CHAPTER 4 – ENVIRONMENTAL IMPACTS

4.1 INTRODUCTION

This chapter describes the effects or impacts, including the potential cumulative effects of the Project, on the environment that potentially could result from the action alternatives described in Chapter 2; specifically the construction, operation, and decommissioning of the 500 kV transmission lines, substations, and associated facilities. Also described are the effects of not building the proposed Project (No Action alternative).

The information regarding the existing condition of the environment in Chapter 3 is the baseline that was used to measure and identify potential impacts resulting from the Project. The EIS considered and incorporated mitigation, where appropriate, before arriving at the impacts described in this chapter.

An impact, or effect, is a modification to the environment brought about by an outside action. Impacts vary in significance from no change, or only slightly discernible change, to a full modification or elimination of the environmental condition. Impacts can be short-term, long-term, or permanent. According to the BLM NEPA Handbook, section 6.8.1.1 "…effects analysis predicts the degree to which the resource would be affected upon implementation of an action. Effects can be ecological, aesthetic, historic, cultural, economic, social, or health. Effects may also include those resulting from actions that may have both beneficial and detrimental effects" (BLM 2008).

Short-term or temporary impacts typically are associated with construction activities, where the environment generally would revert to preconstruction conditions at or within a few years of the end of construction. For the Project, short-term or temporary impacts are those that would occur from the time that ground-disturbing activities begin, through reclamation (anticipated to be approximately 5 years), when vegetation has been re-established in construction areas such as temporary access roads, staging areas, batch plants, wire pulling and tensioning sites, etc. Long-term or permanent impacts are those that would occur through the life of the Project or beyond. The life of the Project is estimated to be a minimum of 50 years.

An action can have direct or indirect effects, and can contribute to cumulative effects. Direct effects occur at the same time and place that an action is being performed. Indirect effects occur later in time or farther from the initial action, but are still reasonably foreseeable. Cumulative effects result from a proposed action's incremental impacts, when these impacts are added to the impacts of other past, present, and reasonably foreseeable future actions, regardless of the agency or person who undertakes them (federal or nonfederal).

4.1.1 Methods

The method of environmental impact analysis included the assessment of initial impacts, mitigation planning, and assessment of residual impacts, and is described as follows.

4.1.1.1 Assessment of Initial Impacts

Based on the Project description and resource data reflecting the affected environment, each resource specialist identified the types and amounts of impacts that could occur (i.e., initial impacts). The potential vulnerability of each resource as affected by the Project was considered both qualitatively and quantitatively in predicting the intensity of initial impacts, and was evaluated against the following:

- *Resource significance* – a measure of formal concern for a resource through legal protection or by designation of special status
- *Resource sensitivity* – the probable response of a particular resource to Project-related activities
- *Resource quality* – a measure of rarity, intrinsic worth, or distinctiveness, including the local value and importance of a resource
- *Resource quantity* – a measure of resource abundance and the amount of the resource potentially affected

Some resources are more conducive to quantification than others. For example, impacts on vegetation can be characterized partly by measuring the area of potential ground disturbance, and air quality can be measured against air quality standards. Where other resources are difficult to quantify, levels of impact were based on best available information and professional judgment. For the purposes of analysis for this Project, the intensity of impacts was described using the following levels:

- *High* – impacts that could cause substantial change or stress to an environmental resource or use (severe adverse or exceptional beneficial effects); or significant impacts
- *Moderate* – impacts that could potentially cause some change or stress to an environmental resource or use (readily apparent effects)
- *Low* – impacts that could be detectable, but slight; or no identifiable impacts

The definitions of a low, moderate, or high impact are specific to each resource, and impact levels may be more specifically defined to include moderate-high and low-moderate categories. Resource-specific impact-level criteria are described in the respective sections in this chapter, and detailed results are included in Appendix H, Resource Impact Analysis Data.

The impact assessment is based on the Project's effects to resources within the study corridors for each of the alternatives (see Section 3.1). The assessment identified the likely impacts that would result from full implementation of the Project utilizing either Option A or Option B. Where applicable, the individual resource sections identified how impacts would differ between these two options. To facilitate the analysis, the study corridors are centered on the "reference centerline," the precise location of which would be determined through engineering surveys of the selected route prior to construction. The assessment also addressed short- and long-term impacts that would result from construction and operation of access roads, substations, converter stations, fiber optic equipment and regeneration stations, and ancillary facilities located within the study corridor. The description of these Project facilities, based on preliminary design

concepts, is provided in Chapter 2 and the Draft POD. Site-specific Project details and mitigation measures, based on final engineering design and surveys, would be developed in conjunction with the Final POD.

The assessment of initial impacts included an estimate of the types and amount of ground disturbance that could occur based on the design and typical specifications of the proposed facilities, construction techniques and equipment used, extent and duration of the construction, and requirements for operation of the transmission line and associated facilities. Other factors for assessment included activities associated with routine maintenance and decommissioning.

Potential impacts primarily would result from the following construction activities:

- Upgrading existing roads or constructing new roads for access where needed
- Preparing structure sites, staging areas, regeneration station site, substation sites, electrode facility, and batch plant site
- Assembling and erecting structures
- Stringing conductors (e.g., wire pulling and splicing sites)

In addition, impacts on some resources would occur following construction, resulting from the presence of the transmission lines and access roads, and from periodic maintenance activities.

The amount of ground surface that could be disturbed as the result of implementation of the Project was estimated based on the typical design characteristics of the 500 kV transmission Project (see Section 2.4, Description of Proposed Action and Plan of Development), including structure sites, staging areas, and batch plant site. The estimated ground disturbance also includes substations and ancillary facilities (areas of disturbance for substations are included in Table 2-6). The estimated ground disturbance associated with using existing access roads, or upgrading or constructing access roads (see Table 2-7) was also considered. Estimates were based on assigned access levels that considered slope, miles of new or existing roads required, and potential spur roads required (see Section 2.4.10.1, Access Roads).

Table 4-1 summarizes the anticipated ground disturbance in acres associated with the construction of each alternative subroute. Temporary ground disturbance during construction would be associated with structure work areas, wire-splicing sites, wire pulling sites, wire tensioning sites, construction yards, and a concrete batch plant. Permanent ground disturbance is estimated to include transmission line structure base areas, substations, ancillary facilities, and permanent access roads.

Table 4-1. Ground Disturbance

Subroute	Length of Subroute (miles)	Ground Disturbance			
		Temporary Disturbance		Permanent Disturbance	
		acres	acres/mile	acres	acres/mile
1A1	228.8	1,813	7.9	1,238	5.4
1A2	230.3	1,819	7.9	1,270	5.5
1A	219.5	1,739	7.9	1,196	5.4

Table 4-1. Ground Disturbance					
Subroute	Length of Subroute (miles)	Ground Disturbance			
		Temporary Disturbance		Permanent Disturbance	
		acres	acres/mile	acres	acres/mile
1B1	223.6	1,772	7.9	1,189	5.3
1B2	209.2	1,657	7.9	1,121	5.4
1B3	206.3	1,635	7.9	1,106	5.4
3A2	123.9	979	7.9	673	5.4
3A	123.4	978	7.9	665	5.4
3B	128.6	1,019	7.9	638	5.0
4A	132.9	1,053	7.9	778	5.9
4B	133.0	1,054	7.9	793	6.0
4C2c	161.2	1,277	7.9	928	5.8
4C1	139.0	1,101	7.9	802	5.8
4C2	151.8	1,203	7.9	870	5.7
4C3	172.9	1,370	7.9	892	5.2

Impacts associated with ancillary facilities—including, but not limited to, substations, regeneration stations, and access roads—are assumed to be located and taken into account within the study corridor analyzed for the transmission line. Site-specific details are not available at this time; site-specific location and mitigation will be developed in conjunction within the Final POD.

4.1.1.2 Mitigation Planning

Mitigation includes specific means, measures, or practices that would reduce or eliminate effects of a proposed action or alternatives, and may be used to reduce or avoid adverse impacts to environmental resources, whether or not they are significant in nature. Standard mitigation measures were incorporated in the assessment of initial impacts for all alternatives considered in the detailed analysis. These measures typically address specific environmental policies, BMPs, planning guidelines, or regulatory requirements. Standard mitigation measures are listed in Table 2-10 (Chapter 2).

After the identification of initial impacts for each resource, selective mitigation measures to reduce or minimize impacts were considered in the analysis of residual impacts. Selective mitigation measures were developed in collaboration with the BLM and cooperating agencies, including measures or techniques recommended or required after initial impacts were assessed. Selective mitigation measures provide a planning tool for minimizing potential adverse impacts and, in most cases, would be considered for moderate to high impacts. Where warranted, selective mitigation measures were recommended to reduce potential impacts in specific locations. A list of these selective mitigation measures is provided in Table 2-11 (Chapter 2).

For each alternative subroute, mitigation measures were identified that would reduce the potential impact of the Project on a particular resource. While selective mitigation measures were identified with respect to the occurrence of resource impacts, the specific locations and

sequencing of such measures would be determined in the Final POD. Prior to construction, the Applicant would coordinate with the BLM and other land-management agencies or landowners, as appropriate, to refine the implementation of mitigation at specific locations or areas. For example, if a road closure were recommended, the Applicant would work with the land-management agency or landowner to determine the specific method of road closure most appropriate for the site or area (e.g., barricading with a locking gate, obstructing access on the road). Detailed mitigation will be incorporated into the POD prior to Project construction.

4.1.1.3 Assessment of Residual Impacts

Residual impacts are the environmental effects that remain after selective mitigation measures are applied. The level of residual impact is determined by how effective the mitigation is in reducing or avoiding the initial impact. Locations and intensities of potential residual impacts anticipated to occur from construction and operation of the transmission line along the reference centerline were assessed for each alternative route and described for each resource in this chapter. The results of the impact analyses are included in tables (Appendix H) and displayed as color-coded centerlines on each resource map (Map Volume). Figure M 1-1, Jurisdiction and Ownership, shows the locations of all alternative link centerlines, land ownership, and jurisdictional boundaries within the study area. Several of the alternative routes considered in this EIS share common links and would result in similar environmental effects. Rather than repeating information, descriptions of alternative routes have been abbreviated, as appropriate, to focus on the effects unique to an alternative.

4.1.1.4 Impacts of Decommissioning

The term of the BLM right-of-way grant to allow use of federal land would be limited to 50 years, although the useful life of the Project facilities is projected to be at least 50 years and up to 75 years. Should the right-of-way and facilities no longer be needed, the transmission lines and associated facilities would be decommissioned. Subsequently, conductors, insulators, concrete pads, and hardware would be dismantled and removed from the right-of-way. All areas of permanent disturbance would be restored in accordance with a Termination and Reclamation Plan to be developed by the right-of-way grant holder, and approved by the BLM Authorized Officer.

Impacts resulting from the decommissioning process would be similar in scope to the impacts that occur during construction of the Project. The amount of ground disturbance for access to the Project facilities would be within the amount of land disturbed during construction. Although impacts associated with decommissioning are anticipated to be similar to the impacts during construction, potential impacts and the timeframe of decommissioning are considered speculative and, therefore, cannot be meaningfully analyzed within each resource section. As described in the Draft POD, procedures would be implemented under the direction of the land management agencies or owners, in compliance with applicable regulations and guidelines.

4.2 CLIMATE AND AIR QUALITY

4.2.1 Introduction

Emissions of air pollutants would occur during construction of the transmission lines and substations and, to a lesser extent, during the Project operations phase. This section provides the estimated amounts of criteria pollutant emissions that would occur during construction of the proposed Project for each of the subroutes under consideration. Where feasible, potential GHG emissions have also been quantified and reported in this section (the potential impact of GHG emissions on climate is discussed in Section 4.17.4.2). Emissions from construction activities would be confined to daytime hours and would occur only during active construction periods. In addition, emissions would be transient as construction progresses, so emissions would not occur in one area for a long duration, thereby limiting their impact. Ambient pollutant concentrations resulting from specific construction activities have been quantified and compared with applicable ambient standards.

In general, emissions have not been quantified for the operation of the transmission lines and substations, with the exception of GHG emissions from circuit breakers. During the operations phase, emissions would be limited primarily to vehicular use for routine maintenance and emergency repair activities. The sources would be similar to those from construction, but pollutants would be emitted in much smaller amounts on an annual basis; therefore, the majority of emissions and impacts would be associated with construction.

Only the No Action alternative would result in no Project-related emissions or impacts. Where emissions and ambient concentrations are below EPA- or state-defined *de minimis* levels, the impacts would be considered low. More substantial emissions and impacts that do not result in potential ambient standard exceedances would be considered moderate. Potential exceedances of ambient standards would represent high impact levels.

The following categories of emission sources have been considered:

- Fugitive dust from earth moving activities associated with construction or expansion of the transmission lines, substations, and concrete batch plants
- Paved and unpaved road dust associated with construction or expansion of the transmission lines, substations, and concrete batch plants, as well as operation of the concrete batch plants
- Traffic (tailpipe) emissions from on-road vehicles associated with construction or expansion of the transmission lines, substations, and concrete batch plants, as well as operation of the concrete batch plants
- Exhaust emissions from nonroad engines (i.e., construction equipment) associated with construction or expansion of the transmission lines, substations, and concrete batch plants
- Helicopter emissions associated with construction of the transmission lines
- Emissions from concrete batching operations
- Emissions of GHGs from circuit breakers at the substations

Reasonable and feasible mitigation measures have been incorporated into the emission estimates. Best available control measures are often defined and, in some jurisdictions, required for use in controlling fugitive dust from construction operations, as well as from both paved and unpaved roads. The EPA has defined requirements for diesel nonroad engine emissions by model year (Tier standards). The use of Tier 3 engines is assumed as the default for quantification of diesel equipment emissions, except where no Tier 3 standard is available for a given engine size range (e.g., Tier 2 was used for equipment < 50 horsepower). The on-road emission factors used in this analysis include the effects of vehicle fleet turnover in reducing tailpipe emissions over time.

4.2.2 Impact Assessment Methodology

This section describes the methods used to calculate emissions and to estimate ambient impacts for the transmission lines, substations, and concrete batch plants. Regulatory requirements potentially applicable to Project components are discussed, and the analysis of general conformity is described. Emissions, impacts, regulatory requirements, and the results of the conformity analysis are presented in Section 4.2.3.

4.2.2.1 Significant Impacts

With respect to air quality, effects have been analyzed by calculating emissions of the major regulated pollutants from construction and operation of the transmission lines and substations. Emissions from construction and maintenance sources such as traffic, construction equipment, fugitive dust from earthmoving, etc., are generally not subject to federal or state limitations; but in some cases do require mitigation (such as watering of disturbed areas) or are indirectly regulated through limitations imposed on the subject equipment itself (e.g., motor vehicle tailpipe standards or diesel engine performance standards). Due to the lack of any direct limitations with which to compare them, significant impacts on air quality are not determined based on project emissions in and of themselves.

However, in addition to tallying Project emissions, a screening-level impact analysis was performed using a dispersion model to predict ambient concentrations of pollutants due to Project activities that have the most potential to exceed standards. Ambient levels of several pollutants are limited by national and/or state ambient air quality standards, which regulate concentrations of pollutants in the atmosphere due to all sources of emissions. A significant impact on air quality would occur if ambient concentrations resulting from mitigated Project emissions, when added to representative background concentrations of the subject pollutants due to all other sources, would exceed any national or state ambient air quality standard.

4.2.2.2 Emission Calculation Methods

During construction, sources of PM_{10} and $PM_{2.5}$ would include grading and earthmoving associated with the development of access roads and work pad and substation areas, digging and drilling to prepare for the structure foundations, constructing and operating the concrete batch plants, and vehicular traffic. Particulate matter emissions from traffic include both tailpipe emissions from fuel burning, and fugitive dust from traffic on paved and unpaved roads.

On-road vehicles and nonroad engines (i.e., construction equipment) would release nitrogen oxides (NO_x); CO; SO_2; hydrocarbons, including volatile organic compounds (VOC); and GHGs, including CO_2, methane (CH_4), and nitrous oxide (N_2O). Fuel combustion in helicopters would release the same pollutants.

The primary emission sources associated with the operations phase of the transmission lines would include windblown dust from ground disturbance, road dust, and vehicle emissions during periodic maintenance or emergency repair activities. In addition, the circuit breakers at each of the substations would be filled with SF_6, a GHG. There would be a small amount of ongoing leakage of SF_6 over time, resulting in emissions of this pollutant.

As noted above, because operations emissions and impacts would be much lower than construction phase emissions and impacts, they have not been quantified; with the exception of SF_6 from the circuit breakers.

Fugitive Dust from Transmission Line, Substation, and Batch Plant Construction

Fugitive dust was estimated from construction of the transmission lines and substations. In addition, fugitive dust emissions were quantified for construction of concrete batch plants, located approximately every 30 miles along the right-of-way.

Uncontrolled fugitive dust emission factors of 0.42 ton PM_{10} per acre per month and 0.042 ton $PM_{2.5}$ per acre per month were used for access road construction; while uncontrolled fugitive dust emission factors of 0.11 ton PM_{10} per acre per month and 0.011 ton $PM_{2.5}$ per acre per month were used for other construction activities, including construction of the substations and batch plants used (Countess Environmental 2006; Midwest Research Institute 2005; EPA 2001). For the transmission lines, the earthmoving and grading activities were assumed to be half for access roads and half for other activities, and average emission factors of 0.27 ton PM_{10} per acre per month and 0.027 ton $PM_{2.5}$ per acre per month were used (Countess Environmental 2006).

A control efficiency of 61 percent for watering, as needed, and application of dust suppressant, if warranted (i.e., if watering is insufficient to prevent visible emissions > 20 percent opacity, or other opacity or dust control specifications), was applied to uncontrolled emissions, based on work sponsored by the WRAP (*ibid*).

Dust from paved and unpaved roads was estimated using vehicle counts supplied by Project engineers for each transmission line option and substation; roads were assumed to be 60 percent unpaved and 40 percent paved. Vehicle counts were converted to total vehicle miles travelled (VMT), assuming average speeds of 45 mph on paved roads and 20 mph on unpaved roads (limitation of speed on unpaved roads is also a mitigation measure), as well as the hours per day each vehicle was expected to be used, as estimated by Project engineers.

Paved and unpaved road emissions for construction of the batch plants were scaled from calculations performed for one of the substations based on the ratio of acreage disturbed for the substation and the batch plants. Additional paved and unpaved road emissions were estimated for batch plant operation, based on the expected number of loads of raw materials delivered to the

plants. The number of raw material loads needed is a function of the expected cubic yards of concrete required for transmission lines and substation construction.

Emissions were calculated using spreadsheet models developed by WRAP (2009). In addition to speed control, mitigation measures would include dust suppressant application on unpaved roads, if warranted (i.e., when dust generation is observed despite imposition of other mitigation measures); frequent watering of unpaved roads (twice daily assumed); and prompt removal of dirt tracked onto paved roads. Construction traffic associated with the Pinal Central Substation was assumed to use only paved roads, based on the character of the existing roads in the vicinity of the substation.

Both earthmoving/grading fugitive dust and dust from paved and unpaved roads for transmission lines and substation construction were apportioned over the Project duration for options A and B, based on relative month-by-month schedules for each activity supplied by Project engineers. Emissions from construction-related fugitive dust were assumed to occur, based on the expected timing of road or pad construction and foundation installation for each option. Emissions from paved and unpaved roads were assumed to occur based on the fraction of total activity occurring in each month, since all activity has associated vehicle traffic, not just road/pad and foundation activities. The monthly emissions thus obtained were summed to provide total emissions during each year of Project activity. Total batch plant construction and paved and unpaved road emissions were calculated, but not apportioned to months.

Traffic Emissions

A number of support vehicles would be used during Project construction, including a fleet of pickup trucks, flatbed trucks, and other vehicles such as concrete and boom trucks. As each of these vehicles would emit regulated pollutants, the emissions of these pollutants were calculated using the EPA's Mobile6 emission model (EPA 2003). Mobile6 calculates emission factors for various vehicle types based on grams of pollutant emitted per vehicle-mile basis. Emission factors obtained from Mobile6 included those for NO_x, CO, SO_2, PM_{10}, $PM_{2.5}$, VOC, and CO_2. Emission factors for CH_4 and N_2O for various types of vehicles were taken from *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance, Direct Emissions from Mobile Combustion Sources* (EPA 2008).

Mobile6 inputs included use of low-altitude mode and conventional Western gasoline composition. Total pound per day emissions were based on the Mobile6 emission factors and the number of VMT for each vehicle type, as estimated in the paved and unpaved road dust task described above. These emission factors were applied to the various vehicle classes based on size and fuel used. For diesel fueled equipment, 15 ppm sulfur content was assumed (as required after June 2010; see 40 CFR 80, Subpart I).

As with fugitive dust, emissions for the transmission lines and for each of the substations were apportioned over the Project schedule for both of the options. In this case, the relative fractions of total Project activities occurring in each month were used to apportion emissions, rather than just road/pad and foundation activities, since vehicle traffic is associated with all activities involved in transmission line and substation construction.

Emissions from traffic associated with batch plant construction were scaled from one of the substations, based on relative disturbed areas.

Construction Equipment Emissions

Nonroad engine exhaust emissions for the Project were estimated on a monthly basis, using the equipment information and schedules provided for each transmission line and substation option. Nonroad engine emission factors were selected based on the type and size of engine. Emission factors for criteria pollutant emissions from diesel engines were taken from federal emission standards applicable to nonroad engines (EPA 2010b), with the exception of SO_2 emission factors. Engines were assumed to be Tier 3.

The SO_2 emission factor for diesel engines was estimated based on an equation given in EPA document NR-009A (*Exhaust Emission Factors for Nonroad Engine Modeling — Compression-Ignition*) (EPA 1998) and the federal diesel fuel sulfur content limitation of 15 ppm. Emission factors for gasoline engines were taken from EPA document 420R-05-019 (*Exhaust Emission Factors for Nonroad Engine Modeling — Spark-Ignition*) (EPA 2005a). The SO_2 emission factor for gasoline engines was estimated based on an equation presented in EPA document NR-0010b (*Exhaust Emission Factors for Nonroad Engine Modeling — Spark Ignition*) (EPA 1999).

Assumptions made in emission factor selection and emission calculations are listed as follows:

- PM emission factors were used to conservatively estimate emissions for PM_{10} and $PM_{2.5}$.
- Where available, nonmethane hydrocarbon (NMHC) emission factors were used to estimate VOC emissions. Where only HC emission factors were available, these emissions were conservatively used to estimate VOC emissions.
- The Tier 3 diesel VOC emission factor for equipment 50-750 hp was assumed to be 0.2 gram per brake horsepower-hour, based on page 7 of EPA document NR-009A.
- The Tier 3 diesel NO_x emission factor was estimated from the difference of the NMHC and NO_x emission standard, and the assumed 0.2 gram per brake horsepower-hour emission factor for VOC.
- Brake-specific fuel consumption for diesel engines 50-100 hp was assumed to be 0.408 pound per horsepower-hour, based on Table B-2 of EPA document NR-009A[1].
- Brake-specific fuel consumption for diesel engines >100 hp was assumed to be 0.367 pound per horsepower-hour, based on Table B-2 of EPA document NR-009A[2].
- Gasoline-fueled air compressors were assumed to have phase 2, 4-stroke engines.

Helicopter emissions were estimated based on hours of operation and fuel usage of the MD600 (Hughes 500) helicopter that would be used. Emission information for helicopters was obtained

[1] http://www.epa.gov/oms/models/nonrdmdl/nr-009a.pdf
[2] *ibid*

from the Swiss Federal Office of Civil Aviation's document *Guidance on the Determination of Helicopter Emissions*, Edition 1, March 2009 (Federal Office of Civil Aviation 2009).

CO_2 emission factors for gas engines were estimated based on an equation given in the EPA document *Exhaust Emission Factors for Nonroad Engine Modeling — Spark-Ignition* (EPA 2005a). For diesel engines, the CO_2 emission factors were calculated based on an equation in EPA document NR-009d (*Exhaust and Crankcase Emission Factors for Nonroad Engine Modeling — Compression-Ignition*) (EPA 2010b). CH_4 and N_2O emission factors for gas and diesel engines, and CO_2, CH_4, and N_2O emission factors for helicopters were obtained from *Climate Leaders Greenhouse Gas Inventory Protocol Core Module Guidance — Direct Emissions from Mobile Combustion Sources* (EPA 2008). Global warming potentials for calculating CO_2 equivalent (CO_2e) emissions from 40 CFR 98, Table A-1[1] were used.

Emissions for each of the transmission lines and for each of the substations were apportioned over the Project schedule for each of the options. Month-by-month schedules for each activity were used to apportion the equipment emissions associated with that activity over time.

Concrete Batch Plant Operation Emissions

Concrete batch plants would be constructed and operated to supply concrete for the Project approximately every 30 miles along the right-of-way. Emissions generated in the construction of the batch plants were discussed in previous subsections.

Operation emissions were based on emission factors in the EPA's *Compilation of Air Pollutant Emission Factors* (AP-42) (EPA 2005b) for concrete batching operation (Section 11.12-1). Emissions were based on a total output from all the batch plants of 20,000 cubic yards of concrete for the transmission lines and 2,000 cubic yards for each substation. The concrete was assumed to be truck-mixed. Emissions resulting from traffic involved in bringing raw materials to each batch plant were based on the estimated raw material loads needed to meet the concrete requirements, which were estimated for each transmission line and substation by Project engineers. Trucks transporting raw material to each concrete batch plant were assumed to have an average weight of 20 tons and to travel 100 miles round trip. Batch plant traffic emissions were not apportioned to months.

Substation Operation Emissions

The substations would include circuit breakers containing SF_6, a highly effective dielectric used for interrupting arcs. A potent GHG, SF_6 emissions from the substations would occur as a result of circuit breaker equipment leaks. A leak rate lower than 0.1 percent is obtainable for circuit breakers, even after many years of service (McDonald 2007). SF_6 emissions for each substation have been calculated based on the total SF_6 content of the breakers and application of a 0.1 percent leak rate. CO_2e emissions have been calculated using the SF_6 global warming potential from Table A-1 of 40 CFR 98.

[1]http://ecfr.gpoaccess.gov/cgi/t/text/textidx?c=ecfr&sid=b974f92ac0ea0bb6bf5f94eceeb7dbe0&rgn=div9&view=text&node=40:21.0.1.1.3.1.1.10.11&idno=40

4.2.2.3 Impact Analysis Methods

Construction activities associated with the Project would release regulated pollutants into the atmosphere for subsequent transport. Some of these pollutants may be transported from the immediate area into the surrounding air. A dispersion modeling analysis was conducted to assess probable Project impacts on ambient air quality[1].

The EPA has recently promulgated a new screening-level dispersion model, AERSCREEN, which is a screening version of the EPA's recommended model for near field dispersion analyses, AERMOD. AERSCREEN was used to simulate emissions and transport from transmission line and substation construction for those pollutants for which state or federal ambient standards have been defined. Construction of concrete batch plants was not modeled because the activities are similar to those employed in substation construction (grading, structure erection, etc.), but with much smaller emissions. Similarly, operation emissions from the batch plants were not modeled because they would be negligible (less than 1 ton of particulate matter emissions for all concrete batch plants associated with each potential transmission line).

For the transmission line segments, maximum fugitive dust emissions would occur during access road construction. For the other pollutants, maximum emissions from construction equipment would occur during installation of the transmission line structures. Emissions from helicopter operations, traffic, and paved and unpaved road traffic were not modeled because they would occur over a large area, resulting in negligible impacts at any given location.

Because AERSCREEN can only simulate emissions from a single source for a 1-hour time period, both fugitive dust and construction equipment emissions were modeled as being emitted from an area representing a work site, rather than from individual pieces of equipment, with the size of the site based on expected activities and the width of the transmission line right-of-way. The release height was set to 10 meters, in accordance with procedures recommended by the Colorado Department of Public Health and Environment (CDPHE), Air Pollution Control Division for fugitive sources with substantial turbulence (e.g., equipment activity) (CDPHE 2005). Although CDPHE guidance was developed for a previous screening model, SCREEN3, the recommendation can be reasonably applied to the newer AERSCREEN model as well.

Maximum 1-hour impacts were conservatively assumed to apply to other short-term averaging periods (i.e., 3-hour, 8-hour, and 24-hour). Annual impacts were not estimated because the equipment and other emitting activities would not stay in one location, but would move along the right-of-way as the transmission lines are constructed. The calculated impacts would apply to the construction of the first transmission line in either option. Based on the projected construction schedules, impacts from construction of multiple transmission lines would not overlap in time and space and are therefore not additive.

AERSCREEN requires information about the surface characteristics that may influence dispersion, including representative albedo, Bowen ratio, and surface roughness length.

[1] The impact analysis of Option B, assumed construction of the AC line first and the DC line second. However, such conclusions would be expected to be the same if the sequencing of construction were reversed such that a DC line was constructed first, followed by an AC line.

Maximum and minimum expected temperatures are also entered. Two data sets were used to simulate the conditions that the various route groups would traverse. Annual average albedo, Bowen ratio, and surface roughness for grasslands and for desert shrublands were calculated from seasonal values given in the AERMET[1] User's Guide, tables 4-1, 4-2a, and 4-3 (EPA 2004b). Route groups 1 and 2 used the grasslands data for modeling, along with average maximum and minimum temperature data for Socorro, New Mexico. The remainder of the route groups used the desert shrubland data, along with average maximum and minimum temperature data for Safford, Arizona. Because the daily or hourly emissions from a single work site were modeled, impacts would apply equally to any route group segment or transmission line within the same modeled vegetation community.

VOCs were not modeled because they are regulated as precursors to other pollutants (O_3, PM_{10}), and are generally modeled only as part of regional applications. GHG emissions were also not modeled because there are no ambient standards for GHGs, and they contribute to climate change on a global, rather than local or regional, scale.

For substation construction, maximum emissions of fugitive dust would occur when each site is graded. Maximum emissions of other pollutants would occur during structure work. As with the transmission lines, these activities were simulated as area sources representing a daily work site. One of the larger substations was used to conservatively represent impacts from any of the substations. Modeling for the SunZia East and Midpoint substations used grasslands/Socorro data, while the rest of the substation modeling used desert shrubland/Safford data.

AERSCREEN calculates conservative impacts that are likely to overestimate actual impacts for several reasons. As noted above, 1-hour impacts are applied to all averaging periods. In reality, wind direction varies with time so that over longer averaging periods, the emissions plume becomes more diffuse, with lower impacts at any given location. In addition, AERSCREEN calculates maximum impacts based on worst-case meteorological conditions. The conditions simulated include those characteristic of both daytime and nighttime, even though construction operations will only occur during the day. Nighttime conditions often lead to the highest impacts, because the atmosphere is often more stable at night; thus the emissions plume does not disperse as readily as during the day. Finally, many of the ambient standards that the impact analysis results are compared to have complicated forms that involve averaging submaximum concentrations over several years. For example, the 1-hour NO_2 standard is based on a 3-year average of the 98th percentile of the annual distribution of daily maximum 1-hour concentrations. AERSCREEN only calculates maximum, rather than submaximum, concentrations and it is unlikely that worst-case impacts would occur in the same location over multiple construction years.

The EPA has established significant impact levels (SIL) for various pollutants and averaging periods. If modeled concentrations for a given pollutant and averaging period are below the SILs, the emissions are not expected to cause or contribute to an exceedance of the NAAQS. Predicted impacts were first compared with the SILs. If the predicted impacts were above the SIL level for a given pollutant and averaging period, the impact was added to a representative background

[1] AERMET is the meteorological processor for the EPA's AERMOD model.

concentration and compared with applicable ambient standards. Resulting impacts are shown in Appendix F and summarized in Section 4.2.3.

4.2.2.4 Regulatory Requirements

Federal, state, and local air quality requirements regulate emissions of a large number of pollutants from various sources. Many of the regulations are aimed at stationary sources, which would include the concrete batch plants and substations, but not the construction emissions. Emissions of regulated pollutants from construction operations are primarily focused on control of fugitive dust, as outlined below. Tailpipe emissions from on-road traffic and from the nonroad engines used in construction equipment (such as cranes, bulldozers, etc.) are regulated at the federal level, through specified performance requirements for various types of engines. The burden of meeting the performance requirements is placed on manufacturers of such equipment.

GHGs have recently become regulated pollutants at the federal level. Federal requirements now impose reporting obligations on owners of certain types of sources. In addition, the EPA has recently begun requiring GHG emission inventories and control technology analyses for new or modified large sources of pollutants. None of the activities involved in the proposed Project would be subject to federal GHG requirements.

States have also taken steps to address GHG emissions. New Mexico, for example, has several regulations limiting GHG emissions from certain large source types. At present, however, it appears that few if any state requirements would apply to GHG emissions from construction of the proposed Project. Operation of the substations may trigger a notification and reporting requirement in New Mexico (see below).

The regulatory requirements that would apply to activities associated with construction and operation of the transmission lines, substations, and concrete batch plants are outlined below.

<u>Transmission Line, Substation, and Concrete Batch Plant Construction</u>

- The City of Deming, New Mexico, has a local ordinance that requires a permit and an approved dust control plan for land disturbance greater than or equal to 3,500 square feet (Ordinance 11-5-4).
- Luna County, New Mexico, Building Code requires a dust control plan approved by the County for land clearing activities (Ordinance 75).
- There are no existing air quality requirements for construction sources in the state of New Mexico, except as administered by specific counties and cities as outlined above. However, New Mexico is considering the need for a statewide dust control regulation. If such a regulation is passed, it could apply to various activities associated with construction of transmission lines, substations, and batch plants.
- On-road diesel vehicles and nonroad diesel vehicles operating in urban areas will be limited to 30 to 40 percent opacity, depending on elevation (NMAC 20.2.61).

- Several requirements in Title 18, Chapter 2, Article 6 (*Emissions from Existing and New Nonpoint Sources*) of the AAC pertain to dust emissions and may apply to various activities associated with transmission line construction.
    - AACR18-2-604 requires dust control measures to limit emissions from open areas, dry washes, and riverbeds
    - AACR18-2-605 requires dust mitigation for roads
    - AACR18-2-606 requires dust mitigation for material handling operations
    - AAC R18-2-607 requires dust mitigation for storage piles
    - AACR18-2-614 limits opacity of emissions from nonpoint sources to 40 percent
    - These requirements would apply in the areas traversed by the various route groups outside of Pinal and Pima counties, which have their own requirements.
- The AAC also contains requirements that would apply to some of the construction equipment used in transmission line construction. AAC R18-2-801 and AAC R18-2-802 limit opacity from certain off-highway mobile sources and off-road machinery to 40 percent.
- AAC section 18-2-804 limits opacity from road and site cleaning machinery and requires dust control for road or site cleaning activities.
- Pima County, Arizona, requires an activity permit for earthmoving, blasting, road construction, trenching, and land stripping above certain thresholds (Pima County Code of Ordinances, Title 17, Chapter 17.12, Article IV, 17.12.470).
- Pima County Code of Ordinances, Chapter 17.16 contains several potentially applicable requirements.
    - 17.16.050 contains opacity requirements for nonpoint sources, limitations on off-site transport of visible emissions, and dust mitigation requirements
    - 17.16.060 contains additional requirements for mitigation and reclamation of fugitive dust producing activities
    - 17.16.070 contains fugitive dust emissions standards for motor vehicle operation
    - 17.16.080 requires dust control measures to limit emissions from open areas, dry washes, and riverbeds
    - 17.16.090 requires dust mitigation for roads
    - 17.16.100 contains requirements for mitigation of material handling, construction, and material transport particulate matter emissions
    - 17.16.110 contains requirements for dust mitigation from storage piles
    - 17.16.450 limits the opacity of emissions from off-road machinery
    - 17.16.470 limits opacity from road and site cleaning machinery and requires dust control for road or site cleaning activities

Pinal County, Arizona, has similar requirements to those in Pima County and in other areas of Arizona with regard to dust mitigation, as codified in the Pinal County Air Quality Control District (PCAQCD) Code of Regulations Chapter 4, Article 2. In addition, PCAQCD Chapter 2, Article 8 limits the opacity of emissions. PCAQCD Chapter 4, Article 3 requires a fugitive dust registration for any area of disturbance greater than 0.1 acre. The registered activity is required to follow Universal Performance Standards to limit dust generation, as spelled out in the regulations. Dust-generating activities within the West Pinal County PM_{10} nonattainment area are subject to further restrictions, including application of specified mitigation measures, and will also likely require a permit from the county.

Concrete Batch Plant and Transmission Line Operation

The concrete batch plants would be considered stationary or portable stationary sources in most air quality jurisdictions. It is assumed that the batch plants would not include any fuel burning equipment or stationary internal combustion (IC) engines, such as generators. If fuel-burning or IC engines are needed, additional requirements may apply. The following requirements are potentially applicable:

- New Mexico requires a construction permit for stationary sources emitting more than 10 pounds per hour or 25 tons per year (tpy) of any federal or New Mexico criteria pollutants, including temporary or portable sources. The individual concrete batch plants are unlikely to emit greater than 25 tpy, but should be evaluated against the 10-pound per hour threshold prior to construction (NMAC 20.2.72.200).
- An NOI is required for new or modified stationary sources in New Mexico emitting greater than 10 tpy of any regulated pollutant. The individual batch plants would probably not exceed this threshold. Portable sources subject to this requirement or to permit requirements must submit relocation notices (NMAC 20.2.73.200).
- Opacity from the batch plant will be limited to 20 percent in New Mexico. On-road diesel vehicles and nonroad diesel vehicles operating in urban areas will be limited to 30 to 40 percent opacity, depending on elevation (NMAC 20.2.61).
- If a permit or NOI is required in New Mexico, the batch plants would be subject to emission inventory requirements (NMAC 20.2.73.300).
- Arizona generally limits the opacity of emissions to 20 percent (AAC R18-2-702); however, certain requirements may specify different limitations.
- Arizona may require a construction permit for the batch plants (AAC R18-2-302). If so, the batch plant(s) may qualify for coverage under the Concrete Batch Plant General Permit. Portable sources that would operate under more than one jurisdiction would apply to ADEQ, while any batch plant that would operate only in Pima or Pinal counties would apply for a county, rather than a state, permit. The appropriate permitting authority (ADEQ, PCAQCD, or the Pima County Department of Environmental Quality) should be consulted prior to batch plant construction (AAC R18-2-302).
- If a permit is required and the batch plants are considered portable sources, a relocation notice is required to be submitted to the permitting authority (AAC R18-2-324).

- If any of the batch plants are considered existing sources in Arizona, there are fugitive dust requirements (AAC R18-2-723).
- The concrete batch plants may be subject to general emission limitations, odor limitations, VOC/solvent handling and storage requirements, and other specific limitations under the AAC (AAC R18-2-730). The appropriate permitting authority should be consulted prior to batch plant construction.
- Pima County has opacity limitations for point sources that apply within the county (Pima County Code of Ordinances, 17.16.040).

It is expected that few air quality requirements would apply to the operation phase of the transmission line; however, dust control permits may be required for certain maintenance activities. The appropriate permitting authority should be consulted regarding permit or other dust control requirements for specific maintenance activities that would result in particulate matter emissions, such as earthmoving activities.

Substation Operation

The substations would be considered stationary sources in most air quality jurisdictions; however, provided the substations have no fuel burning equipment or stationary IC engines, there would be few, if any, regulated emissions. The exception may be the SF_6 leakage from circuit breakers. As a federally regulated pollutant, the SF_6 emission may be subject to an NOI and reporting requirements in New Mexico for annual emissions exceeding specified thresholds (see NMAC 20.2.73.200, NMAC 20.2.73.200).

4.2.2.5 Mitigation Measures

Mitigation measures would be used to limit particulate matter emissions during both the construction and operational phases of the Project. As noted in the previous section, dust control plans or permits would be required in specific areas of New Mexico, subject to NEAPs, and in some Arizona jurisdictions. Such permits or plans would detail specific mitigation measures to be applied and would be adhered to (see ST 20). In Arizona, even where plans or permits are not required, the Project would still be subject to fugitive dust control measures mandated by the applicable regulations. Following construction, disturbed areas would be reclaimed using stabilization methods such as native vegetation, groundcover of non-erodible elements, or approved soil stabilization palliatives as prescribed by the land-management agency, which would limit ongoing fugitive dust emissions.

The following dust control measures have been specifically applied to the Project emission estimates:

- Watering at least twice daily in all disturbed areas undergoing active construction or disturbance
- Watering all unpaved roads at least twice daily in areas of active use

- Application of dust suppressants, if warranted, to unpaved roads and other disturbed areas (i.e., when generation of dust is observed despite application of other control measures, such as speed control and watering)
- Limitation of speeds on unpaved roads to 20 mph in most areas
- Sweeping up tracked-out dirt where unpaved roads or disturbed areas meet paved roads every 14 days, using PM_{10} efficient street sweepers, in areas of active construction or use
- Concrete batch plants will be restricted to areas outside of the West Pinal County and Rillito PM_{10} nonattainment areas

Additional mitigation measures may be applied in accordance with dust control plans or permits issued or approved by the various air quality control jurisdictions.

With respect to other sources and pollutants, nonroad engine emissions would be limited by using diesel equipment with Tier 3 engines. Traffic emissions explicitly incorporate the effects of ongoing federal emissions reduction requirements. Where stationary source permits or notifications are required, the Project would comply with all limitations or requirements imposed by the permitting authority.

Leak detection monitoring that would alert when a circuit breaker loses 10 percent of its SF_6 is proposed to mitigate GHG emissions from the substations. In addition, the Project proponent may participate in EPA's SF_6 Emission Reduction Partnership for Electric Power Systems, the objective of which is to reduce SF_6 emissions via cost-effective technologies and practices. Partners agree to annually estimate SF_6 emissions, establish a strategy for replacing older, leakier pieces of equipment, implement SF_6 recycling, ensure that only knowledgeable personnel handle SF_6, and submit annual progress reports. In turn, the EPA acts as a clearinghouse for technical information on successful strategies to reduce SF_6 emissions, provides partners with recognition for their achievements, and serves as a repository for data on a partner's emission reduction achievements.

General Conformity

In 1993, the EPA promulgated a rule requiring federal actions to conform to State Implementation Plans (SIP). Conformity means that a federal action will not interfere with strategies to attain the NAAQS. New Mexico's conformity regulations are codified at NMAC 20.2.98. Arizona has incorporated the federal conformity requirements in 40 CFR 93, by reference in AAC R18-2-1438.

Federal actions responsible for air pollutant emissions within a nonattainment or maintenance area must undergo a conformity applicability analysis to determine whether a conformity determination is necessary. None of the Project route groups would traverse any nonattainment or maintenance areas in New Mexico; therefore, the New Mexico portions of the proposed Project are exempted from conformity analysis. In Arizona, various proposed route groups would cross the Rillito PM_{10} nonattainment area, the West Pinal County PM_{10} nonattainment area, the San Manual SO_2 maintenance area, and the Tucson/Pima County CO maintenance area. Conformity analyses are required for these four areas.

The Pinal Central Substation will be located in the West Pinal County PM_{10} nonattainment area; none of the other substations would be located in any nonattainment or maintenance area. Concrete batch plants may be located in one or more of the maintenance areas, but it has been assumed that no batch plant would be located within either of the PM_{10} nonattainment areas.

To perform a conformity analysis, the total of Project-related direct and indirect emissions (such as emissions from associated traffic) is tested against *de minimis* emission levels. The total of direct and indirect emissions should include regulated precursor substances. Neither SO_2 nor CO has precursors. The definition of precursors to PM_{10} contained in 40 CFR 93 refers to "those pollutants described in the PM_{10} nonattainment area applicable SIP as significant contributors to the PM_{10} levels." The most recent SIP submittal for the Rillito area (*Final Arizona State Implementation Plan, Rillito PM_{10} Nonattainment Area*; ADEQ 2008b) does not list any substance other than directly emitted PM_{10}; therefore, only directly emitted PM_{10} was included in the total of direct and indirect emissions for the Rillito nonattainment area. There is as yet no SIP for the recently designated West Pinal County PM_{10} nonattainment area; however, the *Technical Support Document, Pinal County, Arizona, Area Redesignation for the 1987 24-hour PM_{10} NAAQS* (EPA 2010c) indicates: "Emissions of SO_2, NO_x, VOCs (volatile organic compounds) and NH_3 (ammonia), which are precursors of secondary PM_{10}, are included for informational purposes in Appendix A but were not considered because the PM_{10} problem in Pinal County is primarily a fugitive dust problem." Therefore, only directly emitted PM_{10} was included in the total of direct and indirect emissions for the West Pinal County PM_{10} nonattainment area.

Conformity determinations are required for any federal action where the total of direct and indirect emissions exceeds the annual *de minimis* thresholds.

To calculate emissions within each of the four areas, pollutant emissions for construction of the transmission line route groups that would traverse the nonattainment or maintenance areas were converted to a ton per mile of transmission line basis, and then multiplied by the number of miles in the longest route that crosses a given nonattainment or maintenance area. The maximum 12-month emissions at any point during the Project schedule were used in these calculations to provide a conservative estimate of total emissions. It was assumed that only one transmission line would be built within each nonattainment or maintenance area in a 12-month period (i.e., construction of the first line and the second line would not overlap in *both* time and space). This assumption is reasonable, considering that the maximum length of any transmission line through any of the nonattainment or maintenance areas is less than 30 miles; a small fraction of the total expected transmission line lengths (minimum length of approximately 460 miles).

Emissions from the construction of batch plants were added to the transmission line construction emissions to provide total estimated emissions within each nonattainment or maintenance area. Only 15 miles of the transmission line route would traverse the Rillito PM_{10} nonattainment area, and approximately 6 miles would traverse the West Pinal County PM_{10} nonattainment area; therefore, since batch plants are expected to be constructed every 30 miles along the right-of-way, it was assumed that a concrete batch plant would not be built/operated within either of the nonattainment areas. For the San Manuel SO_2 maintenance area, a single batch plant was included, based on the length of the longest transmission line route to cross the area. For the Tucson/Pima County CO maintenance area, two batch plants were included in the calculations.

4.2.3 Impact Analysis Results

This section discusses the results of the emissions estimation and impact analyses performed for the proposed Project.

4.2.3.1 No Action Alternative

The No Action alternative would mean that air pollutant emissions from construction equipment, Project-related traffic, earthmoving activities, construction and operation of several concrete batch plants, and leakage of GHGs from substation circuit breakers would not occur. Under the No Action alternative, air quality emissions may continue at current levels and trends, although it is uncertain whether other changes may occur that affect emissions..

4.2.3.2 Impacts Common to All Alternatives

This section addresses transmission line construction emissions, ambient air impacts from construction of either of the transmission line options, emissions and impacts from construction and operation of the concrete batch plants, and the results of the general conformity analysis. No significant impacts to air quality (see Section 4.2.2.1) would result from the construction or operation of the transmission lines, including construction and operation of concrete batch plants.

Transmission Line Construction Emissions and Impacts

While the length of the transmission lines would vary somewhat depending on which alternative routes are selected and permitted, the level of effort required to build a transmission line from the SunZia East Substation to the Pinal Central Substation was assumed to be approximately equivalent for any of the alternatives under consideration. Fugitive dust emissions from earthmoving would be somewhat higher for the first transmission line than for the second line that would be constructed, because some of the roads and portions of the right-of-way would not have to be reworked for the second line.

Appendix F presents the criteria pollutant emissions summary for the transmission line construction options by year and source category (fugitive dust from earthmoving, paved and unpaved roads emissions, nonroad engines/construction equipment, and on-road traffic). The emissions are also presented in tons per mile of transmission line, and GHG emissions are summarized in Appendix F. Note that the CO_2 emissions shown in Appendix F are a summation of the emissions of individual GHGs, including CO_2, CH_4, and N_2O, expressed as an equivalent mass of CO_2.

The results of the air pollutant dispersion modeling conducted for transmission line construction are also shown in Appendix F. Fugitive dust emissions are expected to be higher for the first transmission line than for the second line that would be constructed for Option A or Option B, because the main access roads would be initially constructed where needed for the first transmission line, and for the most part followed by smaller spur roads for the second transmission line. Because construction of the first and second transmission lines (in Option A or B) would not overlap in time and space, the modeling performed can be conservatively assumed

to represent short-term impacts from either of the options. The results of the impact analysis vary slightly by alternative route group, because the background air pollutant concentrations vary in different areas, and because different surface characteristics were used for the various route groups.

Project-related impacts were first compared to SILs defined by the EPA for various pollutants and averaging periods. An air quality modeling SIL should not be confused with the similar sounding term significant adverse effect, or significant impact, in the NEPA sense. Instead, SILs are used to define impacts that are considered to be negligible or *de minimis*. If Project-related impacts are predicted to be below the applicable SIL, the impact would not cause or contribute to an exceedance of the NAAQS. In general, the states would also consider impacts below the federal SILs as *de minimis*.

