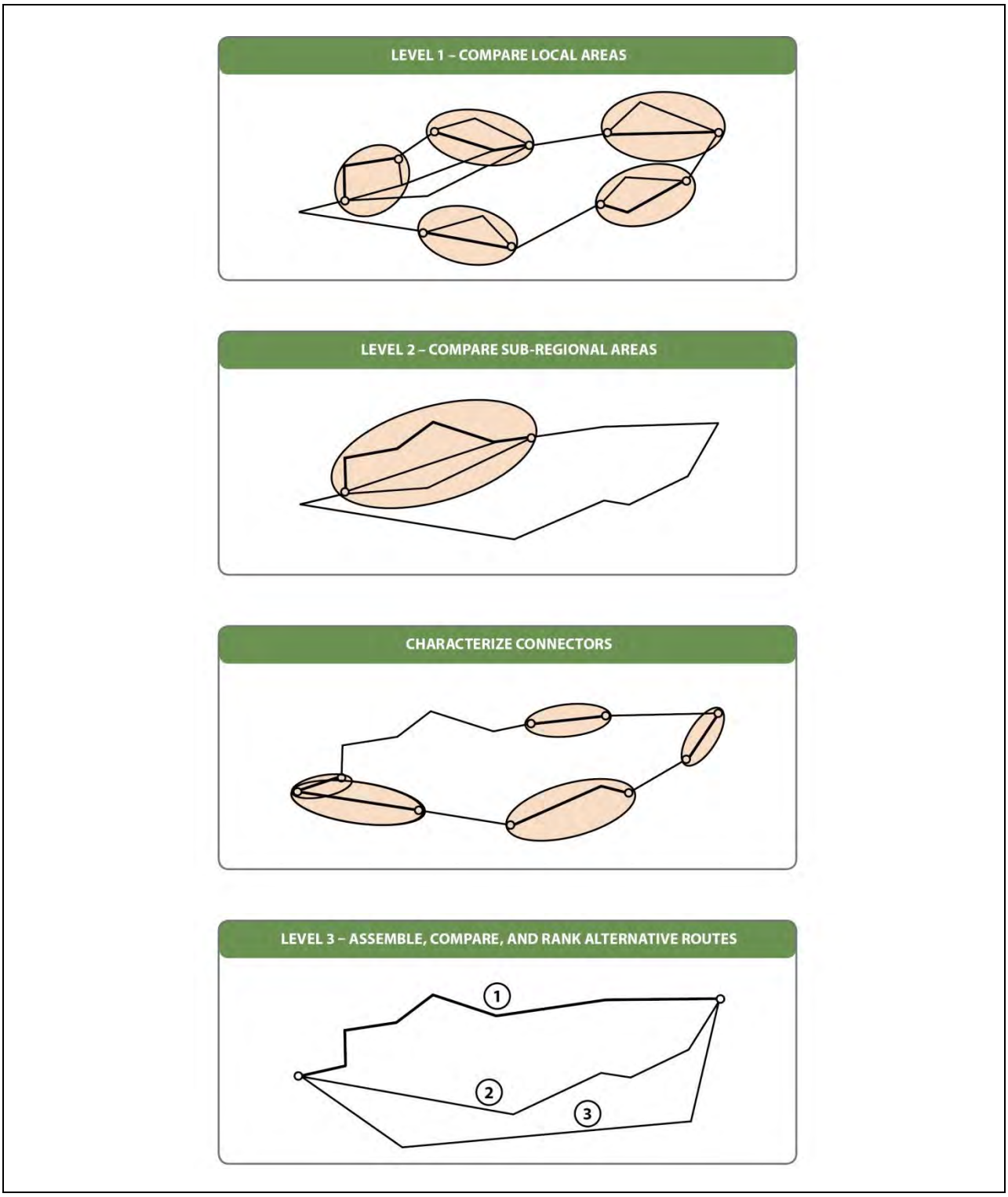

Figure 2-8 Alternative Routes Screening and Comparison Approach

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MAP 2-3
ALTERNATIVE ROUTES CONSIDERED AND ELIMINATED

PROJECT FEATURES
- Alternative Route
- Alternative Route Link Number
- Alternative Route Considered and Eliminated
- Alternative Route Considered and Eliminated Link Number

GENERAL REFERENCE FEATURES
- Project Area
- Link Node
- Bureau of Land Management
- Indian Reservation
- National Park Service
- Private
- State of Utah Trust Lands
- State Park
- U.S. Forest Service
- Substation
- 500kV +/- DC Transmission Line
- 345kV Transmission Line
- 230 to 287kV Transmission Line
- 138 to 161kV Transmission Line
- Pipeline
- County
- Interstate & U.S. Highway
- State Highway
- Railroad
- Lake or Reservoir

SOURCES:
Transportation: Streetmap 50K to 250K, 2008
Land Jurisdiction: BLM State Office Utah, 2008
POWERmap, powermap.platts.com

NOTES:
Substation locations are schematic and do not necessarily represent precise locations.

0 6 12 24 Miles

May 2011

DRAFT EIS

SIGURD TO RED BUTTE NO. 2
345kV TRANSMISSION PROJECT

NATIONAL SYSTEM OF PUBLIC LANDS

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2.4.1.6 Selection of the Preferred Alternative(s)

Alternative routes selected for detailed study in the EIS were ranked for preference based on the results of the comparison process. The alternative routes with the lowest overall impact on the environment were selected as the Environmentally Preferred Alternative (Section 2.6.1).

2.4.2 Transmission Line Alternative Routes

The Project consists of a single-circuit, 345kV, overhead transmission line between the Sigurd Substation, located approximately 6 miles north of Richfield, Utah, and the Red Butte Substation, located west of Central, Utah. Figures 2-9 and 2-10 present route schematics that illustrate numerous alternative routes located between the two substations that are studied in detail in the EIS.

The transmission line alternative routes consist of interconnecting links that form entire routes for each of the Project alternative routes. These alternatives, including the Environmentally Preferred Alternative, and the Proponent's Proposed Action are listed in Table 2-10 (by link), are illustrated in Maps 2-1 through 2-2, and represent the most environmentally acceptable alternative routes determined through the environmental study process described in Section 2.4.1. A description of each alternative route is presented in Sections 2.4.2.1 and 2.4.2.2. Information about engineering issues, including system reliability, associated with each alternative route is presented in Table 2-11d.

TABLE 2-10
ALTERNATIVE ROUTES BY LINK

Alternative Route	Length (miles)	Links
Northern – Sigurd Substation to South Black Mountains		
Alternative N1 Black Rock Road to Intermountain Power Project (IPP) transmission line north of Milford Wind Farm (Environmentally Preferred)	120.7	24, 26, 33, 30, 45, 64, 63, 66, 68, 305, 320, 330, 350, 360, 365, 380, 381, 155, 160
Alternative N2 Black Rock Road to IPP south of Milford Wind Farm	118.2	24, 26, 33, 30, 45, 64, 63, 66, 68, 305, 320, 330, 350, 345, 450, 385, 386, 381, 155, 160
Alternative N3 Black Rock Road parallel to Kern River pipeline	117.2	24, 26, 33, 30, 45, 64, 63, 66, 68, 305, 320, 330, 350, 345, 450, 460, 470, 475, 480, 490, 397
Alternative N4 Mineral Mountains to IPP south of Milford Wind Farm	109.4	24, 26, 33, 30, 45, 64, 63, 66, 68, 75, 455, 385, 386, 381, 155, 160
Alternative N5 Mineral Mountains parallel to Kern River pipeline	106.3	24, 26, 33, 30, 45, 64, 63, 66, 68, 75, 455, 460, 470, 475, 480, 490, 397
Alternative N6 Mineral Mountains 1,500 feet east of Kern River pipeline (Proponent's Proposed Action)	105.5	24, 25, 27, 33, 30, 45, 64, 63, 66, 68, 75, 349, 390, 475, 395, 396, 397
Southern – South Black Mountains to Red Butte Substation		
Alternative S1 Pinto Creek	56.0	163, 165, 220, 240, 245, 260, 500
Alternative S2 IPP West (Environmentally Preferred)	49.6	163, 165, 220, 221, 441, 442, 443, 444, 275, 500
Alternative S3 Ox Valley	57.6	163, 165, 220, 221, 441, 442, 280, 285, 290, 500

TABLE 2-10
ALTERNATIVE ROUTES BY LINK

Alternative Route	Length (miles)	Links
Alternative S4 IPP East	48.9	163, 165, 220, 221, 222, 270, 275, 500
Alternative S5 Iron Springs and Pinto Creek (Proponent's Proposed Action)	59.0	163, 430, 435, 438, 245, 260, 500
Alternative S6 Iron Springs and Ox Valley	61.9	163, 430, 435, 438, 245, 250, 441, 442, 280, 285, 290, 500

NOTE: A link is a segment of the route between two nodes. Links are displayed on Maps 2-1 and 2-2.

2.4.2.1 Sigurd Substation to South Black Mountains – Northern Area

Alternative N1 – Black Rock Road to IPP North of Milford Wind Farm (Environmentally Preferred Alternative)

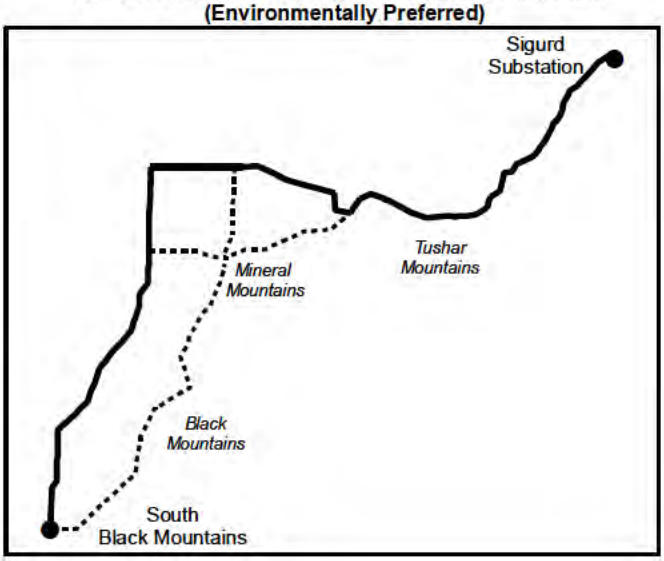
Alternative N1 would be 120.7 miles in length (Map 2-1). As proposed, the alternative route exits the existing Sigurd Substation to the north and crosses Interstate 70 (I-70) approximately 1.0 mile west of the substation. The alternative route then turns south and parallels I-70 to the west for approximately 23.8 miles before crossing I-70 west of Fremont Indian State Park. The alternative route then crosses west through Sage Flat (a narrow mountain valley), south of Fremont Indian State Park, before paralleling the existing Cameron to Sigurd 138kV transmission line through the Fishlake National Forest for approximately 14.0 miles before turning west, approximately 2.6 miles south of the historic Cove Fort.

From the Cove Fort area, the alternative route continues west and crosses Interstate 15 (I-15) before turning northwest to parallel Black Rock Road. The alternative route parallels Black Rock Road for approximately 6.3 miles before heading west at the north end of the Mineral Mountains. From the Mineral Mountains it continues west, crossing SR 257 before turning south to parallel the IPP 500kV transmission line. The alternative route parallels the transmission line 1,500 feet to the east for approximately 48.1 miles before terminating south of the Black Mountains. Notable features or places within proximity to the alternative route include Richfield, Elsinore, Joseph, Fremont Indian State Park, Fish Creek, Cove Fort, and Milford.

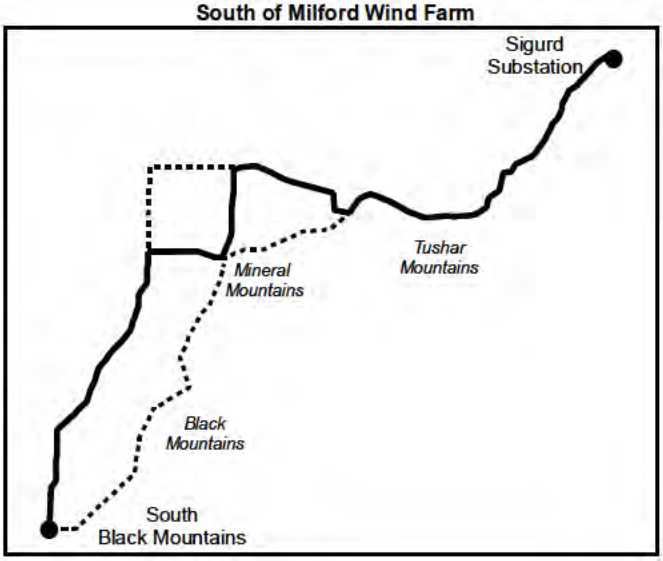
Alternative N2 – Black Rock Road to IPP South of Milford Wind Farm

Alternative N2 is 120.3 miles in length and would follow the same route as Alternative N1 to the North end of the Black Mountains. From the north end of the Mineral Mountains the alternative route turns south and parallels the west bench of the Mineral Mountains for approximately 11.8 miles. Near the Blundell Geothermal Plant the alternative route turns west for approximately 9.1 miles before turning south to parallel the IPP 500kV transmission line. The alternative route parallels the transmission line 1,500 feet to the east for approximately 37.8 miles before terminating south of the Black Mountains. Notable features or places within proximity to the alternative route include Richfield, Elsinore, Joseph, Fremont Indian State Park, Fish Creek, Cove Fort, Blundell Geothermal Plant, and Milford.

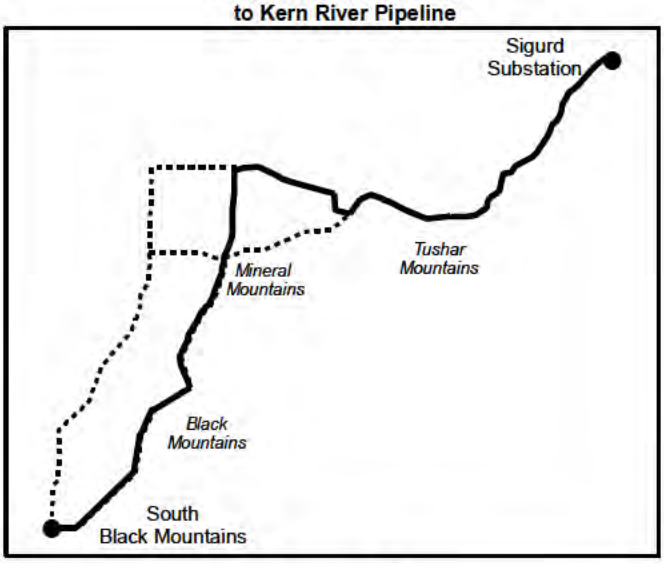
Alternative N1
Black Rock Road to IPP North of Milford Wind Farm
(Environmentally Preferred)



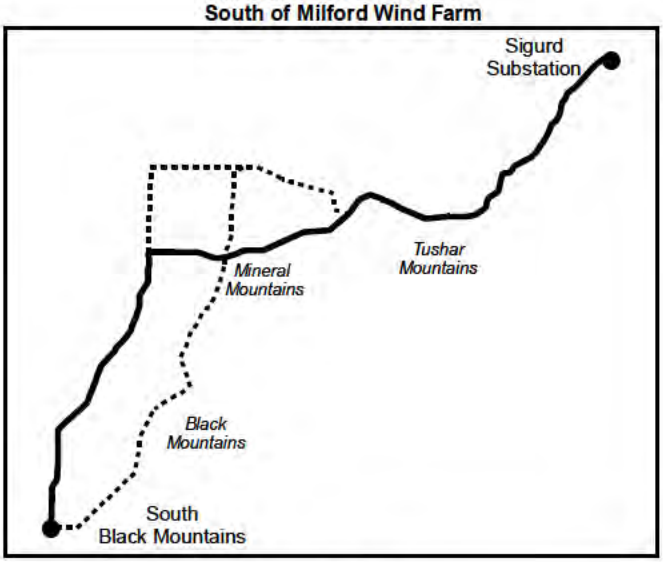
Alternative N2
Black Rock Road to IPP
South of Milford Wind Farm



