

Chapter 4 – Cumulative Effects

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CHAPTER 4 – CUMULATIVE EFFECTS

4.1 Introduction

This section presents the cumulative effects associated with the Project, including (1) a general definition of cumulative effects, (2) elements that were considered in the cumulative effect analysis, (3) the assessment approach, and (4) the results of the assessment of cumulative effects for the Project.

4.1.1 Definition

Cumulative impact, as defined by the CEQ (40 CFR 1508.7), is the impact on the environment that results from the incremental impact of the action when added to other past, present, and reasonably foreseeable future actions, regardless of what agency (federal or non-federal) or person undertakes other such actions. Cumulative impacts could result from individually minor, but collectively significant actions taking place over a period of time. These reasonably foreseeable future actions refer to future action projections, or estimates, of what is likely to take place when a Proposed Action is implemented. They are not part of the Proposed Action, but are projections being made so that future impacts, cumulative and otherwise, could be estimated, as required by NEPA. Cumulative impacts are interdisciplinary, multi-jurisdictional, and usually do not conform to political boundaries. The CEQ has defined the resulting effects as direct and indirect. Direct effects are caused by the Project action and occur at the same time and place. Indirect effects also are caused by the Project action, but are later in time or further removed in distance, yet are still reasonably foreseeable (40 CFR 1508.8). Cumulative effects are the total effect on a given resource or ecosystem of all actions taken or proposed.

4.1.2 Cumulative Assessment Process

The cumulative effects assessment process considered (1) scoping and Project issues; (2) cumulative effect time frames and the resources (or receptors) that could be affected by the Project alternatives; (3) the geographical area in which the impacts would occur; and (4) other past, present, and reasonably foreseeable future actions that have, or could be expected to cause, impacts on these resources when considered with development of the Project.

4.2 Past, Present, and Other Reasonably Foreseeable Actions

Known past and present actions are identified and described in detail in Section 3.3.4, which includes mining, renewable energy, transportation, utilities and utility corridors, parks and recreation, agriculture, residential, commercial, and industrial areas, and hazardous sites.

Given the rural setting of the Project area, it is anticipated agriculture, particularly livestock grazing, will continue to be the dominant land use. Urban land uses, such as residential, commercial, and industrial, will continue to grow near population centers as population growth continues, particularly in and around the Richfield area. As the Richfield area increases in population, demand for water and recreation resources, particularly ATV access, is expected to increase.

With increased emphasis from the federal, state, and local governments on renewable energy, renewable energy projects are expected to increase within the Project area. Wind is expected to be the major renewable energy resource. As more renewable energy projects, such as geothermal and wind, are constructed, it is anticipated additional transmission lines would be required to transmit the energy generated by these facilities to populated areas.

In addition to reasonably foreseeable trends, as described previously, Tables 4-1 and 4-2 list known current and future projects and reasonably foreseeable future actions located in or near the Project area. Current and future projects also are shown in Map 4-1. The projects listed below were incorporated into the analysis for determining the cumulative effects of the Project.

Jurisdiction/ Agency	Project Name	Type of Development	Location	Timeframe
Beaver City	Culinary Water System Improvements	1-million-gallon water tank and underground pipeline	Beaver City	In-service date 2011
BLM	Cove Fort (Enel) Geothermal Plant	Construction of new geothermal plant on site of old power plant	Southeast of the I-70 and I-15 junction in Beaver County	In-service date 2011
	Oski Geothermal Plant	50 to 100 MW geothermal plant	On Paiute tribal land west of Cove Fort, Millard County	No specific timeframe
	Millard Geothermal Leases	Enel long-term plans call for two geothermal plants	North and south of I-70 in Millard County, Utah	No specific timeframe
	Holly Energy UNEV Pipeline	400-mile, 12-inch-diameter petroleum products pipeline	Woods Cross, Utah, to a location north of Las Vegas, Nevada	Under construction
	2011 Oil and Gas Leases	Oil and gas extraction (no developments have been proposed)	Iron County	Leases to be sold in 2011; no specific timeframe for development
	TransWest Express Transmission Project	800-mile-long 600kV DC transmission line	Wyoming, Colorado, Utah, and Nevada	EIS scheduled for completion in 2013; in-service date 2015
	Cameron Substation to Milford Substation 138kV Transmission Project	138kV transmission line	Beaver County	In-service date 2012
	Thermo North to First Wind Transmission Corridor Project	34-mile-long 138kV transmission line	Beaver County	Construction to begin summer 2011
	Wasatch Wind: Milford South Wind Testing Area	Wind testing area, with potential to become a wind farm	Beaver County	No specific timeframe

**TABLE 4-1
CURRENT AND FUTURE PROJECTS**

Jurisdiction/ Agency	Project Name	Type of Development	Location	Timeframe
BLM	Mormon Mesa Power Partners, LLC: Wind Testing Project Area	Wind testing area, with potential to become a wind farm	Millard and Beaver counties	No specific timeframe
	Milford Wind Farm Phases II	Wind farm	Millard County	Notice to proceed given in April 2010
	Milford Wind Farm Phases III	Wind farm	Millard County	Application submitted fall 2010
	Mineral Mountain Wind Development	Wind testing area, with potential to become a wind farm	Beaver County	No specific timeframe
BLM/DOE	Milford Flats South Solar Study Area	Solar study area, with potential to become a solar farm	Beaver County	PEIS released in December 2010; Final PEIS in 2011
	Escalante Valley Solar Study Area	Solar study area, with potential to become a solar farm	Iron County	PEIS released in December 2010; Final PEIS in 2011
FERC/BLM	Kern River Apex Expansion	Compressor station	3 miles northwest of Minersville, Utah	Construction began Fall 2010
Iron County	Palladon Pipelines	9-mile-long aboveground slurry and water pipelines	Iron County	Construction to begin 2011
Sevier County	Sevier Power Company Power plant	540 MW gas-fired power plant	East of Sigurd Substation on SR 118	Construction to begin 2011
USFS	North Beaver Fuels Project EA	Prescribed burn	Fishlake National Forest, Beaver District	Expected implementation, Fall 2010
	Watts Mountain Vegetation Management EA	Prescribed burn and mechanical treatment	Fishlake National Forest, Fillmore District	No specific timeframe
	Meteorological Testing Site CE ¹	Wind testing area, with potential to become a wind farm	Cove Fort Area	No specific timeframe
	Red Butte Substation Expansion	Substation	West of Central, Utah	In-service date 2011
	Green Solutions Pozzolan Mine	Open-pit mine	East of Fremont Indian State Park	No specific timeframe
NOTES: ¹ Mapping data was not available.				

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MAP 4-1 CURRENT AND FUTURE PROJECTS

PROJECT FEATURES

- Alternative Routes Being Considered
- Existing Substation
- Link Node
- Link Number

CURRENT AND FUTURE TRANSMISSION LINES

- Cameron to Milford 138kV
- Thermo North to First Wind
- TransWest Express

CURRENT AND FUTURE PIPELINES

- Palladon Pipeline
- UNEV Pipeline

CURRENT AND FUTURE ENERGY PROJECTS

- Current and Future Energy Projects
- Escalante Valley Solar Study Area
- Milford Flats South Solar Study Area
- Milford Wind Farm Phase I & II
- Milford Wind Farm Phase III
- Mineral Mountain Wind Farm
- Mormon Mesa Wind Testing Area
- North Beaver Fuels Reduction Project Area
- Wasatch Wind Milford South Wind Testing Area
- Watts Mountain Vegetation Management Area
- Oil and Gas Leases
- Geothermal Leases

OTHER CURRENT AND FUTURE PROJECTS

- Beaver City Culinary Water System Improvements
- Green Solutions Pozzolan Mine

OTHER EXISTING LINEAR FACILITIES

- Interstate & U.S. Highway
- State Highway
- Railroad

GENERAL REFERENCE FEATURES

- County Boundary

Note: Current projects are those under construction and future projects are planned.

Data Sources

Energy Gateway South RMP, 2010; Cameron to Milford BLM, 2010
 Thermo North to First Wind Comlink Land Services, LLC, 2010 Transwest Express AECOM, 2010
 Escalante Valley Solar Study Area BLM, 2009; Milford Flats South Solar Area BLM, 2009
 Milford Wind Farm Ch2M Hill, 2008; Milford Wind Farm Ph III BLM, 2011; Mineral Mountains Wind Farm enXco, 2009
 Mormon Mesa Wind Farm Champlin Energy Data, 2008; North Beaver Fuels Reduction Project Area USFS, 2010
 Wasatch Wind Milford South BLM, 2008; Sevier Power Plant Sevier County, 2010
 Parker Knoll BLM, 2010; Beaver Water Beaver City, 2010; Red Butte Substation Expansion USFS, 2010
 Geothermal Leases EPG, 2008; Kern River Apex BLM, 2010; Oil and Gas Leases BLM, 2010
 Oski Geothermal Plant BLM, 2010; Cove Fort Geothermal Plant BLM, 2010
 Green Solutions Pozzolan Mine BIO-WEST Inc., 2010; Geothermal (Sulpherdale) Fishlake National Forest, 2010
 Transportation NTAD2008, U.S. Department of Transportation; Railroad FRA, 2008
 Roads, County Boundary ESRI, 2008
 Water, River, Stream USGS, 2008; Hillshade USGS, 1999; Land Jurisdiction BLM State Office Utah, 2008
 POWERmap, powermap.platts.com © 2007 Platts, A Division of The McGraw-Hill Companies
 Notes: The alternative routes shown on this map are preliminary and may be revised and/or refined throughout the development of the project. Data displayed is preliminary.



May 2011

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SIGURD TO RED BUTTE NO. 2 345KV TRANSMISSION PROJECT



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Jurisdiction/ Agency	Project Name	Type of Development	Location	Timeframe
USFS	Oil and Gas Leases EIS ¹	Oil and gas development	Fishlake and Dixie National Forests	EIS targeted for completion in 2011
BLM/ USFS	Programmatic EIS for Geothermal Leasing in Western United States	Geothermal energy development	Richfield, Cedar City, and St. George BLM Field Offices, and Fishlake and Dixie National Forests	Ongoing through 2025

Table 4-3 identifies the projects identified in Tables 4-1 and 4-2 that occur within a relevant distance to each alternative route and could result in cumulative impacts on the resources. The geographical scope of analysis for each resource, and the existing, current, or planned projects that could cumulatively impact the resource, are described for each resource in that resource section.

Project Name	N1	N2	N3	N4	N5	N6	S1	S2	S3	S4	S5	S6
Beaver City Culinary Water System Improvements												
Cove Fort (Enel) Geothermal Plant	✓	✓	✓	✓	✓	✓						
Oski Geothermal Plant	✓	✓	✓									
Millard Geothermal Leases	✓	✓	✓	✓	✓	✓						
Holly Energy UNEV Pipeline	✓	✓		✓			✓	✓	✓	✓	✓	✓
2011 Oil and gas leases, Cedar City Field Office	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
TransWest Express Transmission Project	✓	✓		✓			✓	✓	✓	✓	✓	✓
Cameron Substation to Milford Substation 138kV Transmission Project					✓	✓						
Thermo North to First Wind Transmission Corridor Project	✓	✓		✓								
Wasatch Wind Milford South Wind Testing Area					✓	✓						
Mormon Mesa Power Partners, LLC: Wind Testing Project Area	✓	✓	✓	✓	✓	✓						
Milford Wind Farm Phase II	✓	✓	✓	✓	✓	✓						
Milford Wind Farm Phase III	✓	✓	✓	✓	✓	✓						
Mineral Mountain Wind Development				✓	✓	✓						
Milford Flats South Solar Study Area			✓		✓	✓						
Escalante Valley Solar Study Area							✓	✓	✓	✓		
Kern River Apex Expansion			✓		✓	✓						
Palladon Pipelines											✓	✓
Sevier Power Company Power Plant	✓	✓	✓	✓	✓	✓						
Red Butte Substation Expansion							✓	✓	✓	✓	✓	✓
North Beaver Fuels Reduction Project Area	✓	✓	✓	✓	✓	✓						
Meteorological Testing Site CE	✓	✓	✓	✓	✓	✓						
Watts Mountain Vegetation Management EA	✓	✓	✓	✓	✓	✓						
Oil and Gas Leases EIS, Fishlake and Dixie	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓

TABLE 4-3 CURRENT AND FUTURE PROJECTS BY ALTERNATIVE												
Project Name	N1	N2	N3	N4	N5	N6	S1	S2	S3	S4	S5	S6
National Forests												
PEIS for Geothermal Leasing in Western US	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓
Green Solutions Pozzolan Mine	✓	✓	✓	✓	✓	✓						

4.3 Cumulative Effects

4.3.1 Climate and Air Quality

Past, present, and reasonably foreseeable future actions were reviewed in evaluating potential cumulative effects on air quality from implementing the Project. Past and present actions with potential for air quality impacts include residential, commercial, and industrial development; highway construction; oil and gas development; pipeline and transmission line construction; and dust from gravel roads and construction. Air quality in the area also would be affected cumulatively by the reasonably foreseeable future construction and operation of projects, such as wind farm development; residential, commercial, and industrial development; and highway, pipeline, and transmission line construction. Impacts related to power generated during transmission line operation also would affect air quality in the region to the extent such power projects could be located in the general Project vicinity.