For the impacts summarized in Appendix F, if the dispersion modeling projected that the SIL would be exceeded or if there was no EPA-defined SIL, the Project impact was added to a representative background concentration and the total compared with the applicable ambient standards (federal or state). The background concentrations used were recent measured values from nearby monitoring sites and represent ambient concentrations of pollutants contributed by sources other than the Project. As shown in Appendix F, most impacts were predicted to be within regulatory limits (below the applicable National, Arizona, and/or New Mexico Ambient Air Quality Standards). Because of high background concentrations of PM_{10} within the West Pinal County PM_{10} nonattainment area, maximum total 24-hour PM_{10} impacts (Project + background) from transmission line and Pinal Central Substation construction were projected to potentially exceed the numerical value of the PM_{10} standards. It should be noted that the form of the standard is "not to be exceeded more than once per year, on average over three years." The modeled concentrations used in this comparison were maximum impacts (rather than second high impacts, as would fit the form of the standard) due to the screening nature of the dispersion model used. In addition, maximum Project emissions within the nonattainment area are unlikely to persist over 3 years, due to the short segment of transmission line (approximately 6 miles) within the nonattainment area.

Concrete Batch Plant Emissions and Impacts

Appendix F summarizes construction and operation emissions for the concrete batch plants. Approximately 16 or 17 concrete batch plants would be constructed and operated for each transmission line and associated substation construction. Batch plants would be located approximately every 30 miles along the transmission line right-of-way. It is expected that two to three batch plants would be operational at any given time. GHGs expressed as CO_2e include CO_2, CH_4, and N_2O.

General Conformity Analysis

The total of Project direct and indirect emissions calculated, as described in Section 4.2.2.5, was compared with conformity determination thresholds (*de minimis* levels) for each nonattainment and maintenance area to determine whether additional analysis was required. The estimated emissions in each area are shown in Table 4-2. Estimated emission totals were below the *de*

minimis levels (100 tons per year of the pollutant for which the area is nonattainment or maintenance) for all three nonattainment and maintenance areas; therefore, a conformity determination is not required.

Table 4-2. Conformity Analysis Results

Nonattainment or Maintenance Area/Pollutant	Total of Direct and Indirect Emissions (tons per year)	Conformity de Minimis Levels (tons per year)
One 500 kV Single-Circuit, AC Facility (First Line)		
Rillito Nonattainment Area/PM_{10}	97.6	100
Tucson/Pima County Maintenance Area/CO	59.2	100
San Manuel Maintenance Area/SO_2	0.09	100
West Pinal County Nonattainment Area/PM_{10}	47.65	100
Option A: Two 500 kV Single-Circuit, AC Facilities		
Rillito Nonattainment Area/PM_{10}	93.2	100
Tucson/Pima County Maintenance Area/CO	58.7	100
San Manuel Maintenance Area/SO_2	0.09	100
West Pinal County Nonattainment Area/PM_{10}	47.65	100
Option B: One 500 kV Single-Circuit AC Facility and One 500 kV Single-Circuit DC Facility		
Rillito Nonattainment Area/PM_{10}	95.2	100
Tucson/Pima County Maintenance Area/CO	62.9	100
San Manuel Maintenance Area/SO_2	0.09	100
West Pinal County Nonattainment Area/PM_{10}	50.96	100

4.2.3.3 Route Group 1: SunZia East Substation to Midpoint Substation

Criteria pollutant emissions associated with construction and expansion of the SunZia East Substation are summarized in Appendix F. GHG emissions associated with construction and operation of the substation are also shown in Appendix F. GHGs expressed as CO_2 from substation construction include CO_2, CH_4, and N_2O, while GHGs emitted during substation operation include only SF_6.

The results of the air pollutant dispersion modeling conducted for construction of the SunZia East Substation are also shown in Appendix F. Emissions from nonroad engines (construction equipment) are slightly higher for the SunZia East Substation than for some of the smaller substations; therefore, the dispersion modeling analysis for the SunZia East Substation construction was used to represent the local ambient impacts from all substations because these impacts are expected to be as high or higher than those from all other substations. For fugitive dust emissions, construction of the Midpoint Substation was modeled instead of the SunZia East Substation because a larger area would be disturbed, thereby increasing emissions. Once again, the most conservative modeling results were used to represent the minor differences in expected impacts between the substations. The results also vary slightly by substation, because the background air pollutant concentrations vary in different areas and because different surface characteristics were used for different substations. Representative background air quality concentrations and surface characteristics were applied to each substation location in estimating impacts. All impacts are predicted to be within regulatory limits (below the applicable National

and/or New Mexico Ambient Air Quality Standards). No significant impacts to air quality (see Section 4.2.2.1) would result from the construction or operation of the substations.

4.2.3.4 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Criteria pollutant emissions associated with construction and expansion of the Midpoint and Lordsburg substations; GHG emissions associated with construction and operation of the two substations; and impacts associated with the construction of the two substations are summarized in Appendix F.

All impacts are predicted to be within regulatory limits (below the applicable National and/or New Mexico Ambient Air Quality Standards). No significant impacts to air quality (see Section 4.2.2.1) would result from the construction or operation of the substations.

4.2.3.5 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Criteria pollutant emissions associated with construction and expansion of the Willow-500 kV and Pinal Central substations; GHG emissions associated with construction and operation of the two substations; and impacts associated with the construction of the two substations are shown in Appendix F.

With the exception of 24-hour PM_{10}, impacts are predicted to be within regulatory limits (below the applicable National and/or Arizona Ambient Air Quality Standards). Because of high background concentrations of PM_{10} within the West Pinal County PM_{10} nonattainment area, maximum total 24-hour PM_{10} impacts (Project + background) from transmission line and Pinal Central Substation construction were projected to potentially exceed the numerical value of the PM_{10} standards. It should be noted that the form of the standard is "not to be exceeded more than once per year, on average over three years." The modeled concentrations used in this comparison were maximum impacts (rather than second high impacts, as would fit the form of the standard) due to the screening nature of the dispersion model used. In addition, maximum project emissions within the nonattainment area are unlikely to persist over 3 years, due to the short segment of transmission line (approximately 6 miles) within the nonattainment area. As a result, an actual exceedance of the standard due to Project activities is unlikely but cannot be ruled out. Therefore, a potential significant impact (see Section 4.2.2.1) could result from Project construction activities[1].

[1] The AERSCREEN model assumes a worst-case scenario, and does not fully account for the use of mitigation measures. Prior to and during construction activities, the Project owners or contractors would be responsible for complying with NAAQS. More site-specific modeling and mitigation would be utilized and implemented such that construction and operation of the Project would not likely indicate an exceedance of any NAAQS.

4.3 EARTH RESOURCES

4.3.1 Introduction

This chapter describes the impacts associated with geological hazards and with Earth resources, such as minerals and soils, that could result from the construction, operation, and decommissioning of the Project.

Potential impacts resulting from geological hazards include ground rupture from Quaternary faults, destabilization of the land surface by fissures, and flooding. Potential impacts to mineral resources associated with the Project includes the restriction of access to locatable, leasable, and salable mineral resources; while potential impacts to soil resources include accelerated rates of erosion by water or wind, and the irreversible conversion of designated Prime or Unique Farmland soils to nonagricultural uses.

Mitigation planning provides a way by which impacts associated with the Project may be reduced to acceptable levels, thereby minimizing the effect that the Project would have on the environment. The mitigation planning process includes: (1) an inventory of Earth resources within the Project area; (2) the assignment of sensitivity levels to the inventoried data; (3) the application of the access model and standard mitigation measures to the resource sensitivities, to produce the initial impact levels; and (4) the application of selective mitigation measures to the initial impact levels, to arrive at the residual impact levels. Initial and residual impacts were assessed on a five-tiered scale, 1 to 5; with 5 being High and 1 being Low.

4.3.2 Impact Assessment Methodology

4.3.2.1 Geological Hazards

Methods for assessing potential impacts resulting from geological hazards include: (1) identifying the types of potential impacts; (2) developing criteria for assessing the intensity of potential impacts to the Project (Table 4-3); (3) classifying the relative sensitivity (high, moderate, or low) of areas to the likelihood of a geological hazard occurring in the future; (4) estimating the initial impacts to the Project based on the resource sensitivity and the access model; (5) identifying the appropriate selective mitigation measures for minimizing potential adverse effects; (6) determining specific areas where selective mitigation should be applied; and (7) estimating the potential residual impacts to the Project.

Table 4-3. Criteria for Assessing Intensity of Impacts Resulting from Geological Hazards

High	Areas where Quaternary faults are present Areas where fissures (and, therefore, subsidence) are present Areas where floodplains are present
Low	Areas where Quaternary faults are not present Areas where fissures are not present

Types of Potential Impacts

Geological hazards could directly and indirectly impact the construction and operation of the Project. The Project would not have any direct or indirect impact on geological hazards.

Potential direct effects resulting from geological hazards include:

- Loss of equipment or injury as a result of earthquakes or flooding

Potential indirect impacts resulting from geological hazards include:

- Loss of transmission service as a result of earthquakes, fault-related ground rupture, or land-surface destabilization by fissures

Criteria for Assessing Intensity of Impacts

Criteria were developed to assess the intensity of potential impacts to the Project resulting from geological hazards. Areas where Quaternary faults are present were assigned a high level of impact intensity, because the faults are considered active and capable of generating strong earthquakes (USGS 2006). Areas where surface fissures are present were also assigned a high level of impact intensity, because the fissures may be actively expanding, and thus capable of destabilizing the land surface in the near future.

Mitigation of Impacts

Initial sensitivity classifications and the impact model are the basis for assessing initial potential impacts of geological hazards on the Project. These classifications, presented in Table 4-4, were assigned using the criteria presented in Table 4-5. Standard mitigation measures would be implemented to mitigate impacts that could occur throughout the Project area. These measures include restricting vehicle access to limit disturbance of the ground surface and vegetation, requiring new access roads to follow the natural land contours as closely as possible, and attempting to use pre-existing access roads to the greatest degree possible; all of which help to prevent land-surface destabilization. Due to their universal application, standard mitigation measures were considered in the assessment of initial impact levels.

In addition to the standard mitigation measures and BMPs included as part of the Project descriptions in Chapter 2 (see Table 2-10), a selective mitigation measure was developed to mitigate potential impacts resulting from areas identified as having fissures (see SE 8, Table 2-11).

Residual Impacts

Table 4-4 summarizes the initial sensitivity classification that provided the basis for assessing initial impacts of geological hazards on the Project, the selective measure applied to mitigate these potentially adverse effects, and residual impacts.

Table 4-4. Summary of Sensitivity Level Impacts by Geological Hazards				
Geological Hazard	**Resource Sensitivity Level**	**Initial impacts**	**Mitigation Measure Applied**	**Residual Impact**
Quaternary Faults	High	Moderate	—	Moderate
Fissures	High	High	SE 8	Moderate
100-year Floodplain	High	High	SE 8	Moderate

4.3.2.2 Mineral Resources

The methods for assessing potential impacts on mineral resources resulting from construction of the Project include: (1) identifying the types of potential impacts; (2) classifying the sensitivity of the mineral resources; (3) developing criteria for assessing the intensity of a potential effect to a mineral resource; (4) estimating the initial impacts to mineral resources; (5) identifying the appropriate selective mitigation measure(s) to mitigate impacts; and (6) estimating the potential residual impacts to mineral resources.

Types of Potential Impacts

Locatable and salable mineral resources can be exposed at the surface, lie just below the surface, or be located several hundred feet below the surface. Active mines and mining operations exist throughout the Project study area. Where mining operations or mineral resources cannot be avoided, the construction and operation of the Project could limit development and extraction of mineral resources, where Project facilities might interfere with mining activities. Blasting done during the construction phase could also impact mineral development. The use of standard and selective mitigation measures would minimize impacts to mineral development. Access constructed for the Project could provide improved access for mining activities in remote areas.

Criteria for Assessing Intensity of Impacts

Criteria were developed to assess the intensity of potential impacts to mineral resources associated with implementation of the Project (Table 4-5). These criteria were based on the type of mineral resource and any activities associated with it, such as mining, drilling, testing, etc.

Table 4-5. Criteria for Assessing Intensity of Impacts to Mineral Resources	
High	Areas with known active mines or mining claims with commercial value Areas with known oil or gas wells with commercial value Areas with known mineral resources with commercial value Areas with known producing geothermal wells with commercial value
Moderate	Areas with geothermal resources or leases Oil and gas leases, coal leases, mineral leases

Table 4-5. Criteria for Assessing Intensity of Impacts to Mineral Resources	
Low	Areas with no known active mines or mining claims Areas with no known oil or gas wells Areas with no known geothermal resources Areas with no known coal or other mineral leases Areas with no known mineral resources

Mitigation of Impacts

Initial resource sensitivity classifications are the basis for assessing initial potential impacts to mineral resources associated with the construction and implementation of the Project. These classifications were assigned using the criteria presented in Table 4-5. Standard mitigation measures would be implemented to mitigate impacts that could occur throughout the Project area, and applied at all points within it. These measures include restricting vehicle access to limit disturbance of the ground surface and vegetation, requiring new access roads to follow the natural land contours as closely as possible, and attempting to use pre-existing access roads to the greatest extent possible. Due to their universal application, standard mitigation measures were considered in the assessment of the initial impact levels.

In addition to the BMPs included as part of the Project description in Chapter 2, a selective mitigation measure was developed to mitigate potential high and moderate impacts to mineral resources. This measure includes the avoidance or spanning of active mines or claims, geothermal leases, or producing wells, where feasible (see SE 8, Table 2-11). Site specific design of roads and structures using standard and selective mitigation measures would minimize restrictions to mineral development.

Residual Impacts

Table 4-6 summarizes the initial resource sensitivity classifications that provided the basis for assessing initial impacts on mineral resources, the mitigation measures applied to mitigate potentially high and moderate adverse effects on those resources, and residual impacts. A determination would be made regarding the presence of pre-1955 mining claims during the survey process. If such claims are located and refuted, the BLM would need to receive authorization from the claimant prior to grant of right-of-way.

Table 4-6. Summary of Sensitivity Level and Residual Impacts on Mineral Resources

Mineral Resource	Resource Sensitivity Level	Mitigation Measure Applied	Residual Impacts
Active mines, active claims, producing wells	High	SE 8	Low to Moderate
Geothermal agreements and leases	Moderate	SE 8	Low to Moderate
Oil and Gas Leases	Moderate	SE 8	Low to Moderate
Potential Mines	Moderate	SE 8	Low to Moderate

4.3.2.3 Soil Resources

The methods for assessing potential impacts on soil resources resulting from construction of the Project include: (1) identifying the types of potential impacts; (2) developing criteria for assessing the intensity of potential impacts to soil resources; (3) classifying the relative sensitivity (high, moderate, low) of areas to accelerated erosion by water or wind, and the conversion of designated Prime or Unique Farmland soils to nonagricultural uses; (4) assessing initial impacts; (5) identifying the appropriate selective mitigation measure(s) to mitigate impacts; (6) determining specific areas where selective mitigation should be applied; and (7) estimating the potential residual impacts on soil resources.

Types of Potential Impacts

The construction of the Project would result in both direct and indirect adverse impacts to soil resources. Direct impacts associated with construction activities could include:

- Accelerated soil erosion in areas where construction-related activities have disturbed or altered the land surface by exposing soils (temporary)
- Accelerated soil erosion in areas where construction-related activities have altered the contours of the land surface (temporary)
- Loss of designated Prime or Unique Farmland soils (i.e., conversion to nonagricultural uses) (permanent)

There would be minimal direct impacts associated with the operation of the facilities, presence of the transmission line, or maintenance activities associated with the Project; however, indirect impacts would occur.

Indirect impacts associated with both the construction and operation of the Project could include the following:

- Construction of permanent access roads, which could be used by the general public to access currently inaccessible areas, potentially resulting in accelerated rates of erosion by water or wind (permanent)
- Degradation of the land surface and loss of soils resulting from accelerated soil erosion (temporary to permanent)
- Loss of soil productivity and negative impacts on water quality, if sediment is washed into nearby streams and lakes (temporary), see Section 4.5

Biological Soil Crusts and Desert Pavements

Potential Project-related impacts to biological soil crusts are associated with the direct impacts of surface-disturbing activities (e.g., blading of new access roads) and the indirect impacts of increased public recreational use (e.g., access of OHVs). Based on the rarity of ideal biological crust supporting soil types (Section 3.3.5.3) within the Project area, it is unlikely that the Project would encounter and impact these unique resources. However, if biological soil crusts were

identified during Project activities, existing standard and selective mitigation measures would be implemented in order to limit impacts, including restricting access to mapped and designated roadways, and spanning and avoiding sensitive areas.

Desert pavements may occur within the Project area on low slope surfaces that have been undisturbed by previous ground-disturbing activities such as grazing or construction. Potential Project-related impacts to desert pavements are associated with the blading of new access roads on these undisturbed surfaces, which would break up the surface and decrease its stability, in turn increasing the potential for both water and wind erosion. Standard and selective mitigation measures, such as restricting construction access to defined travelways, would limit potential direct impacts; and closing or limiting the use of access roads that are not necessary for the operation and maintenance of the Project would limit indirect impacts from increased public recreation access.

Criteria for Assessing Intensity of Impacts

Criteria were developed to assess the intensity of a potential impact on soil resources associated with implementation of the Project (Table 4-7). These criteria were based on susceptibility of soils to water and wind erosion, and potential impacts on designated Prime or Unique Farmland soils.

Soil susceptibilities to water and wind erosion were assessed based on standards from the NRCS. SSURGO-level soil mapping units assigned a K_w value of 0.40 or higher have a high susceptibility to water erosion; soil mapping units assigned a K_w value between 0.20 and less than 0.40 have a moderate susceptibility to water erosion; and soil mapping units assigned a K_w value less than 0.20 have a low susceptibility to water erosion. The susceptibility of a soil mapping unit to wind erosion is based on its assignment to a Wind Erodibility Group or WEG. Soil mapping units assigned to WEG 1 or 2 are highly susceptible to wind erosion; soil mapping units assigned to WEG 3, 4, or 4L have a moderate susceptibility to wind erosion; soil mapping units assigned to WEG 5, 6, or 7 have a low susceptibility to wind erosion; and soil mapping units assigned to WEG 8 are not susceptible to wind erosion.

Table 4-7. Criteria for Assessing Intensity of Impacts to Soil Resources

High	Designated Prime or Unique Farmland soils Soils highly susceptible to water erosion (Kw ≥ 0.40) Soils highly susceptible to wind erosion (WEG = 1 or 2)
Moderate	Soils moderately susceptible to water erosion (0.2 ≥ Kw < 0.40) Soils moderately susceptible to wind erosion (WEG = 3, 4, or 4L)
Low	Soils weakly susceptible to water erosion (Kw < 0.20) Soils weakly or not susceptible to wind erosion (WEG = 5, 6, 7, or 8) Soils that have never been and will never be designated Prime or Unique Farmland

Mitigation of Impacts

Initial resource sensitivity classifications were the basis for assessing initial potential impacts to soil resources associated with the construction and implementation of the Project. These classifications were assigned using the criteria presented in Table 4-7. Standard mitigation

measures are implemented to mitigate impacts that could occur throughout the Project study area, and were applied at all points within it. These measures include restricting vehicle access to limit disturbance of the ground surface and vegetation, requiring new access roads to follow the natural land contours as closely as possible, and attempting to use pre-existing access roads to the greatest degree possible. Due to their universal application, standard mitigation measures were considered in the assessment of the initial impact levels.

In addition to BMPs included as part of the Project description in Chapter 2, selective mitigation measures were developed to mitigate potential high and moderate (initial) impacts to soil resources. Selective mitigation measures applied to reduce these impacts are summarized in Table 4-8.

Based upon site-specific travel planning and NEPA analysis, the respective agency would determine which roads on public lands would remain open, restricted, or closed to the public (SE 4) or gated (SE 6), using the most effective and least environmentally damaging methods appropriate, where feasible. These mutually exclusive measures would minimize traffic across minimally or previously undisturbed landscapes, which would limit the exposure of soils susceptible to water or wind erosion.

A detailed Project reclamation plan would be developed to mitigate site-specific resource impacts (SE 5), which would aid in returning the land surface to a state close to its original condition; thereby limiting the exposure of soils susceptible to water or wind erosion, and the irreversible conversion of designated Prime or Unique Farmland soils to nonagricultural uses.

Structures would span designated Prime or Unique Farmland soils (SE 8) to minimize irreversible conversion of agricultural lands to nonagricultural uses, by limiting the number of structure sites located on designated Prime or Unique Farmland soils.

Residual Impacts

Table 4-8 summarizes the initial resource sensitivity classifications that provided the basis for assessing initial impacts to soil resources, the mitigation measures applied to mitigate potentially adverse impacts on those resources, and residual impacts.

Table 4-8. Summary of Sensitivity Level and Residual Impacts on Soil Resources

Soil Resource	Resource Sensitivity Level	Mitigation Measure(s) Applied (Table 2-11)	Residual Impacts
Soils with a high susceptibility to water or wind erosion	High	SE 5 (4 or 6, but not both)	Moderate to Low-Moderate
Soils designated Prime or Unique Farmland	High	SE 5, 8 (4 or 6, but not both)	Moderate to Low-Moderate
Soils with a moderate susceptibility to water or wind erosion	Moderate	SE 5 (4 or 6, but not both)	Low
Soils with a low susceptibility to water or wind erosion	Low	None	Low
Soils not designated Prime or Unique Farmland	Low	None	Low

4.3.2.4 Significant Impacts

For the purposes of this analysis, a significant impact on earth resources, including geological hazards, mineral resources, and soil resources, could result if any of the following were to occur from construction or operation of the proposed action:

- Loss of equipment or injury as a result of earthquakes or flooding
- Loss of transmission service as a result of earthquakes, fault-related ground rupture, or land-surface destabilization by fissures caused by subsidence
- Loss of availability of a known mineral resource that would be of value
- Limited development and extraction of mineral resources, resulting from the presence of permanent facilities or fences and gates
- Substantial soil erosion and loss of soil material and productivity
- Permanent conversion of designated Prime or Unique Farmland soils to nonagricultural uses

4.3.3 Impact Analysis Results

A summary of baseline resource inventory and results of the impact analysis are presented in Table 4-9 and described in this section.

4.3.3.1 No Action Alternative

Under the No Action alternative, the environment would remain as it presently exists.

4.3.3.2 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Subroute 1A1 begins at the proposed SunZia East Substation, travelling across Chupadera Mesa to the Rio Grande crossing, then travelling south through the Rio Grande Valley to the proposed Midpoint Substation. The total length of the subroute is 228.8 miles. Potentially significant issues discussed in this section include geological hazards, disruption of mineral resource production, and loss of soil resources through accelerated erosion.

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 1A1 would be from Quaternary faults and 100-year floodplains. Following the implementation of SE 8 along Subroute 1A1, less than 1 percent of the subroute would have moderate residual impacts, less than 2 percent would have moderate-low residual impacts, and 98 percent would have low residual impacts from geological hazards. Moderate residual impacts are associated with the presence of Quaternary faults along links E200, A161a, and A260. Available data shows there

are only low and low-moderate residual impacts associated with 100-year floodplains in Luna County, along links A440 and A400.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 1A1 would be associated with restricting access to mineral resources, specifically those in the Socorro Peak mining district, west of Socorro, and in an area west of Caballo Reservoir. There are no moderate residual impacts to mineral resources along Subroute 1A1. Following the implementation of SE 8 along Subroute 1A1, 32 percent would have moderate-low residual impacts, and 68 percent would have low residual impacts to mineral resources.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 1A1 would be to soils that are susceptible to erosion, mainly those in the mountainous areas northeast of Socorro, New Mexico. Soils designated as Prime or Unique Farmland occur along 4 miles of this subroute. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 1A1, 29 percent (rounded to the nearest whole number) would have moderate-low impacts, and 71 percent would have low impacts on soil resources.

Subroute 1A2 – BLM Preferred Alternative

Subroute 1A2 is identical to Subroute 1A1, except for the more northerly route it takes with Link E86.

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 1A2 would be from Quaternary faults and 100-year floodplains. Following implementation of SE 8 along Subroute 1A2, less than 1 percent of the subroute would have moderate residual impacts, less than 2 percent would have moderate-low impacts, and 98 percent would have low residual impacts from geological hazards. Moderate residual impacts are associated with the presence of Quaternary faults along links E200, A161a, and A260.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 1A2 is the restriction of access to mineral resources, specifically those in the Socorro Peak mining district west of Socorro, and in an area west of the Caballo Reservoir. Following implementation of SE 8 along Subroute 1A2, 36 percent would have moderate-low impacts, and 64 percent would have low impacts on mineral resources.

Table 4-9. Alternative Route Comparison: Earth Resource Inventory Data and Residual Impacts

Subroute	Total Miles	Inventory														Impact Assessment										
		Geological Hazards (miles)			Mineral Resources (miles)			Soil Resources (miles)								Miles of Residual Impacts (miles)										
								Water Erosion			Wind Erosion			Farmland		Geological Hazards			Mineral Resources					Soil Resources		
		Faults	Fissures	100-Year Floodplains	No mining	Leases	Active mining	Low	Moderate	High	Low	Moderate	High	Low	High	Low	Low-Moderate	Moderate	Low	Low-Moderate	Moderate	Moderate-High	High	Low	Low-Moderate	Moderate
1A1	229	2.3	0	2.2	215	12	2	129	89	11	139	85	5	225	4	224	4	1	155	74	0	0	0	162	67	0.2
1A2	230	2.3	0	2.2	216	12	2	127	87	16	146	81	3	226	4	225	4	0.8	147	83	0	0	0	156	72	2
1A	220	2	0	2	205	12	2	127	83	9	126	86	8	219	0.6	215	4	0.5	124	95	0.6	0	0	154	66	0
1B1	224	2	0	2	216	5	3	118	95	11	106	96	22	224	0	219	3	1	128	93	2	0	0	149	74	0.1
1B2	209	2	0	2	194	12	3	113	80	17	107	82	20	209	0	205	3	1	122	83	5	0	0	140	69	0.1
1B3	206	2	0	2	188	16	3	118	75	14	112	75	19	206	0	202	3	1	119	81	7	0	0	142	64	0.1
3A2	124	0.5	0	6	116	4	4	61	58	5	49	54	21	110	14	117	4	3	55	69	0	0	0	60	64	0
3A	123	0.5	0	10	116	4	4	65	64	5	49	55	20	110	14	116	4	4	55	69	0	0	0	57	67	0
3B	129	0	0	6	124	2	3	35	94	0.2	54	59	17	101	28	124	2	3	82	46	1	0	0	59	70	0
4A	133	1	0.3	6	113	0.2	20	66	66	0.2	76	57	0.4	125	8	128	4	0.8	55	70	8	0	0	94	39	0.1
4B	133	0.1	0.3	7	113	0.2	20	56	73	4	64	69	0.4	106	27	129	2	2	45	81	8	0	0	76	54	3
4C2c	161	0	0.3	8.8	144	0	17	83	75	3	83	76	2	148	13	152	9	0.4	87	74	0	0	0	110	50	1
4C1	139	0.1	0.3	8	129	0.1	10	66	70	3	75	64	0.2	126	13	134	5	0.4	57	81	1	0	0	92	46	2
4C2	152	0	0.3	9	135	0	17	73	76	3	73	77	2	139	13	144	7	0.4	69	82	1	0	0	99	52	1
4C3	173	0	0.3	29	159	0.1	14	76	95	2	93	73	7	131	40	150	23	0.4	105	68	0.4	0	0	105	67	0.5

Total miles rounded to the nearest whole number.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 1A2 would be to soils that are susceptible to water erosion, mostly those in the mountainous areas northeast of Socorro, New Mexico, and northwest of the Gran Quivira. Soils designated as Prime or Unique Farmland occur along 4 miles of this subroute. Following implementation of SE 4 or 6, 5, and 8 along Subroute 1A2, less than 1 percent of this subroute would have moderate impacts, 31 percent would have moderate-low impacts, and 68 percent would have low impacts on soil resources. Moderate impacts are associated with soils that are highly susceptible to water erosion along Link E86.

Subroute 1A – North River Crossing

Subroute 1A is identical to Subroute 1A1, except for the segment that crosses Chupadera Mesa (Link A22-E80c).

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 1A would be from Quaternary faults and 100-year floodplains. Following the implementation of SE 8 along Subroute 1A, less than 1 percent of the subroute would have moderate residual impacts, less than 2 percent would have moderate-low residual impacts, and 98 percent would have low residual impacts from geological hazards. Moderate residual impacts are associated with the presence of Quaternary faults along links E200, A161a, and A270.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 1A would be associated with restricting access to mineral resources, specifically those in the Socorro Peak mining district, west of Socorro, and in an area west of Caballo Reservoir. Following the implementation of SE 8 along Subroute 1A, less than 1 percent of the total miles would have moderate residual impacts, 43 percent would have moderate-low residual impacts, and 56 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines or leases along Link 161a, and moderate-low residual impacts are associated with the presence of active mines or leases along links A330a and A330b.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 1A would be to soils that are susceptible to water erosion, mainly those in the mountainous areas northeast of Socorro, New Mexico. Soils designated as Prime or Unique Farmland occur along 0.6 mile of this subroute. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 1A, less than 1 percent of this subroute would have moderate impacts, 30 percent would have moderate-low

impacts, and 70 percent would have low impacts on soil resources. Moderate residual impacts are associated with soils that are highly susceptible to wind erosion along Link E80d.

Subroute 1B – San Antonio Crossing

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 1B1 would be from Quaternary faults. Following the implementation of SE 8 along Subroute 1B1, less than 1 percent of the subroute would have moderate residual impacts, less than 1 percent would have moderate-low impacts, and 99 percent would have low impacts from geological hazards. Moderate residual impacts are associated with the presence of Quaternary faults along links A111, A112, A140, A161a, and A270. The impacts from floodplains are the same as for Subroute 1A.

The primary impact of concern associated with the implementation of Subroute 1B2 would be from Quaternary faults. Following the implementation of SE 8 along Subroute 1B2, less than 1 percent of the subroute would have moderate residual impacts, less than 1 percent would have moderate-low residual impacts, and 99 percent would have low residual impacts from geological hazards. Moderate residual impacts are associated with the presence of Quaternary faults along links A111, A112, A140, A161a, and A270.

The primary impact of concern associated with the implementation of Subroute 1B3 would be from Quaternary faults. Following the implementation of SE 8 along Subroute 1B3, less than 1 percent of the subroute would have moderate residual impacts, less than 1 percent would have moderate-low residual impacts, and 99 percent would have low residual impacts from geological hazards. Moderate residual impacts are associated with the presence of Quaternary faults along links A111, A112, A140, A161a, and A270.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 1B1 would be associated with restricting access to mineral resources, specifically those in the Carthage coalfield, the Socorro Peak mining district west of Socorro, the Louis Lopez mining district southwest of San Antonio, and in an area west of Caballo Reservoir. Following the implementation of SE 8 along Subroute 1B1, less than 1 percent would have moderate residual impacts, 42 percent would have moderate-low residual impacts, and 57 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines and leases along links A160 and A161a; and moderate-low impacts are associated with the presence of coal leases and active mines along links A90 and A111.

The primary impact of concern associated with the implementation of Subroute 1B2 would be associated with restricting access to mineral resources, specifically those in the oil and gas leases west of SunZia East, the Carthage coalfield, the Louis Lopez mining district southwest of San Antonio, and in an area west of Caballo Reservoir. Following the implementation of SE 8 along Subroute 1B2, 2 percent would have moderate residual impacts, 39 percent would have

moderate-low residual impacts, and 58 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines and leases along links A160 and A161a; and moderate-low impacts are associated with the presence of coal leases along links A30, A50, A90, and A111, and with the presence of active mines and leases along links A330a and A330b.

The primary impact of concern associated with the implementation of Subroute 1B3 would be associated with restricting access to mineral resources, specifically those in oil and gas leases west of SunZia East, the Carthage coalfield, the Louis Lopez mining district southwest of San Antonio, and in an area west of Caballo Reservoir. Following the implementation of SE 8 along Subroute 1B3, 3 percent would have moderate residual impacts, 39 percent would have moderate-low residual impacts, and 57 would have low residual impacts to mineral resources.

Moderate residual impacts are associated with the presence of active mines and leases along Link A160; and moderate-low impacts are associated with the presence of active mines and coal leases along links A30, A40, A80, and A111, and with the presence of active mines and leases along links A330a and A330b.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 1B1 would be to soils that are susceptible to wind erosion, mainly those in the Jornada del Muerto. No soils designated Prime or Unique Farmland occur along this subroute. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 1B1, less than 1 percent of the subroute would have moderate impacts, 33 percent would have moderate-low impacts, and 67 percent would have low residual impacts on soil resources. Moderate residual impacts are associated with soils that are highly susceptible to wind erosion along links E80d and A111. The primary impact of concern associated with the implementation of Subroute 1B2 would be to soils that are susceptible to wind erosion, mainly those in the Jornada del Muerto. No soils designated Prime or Unique Farmland occur along this subroute. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 1B2, less than 1 percent of the subroute would have moderate impacts, 33 percent would have moderate-low residual impacts, and 67 percent would have low residual impacts on soil resources. Moderate residual impacts are associated with soils that are highly susceptible to wind erosion along Link A111.

The primary impact of concern associated with the implementation of Subroute 1B3 would be to soils that are susceptible to wind erosion, mainly those in the Jornada del Muerto. Soils designated as Prime or Unique Farmland occur along this subroute. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 1B3, less than 1 percent of the subroute would have moderate impacts, 31 percent would have moderate-low residual impacts, and 69 percent would have low residual impacts on soil resources. Moderate residual impacts are associated with soils that are highly susceptible to wind erosion along Link A111.

Local Alternative Links

Geological Hazards

The primary impacts of concern associated with implementation of local alternative links A260, A430, and A481 are from Quaternary faults and from flooding. Following implementation of SE 8, 2 percent of these links have moderate residual impacts, 2 percent have low-moderate residual impacts, and 96 percent have low residual impacts from geological hazards. The other local alternative links have only low residual impacts from geological hazards.

Mineral Resources

Local alternative links for 1A and 1B1 (Gran Quivira area) do not cross any known mineral resources or mines and, therefore, only have low residual impacts. Local alternative links for 1A, 1B1, 1B2, and 1B3 (A161b, A260, A361-A430-A481) do not cross any known mineral resources or mines and, therefore, only have low residual impacts.

Soil Resources

The primary impact of concern associated with the implementation of local alternative links E81, E83, E82-E84-E85 would be to soils that are susceptible to water erosion, mainly those in the Gran Quivira area. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along this local alternative, less than 1 percent of the links would have moderate residual impacts, 66 percent would have moderate-low residual impacts, and 34 percent would have low residual impacts on soil resources.

The primary impact of concern associated with the implementation of local alternative links A161b, A260, A361-A430-A481 would be to soils that are susceptible to water erosion, mainly those in the Uvas Valley. No soils designated Prime or Unique Farmland occur along this subroute. Following the implementation of SE 4 or 6, 5, and 8 along this local alternative, 37 percent would have moderate-low residual impacts and 63 percent would have low residual impacts on soil resources.

Crossover Links

Geological Hazards

Crossover Link A70 has low residual impacts from geological hazards, such as subsidence or flooding.

Mineral Resources

Crossover Link A70 does not cross any known mineral resources or mines.

Soil Resources

The primary impact of concern associated with the implementation of Crossover Link A70 would be to soils that are susceptible to water erosion, mainly those in the vicinity of Yellow Dog Canyon. No soils designated Prime or Unique Farmland occur along this subroute. Following the implementation of SE 4 or 6, 5, or 8 along Crossover Link A70, 75 percent would have moderate-low residual impacts and 25 percent would have low residual impacts on soils.

4.3.3.3 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A2 – BLM Preferred Alternative

Subroute 3A2 begins at the proposed Midpoint Substation, and travels west to the proposed Willow-500 kV Substation. The length of this subroute is 123.9 miles. Potentially significant issues discussed in this section include geological hazards, disruption of mineral resource production, and loss of soil resources through accelerated erosion.

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 3A2 would be from flooding on 100-year floodplains. Following implementation of SE 8 along Subroute 3A2, 2 percent of the subroute would have moderate residual impacts and 98 percent would have low residual impacts. Moderate residual impacts are associated with flooding on 100-year floodplains along links B90, B120a, B160d, and B170.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 3A2 would be associated with the restriction of access to mineral resources, specifically those in mining districts near Deming and Lordsburg. Following the implementation of SE 8 along Subroute 3A2, 56 percent would have moderate-low residual impacts and 44 percent would have low residual impacts.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 3A2 would be to soils susceptible to wind erosion, mainly those in the Animas Valley. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 3A2, 52 percent of the subroute would have moderate-low residual impacts and 48 percent would have low residual impacts to soil resources.

Subroute 3A – North

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 3A would be from flooding on 100-year floodplains. Following the implementation of SE 8 along Subroute 3A, 3 percent of the subroute would have moderate residual impacts, 3 percent would have moderate-low residual impacts, and 94 percent would have low residual impacts resulting from geological hazards.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 3A would be associated with restricting access to mineral resources, specifically those in mining districts near Deming and Lordsburg, the Big Burro Mountains northeast of Lordsburg and an oil and gas lease northwest of Lordsburg. Following the implementation of SE 8 along Subroute 3A, 56 percent would have moderate-low residual impacts and 44 percent would have low residual impacts to mineral resources. Moderate-low residual impacts are associated with the presence of active mines and leases along links B120B, B121, and B160a.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 3A would be to soils susceptible to wind erosion, mainly those in the Animas Valley. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 3A, 54 percent of the subroute would have moderate-low residual impacts and 46 percent would have low residual impacts to soil resources.

Subroute 3B – South

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 3B would be from flooding on 100-year floodplains. Following the implementation of SE 8 along Subroute 3B, 2 percent of the subroute would have moderate residual impacts, 1 percent would have moderate-residual impacts, and 97 percent would have low residual impacts from geological hazards. Moderate residual impacts are associated with flooding on 100-year floodplains along links B80, B110a, and B170.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 3B would be associated with restricting access to mineral resources, specifically those in the Lordsburg and Deming mining districts. Following the implementation of SE 8 along Subroute 3B, less than 1 percent would have moderate residual impacts, 36 percent would have moderate-low residual

impacts, and 64 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines and leases along Link B150a, and moderate-low residual impacts are associated with the presence of active mines and leases along Link B112.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 3B would be to soils susceptible to wind erosion, mainly those in the Animas Valley. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 3B, 54 percent of the subroute would have moderate-low residual impacts and 46 percent would have low residual impacts to soil resources.

Crossover Links

Geological Hazards

Crossover links B111 and B140 have only low residual impacts resulting from geological hazards, such as flooding.

Mineral Resources

Crossover links B111 and B140 have only low and moderate-low residual impacts to mineral resources.

Soil Resources

The primary impact of concern associated with the implementation of crossover links B111 and B140 for Route Group 3 would be to soils that are susceptible to water and wind erosion; mainly those in the Animas Valley. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along the Route Group 3 crossover links, 53 percent would have moderate-low residual impacts and 47 percent would have low residual impacts to soil resources.

4.3.3.4 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 4A would be from flooding on 100-year floodplains. Following the implementation of SE 8 along Subroute 4A, less than 1 percent of the subroute would have moderate impacts, 3 percent would have moderate-low residual impacts, and 97 percent would have low residual impacts from geological

hazards. Moderate residual impacts are associated with the presence of Quaternary faults and flooding on 100-year floodplains along links B153a and C173.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 4A would be associated with restricting access to mineral resources, specifically mines west and north of the Galiuro Mountains, and active claims northwest of Oracle. Following the implementation of SE 8 along Subroute 4A, 6 percent would have moderate residual impacts, 53 percent would have moderate-low residual impacts, and 41 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines and leases along links C170, C173, C592, and C620; and moderate-low residual impacts are associated with the presence of active mines and leases along links C178, C620, and C760.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 4A would be to soils susceptible to water erosion, mainly those in the northern Galiuro Mountains. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 4A, less than 1 percent of the subroute would have moderate impacts to soil resources, 30 percent of the subroute would have moderate-low residual impacts, and 70 percent would have low residual impacts to soil resources. Moderate residual impacts are associated with soils that are highly susceptible to wind erosion or capable of supporting Prime Farmland under appropriate conditions along Link B153a.

<u>Subroute 4B – Sulphur Springs Valley</u>

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 4B would be from flooding on 100-year floodplains. Following the implementation of SE 8 along Subroute 4B, 1.5 percent of the subroute would have moderate residual impacts, 1.5 percent would have moderate-low residual impacts, and 97 percent would have low residual impacts from geological hazards. Moderate residual impacts are associated with the presence of Quaternary faults and flooding on 100-year floodplains along links C90, C130a, and C173.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 4B would be associated with restricting access to mineral resources, specifically mines west and north of the Galiuro Mountains, and active claims northwest of Oracle. Following the implementation of SE 8 along Subroute 4B, 6 percent would have moderate residual impacts, 61 percent would have moderate-low residual impacts, and 33 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines and leases

along links C170, C173, C592, and C620; and moderate-low residual impacts are associated with the presence of active mines and leases along links C178, C620, and C760.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 4B would be to soils susceptible to water erosion, mainly those in the northern Galiuro Mountains and Aravaipa Canyon. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 4B, 3 percent of the subroute would have moderate residual impacts, 40 percent would have moderate-low residual impacts, and 57 percent would have low residual impacts to soil resources. Moderate residual impacts are associated with soils that are highly susceptible to water erosion or capable of supporting Prime or Unique Farmland under the appropriate conditions along Link C130b.

Subroute 4C2c – BLM Preferred Alternative

Subroute 4C2c begins at the proposed Willow Substation, travelling west to the proposed Pinal Central Substation. The length of this subroute is 161.2 miles. The BLM preferred alternative runs southwest from the Willow Substation across the Sulphur Springs Valley, crosses the San Pedro River, and continues northwest along the San Pedro River Valley, turning northwest towards the Pinal Central Substation. Potentially significant issues discussed in this section include geological hazards, disruption of mineral resource production, and loss of soil resources through accelerated erosion.

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 4C2c would be flooding on 100-year floodplains. Following the implementation of SE 8 along Subroute 4C2c, less than 1 percent of this subroute would have moderate residual impacts, 6 percent would have moderate-low residual impacts, and 94 percent would have low impacts. Moderate residual impacts include flooding on 100-year floodplains along Link C110.

Mineral Resources

The primary impact associated with the construction and operation of Subroute 4C2c would be potential restriction of access to mineral resources, specifically access to mines in the San Pedro River Valley near San Manuel, and active claims northwest of Oracle. Following the implementation of SE 8 along Subroute 4C2c, 46 percent of the length of the route would have moderate-low residual impacts and 54 percent would have low residual impacts to mineral resources.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 4C2c would be to soils susceptible to both water and wind erosion, mainly those in the San Pedro River Valley.

Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 4C2c, 1 percent of the subroute would have moderate residual impacts, 31 percent would have moderate-low residual impacts, and 68 percent would have low residual impacts to soils resources. Moderate residual impacts are associated with soils that are highly susceptible to wind erosion along links C201 and C441.

Subroute 4C1 – East of San Pedro River

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 4C1 would be flooding on 100-year floodplains. Following the implementation of SE 8 along Subroute 4C1, less than 1 percent of this subroute would have moderate residual impacts, 4 percent would have moderate-low residual impacts, and 96 percent would have low residual impacts from geological hazards.

Mineral Resources

The primary impact of concern with the implementation of Subroute 4C1 would be associated with restricting access to mineral resources. Following the implementation of SE 8 along Subroute 4C1, 1 percent would have moderate residual impacts, 58 percent would have moderate-low residual impacts, and 41 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines and leases along links C510 and C660, and moderate-low residual impacts are associated with the presence of active mines and leases along links C660, C693, and C760.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 4C1 would be to soils susceptible to water erosion, mainly those in the San Pedro River Valley. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 4C1, 1 percent of the subroute would have moderate residual impacts, 33 percent would have moderate-low residual impacts, and 66 percent would have low residual impacts to soil resources. Moderate residual impacts are associated with soils that are highly susceptible to water or wind erosion along links C470, C331, and C660.

Subroute 4C2 – West of San Pedro River

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 4C2 would be flooding on 100-year floodplains. Following the implementation of SE 8 along Subroute 4C2, less than 1 percent would have moderate residual impacts, 5 percent would have moderate-low

residual impacts, and 95 percent would have low residual impacts from geological hazards. Moderate residual impacts include flooding on 100-year floodplains along Link C110.

Mineral Resources

The potential impacts for Subroute 4C2 would be comparable to those associated with Subroute 4C2c. Following the implementation of SE 8 along Subroute 4C2, 1 percent would have moderate residual impacts, 54 percent would have moderate-low residual impacts, and 45 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines and leases along Link C510, and moderate-low residual impacts are associated with the presence of active mines and leases along links C680, C818, and C820.

Soil Resources

Impacts to soils along Subroute 4C2 are nearly identical to those identified along Subroute 4C2c. The primary impact of concern associated with the implementation of Subroute 4C2 would be to soils susceptible to both water and wind erosion, mainly those in the San Pedro River Valley. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 4C2, 1 percent of the subroute would have moderate residual impacts, 34 percent would have moderate-low residual impacts, and 65 percent would have low residual impacts to soil resources. Moderate residual impacts are associated with soils that are highly susceptible to wind erosion along links C266, C276, and C441.

<u>Subroute 4C3 – Tucson</u>

Geological Hazards

The primary impact of concern associated with the implementation of Subroute 4C3 would be flooding on 100-year floodplains. Following the implementation of SE 8 along Subroute 4C3, less than 1 percent of this subroute would have moderate residual impacts, 13 percent would have moderate-low residual impacts, and 87 percent would have low residual impacts from geological hazards. Moderate residual impacts include flooding on 100-year floodplains along Link C110.

Mineral Resources

The primary impact of concern associated with the implementation of Subroute 4C3 would be associated with restricting access to mineral resources, specifically mines in the Tucson area. Following the implementation of SE 8 along Subroute 4C3, less than 1 percent of the subroute would have moderate residual impacts, 39 percent would have moderate-low residual impacts, and 60 percent would have low residual impacts to mineral resources. Moderate residual impacts are associated with the presence of active mines and leases along Link C820, and moderate-low residual impacts are associated with the presence of active mines and leases along links C817 and C820.

Soil Resources

The primary impact of concern associated with the implementation of Subroute 4C3 would be to soils susceptible to water erosion, mainly those in the Little Rincon Mountains. Soils designated as Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following the implementation of SE 4 or 6, 5, and 8 along Subroute 4C3, less than 1 percent of the subroute would have moderate residual impacts to soil resources, 39 percent (rounded to the nearest whole number) would have moderate-low residual impacts to soil resources, and 61 percent would have low residual impacts to soil resources. Moderate residual impacts are associated with soils that are highly susceptible to wind erosion along links C261 and F40a.

Local Alternative Links

Geological Hazards

The primary impact of concern associated with implementation of Local Alternative Link C790 for subroutes 4A and 4B is from flooding. Following implementation of SE 8, 8 percent of these links have low-moderate residual impacts and 92 percent have low residual impacts from geological hazards.

The primary impact of concern associated with the implementation of local alternative links C860, C870, and C890 for the planned Pinal Central Substation is flooding and fissures. Following implementation of SE 8, 4 percent of these links would have moderate residual impacts, 5 percent would have moderate-low residual impacts, and 91 percent would have low residual impacts from geological hazards. Moderate residual impacts are associated with floodplains.

The primary impact of concern associated with the implementation of Local Alternative Link C692 for Subroute 4C1 is flooding. Following implementation of SE 8 along Local Alternative Link C692, 100 percent of this link would have low residual impacts from geological hazards.

The primary impact of concern associated with the implementation of the Winchester and Tortolita substations local alternative links is flooding. Following implementation of SE 8 at these substations, 1 percent of the links would have moderate-low residual impacts and 99 percent would have low residual impacts from geological hazards.

The primary impact of concern associated with the implementation of the Pantano-Rillito local alternative links is flooding. Following implementation of SE 8 along the Pantano-Rillito alternative route, 56 percent of the links would have moderate-low residual impacts and 44 percent would have low residual impacts from geological hazards.

The primary impact of concern associated with the implementation of local alternative links C72, C90, C121, and C211 for subroutes 4C1, 4C2, and 4C3 is flooding. Following implementation of SE 8 along subroutes 4C1, 4C2, and 4C3, 3 percent of these links would have moderate residual impacts, 24 percent of the links would have moderate-low residual impacts, and 73 percent would have low residual impacts. Moderate residual impacts are associated with floodplains from geological hazards.

Mineral Resources

The primary impact of concern associated with the implementation of local alternative links C692, C790, C860, C870, and C890 is to active mining claims. The local alternative links for the Winchester and Tortolita substations have several mines within 1 mile of their centerline. These links have 50 percent of their total mileage with moderate-low residual impacts. The local alternative links for 4C3 (F40b-F51-F60a, F81a-F81b, C812) have numerous mines within 1 mile of the centerline; but with the implementation of SE 8, only 16 percent of their length have moderate-low residual impacts and 84 percent have low residual impacts. Local alternative links for 4C1, 4C2, and 4C3 (C72-C90-C121-C211) have fewer mines within 1 mile of the centerline. This results in 32 percent of moderate-low residual impacts for their total length, and 68 percent of low residual impacts.

Soil Resources

The primary impact of concern associated with the implementation of Local Alternative Link C790 for subroutes 4A and 4B would be approximately equal between soils that are susceptible to water and wind erosion, mainly those in the vicinity of Brady Wash. No soils designated Prime or Unique Farmland occur along this subroute. Following the implementation of SE 4 or 6, and 5 along Link C790, 33 percent of this link would have moderate-low residual impacts and 67 percent would have low residual impacts.