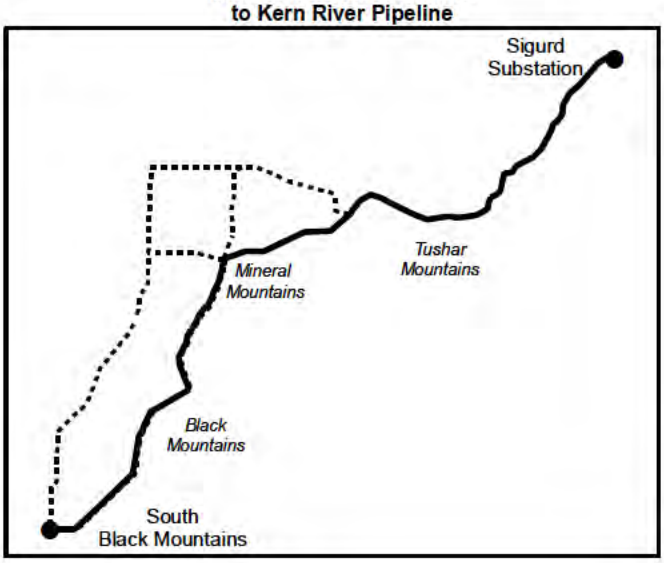
Alternative N3
Black Rock Road Parallel
to Kern River Pipeline



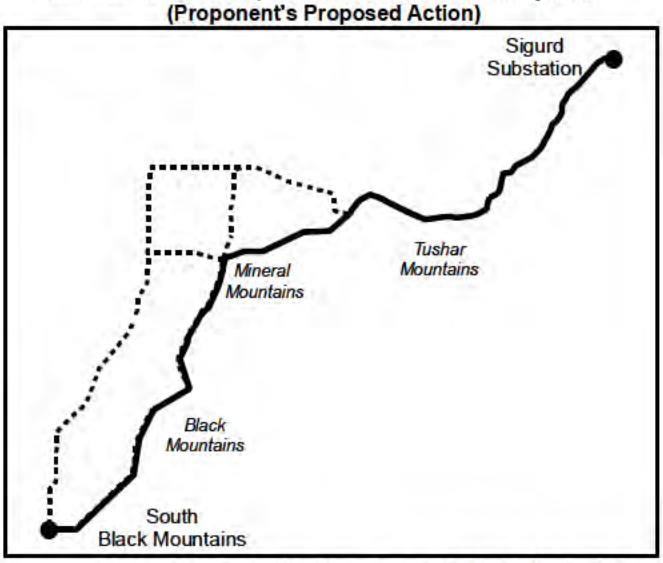
Alternative N4
Mineral Mountains to IPP
South of Milford Wind Farm



Alternative N5
Mineral Mountains Parallel
to Kern River Pipeline

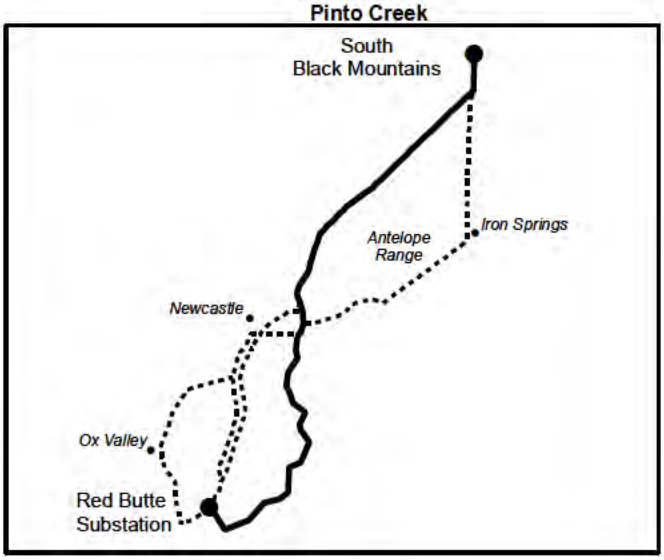


Alternative N6
Mineral Mountains 1,500 feet from Kern River Pipeline
(Proponent's Proposed Action)

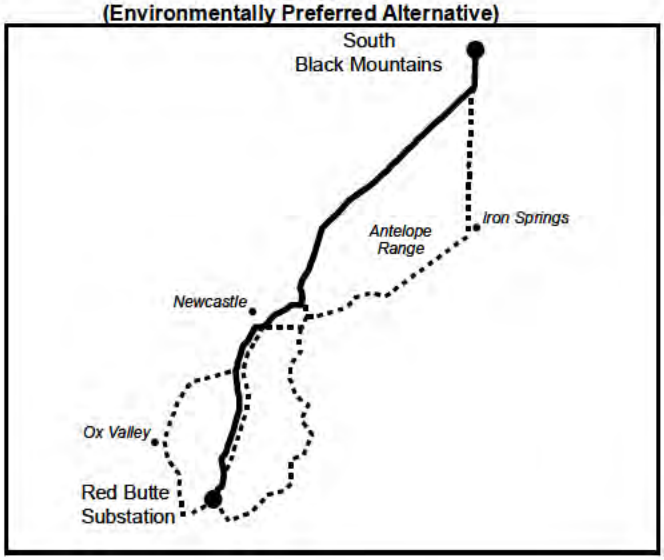


Sigurd Substation to South Black Mountains
Alternative Route Schematics
Figure 2-9

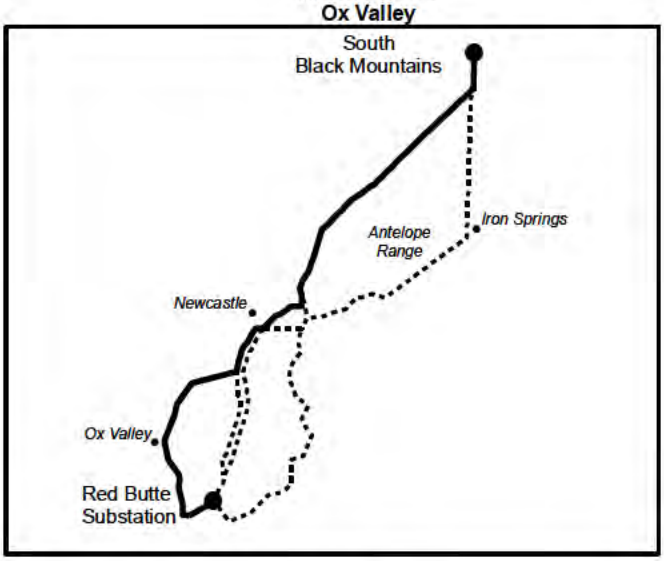
Alternative S1
Pinto Creek



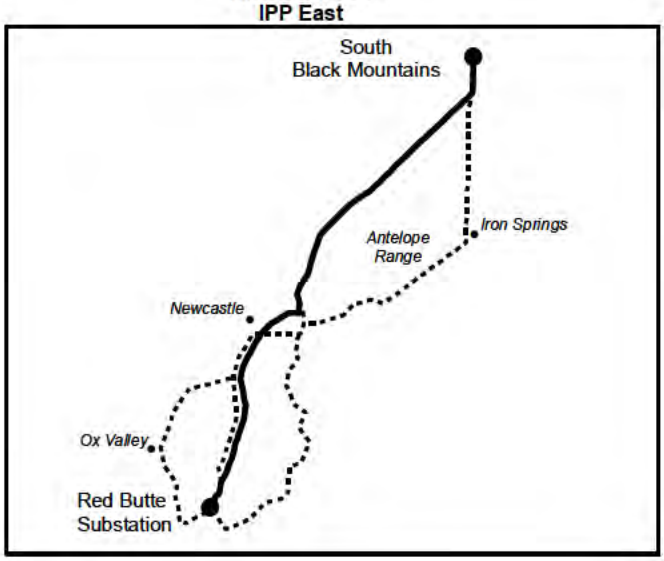
Alternative S2
IPP West
(Environmentally Preferred Alternative)



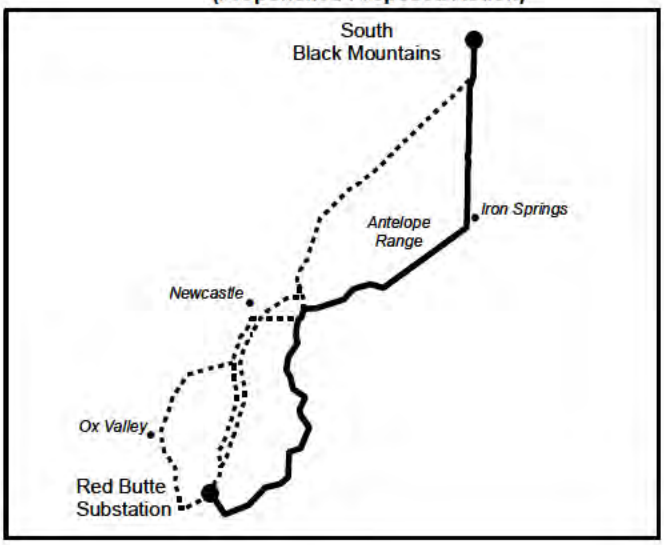
Alternative S3
Ox Valley



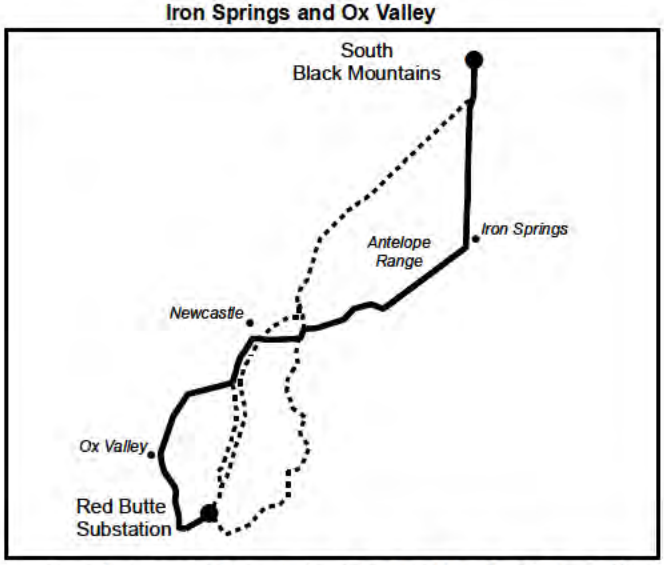
Alternative S4
IPP East



Alternative S5
Iron Springs and Pinto Creek
(Proponent's Proposed Action)



Alternative S6
Iron Springs and Ox Valley



South Black Mountains To Red Butte Substation
Alternative Route Schematics
Figure 2-10

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

Alternative N3 is 117.2 miles in length and is similar to Alternative N1 from the Sigurd to Substation to near the Blundell Geothermal Plant. From the geothermal plant the alternative route parallels the Kern River pipeline approximately 100 feet to the east before turning south at SR 21 to avoid center-pivot-irrigated agriculture. It parallels SR 21 for approximately 4.2 miles before crossing the highway and rejoining the pipeline west of Minersville. The alternative route continues to parallel the pipeline to the south of the Black Mountains. Notable features or places within proximity to the alternative route include Richfield, Elsinore, Joseph, Fremont Indian State Park, Fish Creek, Cove Fort, Blundell Geothermal Plant, and Minersville.

Alternative N4 – Mineral Mountains to IPP South of Milford Wind Farm

Alternative N4 is 109.4 miles in length and follows the same route as Alternative N1 between the Sigurd Substation and Cove Fort area. From the Cove Fort area, the alternative route would parallel an existing 46kV transmission line over the Mineral Mountains north of Bailey Mountain to the Blundell Geothermal Plant. The alternative is also similar to Alternative N2 from the geothermal plant to south of the Black Mountains. Notable features or places within proximity to the alternative route include Richfield, Elsinore, Joseph, Fremont Indian State Park, Fish Creek, Cove Fort, Blundell Geothermal Plant, and Milford.

As a design alternative, the transmission line could be colocated with the existing Cove Fort to Blundell 46kV transmission line. If implemented, the right-of-way of the Cove Fort to Blundell 46kV transmission line would be increased to 150 feet to accommodate this design alternative.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

Alternative N5 is 106.3 miles in length and is similar to Alternative N4 from the Sigurd Substation to the Blundell Geothermal Plant. From the geothermal plant, the alternative route follows the same route as Alternative N3. Notable features or places within proximity to the alternative route include Richfield, Elsinore, Joseph, Fremont Indian State Park, Fish Creek, Cove Fort, Blundell Geothermal Plant, and Minersville. .

Alternative N6 – Mineral Mountains 1,500 Feet East of Kern River Pipeline (Proponent's Proposed Action)

Alternative N6 is 105.5 miles in length and is similar to Alternative N5, except the alternative route is located approximately 1,500 feet east of the Kern River pipeline. This alternative was selected by the Proponent because it provides physical separation from other high-voltage transmission lines (e.g., IPP 500kV transmission line) and underground pipelines (e.g., Kern River pipeline). Notable features or places within proximity to the alternative route include Richfield, Elsinore, Joseph, Fremont Indian State Park, Fish Creek, Cove Fort, Blundell Geothermal Plant, and Minersville.

2.4.2.2 South Black Mountains to Red Butte Substation – Southern Area

Alternative S1 – Pinto Creek

Alternative S1 is 56.0 miles in length. From the Black Mountains it parallels the IPP 500kV transmission line approximately 1,500 feet to the east for approximately 14.9 miles before paralleling the Sigurd to Red Butte No. 1 – 345kV transmission line for approximately 8.8 miles along the east bench of the Antelope Range. The alternative route continues east of Newcastle reservoir and follows Pinto Creek, turning southwest after passing the community of Pinto. The alternative route then turns northwest approximately 2.2 miles south of Central to parallel two existing 345kV and 138kV transmission lines and enters the north side of the Red Butte Substation. Notable features or places within proximity to the alternative route include Newcastle Reservoir, Pinto, Pine Valley, Santa Clara River, and Central.

Alternative S2 – IPP West (Environmentally Preferred)

Alternative S2 is 49.6 miles in length and is similar to Alternative S1 from the Black Mountains to north of the Newcastle Reservoir. North of the Newcastle Reservoir, the alternative route continues west of the reservoir and continues to parallel the Sigurd to Red Butte No. 1 – 345kV transmission line to the east for approximately 3.1 miles. The alternative route then turns west, south of Newcastle, and parallels the IPP 500kV transmission line approximately 1,500 to 2,500 feet to the west. The alternative route crosses back to the east side of the IPP and Sigurd to Red Butte No. 1 transmission lines north of the community of Central and enters the north side of the Red Butte Substation. Notable features or places within proximity to the alternative route include Newcastle, Newcastle Reservoir, Holt Canyon, Mountain Meadows Historic Site, and Central.

Alternative S3 – Ox Valley

Alternative S3 is 57.6 miles in length and is similar to Alternative S2 from the Black Mountains to crossing the IPP and Sigurd to Red Butte No. 1 transmission lines. The alternative route continues to parallel the IPP transmission line until turning west along the north bench of Gum Hill. After crossing SR 18, the alternative route turns south and passes near Ox Valley. The alternative route continues south for approximately 6.4 miles before crossing the IPP and Harry Allen to Red Butte 345kV transmission lines. After crossing the transmission lines, the alternative route turns northeast to parallel the Harry Allen to Red Butte 345kV transmission line approximately 1,500 feet to the east before entering the north side of the Red Butte substation. Notable features or places within proximity to the alternative route include Newcastle, Newcastle Reservoir, Enterprise, Ox Valley, and Central.

Alternative S4 – IPP East

Alternative S4 is 48.9 miles in length and is similar to Alternative S2, with the exception that the alternative route parallels the Sigurd to Red Butte No. 1 – 345kV transmission line approximately 1,500 feet to the east. The alternative route is also parallel to the UNEV pipeline through Holt Canyon. Notable features or places within proximity to the alternative route include Newcastle, Newcastle Reservoir, Holt Canyon, Mountain Meadows Historic Site, and Central. Because the alternative route is located east of the existing transmission lines, it is farther away from the Mountain Meadows Historic Site than Alternative S2, but crosses 7.5 miles of IRAs.

Alternative S5 – Iron Springs and Pinto Creek (Proponent's Proposed Action)

Alternative S5 would be 59.0 miles in length. The alternative route runs south from the Black Mountains for approximately 16.2 miles before turning southwest at Iron Springs. From Iron Springs, the alternative route crosses through the Neck of the Desert (a narrow mountain valley between the Antelope Range and Granite Mountains) and along the southern bench of the Antelope Range before crossing SR 56. After crossing SR 56, the alternative route turns south at the Newcastle Reservoir and follows Pinto Creek, turning southwest after passing the community of Pinto. The alternative route then turns northwest approximately 2.2 miles south of Central to parallel two existing 345kV and 138kV transmission lines and enters the north side of the Red Butte Substation. Notable features or places within proximity to the alternative route include Iron Springs, Newcastle Reservoir, Pinto, Pine Valley, Santa Clara River, and Central.