4.3.1.1 Geographic and Temporal Scope of Analysis

Direct, cumulative impacts on air quality associated with construction of the proposed transmission line would occur, for the most part, within the immediate geographical area of the construction activities. Most impacts would not persist beyond the immediate construction timeframe, although some fugitive dust emissions would be expected until the temporarily disturbed areas are adequately revegetated.

Indirect cumulative impacts during the operation phase would occur primarily in the vicinity of the power plants generating the electricity transmitted through the line and for the duration of power plant operations. Some localized, limited cumulative impacts also would occur in the immediate vicinity of the transmission line during access for maintenance.

Reasonably foreseeable future actions in the analysis include those projects listed in Tables 4-1 and 4-2. Cumulative effects were analyzed over the duration of the life of the Project.

4.3.1.2 Cumulative Effects

Cumulative effects associated with the construction and operation phases of the Project would be common to all alternatives. For emission sources, such as construction activities and road dust, cumulative effects would be temporary and limited in geographic extent. Because of the limited geographical extent and the temporary nature of such activities, the potential for cumulative impacts is minimal and would only occur in the unlikely event construction activities for other projects occur at essentially the same time and place as the construction of the Project.

The emissions occurring from other power projects that might serve the proposed Project would be managed and planned to adhere to air quality rules, regulations, and attainment plans established by the UDEQ and EPA. Power plant emissions would be required to meet permitted emission levels required by

air management agencies (with oversight by EPA). At such levels, the emissions would be consistent with applicable air quality management plans. Because the Project has the potential to import renewable energy resources, a reduction of emissions from existing thermal power plants in the region actually could occur.

4.3.2 Earth Resources

4.3.2.1 Geological Hazards

Numerous geological hazards are present within the broad area covered by the Project. Past, present, and reasonably foreseeable future actions were reviewed for potential cumulative effects on geological hazards. For the most part, the Project does not have an effect on geological hazards; instead, geological hazards could have an effect on the Project. A geological hazard that could be subject to cumulative effects is landslide susceptibility resulting from the loss of vegetation or ground-disturbing activities related to the construction phase of the Project and multiple other projects. Cumulative effects of past, present, and reasonably foreseeable future actions are not expected to affect Quaternary faults or seismicity in the region.

Geographic and Temporal Scope of Analysis

Geological hazards are associated with the geology and topography of a certain region. Much of the Project is located in the eastern margin of the Basin and Range Physiographic Province, west of the Colorado Plateau. The geographic scope of the analysis is the eastern margin of the Basin and Range Physiographic Province. This region is known for its high seismicity, high number of Quaternary faults, and steep terrain.

Geologic hazards could directly and indirectly impact the construction, operation, and maintenance of the Project, either through direct loss of equipment or injury to personnel as a result of seismic activity or landslides or indirect loss of transmission service as a result of seismic activity or landslides.

The temporal scope of analysis for potential cumulative effects on geological hazards includes 2 years of direct effects during construction and 50 years of indirect effects during the life of the Project.

Reasonably foreseeable actions in the analysis include those projects listed in Tables 4-1 and 4-2 (and summarized by alternative in Table 4-3). Cumulative effects were analyzed over the duration of the life of the Project.

Cumulative Effects

Northern Area – Sigurd Substation to South Black Mountains

Alternatives N1 through N6 share the same route between Sigurd and Cove Fort, and for this segment of the alternative routes in the northern area, there are no current or future projects planned within the geographic scope of analysis for cumulative impacts associated with geological hazards except the Sevier Power Company Power Plant, which is not expected to affect geological resources given its location away from areas susceptible to landslides. This area contains several Quaternary faults, areas of moderate to high landslide susceptibility, and moderate-to-high seismicity. Any current or future projects in this area would be similarly affected by geological hazards as those anticipated for the Project.

The following discussion of Alternatives N1 through N6 focuses mostly on the links west of Cove Fort.

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

The current and future projects that occur within the geographic scope of analysis for cumulative impacts associated with geological hazards for Alternative N1 are shown in Table 4-3. There is an area of high landslide susceptibility along Link 66 where the implementation of the Project and other current and future projects could increase the potential for landslides.

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

The cumulative effects anticipated would be the same as Alternative N1.

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

The current and future projects that occur in proximity to Alternative N3 are shown in Table 4-3. There is an area of high landslide susceptibility crossed by Link 66 and two areas of moderate landslide susceptibility crossed by Links 396 and 490 where the implementation of the Project and other current and future projects could increase the potential for landslides.

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

The current and future projects that occur in proximity to Alternative N4 are shown in Table 4-3. There is an area of high landslide susceptibility crossed by Link 66 and a moderate area of high landslide susceptibility crossed by Link 75 where the implementation of the Project and other current and future projects could increase the potential for landslides.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

The current and future projects that occur in proximity to Alternative N5 are shown in Table 4-3. There is an area of high landslide susceptibility crossed by Link 66 and areas of moderate landslide susceptibility crossed by Links 75, 390, 396 and 490 where the implementation of the Project and other current and future projects could increase the potential for landslides.

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

The cumulative effects anticipated would be the same as Alternative N5.

Southern Area – South Black Mountains to Red Butte Substation

Alternative S1 – Pinto Creek

The current and future projects that occur in proximity to Alternative S1 are shown in Table 4-3. The entire portion of Alternative S1 from Link 220 to the Red Butte Substation occurs within an area of moderate landslide susceptibility where the implementation of the Project and other current and future projects could increase the potential for landslides.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

The cumulative effects anticipated would be the same as Alternative S1.

Alternative S3 – Ox Valley

The cumulative effects anticipated would be the same as Alternative S1.

Alternative S4 – IPP East

The cumulative effects anticipated would be the same as Alternative S1.

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

The current and future projects that occur in proximity to Alternative S5 are shown in Table 4-3. The entire portion of Alternative S5 from Link 438 south is within an area of moderate landslide susceptibility where the implementation of the Project and other current and future projects could increase the potential for landslides.

Alternative S6 – Iron Springs and Ox Valley

The current and future projects that occur in proximity to Alternative S6 are shown in Table 4-3. The entire portion of Alternative S6 from Link 438 south is within an area of moderate landslide susceptibility where the implementation of the Project and other current and future projects could increase the potential for landslides.

4.3.2.2 Mineral Resources

The addition of the Project to past, present, and reasonably foreseeable future actions would result in the greater potential for effect on mineral resources throughout the Project area. Grading and cutting of access roads, auguring for tower footings and anchors, or creating staging areas for the Project and other current and future could directly interfere with the mining of mineral resources. Indirect effects could include improved access and increased visibility of mineral resources. However, mineral resources are associated with the geological formations or units they are found within, which are typically localized and do not encompass large areas. Therefore, a particular geological formation and its mineral resources might not be affected by different projects in the same region. Also, not all geological formations contain mineral resources, or mineral resources could be found only in a portion of a certain geological formation.

Geographic and Temporal Scope of Analysis

Since the Project covers a large area, many of the geological formations within the Project area are crossed several times. This increases the cumulative effects that could occur on a mineral resource within a certain geological formation. Other mineral resources, such as oil and gas reserves, can cover large areas, which also could contribute to the cumulative effect for that mineral resource. Mines typically are smaller and more localized, but mining districts can occur that produce various mineral resources over a larger scale.

The temporal scope of analysis for potential cumulative effects on mineral resources includes two years of direct effects during construction and 50 years of indirect effects during the life of the Project. As future projects are implemented in an area, cumulative effects could increase in duration.

Cumulative Effects

N – Sigurd Substation to South Black Mountains

Alternatives N1 to N6 share the same route between the Sigurd Substation and the Cove Fort area. For this route segment, there are no current or future projects planned with the exception of the Sevier Power Company Power Plant, which would not be expected to affect mineral resources. However, this area has several oil and gas leases, active mines, and mineral resources. Any future projects in this area would increase the potential for cumulative effects on mineral resources from implementation of the Project in the northern segment of the Project. The additional discussion below focuses on the route segments located west of Cove Fort.

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

Other current and future projects that could have effects on mineral resources along Alternative N1 are shown in Table 4-3. These projects could cross mineral resources also found on the Project, as well as other mineral resources located outside the Alternative N1 study corridor. Many of these projects are in proximity to, or parallel Alternative N1, potentially adding to the cumulative effect on mineral resources from implementing the Project. Link 68 crosses an oil and gas lease. Link 381 crosses an area considered to have high potential for mineral resources. Links 155 and 160 would cross oil and gas leases. Numerous active mines or producing wells are scattered throughout the Project area. These tend to be small and localized, thereby having little potential impact from implementation of the Project. However, the cumulative effect on these localized mineral resources from implementing the Project increases with the number of projects in a certain region. Areas with concentrations of mineral resources occur near the Cove Fort, Blundell, Milford, and Minersville areas.

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

Other current and future projects that could have effects on mineral resources along Alternative N2 are shown in Table 4-3. These projects could cross mineral resources also found on the Project, as well as other mineral resources outside the N2 route. Many of these projects are in proximity to, or parallel Alternative N2, potentially adding to the cumulative effect on mineral resources from implementing the Project. Link 68 crosses an oil and gas lease. Links 381 and 450 cross an area considered to have high potential for mineral resources. Links 155 and 160 cross oil and gas leases. Numerous active mines or

producing wells are scattered throughout the Project area. These tend to be small and localized and would have little potential impact from implementation of the Project. However, the cumulative effect of the Project on these localized mineral resources increases with the number of projects in a certain region. Areas with concentrations of mineral resources occur near the Cove Fort, Blundell, Milford, and Minersville areas.

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

Other current and future projects that could have effects on mineral resources along Alternative N3 are shown in Table 4-3. These projects could cross mineral resources also found along Alternative N3, as well as other mineral resources outside Alternative N3. Many of these projects are in proximity to, or parallel the Project, potentially adding to the cumulative effect on mineral resources from implementing the Project. Links 68, 475, 480, 485, 490, 396, and 397 cross oil and gas leases. Link 450 crosses an area considered to have high potential for mineral resources. Numerous active mines or producing wells are scattered throughout the Project area. These tend to be small and localized and would have little potential impact from implementation of the Project. However, the cumulative effect of the Project on these localized mineral resources increases with the number of projects in a certain region. Areas with concentrations of mineral resources occur near the Cove Fort, Blundell, Milford, and Minersville areas.

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

Other current and future projects that could have effects on mineral resources along Alternative N4 are shown in Table 4-3. These projects could cross mineral resources also found along the N4 Alternative Route, as well as other mineral resources outside Alternative N4. Many of these projects are in proximity to, or parallel Alternative N4, potentially adding to the cumulative effect on mineral resources from implementing the Project. Link 68, 75, 155, and 160 cross oil and gas leases. Link 381 crosses an area considered to have high potential for mineral resources. Numerous active mines or producing wells are scattered throughout the Project area. These tend to be small and localized and would have little potential impact from implementation of the Project. However, the cumulative effect of the Project on these localized mineral resources increases with the number of projects in a certain region. Areas with concentrations of mineral resources occur near the Cove Fort, Blundell, Milford, and Minersville areas.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

Other current and future projects that could have effects on mineral resources along Alternative N5 are shown in Table 4-3. These projects could cross mineral resources also found on Alternative N5, as well as other mineral resources outside Alternative N5. Many of these projects are in proximity to, or parallel Alternative N5, potentially adding to the cumulative effect on mineral resources from implementing the Project. Links 68, 75, 349, 460, and 465 would cross existing oil and gas leases. Numerous active mines or producing wells are scattered throughout the Project area. These tend to be small and localized and would have little potential impact from implementation of the Project. However, the cumulative effect of the Project on these localized mineral resources increases with the number of projects in a certain region. Areas with concentrations of mineral resources occur near the Cove Fort, Blundell, Milford, and Minersville areas.