The primary impact of concern associated with the implementation of local alternative links C860, C870, and C890 for the planned Pinal Central Substation would be approximately equal between soils that are susceptible to water and wind erosion. Soils designated Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following implementation of SE 4 or 6, 5, and 8, 80 percent of these links would have moderate-low residual impacts and 20 percent would have low residual impacts.

The primary impact of concern associated with the implementation of Local Alternative Link C692 for Subroute 4C1 would be to soils that are susceptible to wind erosion. No soils designated Prime or Unique Farmland occur along this subroute. Following implementation of SE 4 or 6, and 5 along Local Alternative Link C692, 20 percent of the link would have moderate-low residual impacts and 80 percent would have low residual impacts.

The primary impact of concern associated with the implementation of the Winchester and Tortolita substations would be to soils that are susceptible to water erosion. Soils designated Prime or Unique Farmland occur along this subroute, but impacts to them would be mitigated. Following implementation of SE 4 or 6, 5, and 8 at the Winchester and Tortolita substations, 21 percent would have moderate-low residual impacts, and 79 percent would have low residual impacts. Moderate residual impacts are associated with soils that are designated Prime or Unique Farmland.

The primary impact of concern associated with the implementation of local alternative links F40b, F51, F60a, F81a, F81b, and C812 would be to soils that are susceptible to water erosion. Soils designated Prime or Unique Farmland occur along this subroute, but impacts to them

would be mitigated. Following implementation of SE 4 or 6, 5, and 8, 22 percent of the links would have moderate-low residual impacts and 78 percent would have low residual impacts.

The primary impact of concern associated with the implementation of local alternative links C72, C90, C121, and C211 would be to soils that are designated Prime or Unique Farmland. Soils that are highly susceptible to water or wind erosion do not occur along these links. Following implementation of SE 4 or 6, 5, and 8, 52 percent of the links would have moderate-low residual impacts and 48 percent would have low residual impacts.

Crossover Links

Geological Hazards

The primary impact of concern associated with the implementation of crossover links C500, C501, C502, and C174 for subroutes 4A, 4B, and 4C1 is flooding. Following implementation of SE 8 along these subroutes, 1 percent of the links would have moderate residual impact, 1 percent would have moderate-low residual impacts, and 98 percent would have low residual impacts. Moderate residual impacts are associated with floodplains.

The primary impact of concern associated with the implementation of Crossover Link C671 for subroutes 4A, 4B, 4C1, and 4C2 is flooding. Following implementation of SE 8 along these four subroutes, 1 percent of the link would have moderate-low residual impacts and 99 percent would have low residual impacts.

Mineral Resources

Crossover links C500, C501, C502, and C174 have 4 percent moderate residual impacts for their total length, as a result of their close proximity to mines and claims. Crossover Link C671 does not cross any mines, but is within 1 mile of mines and active claims, resulting in 32 percent low-moderate residual impacts and 68 percent low residual impacts.

Soil Resources

The primary impact of concern associated with the implementation of crossover links C500, C501, C502, and C174 would be to soils that are susceptible to water erosion. No designated Prime or Unique Farmland soils occur along this subroute. Following implementation of SE 4 or 6, 5, and 8 along these subroutes, none of the links would have moderate residual impacts, 47 percent would have moderate-low residual impactions, and 53 percent would have low residual impacts. Moderate residual impacts are associated with soils that are susceptible to water erosion.

The primary impact of concern associated with the implementation of Crossover Link C671 would be to soils that are susceptible to water erosion. No designated Prime or Unique Farmland soils occur along this subroute. Following implementation of SE 4, 5, and 6 along subroutes 4A, 4B, 4C1, and 4C2, 37 percent of the link would have moderate-low residual impacts and 63 percent would have low residual impacts.

4.3.3.5 Summary of BLM Preferred Alternative

Based on results of the preceding analysis, the following potentially significant impacts from geological hazards and to mineral and soil resources may occur with construction and operation of the BLM preferred alternative:

- Transmission lines may be impacted by earthquakes occurring along Quaternary faults (subroutes 1A2 and 3A2)
- Transmission lines may be impacted by destabilization of the ground surface by earth fissures in the vicinity of the Pinal Central Substation (Subroute 4C2c)
- Transmission lines may be impacted by flooding along 100-year floodplains associated with various rivers, streams, and washes crossed by the Project (subroutes 1A2, 3A2, and 4C2c)
- Accelerated erosion rates may result in loss of soil material and productivity (subroutes 1A2 and 4C2c)

4.4 PALEONTOLOGICAL RESOURCES

4.4.1 Introduction

The primary concern regarding impacts to paleontological resources is the loss of scientifically significant fossils and their contextual data. The degree of impact to these resources depends upon the amount of ground disturbance within areas having moderate to high sensitivity for fossils, based on the BLM's PFYC predictive model[1]. Mitigation of impacts to paleontological resources includes preconstruction surveys, personnel education, monitoring ground disturbance for fossils, preparation and curation of any discovered fossils, and deposition of collected fossils in a paleontological repository. Specific mitigation measures are discussed more fully in the PRTP that will be part of the POD. Sensitivity level is used instead of impact level for paleontological resources, because the future discovery of buried fossils cannot be quantified.

4.4.2 Sensitivity Assessment Methodology

The methods for assessing the sensitivity of areas with paleontological resources include: (1) identifying the types of potential effects on paleontological resources that could result from the construction and operation of the proposed Project and its associated facilities; (2) classifying the sensitivity of geological formations based on PFYC and paleontological density; and (3) developing a PRTP to mitigate impacts to paleontological resources found as a result of implementing the Project.

[1] Based on a system 1 to 5, with 1 being Very Low and 5 being Very High.

4.4.2.1 Types of Potential Environmental Impacts

The construction and operation of the Project may result in both direct and indirect adverse impacts to paleontological resources. Direct impacts associated with construction activities include the loss of paleontological resources as a result of blasting, excavation and construction of facilities, staging areas, structures, and roads. There would be no direct impacts associated with the operation of the facilities and the presence of the transmission lines. Indirect impacts associated with the construction and operation of the Project include:

- Loss of paleontological resources as a result of increased public access to sensitive geological formations, as the construction of permanent access roads may lead to an increase in unauthorized collection or vandalism
- Loss of paleontological resources as a result of increased erosion from construction activities

4.4.2.2 Sensitivity Assessment Criteria

Sensitivity levels are based on the PFYC of each geological formation. Paleontological density is estimated from known fossil localities, as identified during the data inventory of existing literature, institutional records, and geological maps (see Section 3.4, Paleontological Resources); it represents concentrations of fossil localities and acts as a secondary measure of sensitivity. High paleontological density is often associated with geological formations having high PFYC, and can be useful in predicting patterns of fossil localities within a certain geological formation. However, paleontological density also helps to identify areas of fossil concentrations in areas with low PFYC. Sensitivity levels of high, moderate/undetermined, or low were assigned to portions of the study corridors (within 1 mile of the centerline of the proposed transmission lines), as defined below and included in Table 4-10.

- *High Sensitivity Level* – Areas identified as having a PFYC of 4 or 5. In these cases, the geological unit contains a high density of recorded fossil localities, has produced fossil remains in or near the vicinity of the Project, or is very likely to yield additional fossil remains during construction.
- *Moderate/Undetermined Sensitivity Level* – Areas identified as having a PFYC of 3. The undetermined rating in this category refers to a geological unit that has limited exposure in the Project study area, is poorly studied, or contains no recorded paleontological localities. However, in other areas, the same or similar geological unit may contain sufficient paleontological localities to suggest exposures of the unit in the Project study area would have at least a moderate sensitivity level.
- *Low Sensitivity Level* – Areas identified as having a PFYC of 1 or 2. In these cases, the geological unit contains very low or no density of recorded fossil localities, or has produced little or no fossil remains in the vicinity of the Project, or is unlikely to yield any fossil remains. Nevertheless, geological units with few or no prior recorded fossil localities could prove fossiliferous during construction.

Significant Impacts

For the purposes of this analysis, a significant impact on paleontological resources could result if any of the following were to occur from construction or operation of the Proposed Action:

- Direct destruction of a unique paleontological resource or site
- Indirect destruction of a unique paleontological resource or site by increased erosion or increased visibility leading to unauthorized collection

4.4.2.3 Mitigation of Impacts

The primary potential adverse effect to paleontological resources would be loss of these resources due to construction and ground-disturbing activities. However, the implementation of ST 24 (Table 2-10, Chapter 2) would reduce any potential adverse impacts to paleontological resources to a low level. Mitigation would be applied based on sensitivity level and site-specific conditions, as explained in the PRTP. Specific mitigation measures include paleontological surveys, personnel education, monitoring ground disturbance related to the Project, preparation and curation of fossils, and deposition of fossils in a paleontological repository. If unmitigated, impacts to paleontological resources could remain high along portions of the route that cross those formations with high PFYC, as these areas could contain significant vertebrate fossils and other scientifically important paleontological resources.

4.4.3 Sensitivity Analysis Results

4.4.3.1 No Action Alternative

Under the No Action alternative, there would be no impacts to paleontological resources.

4.4.3.2 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Subroute 1A1 begins at the proposed SunZia East Substation, traveling west through the Gran Quivira area and into Torrance County. From there, the subroute continues south to an area just north of the Jornada del Muerto, heads west across the Rio Grande, then continues south to the proposed Midpoint Substation. Subroute 1A1 (see Table 4-10), has the second highest sensitivity for paleontological resources in Route Group 1. Areas of high and moderate sensitivity are primarily associated with the Upper Santa Fe Group adjacent to the Rio Grande, Quaternary piedmont alluvial deposits located west of I-25, Baca Formation, Tres Hermanos Formation, undivided Cretaceous rocks, Chinle Group, Abo Formation, and Madera Group in the San Andres Mountains. The Upper Santa Fe Group has the greatest number of miles of high sensitivity. Subroute 1A1 crosses both high and moderate paleontological density areas along links E130, E151, and E180 near Carthage, northeast of Socorro.

Subroute 1A2 – BLM Preferred Alternative

Subroute 1A2, the BLM preferred alternative, has similar impacts to 1A1 and 1A because they share numerous links; however, Subroute 1A2 has slightly more moderate sensitivity to paleontological resources as a result of its utilization of Link E86.

Table 4-10. Paleontological Sensitivity Levels based on PFYC and Paleontology Density

Subroute	Total Miles	Paleontology (miles)					
		PFYC			Paleontological Density		
		High Sensitivity	Moderate Sensitivity	Low Sensitivity	High Sensitivity	Moderate Sensitivity	Low Sensitivity
Route Group 1: SunZia East Substation to Midpoint Substation							
1A1	228.8	111.2	10.1	107.5	2	4	222
1A2	230.3	111.2	10.5	108.6	2	4	224
1A	219.5	106	10	103	2	5	213
1B1	223.6	98	3	122	2	3	219
1B2	209.2	98	3	108	2	3	205
1B3	206.3	95	1	110	2	3	202
Route Group 3: Midpoint Substation to Willow-500 kV Substation							
3A2	123.9	30	25	69	0	0	124
3A	123.4	27	25	72	0	0	123
3B	128.6	9	37	82	0	0	129
Route Group 4: Willow-500 kV Substation to Pinal Central Substation							
4A	132.9	26	73	35	0	0	133
4B	133.0	35	65	33	0	0	133
4C2c	161.2	45.6	87.6	28	0	0	161.2
4C1	139.0	52	66	22	0	0	139
4C2	151.8	49	77	26	0	0	152
4C3	172.9	15	106	52	0	0	173

Subroute 1A – North River Crossing

Subroute 1A has similar impacts to 1A1, because they share numerous links. However, Subroute 1A has slightly more sensitivity to paleontological resources than 1A1 as a result of its utilization of Link A270 rather than A260 in the Elephant Butte Reservoir area, and several different links west of the SunZia East Substation.

Subroute 1B – San Antonio Crossing

Subroutes 1B1, 1B2, and 1B3 have common links throughout part of their routes, including Link A111, which crosses moderate to high sensitive Mesozoic formations containing numerous fossil localities. Subroutes 1B1, 1B2, and 1B3 vary only slightly in their sensitivity to paleontological resources, but have less sensitivity to paleontological resources than 1A1.

4.4.3.3 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Areas of high and moderate sensitivity in Route Group 3 are primarily associated with the Upper Santa Fe and Gila groups located between Deming and Lordsburg in New Mexico, and the Gila Group and older Quaternary deposits located in the San Simon Valley of Arizona.

Subroute 3A2 – BLM Preferred Alternative

Subroute 3A2, the BLM preferred alternative, crosses 30 miles of high sensitivity to paleontological resources, 25 miles of moderate sensitivity, and 69 miles of low sensitivity. This results in 44 percent of this route having high and moderate sensitivity, the greatest of the Route Group 3 subroutes.

Subroute 3A – North

Subroute 3A has 3 fewer miles of high sensitivity to paleontological resources than 3A2, but the same distance of moderate sensitivity. This results in 42 percent of this route having high and moderate sensitivity, which is slightly lower than 3A2.

Subroute 3B – South

Subroute 3B has 21 fewer miles of high sensitivity than Subroute 3A2 (see Table 4-10). This is primarily because there are fewer miles of Gila Group deposits crossed by Subroute 3B in New Mexico. Subroute 3B is also the least paleontologically sensitive Route Group 3 subroute, as only 36 percent of this subroute exhibits high and moderate sensitivity, compared to 44 percent for Subroute 3A2.

Route Group 3 has the fewest miles of high and moderate sensitivity as compared to the other route groups. This lack of high or moderate sensitivity is associated with the shorter length of the subroutes in this group and the comparative rarity of fossiliferous geological units along their length. None of the Route Group 3 subroutes includes any areas with a high or moderate paleontological density.

4.4.3.4 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Areas of high and moderate sensitivity in Route Group 4 are primarily associated with older Quaternary deposits and Tertiary sedimentary deposits that include the Gila Group, Quiburis Formation, and the St. David Formation in the San Simon, Sulphur Springs, and San Pedro valleys of Arizona.

Subroute 4A – North of Mt. Graham

Subroute proceeds north from the Willow Substation, east of the Pinaleño Mountains and then turns west towards Pinal Central Substation. This subroute avoids the Quiburis and St. David formations, but does come within close proximity to the 111 Ranch Beds, and does cross the Gila Group in the San Simon Valley. As a result, Subroute 4A is the second least paleontologically sensitive subroute, with only 74 percent of the subroute exhibiting high to moderate sensitivity.

Subroute 4B – Sulphur Springs Valley

Subroute 4B proceeds north from the Willow Substation, west of the Pinaleño Mountains before turning west to the Pinal Central Substation. This subroute avoids the Quiburis and St. David formations, but does cross the Gila Group. Subroute 4B is the third least paleontologically sensitive subroute in Route Group 4, with only 75 percent exhibiting high to moderate sensitivity.

Subroute 4C2c – BLM Preferred Alternative

Subroute 4C2c is the second longest subroute in Group 4 and has 45.6 miles of high sensitivity and 87.6 miles of moderate sensitivity. This results in 83 percent of its route with high or moderate sensitivity to paleontological resources, which is the second highest in Route Group 4. The high sensitivity results from crossing the highly sensitive Quiburis and St. David Formation.

Subroute 4C1 – East of San Pedro River

Subroute 4C1 is the most paleontological sensitive subroute within Route Group 4. Subroute 4C2c crosses 6 more miles of high sensitive to paleontological resources, but 21 fewer miles for moderate sensitive. This results in 85 percent of its route having high and moderate sensitivity to paleontological resources.

Subroute 4C2 – West of San Pedro River

The sensitivity to paleontological resources for Subroute 4C2 is similar to 4C2c. Subroute 4C2 has slightly more mileage of high sensitive than 4C2c, but less moderate sensitivity. This results in 83 percent of its route with high or moderate sensitivity to paleontological resources, which is the same as 4C2c.

Subroute 4C3 – Tucson

Subroute 4C3 is the least paleontologically sensitive subroute, with only 70 percent of the subroute exhibiting high to moderate sensitivity. This subroute crosses very little of the St. David Formation and does not cross the Quiburis Formation.

Route Group 4 subroutes contain very few known fossil localities, due to the limited amount of paleontological research in these areas.

4.4.3.5 Summary of BLM Preferred Alternative

Generally, Route Group 1 has significantly greater mileage of high sensitivity than route groups 3 and 4. This greater amount of sensitivity is associated with the large regions of the highly sensitive Upper Santa Fe Group, piedmont alluvial deposits located on either side of the Rio Grande, and several fossiliferous Mesozoic formations that are crossed by the alternative routes. Subroutes 1A and 1A1 are the most paleontologically sensitive subroute in Route Group 1, with 53 percent of their route crossing high to moderate areas of sensitivity; and have numerous fossil localities within the Sierra Ladrones and Palomas formations, which have a high PFYC. Route

Group 3 has the least sensitivity to paleontological resources since it crosses the fewest miles of formations with high or moderate PFYC.

Based on the preceding analyses, the following potential impacts to paleontological resources were identified:

- Route Group 1
  - The BLM preferred alternative (1A2) has 18 fossil localities within 1 mile of the centerline. Two Permian localities in Abo Formation along Link E101b (Subroutes 1A2, 1A, and 1A1), 2 localities are in the Blancan Sierra Ladrones Formation along link E180 (Subroutes 1A2, 1A, and 1A1), and 14 localities are in the Blancan Palomas Formation along Link E180. Subroute 1A2 has the highest sensitivity for paleontological resources in Route Group 1.
- Route Group 3
  - The BLM preferred alternative (3A2) crosses the fossiliferous 111 Ranch Beds along Links B160a and B160d and crosses several areas containing the Gila Group. Subroute 3A2 is the most paleontologically sensitive subroute in Route Group 3.
- Route Group 4
  - Subroute 4C2c crosses the Quiburis and St. David formations. Subroute 4C2c and 4C2 are the second highest paleontologically sensitive subroutes in Route Group 4.

If unmitigated, impacts to paleontological resources could be high along these routes, as many areas contain scientifically significant fossils, such as land mammals, dinosaurs, and other vertebrates. However, areas with high or moderate/undetermined sensitivity would have ST 24 applied before and during construction, which would reduce these impacts to a low level. Specific mitigation measures, which will be discussed in the PRTP as part of the POD, include paleontological surveys, personnel education, monitoring ground disturbance related to the Project, preparation and curation of fossils, and deposition of fossils in a paleontological repository.

4.5 WATER RESOURCES

4.5.1 Introduction

This section describes and analyzes the impacts to water resources that could result from the construction of the proposed Project.

4.5.1.1 Impacts to Surface Water

Impacts to surface water could result from placement of structures, blasting, construction of access roads, or temporary work areas. Direct impacts to perennial and intermittent surface water features could include sedimentation from Project-related disturbance, fugitive dust deposition, temporary and permanent fill associated with development of access routes, removal of riparian vegetation, bank alteration, accidental contamination associated with spills of environmentally

harmful material, damage to wetlands, or the introduction of herbaceous and aquatic invasive species. Direct impacts to intermittent surface water features are similar to those for perennial water features, although intermittent streams typically have less associated riparian vegetation and, subsequently, are more prone to erosion. Indirect impacts may result from increased soil erosion due to removal of vegetation.

Construction of access roads would likely require crossing several surface-water resources. These crossings could require the placement of temporary or permanent fill into a stream channel, as well as structures that support the crossing and protect water resources (e.g., bridge pilings, culverts, wing walls, etc.).

Temporary impacts would result from temporary crossings or fill used to cross water resources with little to no stream flow or on temporary access roads. Types of temporary stream crossings would include: (1) dry crossings with no bank or channel improvement; (2) mechanically grading banks to a slope sufficient to drive equipment and building materials across the channel (bank recontouring and revegetation would follow the work at the temporary crossing); (3) placement of fill that would be removed following the completion of work at the site; or (4) span structures. While temporary, these crossings would have the potential to impact stream morphology and ecological function. Modification of stream banks could result in removal of vegetation that could take many years to recover. Sedimentation potential may increase, depending upon the extent of disturbance and recontouring needed. Stormwater discharge and quantity of sedimentation to surface-water resources are often correlated to project-related disturbance.

Permanent impacts would result from permanent crossings, into which structures were placed in the streambed, potentially causing an irreversible loss of riparian vegetation on either side of the crossing. All crossings, temporary and permanent, would be constructed with the minimum footprint required to safely transfer building materials and construction equipment.

Work performed below the ordinary high-water mark in streams determined to be Waters of the United States will require a Section 404 CWA permit, issued by the USACE. The CWA requires that impacts resulting from these crossings are avoided or minimized to the extent possible; any unavoidable impacts must be mitigated. Depending on the type of crossing method used, it may also be necessary to obtain a stream alteration permit from the state and/or a Section 404 permit from the USACE.

4.5.1.2 Impacts to Groundwater

Groundwater located within the Project study area is used for both municipal and agricultural water supply. Subsurface water or groundwater resources are less susceptible than surface water to impacts associated with the proposed action. However, if negatively impacted, remedial action would be more problematic and complicated for groundwater than for surface water. The Project has the potential to impact groundwater resources in areas of shallow groundwater (groundwater that is near the surface), where placement of structures could come in contact with the water table. Potential impacts to groundwater resources include accidental contamination during structure placement or accidental spills of environmentally harmful liquids that have the potential of percolating into shallow groundwater. Implementation of the Project would not require placement of hazardous material below ground, and shallow groundwater would be identified

prior to work occurring in those areas. Impacts to groundwater would be highly unlikely, due to appropriate avoidance and mitigation measures (to be identified in the POD). For example, watering facilities such as developed springs or wells would be avoided; but if damaged, would be repaired or replaced. In addition, spill containment facilities and spill prevention procedures are in place, as part of the POD. As proposed, the Project would not impede the flow or depth of groundwater.

Wells providing groundwater for municipal and agricultural uses are located within the Project study area. Wells also provide connectivity between surface water and aquifers through which contamination could travel. Impacts to wells could include accidental physical damage to well structures during construction, or accidental contamination of groundwater resources; although these are highly unlikely. For the purpose of this assessment, it is assumed that impacts to groundwater resources could occur to wells located less than 600 feet from the Project. Impacts to springs are similar to those described for perennial surface water features.

4.5.2 Impact Assessment Methods

The methods for assessing potential impacts to water resources associated with implementing the Project include: (1) identifying the sensitivity of each water feature in the Project study area; (2) identifying the types of potential effects to water resources; (3) the use of USACE and EPA-approved parameters to identify the functions and values of water resources to classify potential environmental effects; (4) developing criteria for assessing the level of a potential impact to water resources; (5) assessing the initial impacts to water resources; (6) identifying appropriate selective mitigation measures for minimizing potential adverse effects; (7) determining areas where mitigation should be applied; and (8) estimating potential residual impacts to water resources. The residual impacts are a result of the initial impacts identified, the amount of disturbance predicted (based on construction and access roads), and the general and selective mitigation measures applied.

Criteria were developed to assess the level of impact to a water resource associated with the implementation of the Project (Table 4-11). These criteria focused on: (1) the abundance of a particular water resource feature; (2) the time in which, if affected, those resources would regenerate; (3) the potential for permanent loss of water resources and/or associated vegetation; (4) federal and state statutes surrounding particular water resources; and (5) the varying degree of importance a particular resource has on the greater ecosystem.

Table 4-11. Impact Levels for Water Resources

High	Permanent loss of Palustrine (marsh) Forest Overstory Wetlands Permanent loss of wetlands that support federally endangered, threatened, or candidate species Construction and operation-related activities that lead to deposition of material into state-listed impaired waters Construction and operation-related activities that impact wells or springs Placement of structure foundations in areas of shallow groundwater, wetlands, or aquifers Degradation of an Outstanding Water
Moderate	Permanent loss of Palustrine (marsh) Scrub/Shrub Wetlands Permanent fill in Waters of the United States Construction and operation activities that result in permanent increase of sedimentation to nearby surface-water resources Further degradation of an Impaired Water

Table 4-11. Impact Levels for Water Resources	
Low	Temporary loss of Palustrine (marsh) Scrub/Shrub Wetlands Temporary fill in Waters of the United States Construction and operation activities that result in temporary increases in sedimentation to nearby surface water resources

Significant Impacts

For the purposes of this analysis, a significant impact on water resources could result if any of the following were to occur from construction or operation of the proposed action:

- Loss of Palustrine (Marsh) Forest Overstory Wetlands
- Loss of wetlands that support federally endangered, threatened, or candidate species
- Deposition of material into state-listed impaired waters or Waters of the United States
- Impairment or restriction of access to wells or springs
- Placement of structure foundations in areas of shallow groundwater, wetlands, or aquifers

4.5.2.1 Mitigation of Impacts

Initial impacts to water resources were assessed based on the sensitivity of known attributes of each water resource to types of effects that could result from implementation of the Project. Water resources identified by this analysis were differentiated into subcategories, to better represent potential impacts. Surface water was broken into three categories: (1) major rivers, such as the Rio Grande and San Pedro; (2) perennial and intermittent streams; and (3) water bodies (ponds, tanks, wetlands, etc.). Wells and springs were analyzed separately during the inventory.

Removal of unique riparian habitat, increased sedimentation, and reduced water quality are among the primary adverse environmental effects on surface water resources that could be associated with the proposed Project. The primary adverse environmental effect to groundwater resources would be potential degradation caused by construction and operation activities and the presence of permanent facilities.

In addition to standard mitigation measures (see Table 2-10), SE 2 and 8 were developed to reduce high to moderate initial impacts in areas where necessary and feasible. SE 2 would minimize potential impacts to surface water resources by minimizing the construction of new access roads at perennial streams and other surface waters. Access roads would be designed to avoid placement of permanent fill in perennial and intermittent streams, as well as avoiding designs that would lead to the removal of riparian or wetland vegetation. Where construction vehicles and equipment would need to access areas within 328 feet (100 meters) of a riparian area, potential impacts would be avoided in the design stage and anticipated impacts would be adequately mitigated. In addition, an erosion control plan would be implemented to minimize the potential for sedimentation. Spill prevention and containment measures would be implemented, and vehicle refueling and maintenance activities would be limited to designated work areas at least 328 feet from all streams. The Project would comply with the requirements of EO

No. 11988 (Floodplain Management), EO No. 11990 (Wetland Protection), and Sections 401 and 404 of the CWA (in Construction, Operation, and Maintenance Plan).

SE 8 would minimize potential impacts to surface water resources by locating structures to avoid or span sensitive features, such as wetlands, riparian areas, perennial rivers, and streams. The avoidance of sensitive water resources through spanning, selective structure placement, or realignment of access routes was applied to all major rivers, perennial streams, springs, wells, and water bodies, where feasible. Spanning or avoiding sensitive features would also be applied as mitigation to those areas where springs or wells are present to reduce impacts to groundwater resources.

4.5.3 Impact Analysis Results

4.5.3.1 No Action Alternative

Under the No Action alternative, there would be no construction or operations activities associated with the Project. Impacts to water resources associated with the implementation of the Project would not occur.

4.5.3.2 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Subroute 1A1 proceeds west from the SunZia East Substation along the route with links E82, E84, and E85. From there it continues west, eventually crossing the Rio Grande at Link E180. Subroute 1A1 continues south along links A161, A161a, A260, A330a, A330b, and A400 until it reaches the Midpoint Substation. Following implementation of SE 2 and 8, there are no identifiable moderate-high or moderate residual impacts (Table 4-12).

Subroute 1A2 – BLM Preferred Alternative

Subroute 1A2 is the northern-most subroute, but its impacts to water resources are similar to those of 1A1. This is a result of the large number of common links between the two subroutes. Subroute 1A2 continues west from Link E84 along Link E86 before connecting to E101. Subroute 1A2 is slightly longer than Subroute 1A1, and has slightly more miles of low residual impacts to water resources than 1A1. Following implementation of SE 2 and 8, there are no identifiable moderate-high or moderate residual impacts for subroute 1A2.

Subroute 1A – North River Crossing

Subroutes 1A, 1B1, 1B2, and 1B3 share a common route after Link A161. Therefore, differences in total mileage of residual impacts for those routes are attributed to differences in impacts before Link A161. Subroute 1A is similar to 1A1 except it proceeds west from SunZia East Substation along a slightly more southern route along Link E80C. Subroute 1A also utilizes Link A270 instead of A260, in the area of Elephant Butte Reservoir.

Subroute 1B – San Antonio Crossing

Subroutes 1B1, 1B2, and 1B3 are common throughout most of their route except where the links vary as the route proceeds west of the SunZia East Substation. Subroutes 1B1, 1B2, and 1B3 have less than 1 percent of low-moderate residual impacts after mitigation. Subroutes 1B1, 1B2, and 1B3 would have similar potential effects to water resources as Subroute 1A. Following the implementation of SE 2 and 8 along these subroutes, the residual impacts to water resources would have no identifiable high or moderate impacts (Table 4-12).

Table 4-12. Route Group 1 Water Resource Inventory Data and Residual Impacts

Subroute	Total Miles	Water (miles or numbers)							Residual Impacts (miles)			
		Perennial Rivers	Intermittent Streams	Impaired Waters	Number of Springs	Number of Wells	Water Bodies	Wetlands	Low	Low-Moderate	Moderate	Moderate-High
1A	219.5	0	12.25	0.2	0	3	0.1	0.2	219.4	0.1	0	0
1A1	228.8	0	14.07	0.2	0	1	0.1	0.2	228.7	0.1	0	0
1A2 (BLM Preferred Alternative)	230.3	0	14.34	0.2	0	1	0.1	0.2	230.2	0.1	0	0
1B1	223.6	0	11.6	0.2	1	5	0.1	0.2	223.5	0.1	0	0
1B2	209.2	0	11.77	0.2	1	5	0.1	0.2	209.1	0.1	0	0
1B3	206.3	0	11.77	0.2	0	2	0.1	0.2	206.2	0.1	0	0
Local Alternative Links for 1A and 1B1 (Gran Quivira area)	62.4	0.3	4.9	—	0	0	0	0	62.4	0	0	0
Crossover Links 1B2, 1B3	7.7	0	1	—	0	0	0	0	7.7	0	0	0

The local alternative links for 1A and 1B1 (Gran Quivira area) have no moderate or high impacts. The low-moderate residual impacts, for both groups of crossover links, result from the crossing of perennial and intermittent streams. One crossover link is available for links 1B2 and 1B3 (A70); it crosses 1 mile of intermittent streams.

4.5.3.3 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Impacts to water resources would be similar among the three subroutes in Route Group 3. All three subroutes for Route Group 3 have similar potential impacts to water resources, and all three cross the Mimbres River and Walnut Creek, which are considered perennial throughout some of their reaches. The longest of the subroutes in Route Group 3, Subroute 3B has the highest mileage of residual impacts to water resources. Following implementation of SE 2 and 8 along subroutes 3A2, 3A, and 3B, residual impacts to water resources would include no identifiable high or moderate impacts (Table 4-13).

Two crossover links are available for Route Group 3 (B111 and B140). These crossover links have no residual impacts after mitigation.

Table 4-13. Route Group 3 Water Resource Inventory Data and Residual Impacts											
		Water (miles or numbers)						Residual Impacts (miles)			
Subroute	Total Miles	Perennial Rivers	Intermittent Streams	Number of Springs	Number of Wells	Water Bodies	Wetlands	Low	Low-Moderate	Moderate	Moderate-High
3A2 (BLM preferred Alternative)	123.9	0	3.5	0		0	0	124	0	0	0
3A	123.4	0	3.7	0	3	0	0	120.7	2.7	0	0
3B	128.6	0	4.2	0	8	3	0	124.4	4.2	0	0
Crossover Links 3A, 3B	15.2	0.4	3.6	0	0	0	0	15.2	0	0	0

4.5.3.4 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

Subroute 4A proceeds north from the Willow Substation, east of the Pinaleño Mountains. Subroute 4A crosses Aravaipa Creek and the San Pedro River. Link C170 crosses an intermittent reach of Aravaipa Creek, approximately 3.4 miles south of the southern boundary to Aravaipa Wilderness. Subroute 4A has very few wells within 1 mile of its centerline, and crosses 21 miles of a sole-source aquifer. The shortest of the subroutes in Route Group 4, Subroute 4A is the least sensitive subroute for water resources. Following implementation of SE 2 and 8 along Subroute 4A, residual impacts to water resources would include no identifiable high, moderate-high, or moderate impacts to water resources, and less than 1 percent of low-moderate impacts.

Subroute 4B – Sulphur Springs Valley

Subroute 4B would have the same potential impacts to water resources as would Subroute 4A. Following the implementation of SE 2 and 8 along Subroute 4B, the residual impacts to water resources would include no identifiable moderate-high or moderate impacts, and less than 1 percent of low-moderate impacts.

Table 4-14. Route Group 4 Water Resource Inventory Data and Residual Impacts													
		Water (miles or numbers)								Residual Impacts (miles)			
Subroute	Total Miles	Perennial Rivers	Intermittent Streams	Outstanding Waters	Number of Springs	Number of Wells	Water Bodies	Wetlands	Sole Source Aquifer	Low	Low-Moderate	Moderate	Moderate-High
4A	132.9	0.06	3.4	—	2	17	0	0.2	21	132.79	0.11	0	0
4B	133.0	0.01	3.6	—	3	17	0	0.2	21	132.89	0.11	0	0
4C1	139.0	0	2.8	—	0	28	0	0	25	139	0	0	0
4C2	151.8	0.02	2.5	—	0	25	0	0.1	42	151.68	0.12	0	0

Table 4-14. Route Group 4 Water Resource Inventory Data and Residual Impacts													
		Water (miles or numbers)								Residual Impacts (miles)			
Subroute	Total Miles	Perennial Rivers	Intermittent Streams	Outstanding Waters	Number of Springs	Number of Wells	Water Bodies	Wetlands	Sole Source Aquifer	Low	Low-Moderate	Moderate	Moderate-High
4C2c (BLM Preferred Alternative)	161.2	0.02	3.3	0	0	11	0	0	42	161.18	0.02	0	0
4C3	172.9	0	5.6	0.1	0	169	0.2	1	88	172.9	0	0	0
Local Alternative Link for 4A, 4B, 4C1	8.8	0	0.1	—	0	0	0	0	3.3	8.8	0	0	0
Local Alternative Links for 4A, 4B, 4C1, 4C2, 4C3	9.9	0.2	0.1	—	0	2	0	0	0	9.9	0	0	0
Local Alternative Links for C1	4.8	0.1	0.1	—	0	0	0	0	4.8	0	4.8	0	0
Local Alternative Links for 4C2 Winchester and Tortolita Substations	68.3	0	1.4	—	0	9	0.1	0	33.4	68.30	0	0	0
Local Alternative Links for 4C3	465	0	0.8	0.1	5.5	53	0	0	42.6	46.4	0.1	0	0
Local Alternative Links for 4C1, 4C2, 4C3	24.4	0	0.7	—	0	6	0.1	0	0	24.4	0	0	0
Crossover Links for 4A, 4B, 4C1	16.5	0	0.3	—	0	0	0	0	0	16.5	0	0	0
Crossover Links for 4A, 4B, 4B, 4C1, 4C2	7.9	0	0.1	—	0	0	0	0.1	0	7.9	0	0	0

4C2c – BLM Preferred Alternative

Subroute 4C2c proceeds west from the Willow-500 kV Substation, through Sulphur Springs Valley, and continues southwest eventually crossing the San Pedro River. From there it heads north, west of the San Pedro River to San Manuel, and then proceeds west to Pinal Central Substation. Subroute 4C2c crosses more mileage of perennial and intermittent streams than the other subroutes, except for 4C3. Following implementation of SE 2 and 8 along Subroute 4C2c, residual impacts to water resources would include no identifiable high, moderate-high, or moderate impacts to water resources, and less than 1 percent of low-moderate impacts.

4C1 – East of San Pedro River

Subroute 4C1 proceeds west from the Willow-500 kV Substation, through Sulphur Springs Valley, and continues north, east of the San Pedro River and crosses the San Pedro River at a point just northeast of San Manuel. Subroute 4C1 crosses fewer miles of perennial streams and a sole source aquifer than 4C2c.

4C2 – West of San Pedro River

Subroute 4C2 has similar sensitivity to water resources as 4C2c.

4C3 – Tucson

Subroute 4C3 is the longest of all subroutes in Route Group 4 and crosses both the San Pedro and Santa Cruz rivers. Subroute 4C3 also crosses the largest mileage of perennial and intermittent streams, a sole source aquifer, and has the largest amount of wells within 1 mile of its centerline. This results in having the highest sensitivity for water resources before mitigation. Subroute 4C3 is also the longest subroute of Route Group 4.

Local Alternatives and Crossover Links for Route Group 4

Several local alternative links are available for Route Group 4. Local alternative links C790, C860, C870, and C890 have only low residual impacts to water resources. Local Alternative Link C692 has low-moderate residual impacts for 100 percent of its total mileage, as a result of crossing a sole source aquifer. Local alternative links for 4C2 have low and low-moderate residual impacts. These are a result of the links crossing a large portion of a sole source aquifer, and several perennial and intermittent streams.

Local alternative links for 4C3 cross a large portion of a sole source aquifer, as well as a greater number of miles for perennial and intermittent streams, and have a large number of wells within 600 feet of their centerline. Local Alternative Link F51 crosses the Outstanding Water Cienega Creek. However, following the implementation of SE 2 and 8, there are only low and low-moderate residual impacts. After the implementation of SE 2 and 8, local alternative links for 4C1, 4C2, and 4C3 have no moderate, moderate-high, or high residual impacts.

Crossover links C500, C501, C502, C174, and C671 have no moderate, moderate-high, or high residual impacts.

4.5.3.5 Summary of BLM Preferred Alternative

Current drought conditions in the Southwest, along with the historical overuse of water for potable and agricultural purposes, make any impact to water resources a concern. Implementation of the Project would be likely to impact water resources located within the Project study area. The construction of access roads, staging areas, work areas, and stream crossings could affect perennial and intermittent streams, water bodies, wetlands, wells, and springs. Impacts to water resources vary between alternative routes. Within Route Group 1, the

impacts to water resources are similar, with 1A1 and 1A2 having slightly more impacts due to their longer routes. Within Route Group 3, Subroute 3A2 has the fewest impacts to water resources, before mitigation. Within Route Group 4, Subroute 4B has the least amount of impacts to water resources, and Subroute 4C3 has the most. Route Group 4 is the only one to contain a sole source aquifer.

Based on results of the preceding analysis, the following potential impacts to water resources were identified for the BLM preferred alternatives:

- Route Group 1
  - Subroutes 1A2 and 1A1 have similar impacts to water resources prior to mitigation, but 1A2 crosses streams that are more intermittent.
  - Subroute 1B3 has the least amount of impacts to water resources.
- Route Group 3
  - Subroute 3A2 crosses the Mimbres River.
  - All of the subroutes in Route Group 3 have similar overall impacts to water resources, with slight variances. Subroute 3A2 crosses the smallest number of streams and does not cross any wells.
- Route Group 4
  - Subroute 4C3 is the most sensitive subroute in Route Group 4, before mitigation, and subroutes 4A and 4B have the least sensitivity.
  - Once mitigation is applied, all of the subroutes have similar residual impacts as 4C2.

4.6 BIOLOGICAL RESOURCES

4.6.1 Introduction

This section addresses the nature, extent, and significance of potential impacts to wildlife, vegetation, and special-status species that could result from Project development. The discussion provides detail on the methods used in the analysis of impacts for biological resources, as well as the development and effectiveness of mitigation measures for the Project, and compares residual impacts that may remain for each subroute after both standard and selective mitigation measures have been applied. A Biological Protection Plan (BPP), which will contain site-specific details on the application of biological mitigation measures during development, construction, and operation of the Project, will be developed as an appendix to the Project POD.

4.6.2 Overview of Potential Impacts

4.6.2.1 Vegetation

Direct impacts to vegetation include removal of plants during construction of new or modified access and spur roads, and at structure and substation sites. Vegetation removal for structure foundations and at substation sites would be permanent. Indirect impacts associated with

vegetation removal may include erosion, reduction of soil water retention, invasive plant colonization, loss of wildlife habitat, habitat fragmentation, and edge effects.

Edge effects can be caused by the creation of an artificial break in a contiguous block of habitat, potentially resulting in increased competition among plants through higher light levels in the understory as the canopy is broken, and water stress caused by decreased humidity in open areas. Riparian woodlands are the only vegetation community within the study corridor that regularly form a closed canopy, and that would be susceptible to substantial edge effects involving changes in humidity and light availability. Other communities may experience edge effects to a lesser degree.

Biological soil crusts are often an important component of aridlands vegetation communities, with an important role in soil stabilization, nutrient cycling, and water retention. These crusts may be composed of lichens, cyanobacteria, fungi, nonvascular plants, and other organisms. Loss of these crusts through ground disturbance can increase susceptibility to wind and water erosion, lower water availability for other plants, and delay vegetation recovery during reclamation. Additional information on biological soil crusts is presented in Section 4.3.2.3.

Special-Status Plants

Special-status plants could be affected by vegetation clearing and construction traffic. Vegetation clearing could potentially impact the seed bank where special-status plants occur, and ground-disturbing activities could allow colonization by invasive plant species. These invasive plant species could compete for resources with special-status plants and other native vegetation, possibly altering the local plant community and fire regime.

4.6.2.2 Wildlife

Linear features such as access roads could fragment wildlife habitat, adversely affecting species that are reluctant to cross areas of open ground due to threat of predation. New access roads may be used by OHVs or other recreational traffic, potentially causing ongoing disturbance to wildlife. Related to this are edge effects created by linear features, which could affect species dependent on large blocks of contiguous habitat. Edge effects may reduce the effective size of habitat blocks for those species, limiting connectivity and dispersal between blocks. Increases in edge habitat may favor some generalist species over others with narrow habitat preferences. Open areas such as access roads may be beneficial to some predators such as raptors and carnivores, due to increased prey visibility. Overall, however, impacts of linear features on wildlife are mostly negative and may be difficult to mitigate onsite.

Large Mammals

Impacts to large mammals could include effects to habitat, forage, and minor loss of prey associated with vegetation removal. Traffic presents a risk to animals crossing roadways during construction, and human presence and construction noise in the construction area may disturb large mammals. These impacts could affect animal movements, breeding, and access to resources. Construction debris and trash may be attractive to wildlife and present a hazard to

them, and often attracts generalist predators such as Coyotes and Common Ravens. Development of new access roads required for the Project may have indirect impacts resulting from increased recreational access in these areas.

Small Mammals

In addition to impacts specified for large mammals, many small mammals are less capable of escaping from ground-disturbing activities. Animals such as rodents take shelter from disturbance in burrows or among vegetation, making them more susceptible to crushing by equipment and vehicular traffic. Vegetation removal for Project access roads may affect movement of small mammals such as mice and ground squirrels that are reluctant to cross open areas due to threat of predation. Animals with larger home ranges or that are relatively mobile, such as skunks and Bobcats (*Lynx rufus*), would be affected less by fragmentation and prey base reduction. Transmission line structures may provide nesting and hunting perch sites for raptors that prey on small mammals.

Aquatic, Shore, and Large Wading Birds

Project development near riparian or other aquatic habitats may affect vegetation that provides nesting habitat, cover, and forage for aquatic, shore, and large wading bird species. Development of stream crossings on access roads and ground-disturbing activities associated with placement of structures in proximity to aquatic habitats may result in erosion that could affect water quality, which could affect aquatic birds directly where increased turbidity reduces foraging success, or indirectly by affecting populations of prey species. Groundwires, conductors, and structures present collision hazards for birds, particularly large-bodied species such as cranes and geese, which cannot make abrupt course corrections when obstacles are encountered in their flight path.

Raptors

Impacts to raptors could potentially include disturbance of breeding and nesting behavior, nest failure, and loss of prey resulting from vegetation clearing. Groundwires, conductors, and structures present collision hazards for raptors, particularly during aerial pursuit of prey. Improperly designed structures, particularly lower-voltage distribution lines, may present electrocution hazards for raptors. Engineering requirements of 500 kV structures must place energy sources far enough from a potential path to ground so as to be beyond the wingspan of even the largest birds, effectively eliminating risk of electrocution from the line itself. “Streamers” (liquid bird waste) directed from a perched bird can also present a conductive path for electricity. This risk can be reduced with design measures that prevent birds from perching on structures at locations where energized lines occur with a short, near-vertical path to grounded components. Substations for 500 kV lines are engineered with spacing similar to transmission lines, with similarly low electrocution risk. Substations that step down to lower-voltage distribution lines may present an electrocution risk if not designed for avian safety. When the risk of electrocution is minimized, beneficial effects for raptors include introduction of perches and nesting sites on structures and the clearing of vegetation that could improve their ability to see prey.

Passerines and Other Upland Birds

Impacts to passerines and other birds could include disturbance to mating and nesting behavior, nest failure, and loss of eggs or young in nests during vegetation clearing. Vegetation clearing would remove cover, nest sites, forage, and invertebrate prey used by passerines; and may allow colonization by invasive plant species that could compete with native vegetation, potentially altering the native plant community and local fire regime. Groundwires, conductors, and structures present collision hazards for passerines, particularly for flocking birds, at night or during other low-visibility conditions. Nocturnally migrating birds typically fly at heights well above transmission line structures, but may be at risk when flying lower, such as in poor weather conditions or where structures are placed on elevated terrain. Transmission line structures are occasionally used by passerines for nesting.

Amphibians

Impacts to amphibians could result from the effects of Project-induced erosion, which could degrade water quality and affect their health and food base. Ephemeral water sources such as stock tanks, often used as breeding sites by amphibians, could be modified or removed during construction. Temporary watering facilities would be provided for wildlife and livestock until permanent repair or replacement is complete, although these temporary replacements may lack established sources of algae, diatoms, and other food sources for larval amphibians. Reproductive success of amphibians using newly constructed ponds could be decreased, although inoculation of newly constructed ponds with sediments from existing ponds may reduce this effect. Amphibian adults, eggs, and larvae could be killed by construction traffic at stream crossings. Many desert amphibians spend the majority of the year underground, and may be crushed during ground-disturbing activities.

Reptiles

Reptiles could be killed by construction traffic or during ground-disturbing vegetation clearing. Invasive plants may alter the native plant community, affecting the invertebrate and small mammal prey base of many reptiles. In addition, many humans have an aversion to snakes in general, and will often kill them without provocation whether encountered in nature or near areas of human activity, including construction sites.

Fish

Potential impacts to fish are primarily associated with the effects of erosion caused by ground-disturbing activities. Introduction of sediment into streams may clog or abrade fish gills, and can alter food webs by decreasing production of algae and reducing invertebrate populations. Severe sedimentation, such as may occur following heavy flooding, can substantially alter stream substrate, filling in gravel or cobble stream beds that may be important spawning sites, and may even fill entire pools and result in the loss of that habitat.

Invertebrates

Eggs, larvae, and adult terrestrial invertebrates could be killed during vegetation clearing and ground-disturbing activities. Changes in the vegetation community would affect local invertebrate populations by reducing their food source, or by reducing cover and making invertebrates more susceptible to predation. Aquatic invertebrates could be affected by reduced water quality, should erosion result from Project development.

4.6.3 Impact Assessment Methods

The potential for occurrence of biological resources was initially assessed with a general search of regional lists of special-status species drafted by land and wildlife management agencies, vegetation maps, and peer-reviewed or other publications providing distribution information for resources (Chapter 3). Using a 4-mile buffer to form the Project study corridor, this approach was intended to account for uncertainty in the distribution of species and their habitat. However, the presence of a resource within the study corridor would not necessarily result in any impacts. Impact potential was assessed based on distributional and ecological information acquired during the search of existing data. Vegetation communities were assumed to be affected if crossed by the centerline of the Project. Special-status species were assumed to be affected if the centerline of the Project was located within their known or reasonably expected range, or if the Project had the potential to alter features of the environment used by that species, including downstream effects on aquatic habitat.

A map of potential occurrence along the Project centerline was created for those ESA-listed, proposed, and candidate species that may be affected by the Project, and was used to estimate the extent of those impacts. This estimated distribution is presented by link in Appendix B3.

Species with a near absence of distribution information within the United States, such as the Jaguar and Ocelot, were not mapped and the extent of effects was not quantified because no mitigation specific to them can be determined to be necessary at a given location. Potential impacts to species that are not known to occur in the study corridor, such as the Todsen's pennyroyal, Kuenzler's cactus, Mexican Gray Wolf, New Mexico Meadow Jumping Mouse, and others, were not assessed quantitatively. However, potential effects are discussed qualitatively below for all species.

Species dependent on a particular vegetation type were mapped as occurring where that vegetation type comprises 50 percent or more of pixels mapped by ReGAP or LANDFIRE, within the overall distribution of the species. Effects to aquatic species were mapped as potentially occurring where the Project centerline would cross major drainages, create substantial new access and ground disturbance, or cross areas of steep slope within watersheds where those species occur. Effects on small-scale, highly sensitive resources, such as riparian woodlands or springs, were generally mapped as occurring within a 1-mile buffer around such locations.