This alternative was selected by the Proponent because it best meets the company's need to provide safe, reliable, adequate, and efficient service to southwestern Utah by providing physical separation from existing high-voltage transmission lines (e.g., IPP 500kV transmission line and Sigurd to Red Butte No. 1 – 345kV transmission line).

Alternative S6 – Iron Springs and Ox Valley

Alternative S6 is 61.9 miles in length and is similar to Alternative S5 between the Black Mountains and Newcastle Reservoir. South of the reservoir the alternative route turns west for approximately 3.3 miles and follows the same alignment as Alternative S3. Notable features or places include Iron Springs, Newcastle Reservoir, Newcastle, Enterprise, Ox Valley, and Central.

2.4.3 No Action Alternative

If no action is taken, the BLM right-of-way and USFS special-use permit for the Project on federal lands would not be granted and the transmission line and ancillary facilities would not be constructed.

2.5 Alternatives Reviewed But Eliminated from Further Consideration

In the preparation of this document, an initial evaluation was made of a full range of alternatives. All reasonable alternatives were given further consideration, including alternatives to the transmission line option, new generation facilities, reliance on the existing transmission system, and alternative transmission technologies. Alternatives that were (1) ineffective (i.e., did not meet the agencies' purpose and need), (2) technically or economically infeasible, (3) inconsistent with the basic policy objectives of the management of an area (e.g., land use plans), (4) remote or speculative (i.e., could not be analyzed), or (5) substantially similar in design or effects to another alternative being analyzed were eliminated from further consideration.

2.5.1 Alternatives to a Transmission Line Option

Alternatives to constructing new transmission lines and substations, which would reduce the electrical load requirements of the system or provide additional capacity to the system, were considered but did not meet the purpose and need of the Project, as explained below.

2.5.1.1 Electrical Load and Demand-Side Management and Energy Conservation

Load management programs are designed to achieve reductions in load (i.e., the amount of power needed), primarily at the time of peak load. For example, by agreement with their customers, utilities can have direct control over loads that can be interrupted by the utility system operator during periods of peak demand by directly interrupting power supply to individual appliances or equipment. This method usually involves consumers to allow the utility to periodically interrupt service to water or space heating units during the hours of peak load.

Another type of load management program makes use of interruptible loads. An interruptible load is a load that can be separated from the system during periods of peak load or system disturbances, either by direct control of the utility system operator, or by action of the consumer at the direct request of the system operator. For example, large commercial and industrial consumers are candidates for interruptible load management, depending on the type of business.

Other load management programs that limit peak loads shift peak load from on-peak to off-peak hours or encourage consumers to respond to changes in the utility's cost of providing power. This includes technologies that primarily shift all or part of a load from one time of day to another and may affect overall energy consumption. Examples include space heating and water-heating storage systems, cool-storage systems, and load-limiting devices in energy management systems.

Demand-side management (DSM) consists of electric utilities planning, implementing, and monitoring activities designed to encourage consumers to modify their levels and patterns of energy consumption. While DSM affects only a small percentage of the system load, utilities implement DSM programs to achieve two basic objectives: energy efficiency and load management.

Energy efficiency (or energy conservation) is achieved primarily through programs that reduce overall energy consumption of specific end-user devices and systems by promoting high-efficiency equipment and building design. Energy efficiency programs typically reduce energy consumption over many hours during the year. Examples include energy-saving appliances and lighting, high-efficiency heating, ventilating, and air-conditioning systems or control modification, efficient building design, advanced electric motors and drive systems, and heat recovery systems.

The Proponent has implemented the following energy-efficiency and load-management programs:

- Since 2003, the Proponent has offered a residential/small commercial air conditioning load control program along the Wasatch Front. Currently, the initiative has approximately 80,000 participating customers. The system is dispatched during summer peak periods and yields approximately 70 MW of peak load relief. There is no energy savings associated with this initiative.

- Additionally, since 2003, the Proponent has offered an irrigation-load-control program in southeast Idaho. The system is dispatched during peak periods (2 p.m. to 8 p.m.), and the Proponent currently has 208 MW of participating load. The Proponent also offers an irrigation-

load-control program in Utah, although agriculture is much smaller in Utah. Currently, the Proponent realizes 5 MW of irrigation load control benefit in Utah on a scheduled-forward initiative. This was expected to grow in 2009, as the Proponent planned to offer an initiative beginning in 2009. It is anticipated the program will grow to approximately 30 MW of avoided peak demand in Utah.

Energy-efficiency and load-management programs are valuable tools that the Proponent is using and will continue to use to manage the demand for and consumption of energy. However, these programs do not address any of the need categories of the Project. These DSM programs focus on managing a very small part of the load on the system; whereas two of the Project's primary needs are to increase transmission capacity and improve the ability of the Proponent's transmission system to transport energy into central Utah and to growth areas along the Wasatch Front, facilitating better operational management of the existing interconnected system. Further, energy-efficiency and load-management programs do not meet the BLM's purpose and need, which is to analyze the Proponent's application for a utility-scale transportation system across federal lands and enhance transportation infrastructure for collection and distribution of energy resources across the nation. Thus, these alternatives were eliminated from further consideration and detailed analysis.

2.5.1.2 New Generation Facilities or Other Types of Generation

The Proponent assesses electric generation needs and transmission expansion requirements on a long-term basis. An electrical system model is established to analyze different transmission and generation options geographically to deliver electricity to customers while evaluating electrical generation alternatives (i.e., natural gas, wind, geothermal, etc.) to assess financial requirements and risk. One of the Proponent's models studies various combinations of electrical generation alternatives and/or transmission to determine the mix of generation sources and transmission options and timing that minimizes investment and operating costs. These studies include electrical system reliability constraints, loads, generation/transmission costs and operating characteristics, transmission system configuration, electricity markets, fuel price variations, and emissions.

Electrical system modeling has indicated the optimal portfolio includes a mix of generation alternatives (i.e., base load generation, intermediate generations, and seasonal peaking generation) that can be delivered to the Proponent's customers. Additionally, market purchases from the Desert Southwest are particularly important for supporting northern and southern Utah loads prior to when generating facilities can be acquired and enables by the Project.

Other types of generation, including distributed (local) generation resources, were also considered. Based on responses to the previous Proponent request for potential new generation resources, none of the current proposed facilities would meet the load growth demands in southern and central Utah and, therefore, would not meet the Project's purpose and need. Construction of the Project would provide flexibility to match customer load requirements in varying locations.

Distributed generation resources can be differentiated from centralized generation resources, primarily in terms of size, multiple units dispersed throughout an area, and they are usually installed at or near customer loads where the generated power is used. Distributed generation generally ranges in size from about 5,000 watts to 10 megawatts, in contrast to centralized generation resources that are typically hundreds of mega watts per site. Distributed generation is also more expensive per watt than central generation due to the types of technology used. Distributed generation resources technologies include solar photovoltaics, energy storage devices, such as batteries, micro turbines, mini wind turbines, and fuel

cells. For the reasons described, it is most effective for the proponent to use a centrally located generation unit in addition to supporting seasonal or regional energy exchanges.

New and distributed generation resources did not meet the agencies' purpose and need, which is to analyze the Proponent's application for a utility-scale transportation system across federal lands and were eliminated from further consideration for this Project.

2.5.1.3 Existing Transmission Systems

Transmission capacity of the existing transmission paths within the Project area is fully allocated to meet native load obligations or point-to-point transmission service. The existing 345kV transmission line (Sigurd to Red Butte No. 1), as part of the electric supply grid, is currently being operated at full capacity. Therefore, the use of the existing transmission system was eliminated from further consideration for this Project.

2.5.1.4 Alternative Transmission Technologies

Alternative Voltage Levels

To provide the Project's needed capacity in the most cost effective manner, a 345kV line was chosen to match the existing voltage infrastructure of the local bulk transmission facilities. If a 345kV line is not built, then multiple 230kV lines or a 500kV line would be needed to meet the Project's needed capacity. However, multiple 230kV lines would be more costly and result in greater surface disturbance and resource impacts. Likewise, because there is no existing 500kV infrastructure in the area, the existing substation facilities would need to be greatly expanded or a new substation site would be required, thereby also resulting in greater cost, surface disturbance, and resource impacts than a single 345kV line. This alternative was dismissed because the effects would be substantially similar to or greater than those predicted to occur under the Proponent's Proposed Action.

Direct or Alternating Current Transmission

The main benefit of a direct current (DC) system is better control of power flows over very long distances (i.e., more than 400 miles); whereas, line construction cost savings may be able to offset the high costs of DC terminal substations. To interconnect with an AC system, the DC must be converted to AC. Converter substations require more land than a typical AC substation, and costs for one 500kV DC converter station can be up to $350 million (a potential total of $700 million for the two new substations) (Rocky Mountain Power 2008). The AC system selected allows for multiple substation interconnections necessary for load centers and for generation resources while being more economical than DC. A DC system also has limited ability for future expansion where additional future transmission capacity is needed and therefore requires a higher upfront cost. For these reasons, the AC design was chosen for the Project over a DC design.

Underground Transmission

Extra high-voltage underground lines (345kV and 500kV) have been constructed in some parts of the United States, but only for short distances, and usually where circumstances dictated overhead lines were not feasible (e.g., in the vicinity of airports and urban centers).

High-voltage underground transmission lines have markedly different technological requirements than lower-voltage underground distribution lines. Underground high-voltage transmission lines require extensive cooling systems to dissipate the heat generated by the transmission of bulk energy. Cooling systems are complex and expensive. The extremely high cost of large cooling systems and other special design requirements are prohibitive for long-distance underground transmission and are estimated to be ten times greater, or more, than the cost of constructing a 345kV overhead transmission line (Rocky Mountain Power 2008).

Operational problems are greater and the duration of outages is normally longer for underground transmission lines. When an outage of an underground line occurs, determining the cause and location of the damage, the replacement parts needed to repair the line, and actually repairing the line takes much more time than for an overhead line. Repairs to an underground line are also more expensive. If an underground line is damaged during the winter at a high elevation, the presence of snow would increase the length of time required and the degree of difficulty to repair the facility. The potential long-term outages associated with the 345kV transmission line would be unacceptable for a circuit carrying bulk power.

The environmental impacts from construction of an underground transmission line would be similar to those for major pipeline construction. Typical construction would require a continuous trench between endpoints, resulting in ground disturbance along an entire right-of-way. By comparison, overhead transmission line construction typically results in partial disturbances of the right-of-way primarily at individual tower sites, pulling and tensioning sites, staging areas, and in areas providing access to the right-of-way.

Because this alternative was not technically or economically feasible, it was eliminated from further consideration.

New Transmission Technologies

Other technologies considered as alternatives for economical bulk-power transmission of electric energy to load centers included microwave, laser, and superconductors. Current research and development indicate some of these technologies eventually may become viable alternatives to overhead transmission systems; however, none of them are currently available for commercial use. Because they are remote and speculative and not technically feasible at this time, alternatives associated with new transmission technologies were eliminated from further consideration.

2.5.2 Transmission Line Routes Considered and Eliminated

Transmission line alternative routes and segments considered and eliminated based on Level 1 and Level 2 screening (described in Section 2.4.1.5) are shown on Map 2-3 and briefly described below. These alternative routes and segments did not perform as well as other routes and segments in the same general vicinity. Several segments that were eliminated prior to Level 1 and Level 2 screening are also described.

2.5.2.1 Pre Level 1 and Level 2 Screening

- *Links 39, 20, 50, 90, 115, 180, 182, 183* – This route segment would conflict with the Proponent's system planning and reliability criteria and purpose and need for the Project because it parallels a

high-voltage transmission line (the Sigurd to Red Butte No. 1 – 345kV transmission line), which shares the same purpose and connection points as the Project. Therefore, an alternative route including this route segment was eliminated from further consideration in that it would pose a high risk to system planning and reliability criteria and thus is not technically feasible.

- *Link 185* – This route segment was no longer relevant after the links listed above, comprised of Links *39, 20, 50, 90, 115, 180, 182, and 183,* were eliminated from consideration. In addition, the route segment would cross over a rifle shooting range and be in proximity to the Three Peaks Recreation Area. An alternative route including this route segment was eliminated from further consideration because its implementation would not be technically feasible.

- *Link 110* – This link was no longer needed after Links 115, 180, 182, and 183 were eliminated from further consideration. An alternative route including this route segment was eliminated from further consideration because its implementation would not be technically feasible.

- *Link 40* – This route segment would conflict with several existing land uses, including residential, commercial, and agricultural. Since it generally was an option to Links 33 and 30, but would substantially have greater environmental effects on these land uses (e.g., impairing current agriculture activities), an alternative route including this route segment was eliminated from further consideration because it was substantially similar in design to an alternative that was analyzed.

- *Links 60, 62* – This route segment would cross through Fremont Indian State Park. Since an alternative route including this route segment was substantially similar in design to an alternative that was analyzed (Link 64), but would have substantially greater environmental effects, this route was eliminated from further consideration.

- *Link 300* – This route segment would potentially cause visual impacts on viewers at Cove Fort. Link 305 was added further to the south to mitigate visual impacts. An alternative route including Link 300 was eliminated because it was substantially similar in design to an alternative that was analyzed.

- *Link 310* – This route segment parallels Black Rock Road. Link 320 was added to provide a shorter, more direct route that would be less costly to construct. Link 310 would have been a longer and more indirect route, which equates to increased costs and increased environmental effects. An alternative route including this route segment was eliminated because it was substantially similar in design to an alternative that was analyzed.

- *Link 340* – This route segment would have paralleled an alternative route that was, at the time of analysis, being considered for the Energy Gateway South 500kV Transmission Line Project and would have conflicted with system planning and reliability criteria stated in the Proponent's purpose and need. The Gateway South 500kV segment within this Project study area has since been eliminated. Link 340 would have greater environmental effects than a route along Links 350 and 345. An alternative route including Link 340 was eliminated from further consideration because it was substantially similar in design to another alternative that was analyzed.

- *Links 370, 375* – This route segment parallels Black Rock Road. Links 360 and 365 were added to provide a shorter, more direct route that would be less costly to construct. Links 370 and 375 would have been a longer and more indirect route segment, which equates to increased costs and increased environmental effects. An alternative route including this route segment was eliminated

from further consideration because it was substantially similar in design to another alternative that was analyzed.

- *Links 378, 400, 401, and 410* – This route segment would conflict with residential and agricultural land uses near Milford. Other alternatives parallel to the Kern River pipeline and IPP 500kV transmission line were determined to be adequate alternatives to this route segment and avoided residential and agricultural conflicts. An alternative route including this route segment was eliminated from further consideration because it was substantially similar in design to another alternative that was analyzed.

2.5.2.2 Northern Area – Sigurd Substation to South Black Mountains

Level 1 Screening

Sigurd Substation to Blundell

- *Link 28* – This route segment would conflict with existing and future land uses, primarily agriculture. Since an alternative including this link would be substantially similar in design to another alternative being analyzed (an alternative including Link 33), but would have greater environmental effects, it was eliminated from further consideration.

- *Link 348* – An alternative route including this route segment was eliminated after comparing it with Link 450 during the Level 1 screening process. It was determined Links 348 and 450 would have similar resource conflicts; however, Link 348 was anticipated to have more ground disturbance because of its 1,500 foot (approximate) separation from the Kern River Pipeline (i.e., the Kern River right-of-way could not be used to access the Project, which would result in the construction of new access roads). An alternative route including this route segment was eliminated from further consideration because it was substantially similar in design to another alternative that was analyzed.

Blundell to Milford

- *Links 80, 85, and 465* – This route segment would conflict with existing and future land uses near Milford. The Beaver County Commission expressed concerns with this route and recommended an alternative route north of Milford (Links 385, 386) to avoid these conflicts. Because an alternative route including Links 80, 85, 465 would be substantially similar in design to another alternative analyzed, but would have greater environmental effects than Links 385 and 386, an alternative route including this segment was eliminated from further consideration.

Level 2 Screening

Cove Fort to South Black Mountains

- *Links 420, 425, and 485* – This route segment would conflict with irrigated agriculture and would be in proximity to residences north of Beaver City. The route segment would cross potential Utah prairie dog habitat as well as a greater sage-grouse lek and brooding habitat. In addition, this route alignment was not supported by Beaver County Commissioners, and the agency

Interdisciplinary (ID) team determined several viable alternatives exist through or around the Mineral Mountains. This route was eliminated from further consideration.