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

The cumulative effects anticipated would be the same as Alternative N5.

Southern Area – South Black Mountains to Red Butte Substation

Alternative S1 – Pinto Creek

The current and future projects that could have effects on mineral resources along Alternative S1 are shown in Table 4-3. These projects are in proximity to, or parallel Alternative S1, possibly adding to the cumulative effect on mineral resources. Links 163 and 165 would cross existing oil and gas leases. Numerous active mines or producing wells are scattered throughout the Project area. These tend to be small and localized and would have little impact from Alternative S1. However, the cumulative effect of the Project on these localized mineral resources increases with the number of projects in a certain region. There are small concentrations of mineral resources near Newcastle and the Red Butte Substation.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

The cumulative effects anticipated would be the same as Alternative S1.

Alternative S3 – Ox Valley

The cumulative effects anticipated would be the same as Alternative S1.

Alternative S4 – IPP East

The cumulative effects would be similar to Alternative S1.

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

The current and future projects that could have effects on mineral resources along Alternative S5 are shown in Table 4-3. These projects are in proximity to, or parallel Alternative S5, possibly adding to the cumulative effect on mineral resources. Links 430 and 438 would cross existing oil and gas leases. Numerous active mines or producing wells are scattered throughout the Project area. These tend to be small and localized and would have little impact from Alternative S5. However, the cumulative effect of the Project on these localized mineral resources increases with the number of projects in a certain region. There are small concentrations of mineral resources near the Red Butte Substation.

Alternative S6 – Iron Springs and Ox Valley

The current and future projects that could have effects on mineral resources along Alternative S6 are shown in Table 4-3. These projects are in proximity to, or parallel Alternative S6, possibly adding to the cumulative effect on mineral resources. Links 430 and 438 cross oil and gas leases. Numerous active mines or producing wells are scattered throughout the Project area. These tend to be small and localized and would have little impact from Alternative S6. However, the cumulative effect of the Project on these

localized mineral resources increases with the number of projects in a certain region. There are small concentrations of mineral resources near Newcastle and Red Butte.

4.3.2.3 Soil Resources

Project-related impacts on soil resources result either from the permanent conversion of designated farmland soils to nonagricultural uses, or from alterations to the natural environment that could increase the rate of soil erosion by water or wind could collectively result in limited loss of productivity of soils within the watershed. The cumulative effect of the Project on soil resources increases with the number of projects in a certain region.

Currently, the Project would not cross any actively irrigated fields, but it would cross soil units that could support Prime and Unique Farmland. The potential for increased erosion resulting from unrestricted public access to previously undisturbed areas could be mitigated by closing and rehabilitating any access roads not necessary for future maintenance of the Project. Further, the cumulative effect the Project could have on increased access would be significantly reduced in previously disturbed areas (e.g., along the Kern River pipeline) because the Project would use pre-existing access points.

The implementation of appropriate mitigation measures would minimize short-term cumulative impacts, such as disturbance of surface soils and other alterations to the natural landscape stemming from construction of the Project and other current projects in an area, such that the local soil resources would be stabilized or returned to a state close to their preconstruction state. Long-term cumulative impacts on soil resources would be associated with the permanent conversion of designated farmland soils to nonagricultural uses and unrestricted public access via new access roads to previously undisturbed areas associated with construction and maintenance of the Project and other current and future projects.

Geographic and Temporal Scope of Analysis

The geographic scope of analysis for soil resources is considered to be each individual geomorphic feature crossed by the Project. These features include the Sevier River Valley, Tushar Mountains, Mineral Mountains, Escalante Desert, Black Mountains, Antelope Range, Ox Valley, and Bull Valley Mountains. Cumulative effects are unlikely to spread beyond a given valley, or the mountain range and valleys bounding that range where the effects would occur.

The temporal scope of analysis for potential cumulative effects on soil resources includes 2 years of direct effects during construction and 50 years of indirect effects during the life of the Project.

Cumulative Effects

Northern Area – Sigurd Substation to South Black Mountains

The northeastern alternative links (Links 24, 26, 33, 30, 45, 64, 63, 66, and 68) for Alternatives N1 to N6 are common to all alternatives. For this route segment, there are no other current or future energy production or transmission projects planned. The Twitchell Canyon Fire burned over 44,000 acres of USFS-administered lands along these links in the summer of 2010. The *Burned Area Emergency Response* report created by the Fishlake National Forest details the immediate and long-term plans for the response and rehabilitation projects that will be implemented within the burned area. Ongoing aspects of the

response and rehabilitation will include applications of wheat straw mulch to stabilize and protect the unvegetated land surface and seeding efforts to restore vegetation to the land surface.

The following discussion consists of route segments located west of Cove Fort (i.e., that are not common to all alternatives).

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

Other current and future projects that could affect soil resources along Alternative N1 are shown in Table 4-3. The TransWest Express Transmission Project would affect erodible soils along Links 380, 381, 155, and 160. The Thermo North to First Wind Transmission Corridor Project would affect erodible soils along Links 380, 381, and 160. Erode soils also are present within the Mormon Mesa Power Partners Wind Testing Project Area along Link 380. Geothermal leases contain erodible soils along Link 320.

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

Current and future projects that could affect soil resources along Alternative N2 are shown in Table 4-3. The TransWest Express Transmission Project would affect erodible soils along Links 381, 155, and 160. The Thermo North to First Wind Transmission Corridor Project would affect erodible soils along Links 381 and 160. The UNEV Pipeline Project would affect erodible soils along Links 381, 155, and 160. Geothermal leases contain erodible soils along Links 381 and 160.

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

Cumulative effects on soil resources along Alternative N3 differ from Alternatives N1 and N2 in that designated farmland soils would be encountered along Link 490 rather than Link 160. Current and future projects that could affect soil resources along Alternative N3 are shown in Table 4-3. The Cameron to Milford 138kV Wind Transmission Corridor Project would affect erodible soils along Link 470. The Milford Flats South Solar Study Area would affect erodible soils along Link 480. The Mormon Mesa Power Partners Wind Testing Project Area would affect erodible soils along Links 480 and 490. Geothermal leases contain erodible soils along Links 320, 345, 450, and 460.

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

Current and future projects that could affect soil resources along Alternative N4 are shown in Table 4-3. The TransWest Express Transmission Project would affect erodible soils along Links 381, 155, and 160. The Thermo North to First Wind Transmission Corridor Project would affect erodible soils along Links 381 and 160. The UNEV Pipeline Project would affect erodible soils along Links 381, 155, and 160. The Mormon Mesa Power Partners Wind Testing Project Area would affect erodible soils along Link 75. The Mineral Mountain Wind Development would affect erodible soils along Link 75. Geothermal leases contain erodible soils along Links 75 and 455.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

Current and future projects that could affect soil resources along Alternative N5 are shown in Table 4-3. The Cameron Substation to Milford Substation 138kV Transmission Project would affect erodible soils

along Link 470. The Mormon Mesa Power Partners Wind Testing Project Area would affect erodible soils along Links 75, 48, and 490. The Milford Flats South Solar Study Area would affect soils along Link 480. The Mineral Mountain Wind Development would affect soils along Link 75. Geothermal leases contain erodible soils along Links 75, 455, and 460.

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

The cumulative effects anticipated would be the same as Alternative N5.

Southern Area – South Black Mountains to Red Butte Substation

Alternative S1 – Pinto Creek

Cumulative effects on soil resources of Alternative S1 include links that cross designated farmland soils along Links 163, 165, 220, 245, and 260. Alternatives S1 to S6 include Link 163, which cross designated farmland soils. Alternative S1 also includes other links that cross designated farmland soils, which are Links 165, 220, 245, and 260.

Current and future projects that could affect soil resources along Alternative S1 are shown in Table 4-3. The TransWest Express Transmission Project would affect designated farmland and erodible soils along Links 163, 165, and 220. The UNEV Pipeline Project would affect designated farmland and erodible soils along Links 163, 165, and 220.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

Cumulative effects on soil resources of Alternative S2 would include links that cross designated farmland soils along Links 163, 165, 220, 221, 441, and 442.

Current and future projects that could affect soil resources along Alternative S2 are shown in Table 4-3. The TransWest Express Transmission Project would affect designated farmland soils along Links 163, 165, 220, and 221, and erodible soils along Links 163, 165, 220, 221, 275, and 500. The UNEV Pipeline Project would affect farmland soils along Links 163, 165, 220, 221, 441, and 442, and erodible soils along Links 163, 165, 220, 221, 441, 442, 275, and 500.

Alternative S3 – Ox Valley

Cumulative effects on soil resources of Alternative S3 would include links that cross designated farmland soils along Links 163, 165, 220, 221, 441, and 442.

Current and future projects that could affect soil resources along Alternative S3 are shown in Table 4-3. The TransWest Express Transmission Project would affect designated farmland soils along Links 163, 165, 220, and 221, and erodible soils along Links 163, 165, 220, 221, 290, and 500. The UNEV Pipeline Project would affect farmland soils along Links 163, 165, 220, and 221, and erodible soils along Links 163, 165, 220, 221, 441, 442, 290, and 500.

Alternative S4 – IPP East

Cumulative effects on soil resources of Alternative S4 would include links that cross designated farmland soils along Links 163, 165, 220, and 221.

Current and future projects that could affect soil resources along Alternative S4 are shown in Table 4-3. The TransWest Express Transmission Project would affect designated farmland soils along Links 163, 165, 220, and 221, and erodible soils along Links 163, 165, 220, 221, 275, and 500. The UNEV Pipeline Project would affect farmland soils along Links 163, 165, 220, and 221, and erodible soils along Links 163, 165, 220, 221, 275, and 500.

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

Cumulative effects on soil resources of Alternative S5 would include links that cross designated farmland soils along Links 163, 430, 435, 438, 245, and 260.

Current and future projects that could affect soil resources along Alternative S5 are shown in Table 4-3. The TransWest Express Transmission Project would affect designated farmland along Link 163, and erodible soils along Links 163 and 500. The UNEV Pipeline Project would affect designated farmland soils along Link 163, and erodible soils along Links 163 and 500.

Alternative S6 – Iron Springs and Ox Valley

Cumulative effects on soil resources of Alternative S6 would include links that cross designated farmland soils along Links 163, 430, 435, 438, 245, 441, and 442.

Current and future projects that could affect soil resources along Alternative S6 are shown in Table 4-3. The TransWest Express Transmission Project would affect designated farmland along Links 163, 441, and 442, and erodible soils along Links 163, 441, 442, 285, 290, and 500. The UNEV Pipeline Project would affect designated farmland soils along Links 163, 441, and 442, and erodible soils along Links 163, 441, 442, 285, 290, and 500.

4.3.3 Water Resources

Cumulative effects on water resources could result from the Project’s incremental modification of surface water features, shallow groundwater, aquifers, riparian areas, springs, and wells when added to the impacts on water resources associated with the implementation of other current and future projects. That is, the effects from implementing the Project and other projects could result in individually minor, but collectively significant impacts as development around and within the Project area takes place over time. Cumulative effects, including, but not limited, to the removal of riparian and wetland vegetation; the addition of crossing structures in streams; an increase in construction, operation and maintenance-related traffic; and the creation of additional roads available for public use could result in increased sediment deposition into water resources, resulting in a subsequent decrease in water quality. Cumulative effects could have the potential for impacting sensitive plants, fish, terrestrial vertebrates, and state-listed special status species, as well as a federally listed endangered species. Disturbances related to surrounding development projects could further fragment the natural habitat throughout the Project area and beyond. This fragmentation is the leading vector for the introduction, spread, and infestation of non-native/invasive plant and animal species into habitats supported by water resources. Past and present

actions with potential to cause these types of impacts include urban development, roadway and bridge construction, oil and gas development, livestock grazing, wind energy development, prescribed burning, geothermal exploration and plant development, and pipeline and transmission line construction, as well as natural events such as wildfire (Table 4-3).