The area of anticipated effects was estimated using the Project slope and access model (see Table 2-7 in Chapter 2). As slope increases or existing access decreases, ground disturbance and effects to terrestrial or aquatic species often increases. Certain bird species were not considered to be affected by changes in slope or access if not dependent on terrestrial resources at a given

location, but the susceptibility of large birds to collision with human structures indicated that the presence of the line itself is a potential effect. The results of the impact analysis for vegetation are presented in Appendix H, Table H-6; and the results for special-status species are presented in Table H-7.

4.6.3.1 Significant Impacts

For the purposes of this analysis, a significant impact on biological resources could result if any of the following were to occur from construction or operation of the proposed action:

- "Take" of a listed, proposed, or candidate species under the ESA or BGEPA, as defined by those acts
- Permanent or long-term loss of suitable critical habitat, or effects that would prevent future recovery of critical habitat
- Mortality rates that result in population-level effects for sensitive and other unlisted species
- Permanent displacement of individuals from biologically important habitats
- Permanent loss of habitat that would result in species-wide or population-wide effects
- Fragmentation resulting from the addition of barriers to wildlife movement, including physical barriers, open spaces avoided by some species, and disturbance or mortality associated with roads, to large, currently intact blocks of habitat

This analysis presents an estimate of the potential for effects to ESA-listed or other species to occur. Consultation with the USFWS under Section 7 of the ESA has been initiated, and includes the development of additional site-specific required or recommended mitigation measures. Preconstruction surveys will further refine these mitigation measures, which will be included as stipulations in the final POD. The NEPA process does not provide a substitute for any requirements under the ESA.

4.6.4 Impact Assessment

4.6.4.1 Mitigation Planning

Mitigation development included a review of biological resources known to occur or potentially occurring within the study corridor. Sources used included land management agency special-status species lists and natural heritage data, Internet resources including GAP vegetation data for New Mexico and Arizona, review of pertinent primary literature, and consultation with specialists regarding certain species. Coordination and cooperation with the USFWS, BLM, AZGFD, and NMDGF, and information from public comments were all integral parts of the resource analysis process, Project alternatives development, analysis of potential impacts, and development of mitigation measures.

Information gathered from these sources was incorporated into a biological resources impact analysis by merging impact levels, topographic gradients, and the degree of existing access to produce an estimate of impacts for the biological resources occurring along each link. Standard

and selective mitigation measures subsequently developed from this information are addressed below and will be incorporated into the BPP, Appendix B1 of the POD.

Standard mitigation measures (see Table 2-10) include those that mitigate general effects to biological resources and the effects of erosion and increased human access. Standard mitigation measures also include preconstruction surveys for special-status species and noxious weeds. These measures would be applied throughout the Project study corridor, as appropriate. Additional species-specific or site-specific potential impacts not sufficiently reduced by standard mitigation measures are addressed with selective mitigation measures (see Table 2-11), and are addressed in the individual resource discussions in this chapter.

For each species or land area discussed below, standard mitigation is assumed but the appropriate selective mitigation measures are listed. In general, if impacts are high-moderate or moderate (see definitions below), application of selective mitigation reduces the impacts to moderate or low-moderate. In most cases, the impacts before implementing selective mitigation were already moderate to low; in such cases, depending on which alternative is chosen and the specifics of design, there may be some lessening of but not a complete reduction in residual impacts.

Five levels of potential impacts are described below for vegetation, and separately for special-status species. Appropriate mitigation measures are listed for each type of impact to the respective resources. ESA-listed, proposed, and candidate species are discussed individually, with descriptions of where they may occur within the study corridor. Impacts to wildlife other than special-status species are not quantified, but in most cases would be closely correlated with total ground disturbance presented in Table 3-31 by vegetation type, and in Appendix H by impact level. However, some areas of high sensitivity to wildlife may not be captured adequately in the vegetation impact analysis. These areas are discussed qualitatively in the discussion of conservation areas and other identified areas of concern (Sections 4.6.4.6 and 4.6.4.7), or in the discussion of individual subroutes and local alternatives (Section 4.6.5).

Table 4-15. Estimated Ground Disturbance by Each Subroute and Vegetation Type

Subroute	Miles (acres below)	Arizona Upland Sonoran Desertscrub	Chihuahuan Desertscrub	Closed Basin Scrub	Great Basin Conifer Woodland	Interior Chaparral	Juniper Savanna (ecotone)	Colorado River Valley Sonoran	Pine-Oak Woodland	Plains-Mesa Grassland	Plains-Mesa Sand Scrub	Semidesert Grassland	Urban/ Agriculture	Floodplain
1A	219.5 (2936.6)	-	89.5 (1195.9)	-	-	-	43.2 (600.7)	-	6.2 (86.9)	13.7 (180.0)		63.1 (822.6)	2.6 (35.1)	1.2 (15.4)
1A1	228.8 (3051.6)	-	93.1 (1234.1)	-	-	-	55.7 (766.0)	-	6.2 (86.9)	6.9 (91.6)	-	63.1 (822.6)	2.6 (35.1)	1.2 (15.4)
1A2	230.3 (3089.6)	-	93.1 (1234.1)	-	-	-	57.2 (804.0)	-	6.2 (86.9)	6.9 (91.6)	-	63.1 (822.6)	2.6 (35.1)	1.2 (15.4)
1B1	223.6 (2961.1)	-	94.6 (1270.7)	-	-	-	31.2 (420.5)	-	6.2 (86.9)	13.7 (180.0)	28.9 (365.8)	45.0 (583.3)	1.9 (27.5)	2.1 (26.4)
1B2	209.2 (2777.5)	-	94.6 (1270.7)	-	-	-	30.4 (402.2)	-	-	12.4 (163.7)	22.8 (303.7)	45.0 (583.3)	1.9 (27.5)	2.1 (26.4)
1B2a	212.8 (2815.7)	-	98.2 (1308.9)	-	-	-	30.4 (402.2)	-	-	12.4 (163.7)	22.8 (303.7)	45.0 (583.3)	1.9 (27.5)	2.1 (26.4)
1B3	206.3 (2740.6)	-	94.6 (1270.7)	2.3 (31.1)	-	-	33.3 (446.7)	-	-	12.4 (163.7)	17.8 (232.9)	41.9 (541.7)	1.9 (27.5)	2.1 (26.4)
3A	123.4 (1642.5)	-	19.8 (261.2)	2.2 (29.6)	-	-		-	-	-	-	101.4 (1351.7)	-	-
3B	128.6 (1657.1)	-	39.4 (518.5)	12.0 (158.2)	-	-	-	-	-	-	-	77.2 (980.4)	-	-
3A2	123.9 (1651.6)	-	20.2 (270.3)	2.2 (29.6)	-	-	-	-	-	-	-	101.5 (1351.7)	-	-
4A	132.9 (1830.5)	41.6 (549.9)	-	-	1.0 (17.0)	7.2 (104.3)	-	6.0 (78.8)	2.1 (35.7)	-	-	67.4 (951.2)	5.6 (67.5)	2.0 (26.1)
4B	133.0 (1846.8)	41.6 (549.9)	-	-	1.0 (17.0)	9.2 (135.3)	-	6.0 (78.8)	2.1 (35.7)	-	-	65.5 (936.6)	5.6 (67.5)	2.0 (26.1)
4C1	139.0 (1903.3)	55.6 (741.2)	2.5 (37.6)	-	-	-	-	6.0 (78.8)	8.5 (129.3)	-	-	59.9 (837.5)	5.6 (67.5)	0.9 (11.4)
4C2	151.8 (2072.2)	51.2 (675.7)	5.5 (82.4)	-	-	-	-	6.0 (78.8)	8.5 (129.3)	-	-	74.6 (1033.0)	5.6 (67.5)	0.4 (11.4)
4C2c	161.2 (2205.2)	51.2 (675.7)	7.5 (108.9)	-	-	-	-	6.0 (78.8)	6.5 (101.9)	-	-	84.2 (1169.8)	5.6 (67.5)	0.2 (2.7)
4C3	172.9 (2261.0)	60.6 (761.3)	12.5 (172.6)	-	-	-	-	11.9 (154.8)	6.5 (101.9)	-	-	59.6 (808.8)	21.3 (255.2)	0.5 (6.5)

4.6.4.2 Impacts and Mitigation Measures for Vegetation

Description of Impact Levels for Vegetation

The following definitions of level of impacts were applied in the analysis of potential Project impacts to vegetation. The sensitivity to disturbance and the regional extent of each vegetation community was considered when analyzing impacts. Any impact to vegetation would also affect wildlife that may be present, but impacts to wildlife would be highest in regionally uncommon or highly productive vegetation communities. Uncommon plant communities such as riparian woodlands can be much more susceptible to the types of impacts created by the Project than are many of the relatively open upland plant communities, and so were assigned higher impact levels. Table H-6 (Appendix H) provides the impacts to vegetation that would occur under each Project alternative.

- *Low Impacts* – typically result in small areas of disturbance that do not significantly affect native plant community continuity, or are limited to disturbance of altered, degraded, or non-native plant communities.
- *Low-Moderate Impacts* – typically involve removal of larger, relatively undisturbed areas of vegetation, and may result in localized changes in local plant communities that affect plant community structure and density on a small scale. Such effects would not normally be anticipated to permanently alter local plant communities, and temporarily disturbed areas would be recolonized from adjacent undisturbed habitat over time. Plant communities affected at this level may be regionally widespread or resilient to the indirect, off-site effects of ground disturbance.
- *Moderate Impacts* – typically affect vegetation over larger areas or in steeper terrain where mitigation for erosion is less effective. Acreage of impact to any vegetation type may be measurable on a local scale, but is unlikely to significantly reduce the amount of the vegetation type regionally. Community structure and species composition of some areas may be permanently altered, but not on a large scale. Formerly intact areas may become partially fragmented, and modified ecotonal vegetation assemblages may permanently develop in localized areas.
- *Moderate-High Impacts* – typically involve loss of mature vegetation over acreages that visibly affect the overall appearance and function of habitats on a small to moderate scale. Changes to plant communities are considered permanent. Long-term plant composition in areas of moderate-high impact would take many years to return to predisturbance conditions, and may never do so.
- *High Impacts* – may include substantial, permanent fragmentation and loss of function, and may involve substantial loss of acreage of the community type in the region. This level of loss would affect not only the vegetation, but may significantly and disproportionately impact the wildlife that is dependent on the plant community for sustenance, habitat, or as part of a movement corridor.

Vegetation Mitigation Measures

The degree of loss or direct disturbance of vegetation at any given point in the Project is determined by the availability of existing access roads and by ground slope, with road construction on steeper slopes resulting in increased ground disturbance (Table 2-7). Within the area of ground disturbance, loss of vegetation would be minimized by (1) reducing this area to the extent practicable (SE 1), (2) plant salvage and revegetation in areas of temporary disturbance (SE 5), and (3) closure and restoration of any access roads not required for Project maintenance or access (SE 4). Temporary "drive and crush" impacts to vegetation would occur at small areas during construction, including conductor pulling and tensioning sites, turnarounds, temporary concrete batch plants, and temporary equipment storage yards (SE 3). Closure of temporary access roads and the limiting of access through gating or other means (SE 4 and 6) would minimize indirect impacts to vegetation caused by recreational travel, including off-road vehicle travel beyond the Project right-of-way. All of these measures to minimize ground disturbance and aid reclamation would also minimize effects to biological soil crusts.

Nearly all vegetation communities affected by the Project are dominated by plants of relatively low stature, and a cleared or brushed right-of-way for conductor clearance and fire safety would not be required. Exceptions include riparian woodland and pine-oak woodland, and some individual trees or large shrubs in juniper savanna and xeroriparian scrubland that may require cutting. Tree cutting would be conducted to meet the NESC and an appropriate level of safety, but would be minimized to the extent possible (SE 14). Under most conditions, vegetation would be allowed to attain a height of no more than 12 feet. However, site-specific conditions may allow taller vegetation to remain, such as where an opportunity exists to place structures on elevated terrain at a stream or wash crossing. A Noxious Weed Management Plan, included as Appendix B2 of the POD, addresses survey needs and mitigation for noxious weeds.

Although some degree of habitat fragmentation would occur due to the construction of new access roads, the effects of fragmentation are generally more evident on wildlife species than on arid-adapted vegetation communities. However, closed-canopy riparian woodland may be affected by fragmentation, as openings created by vegetation trimming or removal allow increased light availability and increased competition among plants; decreased humidity; increased success of seedlings; and the invasion of low-stature shrubs, grasses, and disturbance-adapted invasive plants. These effects may extend some distance from the area of cleared vegetation, and would represent a permanent disturbance for the Project lifespan, but would be minimized where possible through selective tree-cutting, spanning riparian woodlands, and noxious weed and invasive plant management (SE 1, 2, 8, and 14).

Special-Status Plants

Selective mitigation measures that address direct vegetation impacts, vegetation preservation and restoration, and noxious weed control would minimize impacts to special-status plant species (SE 3, 5, and 14). The restriction of construction equipment and vehicle traffic to approved routes would minimize impacts to plants outside of these areas.

4.6.4.3 Noxious and Invasive Weeds

Noxious and invasive weeds are identified as major threats to native ecosystems and multiple-use public land resources. Noxious weeds are typically effective competitors with native plants for resources and may permanently change the plant community, often becoming monocultures that may alter the local fire regime by increasing the fire fuel load. Non-native grasses in particular can provide a fuel source for intense fires, for which some native vegetation communities are not adapted. This may result in direct mortality of animals during the fire (Esque et al. 2003), mortality due to a post-fire reduction in food resources, and/or the threat of long-term habitat change due to the increased abundance of fire-adapted non-native plants that often occurs after such fires. Such changes usually preclude re-establishment of the native plant community in disturbed areas, and represent a permanent change in the local ecology. Several noxious or invasive weed species likely already occur within the Project study corridor, and a Noxious Weed Management Plan is included as Appendix B2 of the POD to describe how this issue will be addressed.

Preconstruction noxious weed surveys would be conducted as a part of Project weed management efforts. Early detection, containment, and control of noxious weeds during and following Project construction would minimize the potential for these invasive species colonizing the Project area, and would contain the spread of pre-existing infestations within the Project limits of disturbance. The Noxious Weed Management Plan provides methods to control the potential occurrence or infestation of noxious weeds during and following construction of the Project.

4.6.4.4 Mitigation Measures for Wildlife

This section describes how selective mitigation measures would be applied to minimize direct impacts to wildlife, and indirect impacts through modification or loss of habitat. Although specified in further detail in Section 4.6.4.2, these measures would also benefit any special-status species that may be present.

Large Mammals

Selective mitigation measures addressing the reduction of ground disturbance and restoration of vegetation would help reduce effects to habitat for large mammals (SE 3, 5, and 14). A posted reasonable construction speed limit could minimize potential collision risk to wildlife in road areas, and construction activities may be constrained during certain seasons to address needs of special-status species at specified locations (SE 12). Debris and trash would be properly contained and regularly removed from the Project to an appropriate landfill site. Construction excavations would be fenced or covered to preclude injury or trapping of wildlife or livestock. Postconstruction access may be controlled by various means (SE 4 and 6).

Small Mammals

Resource awareness training for construction personnel would help mitigate impacts to small mammals, and a reasonable posted construction speed limit could minimize potential impacts

to wildlife occurring in the vicinity of roads. Mitigation measures that address vegetation preservation, restoration, and noxious weed and erosion control would contribute to habitat maintenance and recovery for small mammals (SE 3, 4, 5, and 14). Excavations would be addressed as mentioned above (see *Large Mammals*).

Aquatic, Large Wading, and Shore Birds

Large flocks of wintering waterfowl, including Sandhill Cranes, white geese (Snow Goose and Ross's Goose), and other waterfowl disperse daily from Bosque del Apache NWR and the Ladd S. Gordon Waterfowl Area to forage on agricultural lands along the river. The Rio Grande crossing avian impact assessment study showed that white geese regularly flew at heights well above the proposed transmission line at all surveyed crossing sites during both migratory and foraging flights (Appendix B2). Sandhill Cranes and waterfowl, however, were quite variable in flight heights at different crossing points, some being within the collision danger zone. For many bird species, although long-distance flights often take place well above the height of a transmission line, collision risk can increase when taking off or landing and during low-elevation daily flights near feeding areas.

Bird surveys totaled approximately 1,150 hours, were restricted to peak activity near dawn and dusk, and multiple observers were present during each survey occasion. During the study, Sandhill Cranes were commonly observed flying in close proximity to electrical lines, with no collisions or near-misses documented. Two fatal and two apparently non-fatal collisions of ducks were observed, as well as one apparently non-fatal collision involving a White-winged Dove. All observed collisions were at crossing locations for alternatives that were later eliminated from further consideration.

The study predicted that while potentially fatal collisions of Sandhill Cranes and other large birds are likely to occur, a substantial effect at the population level is unlikely for any species. Mitigation measures to improve visibility of groundwires (SE 15) would reduce the collision risk for large birds. This may include the use of bird diverters on groundwires and guywires, and the use of one-inch OPGW rather than one-half-inch OHGW where practicable. Although either groundwire type presents a collision risk, larger cables increase the visibility of the line and would create a lower risk than smaller cables. An Avian Protection Plan and associated avian conservation strategy would be developed through collaboration between the BLM, cooperating agencies, and the proponent, to mitigate the collision risk and loss of productivity for all birds. The mitigation measures proposed for identified areas of high collision risk would follow the recommendations of the Avian Powerline Interaction Committee (APLIC), including the application of bird diverters (APLIC 2012). Potentially significant impacts could occur, but would likely be restricted to short-duration events such as poor-visibility conditions that prevent birds from detecting the lines or bird diverters in time to avoid collision. Further discussion of bird-powerline interactions at the continental scale is presented in the discussion on cumulative effects, Section 4.17.

Since the transmission line would span most aquatic habitats (SE 8), there should be no significant impacts to aquatic and shorebird nesting habitat. Temporary disturbance to foraging habitat may occur, and some permanent disturbance to foraging habitat may occur in the vicinity of the Lordsburg Playa. Structures would be placed within the Rio Grande floodplain, but they

would not be located near shore habitat and would not permanently affect these species. Maintenance over the life of the Project may cause intermittent disturbance within the Rio Grande floodplain, and a collision risk would be created by conductors and OHGW. The collision risk and any loss of habitat would be addressed through the Avian Protection Plan and conservation strategy. Timing of construction to avoid avian nesting or breeding times would help minimize impacts to birds (SE 12).

Raptors

Disturbance of nesting raptors may be avoided by constructing outside of nesting season (SE 12). Mitigation measures addressing the reduction of ground disturbance and restoration of vegetation would help minimize effects to ground-nesting species such as the Western Burrowing Owl, as well as the small mammal prey base of many raptors (SE 3, 5, and 14). Structure type, design, siting, and application of bird diverter devices on groundwires and conductors would help minimize avian collision potential (SE 7 and 15). All structures, substations, and ancillary facilities would be constructed to APLIC standards to reduce or eliminate the risk of electrocution (APLIC 2006). Measures to reduce the risk of collision and the effects of habitat loss on bird productivity would be addressed through the collaborative development of an Avian Protection Plan and avian conservation strategy.

Passerines and Other Birds

Take or possession of nearly all bird species native to North America, including removal of active nests (defined as containing eggs or young), is prohibited under the MBTA. The timing of construction to avoid the nesting season would mitigate impacts to nesting birds, although construction may occur in some areas following clearance surveys to ensure no active nests are disturbed (SE 12). Mitigation measures addressing the reduction of ground disturbance and restoration of vegetation would help minimize effects to passerines (SE 3, 5 and 14), and the risk of invasive plant colonization would be managed using mitigation measures included in the Noxious Weed Management Plan (POD Appendix B2). Structure type, design, siting, and application of bird diverter devices on groundwires and conductors would help minimize avian collision potential (SE 7 and 9). Measures to reduce the risk of collision and the effects of habitat loss on bird productivity would be addressed through the collaborative development of an Avian Protection Plan and avian conservation strategy.

Amphibians

Aquatic habitats would be spanned, minimizing the potential for direct impacts to many amphibians. Potential effects of erosion on aquatic habitats occupied by amphibians would be mitigated using SE 1, 2, 3, and 8. Direct impacts to amphibians, their eggs, and larvae at stream crossings would be mitigated using SE 8. Amphibians remaining underground during winter and dry seasons cannot be effectively detected or avoided, although they would generally be present only in close proximity to temporary water sources such as washes and stock ponds. These sites would generally be avoided or spanned where possible in consideration of their importance to all wildlife (SE 8). Fencing or covering of excavations would minimize the potential for injury or trapping of amphibians. Any individual dormant or surface-active amphibians in areas subject to

ground disturbance would be at risk, as would active amphibians crossing access roads. Mitigation measures addressing the reduction of ground disturbance and reduced intensity of vegetation management would help reduce the risk to amphibians (SE 3 and 14).

Reptiles

Resource awareness training for construction personnel and implementation and posting of speed limits in construction zones could help minimize the road mortality of reptiles. Mitigation measures that preserve or restore vegetation and habitat, reduce the risk of invasive plant colonization, and minimize the effects of erosion or impacts to riparian or aquatic habitats would reduce potential impacts to habitats occupied by reptiles (SE 1, 2, 3, and 8), and fencing or covering of excavations would minimize the potential for injury or trapping.

Fish

Siting of transmission line structures typically includes avoidance (spanning or re-alignment) of aquatic habitats, due to the inherent potential of ground instability issues in such areas. This creates an additional buffer between aquatic habitats and ground disturbance, which helps minimize erosion and other potential impacts to aquatic resources. Transmission lines would span aquatic habitats and use existing stream crossings, precluding any direct disturbance to fish habitat (SE 2 and 8). BMPs and mitigation measures would effectively control erosion that might otherwise affect waters in the Project area (SE 1, 2, and 3). Although erosion would be effectively controlled with those methods, an elevated risk of erosion may remain in some disturbed areas.

Invertebrates

Aquatic invertebrates are not likely to be affected since the Project would span aquatic habitats (SE 2 and 8). Some invertebrates, their eggs, and larvae could be directly impacted by construction traffic at stream crossings. Mitigation measures directed at reducing erosion would effectively preclude effects to water quality that could potentially affect aquatic invertebrates (SE 1, 2, and 3). Springs would be avoided during development of new construction access (SE 8), and construction activities are unlikely to have any effects on aquifers that support springs. Mitigation measures addressing the reduction of ground disturbance and restoration of vegetation would help minimize effects to terrestrial invertebrates during construction and maintenance (SE 3, 5, and 14).

4.6.4.5 Special-Status Species Impact Overview

This section contains a general discussion of potential impacts and appropriate mitigation measures for species listed under the ESA, and those proposed or candidates for listing; species protected under the BGEPA; the Cactus Ferruginous Pygmy-owl; and the Arizona Striped Whiptail and Chihuahua scurf-pea, which are under review for ESA listing. Detailed, site-specific analysis of impacts and final mitigation measures would be developed during Section 7 consultation with the USFWS. The remaining special-status species known or potentially

occurring within the study corridor are addressed in the biological technical report (Appendix B1).

Impact Levels for Special-Status Species

The following definitions were applied in the analysis of potential Project impacts to special-status species. Table H-7 (Appendix H) provides the mileage of each level of impact to special-status species that may occur under each Project alternative. As discussed in Section 4.6.3.1, "take" of any ESA-listed, proposed, or candidate species would be considered a significant impact. The purpose of this analysis was to estimate the extent of potential impacts, considering existing conditions, to allow a comparison of alternative routes.

Low Impacts – typically occur in areas that are outside the typical range or suitable habitat for the species, including areas heavily affected by human development.

Low-Moderate Impacts – typically occur in areas that pre-existing disturbance, including roads and utilities or minor developments. Suitable habitat may be present, but may be compromised by existing developments. Suitable habitat may also be of moderate quality, may be present only in smaller patches, or may be affected by "type conversion" (e.g., conversion from grassland to shrubland).

Moderate Impacts – typically occur in apparently suitable habitat, and are likely to include permanent loss of substantial portions of that habitat. Often, moderate impacts occur in areas where mitigation measures or existing access roads may assist in minimizing the extent and degree of impacts.

Moderate-High Impacts – occur in habitat that is clearly suitable, generally without existing disturbances; impacts may be difficult to mitigate. Moderate-high impacts may also occur in areas similar to those with moderate impacts, but the total area affected per mile may be greater on steep slopes that require higher amounts of ground disturbance.

High Impacts – occur in areas of the highest value to listed species, such as extensive, intact riparian woodlands or other rare habitat types. Impacts to habitat supporting local endemics, such as species restricted to single springs, would be high.

Mammals

Lesser Long-nosed Bat

A number of known roosts used by Lesser Long-nosed Bats occur within foraging range of the Project study corridor. One roost, in the Peloncillo Mountains, is within 0.25 mile of Subroute 3B. Construction activities such as blasting, drilling, and the use of heavy equipment may transmit ground vibrations that could disturb roosting bats. Near this known roost, these activities would be timed to occur between October and April when Lesser Long-nosed Bats are not present. Other roosts are known to occur within the study corridor, but beyond the distance

where direct disturbance would be anticipated. All known roosts are located more than 2 miles from the BLM preferred alternative.

If preconstruction surveys or other information indicates the presence of additional caves or abandoned mines within the habitat and known distribution of the species that are within 0.25 mile of the Project, these would be surveyed for the presence of bat roosts. Near any active Lesser Long-nosed Bats roosts, activities that could disturb roosting bats would occur between October and April, after the bats have migrated south from Arizona (SE 12).

Large areas of the study corridor contain suitable foraging habitat for Lesser Long-nosed Bats. Some forage plants used by Lesser Long-nosed Bats would be removed during construction. However, studies have shown that agave populations, while variable between years due to annual precipitation, are normally more than adequate to support local populations of nectar-feeding bats (Scott 2004), and that forage plants near roosts are preferred over distant plants (Ober and Steidl 2004). The Project may cause minor loss of plants, generally distant from known roosts, and would be unlikely to significantly affect nectar-feeding bats. Damage to saguaros and agaves would be avoided where possible, but if removal is required they would be transplanted outside of the area of permanent disturbance or used to revegetate temporarily disturbed areas whenever feasible. Larger saguaros (more than 12 feet in height) are less likely to be successfully transplanted (Dimmitt 2011), and their removal would be avoided when possible. Salvage and transplanting would be augmented from suitable nursery stock if necessary, to achieve no-net-loss of forage plants.

Mexican Long-nosed Bat

Mexican Long-nosed Bats are known to roost within foraging range of the Project area in a single roost in the Peloncillo Mountains, shared with Lesser Long-nosed Bats. This roost is within 0.25 mile of Subroute 3B. Construction activities such as blasting, drilling, and the use of heavy equipment may transmit ground vibrations that could disturb roosting bats. Near this known roost, these activities would be timed to occur between October and April when Mexican Long-nosed Bats are not present.

Plants at risk of removal during Project construction would be transplanted or used for onsite revegetation, to achieve no net loss of forage plants. The number of agaves that would be affected by the Project does not represent a significant impact on the population of the plants in the region or availability of this resource for nectar-feeding bats. The portion of the Project within or near the range of the Mexican Long-nosed Bat is generally located in semidesert grassland, where agaves would be rare or absent. The entire potential range of Mexican Long-nosed Bats in the study corridor is within the range of Lesser Long-nosed Bats, and all mitigation measures discussed for that species would be implemented to benefit both species.

New Mexico Meadow Jumping Mouse

New Mexico Meadow Jumping Mouse habitat may be present at the San Antonio crossings of the Rio Grande, although the species has not recently been detected in Socorro County outside of the Bosque del Apache NWR. Nevertheless, any New Mexico Meadow Jumping Mice present would be at risk of direct mortality from vegetation removal. In addition, vegetation maintenance

throughout the life of the Project would require ongoing, intermittent disturbance. Small mammal surveys conducted at that river crossing would provide information on the local status of the Meadow Jumping Mouse. Mitigation measures that minimize effects to riparian vegetation would preserve potential Meadow Jumping Mouse habitat (SE 3, 5, 8, and 14).

Mexican Gray Wolf, Nonessential Experimental Population

No portion of the Project would enter the Gila National Forest, which encompasses the designated Mexican Gray Wolf Recovery Zone; but much of the Project does overlap the NEP boundary. Wolves are long-range dispersers and may enter the study corridor within the NEP boundary. Any alternative in Route Group 3 would pass through areas near the Burro Mountains that are within the dispersal range and habitat tolerance of Mexican Gray Wolves. Mexican Gray Wolves have been introduced into Sonora, Mexico, and may disperse into the United States in the future. However, the potential for the species occurring at present or in the future within the study corridor or being affected by any phase of Project development or operation is very low. If future management allowed Mexican Gray Wolf expansion outside the current Recovery Zone, human presence and construction activity within 1 mile of a wolf den could disturb the animals. Disturbance could affect survival of the pups, which are sensitive to being moved when young. Under management rules covering the NEP, any effect on the Mexican Gray Wolf caused by otherwise-authorized land use is considered legal incidental take, subject to special temporary provisions and restrictions involving den, release, and rendezvous sites (USFWS 1998a). No selective mitigation measures are proposed for the Mexican Gray Wolf.

Jaguar

Linear utilities, such as constructed transmission lines, are likely not a significant barrier to Jaguar movement, as successful dispersal has occurred into and between several mountain ranges in the Southwest with moderate human use of the intervening valleys. All Jaguars recently found in the United States appear to have originated from the nearest reproducing population in northern Sonora, approximately 140 miles south of the United States-Mexico border. While the potential for Jaguars occurring within the Project area is very low, disturbance associated with construction could result in temporary avoidance of those areas by any Jaguars using the area. Mitigation measures that address impacts to vegetation and the effects of erosion would contribute to the minimization of effects to habitat that may be used by Jaguars (SE 1, 2, 3, 4, 5, 14, and 16).

Ocelot

There have been several confirmed sightings of Ocelots in southern Arizona since 2009. Prior to these sightings, the most recent record was from the mid-1960s (AZGFD 2011b; Hoffmeister 1986). The recent sightings could indicate an expansion of the species' range northward, but more likely represent vagrant animals from northern Mexico. Movements of Ocelots in southern Arizona are likely to occur primarily along riparian corridors where elongated ribbons of dense vegetation provide cover for the animals' movements. Removal of vegetation in riparian habitats may be detrimental to continuity of habitat for Ocelots and other animals. Project crossings of riparian habitat would span smaller streams, but engineering constraints may require placement

of structures within the floodplain of larger streams. Vegetation clearing to maintain conductor clearance in compliance with the NESC may require removal of vegetation within the Project right-of-way at stream crossings, and may contribute to riparian habitat fragmentation. Selective vegetation removal, where feasible, would minimize such impacts. Mitigation measures that address vegetation preservation and restoration, erosion prevention, and effects to riparian habitat would minimize impacts to habitats that may be used by Ocelots (SE 1, 2, 3, 4, 5, 8, 14, and 16).

Jaguarundi

Jaguarundis inhabit a wide range of habitats south of the United States, with the common element being dense ground vegetation (de Oliveria 1998). Because dense stands of vegetation in southern Arizona are concentrated along drainages, these areas would be the most likely to support Jaguarundis and their movements. Potential effects on Jaguarundi habitat would be similar to those mentioned above for the Ocelot. Cats could avoid areas subject to disturbance from construction, operation, or recreational traffic. However, based on the lack of any confirmed records in either New Mexico or Arizona (AZGFD 2004b; de Oliveira 1998), and the determination by the USFWS (2001; supported by Brown and González 1999) that Jaguarundis may never have been present in Arizona, no impacts to Jaguarundis are anticipated from development or operation of this Project. Mitigation measures that address vegetation preservation and restoration, erosion prevention, and effects to riparian habitats would minimize impacts to habitats that may be used by Jaguarundis (SE 1, 2, 3, 4, 5, 8, 14, and 16).

Birds

Golden Eagle

Golden Eagles are a wide-ranging species that could occur almost anywhere within the study corridor, outside of urban areas. Because of this Project-wide range and the diversity of habitats that Golden Eagles may use, areas of potential impacts were not mapped in the impact analysis. Prior to construction, surveys would occur and mitigation measures described below would be employed as needed near Golden Eagle nests or other sensitive areas.

Impacts to Golden Eagles could include construction disturbance of breeding or nesting behavior, potentially resulting in nest abandonment. Seasonal avoidance of construction in Golden Eagle nesting areas would minimize disturbance of the birds (SE 12). Mitigation measures that address vegetation preservation and restoration would minimize potential impacts to small mammals, which are important Golden Eagle prey (SE 3, 4, 5, and 14). Transmission line groundwires, conductors, and structures present potential collision hazards for eagles and other birds, particularly during inclement weather when visibility is reduced. This risk can be reduced with mitigation measures SE 7, 9, and 15. Overhead lines are significant sources of avian collision mortality, particularly during dusk, dawn, and at night when the lines are effectively invisible. SunZia incorporates avian protection into its structures in accordance with APLIC recommendations (APLIC 2012, 2006). Increased public access could result in disturbance and shooting of birds. SE 4 and 6 may be employed when feasible and at the

discretion of the landowner or land management agency, to minimize public access to areas occupied by nesting Golden Eagles.

Bald Eagle

Bald Eagles are most likely to occur in the study corridor near the Rio Grande and in the Sulphur Springs Valley in Arizona, where they may prey on waterfowl and Sandhill Cranes foraging in farmland. Bald Eagles nest along the Gila River near Winkelman, Arizona, approximately 10 miles north of the Project study area, and dispersing or foraging eagles have been recorded at Aravaipa Canyon. Bald Eagles would be susceptible to impacts similar to those described for the Golden Eagle. In addition, their habitat is more closely tied to riparian areas that support large fish used as prey and that contain tall trees that are used for nesting or roosting. The Project would not appreciably reduce the amount of available farmland in the Sulphur Springs Valley used by the eagles' prey species, but would present a potential collision risk for all large birds. The collision risk is greatest at dawn and dusk and during inclement weather, when visibility is low. Structure type, design, siting, and application of bird diverter devices on groundwires and conductors (SE 7 and 15) would help reduce the collision risk to Bald Eagles, waterfowl, and Sandhill Cranes.

The effects of vegetation clearing and resultant erosion may adversely affect the birds' habitat and the quality of waters that support their prey. Mitigation measures that address vegetation preservation and restoration, erosion prevention, and stream avoidance would minimize effects to habitat that could be used by Bald Eagles (SE 1, 2, 3, 7, and 14).

Northern Aplomado Falcon

Ground clearing for Project construction could affect areas near Aplomado Falcon nests. Construction in nesting areas would take place between August 1 and January 31, to remain outside of Aplomado Falcon nesting season (SE 12). Because Aplomado Falcons typically use existing nests constructed by other raptor species or corvids, and nest site availability may be a limiting factor for the species, any existing large nests within their habitat would be avoided by Project activities whenever practicable (Keddy-Hector 2000). In addition, many Project alternatives within the range of the species would be adjacent to existing transmission lines, so they would not result in substantial new ground disturbance. The preference of Aplomado Falcons for hunting from low perches reduces the potential for collisions of the birds with groundwires, conductors, and structures. Large areas of available but unoccupied habitat, coupled with the naturally low densities of Aplomado Falcons, would preclude significant negative effects of Project construction related to habitat loss.

While the loss of some vegetation may slightly reduce overall prey abundance, the buffering ability of the large home ranges of Aplomado Falcons would protect against a slight reduction in the prey base of generally abundant bird species. Impacts to Aplomado Falcon habitat would be somewhat mitigated by measures addressing vegetation preservation, as well as restoration and noxious weed control (SE 3, 4, 5, and 6). Additional mitigation measures addressing noxious weed management will be detailed in the POD.

Yuma Clapper Rail

The western terminus of the Project is approximately 3.7 miles west-northwest of Picacho Reservoir, where Yuma Clapper Rails occasionally occur (USFWS 2006). All alternative routes for the Project pass within 1 mile north of the reservoir, with Link C880 approaching approximately 500 feet from the northwest corner of the reservoir. Intermittently suitable habitat forms when the reservoir is filled in some years, but none is present in the portion of the reservoir nearest the Project where the vegetation is dominated by dense tamarisk. Clapper Rails have been recorded colliding with power lines (Shire et al. 2000). However, due to the intermittent presence of suitable habitat and infrequent use of the reservoir by the species, the transmission lines should not present a significant risk. The transmission line is not located between Picacho Reservoir and other nearby areas likely to attract rails, further minimizing the risk of interaction with the Project. Construction practices and design measures, including the application of bird diverters, intended to reduce impacts on waterfowl and other migratory bird species near the reservoir should be sufficient to minimize or eliminate the risk of direct effects to the Yuma Clapper Rail (SE 7 and 15). Water for Picacho Reservoir is largely delivered via canals from the Gila River, and the Project would not affect rail habitat by altering water flow to the reservoir or water quality in the canals.

Piping Plover

Project development may affect some habitat that could be used by Piping Plovers, but would not appreciably diminish the amount of open, sandy shoreline habitat that any migrating or accidental Piping Plovers might use. No mitigation actions are recommended for the Piping Plover.

Yellow-billed Cuckoo

The Yellow-billed Cuckoo requires large patches of dense, mature riparian woodland. Project activities that would compromise the size and structure of those patches could affect the species. As the Yellow-billed Cuckoo avoids habitat edges, creation of access roads through woodlands could fragment habitat and reduce suitability of the surrounding areas. Any Project alternatives crossing or approaching riparian woodlands should use engineering solutions to avoid removal of woodland habitat, in order to reduce potential impacts. Structure design and placement that allows lines to span riparian woodlands at a height sufficient to minimize the need for vegetation removal or tree-topping would be implemented in suitable habitat to reduce impacts to the species (SE 7, 8, and 14). Construction activities within riparian areas would take place outside the nesting period for the Yellow-billed Cuckoo (SE 12), which is approximately late May through late September (Johnson et al. 2007). Mitigation measures that address vegetation preservation and restoration, erosion prevention, and stream avoidance would reduce potential impacts to Yellow-billed Cuckoo habitat (SE 2, 3, 5, 8, and 14).

Mexican Spotted Owl

The Mexican Spotted Owl could potentially occur within the study corridor in the north end of the Galiuro Mountains, in the vicinity of Aravaipa Canyon. The Mexican Spotted Owl is known

to nest in Aravaipa Canyon, Turkey Creek, and other forested canyons (BLM 2009a). Critical habitat is designated in the southeast portion of the Magdalena Mountains in New Mexico and in the Rincon Mountain Wilderness in Arizona, and the species may occur within the study corridor in these areas. However, no habitat suitable for the Mexican Spotted Owl occurs within approximately 0.5 mile of the reference centerline of any of the alternative study corridors, and no impacts to the species or its habitat are anticipated to result from Project construction or operation. Helicopter flight paths during construction and maintenance would be designed to avoid Mexican Spotted Owl habitat by recommended buffer distances. No additional mitigation is proposed for this species.

Cactus Ferruginous Pygmy-owl

Impacts to suitable habitat, including dispersal habitat, would result from vegetation clearing during Project development. Since use of riparian woodlands by the species has greatly diminished in recent years, the primary nesting sites for the species are in cavities in saguaros. Avoidance, salvage, and relocation of saguaros of transplantable size would reduce effects to Cactus Ferruginous Pygmy-owl nesting habitat. Noxious weeds can alter native plant communities, resulting in increased fire frequency and severity to which Sonoran Desert vegetation is not adapted. Such changes adversely affect Pygmy-owl habitat. Mitigation measures contained in Appendix B2 of the POD address noxious weed management. Spanning of washes or riparian habitats and use of selective vegetation clearing in washes or riparian areas, augmented by restoration, would also contribute to preservation of habitat important to Cactus Ferruginous Pygmy-owls (SE 3, 5, 8, and 14).

Southwestern Willow Flycatcher

Southwestern Willow Flycatchers are known to occur within the study corridor along the Rio Grande and San Pedro River, on Cienega Creek east of Vail, Arizona, and downstream of the corridor on Aravaipa Creek and at the confluence of the San Pedro and Gila rivers. Designated critical habitat for the species includes the Rio Grande crossing alternatives and the alternatives crossing the San Pedro River in Arizona.

Clearing of vegetation along riparian corridors for Project construction may impact habitat suitable for Southwestern Willow Flycatchers. Selective mitigation measures that address vegetation preservation and restoration would be implemented to minimize impacts to riparian vegetation (SE 3, 5, and 14). Engineering of structures to span Willow Flycatcher habitat where possible would minimize impacts to these areas and would be the preferred mitigation option where feasible (SE 7 and 8). If engineering limitations preclude spanning in some areas, tall vegetation would not be allowed to exceed NESC conductor clearance requirements, but lower vegetation would be allowed to remain to preserve continuity of habitat to the extent possible.

Transmission line groundwires, conductors, and structures present potential collision hazards for birds, particularly during periods of inclement weather that may affect visibility. Placement of bird diverters on groundwires and conductors has proven effective in mitigating avian collisions (SE 15). Surveys for Southwestern Willow Flycatchers would be performed in areas of suitable

habitat. Construction in areas occupied by Southwestern Willow Flycatchers would be performed outside of the mid-May to mid-August nesting season (SE 12).

Sprague's Pipit

Sprague's Pipits winter in grasslands in southeastern Arizona and southern New Mexico, but all individuals migrate to the northern Great Plains during the nesting season. Therefore, all birds present would be adults capable of avoiding construction activities. However, some grassland habitat used during winter and migration would be lost in construction of the Project. Sprague's Pipits are sensitive to habitat fragmentation (Davis 2004) and may avoid vertical landscape features such as trees, shrubs, and man-made structures (Jones 2010, USFWS 2010c); as such, they may avoid the vicinity of a transmission line in otherwise undisturbed habitat. Postconstruction restoration in areas of habitat suitable for Sprague's Pipit may not be an effective mitigation, since the birds would likely not occupy areas near tall structures. For this reason, no mitigation measures have been identified to benefit Sprague's Pipit.

Reptiles

Sonoran Desert Tortoise

Sonoran Desert Tortoises are highly vulnerable to construction activities. As Desert Tortoises spend much of the year underground, detection can be difficult without intensive surveys, and without such measures the risk of mortality is very high for any Desert Tortoises in areas of ground disturbance. Active Desert Tortoises may take shelter under vehicles, wander into work areas, and potentially become trapped in excavations. However, preconstruction surveys, implementation of construction practices that reduce risk to Desert Tortoises, and construction monitoring are successful at reducing the immediate risk to individual Desert Tortoises posed by construction activities (standard mitigation and SE 1, 2, and 3).

Within areas that support Desert Tortoises, ground clearing for structure pads, other structures, and access roads for the Project would result in the loss of Desert Tortoise habitat, possibly including specific, high-value features such as burrows or calcium licks. In addition to direct habitat loss, Desert Tortoise populations may experience a "road effect," where traffic, collection, or other factors reducing Desert Tortoise survival near roads results in lowered population densities extending well beyond the road itself (Boarman and Sazaki 2006). Unimproved access roads for the Project would have effects of a much lower magnitude, although the availability of any road for recreational traffic can create a higher risk to Desert Tortoises than just that of the direct habitat loss from road construction. The total level of road use would determine the overall level of impact on Desert Tortoises. Postconstruction closures of access roads through gating or reclamation would help minimize these impacts to Desert Tortoises (SE 4 and 6).

Predators of Desert Tortoises, including Coyotes, domestic or feral dogs, and ravens, may be attracted to human activities such as those associated with Project construction. Discarded or unsecured food can augment predator populations, in turn increasing predation pressure on Desert Tortoises. However, BMPs would be employed, which includes securing all solid waste

generated by Project construction. Predator augmentation via increased food resources is not anticipated to be a significant effect on Desert Tortoises.

Transmission structures may locally increase Common Raven densities by providing a nest substrate normally absent from desert valleys. Predation on Desert Tortoises appears to be a learned behavior for ravens, with a small percentage of the raven population apparently responsible for nearly all observed cases of Desert Tortoise consumption. The presence of nesting Common Ravens on Project structures presents a potential risk to Desert Tortoises, with the degree of effects dependent on individual raven behavior. However, as Common Ravens are protected under the MBTA, active raven management can only be conducted under permit from the USFWS. Raven management (including nest removal or lethal take) has not been recommended in the range of the Sonoran Desert Tortoise, as increased predation has not been confirmed to occur at a level that would require such management. Use of modified structure types that do not provide new nesting habitat for predators of Desert Tortoises may reduce predation pressure in areas where other transmission lines are not present (SE 7).

Arizona Striped Whiptail

Individual Arizona Striped Whiptails could be killed during ground-disturbing construction activity. Presence of a biological monitor during construction may minimize direct impacts to individual lizards, and the Project noxious weed plan and mitigation measures addressing vegetation preservation, salvage, and restoration would help preserve grassland habitat in the area (SE 3, 5, and 14).

Tucson Shovel-nosed Snake

Potential impacts to the Tucson Shovel-nosed Snake include loss of individuals during ground-disturbing construction activity, where they could be crushed by equipment or buried in collapsed burrows. Snakes could be killed by vehicles on construction access roads. Resource awareness training for construction personnel, an enforced construction speed limit, and presence of a biological monitor during Project construction would help minimize potential direct impacts to Tucson Shovel-nosed Snakes.

Northern Mexican Garter Snake

Potential impacts to the Northern Mexican Garter Snake could include loss of individual animals during ground-disturbing construction activity and effects to water quality from Project-derived erosion. The upstream crossing of Cienega Creek (Link F600) can effectively be spanned, precluding the need for an access road crossing the creek or into the canyon bottom (SE 8). Due to the angle of crossing, the downstream crossing of Cienega Creek (Local Alternative Link F51) would require placement of one structure for each line in the bottom of a small tributary drainage near its confluence with the creek, and at least three additional pairs of structures east of Cienega Creek in a steep area with high erosion potential. An access road into the canyon bottom would be needed for the pair of structures. Alternatively, helicopter-assisted construction could be used at this location (SE 13). Structure setbacks would reduce impacts to riparian vegetation near the creek, and likely avoid any direct impacts to Northern Mexican Garter Snakes. Mitigation

measures addressing erosion would minimize potential impacts to water quality that might affect prey used by the snakes (SE 1, 2, 3, 5, 7, and 8).

Fish

Apache Trout

Although Subroute 4B would cross Grant Creek on the west side of the Pinaleño Mountains, it would do so approximately 6 miles downstream from permanent water that supports the Apache Trout. The potential for this trout occurring within the study corridor is very low, and would occur only during abnormally high flows of Grant Creek, when fish could be carried to lower elevations that do not contain perennial waters. No impacts to the Apache Trout or its occupied habitat are anticipated to result from Project construction or operation activities.

Gila Chub

The Gila Chub occurs within the study corridor only at the Cienega Creek Preserve. Since it is feasible for the Project to span the upstream crossing of Cienega Creek, and a new road crossing of the creek would not be needed, impacts to the Gila Chub would potentially only be associated with the effects of construction-induced erosion on the water quality of the creek. The terrain at the lower crossing of Cienega Creek (Local Alternative Link F51) may require that a pair of towers be sited within designated critical habitat for the Gila Chub. Standard mitigation measures addressing erosion and SE 1, 2, 3, 5, 7, and 8 would minimize potential effects to stream waters.

Roundtail Chub

Aravaipa Creek supports the only population of the Roundtail Chub in proximity to the study corridor. Link C170 would cross a nonperennial reach of Aravaipa Creek in the northern portion of the Sulphur Springs Valley, approximately 6 miles upstream of the perennial reach of Aravaipa Creek where Roundtail Chubs occur. This link also would span the headwaters of Turkey Creek, a tributary drainage to Aravaipa Creek that supports the Roundtail Chub and other native fish. This location is approximately 0.5 mile from the uppermost limits of the watershed, and approximately 8.5 miles from the confluence with Aravaipa Creek. Potential impacts to the Roundtail Chub and its habitat from the Project would be limited to effects to water quality in Turkey and Aravaipa creeks. Although tower pads may be located on ridgelines forming the Turkey Creek watershed boundary, new access roads would be sited outside the watershed to the extent practicable. Existing access is present in this area, although road improvements may be necessary. Mitigation measures addressing erosion would minimize the potential for sedimentation effects to Turkey and Aravaipa creeks (SE 1, 2, 3, 5, 7, and 8).

Rio Grande Silvery Minnow

Any construction activities that alter the streambed of the Rio Grande could negatively affect Rio Grande Silvery Minnows in the construction area through disturbance and loss of habitat. Deposition of sediments on the substrate downstream may have little direct negative effect on the

fish, although excessive suspended sediments are known to plug or abrade gills in many aquatic species.

The Rio Grande Silvery Minnow could be indirectly affected by local modification of the overall stream system. While the minnow prefers silt substrates, trophic connections to other stream species dependent on cobble-gravel substrates are likely. Construction effects relating to erosion, suspended sediment load, or substrate modification that substantially alter the overall function of the stream system may cause shifts in the species' prey base, modify nutrient input from surrounding riparian zones, or alter competitive or predator-prey relationships; in turn possibly affecting the Rio Grande Silvery Minnow.