2.5.2.3 Southern Area – South Black Mountains to Red Butte Substation

Level 1 Screening

- *Link 440* – This route segment, when compared to Link 443, was longer and had greater impacts on recreation resources, future land use, and high Scenic Integrity Objectives (SIO) on the Dixie National Forest. Link 443 was added as an alternate route to Link 440 and provided a shorter and more direct route that would be less costly to construct and have lower impacts; therefore, Link 440 was eliminated from consideration because it was substantially similar in design to another alternative route being analyzed.

Level 2 Screening

- No links were eliminated from consideration as a result of Level 2 screening.

2.6 Summary Comparison of Alternatives

This section of the document summarizes the alternatives comparison process and results, including the identification of the Environmentally Preferred Alternative and the Proponent's Proposed Action.

Table 2-11 provides a detailed comparative analysis of the resources for each alternative route. For each resource, the table identifies key resource elements and associated impacts. A determination of potential significant impacts remaining after mitigation and cumulative effects (if present) also are identified. The basis for the information summarized for each resource in Table 2-11 (located at the end of this chapter) is contained in Chapter 3. Table 2-11 also presents a numerical ranking by preference for each resource, with consideration of issues raised during public and agency scoping, and the rationale for the ranking and Table 2-12 presents a summary of this information. This preference ranks the alternatives for that resource only and compares only that group of alternatives (i.e., northern and southern areas). If more than one alternative has the same preference number, it indicates that those routes share a similar preference.

The comparison process resulted in the identification of the Environmentally Preferred Alternative (described in Section 2.6.1); that is, the action alternative that exhibits, on balance, lower overall environmental impacts than other alternatives (see Section 2.7.1). The Agency Preferred Alternative on federal lands will be identified after the public has provided comments on the Draft EIS.

2.6.1 Environmentally Preferred Alternative

Section 1505.2(b) of NEPA requires that "the alternative or alternatives which were considered to be environmentally preferable" be specified. The environmentally preferable alternative is the action alternative that will promote the national environmental policy as expressed in NEPA's Section 101. Generally, this means the action alternative exhibits, on balance, lower overall environmental impacts than the other alternatives.

The Environmentally Preferred Alternative is the combination of Alternative N1 and Alternative S2. After implementation of standard and selective mitigation measures, significant long-term impacts resulting from implementation of the Environmentally Preferred Alternative are anticipated only in localized areas, including 2.1 miles of moderate-to-high impacts on views from the Fremont Indian State Park and other recreation and travel corridor views, the Mountain Meadows Massacre Site, portions of the Old Spanish Trail, and some residences. Overall, this alternative exhibits the second lowest impacts on viewers and lowest impact on scenery due to adjacency of existing transmission lines.

It should be noted that, in the southern area, Alternative S2 avoids crossing through IRAs. Alternative S4 to the east crosses through the western edges of the two IRAs (a total of approximately 7.5 miles). These IRAs, identified and mapped by the USFS, are undeveloped and meet the minimum criteria for wilderness consideration by USFS (USDA 2001) and, as such, development in these areas should be avoided. While the Mountain Meadows Massacre Site is an important historic site memorializing the massacre that occurred in the area in 1857, there are not management prescriptions that preclude crossing near the historic site parallel to existing transmission lines and pipelines.

2.6.2 Agency Preferred Alternative on Federal Lands

The Agency Preferred Alternative on federal lands is the alternative the BLM in coordination with the cooperating agencies believe would fulfill its statutory mission and responsibilities, giving consideration to economic, environmental, technical, and other factors. The CEQ regulations at 1502.14(e) require the BLM to "identify the agency's preferred alternative if one or more exists, in the draft statement, and identify such alternative in the final statement. If the responsible federal official in fact has no preferred alternative at the Draft EIS stage, identification of the preferred alternative can be postponed until the Final EIS is filed (Section 1502.14(e), CEQ's 40 Most Asked Questions 4a-4b, and 43 CFR part 46.425)." The Agency Preferred Alternative for this Project will be identified after the public has provided comments on the Draft EIS.

DOI regulations at 43 CFR 46.20(d) allows the responsible official to render a decision on a proposed action as long as it is within the range of alternatives discussed in the relevant environmental document. The responsible official's decision may combine elements of alternatives discussed in the relevant environmental document if the effects of such combined elements of alternatives are reasonably apparent from the analysis in the relevant environmental document.

2.6.3 Proponent's Proposed Action

Alternatives N6 and S5 represent the Proponent's proposed alternative routes. Alternative N6 was selected by the Proponent because it provides physical separation from other high-voltage transmission lines (e.g., IPP 500kV transmission line) and underground pipelines (e.g., Kern River pipeline). Similarly, Alternative S5 was selected by the Proponent because it best meets the company's need to provide safe, reliable, adequate, and efficient service to southwestern Utah by providing physical separation from existing high-voltage transmission lines (e.g., IPP 500kV transmission line and Sigurd to Red Butte No. 1 – 345kV transmission line).

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TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Northern – Sigurd Substation to South Black Mountains							
Alternative N1 Black Rock Road to IPP North of Milford Wind Farm (Environmentally Preferred)	120.7	**Inventory** ▪ 8 perennial stream/river crossings ▪ 10 named intermittent stream crossings ▪ 59 unnamed intermittent or ephemeral stream crossings ▪ 7 canal crossings ▪ 0.6 mile of major river ▪ 7.7 miles of river/stream ▪ 13.0 miles of shallow groundwater ▪ 0.7 mile of springs ▪ 2.9 miles of wells **Impacts** ▪ 958.5 acres of temporary disturbance ▪ 304.5 acres of permanent disturbance ▪ 0.0 mile of high impact ▪ 0.0 mile of moderate impact ▪ 23.6 miles of low impact **Preference Ranking: 6**	**Inventory** ▪ 5.3 miles of designated farmland soils ▪ 13.9 miles of high potential for water erosion ▪ 5.1 miles of active mines, producing wells, or mining claims ▪ 15.9 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 13.9 miles of high sensitivity from geologic hazards ▪ 24.7 miles of moderate sensitivity from geologic hazards **Impacts** ▪ 24.2 miles of moderate impact on soils ▪ 4.5 miles of moderate impact on mineral resources ▪ 4.7 miles of high impact from geologic hazards ▪ 12.6 miles of moderate impact from geologic hazards **Preference Ranking: 1**	**Inventory** ▪ 7 localities within 1 mile ▪ 9.6 miles of PFYC of 4 or 5 **Impacts** ▪ 10.4 miles of high sensitivity ▪ 4.6 miles of moderate sensitivity **Preference Ranking: 1**	**Inventory** ▪ NO_x – 163 tons ▪ SO2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM10 – 250 tons ▪ PM2.5 – 33 tons **Impacts** ▪ CO, SO_2, PM10/PM2.5 within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO2 standard from construction equipment	**Inventory** ▪ 69.9 miles of crucial pronghorn habitat north, west, and southwest of Milford ▪ 33.1 miles of crucial winter mule deer habitat primarily in and around the Mineral and Pahvant Ranges ▪ 4.1 miles of sage-grouse brooding habitat northeast of the Mineral Range ▪ 21.2 miles of high quality raptor habitat and 32.8 miles of medium quality raptor habitat in and around the Mineral and Pahvant Ranges; and 66.7 miles of low quality raptor habitat along Black Rock Road and the IPP ▪ 28.6 miles of potential pygmy rabbit habitat **Impacts** ▪ 99.5 miles of low residual impact on big game ▪ 4.1 miles of high impacts resulting from federally listed species ▪ 32.6 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 88.1 miles of low residual impact resulting from raptor habitats **Preference Ranking: 1**	**Inventory** ▪ 4.9 miles of habitat for sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 319.9 acres of permanent disturbance ▪ 364.6 acres of vegetation clearing **Impacts** ▪ 4.9 miles of low residual impact on sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 13.4 miles of low residual impact on vegetation communities ▪ 107.3 miles of moderate impact on vegetation **Preference Ranking: 1**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative N2 Black Rock Road to IPP South of Milford Wind Farm	118.2	**Inventory** ▪ 7 perennial stream/river crossings ▪ 9 named intermittent stream crossings ▪ 65 unnamed intermittent or ephemeral stream crossings ▪ 7 canal crossings ▪ 0.5 mile of major river ▪ 9.2 miles of river/stream ▪ 6.6 miles of shallow groundwater ▪ 0.9 mile of springs ▪ 4.1 miles of wells **Impacts** ▪ 940.2 acres of temporary disturbance ▪ 295.7 acres of permanent disturbance ▪ 0.0 mile of high impact ▪ 0.0 mile of moderate impact ▪ 19.5 miles of low impact **Preference Ranking: 4**	**Inventory** ▪ 4.7 miles of designated farmland soils ▪ 16.3 miles of high potential for water erosion ▪ 6.4 miles of high potential for wind erosion ▪ 5.5 miles of active mines, producing wells, or mining claims ▪ 15.9 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 14.3 miles of high sensitivity from geologic hazards ▪ 25.7 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 32.4 miles of moderate impact on soils ▪ 4.9 miles of moderate impact on mineral resources ▪ 4.7 miles of high impact from geologic hazards ▪ 13.9 miles of moderate impact from geologic hazards **Preference Ranking: 3**	**Inventory** ▪ 7 localities within 1 mile ▪ 9.6 miles of PFYC of 4 or 5 **Impacts** ▪ 10.4 miles of high sensitivity ▪ 4.6 miles of moderate sensitivity **Preference Ranking: 2**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 248 tons ▪ $PM_{2.5}$ – 33 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 69.5 miles of crucial pronghorn habitat north, west, and southwest of Milford ▪ 42.9 miles of crucial winter mule deer habitat primarily in and around the Mineral and Pahvant Ranges ▪ 15.6 miles of sage-grouse brooding habitat northeast and west of the Mineral Range ▪ 33.4 miles of high raptor quality habitat and 32.8 miles of medium quality habitat primarily in and around the Mineral and Pahvant Ranges; and 54.1 miles of low quality raptor habitat along Black Rock Road and the IPP ▪ 38.1 miles of potential pygmy rabbit habitat **Impacts** ▪ 99.1 miles of low impacts on big game ▪ 15.6 miles of high impacts resulting from federally listed species ▪ 42.1 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 78.2 miles of low residual impact resulting from raptor habitats **Preference Ranking: 3**	**Inventory** ▪ 4.9 miles of habitat for sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 310.7 acres of permanent disturbance ▪ 364.6 acres of vegetation clearing **Impacts** ▪ 4.9 miles of low residual impact on sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 12.7 miles of low residual impact on vegetation communities ▪ 107.6 miles of moderate impact on vegetation **Preference Ranking: 2**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative N3 Black Rock Road Parallel to Kern River Pipeline	117.2	**Inventory** ▪ 7 perennial stream/river crossings ▪ 9 named intermittent stream crossings ▪ 92 unnamed intermittent or ephemeral stream crossings ▪ 2 canal crossings ▪ 1.7 miles of major river ▪ 10.2 miles of river/stream ▪ 0.6 mile of springs ▪ 3.7 miles of wells **Impacts** ▪ 932.9 acres of temporary disturbance ▪ 257.7 acres of permanent disturbance ▪ 0.0 mile of high impact ▪ 0.0 mile of moderate impact ▪ 15.3 miles of low impact **Preference Ranking: 1**	**Inventory** ▪ 5.5 miles of designated farmland soils ▪ 7.9 miles of high potential for water erosion ▪ 15.8 miles of high potential for wind erosion ▪ 4.4 miles of active mines, producing wells, or mining claims ▪ 19.2 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 15.2 miles of high sensitivity from geologic hazards ▪ 27.3 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 43.0 miles of moderate impact on soils ▪ 3.7 miles of moderate impact on mineral resources ▪ 4.8 miles of high impact from geologic hazards ▪ 16.0 miles of moderate impact from geologic hazards **Preference Ranking: 6**	**Inventory** ▪ 5 localities within 1 mile ▪ 10.9 miles of PFYC of 4 or 5 **Impacts** ▪ 11.7 miles of high sensitivity ▪ 2.0 miles of moderate sensitivity **Preference Ranking: 4**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 241 tons ▪ $PM_{2.5}$ – 33 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 0.5 mile of active Utah prairie dog colony 1.2 miles of inactive Utah prairie dog colony ▪ 58.7 miles of crucial pronghorn habitat north, west, and southwest of Milford ▪ 55.0 miles of crucial winter mule deer habitat primarily in and around the Mineral and Pahvant Ranges ▪ 4.0 miles of sage-grouse lek buffer 37.0 miles of sage-grouse brooding habitat northeast and west of the Mineral Range and southwest of Minersville ▪ 59.9 miles of high quality raptor habitat and 44.0 miles of medium quality raptor habitat primarily in and around the Mineral and Pahvant Ranges, and 13.3 miles of low quality raptor habitat along Black Rock Road and the IPP ▪ 57.1 miles of potential pygmy rabbit habitat **Impacts** ▪ 94.1 miles of low impacts on big game ▪ 37.0 miles of high impact resulting from federally listed species ▪ 55.5 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 61.7 miles of low residual impact resulting from raptor habitats **Preference Ranking: 6**	**Inventory** ▪ 4.9 miles of habitat for sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 270.4 acres of permanent disturbance ▪ 421.9 acres of vegetation clearing **Impacts** ▪ 4.9 miles of low residual impact on sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 12.5 miles of low residual impact on vegetation communities ▪ 104.7 miles of moderate impact on vegetation **Preference Ranking: 4**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative N4 Mineral Mountains to IPP South of Milford Wind Farm	109.4	**Inventory** ▪ 7 perennial stream/river crossings ▪ 7 named intermittent stream crossings ▪ 63 unnamed intermittent or ephemeral stream crossings ▪ 7 canal crossings ▪ 0.2 mile of major river ▪ 8.9 miles of river/stream ▪ 6.6 miles of shallow groundwater ▪ 0.9 mile of springs ▪ 5.2 miles of wells **Impacts** ▪ 875.8 acres of temporary disturbance ▪ 294.3 acres of permanent disturbance ▪ 0.0 mile of high impact ▪ 0.0 mile of moderate impact ▪ 20.0 miles of low impact **Preference Ranking: 5**	**Inventory** ▪ 0.7 mile of designated farmland soils ▪ 13.7 miles of high potential for water erosion ▪ 4.9 miles of high potential for wind erosion ▪ 5.3 miles of active mines, producing wells, or mining claims ▪ 17.7 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 14.3 miles of high sensitivity from geologic hazards ▪ 28.2 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 29.3 miles of moderate impact on soils ▪ 4.7 miles of moderate impact on mineral resources ▪ 4.9 miles of high impact from geologic hazards ▪ 13.8 miles of moderate impact from geologic hazards **Preference Ranking: 2**	**Inventory** ▪ 7 localities within 1 mile ▪ 9.6 miles of PFYC of 4 or 5 **Impacts** ▪ 10.4 miles of high sensitivity ▪ 4.6 miles of moderate sensitivity **Preference Ranking: 3**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 245 tons ▪ $PM_{2.5}$ – 33 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 48.2 miles of crucial pronghorn habitat north, west, and southwest of Milford ▪ 40.9 miles of crucial winter mule deer habitat primarily in and around the Mineral and Pahvant Ranges ▪ 6.6 miles of sage-grouse brooding habitat northeast of Milford ▪ 35.8 miles of high quality raptor habitat; 32.8 miles of medium quality raptor habitat primarily in and around the Mineral and Pahvant Ranges; and 40.8 miles of low quality raptor habitat along Black Rock Road and the IPP ▪ 22.4 miles of potential pygmy rabbit habitat **Impacts** ▪ 88.2 miles of low impacts on big game ▪ 6.6 miles of high impacts resulting from federally listed species ▪ 26.3 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 83.1 miles of low residual impact resulting from raptor habitats **Preference Ranking: 2**	**Inventory** ▪ 4.9 miles of habitat for sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 309.2 acres of permanent disturbance ▪ 370.4 acres of vegetation clearing **Impacts** ▪ 4.9 miles of low residual impact on sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 12.9 miles of low residual impact on vegetation communities ▪ 96.5 miles of moderate impact on vegetation **Preference Ranking: 3**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative N5 Mineral Mountains to Kern River Pipeline	106.3	**Inventory** ▪ 7 perennial stream/river crossings ▪ 7 named intermittent stream crossings ▪ 78 unnamed intermittent or ephemeral stream crossings ▪ 9 canal crossings ▪ 1.4 miles of major river ▪ 9.9 miles of river/stream ▪ 0.6 mile of springs ▪ 4.8 miles of wells **Impacts** ▪ 853.1 acres of temporary disturbance ▪ 256.2 acres of permanent disturbance ▪ 0.0 mile of high impact ▪ 0.0 mile of moderate impact ▪ 15.8 miles of low impact **Preference Ranking: 2**	**Inventory** ▪ 1.5 miles of designated farmland soils ▪ 5.3 miles of high potential for water erosion ▪ 14.3 miles of high potential for wind erosion ▪ 4.2 miles of active mines, producing wells, or mining claims ▪ 21.0 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 15.2 miles of high sensitivity from geologic hazards ▪ 29.8 miles of moderate sensitivity to geologic hazards ▪ **Impacts** ▪ 39.9 miles of moderate impact on soils ▪ 3.5 miles of moderate impact on mineral resources ▪ 5.0 miles of high impact from geologic hazards ▪ 15.9 miles of moderate impact from geologic hazards **Preference Ranking: 4**	**Inventory** ▪ 5 localities within 1 mile ▪ 10.9 miles of PFYC of 4 or 5 **Impacts** ▪ 11.7 miles of high sensitivity ▪ 2.0 miles of moderate sensitivity **Preference Ranking: 5**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 238 tons ▪ $PM_{2.5}$ – 32 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 0.5 mile of active Utah prairie dog colony ▪ 1.2 miles of inactive Utah prairie dog colony ▪ 37.4 miles of crucial pronghorn habitat north and southwest of Milford ▪ 53.0 miles of crucial winter mule deer habitat primarily in and around the Mineral and Pahvant Ranges ▪ 4.0 miles of sage-grouse lek buffer 28.0 miles of sage-grouse brooding habitat west of the Mineral Range and southwest of Minersville ▪ 62.3 miles of high quality raptor habitat and 44.0 miles of medium quality raptor habitat primarily in and around the Mineral and Pahvant Ranges ▪ 41.4 miles of potential pygmy rabbit habitat **Impacts** ▪ 83.2 miles of low impacts on big game ▪ 28.0 miles of high impacts resulting from federally listed species ▪ 39.7 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 66.6 miles of low residual impact resulting from raptor habitats **Preference Ranking: 5**	**Inventory** ▪ 4.9 miles of habitat for sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 269.0 acres of permanent disturbance ▪ 427.6 acres of vegetation clearing **Impacts** ▪ 4.9 miles of low residual impact on sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 12.7 miles of low residual impact on vegetation communities ▪ 93.6 miles of moderate impact on vegetation **Preference Ranking: 5**