4.3.3.1 Geographic and Temporal Scope of Analysis

The geographic scope of analysis for water resources is considered to be the four watersheds in the Project area: Beaver Bottoms-Upper Beaver (HUC 16030007), Escalante Desert (HUC 16030006), Middle Sevier (HUC 16030003), and Upper Virgin watersheds (HUC 15010008). The temporal scope of analysis includes 2 years of direct effects during construction and 50 years of indirect effects during the life of the Project.

Reasonably foreseeable actions in the analysis include those projects listed in Tables 4-1 and 4-2. Cumulative effects were analyzed over the duration of the life of the Project.

Project-specific impacts and the effects these impacts have on water resources within the Project area can only be qualitatively analyzed at this point in the project development. Quantified area of disturbance, including temporary and permanent disturbance, can be identified once operational facilities such as access roads, work areas, and specific tower sites have been designated on approved plans. Though it may seem applicable to estimate the amount of ground disturbance for the cumulative effects analysis, the outcome of an estimate based on previously constructed transmission line projects has the potential of greatly overestimating or underestimating the actual area of impact for this specific project. This analysis will focus on the resource quality and the anticipation that the Project will have some form of detrimental effect on the resources associated with each alternative, but those effects will not be specifically quantified due to the lack of specific construction information available at this time.

4.3.3.2 Cumulative Effects

Northern Area – Sigurd Substation to South Black Mountains

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

Current and future projects considered in the cumulative impacts analysis for Alternative N1 are shown in Table 4-3. Impacts associated with implementation of the Project and the TransWest Express Transmission Project could cumulatively increase sedimentation in intermittent streams along Links 155, 160, and 380. Project-related impacts and impacts associated with the Thermo North to First Wind Transmission Corridor Project could also cumulatively affect intermittent and ephemeral streams, including The Big Wash along Links 155, 380, and 381. Maintenance activities associated with the Project and the UNEV Pipeline Project could potentially affect intermittent and ephemeral streams along Links 155, 160, and 380. Implementation of the Project and future development on the geothermal leases could cumulatively affect water resources on Link 320, including the temporary wash at Cove Creek. No resource values associated with perennial streams or rivers will experience cumulative effects from the Project or surrounding projects. Indirect cumulative impacts such as downstream sediment transfer could occur.

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

The cumulative effects anticipated for Alternative N2 would be the same as Alternative N1.

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

Current and future projects considered in the cumulative impacts analysis for Alternative N3 are shown in Table 4-3. Impacts associated with implementation of the Project and the Milford Flats South Solar Study Area could cumulatively affect intermittent or ephemeral washes along on Links 395 and 480. Implementation of the Project and the Mormon Mesa Power Partners Wind Testing Project Area could increase sediment load to numerous intermittent or ephemeral streams along Links 396 and 490. Implementation of the Project in areas leased for geothermal development could affect water resources if the leases are developed in the future, including Links 320 where increased sedimentation on Cove Creek could occur, and Links 345, 348, and 450, where numerous intermittent streams would be crossed. No resource values associated with perennial streams or rivers will experience cumulative effects from the Project or surrounding projects. Indirect cumulative impacts, such as downstream sediment transfer, could occur.

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

Current and future projects considered in the cumulative impacts analysis for Alternative N4 are shown in Table 4-3. Cumulative effects from impacts associated with implementation of the Project, the TransWest Express Transmission Project, and the UNEV pipeline could affect water resources along Links 155, 160, and 381, which could result in increased sedimentation to the Mud Springs Wash and other temporary or ephemeral drainages. Project-related impacts and impacts associated with the Thermo North to First Wind Transmission Corridor Project and the Mineral Mountain Wind Development Project could affect water resources along Links 155 and 381, which could result in increased sedimentation to the Mud Springs Wash and other temporary or ephemeral drainages. Impacts from implementation of the Project combined with impacts from the Mineral Mountain Wind Farm Project and future development on geothermal leases potential could lead to increased sedimentation to the intermittent stream Sulphur Creek near Link 75. No resource values associated with perennial streams or rivers will experience cumulative effects from Project-related impacts associated with surrounding projects. Indirect cumulative impacts such as downstream sediment transfer could occur.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

Current and future projects considered in the cumulative impacts analysis for Alternative N5 are shown in Table 4-3. Cumulative effects from impacts associated with implementation of the Project and the Milford Flats South Solar Study Area could cumulative affect unnamed intermittent streams along Links 395 and 480. Project-related impacts and impacts associated with potential future activities in the Mormon Mesa Power Partners Wind Testing Project Area could cumulatively affect unnamed intermittent streams along Links 396 and 490. Implementation of the Project and the Mineral Mountain Wind Development Project could cumulatively affect water resources along Link 75. Implementation of the Project in areas leased for geothermal development could affect water resources if the leases are developed in the future by causing increased sedimentation in the Sulphur Creek (an intermittent stream) near Link 75.

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

The cumulative effects anticipated would be the same as Alternative N5.

Southern Area – South Black Mountains to Red Butte Substation

Alternative S1 – Pinto Creek

Current and future projects considered in the cumulative impacts analysis for Alternative S1 are shown in Table 4-3. c Energy Gateway South 500kV Transmission Corridor Project could cumulatively affect Little Pinto, Pinto, and West Fork Pinto creeks, and tributaries of Mahogany Creek by increasing sediment loads, reducing riparian habitat, and increasing water temperature due to the loss of vegetation that shades and cools the streams, as well as the potential for the loss of riparian nesting habitat for migratory birds along Links 245 and 260. Project-related impacts and impacts associated with the TransWest Express Transmission Project and the UNEV pipeline could cumulatively increase sediment load and temperature in numerous unnamed intermittent streams along Link 163, Iron Springs Creek along Link 165, and unnamed intermittent streams along 220.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

Current and future projects considered in the cumulative impacts analysis for Alternative S2 are shown in Table 4-3. Impacts associated with the implementation of the Project and the TransWest Express Transmission Project could cumulatively affect the intermittent Iron Springs Creek along Link 165, unnamed intermittent streams along Link 220, Pinto Creek downstream of Newcastle Reservoir along Link 221, one unnamed intermittent stream along Link 275, unnamed intermittent streams along Link 441, one unnamed intermittent stream along Link 442, unnamed intermittent streams along Link 443, as well as Dan Sil Creek and tributaries of Magatsu Creek along Link 444. Project-related impacts and impacts associated with the UNEV pipeline could affect Iron Springs Creek along Link 165 and unnamed intermittent streams along Link 220. Cumulative effects could include, but are not limited to, increased sedimentation, increased temperature, and decreased riparian habitat.

Alternative S3 – Ox Valley

Current and future projects considered in the cumulative impacts analysis for Alternative S4 are shown in Table 4-3. Impacts associated with the implementation of the Project, the TransWest Express Transmission Project, and the UNEV pipeline could cumulatively affect water resources, including Iron Springs Creek along Link 165, unnamed intermittent streams along Link 220, Pinto Creek downstream from Newcastle Reservoir along Link 221, unnamed intermittent streams along Link 441, and an unnamed intermittent stream along Link 442. Cumulative effects could include, but are not limited to, increased sedimentation, increased temperature, and decreased riparian habitat.

Alternative S4 – IPP East

Current and future projects considered in the cumulative impacts analysis for Alternative S4 are shown in Table 4-3. Impacts associated with the implementation of the Project, the Trans West Express Transmission Project, and the UNEV pipeline could affect water resources, including Iron Springs Creek

along Link 165, unnamed intermittent streams along Link 220, Pinto Creek downstream from Newcastle Reservoir along Link 221, and Dan Sil Creek along Link 270. Cumulative effects could include, but are not limited to, increased sedimentation, increased temperature, and decreased riparian habitat.

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

The cumulative effects anticipated would be the same as Alternative S1.

Alternative S6 – Iron Springs and Ox Valley

Current and future projects considered in the cumulative impacts analysis for Alternative S6 are shown in Table 4-3. Impacts associated with the implementation of the Project, the TransWest Express Transmission Project, and the UNEV pipeline could affect water resources along Links 222, 290, 441, and 442. Cumulative effects anticipated would be the same as Alternative S3.

4.3.4 Biological Resources

Implementation of the action alternatives would result in the direct permanent disturbance to vegetation from placement of transmission towers and access roads and direct and indirect temporary impacts from construction activity. In addition, disturbance and removal of existing vegetation during construction would increase the potential for the spread of invasive non-native plant species into the study corridors altering wildfire regimes and reducing the viability of native plant populations. Some of these effects would be short-term, such as construction related impacts. Other effects, such as placement of access roads and transmission infrastructure would be ongoing, continual effects.

Cumulative effects on wildlife could result from the incremental modification of vegetation communities, special status species, and wildlife habitats populations resulting from implementation of the action alternatives when added to other past, present, and reasonably foreseeable future actions regardless of the agency or person undertaking the action. In addition, cumulative impacts on wild horse herds and HMAs may result in cumulative impacts to wild horse populations within the cumulative impact analysis area. These impacts could result in individually minor, but collectively significant, actions taking place over time. In addition to the present and proposed projects identified in Table 4-1 and 4-2 (and summarized by alternative in Table 4-3), actions that have most significantly affected biological resources within the cumulative impact analysis area include agricultural uses of native habitat for livestock grazing and crop production, water diversion for consumptive use, energy generation facilities and transmission corridors, and the development of roads and trails. These actions have resulted in the permanent loss of vegetation and wildlife habitat, degradation of habitat due to fragmentation, the spread of non-native vegetation, changes in habitat utilization, and a disruption to the natural vegetation succession cycle resulting from increased human activity.

4.3.4.1 Geographic and Temporal Scope of Analysis

The geographic scope for analysis of potential cumulative effects on biological resources is the same area of analysis described in Section 3.2.4 (i.e., a 2-mile-wide corridor from the reference centerline [1 mile on each side]). The temporal scope includes a two-year direct and indirect impact window during construction and a 50-year impact window for the life of the Project.

4.3.4.2 Cumulative Effects

Common to All Action Alternatives

Direct and indirect impacts common to all alternatives could include disturbance to sensitive species habitat from the placement of structures, work areas, staging areas, pulling sites, or access roads. Direct and indirect impacts listed in Chapter 3, when coupled with other past, present, and reasonably foreseeable future actions may cause collective modification to the natural habitat resulting in a more significant impact on the natural vegetation and wildlife habitat than any one project alone. This includes the infestation and spread of invasive non-native species resulting in degradation of vegetation community diversity and modification to the natural fire regime.

For generalist species, such as big game, the additive impacts of collocating projects is often less detrimental to the population by reducing the amount of habitat fragmentation and disturbance. In the arid west, where resources are limited by natural phenomena such as precipitation, soils, and vegetation; large unfragmented landscapes are a necessity for the survival of many wildlife species. Collocation of project impacts would reduce the fragmentation of sensitive habitats such as grassland, pinyon-juniper, and sagebrush communities. Species such as antelope would likely benefit from routing projects within a single disturbance corridor.

For specialist species that rely on specific habitat features (e.g., geologic formation, soils, wetland or riparian vegetation), such as Utah prairie dog and Southwest willow flycatcher, additive disturbance could be detrimental due to increased disturbance, potential habitat destruction, and increased indirect impacts. In lieu of species specific data for the EIS, the cumulative impact analysis will focus on the qualitative impacts typically associated with projects within this area or this ecosystem. To develop a more detailed cumulative impact analysis for these specialists, including special status plants and raptor nest locations, more data would be required. Where species-specific data are available for Utah prairie dog, sage-grouse, and Southwest willow flycatcher, impacts are discussed by route.

Under all action alternatives, migratory bird species, mammals, fish, reptiles, amphibians, and plants could be affected by construction and operation of the action alternatives and the current and future projects identified in Tables 4-1 and 4-2. This includes construction activities that occur during the migratory bird breeding season (April 15 through July 15) causing the abandonment of a nest site and the loss of eggs or young and resulting in a less productive breeding season. Loss of an active nest site, incubating adults, eggs, or young could affect populations of migratory bird species that may occur in the study corridors.