The two proposed Project crossing sites of the Rio Grande are complicated by the wide floodplain, roads, canals, and presence of riparian vegetation that may be affected by construction and maintenance activities. Engineering transmission line structures to span riparian woodland associated with the river is more feasible at the northern crossing (Link E180), where structures would likely not be needed within the riparian zone. The width of the riparian zone at the San Antonio crossing may require more extensive vegetation management, with a greater potential to result in erosion that may affect water quality of the Rio Grande downstream of the crossing. However, preliminary engineering indicates that placement of one pair of structures partially within designated critical habitat may be required at either crossing location. Given the existing conditions at both proposed crossing locations, including large areas of cultivated land, temporary disturbance associated with Project construction is not anticipated to result in an appreciable increase in sedimentation with the implementation of mitigation measures addressing erosion (SE 1, 2, 3, 7, and 8).

Spikedace

Direct effects of construction activity on Spikedace would be primarily related to upland topsoil disturbance and disturbance of the stream bed at any road crossings. Disturbed topsoil may erode during heavy rainfall events, increasing suspended sediment load and siltation in streams supporting Spikedace. Spikedace prefer riffles and other rocky areas of flowing water, particularly for spawning; deposition of fine sediment would reduce available habitat. Suspended sediment can also plug or abrade fish gills. Mitigation measures addressing erosion would minimize the potential for sedimentation effects to waterways (SE 1, 2, 3, 5, 7, and 8).

Loach Minnow

Direct effects of construction activity on Loach Minnows would be primarily related to upland topsoil disturbance and disturbance of the stream bed at any road crossings. Disturbed topsoil may erode during heavy rainfall events, increasing suspended sediment load and siltation in streams supporting Loach Minnows. Loach Minnows prefer riffles and other rocky areas of flowing water, particularly for spawning; deposition of fine sediment can reduce available habitat. Suspended sediment can also plug or abrade fish gills. Mitigation measures addressing erosion would minimize the potential for sedimentation effects to waterways (SE 1, 2, 3, 5, 7, and 8).

Desert Pupfish

All Desert Pupfish locations within the study area are located in smaller tributaries upstream from any streams and rivers to be crossed by the Project. Some major systems downstream from pupfish introduction sites support exotic fish, and the portions of any other streams or rivers crossed by the Project are likely to be unsuitable habitat for pupfish should any disperse downstream (USFWS 2005a, c). No effects are anticipated to occur to Desert Pupfish from the construction or operation of the Project.

Gila Topminnow

Gila Topminnows are present in close proximity to the proposed crossing locations of Cienega Creek, and could be affected by any construction activities occurring in the streambed or on adjacent steep slopes where soils may be susceptible to erosion. Gila Topminnows present in the tributaries of Aravaipa Creek, including Turkey Creek, are located several miles downstream from locations where Link C170 would cross the uppermost portion of the Turkey Creek watershed. An existing road that may require improvement is present at this location, and all new disturbance would take place outside the Turkey Creek watershed to the extent practicable. Postconstruction maintenance vehicles could temporarily raise levels of suspended sediment when crossing streams supporting Gila Topminnows or other native fish. However, properly constructed road crossings in the watersheds of Cienega and Turkey creeks should reduce this potential impact to biologically insignificant levels. Mitigation measures addressing erosion would minimize the potential for sedimentation effects to waterways during the construction phase of the Project (SE 1, 2, 3, and 7).

Invertebrates

Chupadera Springsnail

Link A161 would be located approximately 3 miles west of the Willow Spring complex at a lower elevation than the spring. No effects to the Chupadera Springsnail or its designated critical habitat are anticipated.

Socorro Springsnail

Link A161b, a local alternative to Link A161, would pass immediately south (downstream) of the Torreon Spring complex, and may cross the lower portion of the perennial outflow of the spring. Spanning the spring outflow and centering the drainage between adjacent structures would minimize the potential for effects on springsnail habitat (SE 8). The Socorro springsnail would be affected by a reduction in the spring flow (USFWS 1994b); however, construction of the Project is not anticipated to alter the spring hydrology.

Plants

Pima Pineapple Cactus

All areas in suitable Pima pineapple cactus habitat would be surveyed; and where possible, destruction of plants would be avoided. Use of existing roads, when possible, could minimize new habitat loss, and siting of individual structure pads and spur roads should avoid any cacti that may be present. Mitigation measures addressing noxious weed management would minimize the potential for colonization of disturbed ground by invasive plant species (SE 1).

Conservation banks for the Pima pineapple cactus were initiated in 2002 (USFWS 2002b), allowing offsite mitigation for loss of habitat or destruction of individual plants, generally compensating for lost acreage on a 1:1 or 2:1 basis. Transplantation of the cacti is purported to have a high rate of failure, and although not appropriate as a sole mitigation measure, may be conducted if recommended by the USFWS.

Kuenzler's Hedgehog Cactus

The study corridor is outside the known range of the Kuenzler's hedgehog cactus; however, known populations occur within approximately 15 miles of the proposed SunZia East Substation. Surveys throughout the Project area in the foothills of the Gallinas Mountains would assist in determining whether the Kuenzler's hedgehog cactus or a related, unlisted variety is present. Identified Kuenzler's hedgehog cacti would be avoided during detailed siting and engineering to the extent feasible (SE 8), or salvaged for transplantation or donation to an approved conservation facility if necessary.

Acuña Cactus

Because of the presence of potentially suitable habitat in the area and proximity of a known population of the Acuña cactus in the Ninetysix Hills north of Link C620, surveys would be conducted for the species if any suitable habitat is confirmed to be present. Use of existing roads, when possible, could minimize habitat loss, although little access currently exists on Link C620. Siting of individual structure pads and spur roads would avoid any cacti present (SE 8). Plants may be suitable for transplanting, and so those that cannot be avoided could be moved to suitable adjacent habitat if deemed prudent by the USFWS and ADA.

Todsen's Pennyroyal

The distance of the study corridor from all known populations of Todsen's pennyroyal precludes direct effects on the species within its known range. However, the dispersed nature of the populations and incomplete coverage of surveys in the rugged topography preferred by the species suggests that unknown populations may exist. The 2001 recovery plan for the species suggests undocumented populations may exist in suitable habitat on Chupadera Mesa (USFWS 2001), which would be crossed with any subroute from Route Group 1, including the BLM preferred alternative. Potentially suitable habitat along links E85 and E80d was visited in September 2012, to support the Biological Assessment and Section 7 consultation for the Project.

No Todsen's pennyroyal plants were observed, although small patches of gypseous soil were present and other conditions appeared to be similar to habitat near known populations.

Should the Project cross Todsen's pennyroyal populations, construction could have a negative effect on the species. Construction activities could result in direct mortality from ground disturbance, potentially eliminating very small populations. The species appears to have low seed production and low dispersal abilities, increasing sensitivity to the types of disturbance likely to be associated with the Project, as well as increasing the length of time affected populations may need to recover or recolonize disturbed ground, postconstruction. Because populations tend to be small and localized, spanning of identified groups of plants may be feasible (SE 1 and 8). Intensive surveys would occur in any suitable habitat. Standard mitigation measures and SE 1 and 5 addressing erosion and vegetation restoration would contribute to minimizing potential effects to Todsen's pennyroyal and its habitat.

Pecos Sunflower

The Pecos sunflower typically occurs around the margins of wetlands, often in saline soils. No natural populations are known to occur in the study corridor, and no saline wetlands are present at proposed crossing locations of the Rio Grande. Natural populations upstream at Sevilleta NWR and translocated populations south of Socorro on private property are not anticipated to be directly or indirectly affected by the proposed Project. No mitigation measures are proposed for the Pecos sunflower.

Huachuca Water-umbel

The Huachuca water-umbel prefers permanently wet soils at the margins of streams, and benefits from occasional flood-related disturbance. However, the species is susceptible to scouring floods and thus requires refugia for plants or seeds to allow recolonization. The species occurs within the Project corridor at two locations; the Bingham Cienega on the San Pedro River and in the Cienega Creek Natural Preserve east of Tucson. To the extent possible, existing roads would be used for Project construction and maintenance in these areas. Link F600 (Subroute 4C3) has substantial existing access, and no effects to the hydrology of Cienega Creek are anticipated. Local Alternative F51 lacks the same level of access, and crosses Cienega Creek upstream from a short reach of perennial flow. Impacts from construction and maintenance that could adversely affect the water-umbel include any activities that could increase erosion or otherwise increase the effects of scouring floods in Cienega Creek, directly removing water-umbels or their habitat. Due to the marsh-like habitat preferences, this species may be less susceptible to mild increases in siltation than other native aquatic species. Mitigation measures that address erosion prevention and spanning of riparian habitat would minimize any potential impacts (SE 1, 2, 5, and 8).

Chihuahua Scurf-pea

The Chihuahua scurfpea is not known to occur in the study corridor, although suitable habitat is present. Surveys would take place in locations determined necessary, under suitable conditions for plant growth. If Chihuahua scurfpeas are present, impacts could include loss of habitat and removal of any plants present during ground-disturbing activities, particularly clearing of

vegetation. Ground disturbance could allow colonization by invasive plant species, which may compete with the Chihuahua scurf-pea for resources and may alter the plant community and fire regime in the area by increasing the fire fuel load. Standard mitigation measures that address erosion prevention, vegetation restoration, and noxious weed control, as well as SE 1 and 5, would minimize potential impacts to the Chihuahua scurf-pea and its habitat.

4.6.4.6 Biological Resource Conservation Areas

The following biological resource conservation areas are owned, managed, and/or operated by a variety of federal, state, and county agencies, non-profit organizations, and other private owners, or partnerships of these entities:

- USFWS owns and manages the Sevilleta and Bosque del Apache NWRs
- NPS owns and manages Saguaro National Park
- BLM owns and manages the Aravaipa Wilderness, and has partial ownership and cooperates in management with the USFS and TNC of the Muleshoe Ranch CMA
- The AZGFD owns and manages the Cluff Ranch WMA
- Pima County owns and manages the Cienega Creek Natural Preserve and Bingham Ranch and Cienega, and owns a portion of and cooperates with the State Land Department and private owners in management of the A7 Ranch
- The H & E Farm, Three Links Farm, 7B Ranch and Ladder Ranch are all privately owned

Sevilleta National Wildlife Refuge

Links E86b and E101b are the only portions of the Project near Sevilleta NWR. Link E101b passes within 0.85 mile of the southern boundary of the refuge at its closest approach. The north crossing of the Rio Grande (subroutes 1A1, 1A2, and 1A) is approximately 11 miles upstream to the south of the Sevilleta NWR boundary on the river. Transmission lines crossing the Rio Grande would present a potential collision hazard for birds using the Rio Grande corridor. SE 7, 8, 12, and 15 would help reduce this potential.

Bosque del Apache National Wildlife Refuge

Bosque del Apache NWR supports a large contingent of wintering migratory bird species, including very large populations of Sandhill Cranes and waterfowl. These birds move along the Rio Grande corridor daily between feeding sites in farmland and roost sites on the refuge, and would be at risk of collision with structures placed in the flyway. A study of avian collision hazard potential was conducted for proposed Project crossings of the Rio Grande (Appendix B2). Engineering and siting of structures at this Project crossing would involve analysis of bird use of the area, particularly flight paths and altitude. The study looked at potential avian impacts at five proposed Project crossings of the Rio Grande. Some of the results of the study are detailed in the Wildlife Mitigation Measures section of this chapter (Section 4.6.4.4). ESA-listed and candidate species inhabiting Bosque del Apache NWR include the Southwestern Willow Flycatcher,

Yellow-billed Cuckoo, New Mexico Meadow Jumping Mouse, and the Rio Grande Silvery Minnow.

Potential impacts at the Project crossing of the Rio Grande are contingent on the site selected. Engineering of the lines is complicated by two contrasting concerns: potential effects of avian collisions associated with taller structures and lines; and riparian vegetation impacts that would increase with lower structures and conductors, which would in turn affect Southwestern Willow Flycatcher habitat. Effects of Project-induced erosion could potentially affect water quality of the Rio Grande, including downstream locations such as Bosque del Apache NWR. Application of standard and selective mitigation (SE 1, 2, 3, 8, 12, and 14) would minimize potential impacts at the Project crossing. Generally, soils at crossings of the Rio Grande are moderately erodible. Careful siting of structures in areas of lower soil erodibility would further minimize residual erosion effects.

Ladder Ranch

Five streams on the Ladder Ranch support some of the last remaining populations of the threatened Chiricahua Leopard Frog in New Mexico. One of the Chiricahua Leopard Frog locations reported for Cuchillo Negro Creek is within the limits of the study corridor. Link A330b would cross the Ladder Ranch and the five streams, but far downstream from any perennial flow and potential impacts to Chiricahua Leopard Frog habitat. No effects to the Chiricahua Leopard Frog or its habitat are anticipated to result from Project development or operation.

Cluff Ranch Wildlife Management Area

Link B153b passes within 0.25-mile upslope of the Cluff Ranch WMA, and crosses Ash Creek at that point. The transmission line would span Ash Creek; mitigation measures that address spanning of streams and erosion prevention would minimize any potential for effects to this resource. The ponds at Cluff Ranch are attractive to wildlife, waterfowl, and other birds, and Ash Creek may serve as a movement corridor for wildlife traveling between the mountains to the southwest and the Gila River to the northeast. Placement of transmission lines in proximity to this area would present some potential for bird collisions with groundwires and conductors, although the majority of species present are not at a high risk of collision. No specific mitigation measures are proposed for the Cluff Ranch area.

Bonita Grasslands Restoration Project

Potential impacts to the Sulphur Springs Valley Pronghorn population could include habitat fragmentation, disturbance of animals during fawning season, and creation of new access within the valley into previously undisturbed areas. Structures could provide new hunting or nesting perches for Golden Eagles that may prey on Pronghorn fawns; new access roads could potentially encourage development in the valley or support recreational traffic, which could potentially disturb Pronghorns; and disturbance of grassland vegetation could provide opportunities for colonization by noxious weed species that may alter the local plant community.

Regular burning is a common management tool to maintain large areas of healthy grassland by controlling shrubs such as mesquite. The presence of the Project could present a logistical barrier and safety hazard if prescribed burning were desired in the Sulphur Springs Valley. However, shrub management in the area is primarily mechanical at present.

Standard mitigation measures that address erosion prevention, vegetation preservation and restoration, noxious weed management, and access control, as well as SE 1, 3, 4, 5, 6, and 12, would minimize the loss or alteration of grassland habitat and disturbance of Pronghorn in the valley. New or replaced fencing would be designed to be permeable to Pronghorn movement to minimize habitat fragmentation. Construction and non-emergency maintenance would be limited to take place outside Pronghorn fawning season. Potential for impacts to Pronghorns would exist primarily during Project construction; there would be minimal potential for impacts during the operations phase.

Aravaipa Wilderness

Link C170 would be located approximately 3.4 miles to the south of the southern boundary of the Aravaipa Wilderness. Link C592 would cross the San Pedro River approximately 8 river miles upstream of the San Pedro–Aravaipa Creek confluence. There would be no direct impacts on the Aravaipa Wilderness, and potential indirect impacts primarily to surface waters would be mitigated by erosion prevention and vegetation preservation mitigation measures (SE 1, 2, 3, 7, 8, and 14).

Lower San Pedro River Collaborative Conservation Initiative

Each proposed crossing location on the San Pedro River would be within the scoping area for the Lower San Pedro River Collaborative Conservation Initiative. Away from the river crossings, each subroute generally remains outside the scoping area. At the present time, no information is available on specific lands that would be managed as an NWR or on landowners that would participate through conservation easements and other mechanisms. For additional information, please refer to the discussion of individual subroutes in Section 4.6.5 and the discussion on land use in Section 3.10.1.3.

Muleshoe Ranch CMA

Subroute 4C1 would skirt the west side of the Muleshoe Ranch CMA in the vicinity of Soza Mesa (links C331, C361, and C470). Link C331 would cross Hot Springs Canyon, and Link C470 would cross Redfield Canyon, but both links would cross just below the reach of perennial waters in each drainage. The Project would span Hot Springs and Redfield canyons, incorporating a significant setback for structures, and mitigation measures that address erosion prevention and vegetation preservation would preclude any significant effect on local water quality (SE 1, 2, 3, 7, 8, and 14).

H & E Farm

Habitat on the H & E Farm supports wildlife that uses the San Pedro River corridor. Link C660 would cross the San Pedro River 3 miles upstream of the property. The H & E Farm is not within the Project area of influence and no selective mitigation measures are proposed for the farm. Standard mitigation measures would minimize any risk of erosion and siltation affecting water quality in the San Pedro River.

7B Ranch

The mesquite bosque preserved by the 7B Ranch is habitat often used by Southwestern Willow Flycatchers or Yellow-billed Cuckoos, and is important to passerines, raptors, and other migratory or resident birds that use the San Pedro River corridor. Removal of mesquite within the transmission line right-of-way at the river crossing would likely be needed to comply with NESC standards for conductor clearance, and would reduce available bird habitat. Extensive firewood cutting has already impacted such habitat in many areas along the river. Standard Project mitigation measures addressing erosion prevention, vegetation preservation, and restoration would help minimize impacts.

Three Links Farm

The southernmost Project alternative crossing of the San Pedro River occurs at the intersection of links C201, C261, and F40a, and would cross the river 0.37 mile upstream of the south boundary of the Three Links Farm. River flow at the crossing is ephemeral, with the nearest perennial reach being approximately 1.7 river miles downstream within the Three Links Farm property. The floodplain and associated mesquite bosque at this crossing site is approximately 800 feet wide, and may be spanned by the Project; this would avoid impacts to the low-stature mesquite trees that line both banks of the river at this point. Placement of the transmission line across the river would present some collision hazard for birds using the San Pedro River corridor for migration and local movement. However, passerines make up the majority of the bird activity along the river and their movements are likely primarily among vegetation along the river, or higher above the ground during nocturnal migration. Mitigation measures that address the collision risk for birds, and potential impacts to riparian habitat, vegetation removal, and the effects of Project-induced erosion would effectively reduce these issues at this crossing (SE 1, 2, 3, 5, 7, 8, and 14).

A7 Ranch

The A7 Ranch consists of lands on the west slope of the San Pedro River Valley, over a distance of approximately 15 river miles. Within this reach, perennial flow exists for a distance of approximately 6.5 miles along the middle of the length of the A7 Ranch property, but with only a few small segments actually occurring within the property. Link C276 would cross the San Pedro River approximately 850 feet south of the property's southern boundary, and approximately 4.9 river miles upstream of the nearest downstream perennial reach of the river.

Several species identified in Pima County's SDCP are present on the A7 Ranch, and may be affected by Project development. The Lowland Leopard Frog, Bell's Vireo, and other species associated with canyon riparian habitat occur in several of the drainages on the A7 Ranch, including Buehman Canyon, and may also be present at some of the confluences with the San Pedro River. The A7 Ranch contains only a very small reach of Buehman Canyon. Link C441 would cross through the middle of the A7 Ranch in a general south to north orientation, and would cross Buehman Canyon just upstream (within approximately 300 feet) of the A7 Ranch property. Suitable habitat is present on the A7 Ranch for Sonoran Desert Tortoises. Mitigation measures that address potential impacts to riparian habitat, vegetation removal, and the effects of Project-induced erosion would effectively reduce these issues near the A7 Ranch (SE 1, 2, 3, 5, 8, and 14).

Six Bar Ranch

The Six Bar Ranch is adjacent to the A7 Ranch, and protects similar biological resources. Potential effects are similar to those discussed for the A7 Ranch. Mitigation measures that address potential impacts to riparian habitat, vegetation removal, and the effects of Project-induced erosion would effectively reduce these issues near the Six Bar Ranch (SE 1, 2, 3, 5, 8, and 14).

Bingham Ranch and Cienega

Bingham Cienega is a spring-fed marsh within the floodplain on the west side of the San Pedro River, north of Redington, Arizona. A population of the Huachuca water-umbel is present here, but the area was not designated as critical habitat for the species. Effects to water quality at the site could be detrimental to the species, but the San Pedro River and nearby tributaries do not have an upstream surface connection with the cienega. Link C441, the nearest approach of the Project to Bingham Cienega, would cross Edgar Canyon 2.7 miles to the west of it. The Edgar Canyon drainage enters the San Pedro River approximately 0.8 mile upstream of Bingham Cienega. The nearest upstream Project alternative crossing of the San Pedro River is approximately 18 river miles upstream of the cienega on Link C276. Because of the large distances from Project crossings upstream of the cienega, no impacts are likely to occur to this population of the Huachuca water-umbel.

Bar V Ranch

The Bar V Ranch is adjacent to the Cienega Creek Natural Preserve, and protects upland habitat and a portion of Davidson Canyon. Subroute 4C3 would cross this area. Mitigation measures that address potential impacts to riparian habitat in Davidson Canyon, vegetation removal, ground disturbance, and the effects of Project-induced erosion would assist in minimizing impacts to the Bar V Ranch (SE 1, 2, 3, 5, 8, and 14).

Cienega Creek Natural Preserve

Perennial stream flow in the Cienega Creek Natural Preserve supports a variety of important wildlife species, including three special-status fish species. Riparian habitat within the preserve

is important for a wide variety of other wildlife and plant species, including the ESA candidate Yellow-billed Cuckoo. The Project may cross Cienega Creek with either Link F51 or Link F600.

The Link F51 crossing would likely require placement of one structure pair within the floodplain and would affect riparian vegetation, unless engineering design would allow a full span of the creek. However, Link F51 is located downstream from the majority of perennial flow in Cienega Creek, reducing impacts to aquatic species. Due to a narrower width of Cienega Creek and substantial existing access, the Link F600 crossing could easily be spanned using standard structure design and engineering. Link F600 may require the removal of individual trees, but would not cross any substantial patch of riparian woodland.

Potential Project impacts could include habitat fragmentation or loss, removal of vegetation, disturbance of wildlife, and effects of erosion, avian collision with transmission line groundwires or conductors, and colonization by noxious weeds. Standard mitigation measures and SE 1, 2, 3, 5, 7, 8, 9, 12, 13, and 14 would eliminate or minimize these effects.

Saguaro National Park

The Project approaches both units of Saguaro National Park, coming within approximately 1 mile from the west side of the east unit on Link F81a, and approximately 0.7 mile from the east side of the west unit on Link F510. Potential impacts to biological resources in Saguaro National Park resulting from Project development would be limited. Some saguaros and agaves that may be used by foraging nectar-feeding bats that roost in the Park would be removed, but the numbers of plants involved would not be significant for the bats due to abundant available forage in the Park and on adjacent lands. Standard mitigation measures addressing vegetation preservation, salvage, and restoration would further reduce potential impacts to vegetation.

4.6.4.7 Agency-Identified and Other Biological Resource Areas

Wildlife Linkages

The concept of wildlife linkages identifies the importance of corridors connecting large areas of relatively undisturbed, protected natural habitat (wildland blocks) that are threatened by fragmentation resulting from a variety of human-induced impacts. Habitat fragmentation and loss are currently recognized as the principal threats to biodiversity. Impacts to wildlife and their habitat within linkages could include habitat fragmentation resulting from development of new access roads, which would also provide additional access to humans, and could result in increased potential for harassment or loss of some animals. Ground-disturbing activities may affect individual animals and their habitat, and may result in erosion that could affect aquatic resources. Ground disturbance may also allow for colonization by invasive plant species, which may compete with native plants for resources and alter the local plant community and fire regime. Implementation of mitigation measures SE 1, 2, 3, 4, 5, 6, 8, and 14 would minimize these effects. Mitigation measures are applicable to each of the wildlife linkages discussed below.

Galiuro–Pinaleño–Dos Cabezas Linkage

The Galiuro–Pinaleño–Dos Cabezas Linkage system consists of five main strands. Strands A and B provide connectivity between the Galiuro and Pinaleño mountains, and strands C, D, and E link the Pinaleño and Dos Cabezas mountains. Strand A would be crossed by Link 130b, and strand B would be crossed by Link 130a. Strand C would be crossed by links C90 and C110. Strand D would be crossed by links C71, C71a, C72, C90, and C110. Strand E would be crossed by Link C71.

Agriculture forms a substantial barrier in the southern portion of the portion of the Sulphur Springs Valley north of I-10, while the northern portion of the valley is currently largely unfragmented. Project links would cross strands with a mixture of new access roads and existing roads requiring upgrades. The Project would introduce a linear feature in the northern portion of the valley that would cross both strands A and B, perpendicular to the direction of wildlife movement. However, transmission lines are porous to most wildlife movement, and the greatest potential for impacts would be during the construction phase of the Project. Maintenance of vegetation within the transmission line corridor could be beneficial to the resident Pronghorn population, maintaining connectivity for the portions of their range traversed by the transmission line.

The Project would have minor, additive impacts to the connectivity of linkage strands C, D, and E between the Pinaleño and Dos Cabezas mountains. Pre-existing linear developments (UPRR and I-10), which are significantly less porous to wildlife movement than transmission lines, limit wildlife movement to those species able to tolerate the presence of traffic at the risk of collision, or cross through existing box culverts. The Project would have the potential to affect local dispersal of wildlife, and may represent an additional contribution to fragmentation of this portion of the linkage.

Rincon–Santa Rita–Whetstone Linkage

The Rincon–Santa Rita–Whetstone Linkage system consists of six main strands. Strands 1, 2, 3, and 5 are integrated into a network of linkages that interconnect the three ranges, with strands 1, 2, and 3 providing the main routes from the Rincon Mountains south to strand 5, which provides an east-west linkage between the Santa Rita and Whetstone mountains. Strand 4, isolated to the east, provides an isolated north-south linkage between the Rincon and Whetstone mountains. Four of the six strands (1, 2, 3, and 4) of this linkage system would potentially be crossed by Project alternatives. Strand 1 would be crossed by links F40b, F51 and F600; strand 2 would be crossed by links F40a, F40b and F600; strand 3 would be crossed by links F40b and F600; and strand 4 would be crossed by Link F40a. Project links cross strands with a mixture of new access roads and existing roads requiring upgrades. I-10 and the UPRR are significant, pre-existing barriers to wildlife movement south of the Project (in strands 1, 2, 3, and 4), such that any additive effects from Project development would not contribute substantially to a reduction of wildlife movement potential.

Tucson–Tortolita–Santa Catalina Mountains Linkage

The Tucson–Tortolita–Santa Catalina Mountains Linkage system consists of two main strands. Strand A provides connectivity between the Tucson and Tortolita mountains, and strand B provides connectivity between the Tortolita and Santa Catalina mountains. Strand A would be crossed by links F510 and F540, while strand B would not be crossed by the Project. Function of this linkage is compromised by the presence of existing linear developments, including the UPRR right-of-way and I-10. These features create a substantial barrier to wildlife movements through the area. Within the linkage, the Project alignment follows an existing road and would not add significantly to existing fragmentation of wildlife habitat. Because of the existing road, new ground disturbance would be limited to structure spur roads and ancillary construction areas such as splicing, pulling, and tensioning locations.

Ironwood–Picacho–BLM Linkage

The Ironwood–Picacho–BLM Linkage system consists of two main strands. The western strand connects the Picacho Mountains with the Ironwood Forest National Monument, and the eastern strand connects the Ironwood Forest National Monument with the BLM-managed Durham-Coronado Plains. The eastern strand would be crossed by links C810, C810a, C812, C813, C814, C815, C816, and C817. Function of this linkage is reduced by existing linear features that include the CAP, the UPRR, and I-10. The proposed Project would be located entirely adjacent to existing transmission lines and other developments across this linkage, and would represent a very small contribution to further fragmentation to the linkage.

Picacho Reservoir Area

Potential impacts to biological resources at Picacho Reservoir and nearby canals are associated with avian use of the site. The endangered Yuma Clapper Rail is occasionally recorded at Picacho Reservoir, but is only likely to be present during years of abundant rainfall. There is potentially suitable habitat at the reservoir for the Southwestern Willow Flycatcher, but the species has not been documented at the site. Placement of transmission lines in proximity to the reservoir and canals creates a collision hazard for birds approaching or leaving the area. Herons, waterfowl, and other large birds changing altitude as they approach or leave those bodies of water are most susceptible to collisions with wires.

Link C880 passes within 500 feet of the northwest corner of the reservoir, and portions of other links (C890 and C880a, and the western ends of C850 and C860) are between 0.75 and 3.7 miles from it, and would have proportionally less potential as avian collision hazards at those distances. Placement of bird diverters on conductors, groundwires, and guywires (SE 15) would minimize avian collision potential.

Bird Habitat Conservation Areas

Chupadera Mesa

The principal avian habitat of concern on Chupadera Mesa is high-quality grassland and piñon-juniper ecotone. Links A30, A40, A41, A50, A60, A70, E80c, E80d, E81, E83, E84, E85, E86a, and E86b cross portions of this BHCA. Potential impacts to habitat would be primarily from clearing of vegetation for development of access roads, spur roads, and structure sites. Lesser impacts would occur at temporary sites, such as wire pulling and tensioning sites, where preservation or selective removal of trees and cropping of vegetation would be adequate in most instances. Ground disturbance creates potential for erosion and colonization by invasive plant species. Structures may provide hunting perches and nesting substrate for raptors, particularly in grassland where existing perches may not be present. SE 1, 3, 5, and 14 would eliminate or minimize potential impacts.

Luna County Grasslands

Grasslands in this area are important for wintering grassland bird species, and agricultural lands in the Uvas Valley are important feeding areas for wintering Sandhill Cranes and geese. Links A400 and A440 cross portions of this BHCA. The greatest potential impacts from Project development on grassland habitat in the area are related to ground disturbances that may provide opportunities for colonization by invasive plant species. Invasive plant species could alter the native plant community, resulting in loss of suitable habitat for wildlife, and change the local fire regime. The Noxious and Invasive Weeds and Wildland Fire Ecology and Management sections of this chapter (sections 4.6.4.3 and 4.7, respectively) provide additional details relevant to this issue. Transmission lines present a collision hazard for birds; particularly large, less-maneuverable species such as cranes and geese. Placement of lines close to feeding sites in agricultural areas increases the collision risk for these species. Transmission line structures provide potential hunting perches and nest sites for raptors. This can locally increase predation pressure on prey species in grassland habitats, where natural perches may otherwise be rare. SE 3, 5, 7, 14, and 15 would eliminate or minimize potential impacts.

Middle Rio Grande

The Middle Rio Grande BHCA contains significant riparian and adjacent upland habitats along the Rio Grande. These areas support a wide variety of resident and migratory bird species, including the Southwestern Willow Flycatcher and the Yellow-billed Cuckoo. Link A140 would cross this area north of San Antonio, New Mexico, and Link E180 would cross the area north of Socorro, New Mexico. Impacts to these areas resulting from Project development could potentially include minor habitat alteration or loss. Ground-disturbing activities, primarily vegetation removal, may cause erosion that could result in sediment input to the Rio Grande; and ground disturbance may provide habitat suitable for colonization by invasive plant species. SE 1, 2, 3, 5, and 14 would eliminate or minimize potential impacts.

Important Bird Areas (Arizona)

Sabino Creek and Lower Bear Creek

The downstream portion of this IBA south of the CNF boundary overlaps the study corridor, but would not be crossed by the Project. Links F81a and F81b are southwest of the IBA and are separated by at least 1.6 miles of urban development, from the confluence of Sabino Canyon with Tanque Verde Creek. The only potential impact the Project may have on this resource is a potential avian collision hazard for birds migrating into and out of the area seasonally. Since no links occur within 1 mile of the IBA, this hazard should be insignificant for birds within the IBA. No selective mitigation measures are proposed.

Lower San Pedro River

The Lower San Pedro River IBA would be crossed at one of four locations: links C592 near Mammoth, Arizona; C660 near San Manuel, Arizona; C276 near Cascabel, Arizona; or the crossing near The Narrows where links C201, C261, and F40a occur within the limits of the IBA. Potential Project impacts would primarily be the avian collision hazard presented by conductors, groundwires, and structure guywires where the lines cross the river. SE 7, 12, and 15 would minimize effects to avian resources at the river crossing.

Willcox Playa–Cochise Lakes

The Willcox Playa–Cochise Lakes IBA consists of the large, seasonally dry lakebed south of Willcox, Arizona; the associated permanent water features at the south end of the playa at the Apache Power Station; and the Cochise Lakes at the south edge of Willcox. This resource area seasonally supports large numbers of Sandhill Cranes and moderate to large numbers of a variety of shorebirds and waterfowl. Although this IBA is outside the study corridor, wintering waterfowl and Sandhill Cranes in the area cross through the study corridor to forage in farmland in the Sulphur Springs Valley, and would potentially be at risk of collision with transmission lines. SE 7, 12, and 15 would minimize effects to these species.

Colossal Cave Area Karst Resources

Unknown caves and similar features of karst landscapes that support roosting bats, endemic invertebrates, or other wildlife may be present in Paleozoic strata in the Vail, Arizona area and in the San Pedro River Valley. Construction of access and spur roads and placement of structures and their foundations may affect the structural integrity of karst features with a near-surface expression, potentially causing changes in cave atmospheric conditions and adversely affecting roosting bats or endemic invertebrates. Bats are sensitive to temperature and humidity parameters that define suitable roosts. Changes to the physical environment in caves may make roosts unsuitable for use by bats, and may impact endemic subterranean biota. Bats are also subject to human disturbance and substrate vibrations, including those caused by construction equipment or blasting.

Prior to final structure siting, a survey of the Vail karst landscape would likely identify caves and other features with an obvious entrance. Bat roosts identified within the Project right-of-way should be avoided by strategic placement of access and spur roads and structures (SE 8). Bat roosts within 0.25 mile of the right-of-way may be affected by blasting at structure sites. A determination of bat species and roost function should be made, allowing avoidance of sensitive periods for roosting bats (SE 12).

4.6.5 Summary of Impact Analysis Results

This section provides a discussion of potential impacts associated with development of each alternative of the proposed Project, and mitigation measures that would reduce those impacts. Detailed information on the potential distribution of special-status species by link is provided in Appendix B3, and results of the impact analysis are presented in Appendix H, in tables H-6 (Vegetation) and H-7 (Special-status Species).

4.6.5.1 No Action Alternative

Under the No Action alternative, the BLM would not grant right-of-way for construction and operation of the proposed Project. The Project facilities, including transmission lines and substations, would not be built and existing land uses in the Project study area would continue. There would be no new impacts to special-status species, wildlife, vegetation, or habitats occurring within the study area. Under the No Action alternative, it is assumed that current actions and activities in the study area would continue.

4.6.5.2 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Subroute 1A1 begins at the proposed SunZia East Substation, traveling across Chupadera Mesa to the Rio Grande crossing, then traveling south through the Rio Grande Valley to the proposed Midpoint Substation. The total length of the subroute is 228.8 miles. Potentially significant issues discussed in this section include migratory birds and habitat on Chupadera Mesa and at the Rio Grande crossing, state-listed endangered Desert Bighorn Sheep west of the Rio Grande, and habitat for ESA-listed or candidate species at the Rio Grande crossing and throughout grasslands in the Rio Grande Valley.

Beginning approximately 25 miles west of the SunZia East Substation, vegetation management requirements may affect juniper woodland in the Chupadera Mesa BHCA near its northern boundary. Many juniper trees do not exceed 12 feet in height, but the largest trees would be trimmed or removed. Juniper woodland is fragmented or absent along Link E84 and parts of E85, and effects of the Project would be minimal. However, approximately 7 miles of continuous juniper woodland along the western portion of Link E85 (beginning near milepost 3) and the eastern portion of Link E80d (ending near milepost 3) would require more extensive vegetation management. The right-of-way would encompass approximately 340 acres in this area, although tree removal would be required on a lesser amount, depending on site-specific conditions. Minimizing ground disturbance, trimming or clearing of vegetation within the right-of-way, and

the effects of erosion (SE 1, 2, 3, and 5) would reduce potential impacts to habitat within the BHCA. Although residual effects of vegetation management would occur, the loss of juniper trees would not likely be significant given the naturally patchy nature of the existing woodland-savanna matrix present in this area.

The floodplain at the north crossing of the Rio Grande (Link E180) is approximately 1.25 miles wide, and is within an important bird flight corridor. Approximately 50 percent of the floodplain at this crossing is either active or former farmland, lacking riparian woodland and natural vegetation. An open-canopy, mixed native and non-native woodland on both banks of the river between mileposts 1.2 and 1.8 would require the removal of large trees for the Project's vegetation management needs. However, removal of trees in this area would be minimized to the extent practicable (SE 1, 2, 5, 8, and 14). Although dense, mature woodland suitable for Southwestern Willow Flycatcher or Yellow-billed Cuckoo nesting is not present at this crossing, the habitat could support migrating or foraging individuals. Nesting habitat recovery could occur in the future given the dynamic nature of Southwestern riparian habitat. Vegetation management over the lifetime of the proposed Project could prevent or impair that recovery within the right-of-way. Any vegetation management required would be conducted outside the nesting season for Southwestern Willow Flycatchers and Yellow-billed Cuckoos, except in emergency situations (SE 12).

Large flocks of wintering birds, including Sandhill Cranes, white geese (Snow Goose and Ross's Goose), and other waterfowl, disperse daily from Bosque del Apache NWR and the Ladd S. Gordon Waterfowl Area to forage on agricultural lands along the river. The Rio Grande crossing avian impact assessment study showed that white geese regularly flew at heights well above the proposed transmission line at all surveyed crossing sites during both migratory and foraging flights (Appendix B2). Sandhill Crane and waterfowl, however, were quite variable in flight heights at different crossing points, with some being within the height range of conductors or groundwires. For many bird species, although long-distance flights often take place well above the typical height of conductors or groundwires, collision risk can increase when taking off or landing, and during low-elevation daily flights near feeding areas.

The north river crossing location (subroutes 1A, 1A1, and 1A2) is located approximately 12 miles north of the San Antonio river crossing location (subroutes 1B1, 1B2, 1B2a, and 1B3).[1] When compared to the San Antonio crossing, the floodplain is narrower at the north crossing with lower amounts of farmland and riparian woodland used by foraging Sandhill Cranes, waterfowl, and other migratory birds. However, this could serve to constrain bird flight to a narrower corridor. The north river crossing location is also farther from important night roosts than the San Antonio crossing, possibly reducing daily use by cranes and waterfowl. The avian collision risk study estimated that, while collisions would occur, effects at the population level are not expected.

[1] The avian collision risk study conducted at multiple locations along the Rio Grande (Appendix B2) did not include the north river crossing used by Subroute 1A1, as it had not been identified as an alternative when the study was initiated. Although survey data are unavailable to show differences in daily or seasonal bird use between these locations, the collision risk is assumed to be similar for either proposed crossing location.

Mitigation measures to improve visibility of groundwires (SE 15), such as the use of bird diverters on groundwires and guywires, and the use of one-inch OPGW rather than one-half-inch OHGW where practicable, would reduce the collision risk for large birds. Potentially significant impacts could occur, but would likely be restricted to short-duration events such as poor-visibility conditions that prevent birds from detecting the lines or bird diverters in time to avoid collision. Significant contributions of a single, similar transmission project to long-term declines of cranes, waterfowl, or migrating birds have not been documented. Further discussion of interactions between birds and transmission lines in the Central Flyway and at the continental scale is presented in Section 4.17, Cumulative Effects.

Undisturbed portions of the floodplain at this north river crossing location (Link E180) are within designated critical habitat for the Southwestern Willow Flycatcher, and potentially suitable habitat for the Yellow-billed Cuckoo. The crossing does not contain suitably dense, seasonally flooded nesting habitat for the flycatcher or large patches of mature trees suitable for the cuckoo at present. Vegetation management needs may reduce the potential for future recovery of riparian woodland within the designated critical habitat, although removal of low trees such as coyote willows (*Salix exigua*) may not be required. The river crossing is also within designated critical habitat for the Rio Grande Silvery Minnow. Ground-disturbing activities have the potential to result in erosion that could allow sediments to reach the river. Mitigation measures that address erosion (SE 1, 2, 3, 8, and 13) would reduce the potential for river sedimentation.

Impacts to habitat from vegetation clearing or trimming within the riparian zone may affect birds and other wildlife. Mitigation measures that preserve riparian vegetation, reduce the effects of erosion, and lower the risk of avian collisions (SE 1, 2, 3, 4, 8, 12, 14, and 15) would reduce impacts for birds and their habitat along the river. Allowing smaller trees and shrubs to remain within the conductor zone would preserve cover and allow movement of birds and small wildlife that may be sensitive to open spaces. These selective mitigation measures would reduce riparian impacts from moderate-high to moderate.

Links E200 and E211 would cross a Desert Bighorn Sheep movement corridor in Socorro County west of the Rio Grande, between Polvadera Mountain and Socorro Peak. Potential impacts to Bighorn Sheep could include temporary disturbance from construction noise and the presence of humans during Project development, and intermittent disturbance during maintenance through the life of the Project. The presence of transmission structures and associated corona or wind noise has not been demonstrated to significantly affect habitat use by Bighorn Sheep (Smith et al. 1986). Increased recreational vehicle access, potentially resulting in disturbance to Bighorn Sheep, may result from the construction of new access roads in the area on Link E200 between mileposts 1.5 and 6, but Link E211 is parallel to an existing transmission line with existing access. SE 4, 6, and 12 are designed to minimize the effects of construction disturbance and the potential for increased access to a level that is not expected to be significant.

Suitable habitat for the Aplomado Falcon along the subroute is extensive, particularly in Sierra and Luna counties west of the Rio Grande. However, the southern portion of this subroute parallels existing roads and linear utilities from Link A330a west of Elephant Butte Reservoir, to the Midpoint Substation. Paralleling existing utilities minimizes new disturbance to falcon habitat, and concentrates noise and disturbance during maintenance near areas already subject to

other types of ongoing disturbance. Potentially significant impacts to the species could be avoided through vegetation restoration and erosion prevention (SE 1, 3, 5, and 8), and timing construction and maintenance to avoid the nesting season (SE 12).

Subroute 1A1 passes through the Luna County Grasslands BHCA and habitat for the Sprague's Pipit. New access within the BHCA would be limited to spur roads as links A400 and A440, which cross the Nutt Grasslands within the BHCA, are parallel to an existing line. Vegetation preservation and restoration (SE 3 and 5) would minimize the effects of temporary disturbance. Colocating the Project with existing lines avoids potentially significant impacts to the Sprague's Pipit relating to the species' avoidance of tall structures.

Subroute 1A2 – BLM Preferred Alternative

Subroute 1A2 is largely identical to Subroute 1A1 with a length of 230.3 miles, but links E86a and E86b would affect a greater area of Chupadera Mesa with less existing access, partially in steeper terrain.

Table 4-16 provides estimates of the miles of potential suitable habitat for special-status species that would be crossed by Subroute 1A2. Estimates for all alternatives are provided in Appendix B3.

Table 4-16. Estimated Miles of Special-status Species Habitat Crossed by Subroute 1A2

Link	Miles	Northern Aplomado Falcon	Yellow-billed Cuckoo	Southwestern Willow Flycatcher	Sprague's Pipit	Rio Grande Silvery Minnow
A10	2.6					
A161	15.3	12.0				
A161a	9.4	9.4				
A21	10.2					
A260	28.4	11.4				
A330a	14.1	10.0				
A330b	25.5	20.5				
A400	14.6	14.6			9.6	
A440	12.4	12.4			7.0	
A520	0.5	0.5			0.5	
A530	4.0	2.0				
E101b	19.6					
E133	5.9					
E180	4.4	4.4	1.0	1.0		1.0
E200	6.4	2.0				
E211	14.1	14.1				
E82	9.9					
E84a	2.7					
E86a	16.6					
E86b	20.6					

Subroute 1A – North River Crossing

Subroute 1A is shorter than Subroute 1A1, with a total length of 219.5 miles. Subroute 1A is largely identical to Subroute 1A1, but differs in the segment that crosses Chupadera Mesa. The juniper woodland and savanna along Link E80c, beginning near milepost 13.7, is relatively intact and of a higher tree density than on links E84 and E85 (Subroute 1A1). Vegetation management requiring extensive tree removal could occur for a distance of approximately 10.5 miles (approximately 510 acres within the right-of-way) through relatively contiguous juniper woodland. Open, treeless patches do occur throughout the Chupadera Mesa BHCA naturally and as a result of human activities. The proposed Project could result additional fragmentation through the creation of a continuous break in this habitat across the entire BHCA. However, given the often-patchy nature of juniper woodland, and that the species associated with this habitat would typically be capable of moving across such open patches, these effects may be negative but are not likely to be significant. Minimizing ground disturbance, clearing of vegetation within the right-of-way, and the effects of erosion (SE 1, 2, 3, and 5) would minimize potential impacts to habitat within the BHCA.

Subroute 1A also differs from Subroute 1A1 northwest of Elephant Butte Reservoir, where Link A270 is used rather than Link A260. Link A270 is shorter than Link A260, but is not parallel to an existing transmission line. Construction of this link may affect Aplomado Falcons and wintering or migrating Sprague's Pipits. Potentially significant impacts to the Aplomado Falcon could be avoided through vegetation restoration and erosion prevention (SE 1, 3, 5, and 8), and timing construction and maintenance to avoid the nesting season (SE 12). Sprague's Pipits may respond negatively to the presence of transmission structures, but may benefit from measures that reduce effects to vegetation (SE 1, 2, 3, and 5).

Subroute 1B1 – San Antonio Crossing

Subroute 1B1 begins at the proposed SunZia East Substation, traveling across Chupadera Mesa to the San Antonio crossing, then traveling south through the Rio Grande Valley to the proposed Midpoint Substation. The total length of the subroute is 223.6 miles. Potentially significant issues discussed in this section include migratory birds at the San Antonio crossing.

Subroute 1B1 initially uses the same links as Subroute 1A, with similar potential impacts across Chupadera Mesa. After crossing Chupadera Mesa, no potentially significant impacts are identified until reaching Links A111 and A112 east of San Antonio. An SMA of 1,201 acres is designated in this area, for the protection of the Fugate's blue-star. Habitat for this plant may also occur outside the SMA. Surveys for this species may allow direct impacts to be avoided. Minimizing ground disturbance and reducing the risk of invasive plant colonization (SE 1, 5, 6, and 8) would also assist in reducing impacts to be less than significant.

The floodplain at the San Antonio crossing is approximately 2.15 miles wide, although approximately 2.0 miles of the floodplain is within farmland or disturbed areas. Surveys for the avian collision study (Appendix B2) were conducted at this site, which is within an area heavily used by wintering waterfowl and Sandhill Cranes. As discussed under Subroute 1A1, mitigation measures to increase visibility of the groundwires (SE 15) can reduce but not completely eliminate the collision risk, particularly when visibility is poor.

Undisturbed portions of the floodplain at this river crossing location (Link A140) are within designated critical habitat for the Southwestern Willow Flycatcher, and potentially suitable habitat for the Yellow-billed Cuckoo. The Mitchell Fire burned 1,021 acres within the floodplain in 2005. However, a patch of riparian woodland remains on the east bank of the river, and would be affected by Subroute 1B1. This woodland patch totals approximately 37 acres. Of this area, approximately 7 acres of dense coyote willows are present on a sandbar, and may provide suitable nesting habitat for Southwestern Willow Flycatchers. This willow species rarely grows to a height that would mandate intensive vegetation management, and suitable nesting habitat may continue to be present in the right-of-way. However, the remainder of the riparian woodland contains mature cottonwoods and other trees that exceed 12 feet in height, and that portion of the patch would be affected by vegetation management throughout the life of the Project. Any vegetation management required would be conducted outside the nesting season for Southwestern Willow Flycatchers and Yellow-billed Cuckoos (SE 12).

Approximately 20 acres of riparian woodland with numerous large cottonwoods form a contiguous block that may be suitable nesting habitat for Yellow-billed Cuckoos. Construction of the proposed Project would require the removal of the largest trees, creating two smaller patches. Approximately 2 acres would remain to the north, a fragment below the size threshold used by Yellow-billed Cuckoos. Approximately 12 acres would remain to the south, and would potentially remain suitable nesting habitat. However, the extent of habitat affected directly and through fragmentation is potentially significant.

The river crossing is also within designated critical habitat for the Rio Grande Silvery Minnow. Ground-disturbing activities have the potential to result in erosion that could allow sediments to reach the river. Mitigation measures that address erosion (SE 1, 2, 3, 8, and 13) would reduce the potential for river sedimentation. Impacts to other riparian-associated wildlife and associated mitigation measures are discussed under Subroute 1A1.

After crossing the Rio Grande, Link A160 crosses the southern portion of a Desert Bighorn Sheep movement corridor. Potential impacts and mitigation measures are similar to those discussed under Subroute 1A1. The remainder of 1B1 is identical to Subroute 1A.

Subroute 1B2 – San Antonio Crossing

Subroute 1B2, 209.2 miles in length, takes a more southerly route than 1A, 1A1, 1A2, and 1B1, but affects similar vegetation communities. The subroute crosses Chupadera Mesa at a relatively narrow location, with substantial existing access. After reaching Link A90 northeast of San Antonio, the remainder of the subroute is identical to Subroute 1B1.

Subroute 1B2a – San Antonio Crossing

Subroute 1B2a is largely identical to Subroute 1B2, but uses Link A260 to follow an existing transmission line northwest of Elephant Butte Reservoir.

Subroute 1B3 – San Antonio Crossing

Subroute 1B3 is largely identical to Subroute 1B2, but would affect a greater area of Chupadera Mesa with less existing access.

Local Alternative Links for Route Group 1 (Gran Quivira Area)

Biological resources for this group of local alternatives are similar to those along adjacent portions of subroutes 1A, 1A1, 1A2, and 1B1. All alternatives would cross the Chupadera Mesa BHCA, although links E84 and E85 would cross disturbed areas and the smallest amount of juniper savannah, and would require less-extensive tree management. All local alternatives in this group rejoin Link E80D and subroutes 1A1, 1A, or 1B1at the same point.