TABLE 2-11a
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WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative N6 Mineral Mountains 1,500 Feet East of Kern River Pipeline (Proponent's Proposed Action)	105.5	**Inventory** ▪ 7 perennial stream/river crossings ▪ 7 named intermittent stream crossings ▪ 66 unnamed intermittent or ephemeral stream crossings ▪ 9 canal crossings ▪ 1.1 miles of major river ▪ 11.1 miles of river/stream ▪ 5.6 miles of wells **Impacts** ▪ 847.3 acres of temporary disturbance ▪ 313.6 acres of permanent disturbance ▪ 0.0 mile of high impact ▪ 0.0 mile of moderate impact ▪ 17.0 miles of low impact **Preference Ranking: 3**	**Inventory** ▪ 0.8 mile of designated farmland soils ▪ 5.4 miles of high potential for water erosion ▪ 15.5 miles of high potential for wind erosion ▪ 4.5 miles of active mines, producing wells, or mining claims ▪ 22.4 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 15.9 miles of high sensitivity from geologic hazards ▪ 32.5 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 38.8 miles of moderate impact on soils ▪ 44.0 miles of moderate impact on mineral resources ▪ 5.2 miles of high impact from geologic hazards ▪ 18.6 miles of moderate impact from geologic hazards **Preference Ranking: 5**	**Inventory** ▪ 5 localities within 1 mile ▪ 11.5 miles of PFYC of 4 or 5 **Impacts** ▪ 12.3 miles of high sensitivity ▪ 2.0 miles of moderate sensitivity **Preference Ranking: 6**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 247 tons ▪ $PM_{2.5}$ – 33 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 1.5 miles of inactive Utah prairie dog colony ▪ 36.8 miles of crucial pronghorn habitat north and southwest of Milford ▪ 56.3 miles of crucial winter mule deer habitat primarily in and around the Mineral and Pahvant Ranges ▪ 4.1 miles of sage-grouse lek buffer ▪ 27.5 miles of sage-grouse brooding habitat west of the Mineral Range and southwest of Minersville ▪ 61.7 miles of high quality raptor habitat and 43.8 miles of medium quality raptor habitat primarily in and around the Mineral and Pahvant Ranges ▪ 40.6 miles of potential pygmy rabbit habitat **Impacts** ▪ 82.8 miles of low impacts on big game ▪ 27.5 miles of high impacts resulting from federally listed species ▪ 40.1 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 65.4 miles of low residual impact resulting from raptor habitats **Preference Ranking: 4**	**Inventory** ▪ 4.9 miles of habitat for sensitive species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 329.4 acres of permanent disturbance ▪ 481.1 acres of vegetation clearing **Impacts** ▪ 4.9 miles of low residual impact on sensitive plant species Elsinore buckwheat, Ward's beardtongue, and Utah phacelia ▪ 11.9 miles of low residual impact on vegetation communities ▪ 93.6 miles of moderate impact on vegetation **Preference Ranking: 6**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Southern – South Black Mountains to Red Butte Substation							
Alternative S1 Pinto Creek	56.0	**Inventory** ▪ 6 perennial stream/river crossings ▪ 5 named intermittent stream crossings ▪ 22 unnamed intermittent or ephemeral stream crossings ▪ 1.0 miles of major river ▪ 3.6 miles of river/stream ▪ 0.1 mile of springs ▪ 0.8 mile of wells **Impacts** ▪ 446.7 acres of temporary disturbance ▪ 183.6 acres of permanent disturbance ▪ 0.1 mile of high impact ▪ 1.2 miles of moderate impact ▪ 4.0 miles of low impact **Preference Ranking: 5**	**Inventory** ▪ 11.7 miles of designated farmland soils ▪ 7.0 miles of high potential for water erosion ▪ 0.0 mile of active mines, producing wells, or mining claims ▪ 7.9 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 4.9 miles of high sensitivity from geologic hazards ▪ 15.6 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 23.5 miles of moderate impact on soils ▪ 1.8 miles of high impact from geologic hazards ▪ 10.5 miles of moderate impact from geologic hazards **Preference Ranking: 4**	**Inventory** ▪ 1 locality within 1 mile ▪ 3.2 miles of PFYC of 4 or 5 ▪ 1.3 miles of PFYC of 3 **Impacts** ▪ 3.2 miles of high sensitivity ▪ 2.3 miles of moderate sensitivity **Preference Ranking: 4**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 209 tons ▪ $PM_{2.5}$ – 29 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 0.1 mile of Southwestern willow flycatcher occupied habitat ▪ 21.7 miles of crucial pronghorn habitat south of the Lund Road ▪ 8.7 miles of crucial winter mule deer habitat primarily in the Harmony and Pine Valley Mountains ▪ 9.0 miles of crucial summer mule deer habitat primarily in the Dixie National Forest ▪ 0.3 mile of crucial year-long mule deer habitat ▪ 24.4 miles of high quality raptor habitat and 31.6 miles of medium quality raptor habitat primarily in the Harmony and Pine Valley Mountains ▪ 18.1 miles of potential pygmy rabbit habitat **Impacts** ▪ 54.8 miles of low impact on big game ▪ 0.1 mile of high impacts resulting from federally listed species ▪ 18.1 miles of moderate residual impacts resulting from potential pygmy rabbit habitat ▪ 37.9 miles of low residual impact resulting from raptor habitats **Preference Ranking: 4**	**Inventory** ▪ 193.0 acres of permanent disturbance ▪ 328.4 acres of vegetation clearing **Impacts** ▪ 4.1 miles of low residual impact on vegetation communities ▪ 51.9 miles of moderate impact on vegetation **Preference Ranking: 3**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative S2 IPP West (Environmentally Preferred)	49.6	**Inventory** ▪ 1 perennial stream/river crossing ▪ 2 named intermittent stream crossings ▪ 29 unnamed intermittent or ephemeral stream crossings ▪ 1 water body crossing ▪ 3.6 miles of river/stream ▪ 0.6 mile of springs ▪ 0.2 mile of wells ▪ 0.1 mile of water bodies **Impacts** ▪ 401.7 acres of temporary disturbance ▪ 150.6 acres of permanent disturbance ▪ 0.0 mile of high impact ▪ 0.0 mile of moderate impact ▪ 4.2 miles of low impact **Preference Ranking: 1**	**Inventory** ▪ 12.9 miles of designated farmland soils ▪ 7.0 miles of high potential for water erosion ▪ 0.2 mile of active mines, producing wells, or mining claims ▪ 7.7 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 3.2 miles of high sensitivity from geologic hazards ▪ 9.7 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 24.2 miles of moderate impact on soils ▪ 1.4 miles of high impact on geologic hazards ▪ 5.9 miles of moderate impact from geologic hazards **Preference Ranking: 1**	**Inventory** ▪ 4 localities within 1 mile ▪ 0.5 mile of PFYC of 4 or 5 ▪ 1.1 miles of PFYC of 3 **Impacts** ▪ 2.0 miles of high sensitivity ▪ 2.1 miles of moderate sensitivity **Preference Ranking: 1**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 201 tons ▪ $PM_{2.5}$ – 29 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 21.7 miles of crucial pronghorn habitat south of the Lund Road ▪ 10.2 miles of crucial winter mule deer habitat between Central and Newcastle ▪ 5.6 miles of crucial summer mule deer habitat primarily in the Dixie National Forest ▪ 1.3 miles of crucial year-long mule deer habitat ▪ 49.6 miles of medium quality raptor habitat primarily between Central and Newcastle ▪ 22.0 miles of potential pygmy rabbit habitat **Impacts** ▪ 46.9 miles of low impact on big game ▪ 22.0 miles of moderate residual impact t resulting from potential pygmy rabbit habitat ▪ 27.6 miles of low residual impact resulting from raptor habitats **Preference Ranking: 1**	**Inventory** ▪ 158.2 acres of permanent disturbance ▪ 147.0 acres of vegetation clearing **Impacts** ▪ 4.3 miles of low residual impact on vegetation communities ▪ 45.3 miles of moderate impact on vegetation **Preference Ranking: 1**

TABLE 2-11a
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WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative S3 Ox Valley	57.6	**Inventory** ▪ 2 perennial stream/river crossings ▪ 4 named intermittent stream crossings ▪ 36 unnamed intermittent or ephemeral stream crossings ▪ 3.9 miles of river/stream ▪ 0.2 mile of wells **Impacts** ▪ 462.1 acres of temporary disturbance ▪ 210.9 acres of permanent disturbance ▪ 0.1 mile of high impact ▪ 0.0 mile of moderate impact ▪ 4.0 miles of low impact **Preference Ranking: 3**	**Inventory** ▪ 12.9 miles of designated farmland soils ▪ 7.0 miles of high potential for water erosion ▪ 0.2 mile of active mines, producing wells, or mining claims ▪ 7.7 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 8.0 miles of high sensitivity from geologic hazards ▪ 21.2 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 27.1 miles of moderate impact on soils ▪ 2.7 miles of high impact from geologic hazards ▪ 11.0 miles of moderate impact from geologic hazards **Preference Ranking: 6**	**Inventory** ▪ 1 locality within 1 mile ▪ 1.0 miles of PFYC of 4 or 5 ▪ 7.6 miles of PFYC of 3 **Impacts** ▪ 1.0 miles of high sensitivity ▪ 8.2 miles of moderate sensitivity **Preference Ranking: 3**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 214 tons ▪ $PM_{2.5}$ – 30 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 21.7 miles of crucial pronghorn habitat south of the Lund Road ▪ 9.0 miles of crucial winter mule deer habitat west of Central and Newcastle ▪ 8.0 miles of crucial summer mule deer habitat primarily in the Dixie National Forest ▪ 6.2 miles of crucial year-long mule deer habitat ▪ 12.2 miles of high quality raptor habitat and 45.4 miles of medium quality raptor habitat primarily in the Bull Valley Mountains ▪ 21.8 miles of potential pygmy rabbit habitat **Impacts** ▪ 54.9 miles of low impact on big game ▪ 21.8 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 35.8 miles of low residual impact resulting from raptor habitats **Preference Ranking: 3**	**Inventory** ▪ 221.6 acres of permanent disturbance ▪ 339.8 acres of vegetation clearing **Impacts** ▪ 4.7 miles of low residual impact on vegetation communities ▪ 52.9 miles of moderate impact on vegetation **Preference Ranking: 4**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative S4 IPP East	48.9	**Inventory** ▪ 1 perennial stream/river crossing ▪ 2 named intermittent stream crossings ▪ 30 unnamed intermittent or ephemeral stream crossings ▪ 2.8 miles of river/stream ▪ 0.2 mile of springs ▪ 0.2 mile of wells **Impacts** ▪ 392.9 acres of temporary disturbance ▪ 192.5 acres of permanent disturbance ▪ 0.0 mile of high impact ▪ 0.0 mile of moderate impact ▪ 3.2 miles of low impact **Preference Ranking: 2**	**Inventory** ▪ 11.5 miles of designated farmland soils ▪ 7.0 miles of high potential for water erosion ▪ 0.2 mile of active mines, producing wells, or mining claims ▪ 7.7 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 7.2 miles of high sensitivity from geologic hazards ▪ 17.0 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 24.2 miles of moderate impact on soils ▪ 2.1 miles of high impact from geologic hazards ▪ 9.2 miles of moderate impact from geologic hazards **Preference Ranking: 3**	**Inventory** ▪ 4 localities within 1 mile ▪ 0.9 mile of PFYC of 4 or 5 ▪ 4.5 miles of PFYC of 3 **Impacts** ▪ 2.0 miles of high sensitivity ▪ 5.6 miles of moderate sensitivity **Preference Ranking: 2**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 208 tons ▪ $PM_{2.5}$ – 29 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 21.7 miles of crucial pronghorn habitat south of the Lund Road ▪ 10.6 miles of crucial winter mule deer habitat between Central and Newcastle ▪ 5.5 miles of crucial summer mule deer habitat primarily in the Dixie National Forest ▪ 1.3 miles of crucial year-long mule deer habitat ▪ 48.9 miles of medium quality raptor habitat primarily between Central and Newcastle ▪ 16.2 miles of potential pygmy rabbit habitat **Impacts** ▪ 74.7 miles of low impact on big game ▪ 16.2 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 28.2 miles of low residual impact resulting from raptor habitat **Preference Ranking: 2**	**Inventory** ▪ 5.0 miles of habitat for sensitive plant species pinyon penstemon ▪ 202. acres of permanent disturbance ▪ 292.1 acres of vegetation clearing **Impacts** ▪ 5.0 miles of moderate residual impact on sensitive plant species pinyon penstemon ▪ 4.0 miles of low residual impact on vegetation communities ▪ 44.9 miles of moderate impact on vegetation **Preference Ranking: 2**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative S5 Iron Springs and Pinto Creek (Proponent's Proposed Action)	59.0	**Inventory** ▪ 6 perennial stream/river crossings ▪ 3 named intermittent stream crossings ▪ 20 unnamed intermittent or ephemeral stream crossings ▪ 1.0 miles of major river ▪ 4.3 miles of river/stream ▪ 0.5 mile of springs ▪ 0.8 mile of wells **Impacts** ▪ 468.7 acres of temporary disturbance ▪ 184.8 acres of permanent disturbance ▪ 0.1 mile of high impact ▪ 1.2 miles of moderate impact ▪ 5.0 miles of low impact **Preference Ranking: 6**	**Inventory** ▪ 6.9 miles of designated farmland soils ▪ 4.3 miles of high potential for water erosion ▪ 0.5 mile of active mines, producing wells, or mining claims ▪ 11.0 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 3.7 miles of high sensitivity from geologic hazards ▪ 13.3 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 22.0 miles of moderate impact on soils ▪ 1.4 miles of high impact from geologic hazards ▪ 9.6 miles of moderate impact from geologic hazards **Preference Ranking: 2**	**Inventory** ▪ 1 locality within 1 mile ▪ 6.0 miles of PFYC of 4 or 5 ▪ 1.5 miles of PFYC of 3 **Impacts** ▪ 6.0 miles of high sensitivity ▪ 2.5 miles of moderate sensitivity **Preference Ranking: 6**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 210 tons ▪ $PM_{2.5}$ – 29 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 0.1 mile of Southwestern willow flycatcher occupied habitat 18.4 miles of crucial pronghorn habitat south of the Lund Road ▪ 3.1 miles of crucial winter mule deer habitat primarily in the Harmony and Pine Valley Mountains ▪ 9.0 miles of crucial summer mule deer habitat primarily in the Dixie National Forest ▪ 0.3 mile of crucial year-long mule deer habitat ▪ 32.2 miles of high quality raptor habitat and 26.8 miles of medium quality raptor habitat primarily in the Harmony and Pine Valley Mountains ▪ 20.1 miles of potential pygmy rabbit habitat **Impacts** ▪ 53.3 miles of low impact on big game ▪ 0.1 mile of high impacts resulting from federally listed species ▪ 20.1 miles of moderate residual impact t resulting from potential pygmy rabbit habitat ▪ 37.8 miles of low residual impact resulting from raptor habitat **Preference Ranking: 5**	**Inventory** ▪ 5.1 miles of habitat for sensitive plant species pinyon penstemon ▪ 194.1 acres of permanent disturbance ▪ 423.8 acres of vegetation clearing **Impacts** ▪ 5.0 miles of moderate residual impact on sensitive plant species pinyon penstemon ▪ 3.5 miles of low residual impact on vegetation communities ▪ 55.5 miles of moderate impact on vegetation **Preference Ranking: 5**