Cumulative impacts on special status plants common to all alternatives include the potential impacts on Elsinore buckwheat, Ward's beardtongue, and Utah phacelia on Links 30 and 45.

Northern Area – Sigurd Substation to South Black Mountains

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

Under Alternative N1, fragmentation associated with the Project would be minimized and known sensitive areas would be avoided. Where the alternative routes would follow I-70, then Black Rock road, and then the existing IPP transmission line to the west of Milford, the collocation of projects would reduce habitat fragmentation. Minimizing fragmentation through collocation with the I-70 corridor, Black Rock

Road/Cove Fort/Oski geothermal leases, and the existing IPP corridor could benefit generalist species, such as pronghorn, and the overall regional ecological condition.

For specialist species, additive impacts from multiple projects along Alternative N1 may result in additional cumulative impacts of the Interstate Highway, Black Rock Road, and IPP transmission line as well as the other projects listed in Table 4-3. The specialist species along the I-70 corridor that may incur cumulative impact from additive development include bald eagles roosting along the route during winter months and Elsinore buckwheat. Specialist species along the Black Rock Road corridor affected by multiple geothermal projects may include sage-grouse on Link 320. The specialist species along the IPP/TransWest/UNEV/Thermo North corridor with a potential for cumulative habitat degradation and fragmentation impacts may include kit fox and burrowing owls on Links 155, 160, 380, 381, and 386.

Access roads and transmission infrastructure constructed for the Project on the Fishlake National Forest between the Sigurd Substation and the Cove Fort area, in addition to the existing access road for the 138kV transmission line and the disturbances associated with the proposed oil and gas leases, would result in the cumulative incremental loss of elk habitat, mule deer winter and summer range, pygmy rabbit habitat, as well as raptor nesting and foraging habitat. The cumulative effects also would result in the degradation and loss of high sensitivity resources such as surface water and the establishment of invasive species in native vegetation communities and habitat types.

Access roads and transmission infrastructure constructed for the Project between the Cove Fort area and the South Black Mountains, in addition to those associated with the TransWest Express Transmission Project, Thermo North to First Wind Transmission Corridor Project, UNEV Pipeline Project, Mormon Mesa Power Partners Wind Testing Project, and future projects on various geothermal leases, would result in the direct and indirect incremental loss and fragmentation of elk habitat, pronghorn habitat, mule deer winter range, sage-grouse critical brooding areas, raptor-foraging habitat, and pygmy rabbit habitat. The cumulative effects would result in the additive degradation and loss of high-sensitivity resources such as surface water, and riparian vegetation communities, as well as the establishment of invasive species in native habitat types.

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

The cumulative effects anticipated would be the same as Alternative N1 with the exception of where Alternative N2 separates from the Black Rock Road and drops south along the west flank of the Mineral Mountains for 11 miles then turns west for 10 miles back to the existing IPP corridor. Table 4-3 identifies other projects with the potential to contribute additional impacts on this alternative. The 11 miles of disturbance along the Mineral Mountains occurs along high quality habitat for raptors where impacts are likely to be higher than in Alternative N1. The Mineral Mountain segment of Alternative N2 has experienced wildfire and weed invasion. Additional impacts in this area could include additional habitat fragmentation and the subsequent establishment of non-native vegetation. Cumulative impacts where Alternative N2 meets the proposed geothermal lease area poses a moderate impact to crucial mule deer habitat and high quality raptor habitats.

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

Alternative N3 is colocated with existing and future projects including the I-70, Milford Flats Solar, Mormon Mesa Wind, geothermal leases, and Kern River pipeline corridors. Cumulative effects in the I-70 area would be the same as in Alternative N1. Alternative N3 separates from Black Rock Road and drops south along the west flank of the Mineral Mountains for over 30 miles, past Minersville following the

Kern River corridor. The impacts on the first 11 miles on the flank of the Mineral Mountains would be the same as for Alternative N2. Direct impacts from additional activities in this area would likely affect specialist species with select habitats including the Utah prairie dog and sage-grouse. Additional access roads, structures, soil disturbance, and human presence could include crushing of animals and behavior changes. Indirect impacts could include adding perching structures for predators, increasing the risk of invasive plants, increasing public access, and increasing the risk of wildfire.

The area along the Mineral Mountains is also high quality habitat for raptors, elk, and mule deer. There would be cumulative impacts from habitat degradation to raptors, elk, and mule deer from construction and operation of multiple projects. Impacts from multiple projects along the Mineral and Black Mountains would be a major, potentially long-term, cumulative impact. Impacts would include cumulative, direct, and indirect effects on the habitat within the 2-mile sage grouse lek buffer as well as active and inactive Utah prairie dog colonies. The proposed Project, in addition to the relevant proposed and future projects in Table 4-1 and 4-2, could result in reduced sage grouse lek persistence and reduced reproductive success. Potential cumulative impact on Utah prairie dog includes increased predation, decreased habitat quality from increases in invasive plants, decreased vegetation diversity, and direct habitat loss.

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

Alternative N4 is collocated with existing and future projects including the I-70, IPP transmission line, UNEV pipeline project, Thermo North to First Wind, Mormon Mesa, geothermal leases, Mineral Mountain Wind Farm, and TransWest Express corridors. Alternative N4 separates from I-70 and crosses through 15 miles of the Mineral Mountains before it crosses 8 miles of the Milford Flat, and then back to the IPP for 35 miles. Cumulative effects in the I-70 and the IPP transmission line corridors would be the same as in Alternative N1. The 15 miles of disturbance bisecting the Mineral Mountains would be collocated with the Mineral Mountain Wind Farm and the Milford to Sulphurdale 46kV line. Colocation would minimize impacts but this area supports high quality habitat for raptors, elk, and mule deer that would be further degraded by increased fire frequency, invasive non-native species, and habitat fragmentation.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

The cumulative effects anticipated for the majority of N5 would be the same as Alternative N3 and would result in the degradation and loss of high sensitivity resources. Cumulative effects anticipated for the section of N5 running through the Mineral Mountain would be the same as Alternative N4.

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

The cumulative effects anticipated for this alternative would be the same as Alternative N5. The 1,500-foot offset from N5 is not anticipated to change the cumulative effects.

Southern Area – South Black Mountains to Red Butte Substation

Alternative S1 – Pinto Creek

Access roads and transmission infrastructure constructed for the Project between the South Black Mountains and Red Butte Substation, in addition to those associated with the proposed TransWest Express Transmission Project, UNEV Pipeline, the existing IPP 500kV and Sigurd to Red Butte No. 1 345kV transmission lines, and Kern River pipeline, would result in the cumulative incremental loss of winter range, summer range, year-long mule deer habitat; and year-long pronghorn habitat; Southwestern willow flycatcher occupied habitat; pygmy rabbit habitat; and, raptor nesting and foraging habitat. Cumulative impacts that could result include the degradation or loss of riparian vegetation communities, which was determined to be a high sensitivity resource within the Project area. Minimizing fragmentation through colocation along the IPP and UNEV corridor is recognized as beneficial for the generalist species and regional ecological condition. However, Alternative S1 leaves the IPP/UNEV corridor at Newcastle and turns due south. Cumulative impacts from this Project and geothermal leases may result in additional disturbance of species such as the Southwestern willow flycatcher as well as raptors and mule deer along Pinto Creek. Cumulative impacts where the alternative turns due south may result in habitat loss to Southwestern willow flycatcher, mule deer, and high quality raptor.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

Alternative S2 is collocated with existing and future projects including the IPP, UNEV, and TransWest Express corridors. Minimizing fragmentation through colocation along the IPP and UNEV corridor is anticipated to be a beneficial impact for generalist species and the regional ecological condition.

Alternative S3 – Ox Valley

Alternative S3 is collocated with existing and future projects including the IPP, UNEV, and TransWest Express corridors. Colocation along the IPP and UNEV corridor is anticipated to be beneficial for generalist species and regional ecological condition. Alternative S3 leaves the IPP/UNEV corridor east of Enterprise and turns west up Ox Valley where there are no known additive project impacts.

Alternative S4 – IPP East

The cumulative effects for Alternative S4 would be similar to those for Alternative S2. Cumulative effects on high sensitivity vegetation communities and habitat types would not be anticipated but cumulative impacts to pinyon penstemon habitat resulting in loss and degradation is anticipated.

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

The cumulative effects for Alternative S5 would be the same as Alternative S1 except cumulative impacts to pinyon penstemon resulting from habitat degradation may occur in Alternative S5. Alternative S5 is collocated with existing and future projects including the IPP, UNEV, oil and gas leases, geothermal leases, and TransWest Express corridors. However, the colocation with IPP and UNEV is only for the first 3 miles. Alternative S5 leaves the IPP/UNEV corridor at the Lund Road and turns due south. Additive impacts from this Project and geothermal leases could lead to disturbance of species such as the Southwestern willow flycatcher, raptors, and mule deer along Pinto Creek. The cumulative impacts from

this alternative could result in long-term habitat loss and degradation to Southwestern willow flycatcher, mule deer, and high quality raptor.

Alternative S6 – Iron Springs and Ox Valley

Cumulative impacts on Alternative S6 from the North to Newcastle are the same as Alternative S5 and impacts on S6 are the same as Alternative S3 for the Ox Valley.

Conclusion

Cumulative impacts could result in loss and degradation to sensitive habitat types. Impacts on specialist species such as the Utah prairie dog which depends on a combination of soils, vegetation structure, slope, and an area free of predator perches within line of sight as well as the Southwest willow flycatcher which depends on dense stands of riparian vegetation may be detrimental to these sensitive species. In contrast, species with more generalist habitat requirements such as pronghorn could benefit more from the colocation of projects and minimizing habitat fragmentation. Generalist species that depend more on large open expanses rather than a well-defined area would have higher impacts from Projects that do not share a similar route.

4.3.5 Cultural Resources

Over time, cultural resources are subject to attrition as cultures change, and archaeological and historical sites weather and erode. In addition, prior development in the region has either degraded or resulted in the loss of some cultural resources. The addition of the Project to past and reasonably foreseeable future actions would result in the greater potential for effects on cultural resources throughout the Project area.

4.3.5.1 Geographic and Temporal Scope of Analysis

The geographic scope of analysis for cultural resources is defined as a 4-mile-wide corridor centered on the reference centerlines (similar to the methodology identified in Section 3.2.5). Cumulative effects on cultural resources would occur over the life of the Project and other current and future projects, including direct effects during construction of the projects, and indirect effects during operation and maintenance activities associated with the projects. Disturbances from future developments and surface-disturbing activities could uncover or destroy unrecorded cultural resource sites. Despite the potential for adverse effects on some sites, future actions proposed on federal and/or state lands would require cultural resource evaluations and mitigation of affected significant historic properties prior to implementation. The resulting cultural resource documentation would increase the cultural resources knowledge base for the region; however, developments solely on private land are largely exempt from this requirement. Reasonably foreseeable future actions in the analysis include those projects listed in Tables 4-1 and 4-2 (and summarized by alternative in Table 4-3). Cumulative effects were analyzed over the duration of the life of the Project.

4.3.5.2 Cumulative Effects

Other current and future projects that could have cumulative effects on cultural resources along the Sigurd Substation to South Black Mountains route (Table 4-3) include the TransWest Express Transmission

Project, Thermo North to First Wind Transmission Corridor Project, UNEV Pipeline Project, Mormon Mesa Power Partners Wind Testing Project Area, and future development of various geothermal leases. Other current and future projects that could have cumulative effects on cultural resources along the South Black Mountains to Sigurd route (Table 4-3) include the TransWest Express Transmission Project and UNEV Pipeline Project.

Cumulative effects from impacts associated with the construction and operation phase of the Project would be similar for any of the alternatives. Cultural resources could be destroyed by construction activities, such as clearing, grading, drilling, and substation development. Development of new access corridors and rights-of-way could increase access to previously inaccessible areas, leading to potential vandalism of cultural resource sites. The extent of cumulative effects on cultural resources could be significantly reduced through avoidance and the implementation of mitigation measures. Potential impacts on cultural resources in the area would be incremental; as a result, major impacts on cultural resources would be unlikely. The potential to mitigate impacts on archaeological and historical sites is good, and indirect cumulative effects on cultural resources, as a result of increased public access, are expected to be low.