4.6.5.3 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A2 – BLM Preferred Alternative

Subroute 3A2 connects the proposed Midpoint Substation to the proposed Willow-500 kV Substation, with a length of 123.9 miles. Potentially significant issues associated with this subroute are nesting habitat for the Aplomado Falcon and wintering habitat for the Sprague's Pipit.

From the proposed Midpoint Substation to the Peloncillo Mountains northwest of Lordsburg, New Mexico, much of this subroute could affect semidesert grassland habitat that may be used by Aplomado Falcons and Sprague's Pipits. Potentially significant impacts to the Aplomado Falcon could be avoided through vegetation restoration and erosion prevention (SE 1, 3, 5, and 8), and timing construction and maintenance to avoid the nesting season (SE 12). Portions of this subroute are parallel to other transmission lines in wintering habitat for the Sprague's Pipit, but potentially significant impacts to the species may occur where no transmission lines are currently present, including links B90 and B120a northwest of Deming, and northwest of Lordsburg on parts of Link B160a.

Subroute 3A2 uses links B160a and B160b to cross the Peloncillo Mountains, where foraging habitat for the Lesser Long-nosed Bat may be affected. Existing access is absent for a substantial portion of the crossing of the Peloncillo Mountains, including a continuous segment approximately 7.8 miles in length. Habitat suitable for movements of Jaguars may be present in the Peloncillo Mountains along Link B160a. Potential impacts to the Lesser Long-nosed Bat are limited to effects to food plants (agaves). Mitigation measures that preserve agaves (SE 1, 3, 5, 12, and 16) would greatly reduce potential impacts to Lesser Long-nosed Bats. Potential effects to the Jaguar would likely be limited to construction-related disturbance of any animals occurring in the area during development. As no Jaguars have recently been detected in the Project area of influence, the potential for the species occurring is considered very low, and mitigation for potential disturbance of Jaguars would not occur unless evidence indicates an individual may be present.

The Chihuahua scurf-pea may occur on this subroute, particularly where Link B160b crosses the San Simon Valley. Potential impacts to the Chihuahua scurf-pea include alteration of habitat and direct mortality of plants from ground-disturbing activities. Standard and selective mitigation measures would reduce the potential for these effects.

Table 4-17 provides estimates of the miles of potential suitable habitat for special-status species that would be crossed by Subroute 3A2. Estimates for all alternatives are provided in Appendix B3.

Table 4-17. Estimated Miles of Special-status Species Habitat Crossed by Subroute 3A2

Link	Miles	Lesser Long-nosed Bat	Northern Aplomado Falcon	Sprague's Pipit	Chihuahua Scurf-pea
B120a	16.8		16.8	9.0	
B120b	24.1		24.1		
B121	14.2		14.2	8.0	
B160a	25.7	12.7	16.0	4.0	
B160d	17.5				13.5
B170	7.5	7.5			
B60	1.6		1.6	1.6	
B90	16.0		16.0	8.0	

Subroute 3A – North

Subroute 3A, with a total length of 123.4 miles, would result in impacts to biological resources similar to those that would occur on Subroute 3A2.

Subroute 3B – South

Subroute 3B, with a total length of 128.6 miles, takes a southerly route after leaving the proposed Midpoint Substation. All resources along this subroute between the Midpoint Substation and Lordsburg are expected to be similar to those present on the links used by subroutes 3A2 and 3A. Potentially suitable habitat for the Aplomado Falcon and Sprague's Pipit is present. A lower proportion of transmission lines is parallel to Subroute 3B compared to subroutes 3A or 3A2, potentially increasing impacts to Sprague's Pipits.

After crossing the foothills of the Pyramid Mountains near Lordsburg, Subroute 3B crosses the Lordsburg Playa parallel to an existing gas pipeline. Sensitive plants and invertebrates, including fairy shrimp, associated with the playa may be affected by ground disturbance. Reducing ground disturbance and avoiding any seasonally flooded pools would reduce impacts to these species (SE 1, 3, 5, 8, and 12).

Much of the remainder of Subroute 3B west of the Peloncillo Mountains is located in or near disturbed former agricultural lands and areas heavily affected by past overgrazing and erosion. The Chihuahua scurf-pea has not been recorded from the vicinity of Subroute 3B, but potentially suitable habitat is widespread. Mitigation measures would be similar to those described under Subroute 3A2.

4.6.5.4 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

Suitable foraging habitat for the Lesser Long-nosed Bat occurs along Subroute 4A, from the west end of Link C170 west to the CAP canal. Potential habitat for the Jaguar may be present along the east flank of the Pinaleño Mountains (Link B153a) and the central Galiuro Mountains (links C170 and C178). Suitable habitat for the Ocelot may occur along links B153a and B153b (north flank of the Pinaleño and Santa Teresa mountains), and on Link C170 in the Galiuro Mountains.

Subroute 4A crosses an ephemeral reach of upper Aravaipa Creek, approximately 5 miles upstream from the nearest permanent water. The floodplain of Aravaipa Creek, both upstream and downstream of Link C170, is affected by ongoing sources of disturbance including access roads and active agriculture, minimizing the need for new ground disturbance during Project construction. Existing access is limited in steeper terrain at higher elevations in the Aravaipa Creek and Turkey Creek watersheds. Construction in these areas would require access roads, but would also be facilitated by helicopters (SE 13). Access roads in this area would typically be reclaimed or blocked from public use (SE 4 and 6), and maintenance would be conducted primarily with the use of helicopters. These measures, standard mitigation measures, and SE1, 2, 3, and 8 would reduce the risk that erosion would affect native fish habitat in Aravaipa Creek. Construction in this area may also result in temporary disturbance to Desert Bighorn Sheep, although construction activities would take place outside identified sensitive seasons (SE 12).

Habitat for the Yuma Clapper Rail is present at Picacho Reservoir near links C880 and C880a. Habitat for the Southwestern Willow Flycatcher (including designated critical habitat) and Yellow-billed Cuckoo is present on Link C592, at the crossing of the San Pedro River. Habitat for the Southwestern Willow Flycatcher is suitable for migrating individuals but unsuitable for nesting at present. However, vegetation management over the lifetime of the proposed Project could prevent or impair future recovery of nesting habitat within the right-of-way. Any vegetation management required would be conducted outside the nesting season for Southwestern Willow Flycatchers and Yellow-billed Cuckoos (SE 12). Impacts to the riparian habitat at this crossing would be high-moderate to high before selective mitigation; SE 1, 2, 3, 4, 8, 12, and 14 would reduce impacts to moderate.

Suitable nesting, foraging, and dispersal habitat for the Cactus Ferruginous Pygmy-owl is present on Subroute 4A, from Link C178 east of the San Pedro River west to the CAP canal. Suitable habitat for Sprague's Pipit is present on Subroute 4A links B153a and B153b. Sonoran Desert Tortoise habitat occurs along portions of all Subroute 4A links, between Link C178 on the west flank of the Galiuro Mountains and west to the vicinity of the CAP canal on Link C850. Habitat for the Tucson Shovel-nosed Snake occurs in areas with sandy soils on Link C850 at the northwest corner of the Picacho Mountains. Potential habitat for the Acuña cactus may be present on suitable soils in the vicinity of the Ninetysix Hills (Link C620).

Potential impacts and mitigation measures for the Lesser Long-nosed Bat, Jaguar, Southwestern Willow Flycatcher, Yellow-billed Cuckoo, and Sprague's Pipit are the same as listed previously for other subroutes. Potential impacts to the Ocelot are probably limited to construction disturbance, which are not able to be mitigated effectively in the absence of detailed information

on Ocelot presence; but the species has a very low potential for occurring within the Project area of influence. No mitigation measures are proposed for the Ocelot.

Impacts to the Cactus Ferruginous Pygmy-owl could include loss of potential nest sites (primarily saguaros) and fragmentation of home range, foraging, and dispersal habitats. Impacts to nesting habitat are reduced by standard mitigation measures that address avoidance or salvage of saguaro cacti. Effects of habitat loss and fragmentation are reduced by SE 1, 3, 5, 8, and 12. Potential impacts to Sonoran Desert Tortoises are primarily direct mortality from construction traffic and ground-disturbing activities. Habitat loss and vegetation impacts are also important, and are mitigated by applying SE 3, 4, 5, and 6. Restricting construction to periods when Desert Tortoises are typically underground (November 1 through March 1) would reduce the risk of Desert Tortoises entering the work area (SE 12). Potential impacts to the Tucson Shovel-nosed Snake include habitat loss and direct mortality resulting from construction traffic and ground-disturbing activities. Application of SE 3, 4, and 6 would minimize these effects. Potential impacts to the Acuña cactus include direct mortality, habitat degradation or loss, and the effects of illegal collecting. SE 1, 4, and 6 would minimize these impacts.

Impacts to the Yuma Clapper Rail would be limited to the collision potential presented by conductors, groundwires, and structure guywires. Placement of bird diverters (SE 15) and use of modified structure types (SE 7) near Picacho Reservoir would reduce the collision potential for this species and other birds.

Subroute 4B – Sulphur Springs Valley

Subroute 4B follows the same path as Subroute 4A, but replaces links B153a and B153b (north of the Pinaleño Mountains) with links C71, C72, C90, C130a, and C130b around the south and west sides of the Pinaleño Mountains. Subroute 4B would cross a large, relatively unfragmented area of semidesert grassland in the northern Sulphur Springs Valley. The Pronghorn population in this valley is the subject of focused conservation efforts by the AZGFD, including extensive mechanical vegetation management, to increase the quality of the grasslands. Timing construction to avoid sensitive periods such as the fawning season would reduce impacts to the species (SE 12).

The Arizona Striped Whiptail does not occur on Subroute 4A, but potentially occurs along Subroute 4B. Application of SE 3 would minimize potential impacts to vegetation, prey, and habitat used by the Arizona Striped Whiptail. Subroute 4A and Subroute 4B share the same route beginning at the north end of the Pinaleño Mountains. From this point, all potential impacts to special-status species and mitigation measures that address these impacts are identical to those listed for Subroute 4A.

Subroute 4C2c – BLM Preferred Alternative

Subroute 4C2c begins at the proposed Willow 500 kV Substation, and is parallel to existing transmission lines at a distance of one-quarter to one-half mile until reaching the San Pedro River. The subroute then turns northward along the western side of the San Pedro River Valley before turning west to the Tortolita Substation, then north and west to the Pinal Central Substation. The total length of this subroute is 161.2 miles. Potentially significant issues

discussed in this section include impacts to migratory birds in the Sulphur Springs and San Pedro River valleys, and potential impacts to special-status species along much of the subroute.

Link C110 crosses approximately 5 miles of farmland in the Sulphur Springs Valley, north of Willcox. Large numbers of Sandhill Cranes that travel daily from roosting areas near Willcox Playa to forage in this farmland would be at risk of collision. Link C110 is parallel to existing 345 kV lines, in a relatively narrow corridor to reduce land use impacts. Minimizing distance between adjacent transmission lines can increase overall visibility of the lines to birds, reducing the collision risk. Along Link C110, four transmission lines would be present within a corridor less than 1,000 feet wide. Tubular steel pole or self-supporting lattice structures would be used in place of guyed-V structures (SE 7), which would eliminate the collision risk posed by guywires. Additional mitigation to increase groundwire visibility would be employed if necessary (SE 15).

Potential impacts to Lesser Long-nosed Bats could occur along the majority of Subroute 4C2c. These impacts may include disturbance of roosts and removal of food plants (agaves and saguaro cacti) used by the bats, and may be minimized with standard mitigation measures and SE 1, 3, 5, 8, and 12. Potential effects to the Jaguar or Ocelot could occur during construction or maintenance within potential riparian or montane movement corridors. The potential for either of these species occurring is considered very low, and mitigation for potential disturbance of these species would not occur unless evidence indicates an individual may be present.

A small, introduced population of Pronghorn is present on Allen Flat west of Willcox (Link C260). Similar to the population present in the Sulphur Springs Valley (Subroute 4B), construction activities and vegetation maintenance could result in temporary disturbance to the species. However, removal of shrubs during vegetation management would improve habitat suitability. Timing construction to avoid sensitive periods such as the fawning season would reduce impacts to the species (SE 12).

Suitable nesting habitat for the Southwestern Willow Flycatcher is not currently present within the designated critical habitat at the San Pedro River crossing. Future recovery of nesting habitat could occur if changes in upstream water use allow the river base flow to increase to a level that supports riparian habitat. Any developing riparian woodland under those circumstances could be affected by vegetation management needs over the lifetime of the Project. However, the narrow floodplain is bordered by higher terrain, and spanning of the floodplain would minimize the needs for vegetation management. The effect of existing water use in the San Pedro River is also discussed in Section 4.17, Cumulative Effects. Impacts to wildlife and existing or future riparian habitat at the San Pedro River crossing would be mitigated through measures SE 1, 2, 3, 4, 8, 12, and 14.

Impacts to the Cactus Ferruginous Pygmy-owl include loss of potential nest sites (primarily saguaros) and fragmentation of home range, foraging, and dispersal habitats. Impacts to nesting habitat are reduced by standard mitigation measures that address avoidance or salvage of saguaro cacti. Effects of habitat loss and fragmentation would be reduced to a level not likely to be significant by SE 1, 3, 5, 8, and 12.

Potential direct impacts to Sonoran Desert Tortoises are primarily mortality from construction traffic and ground-disturbing activities. Habitat loss and vegetation impacts are also important,

and are mitigated by applying SE 3, 4, 5, and 6. Restricting construction to periods when Desert Tortoises are typically underground (November 1 through March 1) would reduce the risk of Desert Tortoises entering the work area (SE 12). The creation of new access roads may allow increased recreational access, resulting in potential indirect impacts to the species. Preventing public access to new roads may be feasible in some locations (SE 4), but potentially significant impacts could occur where road closure is not possible.

Potential impacts to the Tucson Shovel-nosed Snake could occur northeast of Red Rock (Link C820) and west of the Picacho Mountains (Link C850). Effects may include temporary and permanent habitat loss and potential mortality during the construction phase resulting from traffic and ground-disturbing activities. As the species is very difficult to detect or avoid, application of SE 3, 4, and 6 would reduce but not eliminate these effects, and potentially significant impacts could occur.

Table 4-18 provides estimates of the miles of potential suitable habitat for special-status species that would be crossed by Subroute 4C2c. Estimates for all alternatives are provided in Appendix B3.

Table 4-18. Estimated Miles of Special-status Species Habitat Crossed by Subroute 4C2C

Link	Miles	Lesser Long-nosed Bat	Yuma Clapper Rail	Cactus Ferruginous Pygmy-owl	Sprague's Pipit	Sonoran Desert Tortoise	Tucson Shovel-nosed Snake
C110	18.8	6.8			5.0		
C201	13.7	13.7		6.7		13.7	
C212	3.9	3.9					
C260	10.9	10.9					
C261	6.4	6.4				4.4	
C441	15.3	15.3		15.3		15.3	
C450	17.0	17.0		17.0		17.0	
C661	3.1	3.1		3.1		3.1	
C670	3.3	3.3		3.3		3.3	
C680	26.1	26.1		26.1		26.1	
C71	4.7	4.7					
C71a	1.0	1.0					
C818	3.0	3.0		3.0		3.0	
C820	15.9	15.9		15.9		2.0	
C830	4.3	4.3		4.3			
C840	2.0	2.0		2.0		2.0	
C850	6.9	6.0	0.9	5.0		2.0	5.0
C880	2.3		2.3				
C880a	2.6		2.6				

Subroute 4C1– San Pedro Valley

Subroute 4C1 is initially identical to Subroute 4C2c from the proposed Midpoint Substation across the Sulphur Springs Valley, but travels along the eastern side of the San Pedro River

Valley and follows an existing pipeline north of the Tortolita Mountains. The total length of the subroute is 139.0 miles. Potentially significant issues associated with this subroute include many of the same special-status species that would be affected by Subroute 4C2c, bird collision risk in the Sulphur Springs Valley, and riparian impacts at the San Pedro River crossing.

Potential impacts to special-status species that occur along this subroute would be generally similar to those associated with Subroute 4C2c, and would be reduced with the same mitigation measures. This subroute crosses Hot Springs and Redfield canyons (links C331 and C361), but would be located downstream of permanent water and designated critical habitat for Gila Chub, Spikedace, and Loach Minnow. Both of these canyons would be spanned, and steep terrain at each crossing would allow structures to be sited at a height above the streambed that would preclude the need for any riparian vegetation management. In the northern portion of the San Pedro River Valley, Subroute 4C1 would require the creation of a greater amount of new access roads relative to Subroute 4C2c, potentially resulting in a higher impact to Sonoran Desert Tortoises.

Link C660 would affect mesquite bosque and a small area of existing riparian woodland within designated critical habitat for the Southwestern Willow Flycatcher at the San Pedro River crossing. No transmission lines are present at this crossing, although the proposed San Manuel Interconnect would be located adjacent to this crossing location once completed. Although no suitable nesting habitat for the Southwestern Willow Flycatcher currently exists at this crossing location, a reach with permanent flow and suitable habitat is located a short distance upstream. Riparian woodland could recover at the proposed crossing location with an increase in the river's base flow, and future vegetation management needs for the Project could affect that recovery. Impacts to riparian habitat at the San Pedro River crossing would be mitigated through measures SE 1, 2, 3, 4, 8, 12, and 14.

After crossing the San Pedro River and the northern foothills of the Santa Catalina Mountains, Subroute 4C1 follows an existing gas pipeline through habitat for the Sonoran Desert Tortoise and Cactus Ferruginous Pygmy-owl. Subroute 4C1 is identical to Subroute 4C2c from Link C830 to the Pinal Central Substation.

Subroute 4C2 – San Pedro Valley

Subroute 4C2 is largely identical to Subroute 4C2c, but differs in the links used to cross the San Pedro River. Subroute 4C2 is 151.8 miles in length. This subroute would cross an ephemeral reach of the San Pedro River at Link C276, within designated critical habitat for the Southwestern Willow Flycatcher. Dense mesquite bosque with small numbers of willows and tamarisk trees may be affected by vegetation management. Impacts to riparian vegetation would be high-moderate to high; however, SE 1, 2, 3, 4, 8, and 12 would result in residual impacts of moderate.

Subroute 4C2a is largely identical to Subroute 4C2c, but crosses the San Pedro River using the same links as Subroute 4C2. After leaving the San Pedro River Valley, Subroute 4C2a follows the existing gas pipeline also followed by Subroute 4C1. The total length of this subroute is 137.8 miles.

Subroute 4C2b is largely identical to Subroute 4C2c, using the same links to cross the San Pedro River but following the existing gas pipeline similar to subroutes 4C1 and 4C2a. Subroute 4C2b is 147.2 miles in length.

Subroute 4C3 – Tucson

Subroute 4C3 is initially identical to Subroute 4C2c, from the proposed Midpoint Substation to the crossing location of the San Pedro River. Subroute 4C3 then continues parallel to existing transmission lines with Link F40a, crosses Cienega Creek with Link F600, passes through Tucson to the Tortolita Substation, then becomes identical to Subroute 4C2c to the Pinal Central Substation. The total length of the subroute is 172.9 miles. Potentially significant impacts that could occur along this subroute include those shared with identical segments of Subroute 4C2c, and impacts to special-status species in Cienega Creek and locations near Tucson.

After crossing the San Pedro River and the links used by Subroute 4C2c, Subroute 4C3 continues through additional foraging habitat for Lesser Long-nosed Bats and potential habitat for Sonoran Desert Tortoises. Link F600 would cross an ephemeral reach of Cienega Creek near an existing gas pipeline and several road crossings, but upstream from permanent reaches within the Cienega Creek Natural Preserve. This section of the creek is within designated critical habitat for the Gila Chub, and the Northern Mexican Garter Snake, Gila Topminnow, Huachuca water-umbel, Yellow-billed Cuckoo, and Southwestern Willow Flycatcher may occur downstream in suitable habitat. Standard mitigation measures and SE 1, 2, 3, and 8 would minimize the potential for any effects related to erosion and sedimentation.

No large trees or suitable nesting habitat for Southwestern Willow Flycatchers are present at this crossing, although existing young cottonwood trees may be affected by future vegetation management needs. However, the entire creek at this location can be spanned using existing access, and terrain at the crossing may allow vegetation greater than 12 feet in height to remain through the lifetime of the Project. Any vegetation management required would be conducted outside the nesting season for Southwestern Willow Flycatchers and Yellow-billed Cuckoos (SE 12). Flow regimes and riparian habitat may also change at this location, and future increases in flow or any recovering riparian vegetation could be affected by maintenance activities. Under current conditions, no significant effects to special-status species or vegetation are expected to occur at this crossing.

Pima pineapple cactus may be present on portions of this subroute from near Cienega Creek to the southeastern outskirts of Tucson. Surveys for the species would occur in suitable habitat along this subroute, and SE 1, 5, and 8 would allow potential impacts to be minimized or avoided.

Link F112 would create a potential collision risk for waterfowl and other birds wintering at Sweetwater Wetlands, immediately adjacent to the Project. Collision risk is often highest near staging and roosting areas, where birds frequently take off and land. Bird diverters and other available measures to increase groundwire visibility (SE 15) would reduce the collision risk at this location.

Portions of the subroute may affect suitable habitat for the Tucson Shovel-nosed Snake near Marana and the Tortolita Substation. Mitigation measures for this species are listed under Subroute 4C2c. From the Tortolita Substation, the remainder of this subroute is identical to Subroute 4C2c.

Local Alternative Links for Route Group 4 (Pinal Central Substation)

Known or potentially occurring special-status species along local alternatives for the planned Pinal Central Substation include the Lesser Long-nosed Bat, Yuma Clapper Rail, Cactus Ferruginous Pygmy-owl, Sonoran Desert Tortoise, and Tucson Shovel-nosed Snake. Potential impacts and appropriate mitigation measures for these species are the same as listed for Subroutes 4A and 4B.

Local Alternative Links for Subroute 4C2 (Winchester Substation)

This local alternative, composed of links C260, C261, and C201, follows existing 345 kV transmission lines past the Winchester Substation, then turns to the north after crossing the San Pedro River. Habitat for three special-status species (Lesser Long-nosed Bat, Jaguar, and Ocelot) is potentially present along these links. Potential impacts and appropriate mitigation measures for these species are identical to those listed for Subroute 4C2. Although critical habitat is proposed for the Southwestern Willow Flycatcher at the crossing of the San Pedro River, no riparian woodland suitable for nesting is present.

Local Alternative Links for Subroute 4C2 (Tortolita Substation)

Special-status species potentially occurring on this local alternative include Lesser Long-nosed Bat, Cactus Ferruginous Pygmy-owl, Sonoran Desert Tortoise, and Tucson Shovel-nosed Snake. Potential impacts and appropriate mitigation measures for these species are identical to those listed for Subroute 4C2.

Local Alternative Links for Subroute 4C3 (Cienega Creek)

Special-status species that are known or may occur along this local alternative include Lesser Long-nosed Bat, Yellow-billed Cuckoo, Cactus Ferruginous Pygmy-owl, Southwestern Willow Flycatcher, and Sonoran Desert Tortoise. Potential impacts and mitigation measures for this local alternative are identical to those listed in subroute 4C2c and for the affected species. Similar to crossing locations on the San Pedro River, no suitable nesting habitat for Southwestern Willow Flycatcher is present at this time. Development of suitable habitat in the future may be impaired by vegetation management needs over the lifetime of the proposed Project.

Additionally, the Northern Mexican Garter Snake, Gila Chub, Gila Topminnow, and Huachuca water-umbel are present within the Cienega Creek Natural Preserve, which would be crossed by Link F51. Potential impacts to these species would be associated with sedimentation of waters (directly affecting the Gila Topminnow and Gila Chub, indirectly affecting the Mexican Garter Snake) or effects of streambed erosion (all species). Mitigation measures that address potential

impacts to streams and erosion (SE 1, 2, 3, and 8) would effectively reduce potential effects to these species.

Local Alternative Links for Subroute 4C3 (Pantano Wash to Rillito River)

Special-status species that are known or may occur along this local alternative include Lesser Long-nosed Bat, Cactus Ferruginous Pygmy-owl, Sonoran Desert Tortoise, and Pima pineapple cactus. Potential impacts and mitigation measures for this local alternative are identical to those listed in subroute 4C2c and for the affected species.

4.6.5.5 Summary of BLM Preferred Alternative

Based on results of the preceding analysis, the following potentially significant impacts to biological resources may occur with construction and operation of the BLM preferred alternative:

- Transmission lines may interfere with Sandhill Crane and waterfowl migration routes and lead to increased bird-powerline collision risk at the Rio Grande crossing and the Sulphur Springs Valley. (Subroute 1A2, 4C2c)
- Impacts may occur to Southwestern Willow Flycatcher designated critical habitat at the Rio Grande crossing, and future impacts may occur to proposed critical habitat at the San Pedro River Crossing. (Subroute 1A2, 4C2c)
- Impacts may occur to the Yellow-billed Cuckoo, Rio Grande Silvery Minnow, and designated critical habitat for the Rio Grande Silvery Minnow at the Rio Grande crossing as a result of vegetation management or erosion. (Subroute 1A2)
- Disturbance associated with construction and maintenance could impact a movement corridor for the Desert Bighorn Sheep west of the Rio Grande in Socorro County. (Subroute 1A2)
- Habitat for the Northern Aplomado Falcon may be affected west of the Rio Grande in New Mexico. (Subroute 1A2, 3A2)
- The Chihuahua scurfpea may be impacted by ground disturbance in western New Mexico and the San Simon Valley, Arizona. (Subroute 1A2, 3A2)
- A small population of Pronghorn is present on Allen Flat, and may be impacted by construction or maintenance activities. (Subroute 4C2c)
- Road construction and habitat loss may impact the Sonoran Desert Tortoise from the San Pedro River Valley to the vicinity of the Tortolita Substation, and near the Picacho Mountains. (Subroute 4C2c)
- Habitat for the Tucson Shovel-nosed Snake may be impacted near the Tortolita Substation and Picacho Mountains. (Subroute 4C2c)

4.7 WILDLAND FIRE ECOLOGY AND MANAGEMENT

4.7.1 Introduction

This section discusses the potential for the proposed Project to increase fire risk regionally, to affect fire management planning, and to constrain fire suppression operations in the vicinity of the Project.

4.7.2 Impact Assessment Methods

Most impacts that could result from the proposed Project on wildland fire ecology and management cannot be quantified or feasibly compared between alternatives. Fires may be ignited naturally, accidentally, or intentionally at any location with burnable vegetation. Incidents involving operation of the proposed Project, such as vehicle and aircraft collisions or failure of any structural components, cannot be predicted. The extent and effects of any fires that do occur would vary with the conditions at that time, as well as the specific resources that would be affected. Impacts to fire planning can be discussed at a broader scale, but any effects on desired fire management, such as the use of prescribed fire, also cannot be predicted for specific areas.

4.7.3 Impact Analysis Results

Section 4.7.3.1 discusses ways in which construction and operation of the proposed Project may directly present an increased risk of fires occurring, and indirect ways in which it may contribute to further alteration of local fire regimes. Section 4.7.3.2 discusses the effects that could result from a fire, should one occur as a result of the proposed Project. Section 4.7.3.3 presents potential effects of the proposed Project on fire management planning, and Section 4.7.3.4 discusses the effects of the presence of a transmission line on firefighting techniques, in the event of a fire in the Project vicinity.

4.7.3.1 Effects on Fire Risk

Although fire is a natural component of many healthy ecosystems, unplanned fires may threaten life, property, resources, and infrastructure, and the effects of such a fire would often be negative. The highly altered conditions now widespread across the Southwest require that the reintroduction of fire be cautious, conducted under safe conditions, and may be preceded by mechanical fuels reduction. The proposed Project could raise the risk of an unplanned ignition through several potential direct and indirect mechanisms as presented in the following discussion. However, the risk cannot be quantified, and varies with the fire threat presented by current weather and fuel conditions rather than being site-specific or associated with a particular alternative.

Construction activities that increase the fire risk are numerous, but that risk can be minimized with proper safety precautions. Blading and other earthwork can create sparks from contact between metal and rock. Welding generates large amounts of sparks and pieces of hot metal that can easily ignite fires. Small engines such as those used on chainsaws can generate sparks, and

vehicles driven or parked with the undercarriage in contact with dry vegetation may also start fires. Overland drive-and-crush is proposed as a selective mitigation measure to minimize ground disturbance, but this measure would increase the fire risk where fine fuels may be ignited by vehicles and so not be used under those conditions. Blasting may be required in some locations, and can pose a fire risk. In recognition of all of these risks, a detailed Fire Protection Plan has been developed as Appendix A4 of the POD.

In summary, the Fire Protection Plan requires the designation of a Fire Marshal by the construction contractor, who would be responsible for ensuring compliance with all mitigation measures for fire safety, as well as coordination and communication with agencies and emergency responders. All engines would be required to have an approved spark arrestor. Refueling, smoking, blasting, welding, and any other activities with a high inherent risk of fire ignition would only be conducted on cleared ground. Welding and similar activities would also require the use of a spotter. The spotter would be equipped with water and tools to quickly extinguish any sparks, and would remain for 30 minutes after such activities cease to ensure that no smoldering vegetation remains. In addition, all contractors would receive training in basic fire suppression to attempt to prevent the spread of any accidental ignitions beyond the work area. If this could not be conducted safely, contractors would contact the appropriate agency and immediately evacuate the work area. Open fires would not be permitted, and proper signage would be employed to indicate where and when activities that pose a fire hazard may take place.

Operation of 500 kV transmission lines generally presents a very low risk of fire ignition, as the scale of the structures minimizes the risk of vegetation contact. However, unforeseen events do have the potential to occur. Transmission structures may fail or be accidentally damaged as a result of human activity such as vehicle or aircraft collisions, or from severe weather, geologic hazards, and other natural events. Vandalism, such as shooting conductors or insulators, is uncommon but is impossible to predict or prevent. However, 500 kV conductors and structures are of sufficient size to be somewhat resistant to physical damage. Physical inspection of the Project would be the responsibility of local operators, but would be conducted as necessary and to industry standards.

Vegetation can contact conductors and ignite fires if the conductor clearance zone is not properly maintained. Vegetation maintenance is described in the POD, including the standards necessary for safe conductor clearance. Maintenance activities, including vehicle and small engine use, safety measures, and agency coordination, would be subject to the Fire Protection Plan similar to construction activities. Vegetation management for the purposes of fire safety inherently affects biological resources, as discussed in Section 4.6.

Although lightning may strike transmission structures, overhead groundwires are designed to capture the current and direct it to a safe ground location. Barring equipment malfunction or failure, lightning would not present an increased fire risk when striking transmission structures. By capturing and safely grounding lightning strikes that may otherwise strike flammable vegetation, groundwires may result in a small, local decrease in fire risk from lightning.

Indirect effects of the proposed Project relate to vehicle traffic and invasive plants. Increased recreational access, such as may occur along access roads, has the potential to result in unplanned ignitions. The increase in human traffic created with new roads also provides an

avenue for introduction of invasive plants. Disturbed areas have a higher risk than undisturbed areas of supporting invasive plants, many of which may be more fire-adapted than native plants and can alter the natural fire regime. Once established in a disturbed area, some plants may be able to successfully expand into surrounding undisturbed habitat, particularly when aided by fires.

4.7.3.2 Effects if the Proposed Project Contributes to Fire Ignition

The effects of an unplanned fire can range from generally beneficial to extremely dangerous, costly, and environmentally damaging. The degree of effects depends on current fuel and weather conditions, whether there is an extensive WUI, and the resources that may be affected.

Beneficial effects of fires primarily occur when fires burn under conditions similar to a typical "natural" fire. Healthy fires in forests remove ground fuels and do not kill the majority of mature trees, although occasional patches of high-intensity burns are expected. The fuel reduction from low-intensity fires reduces the risk that a large-scale, high-intensity fire could occur in the future. Grassland, savanna, and mesquite scrub fires may burn at a high intensity and remove nearly all above-ground vegetation. These vegetation communities are composed of fire-adapted plants that can recover rapidly, either through the existing seed bank or by resprouting from living roots. Regular burning is important to the maintenance of healthy grasslands.

Negative effects of fire, in addition to threats to human safety and property, can affect many other resources. Fires may directly damage cultural resources. Fire, particularly at high intensities, can threaten wildlife. However, mortality of burrowing animals is generally low, and birds or large mammals may be able to avoid direct effects of the fire. Post-fire habitat change may affect individual species either negatively or positively. High levels of erosion can occur after a fire, even in successive years if sufficiently heavy rains do not occur earlier. Erosion can result in loss of topsoil, further loss of cultural resources, degradation of water quality, and the loss of aquatic habitats as sediments fill pools and cover rocky substrates in streams (DeBano et al. 2005). The interaction between fire and non-native plants may result in conversion of native plant communities to non-native-dominated areas. Air quality can be affected over long distances (Sandberg et al. 2002).

No alternatives would cross through montane conifer forest, where some of the most severe fires have occurred in recent years. Chupadera Mesa, with an open-canopy juniper woodland-savanna of moderate height on relatively level terrain, is the most extensive woodland area that would be crossed by any subroute. Every subroute within Route Group 1 would cross some portion of Chupadera Mesa, although the juniper woodland extent and density varies among the subroutes. However, under extreme fire conditions, a fire ignited near certain parts of the proposed Project could rapidly reach nearby montane areas. The 2012 Fox and Grapevine fires in Arizona, discussed in Section 4.7.3.2, are examples of fires that burned at lower elevations in vegetation communities similar to the Project area, but extended into higher elevations.

Fire suppression can result in negative environmental effects. Ground disturbance from the creation of fuel breaks can increase the erosion risk. Fire retardant contains compounds that act as fertilizers, and may support the establishment of invasive plants or alter aquatic ecosystems. Additionally, while retardants can be critical to fire suppression, they pose a threat to cultural

resources; the salts used in these compounds can alter rock art and petroglyph panels. The principle of "minimum impact suppression techniques" may be employed in areas identified as likely to contain sensitive resources, as mitigation for the potential impacts of fire suppression. This may include reductions in the amount of vegetation management and disturbed ground, and the use of adequate buffers between aquatic sites and retardant drops or staging areas. Postfire reclamation may reduce erosion and other impacts of a fire, but can also result in the introduction of non-native plants.

4.7.3.3 Effects on Fire Management Planning in New Mexico And Arizona

The BLM's Resource Management Plan Amendment for Fire and Fuels on Public Land in New Mexico and Texas (BLM 2004a), the Arizona Statewide Land Use Plan Amendment for Fire, Fuels, and Air Quality Management (BLM 2004b), and district or field office RMPs do not specify fire management within utility corridors. However, the presence of utilities may be a constraint to the use of fire as a management tool.

Prescribed burning could occur near transmission lines under suitable conditions, but additional precautions may be necessary to reduce risk to personnel and prevent damage to structures. Intensive fuel reduction or higher-than-normal constraints on weather conditions are measures that could lower the risk of a high-intensity fire burning through a transmission corridor, and permit burning to occur in some cases. Typically, steep terrain or heavy vegetation would preclude prescribed burns, or require a full-suppression response for unplanned fires. These factors would be assessed in site-specific detail in a Prescribed Fire Plan, and would be coordinated with the Proponent and operators of the Project.

4.7.3.4 Effects of the Proposed Project on Fire Suppression

This section discusses the positive and negative effects that the presence of a transmission line can have on fire suppression, as well as the effects of damage to the Project itself from wildland fires. Transmission lines can pose a hazard to firefighting operations through several mechanisms. As human safety is of the ultimate concern in firefighting operations, these risks must be avoided. The risks would be present to some degree with any fire. However, prescribed burns would be planned and conducted under suitable conditions, taking such risks into account. The greatest threat would occur during an unplanned fire in heavy fuels during adverse weather conditions, although vegetation types with such fuels are uncommon along most proposed subroutes.

Transmission lines and other utilities represent major investments in infrastructure, with substantial economic effects incurred to customers and operators if they are damaged. As such, fire personnel and equipment may be diverted from other suppression-related activities for their protection when feasible. In some remote areas, the proposed Project would be the only infrastructure and the only obstacle to letting a fire burn safely to natural or engineered containment boundaries.

Wildland fire suppression ground operations typically use a wide range of vehicles such as light-duty and heavy-duty pickups, fire engines (Type 3, Type 6), tactical and support-type water tenders, bulldozers, and other support vehicles. These vehicles may be suitable for operation on

four-wheel drive roads, but may need certain roads prepared or upgraded by bulldozers to allow adequate access to planned fuel breaks. However, emergency fire road construction by bulldozers is rarely employed on BLM-administered lands within the study area. If a fire were to ignite near the proposed Project but expand into a montane area, emergency road construction could be part of the suppression strategy.

Transmission line rights-of-way and access roads may benefit fire crews directly, and indirectly reduce the impacts of fires and fire suppression on sensitive resources. Emergency fire roads or bulldozed fuel breaks can result in high impacts to some resources, as there is rarely time for proper engineering or surveys to determine where the lowest impact may occur. As discussed below, fire crews cannot safely work in the immediate vicinity of energized transmission lines during a fire, but transmission line access roads may be used to reduce the amount of new, unplanned roads required. Crews may also be able to use the existing utility access road and managed vegetation within the right-of-way as an initial point to expand a fuel break, and then work from a safe distance as the fire approaches. These opportunities may benefit resources that would otherwise be affected by road construction in the absence of proper engineering, and may assist in timely containment of fires that may damage resources.

Transmission lines can be hazardous to fire crews for several reasons. If a sufficient safe zone is not maintained around conductors, falling trees may damage or break the conductors and create an electrocution hazard. Broken conductors pose a direct electrocution hazard in their immediate vicinity, but can also deliver dangerous currents long distances when in contact with conductive objects such as fencing. Smoke contains particles that can carry an electric charge, and dense smoke may allow arcing from the conductor directly to the ground. Adding water to a fire further increases this risk, as the steam generated enhances the air's conductivity. Water streams themselves could conduct electricity if directed near transmission lines. To reduce the hazard posed by energized transmission lines, the Project could be de-energized when conditions would support flashovers through heavy smoke or if other concerns necessitate fire suppression within the conductor zone. This would typically be requested at the discretion of each fire's Incident Commander.

If the Project is not de-energized for a given fire, buffers would be required around structures and conductors for the safety of fire personnel. Buffers around energized transmission lines vary with the structure size and voltage, but would not be less than 100 feet from the outside conductor. This distance may be greater depending on fire behavior and fuel conditions. The outer conductors of the proposed Project would be near the edge of the 400-foot-wide right-of-way. With an additional 100 feet of buffer on each side, this would create a continuous zone nearly 600 feet wide where fire suppression could not safely occur. This area may be wider where other transmission lines are paralleled. As a fire burns through this area, it may increase in intensity or spread beyond containment lines that could otherwise be defended. Vegetation treatments could occur prior to a fire reaching the conductor zone, partially reducing fire intensity.

Air crews, particularly helicopters with water buckets, could be at risk of collision with structures or conductors. Transmission structures may also alter desired flight paths for aerial drops of water or fire retardant, the greatest effect occurring when structures are placed on high points such as ridgelines that could otherwise serve as fuel breaks. Aircraft would also need to avoid dropping water or retardant directly on or near energized transmission lines, for the safety

of ground crews and the proposed Project. Drops could safely occur on or near de-energized lines, although retardant can contaminate insulators, which would require cleaning before re-energizing the line.

Transmission lines and other utilities represent major investments in infrastructure, with substantial economic effects incurred to customers and operators if they are damaged. As such, fire personnel may be diverted from other suppression objectives for their protection when feasible and necessary. In some remote areas, the proposed Project would be the only infrastructure and the only obstacle to letting a fire burn safely to natural or engineered containment boundaries.

4.8 CULTURAL RESOURCES

4.8.1 Introduction

Potential impacts on cultural resources and tribal concerns that would result from the construction and operation of the proposed Project are described in this section.

The anticipated impacts to cultural resources would result from a loss of integrity for prehistoric and historic sites. Four types of impacts that could adversely affect historic properties (cultural resources that have been determined eligible for listing on the NRHP) during and after construction of the proposed Project include:

- Direct and permanent ground disturbance
- Direct and permanent visual and auditory intrusions
- Indirect and temporary visual intrusions
- Indirect and permanent disturbances due to changes in public accessibility and visual intrusions

If the BLM approves the proposed action and issues a right-of-way permit, intensive pedestrian inventories (Class III) within the APE of the Project, including associated access roads, substations, and ancillary facilities, would be conducted prior to construction and in accordance with the PA. All cultural resources identified during the inventory would be evaluated for eligibility to the NRHP, based on the criteria set forth in federal regulation 36 CFR 60.4, which states the following:

> *The quality of significance in American history, architecture, archaeology, and culture is present in districts, sites, buildings, structures, and objects that possess integrity of location, design, setting, materials, workmanship, feeling, and association, and:*
>
> *a) that are associated with events that have made a significant contribution to the broad patterns of our history*
> *b) that are associated with the lives of persons significant in our past*
> *c) that embody the distinctive characteristics of type, period, or method of construction, or that represent the work of a master, or that possess high artistic values or that represent a significant and distinguishable entity whose components may lack individual distinction*

d) that have yielded, or may be likely to yield, information important to prehistory or history

4.8.1.1 Tribal Concerns

Tribal concerns regarding this Project are being compiled and will continue to be documented as the Project becomes more defined. Information on tribal concerns was obtained during several consultation meetings that were held in 2009, 2010, 2011, and 2012. Areas of concern identified by consulted tribes include Mount Graham; Bosque del Apache; Rio Grande; Mesilla Valley; Klondyke and Duncan, Arizona; Deming, New Mexico; Salinas Pueblo Missions National Monument, including Gran Quivira; and the San Simon, Sulphur Springs and San Pedro valleys. An additional concern was raised by the GRIC regarding the Project's possible interference with spiritual communication paths between cultural sites.

Tribes have requested more detailed maps and/or ethnographic studies. Consultation with appropriate land management agencies, tribal governments, Tribal Historic Preservation Offices, and SHPOs is ongoing and will result in a PA that will establish project-specific procedures for complying with the NHPA, including those to follow during the execution of the Project.

The following section describes the impact assessment methodology developed for this Project.

4.8.2 Impact Assessment Methodology

An impact assessment methodology was developed to identify and evaluate the potential impacts to cultural and historic resources associated with the proposed Project. The methodology takes into consideration previous inventories conducted in the area, the sensitivity of cultural resources, and anticipated Project disturbances. The baseline data for the previously conducted inventories and sensitivity of resources were provided in Chapter 3. The results of the cultural resource impact assessment are shown on Figure M 8-1 (see Map Volume). Impacts associated with ancillary facilities, including but not limited to substations, generation stations, and access roads, are assumed to be identified and taken into account within the study corridor analyzed for the transmission lines. The APE would be identified based on site-specific construction plans, including all Project facilities. Cultural resource site locations and necessary mitigation would be determined after Class III surveys are completed in conjunction with the Final POD prior to construction.

The potential cultural and historical resource impacts within the study corridors were calculated by factoring in site density, size and location of the Project area, and site sensitivity. The resulting impact matrix is a projection of impacts based on known site densities of inventoried areas, sensitivities of known sites, and anticipated number of sites.

Site Density

A critical factor in evaluating potential impacts to cultural and historical resources is the amount of previous inventory data available for the Project alternatives. These inventories provide information on the resources identified, and on the resource density in those areas.

Approximately 8 percent of the Project study corridors has been previously inventoried for cultural and historical resources, with some alternatives having more inventoried segments (up to 28 percent) than others.

In order to compare each of the alternatives, the site density for each was calculated based on the number of recorded sites within previously inventoried areas as identified from the Class I data (see Table 3-36), which are assumed to represent the median site density that would be expected along the alternatives. Because there are significant gaps in the Class I data, a judgmental Class II inventory was conducted in areas with potential for high site density, the results of which are summarized in Chapter 3 and documented in a separate report. Areas that were inventoried in the Class II inventory were located adjacent to major rivers and historic trails. The site density for the Class II areas within each of the subroutes was higher than the site density for the Class I areas (see tables 3-37 and 3-42).

In order to anticipate the potential for additional sites in areas not yet inventoried, a combination of the site densities for both the Class I and Class II areas was compiled. Calculations were completed for each of the alternatives, because the site densities and numbers of acres per each alternative are different. This calculation is provided below.

Class I site density by alternative x (total project acres in each alternative – Class II acres for each alternative)
+ (Class II site density for each alternative x Class II acres for each alternative)
= Anticipated number of sites for each alternative

Along with site density, the Project area is an important component in the calculation for the anticipated number of sites. The APE for the Project involves the right-of-way corridor where the transmission lines would be placed, as well as access roads, substations, and other ancillary facilities. At the time of this EIS, specific locations of access roads and ancillary facilities needed for the Project have yet to be defined, although an access model has been developed to address potential ground disturbance, based on slopes, vegetation, and presence of existing access roads. Areas of the proposed alignment that do not have existing access roads and for which there is a steep slope would necessitate more ground disturbance for construction purposes. Conversely, potential ground disturbance would be minimal for areas of the proposed alignment that are relatively flat and where there are existing access roads.

In the absence of specific locations of potential access roads, the analysis of impacts to cultural resources was based generically on the amount of ground disturbance, and on the amount and sensitivity of the existing resources within each subroute.

The typical transmission right-of-way width is 400 feet, but could be up to 1,000 feet in areas where engineering or terrain constraints require a greater than 200-foot line separation. For the purposes of this calculation, the Project area involves a 600-foot-wide study corridor, to accommodate right-of-way width increases due to construction challenges, ancillary facilities, and future access roads. Table 4-19 provides estimates of the number of cultural sites that might be present within the 600-foot corridor for each subroute.

Table 4-19. Anticipated Number of Sites per Subroute Based on Existing Site Density						
Subroute	**Area of 600' Corridor (acres)**	**Percent Previously Surveyed**	**Site Density in Previously Surveyed Area (sites per 100 acres)**	**Anticipated Sites in Unsurveyed Areas**	**No. of Sites in Class II Survey Area**	**Total Anticipated Sites[1]**
1A1	16,634	7.3	0.74	114	4	127
1A2	16,743	8.3	0.72	110	4	124
1A	15,964	6.2	0.80	121	4	133
1B1	16,258	6.6	0.84	127	6	142
1B2	15,214	7.0	1.04	143	6	160
1B3	14,996	7.1	0.84	118	6	133
3A2	9,019	2.8	2.72	243	5	255
3A	8,984	3.9	2.00	172	13	192
3B	9,356	3.1	3.79	344	6	361
4A	9,661	6.2	4.34	393	1	220
4B	9,663	2.5	5.35	507	1	521
4C1	10,106	6.0	3.95	376	3	403
4C2	11,018	11.8	1.84	179	2	205
4C2c	11,727	12.5	1.57	161	5	188
4C3	12,582	29.1	2.73	244	5	349

[1] Anticipated number of sites is rounded to the nearest whole number and includes sites identified during Class I and Class II surveys.

Site Sensitivity

Each of the known sites located within the Class I study corridor was ranked according to sensitivity, on a scale from 1 (low) to 5 (high) (see Table 3-38). The sensitivity ranking was based on several items important in assessing the potential value of the site, including the site's eligibility for listing on the NRHP, type, and presence of specific features (nonmovable items that represent past human activities). In addition, the relative percentage of sites for each category was noted.

The site density calculations discussed above allow for the projection of anticipated sites for each subroute alternative. Although the potential number of future sites is easily calculated, the potential sensitivity is more difficult to assess. Therefore, it is assumed that future sites would share the same percentage of sensitivity currently assigned to the known sites within each of the subroutes. Subroute 1A currently has 18 percent of the sites (n=13) ranked as low sensitivity. When the projected site numbers are applied to Subroute 1A, a total of 24 (18 percent of 133 anticipated sites) would be expected to be ranked with low sensitivity. The results of the anticipated sensitivity analysis, and associated impact level, are presented in Section 4.8.3, Table 4-17.

Impact Levels

The goal of the impact analysis is to evaluate the known and anticipated resources in order to compare the alternative routes. Based on existing Class I data, site densities were developed and the anticipated number of sites for each subroute was calculated. Using site sensitivity levels, Class I sites were ranked accordingly, based on the categories defined below.

- *High Impact Level* – Locations where the sites are already listed on the NRHP, or where special-status sites would be physically affected by construction. These types of sites may be difficult to avoid and most likely would require data recovery studies, which may or may not eliminate high impacts. Mitigation measures or avoidance are often necessary for these areas.
- *High-Moderate Impact Level* – Locations where sites have been determined eligible or would be recommended eligible for listing on the NRHP, and would be physically affected by construction. Data recovery studies would most likely be required for these types of sites, and would involve a great number of features. The discovery of human remains would be possible.
- *Moderate Impact Level* – Locations where sites have not been evaluated for NRHP eligibility, but would likely be recommended eligible for listing and physically affected by construction. Testing studies may be required for these sites to evaluate whether they would be eligible for listing on the NRHP, or to determine the nature and extent of buried deposits in eligible sites.
- *Moderate-Low Impact Level* – Locations where sites have not been evaluated for NRHP eligibility, but would not likely be eligible for listing on the NRHP, and would be physically affected by construction. Testing may be required for these sites in order to evaluate site eligibility.
- *Low Impact Level* – Locations where sites are not eligible for listing on the NRHP, and would be physically affected by construction. No further studies would be required for these types of sites.