TABLE 2-11a
ALTERNATIVE ROUTE COMPARISON
WATER RESOURCES, GEOLOGY AND SOILS, PALEONTOLOGY, AIR QUALITY, AND BIOLOGY

Alternative Routes	Length (miles)	Water Resources	Geology and Soils	Paleontology	Air Quality	Biology	
						Wildlife	Vegetation
Alternative S6 Iron Springs and Ox Valley	61.9	**Inventory** ▪ 4 perennial stream/river crossings ▪ 3 named intermittent stream crossings ▪ 33 unnamed intermittent or ephemeral stream crossings ▪ 0.2 mile of major river ▪ 4.6 miles of river/stream ▪ 0.4 mile of springs **Impacts** ▪ 513.6 acres of temporary disturbance ▪ 215.2 acres of permanent disturbance ▪ 0.2 mile of high impact ▪ 0.1 mile of moderate impact ▪ 4.6 miles of low impact **Preference Ranking: 4**	**Inventory** ▪ 8.0 miles of designated farmland soils ▪ 4.3 miles of high potential for water erosion ▪ 0.7 mile of active mines, producing wells, or mining claims ▪ 10.8 miles of potential mineral resources, inactive mining claims, or geothermal areas ▪ 6.1 miles of high sensitivity from geologic hazards ▪ 20.0 miles of moderate sensitivity to geologic hazards **Impacts** ▪ 25.5 miles of moderate impact on soils ▪ 0.2 mile of moderate impact on mineral resources ▪ 2.0 miles of high impact from geologic hazards ▪ 11.1 miles of moderate impact from geologic hazards **Preference Ranking: 5**	**Inventory** ▪ 1 locality within 1 mile ▪ 4.0 miles of PFYC of 4 or 5 ▪ 8.5 miles of PFYC of 3 **Impacts** ▪ 4.0 miles of high sensitivity ▪ 9.1 miles of moderate sensitivity **Preference Ranking: 5**	**Inventory** ▪ NO_x – 163 tons ▪ SO_2 – 0.5 tons ▪ CO – 162 tons ▪ VOC – 14 tons ▪ PM_{10} – 216 tons ▪ $PM_{2.5}$ – 30 tons **Impacts** ▪ CO, SO_2, $PM_{10}/PM_{2.5}$ within standards for all averaging periods ▪ Potential localized exceedances of 1-hour NO_2 standard from construction equipment	**Inventory** ▪ 0.1 mile of Southwestern willow flycatcher occupied habitat 18.4 miles of crucial pronghorn habitat south of the Lund Road ▪ 1.8 miles of crucial winter mule deer habitat primarily in the Harmony and Bull Valley Mountains ▪ 8.0 miles of crucial summer mule deer habitat primarily in the Dixie National Forest ▪ 6.2 miles of crucial year-long mule deer habitat ▪ 23.5 miles of high quality raptor habitat and 38.4 miles of medium quality raptor habitat primarily in the Harmony and Bull Valley Mountains ▪ 24.5 miles of potential pygmy rabbit habitat **Impacts** ▪ 54.7 miles of low impact on big game ▪ 0.1 mile of high impacts resulting from federally listed species ▪ 24.5 miles of moderate residual impact resulting from potential pygmy rabbit habitat ▪ 36.3 miles of low residual impact resulting from raptor habitat **Preference Ranking: 6**	**Inventory** ▪ 5.1 miles of habitat for sensitive plant species pinyon penstemon ▪ 226.0 acres of permanent disturbance ▪ 465.8 acres of vegetation clearing **Impacts** ▪ 5.0 miles of moderate residual impact on sensitive plant species pinyon penstemon ▪ 4.1 miles of low residual impact on vegetation communities ▪ 57.8 miles of moderate impact on vegetation **Preference Ranking: 6**

NOTES:

PFYC	Potential Fossil Yield Classification	CO	Carbon monoxide
NO_x	Nitrogen oxides	VOC	Volatile organic compounds
NO2	Nitrogen dioxide	PM_{10}	Particulate matter less than 10 microns in diameter
SO2	Sulfur dioxide	$PM_{2.5}$	Particulate matter less than 2.5 microns in diameter

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Northern – Sigurd Substation to South Black Mountains								
Alternative N1 Black Rock Road to IPP North of Milford Wind Farm (Environmentally Preferred	120.7	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $1.97M year 1 and $192K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 712 sites identified by the Class I ▪ 1 identified by the Class II ▪ 38 sites within APE **Impacts** ▪ 10.8 miles of high cultural resource sensitivity **Preference Ranking: 1** ▪ Lowest mileage through areas with high cultural resource sensitivity	Class B Scenery – 32.7	**Views within 0.25 mile –** 11.0 **Views between 0.25 and 0.5 mile –** 15.7	**Views within 0.25 mile –** 35.8 **Views between 0.25 and 0.5 mile –** 19.0	▪ In compliance with VRM Class III and IV objectives ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Moderate impact on the Pahvant Range, Tushar Mountains, and Juniper Hills landscapes **Residential Views** ▪ Moderate impact on residential viewers in Sigurd, Richfield, Elsinore, Joseph, and Milford **Recreation/Travel Corridor Views** ▪ Moderate/high impact on views from the Fremont Indian State Park ▪ Moderate impact on views from the Jens Larson Lime Kiln, Kimberly/Big John Road Scenic Backway, Fish Creek, Paiute ATV Trail, I-70, Escalante Trail, and American Discovery Trail **Impacts** ▪ 1.2 miles of moderate/ high impact **Preference Ranking: 1** ▪ Lowest impact on scenery due to adjacency of existing transmission lines

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Alternative N2 Black Rock Road to IPP South of Milford Wind Farm	118.2	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $2.0M year 1 and $195K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 849 sites identified by the Class I ▪ 3 sites identified by the Class II ▪ 49 sites within APE, including two National Register of Historic Places (NRHP) listed sites (Negro Mag obsidian source and Wildhorse Canyon obsidian source) **Impacts** ▪ 16.5 miles of high cultural resource sensitivity **Preference Ranking: 4** ▪ High mileage through areas with high cultural resource sensitivity	Class B Scenery – 340	**Views within 0.25 mile -** 15.7 **Views between 0.25 and 0.5 mile –** 15.7	**Views within 0.25 mile –** 35.8 **Views between 0.25 and 0.5 mile –** 18.9	▪ In compliance with VRM Class III and IV objectives ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Impact on scenery identical to N1 **Residential Views** ▪ Impact on residential viewers identical to N1 **Recreation/Travel Corridor Views** ▪ Impact on recreation/travel corridor viewers are identical to N1 **Impacts** ▪ 1.2 miles of moderate/ high impact **Preference Ranking: 2** ▪ Similar to N1 except fewer miles are adjacent to existing transmission lines
Alternative N3 Black Rock Road Parallel to Kern River Pipeline	117.2	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $1.95M year 1 and $190K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 869 sites identified by the Class I ▪ 6 sites identified by the Class II ▪ 84 sites within APE, including two NRHP listed sites (Negro Mag obsidian source and Wildhorse Canyon obsidian source) **Impacts** ▪ 28.5 miles of high cultural resource sensitivity **Preference Ranking: 6** ▪ Highest mileage through areas with high cultural resource sensitivity	Class B Scenery – 38.0	**Views within 0.25 mile –** 11.7 **Views between 0.25 and 0.5 mile –** 16.4	**Views within 0.25 mile –** 37.1 **Views between 0.25 and 0.5 mile –** 9.6	▪ In compliance with VRM Class III and IV objectives ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Impact on scenery identical to N1 with the addition of moderate impacts on the Foothills landscape **Residential Views** ▪ Impact on residential viewers identical to N1 **Recreation/Travel Corridor Views** ▪ Impact on recreation/travel corridor viewers identical to N1 **Impacts** ▪ 1.2 miles of moderate/ high impact **Preference Ranking: 3** ▪ Similar to N1 except fewer miles adjacent to existing transmission lines

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Alternative N4 Mineral Mountains to IPP South of Milford Wind Farm	109.4	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $1.86M year 1 and $181K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 625 sites identified by the Class I ▪ 2 sites identified by the Class II ▪ 41 sites within APE, ▪ , including two NRHP listed sites (Negro Mag obsidian source and Wildhorse Canyon obsidian source) **Impacts** ▪ 11.5 miles of high cultural resource sensitivity **Preference Ranking: 2** ▪ Lower mileage through areas with high cultural resource sensitivity	Class B Scenery – 39.6	**Views within 0.25 mile –** 11.0 **Views between 0.25 and 0.5 mile –** 15.7	**Views within 0.25 mile –** 36.2 **Views between 0.25 and 0.5 mile –** 19.2	▪ In compliance with VRM Class III and IV objectives ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Impact on scenery identical to N1 with the addition of moderate impact on the Mineral Mountains landscape **Residential Views** ▪ Impact on residential viewers identical to N1 **Recreation/Travel Corridor Views** ▪ Impact on recreation/travel corridor viewers identical to N1 **Impacts** ▪ 1.2 miles of moderate/ high impact **Preference Ranking: 4** ▪ Third highest impact on scenery due to crossing of Mineral Mountains
Alternative N5 Mineral Mountains to Kern River Pipeline	106.3	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $1.81M year 1 and $177K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 645 sites identified by the Class I ▪ 5 sites identified by the Class II ▪ 76 sites within APE, including two NRHP listed sites (Negro Mag obsidian source and Wildhorse Canyon obsidian source) **Impacts** ▪ 23.4 miles of high cultural resource sensitivity **Preference Ranking: 5** ▪ High mileage through areas with high cultural resource sensitivity	Class B Scenery – 43.6	**Views within 0.25 mile –** 11.7 **Views between 0.25 and 0.5 mile –** 16.4	**Views within 0.25 mile –** 37.5 **Views between 0.25 and 0.5 mile –** 9.9	▪ In compliance with VRM Class III and IV objectives ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Impact on scenery identical to N1 with the addition of moderate impact on the Mineral Mountains and Foothill landscapes **Residential Views** ▪ Impact on residential viewers identical to N1 **Recreation/Travel Corridor Views** ▪ Impact on recreation/travel corridor viewers identical to N1 **Impacts** ▪ 1.2 miles of moderate/ high impact **Preference Ranking: 5** ▪ Second highest impact on scenery due to crossing of Mineral Mountains

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Alternative N6 Mineral Mountains 1,500 Feet East of Kern River Pipeline (Proponent's Proposed Action)	105.5	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $1.78M year 1 and $173K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 633 sites identified by the Class I ▪ 5 sites identified by the Class II ▪ 49 sites within APE, including two NRHP listed sites (Negro Mag obsidian source and Wildhorse Canyon obsidian source) **Impacts** ▪ 14.2 miles of high cultural resource sensitivity **Preference Ranking: 3** ▪ Low mileage through areas with high cultural resource sensitivity	Class B Scenery – 57.5	**Views within 0.25 mile –** 11.8 **Views between 0.25 and 0.5 mile –** 15.0	**Views within 0.25 mile –** 32.7 **Views between 0.25 and 0.5 mile –** 13.5	▪ In compliance with VRM Class III and IV objectives ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Impact on scenery identical to N1 with the addition of moderate impacts on the Mineral Mountains and Foothill landscapes **Residential Views** ▪ Impact on residential viewers identical to N1 **Recreation/Travel Corridor Views** ▪ Impact on recreation/travel corridor viewers identical to N1 **Impacts** ▪ 1.2 miles of moderate/high impact **Preference Ranking: 6** ▪ Highest impact on scenery due to crossing of Mineral Mountains and the separation from the existing Kern River pipeline

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Southern – South Black Mountains to Red Butte Substation								
Alternative S1 Pinto Creek	56.0	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $1.0M year 1 and $98K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 91 sites identified by the Class I ▪ 9 sites identified by the Class II ▪ 18 sites within APE **Impacts** ▪ 2.3 miles of high cultural resource sensitivity **Preference Ranking: 5** ▪ Higher mileage through areas with high cultural resource sensitivity	Class B Scenery – 24.5	**Views within 0.25 mile –** 7.6 **Views between 0.25 and 0.5 mile –** 10.3	**Views within 0.25 mile –** 11.2 **Views between 0.25 and 0.5 mile –** 3.6	▪ In compliance with VRM Class III and IV objectives ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Moderate impact on the Foothill, Juniper Hills, and Atchinson Mountain landscapes **Residential Views** ▪ Moderate/high impact on residential viewers along Pinto Creek and southeast of Central ▪ Moderate impact on residential views east of Newcastle **Recreation/Travel Corridor Views** ▪ Moderate impact on views from Forest Road (FR) 011, FR 035, and the Old Spanish Trail **Impacts** ▪ 0.7 mile of moderate/ high impact **Preference Ranking: 5** ▪ Highest impact on viewers due to proximity to residences along Pinto Creek and southeast of Central. Second highest impact on scenery. The majority of this alternative in the Dixie National Forest is in a high proposed SIO.

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Alternative S2 IPP West (Environmentally Preferred)	49.6	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $876K year 1 and $85K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 128 sites identified by the Class I ▪ 25 sites within APE, including the Old Spanish Trail/Road to Mountain Meadows Massacre Site, the historic Hamblin town site, and the NRHP listed 1857 Mountain Meadows Massacre Site **Impacts** ▪ 6.4 miles of high cultural resource sensitivity **Preference Ranking: 6** ▪ Highest mileage through areas with high cultural resource sensitivity, in particular the highly sensitive Mountain Meadows Massacre Site	Class B Scenery – 14.0	**Views within 0.25 mile –** 8.9 **Views between 0.25 and 0.5 mile –** 11.7	**Views within 0.25 mile –** 8.4 **Views between 0.25 and 0.5 mile –** 7.9	▪ In compliance with VRM Class IV objective ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Moderate impact on the Foothill and Juniper Hills landscapes **Residential Views** ▪ Moderate impact on residential viewers in Newcastle, Mountain Meadow, and Central **Recreation/Travel Corridor Views** ▪ Moderate/high impact on views from the Mountain Meadows Massacre Site ▪ Moderate impact on views from the Old Spanish Trail ▪ 0.9 mile of moderate/high impact **Preference Ranking: 1** ▪ Second lowest impact on viewers and lowest impact on scenery due to adjacency of existing transmission lines. The majority of this alternative in the Dixie National Forest is in a moderate proposed SIO.

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Alternative S3 Ox Valley	57.6	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $1M year 1 and $106K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 133 sites identified by the Class I ▪ 5 sites within APE ▪ 4 sites bisected by centerline **Impacts** ▪ 1.0 mile of high cultural resource sensitivity **Preference Ranking: 1** Lowest mileage through areas with high cultural resource sensitivity	Class B Scenery – 26.5	**Views within 0.25 mile –** 8.0 **Views between 0.25 and 0.5 mile –** 8.0	**Views within 0.25 mile –** 10.7 **Views between 0.25 and 0.5 mile –** 6.3	▪ In compliance with VRM Class IV objective ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Moderate impact on the Foothill, Juniper Hills, and Bull Valley Mountain landscapes **Residential Views** ▪ Moderate/high impact on residential viewers east of Enterprise ▪ Moderate impact on residential viewers in Newcastle, Enterprise, and Ox Valley **Recreation/Travel Corridor Views** ▪ Moderate impact on views from Old Spanish Trail, SR 18, FR 007, and Hardscrabble Trail **Impacts** ▪ 0.3 mile of moderate/ high impact **Preference Ranking: 3** ▪ Second highest impact on viewers due to proximity of residences east of Enterprise. Highest impact on scenery due to the crossing the Bull Valley Mountains. The majority of this alternative in the Dixie National Forest is in a high proposed SIO.