4.3.6 Native American Concerns

The BLM is engaged in on-going consultations with tribes within the Project area, as described in Section 5.2.2.2. The addition of the Project to past and reasonably foreseeable future actions would result in the greater potential for cumulative effect on TCPs throughout the Project area.

4.3.6.1 Geographic and Temporal Scope of Analysis

The geographic scope of analysis for Native American concerns is defined as a 4-mile-wide corridor centered on the reference centerline for each alternative. Cumulative effects on TCPs would occur over the life of the Project and other current and future projects, including direct cumulative effects during construction of the projects, and indirect cumulative effects during operation and maintenance activities associated with the projects. Reasonably foreseeable future actions in the analysis include those projects listed in Tables 4-1 and 4-2. Cumulative effects were analyzed over the duration of the life of the Project.

4.3.6.2 Cumulative Effects

Other current and future projects that could have effects on TCPs along the Sigurd Substation to South Black Mountains route (Table 4-3) include the TransWest Express Transmission Project, Thermo North to First Wind Transmission Corridor Project, UNEV Pipeline Project, Mormon Mesa Power Partners Wind Testing Project Area, and future development of various geothermal leases. Other current and future projects that could have effects on TCPs along the South Black Mountains to Red Butte Substation route (Table 4-3) include the TransWest Express Transmission Project and UNEV Pipeline Project.

Cumulative effects from impacts associated with the construction and operation phase of the Project would be similar for any of the alternatives. TCPs could be affected by construction activities, such as clearing, grading, drilling, and substation development. Development of new access corridors and rights-of-way for the Project could cumulatively increase access to previously inaccessible areas, leading to potential vandalism of TCPs. The extent of cumulative effects on TCPs could be significantly reduced through avoidance and the implementation of mitigation measures. Potential impacts on TCPs in the area would be incremental; as a result, major impacts on TCPs would be unlikely. The potential to mitigate

impacts on TCPs is good, and indirect cumulative effects on TCPs, as a result of increased public access to this area, are expected to be low.

4.3.7 Paleontological Resources

The addition of the Project to past, present, and reasonably foreseeable future actions would result in the greater potential for effect on fossils, resulting in the loss of important scientific information. Ground disturbance associated with construction of the Project, such as grading and cutting of access roads, auguring for tower footings and anchors, or creating staging areas, could contribute to the destruction of important paleontological resources. Improved access and increased visibility indirectly could result in unauthorized collection or vandalism. Also, accelerated soil erosion potentially resulting from construction activities could cumulatively increase the potential for destruction of fossils.

4.3.7.1 Geographic and Temporal Scope of Analysis

The geographic scope of analysis for paleontological resources is based on the extent of the geological formation. Geological formations are of variable geographic extent, and cumulative effects on associated paleontological resources are somewhat correlated with the geographic extent of the formations (reflecting how many other ground disturbing projects may be located in the outcrop “footprints” of the respective formations). Examples of widely exposed formations include the Green River Formation and the Mancos Shale, which are present in several states, including Utah. Other formations, such as the Ox Valley Tuff, crop out in much smaller areas. Therefore, a particular geological formation and the paleontological resources occurring within may or may not be affected by different projects in the same region. Also, not all geological formations contain paleontological resources. Formations composed mostly of volcanic rocks typically do not contain fossils. In addition, paleontological resources typically are not found throughout a fossil-bearing geological formation.

The temporal scope of analysis for paleontological resources includes 2 years of direct effects during construction and 50 years of indirect effects during the life of the Project.

Reasonably foreseeable future actions in the analysis include those projects listed in Tables 4-1 and 4-2 and summarized by alternative in Table 4-3. Cumulative effects were analyzed over the duration of the life of the Project.

4.3.7.2 Cumulative Effects

Northern Area – Sigurd Substation to South Black Mountains

Alternatives N1 to N6 share the same route segment between Sigurd Substation and Cove Fort. For this route segment, there are no other current or future projects planned or proposed. The following discussion of cumulative effects associated with Alternatives N1 through N6 focuses on the route segments located west of Cove Fort.

Impacts from implementation of the Project combined with impact from future construction of other projects proposed in proximity or parallel would cumulatively increase the potential for effects on paleontological resources because they could cross the same geological formations.

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

Other current and future projects that could have effects on paleontological resources along Alternative N1 are shown in Table 4-3. Cumulative effects on paleontological resources occurring west of the Cove Fort area associated with the alternative route would be anticipated to be low, as no significant fossil localities exist within 1 mile of the centerline and no geological formations with a high PFYC are present. Further, this area consists mostly of Quaternary alluvium and volcanic rocks with a few exposures of Permian and Cretaceous rocks.

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

Other current and future projects that could have effects on paleontological resources along Alternative N2 are shown in Table 4-3. Cumulative effects on paleontological resources occurring west of the Cove Fort area associated with this alternative route would be anticipated to be low, as no significant fossil localities exist within 1 mile of the centerline and no geological formations with a high PFYC are present. Further, this area consists mostly of Quaternary alluvium and volcanic rocks with a few exposures of Permian and Cretaceous rocks.

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

Other current and future projects that could have effects on paleontological resources along Alternative N3 are shown in Table 4-3. Cumulative effects on paleontological resources occurring west of the Cove Fort area associated with this alternative route would be anticipated to be low, as no significant fossil localities exist within 1 mile of the centerline and no geological formations with a high PFYC are present. This area consists mostly of Quaternary alluvium and volcanic rocks with a few exposures of Permian and Cretaceous rocks. However, the Sevier River Formation is present in the southern portion of Alternative N3 along Links 396 and 490, which has a high potential for paleontological resources. A portion of the Mormon Mesa Power Partners Wind Testing Project Area is located adjacent to these links. Therefore, in this area, implementation of the Project could contribute to cumulative effects on paleontological resources would be anticipated if appropriate mitigation was not applied.

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

Other current and future projects that could have effects on paleontological resources along Alternative N4 are shown in Table 4-3. Cumulative effects on paleontological resources occurring west of the Cove Fort area associated with this alternative route would be anticipated to be low, as no significant fossil localities exist within 1 mile of the centerline and no geological formations with a high PFYC are present. Further, this area consists mostly of Quaternary alluvium and volcanic rocks with a few exposures of Permian and Cretaceous rocks.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

Other current and future projects that could have effects on paleontological resources along Alternative N5 are shown in Table 4-3. Cumulative effects on paleontological resources occurring west of the Cove Fort area associated with this alternative route would be anticipated to be low, as no significant fossil localities exist within 1 mile of the centerline and no geological formations with a high PFYC are present.

This area consists mostly of Quaternary alluvium and volcanic rocks with a few exposures of Permian and Cretaceous rocks. However, the Sevier River Formation is present in the southern portion of the N5 Alternative along Links 396 and 490, which has a high potential for paleontological resources. A portion of the Mormon Mesa Power Partners Wind Testing Project Area is located adjacent to these links. Therefore, in this area, implementation of the Project could contribute to cumulative effects on paleontological resources would be anticipated if appropriate mitigation was not applied.

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

The cumulative effects anticipated would be the same as Alternative N5.

Southern Area – South Black Mountains to Red Butte Substation

Impacts from implementation of the Project combined with impact from future construction of other projects proposed in proximity or parallel would cumulatively increase the potential for effects on paleontological resources. In general, the northern portions of Alternatives S1 through S6 consist mostly of Quaternary alluvium and volcanic rocks that have a low potential for paleontological resources. The southern portions of these alternative routes cross several geological formations that have a moderate-to-high potential for paleontological resources.

Alternative S1 – Pinto Creek

Other current and future projects that could have effects on paleontological resources along Alternative S1 are shown in Table 4-3. These projects could cross the same geological formations the alternative route would cross. One fossil vertebrate locality is present along the Alternative S1. Therefore, in this area, implementation of the Project could contribute to cumulative effects on paleontological resources would be anticipated if appropriate mitigation was not applied.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

Other current and future projects that could have effects on paleontological resources along Alternative S2 are shown in Table 4-3. Four fossil vertebrate localities exist within 1 mile of Alternative S2. These fossil localities exist in Quaternary alluvium, which has a low PFYC. It is possible that Quaternary alluvium in this area could produce additional fossils in the future. Therefore, implementation of the Project could contribute to cumulative effects on paleontological resources in this area if appropriate mitigation was not applied.

Alternative S3 – Ox Valley

Other current and future projects that could have effects on paleontological resources along Alternative S3 are shown in Table 4-3. One invertebrate locality is within 1 mile of Alternative S3. This locality produced marine invertebrates from a formation that has a high potential for paleontological resources. Therefore, implementation of the Project could contribute to cumulative effects on paleontological resources in this area if appropriate mitigation was not applied.

Alternative S4 – IPP East

The cumulative effects anticipated would be the same as Alternative S2.

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

The current and future projects that could have effects on paleontological resources along Alternative S5 are shown in Table 4-3. One fossil vertebrate locality is present along Alternative S5. Therefore, in this area, implementation of the Project could contribute to cumulative effects on paleontological resources if appropriate mitigation was not applied.

Alternative S6 – Iron Springs and Ox Valley

The current and future projects that could have effects on paleontological resources along Alternative S6 are shown in Table 4-3. One fossil vertebrate locality is present along Alternative S6. Therefore, in this area, implementation of the Project could contribute to cumulative effects on paleontological resources if appropriate mitigation was not applied.

4.3.8 Visual Resources

Cumulative visual effects could result from the incremental modification of the inherent character of affected landscapes and the disruption of sensitive viewer viewsheds resulting from the construction, operation, and maintenance of the Project and other past and reasonable foreseeable future actions. Cumulative impacts common to all alternatives (at varying degrees) would be the industrialization of natural appearing landscapes resulting from the construction of multiple projects, including associated vegetation clearing, in forested and arid environments.

4.3.8.1 Geographic and Temporal Scope of Analysis

The geographic scope for analysis of potential cumulative effects on visual resources was defined as a 6-mile-wide corridor centered on the reference centerline (i.e., same as the analysis area described in Section 3.2.7). Cumulative effects on visual resources would occur over the life of the Project and could include impacts on landscape scenery and the viewsheds of sensitive viewers.

Reasonably foreseeable future actions in the analysis include projects listed in Tables 4-1 and 4-2. Cumulative effects were analyzed over the duration of the life of the Project.

4.3.8.2 Cumulative Effects

Northern Area – Sigurd Substation to South Black Mountains

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

In the vicinity of the Sigurd Substation, the landscape would be modified and exhibit an industrial landscape character as a result of the Project, the Sevier Power Company Power Plant, and existing

transmission lines. Residences adjacent to the substation, between 0.25 mile and 1 mile away, would have a compromised viewshed based on the potential for numerous industrial vertical elements to be introduced into the landscape.

Within the Fishlake National Forest, impacts associated with the implementation of the Project in addition to the projects identified in Table 4-3 (including oil and gas development, vegetation management, and two geothermal plants) would result in the construction of networks of access roads and large areas of vegetation clearing. These modifications would produce a patchwork of vegetation, which would differ from natural patterns in the existing landscape and would be visible from less than 0.25 mile away by viewers associated with Fremont Indian State Park, the Kimberly/Big John Scenic Backway, Fish Creek, and I-70.

Potentially affected lands located adjacent to the Mineral Mountains currently exhibit a comparatively natural landscape character with minimal deviations, which would become industrialized through the addition of the Project, potential geothermal development, and further wind turbine construction (see Table 4-3). Viewers related to the Escalante Trail and SR 257 would have a compromised viewshed due to the introduction of multiple strong vertically dominated projects within 0.25 mile of these viewers in a flat to slightly rolling landscape.

The utility corridor located west of Milford has modified the existing landscape through the construction and operation of existing utility development, creating an industrial landscape. With the introduction of the Project and projects identified in Table 4-3 (including the UNEV Pipeline Project, TransWest Express Transmission Project, Thermo North to First Wind Transmission Corridor Project, and potential wind turbine development) into this previously modified landscape, the character would be further industrialized and the viewshed from residential viewers located approximately 2 miles away in Milford would be further compromised.

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

The cumulative effects anticipated would be the same as Alternative N1.