For the purposes of this analysis, a significant impact on cultural resources could result if any of the following were to occur from construction or operation of the proposed action:

- Disturbance of a human burial during construction of the transmission line
- Discovery of a buried Paleoindian site during construction
- Indirect or direct impacts to cultural sites (e.g., physical impacts from construction activities, visual impacts from tower construction, potential cumulative impacts from new access road construction, etc.)
- Indirect or direct impacts stemming from the vibrations of construction activities (e.g., use of heavy machinery or blasting and drilling for foundation installation)
- Indirect or direct impacts to locations that are spiritually significant to tribes
- Restricted access to areas where tribes conduct ceremonies or collect plants
- Destruction of existing significant historic structures or features during the construction of the Project
- Vandalism or looting of historic properties during construction or operation due to illegal use of the right-of-way or access roads

Evaluation of Visual Impacts to Historic Properties

Visual resource specialists assessed project contrast using secondary data to define the landscape character (i.e., existing setting). Secondary data sources include topographic maps, aerial photographs, existing land use data, and vegetation databases. Landscape character is a term that

describes existing features in the landscape that cumulatively express a discrete setting, and typically comprises vegetation community type, topography, presence or absence of water, and the presence and type of modifications (e.g., roads, transmission lines, pipelines, development, etc.) that occupy a given area of land. Generally, visual effects to landscapes or settings that have modifications that are similar to the proposed Project in form, line, color, and texture would be considered minimal. For historic properties associated with visual sensitivity, modifications that are contributing factors to the integrity or eligibility will be identified by the cultural resource specialist so that the visual resource specialist can accurately characterize the existing setting and non-contributing modifications. Characterization of the existing setting is a key component in determining the level of project contrast or visual change.

Contrast is defined as the degree of perceived change that occurs in the landscape due to the construction and operation of a proposed facility. Project contrast typically results from (1) landform modifications that are necessary to prepare a right-of-way for construction, (2) the removal of vegetation to construct and maintain a facility, and (3) the introduction of new above-ground elements into the landscape.

Impacts to setting and feeling of historic properties associated with visual sensitivity include the assessment of potential visual effects and level of visual contrast. As part of the baseline data for the visual resource study, contrast ratings were recorded for all Project alternatives. The definitions for the contrast ratings and evaluation of the potential visual impacts to cultural resources are as follows:

- *Weak Contrast* – If the proposed Project would be seen, but is subordinate in the landscape, a weak level of contrast is anticipated between the undertaking and the setting. Based on the level of weak contrast, the evaluation of visual effect to the integrity of the historic property would be negligible. Given the negligible impact of the Project, it is unlikely that a historic property would be adversely affected by the Project.
- *Weak-Moderate Contrast* – If the proposed Project begins to attract attention and is moderately subordinate in the landscape, a weak-moderate level of contrast is anticipated between the undertaking and the setting. Based on the level of weak-moderate contrast, the evaluation of visual effect to the integrity of the historic property could be somewhat diminished. Although unlikely to be substantially altered, the historic property may be adversely affected by the Project.
- *Moderate Contrast* – If the proposed Project attracts attention and is co-dominant in the landscape, a moderate level of contrast is anticipated between the undertaking and the setting. Based on the level of moderate contrast, the evaluation of visual effect to the integrity of the historic property may adversely affect the property.
- *Moderate-Strong Contrast* – If the proposed Project begins to demand attention and is still moderately dominant in the landscape, a moderate-strong level of contrast is anticipated between the undertaking and the setting. Based on the level of moderate-strong contrast, the evaluation of visual effect to the integrity of the historic property may adversely affect the property.
- *Strong Contrast* – If the proposed Project demands attention and strongly dominates the landscape, a strong level of contrast is anticipated between the undertaking and the

setting. Based on the level of strong contrast, the evaluation of visual effect to the integrity of the historic property may adversely affect the property.

Based on the results of the determination of visual effects, mitigation measures may be recommended to reduce project (visual) contrast. Both standard and selective mitigation measures relating to visual resources can be found in tables 2-10 and 2-11.

4.8.3 Impact Analysis Results

Table 4-20 provides a summary of anticipated impact levels for each of the Project alternatives within the Project right-of-way. The table is followed by an evaluation of the anticipated impacts to cultural resources for each subroute, based on the anticipated total number of sites, and the proportion anticipated to experience moderate, moderate-high, or high impacts from the Project.

Table 4-20. Summary of Anticipated Sites and Impact Levels for Alternative Subroutes

Subroute/ Sites	No. of Low	Percent in Subroute	No. of Low-Moderate	Percent in Subroute	No. of Moderate	Percent in Subroute	No. of Moderate-High	Percent in Subroute	No. of High	Percent in Subroute
1A1	25	20	25	20	43	34	31	24	3	2
1A2	8	6	67	54	22	18	22	18	5	4
1A	24	18	31	23	44	33	33	25	1	1
1B1	24	17	34	24	55	39	27	19	2	1
1B2	26	18	44	31	58	40	16	11	—	—
1B3	33	25	41	31	44	33	15	11	—	—
3A2	28	11	99	39	77	30	43	17	8	3
3A	17	9	40	21	112	58	23	12	—	—
3B	65	18	130	36	148	41	18	5	—	—
4A	26	12	22	10	132	60	33	15	7	3
4B	78	15	68	13	323	62	52	10	—	—
4C1	93	23	56	14	202	50	40	10	12	2
4C2	18	9	37	18	127	62	20	10	3	1
4C2c	21	11	36	19	102	54	26	14	3	2
4C3	24	7	87	25	210	60	14	4	14	4

4.8.3.1 No Action Alternative

There would be no impacts to cultural resources attributed to the construction and operation of the Project with the No Action alternative.

4.8.3.2 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Subroute 1A1 begins at the proposed SunZia East Substation, heading west across Chupadera Mesa to the Rio Grande crossing at Socorro, then heads south through the Rio Grande Valley to

the proposed Midpoint Substation. The total length of the subroute is 228.8 miles. Based on the results of the Class I study, important known cultural resources for this subroute include four trail segments and two habitation sites. Although Gran Quivira is located outside of the Class I study area, it was included in this study because there could be potential visual effects to the cultural landscape.

One NHT (El Camino Real de Tierra Adentro Trail) and three historic trails (Butterfield, Gila, and General Cooke's Wagon Road/Mormon Battalion) cross Subroute 1A1. Subroute 1A1 crosses the El Camino Real de Tierra Adentro Trail at the Rio Grande (Link E180), where field investigations were conducted. No intact segments of the trail such as wagon road tracks or ruts were identified. The area is previously disturbed by Bosquecito Road, a partially paved and bladed gravel road that occupies the former El Camino Real Trail corridor on the east side of the Rio Grande. On the western side of the Rio Grande, the trail is believed to be under Highway 85. Despite this, the modern road alignments are considered part of the El Camino Real de Tierra Adentro Trail NHT, and retain their historic integrity regarding association, location, setting, and feeling. Standard mitigation, and SE 8 and SE 10 would likely avoid direct impacts to the Butterfield trail; however, visual impacts to the trail will occur.

Speculative segments of the El Camino Real de Tierra Adentro Trail may exist parallel to Link E133, but further field investigations would be required to verify the presence or absence of trail segments in these locations along Link A440. Class II field study has identified segments of the Butterfield Trail along Link A440 that would be visually impacted.

Subroute 1A1 also crosses the Butterfield, Gila, and General Cooke's Wagon Road/Mormon Battalion trail alignments near Deming (Link A440). Class II field studies near Deming (Link A440) identified potential segments of the Butterfield Trail alignment; however, segments of the Gila and General Cooke's Wagon Road/Mormon Battalion alignments were not included in the study. In this area, the Project would parallel an existing 345 kV transmission line, and it is anticipated that the Project will cumulatively add to visual impacts stemming from the existing transmission structures, resulting in a moderate visual impact to the Butterfield Trail at Link A440. Although the construction and operation of the Project could have a direct impact resulting from ground disturbing activities on these Butterfield Trail segments, SE 8 (avoidance of cultural sites through tower placement) and SE 10 (tower placement at maximum distance to reduce visual impacts) would likely be effective in avoiding potential direct impacts. Further evaluation of direct impacts to the Gila and General Cooke's Wagon Road/Mormon Battalion trails would require field studies to verify the presence or absence of trail segments in these locations along Link A440.

Construction of the Project associated with Subroute 1A1 could also physically impact habitation sites LA45163 and LA50766, located along links 330a and 330b. Site LA45163 contains a roomblock and an associated artifact scatter. Site LA50766 contains pithouse structures, roomblocks, and an associated artifact scatter. Both of these sites have moderate-high sensitivity. An existing 345 kV transmission line is adjacent to links 330a and 330b, and it is anticipated that the Project would cumulatively add to the existing visual impacts. Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Standard mitigation and SE 8 could be used to lessen impacts to

these sites. Mitigation measures for habitation sites (LA45163 and LA50766) would likely be effective in avoiding significant impacts either through avoidance or data recovery efforts.

Based on site density calculations, 127 sites are estimated, 60 percent of which could have moderate to high sensitivity. Moderate to high sensitivity sites would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery efforts.

Cultural-Visual Assessment Associated with the Gran Quivira

Integrity is the ability of a property to convey its significance. To retain historic integrity, a property must possess some of the seven aspects of integrity: location, design, setting, materials, workmanship, feeling, and association. Of particular relevance regarding the cultural-visual assessment is the aspect of setting, which is the physical environment of a historic property. Setting may refer to the character of the site in addition to the physical elements of a site, including spatial organization, land use, vegetation, topography, circulation, and small-scale features. Setting also includes the character of the contextual lands that surround a historic property. Views and vistas of the land that surround Gran Quivira are an important component of its cultural landscape; therefore, the cultural-visual assessment was used to evaluate the potential impacts to the setting and feeling of the Gran Quivira.

The Cultural Landscapes Inventory: Gran Quivira – Salinas Pueblo Missions National Monument (NPS 2010) states that 360 degree panoramic views at Gran Quivira are contributing components to the landscape. Prehistorically, views focused on the Gallinas Mountains to the east, with Chupadera Mesa to the west and Mesa de Los Jumanos to the north. Historically, the views would have included the village of Gran Quivira, dirt roads, homesteads, agricultural fields, and grazing lands in the valleys below. During the different periods of use, the views would have changed, but the points of observation remain centered around the ruins on the ridgetop. Representative views from the ridgetop of Gran Quivira were evaluated and studied as part of the cultural-visual assessment. Potential impacts to the cultural landscape setting of Gran Quivira that could result from the construction and operation of the Project were evaluated.

For Subroute 1A1, the alignment around Gran Quivira to the north consists of links E82, E84, and E85 (links E80d and E81 were also evaluated; see below). The methodology for the study can be found in Section 4.8.2. Link E84 is located approximately 4 miles north of Gran Quivira. Existing modern features such as wind turbines, ranches, and NM Highway 55 are considered noncontributing components to the views and vistas of the cultural landscape (*ibid*).

Based on the results of the visual contrast study, a weak contrast rating would result from the construction and operation of the proposed Project when viewed from Gran Quivira. Some transmission line structures would be visible at this distance due to the partial skyline condition. Although the impacts to the views from Gran Quivira are anticipated to be low, selective mitigation measures such as special tower design and placement could minimize the visual impacts.

Subroute 1A2 – BLM Preferred Alternative

Subroute 1A2 varies slightly from 1A1 by using Link E86, north of Subroute 1A1. The total length of the subroute is 230.3 miles. Based on site density calculations, 124 sites are estimated. Subroute 1A2 is predicted to contain mostly sites with low to moderate sensitivity, although 40 percent of the anticipated sites could have moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery efforts.

Subroute 1A – North River Crossing

Subroute 1A is similar to Subroute 1A2, except that 1A is south of Gran Quivira and includes Link E80c. In addition, Subroute 1A uses Link A270 instead Link A260. No known sites were identified on Link A270.

Additional resources identified within 5 miles of Subroute 1A that have the potential to be visually impacted include the Camino Real de Tierra Adentro NHT, the Gila Trail Route, the General Cooke's Wagon Road/Mormon Battalion Trail, and the Butterfield Trail. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 133 sites are estimated. Sixty percent of the anticipated sites within Subroute 1A are predicted to have moderate to high sensitivity, thus requiring mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE8, which would likely be effective through avoidance or data recovery efforts.

Cultural-Visual Assessment Associated with the Gran Quivira

Link E80c is located approximately 6 miles south of Gran Quivira. For this segment, a weak contrast rating would result from the construction and operation of the proposed Project. Based on the distance of the Project and viewing conditions toward the Project where mountains provide a backdrop, visual impacts to Gran Quivira are anticipated to be low. Mitigation measures could further minimize these visual impacts.

Subroutes 1B1 – San Antonio Crossing

Subroute 1B1 varies from Subroute 1A1 as it crosses the Rio Grande at the San Antonio crossing, rather than the Socorro crossing. No cultural resources were identified for this subroute other than those previously addressed in Subroute 1A1.

Additional resources identified within 5 miles of Subroute 1B1 that have the potential to be visually impacted include the Camino Real de Tierra Adentro NHT, the Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, the Butterfield Trail, and the Playas Pueblos Archaeological District. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 142 sites are estimated to be identified. Sixty percent of the anticipated sites within Subroute 1B1 are predicted to have moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation measures and SE 8, which would likely be effective through avoidance or data recovery efforts.

Subroutes 1B2 – San Antonio Crossing

Subroute 1B2 varies from Subroute 1A1 in that it crosses the Rio Grande at the San Antonio crossing, rather than at the Socorro crossing. The cultural resources associated with Subroute 1B2 are similar to Subroute 1A1, except that the Playas Pueblo Archaeological District is less than 1 mile from Subroute 1B2. There would be no direct impact to the archaeological district, although there is a potential for visual or other indirect impacts. Further studies would be needed to evaluate the potential visual impact on the archaeological district.

Additional resources identified within 5 miles of Subroute 1B2 that have the potential to be visually impacted include the Camino Real de Tierra Adentro NHT, Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, Butterfield Trail, and Playas Pueblos Archaeological District. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 144 sites are estimated to be identified. Fifty-one percent of the anticipated sites within Subroute 1B2 are predicted to have moderate to high sensitivity, and would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation measures and SE 8, which would likely be effective through avoidance or data recovery efforts.

Subroute 1B3 – San Antonio Crossing

Subroute 1B3 varies from Subroute 1A1 as it crosses the Rio Grande at the San Antonio crossing rather than at the Socorro crossing. Subroute 1B3 also crosses the Mockingbird Gap Archaeological District; field investigations would be needed to identify cultural resources that could be impacted from the construction and operation of the Project within the district. In addition to the potential direct impacts to crossing the Mockingbird Gap Archaeological District, the proximity of the Project to the district may contribute to visual or other indirect impacts. If cultural resources are identified during the field investigations, mitigation measures such as SE 8 and SE10 could be used, and would likely be effective in avoiding significant impacts to the archaeological district.

Additional resources identified within 5 miles of Subroute 1B3 that have the potential to be visually impacted include the Camino Real de Tierra Adentro NHT, Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, Butterfield Trail, Zuñiga route, Janos Copper Road route, and Playas Pueblos Archaeological District. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, a total of 133 sites are estimated, 44 percent of which are predicted to have moderate to high sensitivity, and would require mitigation if impacted by

Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8.

Local Alternatives Associated with Gran Quivira

Construction of the Project for local alternatives E81 and E83 could impact habitation sites LA9021 and LA2579. Site LA9021 contains a roomblock, kiva, plaza, and an associated artifact scatter. Site LA2579 contains pithouse structures, historic homestead, and an associated artifact scatter. Both of these sites have moderate-high sensitivity. Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Standard mitigation measures and SE 8 could be used to mitigate impacts to these sites. Mitigation measures for habitation sites (LA45163 and LA50766) would likely be effective in avoiding significant impacts to these features either through avoidance or data recovery.

Local Alternative Link E81 is approximately 1.5 miles south of Gran Quivira, and Local Alternative Link E83 is located approximately 2 miles north of the Gran Quivira. Based on the visual contrast study, a weak-moderate contrast would result from the construction and operation of the proposed Project along either of these links. For Local Alternative Link E81, the Project would cross flat to slightly rolling terrain and would be backdropped by adjacent terrain. For Local Alternative Link E83, the Project would cross flat to slightly rolling terrain and would also be backdropped by adjacent terrain, but also partially skylined. NM 55 and the modern facilities of Gran Quivira constitute the only contemporary intrusions into the existing environmental conditions.

Other Local Alternatives for Route Group 1

Local alternatives for Route Group 1 (subroutes 1A, 1B1, 1B2, and 1B3) include links A161b and A361-A430-A481, and could impact known prehistoric sites and historic trail alignments.

Construction and operation of the transmission line and associated access roads located in Local Alternative Link A161b could impact one known site, LA 27569, a prehistoric artifact scatter with features. Field investigations are necessary to evaluate whether the Project would impact site LA 27569. SE 8 could mitigate the potential impact to site LA 27569 through avoidance; however, if avoidance is not possible, testing or data recovery would be used to minimize the impacts to this cultural resource.

In the Las Cruces area (Link A430), field investigations for the Butterfield Overland Mail and Stage Route identified segments of a trail alignment west of Las Cruces with associated artifacts dating to the twentieth century. Link A430 does not parallel any existing transmission lines in this location. Standard mitigation and SE 8 and SE 10 would likely avoid direct impacts to the Butterfield Trail; however, visual impacts to the trail would occur.

Local alternative links A361-A430-A481 also extend across the Gila and General Cooke's Wagon Road/Mormon Battalion Trail alignments. Field investigations were conducted along Local Alternative Link A430 for the presence of the Butterfield Trail. Segments were identified in these areas for the Butterfield Trail, but the Gila and General Cooke's Wagon Road/Mormon Battalion trails were not included in this study. Standard mitigation and SE 8 and SE 10 would

likely avoid direct impacts to the Butterfield Trail; however, visual impacts to the trail would occur.

Evaluation of direct impacts to the Gila and General Cooke's Wagon Road/Mormon Battalion (along Local Alternative Link A430) would require field investigations to verify the presence or absence of trail segments in these locations.

Crossover Links for Route Group 1

Crossover Link A70 for subroutes 1B2 and 1B3 connects with Link A50 from Subroute 1B2, and Link A80 from Subroute 1B3. Crossover Link A70 could impact the Mockingbird Gap Historic Archaeological District and known site LA 67452, a historic house foundation and associated trash scatter. Field investigations would be needed to identify whether the construction and operation of the Project would result in impacts to cultural resources within the archaeological district and site LA 67452. In addition to the potential direct impacts to crossing the district, its proximity may also contribute to visual or other indirect impacts. If cultural resource sites are identified during the field investigations, standard mitigation measures and SE 8 and SE 10 would likely be used to minimize or avoid impacts to cultural resources.

4.8.3.3 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A2 – BLM Preferred Alternative

Subroute 3A2 begins at the Midpoint Substation and proceeds west through the Deming area along links B60 and B90. From there it continues west along links B120a and B120b approaching the Lordsburg area, and then onto links B121, B160a, B160d, and B160c. The total length of the subroute is 123.9 miles. Based on the results of the Class I study, important known cultural resources for this subroute include four trail segments and three habitation sites.

Four historic trails (Butterfield, Gila, Janos Copper, and General Cooke's Wagon Road/Mormon Battalion) are crossed by Subroute 3A2. Subroute 3A2 crosses the Butterfield Trail east of Lordsburg along Link B120b where field investigations were conducted. Rock cairns associated with the trail were identified, but no physical segments of the trail were observed. Standard mitigation and SE 8 and SE 10 would likely avoid direct impacts to the Butterfield Trail at this location; however, visual impacts to the trail would occur.

Along Link B120b, the Project would parallel an existing 345 kV transmission line. Visual impacts to the Butterfield Trail corridor along Link B120b are anticipated to be low due to the presence of existing transmission structures. Although the construction and operation of the Project could have a direct impact on potential features associated with the Butterfield Trail resulting from ground disturbing activities, mitigation measures SE 8 and SE 10 would likely be effective in avoiding potential significant impacts. Further evaluation of direct impacts to the Gila trail would require field studies to verify the presence or absence of these trail segments at B120b.

Subroute 3A2 crosses the Gila Trail east of Lordsburg along Link B120b. Subroute 3A2 also crosses the Janos Copper Trail and General Cooke's Wagon Road/Mormon Battalion Trail along Link B120a, west of Deming. Further evaluation of direct and indirect impacts to the Gila, Jano Copper, and General Cooke's Wagon Road/Mormon Battalion Trail would require field studies to verify the presence or absence of trail segments in these locations.

Construction of the Project associated with Subroute 3A2 could also impact prehistoric habitation sites LA49 and LA98750 located along links B90 and B120b. Site LA49 is the type site for the Black Mountain Phase and consists of a large-scale multicomponent habitation site containing pit houses and buried adobe architecture. The site has been subject to extensive vandalism; however, intact segments still remain. Site LA98750 is also a habitation site and contains a roomblock and associated artifact assemblage. Both sites have a moderate to high sensitivity. Site LA49 has a high sensitivity because of its importance for the understanding of the Mimbres Mogollon and because human remains are present.

An existing 345 kV transmission line is adjacent to Link B120b. Extents of the LA98750 site boundary are currently unknown, but would be identified through a Class III inventory prior to the construction of the Project. Recent studies have identified the boundaries of LA49 (Putsavage and Lekson 2010). Standard mitigation and SE 8 could be used to mitigate impacts to these sites. Mitigation measures for habitation sites LA49 and LA98750 would likely be effective in avoiding significant impacts to these sites either through avoidance or data recovery efforts.

Additional resources identified within 5 miles of Subroute 3A2 that have the potential to be visually impacted consist of the Zuñiga route. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on the site density calculations, 255 sites are estimated. Fifty percent of the anticipated sites could have a moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8.

Subroute 3A – North

Subroute 3A is the same as Subroute 3A2 from the Midpoint Substation to Link B160a, near Lordsburg, where Subroute 3A diverges from Subroute 3A2 by continuing to head in a westerly direction to the Willow Substation along links B160a, B160b, and B170. Known sites of low to moderate sensitivity are present along these links, plus one moderate-high sensitivity site, AZ CC:7:3(ASM), which is a prehistoric habitation site containing pithouses and associated artifact scatter.

Construction of the Project associated with Subroute 3A could impact site AZ CC:7:3(ASM). Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Standard mitigation and SE 8 could be used to mitigate impacts to this site, either through avoidance or data recovery efforts.

Additional resources identified within 5 miles of Subroute 3A that have the potential to be visually impacted include the Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion

Trail, Butterfield Trail, Zuñiga route, Janos Copper Road route, and the ghost town of Shakespeare. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 192 sites are estimated. Seventy percent of the anticipated sites could have a moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery efforts.

Subroute 3B – South

Subroute 3B is the same as Subroute 3A2 from the Willow Substation to Link 150A, but differs from Subroute 3A2 from Lordsburg to the Midpoint Substation along links B80, B110a, B110b, and B112. Subroute 3B crosses the Gila, General Cooke's Wagon Road/Mormon Battalion, and Janos Copper Road trails at links B110a and B112. Sites of low to moderate sensitivity are present along these links.

Construction of the Project associated with Subroute 3B could impact the Gila, General Cooke's Wagon Road/Mormon Battalion, and Janos Copper Road trails along links B110a and B120b. An existing 345 kV transmission line is adjacent to Link B110a, and an existing pipeline is adjacent to Link B112. Further evaluation of direct and indirect impacts would require field studies to verify the presence or absence of trail segments in these locations.

Additional resources identified within 5 miles of Subroute 3B that have the potential to be visually impacted include the Zuñiga route and the ghost town of Shakespeare. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 361 sites are estimated. Forty-six percent of the anticipated sites could have a moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate the potential impacts to these sites include standard mitigation and SE 8.

Crossover Links

Crossover Link B111 for subroutes 3A, 3A2, and 3B connects with Link B120b from Subroute 3A and Link B110a from 3B. Crossover Link B111 could impact two historic trails (Butterfield and Gila). Field investigations conducted for the Butterfield Trail along Link B111 did not identify any physical segments of the trail (segments of the Gila Trail alignments were not included in the study); however, historic artifacts were recorded. No existing utilities were noted in the area. Although the construction and operation of the Project could have a direct impact resulting from ground disturbance activities on the historic artifacts, mitigation measures SE 8 and SE 10 would likely be effective in avoiding potential significant impacts. Further evaluation of direct and indirect impacts to the Gila Trail would require field studies to verify the presence or absence of trail segments in this location along Link B111.

Crossover Link B140 for subroutes 3A, 3A2, and 3B connects with Link B121 from Subroute 3A and Link B112 from Subroute 3B. Crossover Link B140 could impact the Butterfield Trail. Field investigations conducted for the Butterfield Trail did not identify any physical segments; however, rock cairns were observed at this location. No existing utilities were noted in the area. Although the construction and operation of the Project could have a direct impact on the rock cairns resulting from ground disturbance activities, mitigation measures SE 8 and SE 10 would likely be effective in avoiding potential significant impacts; however, visual impacts to the trail would occur.

4.8.3.4 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

Subroute 4A differs substantially from Subroute 4C2c, sharing only the last few links from Link C830 to the Pinal Central Substation. The cultural resources associated with Subroute 4A are similar to Subroute 4C2c, except that construction and operation of the Project associated with links B153a and B153b of Subroute 4A could impact five prehistoric habitation sites and is within 1.5 miles from the Oak Draw and Marijilda archaeological districts. Known sites of low to moderate sensitivity are present along Subroute 4A.

Prehistoric habitation sites that could be impacted by the construction and operation of the Project associated with Subroute 4A include AZ CC:1:43(ASM), AZ CC:1:58(ASM), AZ CC:1:59(ASM), AZ CC:1:62(ASM), and AZ CC:6:6(ASM). Site AZ CC:1:43(ASM) consists of several one-room structures surrounding a kiva, with a possible low platform mound and associated artifact scatter. Sites AZ CC:1:58(ASM) and AZ CC:1:59(ASM) both contain one-room structures with irrigation canals and associated artifact scatters. Site AZ CC:1:62(ASM) consists of a check dam, irrigation canal, and human remains identified in a midden area. Site AZ CC:6:6(ASM) consists of a habitation area with features and associated artifacts with a long period of reoccurring use from Middle/Late Archaic to Late Prehistoric. These sites were given a moderate-high sensitivity, with the exception of site AZ CC:1:62(ASM), which has a high sensitivity based on the human remains noted at the site. Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Standard mitigation and SE 8 could be used to mitigate impacts to these sites.

Although there would be no direct impacts to the Oak Draw and Marijilda Canyon archaeological districts, there is a potential for visual impacts. An existing 230 kV transmission line and US Highway 191 parallel the Project along Link B153a, near the Oak Draw Archaeological District; however, along Link B153a near Marijilda Canyon Archaeological District, these modern features are not present. Further studies would be needed to evaluate the potential visual impacts to these districts.

The San Carlos and other Apache tribes have voiced strong concerns regarding potential impacts to Mount Graham, which is considered a culturally sensitive place. The alternative corridor for Subroute 4A surrounds the Pinaleño Mountains to the east and north, including Mount Graham. A portion of the transmission line of Subroute 4A (links B153a and B153b) would be located in

the background distance zone (approximately 6 miles) viewed from Mount Graham. If visible, the project elements of form, line, color, and texture would be subordinate in the landscape.

Additional resources identified within 5 miles of Subroute 4A that have the potential to be visually impacted include the Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, Butterfield Trail, Southern Pacific Mail and Stage Line (Picacho to Florence route), Zuñiga route, Juan Bautista de Anza route, Verdugo Homestead Historic District, and Camp Grant, including the Camp Grant Reservation/Camp Grant Massacre site. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 220 sites are estimated to be identified. Seventy-eight percent of the anticipated sites could have moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery efforts.

Subroute 4B – Sulphur Springs Valley

Subroute 4B differs substantially from Subroute 4C2c, sharing only the last miles from Link C830 to the Pinal Central Substation. Known sites of low to moderate sensitivity are present along these links; however, no known sites of moderate to high sensitivity were identified for this subroute other than those addressed in Subroute 4C2c.

The San Carlos and other Apache tribes have voiced strong concerns regarding potential impacts to Mount Graham. The alternative corridor for Subroute 4B is located west of the Pinaleño Mountains, approximately 10 miles west of Mount Graham. A portion of the transmission line of Subroute 4B (links C71, C72, C90, C130a, and C130b) would be located in the background distance zone (10 miles or more) viewed from Mount Graham. If visible, the project elements of form, line, color, and texture would be subordinate in the landscape.

Additional resources identified within 5 miles of Subroute 4B that have the potential to be visually impacted include the Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, Butterfield Trail, Southern Pacific Mail and Stage Line (Picacho to Florence route), Zuñiga route, Juan Bautista de Anza route, Verdugo Homestead Historic District, Fort Grant, and Camp Grant, including the Camp Grant Reservation/Camp Grant Massacre site. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 521 sites are estimated. Seventy-two percent of the anticipated sites could have a moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery.

Subroute 4C1 – East of San Pedro Valley

Subroute 4C1 differs substantially from Subroute 4C2c, sharing only the beginning and ending segments. Subroute 4C1 shares the same alignment from the Willow Substation to Willcox (Link

212) and then diverges until Link C830, where it shares the same alignment into the Pinal Central Substation. Subroute 4C1 crosses the San Pedro River near San Manuel along Link C660. Known sites of low to moderate sensitivity are present along Subroute 4C1, as are five prehistoric habitation sites of moderate to high sensitivity.

Construction of the Project associated with Subroute 4C1 could physically impact prehistoric habitation sites AZ BB:6:2(ASM), AZ BB:6:113(ASM), AZ BB:6:114(ASM), and AZ BB:6:115(ASM) located along Link C660. Site AZ BB:6:2(ASM) is a large cobble adobe pueblo with human remains. Site AZ BB:6:113(ASM) contains a possible pit structure with a cobble cluster and an artifact midden. Site AZ BB:6:114(ASM) consists of a vandalized, one-room structure and associated artifact scatter. A probable protohistoric Sobaipuri pot break was also noted within this site. Site AZ BB:6:115(ASM) was vandalized and includes two cobble-lined pit houses, a roasting pit, and an artifact midden. These sites are moderate-high sensitivity, with the exception of sites AZ BB:6:2(ASM) and AZ BB:6:114(ASM), which have high sensitivities given the presence of human remains and the rare protohistoric artifacts. Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Standard mitigation and SE 8 could be used to mitigate impacts to these sites.

Additional resources identified within 5 miles of Subroute 4C1 that have the potential to be visually impacted include the Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, Butterfield Trail, Southern Pacific Mail and Stage Line (Picacho to Florence route), Juan Bautista de Anza route, Zuñiga route, Verdugo Homestead Historic District, and Rancho Linda Vista Historic District. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 403 sites are estimated. Sixty-three percent of the anticipated sites could have moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery efforts.

Subroute 4C2 – West of San Pedro River

Subroute 4C2 shares most of the same alignment as Subroute 4C2c, diverging only from the 4C2c subroute at Willcox to cross the San Pedro River near Cascabel and reconnecting at Link 441 as it continues along the west side of the San Pedro River. A known site of moderate sensitivity is present along Subroute 4C2, and one prehistoric habitation site of moderate to high sensitivity is located along Link C276.

Construction of the Project associated with Subroute 4C2 could physically impact prehistoric habitation site AZ BB:11:105(ASM), which contains a possible pit house, water control feature, rock pile, rock ring, and an associated prehistoric and historic artifact scatter. Extents of the site boundary are currently unknown, but would be identified during the Class III field study prior to construction of the Project. Standard mitigation and SE 8 would likely be effective in avoiding significant impacts to these sites through avoidance or data recovery.

Additional resources identified within 5 miles of Subroute 4C2 that have the potential to be visually impacted include the Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, Butterfield Trail, Southern Pacific Mail and Stage Line (Picacho to Florence route), Juan Bautista de Anza route, Zuñiga route, Verdugo Homestead Historic District, and Rancho Linda Vista Historic District. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 205 sites are estimated to be identified. Seventy-three percent of the anticipated sites could have a moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery.

4C2c – BLM Preferred Alternative

Subroute 4C2c begins at the proposed Willow Substation, heading southwesterly toward Willcox, crossing the San Pedro River near Cascabel, proceeding north along the San Pedro River toward Oracle, then west along Link C680 toward the Tortolita Substation. At the Tortolita Substation, Subroute 4C2c heads north along Link C820, and at the northern end of the Picacho Mountains heads west into the Pinal Central Substation. The total length of Subroute 4C2c is 161.2 miles. Based on the results of the Class I study, important known cultural resources for this subroute include three historic trails (Butterfield Trail, Southern Pacific Mail Line, and Zuñiga Trail) and two habitation sites. In addition, the McClellan Archaeological District is located within 0.25 mile of Subroute 4C2c along Link C820.

Subroute 4C2c crosses the Southern Pacific Mail Trail along Link C850 and the Butterfield and Zuñiga trails along Link C880a. In these areas, the Project would parallel a proposed 500 kV transmission line. In addition, Link C880a has been subject to farming, erasing any evidence of potential trails. Further evaluations of direct and indirect impacts would require field studies to verify the presence or absence of the trail segment along Link C850.

Construction and operation of the Project associated with Subroute 4C2c could also physically impact habitation sites AZ AA:8:331(ASM) and AZ AA:3:136(ASM), located along links C820 and C680. Site AZ AA:8:331(ASM) is a rock shelter, and site AZ AA:3:136(ASM) is a habitation site with possible adobe walls, trash mound, and an associated artifact scatter. Both of these sites have moderate-high sensitivities. Along Link C820, the Project would parallel a proposed 500 kV transmission line, and adjacent to Link C680 there is an existing 500 kV Transmission line. Extents of the site boundaries are currently unknown, but would be identified though a Class III inventory prior to construction of the Project. Standard mitigation and SE 8 could be used to mitigate impacts to these sites.

McClellan Wash Archaeological District is located along Link C820 of Subroute 4C2c. Although the construction and operation of the Project associated with Subroute 4C2c would not directly impact the archaeological district, there is a potential for visual or other indirect impacts. A proposed 500 kV transmission line parallels the Project in this location. Further studies would be needed to evaluate the potential visual impacts on the archaeological district.

Additional resources identified within 5 miles of Subroute 4C2c that have the potential to be visually impacted include the Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, Juan Bautista de Anza route, Verdugo Homestead Historic District, and Rancho Linda Vista Historic District. Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations, 188 sites are estimated. Seventy percent of the anticipated sites could have moderate to high sensitivity, which would require mitigation if impacted by Project construction. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which could be effective in through avoidance or data recovery efforts.

Subroute 4C3 – Tucson

Subroute 4C3 is the same as Subroute 4C2c from the Willow Substation to Link C261 near Benson. At this point, Subroute 4C3 continues south around Tucson before heading north to the Tortolita Substation and then north toward the Pinal Central Substation. Based on the Class I data, the differences between Subroute 4C2c and 4C3 include additional crossings of 1 NHT (Juan Bautista de Anza) and 4 historic trails (Gila, Zuñiga, Butterfield, and General Cooke's Wagon Road/Mormon Battalion), 5 historic districts within 0.25 mile, 1 National Historical Landmark (Colossal Cave Mountain Park), and 8 additional habitation and burial sites. Known sites of low and moderate sensitivity are also present within Subroute 4C3.

Historic trails intersect Subroute 4C3 along links F111, F112, F510, and F600. North of Tucson along the Santa Cruz River, Link F510 crosses the Juan Bautista de Anza Trail, Butterfield Trail, Zuñiga Trail, and General Cooke's Wagon Road/Mormon Battalion. Along Link F111 southwest of Tucson, Subroute 4C3 crosses the Gila Trail. Subroute 4C3 also crosses the Butterfield and de Anza trails along links F112, west of Tucson. West of Benson along Link F600, Subroute 4C3 crosses the General Cooke's Wagon Road/Mormon Battalion, Butterfield Trail, and Gila Trail (twice). Field studies west of Benson (Link F600) did not identify any traces of the Butterfield Trail alignment; however, segments of the Gila, Zuñiga, de Anza, and General Cooke's Wagon Road/Mormon Battalion trails were not included in the study. Existing 138 kV and 115 kV transmission lines parallel portions of Link F112, while links F510, F111, and F112 are disturbed from the construction of Tucson. Further evaluation of direct impacts to the de Anza, Zuñiga, Gila, General Cooke's Wagon Road/Mormon Battalion, and Butterfield trails would require field studies to verify the presence or absence of trail segments in these locations along links F111, F112, F510, and F600.

A total of 30 current and proposed historic districts are within the city of Tucson. Five of the 30 historic districts are within 0.25 mile of Link F112, including El Presidio, Winterhaven, Menlo Park, Barrio Anita (proposed), and Rillito Race Track (proposed). An existing 138 kV transmission line parallels Link F112. There would be no direct impacts to the historic districts, although there is a potential for visual or other indirect impacts. Further studies would be needed to evaluate the potential visual impacts to the historic districts.

Colossal Cave Mountain Park is a national historic landmark and is within 0.25 mile of Subroute 4C3 along Link F40b. There would be no direct impact to the national historic landmark, though

there is a potential for visual and other indirect impacts. An existing 345 kV transmission line roughly parallels the Project in this location. Further studies would be needed to evaluate the potential visual impact on the national historic landmark.

Construction of the Project associated with Subroute 4C3 could also physically impact prehistoric habitation and burial sites, located along links F111, F112, F510, and F600; all of these sites have moderate to high sensitivities.

Site AZ AA:12:256(ASM) is a prehistoric habitation site that contains two pit houses, a hearth, a prehistoric artifact scatter, and a historic trash dump. Site AZ BB:13:6(ASM) includes a prehistoric pit house component, as well as the San Agustin Mission, historic kiln, and historic trash dump. AZ EE:2:44(ASM) contains pit structures, hearths, an artifact midden, and a historic trash scatter.

The sites with known human remains include habitation sites at which burials were encountered, as well as instances of sites eroding out of the ground. Site AZ AA:12:46(ASM) is a habitation site containing pit structures, associated artifacts, and burials. Site AZ AA:12:314(ASM) is also a habitation site with multiple pit structures, pit features, burials, and a midden. Site AZ AA:12:781(ASM) consists of an eroded burial washing out of the Santa Cruz River. Site AZ AA:13:17(ASM) is a large habitation site containing a ball court, trash mound, pit structures, pit features, canal, roasting pits, hearths, ramada shelter, and burials. Site AZ BB:13:90(ASM) is an eroded burial washing out of the Santa Cruz floodplain. These sites include human remains that were removed from unsecured locations and repatriated to the appropriate tribe (i.e., Tohono O'odham Nation), in accordance with state and federal laws.

Extents of the site boundaries for the habitation and burial sites are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Standard mitigation and SE 8 would likely be effective in avoiding significant impacts to these sites, either through avoidance or data recovery efforts.

Additional resources identified within 5 miles of Subroute 4C2c that have the potential to be visually impacted include the Gila Trail Route, General Cooke's Wagon Road/Mormon Battalion Trail, Butterfield Trail, Southern Pacific Mail and Stage Line (Picacho to Florence route), Juan Bautista de Anza route, Zuñiga route, Saguaro National Park, and Tumamoc Hill Archaeological District/Desert Laboratory National Historic Landmark, Pascua Cultural Plaza, Binghampton Historic Rural Historic Landscape, and 24 historic districts (Verdugo Homestead, Rancho Linda Vista, Aldea Linda, Armory Park, Barrio Libre, Blenman-Elm, Catalina Vista, Colonia Solana, El Encanto Estates, El Montevideo, Indian House, Iron Horse Expansion, Jefferson Park, John Spring, Pie Allen, Rincon Heights, Sam Hughes, San Clemente, Santa Rosa, Speedway-Drachman, University of Arizona Campus, Warehouse, West University, and DeGrazia Gallery in the Sun). Cultural-visual sensitivity assessments will be conducted during the Class III inventory.

Based on site density calculations for Subroute 4C3, a total of 349 sites are estimated. Sixty-eight percent of the anticipated sites could have a moderate to high sensitivity, which would require mitigation if impacted by project construction. Measures that could be used to mitigate

potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery.

Local Alternatives

Construction of the Project associated with subroutes 4A, 4B, and 4C1 for Local Alternative Link C790 could impact known low and moderate sensitivity sites.

Local alternative links for the proposed Pinal Central Substation for subroutes 4A, 4B, 4C1, 4C2, and 4C3 include local alternative links C860, C870, and C890. Construction of the Project could impact known low and moderate sensitivity sites and the Southern Pacific Mail Line (links C850 and C860). A proposed 500 kV transmission line would parallel the Project along this link. Further evaluation of direct and indirect impacts to the Southern Pacific Mail Route would require field studies to verify the presence or absence of the route in these locations (links C850 and C860).

Construction of the Project associated with Local Alternative Link C692 of Subroute 4C1 could physically impact two known high sensitivity sites: a habitation site (AZ AA:8:21[ASM]) and a petroglyph site (AZ AA:8:370[ASM]). Site AZ AA:8:21(ASM) is a large habitation site that contains 15 to 20 trash mounts, a ball court, and 2 structures. Site AZ AA:8:370(ASM) is an anthromorphic petroglyph located south of site AZ AA:8:21(ASM). Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Examples of mitigation measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery; however, visual impacts to AZ AA:8:370(ASM) would occur.

Local Alternatives for Subroute 4C2

Local alternative links for 4C2 include variations around the Willow-500 kV and Tortolita substations. Construction of the Project associated with Subroute 4C2 for local alternative links C260-C261-C201 could impact known low and moderate sensitivity sites.

Construction of the Project with associated local alternatives for Subroute 4C2 could directly or indirectly impact known low and moderate sensitivity sites as well as one moderate-high sensitivity site. Site AZ AA:8:331(ASM) is a rockshelter located along Link C680. Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery.

Local alternative links C680-C820 of Subroute 4C2 include known low and moderate sensitivity sites as well as two moderate-high sensitivity. Construction could impact sites AZ AA:8:331(ASM) and AZ AA:3:136(ASM). Site AZ AA:8:331(ASM) is a rockshelter, and site AZ AA:3:136(ASM) is a probable habitation site with possible adobe walls and a trash mound. Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Measures that could be used to mitigate

potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery.

Local Alternatives for Subroute 4C3

Local alternative links for 4C3 include variations along Pantano Wash and Rillito Creek. Local alternative links F40b-F51-F60a, F81a-F81b, and C812 for Subroute 4C3 include three historic trails, three habitation sites, and two historic districts. Known low and moderate sensitivity sites are also present in the local alternative links.

Construction of the Project associated with Local Alternative Link F40b of Subroute 4C3 could visually impact the Butterfield Trail, but field studies near Benson did not identify any physical segment of the trail. An existing 345 kV transmission line parallels the Project in this area. Given that no trail segments were identified during field investigation, no impacts can be identified.

Construction of the Project associated with Local Alternative Link F81b could impact 3 historic trails (Butterfield, Zuñiga, and General Cooke's Wagon Road/Mormon Battalion), 3 habitation sites, and 2 historic districts (Fort Lowell Multiple Resource Area and Rillito Race Track). In this area, two existing 138 kV transmission lines and one existing 115 kV transmission line are perpendicular to Link F81b. Further evaluation of direct and indirect impacts to the Butterfield, Zuñiga, and General Cooke's Wagon Road/Mormon Battalion would require field studies to verify the presence or absence of trail segments in these locations along Link F81b.

Three known habitation sites (AZ AA:12:10[ASM], AZ AA:12:781[ASM], and AZ BB:9:14[ASM]) are located along Link F81b. Site AZ AA:12:10(ASM) is a prehistoric habitation site and historic homestead. The prehistoric habitation component includes pit structures, canals, artifact midden, and burials; the historic homestead is the 1893 adobe house of Basilio Cuevas with associated trash scatter. Site AZ AA:12:781(ASM) is a burial eroding out of the bank of the Santa Cruz River. Site AZ BB:9:14(ASM) is a multicomponent site. The prehistoric component includes a habitation with pit structures, pit features, trash mounds, a ball court, and cremations, and the historic component of the site is Fort Lowell. Extents of the site boundaries are currently unknown, but would be identified through a Class III inventory prior to construction of the Project. Measures that could be used to mitigate potential impacts to these sites include standard mitigation and SE 8, which would likely be effective through avoidance or data recovery.

Construction of the Project associated with Local Alternative link F81b could directly or indirectly impact the Fort Lowell Multiple Resources Area and Rillito Race Track historic districts. An existing 138 kV transmission line parallels the Project near the Fort Lowell Multiple Resources Area, but no known utilities are identified in the vicinity of the Rillito Race Track. Further evaluations of direct and indirect impacts to these historic districts would require field studies to verify the presence or absence of contributing components of the districts within the proposed tower locations. Standard mitigation and SE 8 and SE 10 would likely be effective in avoiding potential significant impacts.

Local Alternative Link C812 is compared to links C810-C816-C813-C814-C815 of Subroute 4C3. None of these links is associated with any known cultural resources.

Local Alternatives for Subroutes 4C1, 4C2, and 4C3

Local alternative links for subroutes 4C1, 4C2, and 4C3 include C72-C90-C121-C211. A known moderate sensitivity site is present in these alternative links.

Crossover Links

Crossover links for subroutes 4A, 4B, and 4C1 include links C500, C501, C502, and C174. None of these links would impact any known cultural resource sites. Link C671 is the crossover link for subroutes 4A, 4B, 4C1, and 4C2. This link may potentially impact one moderate sensitivity site.

4.8.4 Mitigation of Impacts

Direct impacts to significant resources can be effectively minimized, if not eliminated, through planning. Standard mitigation measures will be applied to all applicable phases of the Project, including engineering/design, construction, and operation. Application of the following standard mitigation measures would reduce impacts to cultural resources:

- ST 1 – Prior to construction, a detailed POD will be developed to further describe Project features, selective mitigation, and procedures. At a minimum, the POD will address project design, construction and operation considerations, biological considerations (including noxious weed management), archaeological consideration, paleontological considerations, hazardous material management, and reclamation considerations.
- ST 2 – All vehicle movement outside of the right-of-way will be restricted to predesignated access, contractor-acquired access, or public roads.
- ST 3 – The boundary of construction activities will be predetermined, with activity restricted to and confined within those limits. No paint or permanent discoloring agents will be applied to rocks or vegetation to indicate survey or construction activity limits.
- ST 14 – Prior to construction, all supervisory construction personnel will be instructed on the protection of cultural and ecological resources. To assist in this effort, the construction CIC or a resource specialist will address: (a) federal and state laws regarding antiquities and plants and wildlife, including collection and removal; and (b) the importance of these resources and the purpose and necessity of protecting them.
- ST 15 – Cultural resources will continue to be considered during post-EIS phases of Project implementation, in accordance with an executed agreement. This will involve intensive surveys to inventory and evaluate cultural resources within the selected corridor and any appurtenant impact zones beyond the corridor, such as access roads and construction equipment yards. This also requires completion and approval of a cultural inventory report, approval of an HPTP, and implementation of the HPTP to ensure proper data recovery and recordation prior to construction in the sensitivity areas identified in the HPTP. Monitoring of construction activities will be required to ensure that cultural sites that are to be avoided during construction remain undisturbed.

In addition, several selective mitigation measures would be used to minimize impacts to cultural resources, including the following:

- SE 1 – No widening or upgrading of existing access roads will be undertaken in the area of construction and operation, except for repairs necessary to make roads passable, where soils and vegetation area very sensitive to disturbance, or where existing archaeological sites are present.
- SE 2 – There will be no blading of new access roads in select areas of construction and operation. Existing crossings will be utilized at perennial streams, designated recreational trails, and irrigation channels. Off-road or cross-county access routes will be used for construction and maintenance in selected areas. This will minimize ground disturbance impacts. These access routes must be flagged with an easily seen marker, and the route must be approved in advance of use by the BLM Authorized Officer or landowner.
- SE 4 – All new access roads not required for maintenance would be permanently closed using the most effective and least environmentally damaging methods appropriate to that area (e.g., stock piling and replacing topsoil, or rock replacement), with concurrence of the landowner or appropriate land management agency. This would limit new or improved accessibility in the area.
- SE 6 – To minimize disturbance to sensitive habitats or resources, access roads required for operation and maintenance purposes will be gated or otherwise blocked from public access.
- SE 8 – In designated areas, structures would be placed so as to avoid and/or to allow conductors to span sensitive features such as riparian areas, water courses, roads, trails, bat roosts, and cultural sites within limits of standard tower design. This will minimize the amount of sensitive features disturbed and/or reduce visual contrast.
- SE 10 – At highway, canyon, and trail crossings, structures are to be placed at the maximum distance practicable from the crossing to reduce visual impacts.

Project costs and levels of effort necessary for mitigating the adverse effects to cultural resources are directly correlated with the degree of Project impact (i.e., low, moderate, or high). All mitigation measures will be in accordance with the HPTP for this Project.