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Alternative S4 IPP East	48.9	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $950K year 1 and $93K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 73 sites identified by the Class I ▪ 3 sites identified by the Class II ▪ 11 sites within APE **Impacts** ▪ 1.3 miles of high cultural resource sensitivity **Preference Ranking: 2** ▪ Lower mileage through areas with high cultural resource sensitivity	Class B Scenery – 29.1	**Views within 0.25 mile –** 4.4 **Views between 0.25 and 0.5 mile –** 8.5	**Views within 0.25 mile –** 3.5 **Views between 0.25 and 0.5 mile –** 6.5	▪ In compliance with VRM Class IV objective ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Impact on scenery identical to S2 with the addition of moderate impact on the Atchinson Mountain landscape **Residential Views** ▪ Impact on residential viewers identical to S2 **Recreation/Travel Corridor Views** ▪ Impact on recreation/travel corridor viewers identical to S2 except low/moderate impact expected on views from Mountain Meadows Massacre Site and the Old Spanish Trail **Impacts** ▪ 0.0 mile of moderate/ high impacts **Preference Ranking: 2** ▪ Lowest impact on viewers and second lowest impact on scenery due to adjacency of existing transmission lines. The majority of this alternative in the Dixie National Forest is in a high proposed SIO with portions in an IRA.

TABLE 2-11b
ALTERNATIVE ROUTE COMPARISON
SOCIOECONOMIC, CULTURAL RESOURCES, AND VISUAL RESOURCES

Alternative Routes	Length (miles)	Socioeconomic	Cultural Resources	Visual Resources				
				Landscape Scenery (miles crossed)	Sensitive Viewers		Federal Agency Visual Management Objectives	Summary of Residual Impacts
					High Sensitivity Viewers (miles crossed)	Moderate Sensitivity Viewers (miles crossed)		
Alternative S5 Iron Springs and Pinto Creek (Proponent's Proposed Action)	59.0	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $981K year 1 and $96K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 107 sites identified by the Class I ▪ 2 sites identified by the Class II ▪ 13 sites within APE **Impacts** ▪ 2.0 miles of high cultural resource sensitivity **Preference Ranking: 4** ▪ Higher mileage through areas with high cultural resource sensitivity	Class B Scenery – 29.9	**Views within 0.25 mile –** 4.6 **Views between 0.25 and 0.5 mile –** 8.9	**Views within 0.25 mile –** 11.3 **Views between 0.25 and 0.5 mile –** 3.9	▪ In compliance with VRM Class III and IV objectives ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Impact on scenery identical to S1 **Residential Views** ▪ Impact on residential viewers identical to S1 **Recreation/Travel Corridor Views** ▪ Impact on recreation/travel corridor viewers identical to S1 **Impacts** ▪ 0.7 mile of moderate/high impact **Preference Ranking: 6** ▪ Similar to S1 except fewer miles adjacent to existing transmission lines
Alternative S6 Iron Springs and Ox Valley	61.9	**Impacts** ▪ Minimal impact on employment, population, housing, government services ▪ Increased property taxes of $1.1M year 1 and $103K remaining years ▪ No disproportionate impact on environmental justice populations	**Inventory** ▪ 131 sites identified by the Class I ▪ 2 sites identified by the Class II ▪ 10 sites within APE **Impacts** ▪ 1.7 miles of high cultural resource sensitivity **Preference Ranking: 3** ▪ Lower mileage through areas with high cultural resource sensitivity	Class B Scenery – 28.4	**Views within 0.25 mile –** 4.6 **Views between 0.25 and 0.5 mile –** 3.7	**Views within 0.25 mile –** 10.8 **Views between 0.25 and 0.5 mile –** 5.2	▪ In compliance with VRM Class IV objective ▪ Consistent with moderate SIO, not consistent with high SIO	**Landscape Scenery** ▪ Impact on scenery identical to S3 **Residential Views** ▪ Impact on residential viewers identical to S3 **Recreation/Travel Corridor Views** ▪ Impact on recreation/travel corridor viewers identical to S3 **Impacts** ▪ 0.3 mile of moderate/high impacts **Preference Ranking: 4** ▪ Similar to S3 except fewer miles adjacent to existing transmission lines

NOTES:
APE Area of Potential Effect
K Hundred thousand
M Million
VRM Visual resource management

TABLE 2-11c
ALTERNATIVE ROUTE COMPARISON
LAND USE AND RECREATION RESOURCES

Alternative Routes	Length (miles)	Parallel Linear Facilities (within 1500 feet) (miles)					Jurisdiction (miles)				Summary of Residual Impacts
		500kV	345kV	138kV	230kV	Pipeline	BLM	USFS	State	Private	
Northern – Sigurd Substation to South Black Mountains											
Alternative N1 Black Rock Road to IPP North of Milford Wind Farm (Environmentally Preferred)	120.7	41.5	5.5	37.4	–	1.8	46.8	30.6	4.9	38.4	**Inventory** ▪ 116 residences within 0.25 mile; crosses 7.8 miles of Areas of Potential Wilderness on USFS-administered lands; proximity to Richfield and Milford airports ▪ Crosses 0.6 mile parks/preservation; 1.7 miles proposed Mormon Mesa Wind Farm; 2.2 miles citizen proposed wilderness area (not to be confused with lands with wilderness characteristics); 5.2 miles geothermal leases; 14.5 miles oil and gas leases ▪ Crosses 0.9 mile of an off-highway vehicle (OHV) area; Paiute ATV trails; Kimberly/Big John Scenic Backway; 1.4 miles semi-primitive nonmotorized; 9.8 miles semi-primitive motorized **Impacts** ▪ High impact associated with semi-primitive nonmotorized areas ▪ Moderate impact associated with Areas of Potential Wilderness on USFS-administered lands, proposed wind farm, and semi-primitive motorized areas **Preference Ranking: 1** ▪ Least amount of impact on proposed energy projects
Alternative N2 Black Rock Road to IPP South of Milford Wind Farm	118.2	36.4	–	37.4	–	4.8	56.0	30.6	3.6	28.0	**Inventory** ▪ Similar to Alternative N1 between Sigurd Substation and Cove Fort; crosses 6.1 miles geothermal leases; 14.5 miles oil and gas leases; 0.7 mile Milford Flats South solar study area; 2.6 miles proposed Mormon Mesa Wind Farm; proximity to Milford airport **Impacts** ▪ Similar to Alternative N1 **Preference Ranking: 2** ▪ Less impact on proposed energy projects than Alternative N3, N4, N5, and N6

TABLE 2-11c
ALTERNATIVE ROUTE COMPARISON
LAND USE AND RECREATION RESOURCES

Alternative Routes	Length (miles)	Parallel Linear Facilities (within 1500 feet) (miles)					Jurisdiction (miles)				Summary of Residual Impacts
		500kV	345kV	138kV	230kV	Pipeline	BLM	USFS	State	Private	
Alternative N3 Black Rock Road Parallel to Kern River Pipeline	117.2	–	–	38.4	–	39.1	64.5	30.6	6.3	15.8	**Inventory** ▪ Similar to Alternative N1 between Sigurd Substation and Cove Fort; crosses 9.2 miles geothermal leases; 17.4 miles oil and gas leases; proximity to Milford airport **Impacts** ▪ Similar to Alternative N1 **Preference Ranking: 3** ▪ Less impact on proposed energy projects than Alternatives N4, N5, and N6
Alternative N4 Mineral Mountains to IPP South of Milford Wind Farm	109.4	36.4	–	38.3	–	2.1	45.0	30.6	4.5	29.3	**Inventory** ▪ Similar to Alternative N1 between Sigurd Substation and Cove Fort; crosses 8.8 miles geothermal leases; 14.5 miles oil and gas leases; 1.8 miles proposed Mineral Mountain Wind Farm; 2.2 miles proposed Mormon Mesa Wind Farm; proximity to Milford airport **Impacts** ▪ Similar to Alternative N1 **Preference Ranking: 4** ▪ More impact on proposed energy projects than Alternatives N1, N2, and N3
Alternative N5 Mineral Mountains to Kern River Pipeline	106.3	–	–	39.3	–	36.4	52.9	30.6	7.2	15.6	**Inventory** ▪ Similar to Alternative N1 between Sigurd Substation and Cove Fort; 117 residences within 0.25 mile; crosses 9.5 miles geothermal leases; 10.0 miles oil and gas leases; 0.7 mile Milford Flats South solar study area; 1.8 miles proposed Mineral Mountain Wind Farm; 2.6 miles proposed Mormon Mesa Wind Farm **Impacts** ▪ Similar to Alternative N1 **Preference Ranking: 5** ▪ Most impact on proposed energy projects
Alternative N6 Mineral Mountains 1,500 Feet East of Kern River Pipeline (Proponent's Proposed Action)	105.5	–	0.3	39.4	–	32.6	52.5	30.6	7.0	15.4	**Inventory** ▪ Similar to Alternative N5 **Impacts** ▪ Similar to Alternative N1 **Preference Ranking: 6** ▪ Most impact on proposed energy projects and is further away from the Kern River Pipeline than Alternative N5

TABLE 2-11c
ALTERNATIVE ROUTE COMPARISON
LAND USE AND RECREATION RESOURCES

Alternative Routes	Length (miles)	Parallel Linear Facilities (within 1500 feet) (miles)					Jurisdiction (miles)				Summary of Residual Impacts
		500kV	345kV	138kV	230kV	Pipeline	BLM	USFS	State	Private	
Southern – South Black Mountains to Red Butte Substation											
Alternative S1 Pinto Creek	56.0	18.9	10.1	4.2	–	0.1	13.0	20.7	0.4	21.9	**Inventory** ▪ 11 residences within 0.25 mile; crosses 11.7 miles Areas of Potential Wilderness on USFS-administered lands ▪ Crosses 1.6 miles parks/preservation; 0.6 mile citizen proposed wilderness area (not to be confused with lands with wilderness characteristics); 7.7 miles oil and gas leases ▪ Crosses 2.6 miles semi-primitive nonmotorized; 6.7 miles semi-primitive motorized **Impacts** ▪ High impacts associated with semi-primitive nonmotorized areas ▪ Moderate impacts associated Areas of Potential Wilderness on USFS-administered lands, citizen proposed wilderness areas (not to be confused with lands with wilderness characteristics), and semi-primitive motorized areas **Preference Ranking: 2** ▪ High impact on semi-primitive nonmotorized areas
Alternative S2 IPP West (Environmentally Preferred)	49.6	29.0	16.6	10.0	–	16.6	13.3	10.4	0.9	25.0	**Inventory** ▪ 1 residence within 0.25 mile; crosses 0.6 mile Areas of Potential Wilderness on USFS-administered lands ▪ Crosses 2.6 miles parks/preservation; 3.1 miles citizen proposed wilderness area (not to be confused with lands with wilderness characteristics); 0.8 mile geothermal leases; 7.7 miles oil and gas leases ▪ Crosses 5.4 miles semi-primitive motorized **Impacts** ▪ Moderate impacts associated with Areas of Potential Wilderness on USFS-administered lands, citizen proposed wilderness areas (not to be confused with lands with wilderness characteristics), and semi-primitive motorized areas **Preference Ranking: 1** ▪ No high impacts

TABLE 2-11c
ALTERNATIVE ROUTE COMPARISON
LAND USE AND RECREATION RESOURCES

Alternative Routes	Length (miles)	Parallel Linear Facilities (within 1500 feet) (miles)					Jurisdiction (miles)				Summary of Residual Impacts
		500kV	345kV	138kV	230kV	Pipeline	BLM	USFS	State	Private	
Alternative S3 Ox Valley	57.6	24.5	16.2	1.9	–	8.1	13.8	20.3	0.9	22.6	**Inventory** ▪ 2 residences within 0.25 mile; crosses 9.1 miles Areas of Potential Wilderness on USFS-administered lands ▪ Crosses 0.2 mile parks/preservation; 3.1 miles citizen proposed wilderness area (not to be confused with lands with wilderness characteristics); 0.8 mile geothermal leases; 7.7 miles oil and gas leases ▪ Crosses the Hardscrabble Trail; 4.2 miles semi-primitive nonmotorized; 14.8 miles semi-primitive motorized **Impacts** ▪ High impacts associated with semi-primitive nonmotorized areas ▪ Moderate impacts associated with Areas of Potential Wilderness on USFS-administered lands, citizen proposed wilderness areas (not to be confused with lands with wilderness characteristics), and semi-primitive motorized areas **Preference Ranking: 3** ▪ High impact on semi-primitive nonmotorized areas
Alternative S4 IPP East	48.9	19.8	27.5	2.3	–	3.1	12.7	15.1	0.4	20.7	**Inventory** ▪ Crosses 9.7 miles Areas of Potential Wilderness on USFS-administered lands; 7.5 miles IRAs ▪ Crosses 2.6 miles citizen proposed wilderness area (not to be confused with lands with wilderness characteristics); 0.8 mile geothermal leases; 7.7 oil and gas leases ▪ Crosses 4.6 miles semi-primitive nonmotorized; 6.4 miles semi-primitive motorized **Impacts** ▪ High impacts associated with semi-primitive nonmotorized areas and IRAs ▪ Moderate impacts associated with Areas of Potential Wilderness on USFS-administered lands, citizen proposed wilderness areas (not to be confused with lands with wilderness characteristics), and semi-primitive motorized areas **Preference Ranking: 6** ▪ Crosses IRAs

TABLE 2-11c
ALTERNATIVE ROUTE COMPARISON
LAND USE AND RECREATION RESOURCES

Alternative Routes	Length (miles)	Parallel Linear Facilities (within 1500 feet) (miles)					Jurisdiction (miles)				Summary of Residual Impacts
		500kV	345kV	138kV	230kV	Pipeline	BLM	USFS	State	Private	
Alternative S5 Iron Springs and Pinto Creek (Proponent's Proposed Action)	59.0	3.7	1.6	5.2	–	1.1	25.5	20.7	2.2	10.6	**Inventory** ▪ Similar to Alternative S1; crosses 10.8 miles oil and gas leases **Impacts** ▪ Similar to Alternative S1 **Preference Ranking: 4** ▪ High impact on semi-primitive nonmotorized areas
Alternative S6 Iron Springs and Ox Valley	61.9	9.3	4.5	3.0	–	7.3	27.5	20.3	2.7	11.4	**Inventory** ▪ Similar to Alternative S3; crosses 10.8 miles oil and gas leases **Impacts** ▪ Similar to Alternative S3 **Preference Ranking: 5** ▪ High impact on semi-primitive nonmotorized areas

TABLE 2-11d
ALTERNATIVE ROUTE COMPARISON
ENGINEERING ISSUES AND GROUND DISTURBANCE

Alternative Routes	Length (miles)	System Reliability	Topography[1]	Construction Access and Design Issues	Ground Disturbance		
					Temporary (acres)[2]	Permanent (acres)[3]	Right-of-Way Clearing (acres)[4]
Northern – Sigurd Substation to South Black Mountains							
Alternative N1 Black Rock Road to IPP North of Milford Wind Farm (Environmentally Preferred)	120.7	▪ 41.5 miles parallel to 500kV transmission line and 5.5 miles parallel to 345kV transmission lines; 1,500-foot separation from lines ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 11.9 miles of moderate terrain ▪ Approximately 18.3 miles of steep terrain	▪ 42.9 miles of existing access ▪ 77.8 miles of new access	958.5	304.5	347.3
Alternative N2 Black Rock Road to IPP South of Milford Wind Farm	118.2	▪ 36.4 miles parallel to 500kV transmission line; 1,500-foot separation from lines ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 15.3 miles of moderate terrain ▪ Approximately 18.5 miles of steep terrain	▪ 52.3 miles of existing access ▪ 68.0 miles of new access	940.2	295.7	347.3
Alternative N3 Black Rock Road Parallel to Kern River Pipeline	117.2	▪ No major reliability issues	▪ Approximately 18.2 miles of moderate terrain ▪ Approximately 19.8 miles of steep terrain	▪ 83.1 miles of existing access ▪ 34.1 miles of new access	932.9	257.7	401.8
Alternative N4 Mineral Mountains to IPP South of Milford Wind Farm	109.4	▪ 36.4 miles parallel to 500kV transmission line; 1,500-foot separation from lines ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 14.5 miles of moderate terrain ▪ Approximately 22.1 miles of steep terrain	▪ 40.4 miles of existing access ▪ 69.0 miles of new access	875.8	294.3	352.7
Alternative N5 Mineral Mountains to Kern River Pipeline	106.3	▪ No major reliability issues	▪ Approximately 17.4 miles of moderate terrain ▪ Approximately 23.4 miles of steep terrain	▪ 71.2 miles of existing access ▪ 35.1 miles of new access	853.1	256.2	407.3
Alternative N6 Mineral Mountains 1,500 Feet East of Kern River Pipeline (Proponent's Proposed Action)	105.5	▪ No major reliability issues	▪ Approximately 18.5 miles of moderate terrain ▪ Approximately 25.9 miles of steep terrain	▪ 37.0 miles of existing access ▪ 68.5 miles of new access	847.3	313.6	458.2