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

Cumulative effects would be similar to Alternative N1, except this alternative route does not follow the utility corridor west of Milford. The landscapes between the Mineral Mountains and the Black Mountains, as well as the Black Mountains themselves, have minimal disturbances except for the existing Kern River pipeline. The addition of the Project and projects identified in Table 4-3 (including potential solar and wind development) would produce a landscape with strong disturbances associated with energy production that would modify the existing scenic quality. Residential viewers associated with Minersville, located approximately 2 miles away, would have a compromised viewshed based on the potential development of additional structural elements, access roads, and areas of cleared vegetation during the construction and operation of these multiple projects.

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

Cumulative effects would be similar to Alternative N1, except this alternative route crosses the Mineral Mountains landscape, which has limited deviations in the existing character of the landscape. With the introduction of the Project and projects listed in Table 4-3 (including potential geothermal development

and wind turbine construction), the resulting landscape would be industrialized due to the multiple, strong vertical elements proposed in steeply sloping terrain. The network of access roads and associated vegetation clearing from the construction of these potential projects would further increase contrast in the landscape and viewers located within 0.25 mile, including SR 257 and the Escalante Trail, would have a further compromised viewshed.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

Cumulative effects would be similar to Alternative N4, except the utility corridor west of Milford would not be located parallel to this alternative route. The landscapes from the Mineral Mountains to the Black Mountains have few modifications, with the exception of the Kern River pipeline. The construction and operation of the Project and projects identified within Table 4-3 would modify the existing landscape character into an industrial landscape dominated by utility projects with linear, man-made elements. Residential viewers located approximately 2 miles away in Minersville would have a viewshed modified from the development of these multiple energy projects.

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

The cumulative effects anticipated would be the same as Alternative N5.

Southern Area – South Black Mountains to Red Butte Substation

Alternative S1 – Pinto Creek

From the Black Mountains to Newcastle, the existing utility corridor has modified the landscape, and exhibits an industrial characterized viewshed from sensitive viewers including the Old Spanish Trail, which is located less than 0.5 mile away. With the construction of the Project, UNEV Pipeline Project, TransWest Express Transmission Project, and potential oil and gas development (Table 4-3), the landscape would be further modified and would have a character defined by energy development.

Landscapes between Newcastle and Central areas are generally intact, including few modifications with an agrarian character. With the introduction of the Project and potential projects listed in Table 4-3, this landscape would become industrialized and views from residences in Pinto and Pine Valley between 0.25 mile and 2 miles away, as well as the Pine Valley Wilderness, would be compromised due to the increase in vegetation clearing and the network of access roads.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

Cumulative effects would be similar to Alternative S1 between the Black Mountains and Newcastle. South of Newcastle to Central, the landscape has been heavily modified from the multiple linear utility projects and exhibits an industrial landscape character. The introduction of the Project, in addition to the projects identified within Table 4-3, would further expand the influence of industrial development into the existing character of this landscape. The viewshed from the Mountain Meadows Historic Site and the Old Spanish Trail, located within 0.5 mile, would be further compromised and the experience associated with these locations would be diminished.

Alternative S3 – Ox Valley

Cumulative effects would be similar to Alternative S1 between the Black Mountains and Newcastle. The construction of the Project and potential oil and gas development between Enterprise and the area south of Ox Valley would modify a natural appearing landscape through the construction of access roads and associated vegetation clearing.

Along the utility corridor west of Central to the Red Butte Substation, the existing utility projects have modified the landscape, which exhibits an industrial landscape character. With the introduction of the Project and the projects identified in Table 4-3 into this modified landscape, the character of this landscape would be further characterized as a major utility corridor. Residential viewers in Central located between 0.5 and 1 mile away would have a heavily modified viewshed as a result of the multiple potential major utility projects that would clear vegetation and construct access roads on moderate to steep terrain.

Alternative S4 – IPP East

The cumulative effects anticipated would be the same as Alternative S2.

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

Cumulative effects would be similar to Alternative S1, except for the area between the Black Mountains and Newcastle. These landscapes have few modifications and contain areas of dense pinyon-juniper vegetation on moderate to steep slopes. The introduction of the Project, the Palladon Pipelines, and potential oil and gas development would modify this landscape and develop an industrial character. Vegetation clearing and access road construction associated with these potential utility projects would each increase visual contrast in the landscape from viewers associated with the Three Peaks Special Recreation Management Area, which is located more than 2 miles away.

Alternative S6 – Iron Springs and Ox Valley

Cumulative effects would be similar to Alternative S3 except for the area between the Black Mountains and Newcastle, which would be similar to Alternative S5.

4.3.9 Land Use and Recreation Resources

Impacts associated with the implementation of the Project in addition to impacts from with past and reasonably foreseeable future actions would result in the permanent loss of grazing opportunities where permanent facilities, such as access roads and structure foundations, were located. Because new access roads would be constructed for the Project and other reasonably foreseeable future actions, OHV use could increase in areas that were previously secluded and inaccessible, or may not be suitable for motorized access (e.g., primitive and semi-primitive non-motorized ROS classifications).

Impacts on grazing could be minimized by using existing access and overland travel, where feasible, and locating the Project near existing linear facilities, such as the IPP 500kV transmission line. Access to areas not suitable to OHV use could be minimized by reclaiming temporary access roads or limiting access to new permanent access roads.

4.3.9.1 Geographic and Temporal Scope of Analysis

The geographic scope for analysis of potential cumulative effects on land use and recreation resources was defined as a 6-mile-wide study corridor (i.e., three miles each side of the reference centerline of each alternative route). The study corridor was widened from the inventory study corridor identified in Section 3.2.8 to include reasonably foreseeable future actions that could have cumulative effects on land use and recreation resources. Reasonably foreseeable actions in the analysis include those projects listed in Tables 4-1 and 4-2. Cumulative effects were analyzed over the duration of the life of the Project.

4.3.9.2 Cumulative Effects

Northern Area – Sigurd Substation to South Black Mountains

Cumulative Effects Common to Northern Alternative Routes

In the vicinity of the Sigurd Substation, agricultural land uses (e.g., irrigated agriculture) would permanently be lost with the addition of the Project and the projects identified in Table 4-3, specifically the Sevier Power Plant and TransWest Express transmission line. The anticipated loss would be minimal when compared to the surrounding Sevier Valley, which is dominated by irrigated agricultural uses. Opportunities for grazing (livestock) west of the Tushar and Pahvant mountains would be permanently reduced as more projects, especially wind and solar farms, which occupy vast tracks of land, are constructed in addition to existing facilities (e.g., Milford Wind Farm). However, grazing would remain the dominant land use and would continue, considering the context and composition of western Utah. Cumulative impacts on grazing would vary depending on alternative route.

The addition of new access roads constructed for the Project on the Fishlake National Forest between the Sigurd Substation and the Cove Fort area, in addition to the existing access road for the 138kV transmission line and those potentially built for the projects identified in Table 4-3, could increase OHV and motorized access into semi-primitive motorized and nonmotorized areas, which would reduce opportunities for solitude and primitive recreation. Similar impacts would occur on BLM-administered lands where the Project and other current and future projects could either increase access to popular destination points (e.g., rock-hounding sites), hastening the degradation of these areas, or could hinder access, compromising the enjoyment of future generations.

The wilderness qualities of USFS Areas of Potential Wilderness on the Fishlake National Forest would be diminished as more human developments and prescribed burns are permitted or implemented within these areas. The cumulative effects would reduce the natural and undeveloped characters of these areas, opportunities for solitude and primitive recreation would be limited, and the overall manageability of these areas as wilderness would permanently be compromised. However, the wilderness qualities of these areas could increase as burned areas recover overtime and other developments, such as oil and gas leases, are not constructed.

Southern Area – South Black Mountains to Red Butte Substation

Cumulative Effects Common to Southern Alternative Routes

Similar to all northern alternatives, all southern alternatives, impacts associated with the implementation of the Project in addition to the existing facilities and current and future projects identified in Table 4-3 would result in a cumulative loss of grazing opportunities; however, the impacts would be less as there

are fewer projects identified in the southern area. Cumulative effects on dispersed recreation on BLM-administered land would also be similar to all northern alternatives, to a lesser extent.

Alternative S1 – Pinto Creek

The wilderness qualities of USFS Areas of Potential Wilderness would be diminished as more human developments, specifically oil and gas, are permitted. Furthermore, opportunities for semi-primitive motorized and nonmotorized recreation and solitude would be limited or permanently lost as more access roads are constructed. The cumulative effects on USFS Areas of Potential Wilderness and semi-primitive motorized and nonmotorized areas would be similar to the northern alternative routes, except the impacts would be less because there are fewer projects proposed on the Dixie National Forests.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

Cumulative effects would be similar to Alternative S1, except cumulative effects on semi-primitive non-motorized areas and USFS Areas of Potential Wilderness would be reduced because the alternative parallels the Kern River pipeline and the IPP 500kV and Sigurd to Red Butte No. 1 – 345 transmission lines. The alternative route also parallels projects identified in Table 4-3. The colocation of these existing and future facilities would minimize the establishment of new access roads into areas not suitable for OHV and other motorized travel, minimizing the cumulative effects on USFS Areas of Potential Wilderness and semi-primitive motorized and nonmotorized areas. In addition, opportunities for semi-primitive non-motorized recreation and solitude in IRAs would be reduced due to the presence of additional facilities, including access roads and structures.

Alternative S3 – Ox Valley

The cumulative effects anticipated would be similar to Alternative S1.

Alternative S4 – IPP East

The cumulative effects anticipated would be the same as Alternative S2.

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

The cumulative effects anticipated would be similar to Alternative S1.

Alternative S6 – Iron Springs and Ox Valley

The cumulative effects anticipated would be the same as Alternative S3.

4.3.10 Special Designations

Cumulative effects on special designations are primarily associated with visual concerns as described in Section 4.3.8.

4.3.11 Wildland and Fire Ecology Management

Potential cumulative effects on wildland fire ecology and management from implementation of the Project and other reasonably foreseeable future actions include (1) an increase in the spread of cheatgrass, which has the potential to significantly alter natural fire regimes by increasing fire frequency and size, and (2) an increase in the complexity of fire suppression operations.

New access roads, combined with new disturbance in the right-of-way and staging areas, could lead to an increased potential for proliferation of invasive species such as cheatgrass. In areas where previous disturbance has been invaded by cheatgrass, the risk of wildfire from implementation of the Project cumulatively increases. Increased access along access roads and rights-of-way established for the Project and other projects could lead to increases in the number of human-caused ignitions in the Project area. In the short-term, these cumulative impacts would be mitigated during construction of the Project, as prescribed in the weed management plan and fire protection plan that will be approved by the BLM and USFS and included in the POD. Long-term cumulative impacts could be mitigated by limiting the number of new access roads constructed and prohibiting access along permanent access roads, especially during periods of high fire danger.

The addition of linear features and developments in the Project area would further fragment the landscape and increase the complexity of fire suppression operations. However, access roads also could be used as fire breaks and access for fire fighting vehicles. The proposed and future transmission line projects, pipelines, and other projects, such as renewable energy sites, could affect areas by limiting opportunities for prescribed fire where the restoration of natural fire processes is desired. Additional features and structures on the landscape would increase the complexity of fire suppression operations by increasing the number of structures that need protection, potentially posing safety hazards to firefighters and the public. Despite these potential impacts, the addition of the Project facilities to the landscape is not expected to significantly affect the fire ecology and management of the area.

4.3.11.1 Geographic and Temporal Scope of Analysis

The wildfire study area includes a 2-mile-wide corridor of the centerline (i.e., 1 mile each side) for each alternative. The temporal scope includes a 2-year direct-impact window during construction and a 50-year indirect impact window for the life of the Project. Reasonably foreseeable future actions in the analysis include those projects listed in Tables 4-1 and 4-2. Cumulative effects were analyzed over the duration of the life of the Project.

4.3.11.2 Cumulative Effects

Northern Area – Sigurd Substation to South Black Mountains

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

Alternative N1 is colocated with existing and future projects (Table 4-3), including the I-70, IPP transmission line, UNEV Pipeline Project, Thermo North to First Wind Transmission Corridor Project, Mormon Mesa Power Wind Testing Project Area, and TransWest Express Transmission Project. Fragmentation of the landscape would be minimized and most sensitive areas avoided within this corridor down I-70, across Black Rock Road, then down the IPP utility corridor to the west of Milford. Colocation along the I-70 corridor, Black Rock Road, and the IPP corridor would minimize fragmentation. However,

additive impacts of the Project and multiple projects along Alternative N1 could cumulatively result in an increased rate where new disturbance areas are repopulated by species such as cheatgrass. Proximity to existing or future roads also could increase risk from wildfire due to public access.

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

Alternative N2 is colocated with existing and future projects (Table 4-3), including the I-70, IPP transmission line, UNEV Pipeline Project, Thermo North to First Wind Transmission Corridor Project, Mormon Mesa Power Wind Testing Project Area, geothermal leases, and TransWest Express Transmission Project. Alternative N2 separates from the Black Rock Road and drops south along the west flank of the Mineral Mountains for 11 miles, then turns west for 10 miles back to the IPP corridor. The southern portion of the segment along the Mineral Mountains also runs through an area proposed for geothermal energy production. This area along the Mineral Mountains was burned in the Milford Flat Fire. Efforts are under way to restore the area, but it is still prone to invasion of cheatgrass where there is new disturbance. The cumulative effects on the area along I-70 and IPP transmission line would be the same as Alternative N1.

Alternative N3 – Black Rock Road Parallel to Kern River Pipeline

Alternative N3 is colocated with existing and future projects (Table 4-3), including the I-70, Milford Flats Solar Study Area, Mormon Mesa Power Wind Testing Project Area Wind, geothermal leases, and Kern River pipeline. The cumulative effects on the area along I-70 would be the same as in Alternative N1. Alternative N3 separates from Black Rock Road and drops south along the west flank of the Mineral Mountains for more than 30 miles, past Minersville following the Kern River corridor. The cumulative effects anticipated in the area of the North Mineral Mountains would be the same as for Alternative N2. This alternative route is colocated with the Kern River pipeline along the south Mineral Mountains, past Minersville, and to the terminus of Alternative N3. The southern portion of this alternative route also would be prone to cumulative effects on wildlife resulting from potential increased human use in the Horse Valley and the spread of cheatgrass.

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

Alternative N4 is colocated with existing and future projects (Table 4-3), including the I-70, IPP transmission line, UNEV Pipeline Project, Thermo North to First Wind Transmission Corridor Project, Mormon Mesa Power Wind Testing Project Area, geothermal leases, Mineral Mountain Wind Development, and TransWest Express Transmission Project corridors. Alternative N4 separates from I-70 and crosses through 15 miles of the Mineral Mountains before it crosses 8 miles of the Milford Flat, then back to the IPP transmission line for 35 miles. The cumulative effects on the area along I-70 and IPP transmission line would be the same as in Alternative N1. The 15 miles of disturbance bisecting the Mineral Mountains would be colocated with the Mineral Mountain Wind Development and the Milford to Sulphurdale 46kV line. Cumulative effects across the Mineral Mountains could include increasing the potential for human use and the spread of cheatgrass.

Alternative N5 – Mineral Mountains Parallel to Kern River Pipeline

Cumulative effects anticipated for Alternative N5 in the area along I-70 and Black Rock Road are the same as Alternative N1 (Table 4-3), the north Mineral Mountains are the same as Alternative N2, and the south Mineral Mountains to the terminus are the same as Alternative N3.

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

The cumulative effects anticipated for Alternative N6 are the same as those for Alternative N5 (Table 4-3).

Southern Area – South Black Mountains to Red Butte Substation

Alternative S1 – Pinto Creek

Alternative S1 is collocated with existing and future projects (Table 4-3), including the IPP transmission line, UNEV Pipeline Project and TransWest Express Transmission Project. Colocation along the IPP transmission line and UNEV Pipeline corridor minimizes fragmentation. Alternative S1 exits the IPP/UNEV corridor at Newcastle and turns due south. Additive impacts of multiple projects along Alternative S1 could lead to a cumulative increase in the rate at which new disturbance areas are repopulated by species such as cheatgrass. Proximity to existing or future roads also could increase risk from wildfire due to public access.

Alternative S2 – IPP West (Environmentally Preferred Alternative)

Alternative S2 is collocated with existing and future projects (Table 4-3), including the IPP transmission line, UNEV Pipeline Project, and TransWest Express Transmission Project. Colocation along the IPP/UNEV corridor would minimize fragmentation and reduce the potential for cumulative effects from implementation of the Project.

Alternative S3 – Ox Valley

Alternative S3 is collocated with existing and future projects (Table 4-3), including the IPP transmission line, UNEV Pipeline Project and TransWest Express Transmission Project corridors. Colocation along the IPP/UNEV corridor would minimize fragmentation and reduce the potential for cumulative effects from implementation of the Project in this area. Alternative S3 exits the IPP/UNEV corridor east of Enterprise and turns west. Cumulative effects from impacts associated with implementing the Project would not be anticipated in the Ox Valley.

Alternative S4 – IPP East

The cumulative effects for Alternative S4 are the same as Alternative S2 (Table 4-3).

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

Alternative S5 is collocated with existing and future projects (Table 4-3), including the IPP transmission line, UNEV Pipeline Project and TransWest Express Transmission Project corridors. However, the collocation with IPP/UNEV is only for the first 3 miles of the alternative route. Alternative S5 leaves the IPP/UNEV corridor at the Lund Road and turns due south. Impacts from implementing the Project would add to the potential for cumulative effects in the areas where the Project is not collocated with other projects.

Alternative S6 – Iron Springs and Ox Valley

Cumulative effects for Alternative S6 from the North to Newcastle are the same as Alternative S5 and the same as Alternative S3 for Ox Valley (Table 4-3).

4.3.12 Social and Economic Conditions

The potential for cumulative socioeconomic impacts from implementing the Project exist where there are multiple projects proposed in an area that have overlapping construction schedules and/or project operations that could affect similar resources. Concurrent and similar projects could result in a demand for labor that cannot be met by the region’s labor pool, which could lead to an influx of nonlocal workers. This population increase could affect socioeconomic resources.

4.3.12.1 Geographic and Temporal Scope of Analysis

Cumulative effect on social and economic conditions would be expected to occur within the five-county study area as previously defined. However, some beneficial impacts could occur throughout Utah. Cumulative effects would be short- and long-term. Reasonably foreseeable future actions in the analysis include those projects listed in Tables 4-1 and 4-2. Cumulative effects were analyzed over the duration of the life of the Project.

4.3.12.2 Cumulative Effects

There are six additional projects in the Project area with similar schedules:

- Thermo North to First Wind Transmission Corridor
- Milford Wind Farm Phases II and III
- Palladon Pipelines
- Sevier Power Company Power Plant
- UNEV Pipeline
- TransWest Express Transmission Project

These projects in particular have similar construction schedules. As a result, the construction schedules of the Project, when added to these schedules, could lead to cumulative effects. If there is some overlap in construction schedules among the Project and the other projects, all would be expected to draw on the regional construction workforce in southwestern Utah where there is a supply of qualified workers. The cumulative demand for skilled laborers in construction and operation would likely require additional workers temporarily, or permanently, relocate from outside the Project area to fill these positions. This

would result in a slight increase in population and an increased demand on housing, public services, and infrastructure.

If the Project is built, the cumulative beneficial impact on the social and economic conditions within the Project area could be significant, including operational revenues, employment revenues, and increased availability of electricity. It is reasonable to assume a future transmission line would have similar beneficial cumulative effects. In addition, indirect cumulative effects range from increases in housing stock to job growth. If current trends continue, Utah's economy will continue to grow, the population will increase, government services will expand, and the housing stock will increase. This Project would not induce this growth; however, this Project would accommodate the increased demand that would be placed on the current electrical system.

4.3.13 Public Health and Safety

Past, present, and reasonably foreseeable future actions that could affect EMF levels near residences were considered in this cumulative effects analysis. Additionally, other potential impacts on occupational and public safety were considered. Reasonably foreseeable future actions in the analysis include those projects listed in Tables 4-1 and 4-2. Cumulative effects were analyzed over the duration of the life of the Project.

Several public health and scientific organizations have reviewed the research on EMF and health and considered the strengths and limitations of the epidemiologic and laboratory studies. These reviewers have concluded the overall body of research does not indicate any disease or adverse health effect caused by EMF exposure at levels below the guideline limits. The audible noise levels at the edges of the right-of-way are estimated to be less than 55 dBA, the annual average level outdoor target value published by the EPA. While the proposed transmission line would produce EMF, as do all sources of electricity, EMF at intensity levels that would be produced at the edge of the right-of-way also can be found in the ordinary environment. EMF exposure resulting from the proposed transmission line would be well below exposure limits. With the addition of any future transmission line(s), cumulative effects of audible noise levels and EMF exposures could be additive. If additional transmission lines were built in the same right-of-way, estimates of EMF exposure would have to be reevaluated.

Potential effects on occupational health and safety from construction and operation of reasonably foreseeable future actions would be limited. Nevertheless, with the unique occupational hazards associated with heavy construction (including the use, storage, and transport of hazardous materials) and the electric power industry, fatalities and injuries from on-the-job accidents could occur.

4.4 Irreversible and Irretrievable Commitment of Resources

Resources committed to the proposed Project would be material and nonmaterial, including financial resources. Irreversible commitment of resources for the purposes of this section has been interpreted to mean that those resources once committed to the proposed Project would continue to be committed throughout the 50-year life of the Project. Irretrievable commitment of resources has been interpreted to mean that those resources used, consumed, destroyed, or degraded during construction, operation, maintenance of the proposed Project could not be retrieved or replaced for future use. Irreversible and irretrievable commitments of resources for the Project are summarized in Table 4-4.

**TABLE 4-4
IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES**

Resource	Type of Commitment/ Reason for Commitment	Irreversible	Irretrievable
Air quality	<ul style="list-style-type: none"> ▪ Degradation of air quality ▪ Construction activities 	No	Construction phase
Soils	<ul style="list-style-type: none"> ▪ Soil loss and erosion ▪ Construction activities 	Yes	Yes
Water	<ul style="list-style-type: none"> ▪ None (see construction materials below) 	–	–
Biological	<ul style="list-style-type: none"> ▪ Disturbance to and/or loss of vegetation, habitat, and wildlife species ▪ Construction and operation 	Yes	Project life
Archaeological and historical sites	<ul style="list-style-type: none"> ▪ Disturbance or removal of sites ▪ Construction, operation, and maintenance 	Yes	Yes
Important cultural sites	<ul style="list-style-type: none"> ▪ Disturbance or removal of sites, interference with visual setting ▪ Construction, operation, and maintenance 	Yes	Project life
Traditional cultural places	<ul style="list-style-type: none"> ▪ Disturbance or removal of sites, interference with visual setting, aural disturbance ▪ Construction, operation, and maintenance 	Yes	Project life Construction phase
Paleontological resources	<ul style="list-style-type: none"> ▪ Disturbance or removal of fossils ▪ Construction activities 	Yes	Yes
Visual resources	<ul style="list-style-type: none"> ▪ Degradation of natural scenic quality, viewshed intrusion ▪ Construction and operation 	Yes	Project life
Land use and recreation resources	<ul style="list-style-type: none"> ▪ Disturbance to agriculture and grazing ▪ Exclusion of residential, institutional, and industrial uses ▪ Increased recreational use along new access roads ▪ Increased access construction ▪ Construction and operation 	Yes	Project life
Public health	<ul style="list-style-type: none"> ▪ Potential adverse electrical effects ▪ Operation 	Unknown	Unknown
Noise	<ul style="list-style-type: none"> ▪ Noise exceeding ambient levels ▪ Construction and operation 	Yes No	Construction phase
Social and economic conditions	<ul style="list-style-type: none"> ▪ Increased regional and local employment and revenues ▪ Construction and operation 	Yes	Project life
Construction materials and fuels	<ul style="list-style-type: none"> ▪ Use of: <ul style="list-style-type: none"> ○ Aggregate ○ Water ○ Steel ○ Aluminum ○ Concrete ○ Wood ○ Fossil fuels 	Yes Yes Yes Yes Yes Yes Yes	Yes Yes No No Yes No Yes

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