TABLE 2-11d
ALTERNATIVE ROUTE COMPARISON
ENGINEERING ISSUES AND GROUND DISTURBANCE

Alternative Routes	Length (miles)	System Reliability	Topography[1]	Construction Access and Design Issues	Ground Disturbance		
					Temporary (acres)[2]	Permanent (acres)[3]	Right-of-Way Clearing (acres)[4]
▪ Southern – South Black Mountains to Red Butte Substation							
Alternative S1 Pinto Creek	56.0	▪ 18.9 miles parallel to 500kV transmission line and 10.1 miles parallel to 345kV transmission lines; 1,500-foot separation from lines ▪ Crosses Sigurd to Red Butte No. 1 – 345kV transmission line ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 11.3 miles of moderate terrain ▪ Approximately 12.2 miles of steep terrain	▪ 13.6 miles of existing access ▪ 42.4 miles of new access	444.9	183.6	312.7
Alternative S2 IPP West (Environmentally Preferred)	49.6	▪ 29.0 miles parallel to 500kV transmission line and 16.6 miles parallel to 345kV transmission lines; 1,500-foot separation from lines ▪ Crosses IPP 500kV transmission line twice and Sigurd to Red Butte No. 1 – 345kV transmission line three times ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 8.6 miles of moderate terrain ▪ Approximately 7.5 miles of steep terrain	▪ 10.2 miles of existing access ▪ 39.4 miles of new access	398.1	150.6	140.0
Alternative S3 Ox Valley	57.6	▪ 24.5 miles parallel to 500kV transmission line and 16.2 miles parallel to 345kV transmission lines; 1,500-foot separation from lines ▪ Crosses IPP 500kV transmission line twice, Sigurd to Red Butte No. 1 – 345kV transmission line twice, and Harry Allen to Red Butte 345kV transmission line once ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 9.1 miles of moderate terrain ▪ Approximately 15.7 miles of steep terrain	▪ 10.6 miles of existing access ▪ 47.0 miles of new access	456.6	210.9	323.6
Alternative S4 IPP East	48.9	▪ 19.8 miles parallel to 500kV transmission line and 27.5 miles parallel to 345kV transmission lines; 1,500-foot separation from lines ▪ Crosses Sigurd to Red Butte No. 1 – 345kV transmission line once ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 8.0 miles of moderate terrain ▪ Approximately 13.4 miles of steep terrain	▪ 4.2 miles of existing access ▪ 44.7 miles of new access	392.9	192.5	278.2

TABLE 2-11d
ALTERNATIVE ROUTE COMPARISON
ENGINEERING ISSUES AND GROUND DISTURBANCE

Alternative Routes	Length (miles)	System Reliability	Topography[1]	Construction Access and Design Issues	Ground Disturbance		
					Temporary (acres)[2]	Permanent (acres)[3]	Right-of-Way Clearing (acres)[4]
Alternative S5 Iron Springs and Pinto Creek (Proponent's Proposed Action)	59.0	▪ 3.7 miles parallel to 500kV transmission line and 1.6 miles parallel to 345kV transmission lines; 1,500-foot separation from lines ▪ Crosses Sigurd to Red Butte No. 1 – 345kV transmission line once ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 11.5 miles of moderate terrain ▪ Approximately 11.0 miles of steep terrain	▪ 16.9 miles of existing access ▪ 42.1 miles of new access	466.9	184.8	403.6
Alternative S6 Iron Springs and Ox Valley	61.9	▪ 9.3 miles parallel to 500kV transmission line and 4.5 miles parallel to 345kV transmission lines; 1,500-foot separation from lines ▪ Crosses IPP 500kV transmission line twice, Sigurd to Red Butte No. 1 – 345kV transmission line twice, and Harry Allen to Red Butte 345kV transmission line once ▪ System reliability issues associated with paralleling the existing transmission lines in an area susceptible to outages due to potential for wildfires	▪ Approximately 10.1 miles of moderate terrain ▪ Approximately 14.9 miles of steep terrain	▪ 16.7 miles of existing access ▪ 45.2 miles of new access	508.1	215.2	443.6

NOTES: [1]Permanent disturbance: Estimated area of disturbance associated with H-frame and lattice structure base areas and permanent access roads (refer to Table 2-2).
[2]Right-of-way clearing: Estimated area of vegetation clearing within the right-of-way for construction (calculations include vegetation types with the potential to grow 12 feet tall: aspen, pinyon-juniper, mountain shrub, and riparian).
[3]Moderate terrain: 8 to 15 percent slope; steep terrain: greater than 15 percent slope
[4]Temporary disturbance: Estimated area of disturbance associated with structure work areas, wire splicing sites, wire pulling sites, wire tensioning sites, construction yards, and a concrete batch plant (refer to Table 2-1)

TABLE 2-12
SUMMARY OF ALTERNATIVE ROUTE COMPARISON

Alternative Routes	Overall Length (miles)	Parallel to Existing Transmission Line (miles/percent)	New Transmission Line Route (miles/percent)	Jurisdiction (miles crossed)				Environmental Preference Ranking[1]								Estimated Ground Disturbance			Access Roads	Overall Environmental Preference	Summary of Stakeholder Comments
								Natural Resources					Human Resources								
								Water/Geology		Biology											
				BLM	USFS	State	Paleontology Private	Water	Earth	Wildlife	Vegetation/Wetlands	Paleontological Resources	Cultural	Visual	Land Use	Temporary (acres)	Permanent (acres)	Right-of-Way Clearing (acres)			
Northern – Sigurd Substation to South Black Mountains																					
Alternative N1 Black Rock Road to IPP North of Milford Wind Farm (Environmentally Preferred)	120.7	84.4 (69.9%)	36.3 (30.1%)	46.8	30.6	4.9	38.4	6	1	1	1	1	1	1	1	958.5	304.5	347.3	▪ 42.9 miles of existing access ▪ 77.8 miles of new access	**1**	**Richfield City** ▪ Expressed concern with impact on water storage tanks, watershed, and fireworks launching pad **Town of Joseph** ▪ Expressed concern with proximity of the alternative route to the location of future water storage tanks **Millard County** ▪ Expressed concern with visual impact on Cove Fort
Alternative N2 Black Rock Road to IPP South of Milford Wind Farm	118.2	73.8 (62.4%)	44.4 (37.6%)	56.0	30.6	3.6	28.0	4	3	3	2	2	4	2	2	940.2	295.7	347.3	▪ 52.3 miles of existing access ▪ 68.0 miles of new access	**2**	**Richfield City** ▪ Expressed concern with impact on water storage tanks, watershed, and fireworks launching pad **Town of Joseph** ▪ Expressed concern with proximity of the alternative route to the location of future water storage tanks **Millard County** ▪ Expressed concern with visual impact on Cove Fort

TABLE 2-12
SUMMARY OF ALTERNATIVE ROUTE COMPARISON

Alternative Routes	Overall Length (miles)	Parallel to Existing Transmission Line (miles/percent)	New Transmission Line Route (miles/percent)	Environmental Preference Ranking[1]														Estimated Ground Disturbance			Access Roads	Overall Environmental Preference	Summary of Stakeholder Comments
				Jurisdiction (miles crossed)				Natural Resources					Human Resources										
								Water/Geology		Biology														
				BLM	USFS	State	Paleontology Private	Water	Earth	Wildlife	Vegetation/Wetlands	Paleontological Resources	Cultural	Visual	Land Use			Temporary (acres)	Permanent (acres)	Right-of-Way Clearing (acres)			
Alternative N3 Black Rock Road Parallel to Kern River Pipeline	117.2	38.4 (32.7%)	78.8 (67.3%)	64.5	30.6	6.3	15.8	1	6	6	4	4	6	3	3			932.9	257.7	401.8	▪ 83.1 miles of existing access ▪ 34.1 miles of new access	**4**	**Richfield City** ▪ Expressed concern with impact on water storage tanks, watershed, and fireworks launching pad **Town of Joseph** ▪ Expressed concern with proximity of the alternative route to the location of future water storage tanks **Millard County** ▪ Expressed concern with visual impact on Cove Fort
Alternative N4 Mineral Mountains to IPP South of Milford Wind Farm	109.4	74.7 (68.3%)	34.7 (31.7%)	45.0	30.6	4.5	29.3	5	2	2	3	3	2	4	4			875.8	294.3	352.7	▪ 40.4 miles of existing access ▪ 69.0 miles of new access	**3**	**Richfield City** ▪ Expressed concern with impact on water storage tanks, watershed, and fireworks launching pad **Town of Joseph** ▪ Expressed concern with proximity of the alternative route to the location of future water storage tanks **Millard County** ▪ Expressed concern with visual impact on Cove Fort ▪ Preferred alternative to avoid the county and general plan amendment process **Beaver County** ▪ Preferred alternative to avoid residential development near Milford and provide interconnection opportunities for future renewable energy projects ▪ Recommended the Project transmission line be a double-circuit with the existing 46kV transmission line between Cove Fort and Blundell

TABLE 2-12
SUMMARY OF ALTERNATIVE ROUTE COMPARISON

Alternative Routes	Overall Length (miles)	Parallel to Existing Transmission Line (miles/percent)	New Transmission Line Route (miles/percent)	Environmental Preference Ranking[1]														Estimated Ground Disturbance			Access Roads	Overall Environmental Preference	Summary of Stakeholder Comments
				Jurisdiction (miles crossed)				Natural Resources					Human Resources										
								Water/Geology		Biology														
				BLM	USFS	State	Paleontology Private	Water	Earth	Wildlife	Vegetation/Wetlands	Paleontological Resources	Cultural	Visual	Land Use			Temporary (acres)	Permanent (acres)	Right-of-Way Clearing (acres)			
Alternative N5 Mineral Mountains to Kern River Pipeline	106.3	39.3 (37.0%)	67.0 (63%)	52.9	30.6	7.2	15.6	2	5	5	5	5	5	5	5			853.1	256.2	407.3	▪ 71.2 miles of existing access ▪ 35.1 miles of new access	**5**	**Richfield City** ▪ Expressed concern with impact on water storage tanks, watershed, and fireworks launching pad **Town of Joseph** ▪ Expressed concern with proximity of the alternative route to the location of future water storage tanks **Millard County** ▪ Expressed concern with visual impact on Cove Fort ▪ Preferred alternative to avoid the county and general plan amendment process
Alternative N6 Mineral Mountains 1,500 Feet East of Kern River Pipeline (Proponent's Proposed Action)	105.5	39.7 (37.6%)	65.8 (62.4%)	52.5	30.6	7.0	15.4	3	4	4	6	6	3	6	6			847.3	313.6	458.2	▪ 37.0 miles of existing access ▪ 68.5 miles of new access	**6**	**Richfield City** ▪ Expressed concern with impact on water storage tanks, watershed, and fireworks launching pad **Town of Joseph** ▪ Expressed concern with proximity of the alternative route to the location of future water storage tanks **Millard County** ▪ Expressed concern with visual impact on Cove Fort ▪ Preferred alternative to avoid the county and general plan amendment process

TABLE 2-12
SUMMARY OF ALTERNATIVE ROUTE COMPARISON

Alternative Routes	Overall Length (miles)	Parallel to Existing Transmission Line (miles/percent)	New Transmission Line Route (miles/percent)	Jurisdiction (miles crossed)				Environmental Preference Ranking[1]								Estimated Ground Disturbance			Access Roads	Overall Environmental Preference	Summary of Stakeholder Comments
								Natural Resources					Human Resources								
								Water/Geology		Biology											
				BLM	USFS	State	Paleontology Private	Water	Earth	Wildlife	Vegetation/Wetlands	Paleontological Resources	Cultural	Visual	Land Use	Temporary (acres)	Permanent (acres)	Right-of-Way Clearing (acres)			
Southern – South Black Mountains to Red Butte Substation																					
Alternative S1 Pinto Creek	56.0	33.2 (59.3%)	22.8 (40.7%)	13.0	20.7	0.4	21.9	5	2	4	3	4	3	5	2	444.9	183.6	312.7	▪ 13.6 miles of existing access ▪ 42.4 miles of new access	**4**	**SUWA** ▪ Expressed concern with impact on proposed Antelope Range citizen proposed wilderness area
Alternative S2 IPP West (Environmentally Preferred)	49.6	49.6 (100.0%)	0.0 (0.0%)	13.3	10.4	0.9	25.0	3	3	1	1	1	6	1	1	398.1	150.6	140.0	▪ 10.2 miles of existing access ▪ 39.4 miles of new access	**1**	**SUWA** ▪ Expressed concern with impact on proposed Antelope Range citizen proposed wilderness area **Iron County** ▪ Preferred alternative **Enterprise City** ▪ Preferred alternative to avoid impact on future development **Washington County** ▪ Preferred alternative because it parallels existing transmission lines and would mitigate visual impacts
Alternative S3 Ox Valley	57.6	42.6 (74.0%)	15.0 (26.0%)	13.8	20.3	0.9	22.6	2	5	3	4	3	1	3	3	456.6	210.9	323.6	▪ 10.6 miles of existing access ▪ 47.0 miles of new access	**3**	**SUWA** ▪ Expressed concern with impact on proposed Antelope Range citizen proposed wilderness area **Enterprise City** ▪ Opposed alternative due to impact on future development **St. George City** ▪ Preferred alternative to provide adequate separation from the Sigurd to Red Butte No. 1 – 345kV and IPP 500kV transmission lines to improve reliability and redundancy

TABLE 2-12
SUMMARY OF ALTERNATIVE ROUTE COMPARISON

Alternative Routes	Overall Length (miles)	Parallel to Existing Transmission Line (miles/percent)	New Transmission Line Route (miles/percent)	Jurisdiction (miles crossed)				Environmental Preference Ranking[1]								Estimated Ground Disturbance			Access Roads	Overall Environmental Preference	Summary of Stakeholder Comments
								Natural Resources					Human Resources								
								Water/Geology		Biology											
				BLM	USFS	State	Paleontology Private	Water	Earth	Wildlife	Vegetation/Wetlands	Paleontological Resources	Cultural	Visual	Land Use	Temporary (acres)	Permanent (acres)	Right-of-Way Clearing (acres)			
Alternative S4 IPP East	48.9	48.9 (100%)	0.0 (0.0%)	12.7	15.1	0.4	20.7	1	2	2	2	2	5	2	6	392.9	192.5	278.2	▪ 4.2 miles of existing access ▪ 44.7 miles of new access	**2**	**SUWA** ▪ Expressed concern with impact on proposed Antelope Range citizen proposed wilderness area
Alternative S5 Iron Springs and Pinto Creek (Proponent's Proposed Action)	59.0	10.5 (17.8%)	48.5 (82.2%)	25.5	20.7	2.2	10.6	6	1	5	5	6	4	6	4	466.9	184.8	403.6	▪ 16.9 miles of existing access ▪ 42.1 miles of new access	**6**	**SUWA** ▪ Expressed concern with impact on proposed Antelope Range citizen proposed wilderness area **Washington County** ▪ Expressed concern about potential impact on Pine Valley area and conflict with Vision Dixie Principles for protecting visual aesthetics
Alternative S6 Iron Springs and Ox Valley	61.9	16.8 (27.1%)	45.1 (72.9%)	27.5	20.3	2.7	11.4	4	4	6	6	5	2	4	5	508.1	215.2	443.6	▪ 16.7 miles of existing access ▪ 45.2 miles of new access	**5**	**SUWA** ▪ Expressed concern with impact on proposed Antelope Range citizen proposed wilderness area

NOTES:
Ranking 1 = Most preferred ranking, 6 = Least preferred ranking
Impacts on resources including climate, air quality, socioeconomics, and public health and safety are generally the same across all alternatives; therefore, no ranking was assigned.