Gran Quivira, located within Route Group 1, was evaluated for potential cultural and visual impacts from the proposed Project. Mitigation measures, including special tower design and placement, would minimize the visual impact of the BLM preferred alternative (Subroute 1A2).

Summary

Based on results of the preceding analysis, the following potential impacts to cultural resources were identified:

- Route Group 1
  - Route crosses El Camino Real, Butterfield, Gila, and General Cooke's Wagon Road/Mormon Battalion trails

- Field verification of the proposed crossing of the El Camino Real at the Socorro and San Antonio river crossings did not identify any intact segments, except for present-day alignments; however, these are considered part of the El Camino Real de Tierra Adentro NHT and will be visually impacted
- Field verification of the proposed crossings of the Butterfield Trail west of Las Cruces did identify potentially intact segments, although the setting has been modified by existing transmission and pipelines; visual impacts to the trail in these locations are anticipated to be low due to existing transmission structures
- Potential for direct physical impacts to two known habitation sites
- Potential direct physical as well as indirect and visual impacts to Mockingbird Gap Archaeological District
- Link E84 (BLM preferred alternative) and Link E80c (alternative Subroute 1A) would have a low visual impact to views from the Gran Quivira
- Local alternative links E81 and E83 would have a moderate visual impact to views from the Gran Quivira
- Potential for visual cultural impact: less than 1 mile from Playas Pueblo Archaeological District

- Route Group 3
  - Route crosses Gila, Butterfield, General Cooke's Wagon Road/Mormon Battalion, and Janos Copper trails
  - Field verification of the proposed crossing of the Butterfield Trail did not identify any intact segments along Link B150a; the present-day Doubtful Canyon Road alignment lies within the historic trail corridor, and has been determined to be the Butterfield Trail; visual impacts to the trail will occur
  - Field verification of the proposed crossings (B140 and B120b) did not identify any physical segments of the trail; however, rock cairns associated with the trail confirm its presence in these locations; visual impacts to the trail will occur in these locations
  - Potential direct physical impacts to three known habitation sites

- Route Group 4
  - Crosses Southern Pacific Mail Line, Butterfield, Juan Bautista de Anza, Gila, General Cooke's Wagon Road/Mormon Battalion, and Zuñiga trails
  - Field verification of the proposed crossings of the Butterfield Trail did not identify any intact segments
  - Potential cultural-visual impacts to Fort Lowell Multiple Resource Area and Rillito Race Track
  - Mount Graham area is significant to the San Carlos Apache Nation
  - Potential physical impacts of up to eight known habitation sites
  - Potential visual impacts to five historic districts (El Presidio, Rillito Race Track, Winterhaven, Barrio Anita, and Menlo Park) within 0.25 mile of the Project area
  - A high density of cultural resources within and surrounding the Tucson area
  - Potential cultural-visual impacts to Oak Draw and Marijilda Canyon archaeological districts
  - Potential cultural-visual impacts to the McClellan Wash Archaeological District
  - Potential cultural-visual impacts to Colossal Cave Mountain Park

- The BLM Preferred Alternative (1A2-3A2-4C2c)
  - Crosses El Camino Real, Butterfield, Gila, Janos Copper, Zuñiga, Southern Pacific Mail, and General Cooke's Wagon Road/Mormon Battalion trails
  - Potential physical impacts to five known habitation sites
  - Potential cultural-visual impacts to the Gran Quivira, McClellan Wash Archaeological District, Verdugo Homestead Historic District, Rancho Lina Vista Historic District, ghost town of Shakespeare, and Juan Bautista de Anza route, as well as El Camino Real, Butterfield, Gila, Janos Copper, Zuñiga, Southern Pacific Mail, and General Cooke's Wagon Road/Mormon Battalion trails

4.9 VISUAL RESOURCES

4.9.1 Introduction

This section focuses on the identification and characterization of visual impacts associated with the Project. Visual resource impacts would result from the construction and operation of the proposed 500 kV transmission lines and associated substations. The impact assessment was developed in consultation with the BLM and is consistent with, and adheres to, the BLM VRM system (BLM Handbook 8431 – Visual Resource Contrast Rating).

In general, concern for changes to existing viewsheds and modifications that would alter the landscape character of natural lands is the primary factor considered for identifying and characterizing impacts related to visual resources. Similar to other resources addressed in this Final EIS, effects to visual resources were assessed in terms of initial and residual impacts, both of which consider resource-specific mitigation measures. Initial impacts were identified in consideration of the Project description, standard mitigation, BMPs, and agency consultation. Residual impacts, the primary effects to resources disclosed in this Final EIS, were assessed and disclosed based on the assumption that selective mitigation measures would be implemented during the construction and operation of the Project and that, over time, these selective mitigation measures would reduce impacts to scenery and viewers (viewing locations).

Significant impacts related to visual resources would be the result of high impacts from the Project that cannot be effectively mitigated. Following are general descriptions of anticipated visual impacts that would result from the construction and operation of the Project.

- *High Impacts* would occur for those portions of the Project where Project components (including access, structures, and ancillary facilities) would be dominant or readily apparent from viewing locations frequented by casual observers. In these locations, the Project would introduce form, line, color, and texture inconsistent with existing landscape features. High impacts are expected in high-quality, diverse, and rare or unique and natural landscapes (Class A or Class B), where anything more than minimal change in the landscape would occur.
- *Moderate Impacts* are anticipated for segments of the Project or areas where the Project would be codominant with existing landscape features, and be moderately apparent from viewing locations frequented by the casual observer. Moderate impacts are anticipated in interesting but not outstanding natural landscapes (Class B or Class C), where changes

would modify the inherent quality of the landscape. Typically, moderate impacts are anticipated where the Project would parallel existing linear features that exhibit similar form, line, color, and texture to the Project.

- *Low Impacts* are anticipated for segments of the Project where the Project would be subordinate in the landscape and not readily apparent from viewing locations frequented by the casual observer. Low impacts on scenery are anticipated where the Project would result in minimal change to existing landscape character in interesting and common landscapes (Class B and Class C). In most cases, low impacts are anticipated where the Project would parallel an existing similar HVTL facility or occur within a designated utility corridor with similar modifications in terms of form, line, color, and texture to the Project.

4.9.2 Impact Assessment Methodology

The impact assessment is based on the BLM VRM system 8400 series, BLM and ACC (State of Arizona) approved and legally defended visual resource assessments for 500 kV transmission line projects, and the BLM's (including third-party contractor) experience in conducting visual impact analysis for EHV transmission lines and substations. In addition to Project-level coordination regarding the NEPA and impact analyses, two visual resource workshops were coordinated and conducted with the BLM to develop impact methodology and establish criteria for assessing compliance with applicable VRM classes. Attendees of the workshops included representatives from the BLM Washington Office (Chief Landscape Architect), New Mexico and Arizona State BLM offices (State VRM leads), and VRM specialists from Socorro and Las Cruces (New Mexico), and Safford and Tucson (Arizona) field offices.

The measure of visual impacts is based on visual contrast as defined by the BLM VRM system (BLM Manual 8431). Using the baseline data developed during the Project-level inventory, including a detailed assessment of existing linear facilities within the Project area, the GIS was used to assess initial impacts to scenery and viewing locations in conjunction with field investigations and BLM procedures. Compliance with VRM classifications was determined by a contrast analysis from viewing locations and BLM-approved KOPs. Following are specific techniques that were employed to assess visual impacts to scenery and viewers, and to demonstrate compliance with VRM classes for the Project.

4.9.2.1 Assessment Techniques

Impact assessment techniques for visual resources include performing a contrast analysis for the proposed Project and identifying initial impacts for scenery, viewing locations and KOPs, and compliance with VRM classifications.

Contrast

The first step in identifying potential impacts is to perform a Project-wide contrast analysis to establish a baseline for anticipated landscape change, based on the construction and operation of the Project. Contrast is defined as the degree of visual change that occurs in the landscape, due to the construction and operation of the proposed transmission lines. In the context of EHV

transmission lines, visual contrast typically results from (1) landform modifications that are necessary to prepare the right-of-way for construction, (2) the removal of vegetation to construct and maintain the transmission lines, (3) the construction of temporary and permanent access roads required to erect the structures and maintain the conductors, and (4) the introduction of transmission line facilities (structures, etc.) into the landscape. The visual contrast assessment was performed by comparing the visual elements (form, line, color, and texture) of the existing landscape (identified during the inventory) with the visual elements associated with the proposed Project. Using this method, each Project alternative was assigned one of the five following contrast levels: weak, weak-moderate, moderate, moderate-strong, and strong.

- Strong – contrast demands attention and strongly dominates the landscape
- Moderate-Strong – contrast begins to demand attention and is still moderately dominant in the landscape
- Moderate – contrast attracts attention but is co-dominant in the landscape
- Weak-Moderate – contrast begins to attract attention and is moderately subordinate in the landscape
- Weak – contrast is discernible (visible) but subordinate (does not attract attention) in the landscape

This baseline contrast level was then used when considering impacts to scenery, impacts to viewing locations (viewers), and compliance with VRM objectives, as described below.

Impacts to Scenery

The primary factor in determining impacts to scenery is the level of contrast associated with the Project as compared to existing landscape conditions (e.g., access roads, transmission lines, etc.) and the factors that compose the landscape (e.g., vegetation, landform, water). Initial impacts to scenery were assessed by reviewing the scenery rating (A, B, or C), with contrast accounting for standard mitigation and Project design. Areas of Class A or B scenery that would be substantially altered by the Project (i.e., areas where similar linear facilities do not exist) would result in high impacts. Moderate to low impacts are anticipated for low levels of modification in Class B or C scenery. The results of the impact analysis were mapped and verified (see Figure M 9-1, Map Volume).

Impacts to Viewing Locations (viewers) and KOPs

Initial impacts to viewing locations and KOPs were based on an assessment of baseline contrast, viewing location concern level (moderate or high), and Project visibility; all of which, when combined, allude to the visual dominance of the Project. Project-specific influence zones were developed to quantify visibility specifically associated with the Project (i.e., two 500 kV transmission facilities and associated access roads). Influence zones were developed based on field reconnaissance and photo documentation of existing, similarly scaled facilities in comparable landscapes; a review of agency-approved (BLM, USFS) visual resource assessments relating to 500 kV facilities; in-depth consultation with BLM visual resource staff (local, state, and Washington Office); and photo simulations developed for the Project.

Initial impacts to viewing locations and KOPs were determined by evaluating the Project-specific influence zones associated with viewing locations with the baseline contrast using GIS. A viewshed analysis was also conducted for all alternatives, to ascertain where in the landscape the Project would not be visible. The result of the viewshed analysis was used in conjunction with the GIS impact assessment to verify or modify the resulting initial impacts. Concurrent with the GIS impact analysis, BLM contrast rating sheets were developed during the field investigation for all alternatives from agency approved KOPs. The contrast assessed from each KOP was compared to the results of the GIS impact assessment and refined, as necessary. The results of this impact analysis were mapped for inclusion in the Final EIS (see Figure M 9-2 and Figure M 9-3, Map Volume).

Visual simulations were prepared from agency-approved KOPs to illustrate the range of typical impacts to viewing locations and are included in Appendix D. More specifically, visual simulations were developed to (1) support the contrast rating and impact analysis associated with the Project, (2) illustrate the effectiveness of standard and selective mitigation measures, where applicable, on a case by case basis, (3) disclose anticipated effects of the Project based on the best data available at the time of the Draft EIS, and (4) support the assessment of compliance with designated VRM classes and provide defensible materials for BLM managers to make informed decisions regarding plan amendments.

KOP simulation locations were selected to represent each viewing location type (travel route, recreation area, and residences), associated concern level, and distance (influence zone) from the Project. In this regard, a total of 34 KOP[1] simulation locations were selected in consultation with the BLM during the inventory phase of the visual assessment. Appendix D includes a summary of the locations of the visual simulations (KOPs), associated concern level, and detailed selection rationale.

Visual Resource Inventory Data

Per BLM direction, VRI Classification data was assessed for portions of the proposed Project crossing BLM land (see Figure M 9-4, Map Volume). Appendix D describes the miles and acreage of VRI Classification data crossed by each subroute. The percentage of VRI Classification data (i.e., unit area) affected by the Project was also calculated, as compared to the total unit area crossed.

Compliance with BLM VRM Objectives

Per BLM policy, compliance with VRM classes was evaluated using the contrast rating process (see Figure M 9-5, Map Volume). Pursuant to BLM guidance, Contrast Rating Sheets (BLM form 8400-4) were prepared from agency-approved KOPs and included in Appendix D. In addition, VRM class compliance was assessed by studying the level of change in the landscape (baseline contrast) resulting from the Project, as seen from sensitive viewing locations (regardless of jurisdiction). Sensitive viewing locations included residences, recreation areas,

[1] An additional 13 simulation locations have been removed, with the elimination of Route Group 2 and Subroute 1C.

travel routes, and other viewing locations identified through agency consultation and/or public scoping or comment.

Table 4-21 reflects the management objectives as described in the BLM Manual with regard to changes in the characteristic landscape. A strong project contrast would be compliant in a VRM Class IV objective area, because "the level of change to the characteristic landscape can be high," or management activities may contrast strongly with the existing character of the landscape. Similarly, in a Class III objective VRM area, "change to the characteristic landscape should be moderate." Therefore, moderate project contrast resulting from management activities of the Project would be compliant. Class II VRM objectives allow for weak project contrast, or a "low level of change" in the landscape. Finally, Class I VRM objectives would only allow for very limited management activity (i.e., natural ecological changes) where the level of change in the landscape should be "very low and must not attract attention."

Table 4-21. Visual Resource Management Classifications

Class I	To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
Class II	To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.
Class III	To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
Class IV	To provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

In regard to VRM Class compliance, a plan amendment would be required if the Project would remain noncompliant after the implementation of selective mitigation measures. It should be noted that if a segment of the Project crosses Class II or Class III designated landscapes that are not visible from a viewing location or KOP with a moderate or high level of concern, the Project would be in compliance with Class II or Class III objectives. In addition, the Project may not be in compliance, based on Project design and standard mitigation (initial impacts); however, through the assignment of selective mitigation (i.e., using self-supporting lattice structures and restoring access roads), contrast would be reduced and the Project would be in compliance (residual impact). The contrast rating assessment was verified in conjunction with the results of the viewing locations impact assessment and field observation.

4.9.2.2 Conformance with Applicable RMPs

Per BLM VRM system (BLM Handbook H-8431-1), an assessment of all major proposed surface-disturbing activities or developments, such as the proposed Project, must be conducted in order to evaluate compliance with visual management objectives designated in applicable RMPs for BLM administered lands. Conformance or lack thereof with relevant RMPs was determined by assessing visual contrast in context with VRM objectives.

4.9.2.3 Mitigation Planning

Two groups of mitigation measures that are pertinent to the Project (as described in Chapter 2) are standard and selective mitigation measures. Standard mitigation measures would be applied Project-wide (BMPs) and to some extent serve as part of the overall Project description. Mitigation measures beyond these standard measures are referred to as selective mitigation, and are recommended on a case-by-case basis to reduce impacts or address compliance issues in specific locations.

Selective mitigation was applied to all areas of high, moderate-high, and moderate initial impacts to reduce impact levels where necessary and effective, and where feasible based on the Project description. After the implementation of selective mitigation measures at various locations throughout the Project, residual impacts would be reduced to varying degrees depending on site-specific circumstances (e.g., from moderate-high to moderate, from low-moderate to low, etc.).

4.9.3 Impact Analysis Results

Potential visual impacts resulting from the construction and operation of the Project are described in the following section. Visual impacts are described in context with scenery, viewing locations and KOPs, and compliance with BLM VRM classifications. As previously described, impacts to visual resources are residual and based on the assignment (where feasible) of selective mitigation measures for each alternative route. The Map Volume illustrates the results of the impact assessment in regard to scenery, viewing locations and KOPs, and compliance with the BLM VRM objectives impact analysis.

4.9.3.1 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Scenery

The majority of impacts (approximately 41.9 percent) along this subroute is associated with Class B scenery and is anticipated to be moderate. Moderate-high impacts (approximately 9.5 percent) and low-moderate impacts (approximately 33 percent) are anticipated to occur along this subroute in Class A and Class B scenery. Low impacts are anticipated along this subroute in Class C scenery, where the Project parallels existing transmission lines (approximately 15.6 percent). High impacts to scenery are not anticipated along Subroute 1A1.

Impacts for Subroute 1A1 between SunZia East and Link A161 are anticipated to be moderate when crossing Class B scenery with few existing transmission lines and linear facilities. Impacts are anticipated to range from moderate-high to moderate along Link E180 where the route crosses the Rio Grande (Class A scenery), and Rio Grande Floodplain and agricultural landscapes (Class B scenery). Although the Rio Grande has been channelized in this area, riparian vegetation is abundant along the river and extends beyond the banks and throughout the adjacent floodplain. Moderate-strong landscape contrast would be introduced where riparian vegetation would be removed for construction access. Contrast would be reduced by

implementing SE 10 (maximize span at crossings) and SE 14 (selective vegetation removal) to reduce contrast created by right-of-way clearing.

Impacts are also anticipated to range from moderate-high to moderate in Class B scenery where modifications are limited to unpaved roads. This would occur along Link E200 where the route crosses Madrean Mountain landscapes and Chihuahuan Desert Creosote Bajadas associated with the San Mateo Mountains, links E101a and E101b where the route crosses juniper hills between Sevilleta NWR and Stallion WSA, links E80d and E85 where the route crosses juniper hills of Chupadera Mesa, and Link A21 where the route crosses rolling juniper savanna east of Claunch.

Low-moderate to low impacts to Class B and Class C scenery are anticipated for Link E211, which would parallel a 345 kV transmission line for approximately 14 miles. Low-moderate impacts to Class C scenery would occur where existing access would reduce landscape contrast (portions of links E133 and E200). Link E211, associated with Class B scenery, occurs within the DOE West-wide Energy Corridor, where there is an existing 345 kV transmission line.

The majority of impacts between Link A161 and the Midpoint Substation (common to subroutes 1A, 1B1, 1B2, and 1B3) are anticipated to be low-moderate to low (approximately 60 percent), because the route would parallel one or more existing transmission lines (115 kV and 345 kV) in Class B and Class C scenery that is associated with the Rio Grande Valley and desert valley plains, respectively. Although parallel to an existing 115 kV transmission line, moderate impacts are anticipated for isolated portions of links A330a and A330b, when crossing rolling to steep terrain associated with deep ravines that occasionally cross the Rio Grande Valley. Landscape contrast would be moderate-strong to strong in these terrain conditions, where new construction access would be required. Moderate impacts would occur in Class B scenery associated with the Rio Grande Valley for the majority of Link A161a, where the route would not parallel existing transmission lines in flat to rolling terrain. Landscape and structure contrast would be stronger along this portion of the route, where new access and new structures would be introduced into Class B scenery. Moderate-high impacts would occur along isolated portions of these links when crossing moderate to steep terrain associated with deep ravines. Landscape contrast would be reduced by implementing SE 10. Links A161 and A161a occur within the DOE West-wide Energy Corridor, where there are existing 345 kV and 115 kV transmission lines.

Viewing Locations and KOPs

Residential

Residences between the SunZia East Substation and Link A161 are generally dispersed, except for some higher concentrations of residences near Socorro. Impacts to residences near Socorro are anticipated to be high along Link E180, where direct views of the Project within 0.5 mile would occur. High to moderate-high impacts to residences are anticipated for Socorro residences and in isolated areas along links A21, E84b, and E80d, west of SR 54 and east of the Sevilleta NWR (see Visual Contrast Rating Worksheets R01 and SO4, and associated simulations 2a and 2b). In these locations, existing transmission lines are not present and residences would have unobstructed views of the Project within 0.5 mile in flat to rolling terrain where access may be visible, resulting in high to moderate-high impacts. Moderate impacts are anticipated along links A21, E80d, E101a, E101b, and E200, where the Project would be viewed by residences within

1 to 2 miles in a landscape setting that is primarily intact. Low-moderate to low impacts are anticipated, where the proposed structures are viewed from residences beyond 2 miles or where the route would parallel an existing transmission line along Link E211 (see Visual Contrast Rating Worksheet SO1). Residences with views of the Project that would be partially screened and viewed in context with existing structures and/or development would have low impacts (see Visual Contrast Rating Worksheet SO18). Through the implementation of SE 7 (self-supporting lattice), impacts could be moderately reduced for portions of Subroute 1A1 that would be backdropped by adjacent terrain for residential viewers with high to moderate initial impacts.

Subroute 1A1 between Link A161 and Midpoint Substation (common to all subroutes in Route Group 1) would generally have limited impacts to high concern residential viewers, primarily low concentration residences, where the Project would be viewed within 0.5 mile. Residences in this area are generally dispersed, except for a higher concentration near the I-25 corridor and the New Mexico SR 26 corridor. Moderate-high to moderate impacts are anticipated for existing residences within 0.5 mile of Link A161 (near the future development of Willow Springs) and would be viewed in context with an existing 115 kV transmission line; therefore, structure contrast would be reduced (see Visual Contrast Rating Worksheet SO24). Links A161, A330a, A330b, A400, A440, and A530 would parallel one or more transmission lines, which would reduce structure contrast because the Project would be in proximity to similar transmission structures, thus reducing impacts for residential viewers. Low-moderate to low impacts to residences would occur where the Project would be viewed beyond 1.0 mile and/or when parallel to existing transmission lines. Impacts were identified for the future development of Willow Springs, which has plat-approved parcels and varying degrees of infrastructure in place to support that development. Impacts are anticipated to be moderate along the southern boundary of the future development, where the Project would cross flat terrain in a natural landscape setting.

Recreation

Overall, high to moderate impacts are anticipated for a portion of Subroute 1A1 (primarily between the SunZia East Substation and Link A161), because high concern level recreation viewers would have views of the route in a landscape with minimal modifications. Near Socorro, high to moderate-high impacts are anticipated for high concern recreation viewers associated with the Stallion WSA, Veranito WSA, Sevilleta NWR, Johnson (Gordy's) Hill SRMA, and the Rio Grande. High impacts for the WSAs and SRMA would be concentrated along the boundaries of the WSAs and along the north side of the SRMA, where dispersed recreational use may occur near Link E133 (see Visual Contrast Rating Worksheet SO14 and associated Simulation 5). The varied terrain near the WSAs and SRMA would provide a background condition for the Project. In this terrain, SE 7 would be effective in reducing contrast through the use of SSL structures. High impacts for viewers associated with the Rio Grande are anticipated for Link E180, which crosses the river and would be partially screened by riparian vegetation (see Visual Contrast Rating Worksheets SO16 and associated Simulation 7). SE 10 and 14 would reduce contrast at the river crossing, where riparian vegetation would be removed for construction.

Impacts are anticipated to be low-moderate for dispersed recreation viewers associated with Cibola National Forest (near the SunZia East Substation), because the route would be viewed within 2 miles, crossing slightly rolling terrain occupied by juniper grassland. Recreation viewers associated with Cibola National Forest and The Box SRMA (see Visual Contrast Rating

Worksheet SO19) would have views of the Project crossing relatively flat terrain in a natural landscape setting (Link E211). Impacts are anticipated to be low, because the Project would be viewed within 2 miles and in context of an existing 115 kV transmission line that would reduce contrast. Similar to Link E211, impacts to recreation viewers associated with the Bosque del Apache NWR, Devil's Backbone WSA, Chupadera Wilderness, and Indian Well Wilderness are also anticipated to be low because Link A161 would parallel an existing 115 kV transmission line in flat terrain. Moderate-high impacts are anticipated for moderate concern viewers associated with the Ladron Mountain/Devil's Backbone Complex ACEC near Link E200. Impacts would be concentrated at the southern end of the ACEC, where dispersed recreation viewers would have views of the Project crossing rolling terrain in a natural, unmodified landscape setting. Self-supporting lattice structures would be used to reduce contrast where views of the Project would be backdropped by adjacent terrain.

There are few recreation viewers associated with Subroute 1A1 between Link A161 and the Midpoint Substation (common to all subroutes in Route Group 1). Low impacts are anticipated for moderate concern viewers associated with the Ladron Mountain/Devil's Backbone Complex ACEC, near Link A161. Low impacts for viewers at Fort Craig National Historic Site are anticipated because the Project would be viewed beyond 5 miles and would be partially screened by topography (see Visual Contrast Rating Worksheet SO27). Low impacts for viewers along the CDTS route are anticipated because the Project would be viewed beyond 4 miles and within context of an existing wind farm near links A400 and A440. Dispersed recreation viewers associated with Cibola National Forest may have views of the Project within 3 miles; however, it would be viewed in context of an existing 115 kV transmission line that would reduce impacts. Low impacts for viewers at El Camino Real International Heritage Center and El Camino Real Lands Recreation Trail and Trailhead are anticipated, because the Project would be viewed in context with existing modifications (I-25) within 2 miles in a backdropped condition; thus, contrast would be reduced. Viewers associated with Elephant Butte State Park, approximately 1 mile from Subroute 1A1, would have low impacts because views would be screened by intervening terrain.

Travel Routes

Between the SunZia East Substation and Link A161, high concern travel routes crossed include WSMR Route 3607 (see Visual Contrast Rating Worksheet SO11 and associated Simulations 4a and 4b), WSMR Route 5 (see Visual Contrast Rating Worksheet SO13), and El Camino Real National Scenic Byway along SR 408 (see Visual Contrast Rating Worksheets SO17 and associated Simulation 8). Viewers associated with the Quebradas Back Country Byway (see Visual Contrast Rating Worksheet SO15 and associated Simulation 6) would have backdropped views of the Project within 1 mile. High to moderate impacts are anticipated for each of these high concern level travel routes where views of the Project would be unobstructed while crossing rolling to steep terrain. Although landscape modifications are limited to unpaved access, adjacent terrain would result in a backdropped condition for portions of this subroute, which would reduce contrast. SE 7 would reduce contrast where views of the Project would be backdropped by adjacent terrain; SE 10 would reduce contrast at the crossing of El Camino Real National Scenic Byway. Impacts are anticipated to be moderate-high where the Project crosses and/or is within 0.5 mile of the following moderate concern level travel routes: US Route 54 (see Visual Contrast Rating Worksheet RO2), SR 55, and US Route 60.

Subroute 1A1 between Link A161 and Midpoint Substation would cross travel routes (including travel routes that provide access to recreation) that have been identified as having a high concern for viewers. High to moderate-high impacts would be concentrated where the Project crosses these routes and/or would be viewed within 0.5 mile. These travel routes include El Camino Real National Byway (see Visual Contrast Rating Worksheets SO30 and associated Simulation 11) and the Geronimo Trail National Scenic Byway and Lake Valley Back Country Byway (see Visual Contrast Rating Worksheets LC21 and LC22, and associated Simulation 24). SE 10 would reduce contrast at the crossing of these scenic designated travel routes. Low-moderate impacts would result where the Project crosses level terrain and would be viewed by I-25 viewers at a rest stop. At this location, the Project would be viewed within 1.5 miles and would be backdropped by adjacent terrain, which would reduce contrast (see Visual Contrast Rating Worksheet SO28). Impacts are anticipated to be moderate-high where the Project crosses and/or is within 0.5 mile of the following moderate concern level travel routes: I-25 (non-scenic portion), SR 107, FR 255, and SR 142. Low-moderate impacts would occur for viewers along SR 26, a moderate concern level travel route, and the Butterfield Trail (see Visual Contrast Rating Worksheets LC26 and associated Simulation 27). The proposed Project would be visible in a linear corridor through flat terrain with two transmission lines and a railroad, which also cross the historic trail.

Compliance

Portions of Subroute 1A1 would not be compliant with VRM Class II lands where strong to weak-moderate contrast would be viewed by travel routes and recreation viewers. In addition, VRM Class III lands would not be compliant where strong to moderate contrast would be viewed primarily by travel route viewers. Subroute 1A1 crosses approximately 14.1 miles of BLM land not in VRM compliance in the Socorro Field Office, 7.9 miles of Class II, and 6.2 miles of Class III (approximately 6.1 percent of BLM land crossed by Subroute 1A1).

Following is a discussion of these individual areas of noncompliance, including the areas where existing landscape conditions and selective mitigation measures could be applied to reduce contrast and bring portions of this subroute into compliance with visual resource management objectives.

Subroute 1A1 between Link A161 and Midpoint Substation

- *Link A260* – High concern viewers associated with El Camino Real National Scenic Byway and residences would have views of strong to moderate-strong project contrast, as Link A260 crosses VRM Class III lands. Compliance with VRM Class III objectives is anticipated, because the Project would parallel an existing 115 kV transmission line. In addition, viewers associated with El Camino Real National Scenic Byway would experience short viewing durations of the Project.
- *Link A330b* – Travel route viewers along the Geronimo Trail/Lake Valley Scenic Byway (along SR 152) associated with a high concern level would have views of moderate project contrast as Link A330b crosses VRM Class III land. Contrast would be reduced through the implementation of SE 7 and 10. In addition, existing modifications include a 345 kV transmission line that the Project would parallel, and a 115 kV transmission line

that parallels this scenic route. Travel route viewers would have a short viewing duration as the Project crosses the road; therefore, compliance with VRM Class III is anticipated.

- *Links A440 and A530* – Travel route viewers along SR 26 associated with a moderate concern level would have views of weak project contrast as links A440 and A530 cross VRM Class II land. Existing modifications along this portion of the subroute include 115 kV and 345 kV transmission lines that would parallel the Project while crossing VRM Class II land (including a 0.5 mile Class II buffer associated with the historic Butterfield Trail, and 2.2 miles Class II lands associated with Cooke's Range) and would be in the foreground of views from SR 26. Based on the rate of speed of moderate concern viewers traveling along SR 26, the Project would be seen for a short viewing duration (approximately 30 seconds and less than 3 minutes, respectively) and viewed through the context of existing modifications with similar line and repetition. Through the application of SE 8, structures would be selectively located to minimize visibility (i.e., maximize backdropping opportunities and avoidance of tower placement on ridgelines). In addition, access roads associated with existing transmission lines should be used to reduce the visibility of access associated with the Project. A low level of visual change would result; therefore, links A440 and A 530 would be compliant with VRM Class II objectives.

Subroute 1A1 between the SunZia East Substation and Link A161

- *Links E101a, E101b, and E133* – High concern level viewers associated with the Veranito WSA, Johnson (Gordy's) Hill SRMA, and the WSMR Route 5 would have views of strong to moderate-strong project contrast in VRM Class II land. Selective mitigation measures would not reduce project contrast to a weak level; thus, portions of links E101a and E133 would not conform to VRM Class II. WSMR Route 3607, a high concern level travel route, would have views of strong to moderate-strong project contrast for a long viewing duration as links E101a and E101b cross VRM Class III land. High concern level viewers associated with the Veranito WSA, Johnson (Gordy's) Hill SRMA, and the WSMR Route 5 would have views of moderate-strong project contrast for a long viewing duration as Link E133 crosses VRM Class III land. Selective mitigation measures would not reduce project contrast to a moderate level; thus, portions of links E101a, E101b and E133 would not conform to VRM Class III.

Impacts to the Gran Quivira Unit of Salinas Pueblo Missions National Monument

Regional modifications to the north of Gran Quivira include a wind farm, pipelines, ranches, NM Highway 55, and other paved or unpaved roads. The majority of Subroute 1A1 (links E82, E84a, E84b, and E85) would not be immediately adjacent to existing utilities or roads and would require new access. Moderate-high impacts to Class B scenery are anticipated for isolated portions of this segment in juniper woodland hills, where the Project facilities would require landform modifications in moderate to steep terrain. Clearing of juniper woodland vegetation would increase landscape contrast in this vegetation community.

For portions of this segment associated with Class B piñon-juniper vegetation, landscape contrast would be reduced by implementing mitigation measure SE 14. Moderate impacts are anticipated for Class B scenery crossing flat to rolling terrain, where modifications are minimal in juniper

woodland savanna. In addition to SE 14, the implementation of a detailed reclamation plan (SE 5) would reduce impacts to scenery by restoring lands within the right-of-way.

Visitors to Gran Quivira would have superior views of the landscape where the Project would be viewed within 4 miles crossing slightly rolling terrain and vegetation associated with the juniper woodland savanna. A portion of Link E84b would be skylined, although the majority of the route would be backdropped by adjacent terrain and would be viewed at a distance of approximately 4 miles in context with existing regional modifications. In addition, access would be partially screened by topography and/or existing vegetation that would reduce contrast for Link E84b. Project components may often be subdued or absorbed into the contextual landscape, reducing visibility of the Project. Overall, Subroute 1A1 would result in low impacts for high-concern level viewers associated with Gran Quivira because the Project, although visible, would be subordinate in the landscape (see Visual Contrast Rating Worksheet SO31b and associated Simulation 47b). Impacts to viewers could be further reduced by modifying the tower height (SE 7) or tower placement (SE 8) for portions of the route that are skylined.

High to moderate impacts are anticipated for the Salt Missions Trail Scenic Byway, a high concern level travel route that Gran Quivira visitors use to access the national monument, because views of the Project would be direct and unobstructed. Viewing duration is anticipated to be short because the Project would cross the road perpendicularly for viewers traveling at a high rate of speed. Implementation of SE 10 would maximize the tower span at the crossing of this scenic designated route to reduce visual contrast (see Visual Contrast Rating Worksheet RP1, which was completed for Link E83 but would have similar contrast rating for Link E84b.)

Subroute 1A2 – BLM Preferred Alternative

Scenery

The majority of impacts (approximately 38 percent) along the BLM preferred alternative is associated with Class B scenery and is anticipated to be moderate. Moderate-high impacts (approximately 14 percent) and low-moderate impacts (approximately 33 percent) are anticipated to occur along this subroute in Class A and Class B scenery. Low impacts are anticipated along this subroute in Class C scenery, where the Project parallels existing transmission lines (approximately 15 percent). High impacts to scenery are not anticipated.

Impacts for Subroute 1A2 between SunZia East and Link A161 are anticipated to be moderate when crossing Class B scenery with few existing transmission lines and linear facilities. Impacts are anticipated to range from moderate-high to moderate in Class B scenery where modifications are limited to unpaved roads. This would occur along Link E200 where the route crosses Madrean Mountain landscapes and Chihuahuan Desert Creosote Bajadas associated with the San Mateo Mountains, Link E101b where the route crosses juniper hills between the Sevilleta NWR and Stallion WSA, links E86a and E86b where the route crosses juniper hills of Chupadera Mesa, and Link A21 where the route crosses rolling juniper savanna east of Claunch.

Impacts are also anticipated to range from moderate-high to moderate along Link E180 where the route crosses the Rio Grande (Class A scenery), and Rio Grande Floodplain and agricultural landscapes (Class B scenery). Although the Rio Grande has been channelized and cultivated in

this area, riparian vegetation is confined to the river and consists of Cottonwood galleries. Moderate-strong landscape contrast would be introduced where riparian vegetation would be removed for construction access. Contrast would be reduced by implementing SE 10 (maximize span at crossings) and SE 14 (selective vegetation removal) to reduce contrast created by right-of-way clearing.

Low-moderate to low impacts to Class B and Class C scenery are anticipated for Link E211, which would parallel a 345 kV transmission line for approximately 14 miles. Low-moderate impacts to Class C scenery would occur where existing access would reduce landscape contrast (portions of links E133 and E200). Link E211, associated with Class B scenery, occurs within the DOE West-wide Energy Corridor, where there is an existing 345 kV transmission line. The majority of impacts between Link A161 and the Midpoint Substation (common to subroutes 1A, 1B1, 1B2, and 1B3) would be similar to Subroute 1A1.

Viewing Locations and KOPs

Residential

Residences between the SunZia East Substation and Link A161 are generally dispersed, except for some higher concentrations of residences near Socorro. Impacts to residences near Socorro are anticipated to be high along Link E180 where direct views of the Project within 0.5 mile would occur. High to moderate-high impacts to residences are anticipated in isolated areas along Links A21, west of SR 54, and east of the Sevilleta NWR (see Visual Contrast Rating Worksheets RO1 and RP4, and associated Simulation 49). In these locations, existing transmission lines are not present and residences would have unobstructed views of the Project within 0.5 mile in flat to rolling or steep terrain where access may be visible, resulting in high to moderate-high impacts. Portions of the Project may be skylined while crossing steep terrain near these residences, resulting in strong contrast. High impacts would be limited to a few residences near Local Alternative Link E86a, where unobstructed views of the Project would occur within 0.5 mile in a landscape setting with limited modifications (KOP RP4). Similar to Subroute 1A1, residences would have views of the BLM preferred alternative within the foreground distance zone with minimal screening. Link E84a would result in low-moderate to low impacts where the Project would be viewed beyond 1 mile in a setting with minimal modifications (see Visual Contrast Rating Worksheet RP2).

Moderate impacts are anticipated along links A21, E101b, and E200, where the Project would be viewed by residences within 1 to 2 miles in a landscape setting that is primarily intact. Low-moderate to low impacts are anticipated, where the proposed structures are viewed from residences beyond 2 miles or where the route would parallel an existing transmission line along Link E211 (see Visual Contrast Rating Worksheet SO1). Residences with views of the Project that would be partially screened and viewed in context with existing structures and/or development would have low impacts (see Visual Contrast Rating Worksheet SO18). Through the implementation of SE 7 (self-supporting lattice), impacts could be moderately reduced for portions of the BLM preferred alternative that would be backdropped by adjacent terrain for residential viewers with high to moderate initial impacts.

Subroute 1A2 between Link A161 and the Midpoint Substation (common to all subroutes in Route Group 1) would have residential impacts similar to Subroute 1A1.

Recreation

Overall, high to moderate impacts are anticipated for a portion of the BLM preferred alternative (primarily between the SunZia East Substation and Link A161), because high concern level recreation viewers would have views of the route in a landscape with minimal modifications. Near Socorro, high to moderate-high impacts are anticipated for high concern recreation viewers associated with the Stallion WSA, Veranito WSA, Sevilleta NWR, Johnson (Gordy's) Hill SRMA, and the Rio Grande. High impacts for the WSAs and SRMA would be concentrated along the boundaries of the WSAs and along the north side of the SRMA, where dispersed recreational use may occur near Link E133 (see Visual Contrast Rating Worksheet SO14 and associated Simulation 5). The varied terrain near the WSAs and SRMA would provide a background condition for the Project. In this terrain, SE 7 would be effective in reducing contrast through the use of SSL structures. High impacts for viewers associated with the Rio Grande are anticipated for Link E180, which crosses the river and would be partially screened by riparian vegetation (see Visual Contrast Rating Worksheets SO16 and associated Simulation 7). SE 10 and SE 14 would reduce contrast at the river crossing, where riparian vegetation would be removed for construction.

Low impacts are anticipated for Link E86a approximately 4.7 miles to the north, which would be visible to viewers associated with Gran Quivira, with superior views of the surrounding landscape. Existing visible modifications to the north of Gran Quivira include residences associated with ranching, two pipelines, unpaved roads, and a wind farm (see Visual Contrast Rating Worksheet SO31c and associated Simulation 47c). In addition, the Project would be partially skylined for viewers where Link E86a crosses rolling to hilly terrain; however, the majority of the Project visible to viewers at Gran Quivira would be backdropped by adjacent terrain and would be subordinate in the landscape setting. Some vegetation clearing may be visible at this distance, although access may be partially to totally screened where juniper woodland vegetation is dense. Impacts to viewers could be further reduced by modifying the tower height (SE 7) or tower placement (SE 8) for portions of the route that are skylined.

Impacts are anticipated to be low-moderate for dispersed recreation viewers associated with Cibola National Forest (near the SunZia East Substation), because the route would be viewed within 2 miles, crossing slightly rolling terrain occupied by juniper grassland. Few recreation viewers are associated with land east of Sevilleta NWR near link E86b; thus, impacts are anticipated to be low along that portion of the BLM preferred alternative. Recreation viewers associated with Cibola National Forest and The Box SRMA (see Visual Contrast Rating Worksheet SO19) would have views of the Project crossing relatively flat terrain in a natural landscape setting (Link E211). Impacts are anticipated to be low, because the Project would be viewed within 2 miles and in context of an existing 115 kV transmission line that would reduce contrast. Similar to Link E211, impacts to recreation viewers associated with the Bosque del Apache NWR, Devil's Backbone WSA, Chupadera Wilderness, and Indian Well Wilderness are also anticipated to be low because Link A161 would parallel an existing 115 kV transmission line in flat terrain. Moderate-high impacts are anticipated for moderate concern viewers associated with the Ladron Mountain/Devil's Backbone Complex ACEC near Link E200.

Impacts would be concentrated at the southern end of the ACEC, where dispersed recreation viewers would have views of the Project crossing rolling terrain in a natural, unmodified landscape setting. Self-supporting lattice structures would be used to reduce contrast where views of the Project would be backdropped by adjacent terrain.

There are few recreation viewers associated with Subroute 1A2 between Link A161 and the Midpoint Substation (common to all subroutes in Route Group 1). Impacts are anticipated to be similar to Subroute 1A1.

Travel Routes

Between the SunZia East Substation and Link A161, high concern travel routes crossed include Salt Missions Scenic Byway, WSMR Route 3607 (see Visual Contrast Rating Worksheet SO11 and associated Simulations 4a and 4b), WSMR Route 5 (see Visual Contrast Rating Worksheet SO13), and El Camino Real National Scenic Byway along SR 408 (see Visual Contrast Rating Worksheets SO17 and associated Simulation 8). Salt Mission Scenic Byway, a travel route that provides access to Gran Quivira, is anticipated to have high impacts where views of the Project would be unobstructed while crossing the scenic byway in flat terrain. Viewers associated with the Quebradas Back Country Byway (see Visual Contrast Rating Worksheet SO15 and associated Simulation 6) would have backdropped views of the Project within 1 mile. High to moderate-high impacts are anticipated for Camino Real and WSMR Route 5 where views of the Project would be within 0.5 mile and unobstructed while crossing rolling to steep terrain with minimal modifications. Although landscape modifications are limited to unpaved access, adjacent terrain would result in a backdropped condition for portions of this subroute, which would reduce contrast. SE 7 would reduce contrast where views of the Project would be backdropped by adjacent terrain, and SE 10 would reduce contrast at the crossing of the Salt Missions Scenic Byway (SR 55) and El Camino Real National Scenic Byway. Impacts are anticipated to be moderate-high where the Project crosses and/or is within 0.5 mile of the following moderate concern level travel routes: US Route 54 (see Visual Contrast Rating Worksheet RO2), SR 55, I-25, and US Route 60.

Subroute 1A2 between Link A161 and the Midpoint Substation would have similar impacts to travel routes associated with Subroute 1A1.

Compliance

Portions of Subroute 1A2 would not be in compliance with VRM Class II lands where strong to weak-moderate contrast would be viewed by travel routes and recreation viewers. In addition, VRM Class III lands would not be compliant where strong to moderate contrast would be viewed primarily by travel route viewers. The BLM preferred alternative crosses approximately 13.8 miles of BLM land not in VRM compliance in the Socorro Field Office, 7.7 miles of Class II, and 6.1 miles of Class III (approximately 6 percent of BLM land crossed by Subroute 1A2).

Following is a discussion of these individual areas of noncompliance, including the areas where existing landscape conditions and selective mitigation measures could be applied to reduce contrast and bring portions of this subroute into compliance with VRM objectives.

Subroute 1A2 between the SunZia East Substation and Link A161

Links E86b, E101b and E133 – High concern level viewers associated with the Veranito WSA, Johnson (Gordy's) Hill SRMA, and the WSMR Route 5 would have views of strong to moderate-strong project contrast in VRM Class II land. Selective mitigation measures would not reduce project contrast to a weak level; thus, portions of links E101b and E133 would not conform to VRM Class II. WSMR Route 3607, a high concern level travel route, would have views of strong to moderate-strong project contrast for a long viewing duration as links E86b and E101b cross VRM Class III land. High concern level viewers associated with the Veranito WSA, Johnson (Gordy's) Hill SRMA, and the WSMR Route 5 would have views of moderate-strong project contrast for a long viewing duration as Link E133 crosses VRM Class III land. Selective mitigation measures would not reduce project contrast to a moderate level; thus, portions of links E86b, E101b, and E133 would not conform to VRM Class III.

- Compliance for Subroute 1A2 between Link A161 and the Midpoint Substation would be similar to Subroute 1A1.

Subroute 1A – North River Crossing

Impacts to visual resources along Subroute 1A would be similar to Subroute 1A1 where links are common (links E80d, E101, E133, E180, E200, E211, A161, and A161a, and from Link A330a to the Midpoint Substation). Impacts described below pertain to visual resources associated with links A22 and E80c (Gran Quivira) and Link A270 (Rio Grande Valley), which are specific to Subroute 1A.

Scenery

Similar to the BLM preferred alternative, the majority of impacts (approximately 46.7 percent) along this subroute is associated with Class B scenery and is anticipated to be moderate. Moderate impacts would occur in Class B scenery associated with the Rio Grande Valley for Link A270, and links E80c and A22 in the Gran Quivira area, where the route would not parallel existing transmission lines in flat to rolling terrain. Landscape and structure contrast would be stronger along these portions of Subroute 1A, where new access and new structures would be introduced into Class B scenery with minimal modifications. Moderate-high impacts (approximately 11.6 percent) are anticipated for Class B scenery when crossing moderate to steep terrain. These isolated occurrences of moderate-high impacts in Class B scenery are limited to deep ravines that cross the valley. Landscape contrast would be reduced by implementing SE 10, where practicable. Low to low-moderate impacts (approximately 25.3 percent) are anticipated for Class B and C scenery. Similar to Subroute 1A1, a limited portion of Class A scenery would be affected by this subroute while crossing the Rio Grande, resulting in moderate-high to moderate impacts due to removal of riparian vegetation.

Viewing Locations and KOPs

Residential

Along an isolated portion of Link A270, high to moderate-high impacts are anticipated for residences west of I-25 (see Visual Contrast Rating Worksheet LC18). Residential viewers would have unobstructed views of the Project within 0.5 mile crossing flat to rolling terrain. Landscape contrast associated with access may be visible, although this portion of the route would not parallel an existing transmission line; thus contrast would not be reduced. Dispersed residences along links A270, E80c, and A22 may also have unobstructed views of the Project within 2 miles crossing flat to rolling terrain, which would reduce landscape and structure contrast. Impacts are thus anticipated to be low to low-moderate.

Recreation

Recreation viewers at Gran Quivira would have superior views of the landscape with minimal modifications where the Project would be viewed within 6 miles. Although the Project would be visible, impacts would be low because the structures would be completely backdropped by adjacent terrain, and vegetation clearing for access would be partially screened by the dense juniper vegetation. Dispersed recreation viewers associated with Cibola National Forest may have views of Subroute 1A (Link A270) crossing flat to rolling terrain in a minimally modified landscape setting. Impacts are anticipated to be strong to moderate when the Project would be viewed within 0.5 to 1 mile.

Travel Routes

Subroute 1A crosses similar travel routes west of the Gran Quivira area, resulting in similar impacts as stated for the assessment of the BLM preferred alternative. Link E80c crosses SR 14; although it is not designated as a scenic road, it turns into SR 55 (Salt Missions Trail Scenic Byway) at the Torrance County line and may be used by Gran Quivira visitors. Subroute 1A also crosses SR 54 near the SunZia East Substation. Impacts are anticipated to be moderate-high for these moderate concern-level travel route viewers where views of the Project would be direct and unobstructed. Viewing duration is anticipated to be short because the Project would cross these roads perpendicularly for viewers traveling at a high rate of speed. The implementation of SE 10 would maximize the tower span at the crossing of this scenic designated route to reduce visual contrast.

Compliance

Compliance for Subroute 1A is similar to the BLM preferred alternative, with the exception of Link A270. Overall, Subroute 1A crosses approximately 14.1 miles of BLM land not in VRM compliance in the Socorro Field Office and Las Cruces District Office, 7.9 miles of Class II, and 6.2 miles of Class III.

Compliance specific to Subroute 1A between Link A161 and Midpoint Substation includes:

- Link A270 – High concern level viewers associated with El Camino Real National Scenic Byway (along SR 1) and a residence would have views of strong project contrast as Link A270 crosses VRM Class III land. Contrast would be reduced through the application of SE 3, 5, and 7. In addition, modifications near this location include two radio towers approximately 300 feet tall. Compliance for Link A270 crossing VRM Class III land is anticipated, because contrast would be reduced to a moderate level through selective mitigation. In addition, the Project would be viewed in context with existing modifications.

Subroute 1B – San Antonio Crossing

Scenery

Subroute 1B1: The majority of impacts (approximately 46.1 percent) along this entire subroute are anticipated to be moderate. Moderate-high impacts (approximately 8.8 percent) are anticipated to occur along this subroute in Class A and Class B scenery associated with the Rio Grande and Rio Grande Valley, respectively. Low-moderate impacts (approximately 31.2 percent) are anticipated along this subroute in lower quality Class B and Class C scenery. Low impacts (approximately 13.8 percent) are anticipated along this subroute in Class C scenery, typically where the Project would parallel existing linear features. High impacts are not anticipated along this subroute. Impacts for Subroute 1B1 between links E80d and A161 are anticipated to vary between moderate and moderate-high, when crossing Class B scenery with few existing transmission lines and linear facilities. Impacts to Class A and Class B scenery associated with the Rio Grande and Rio Grande Floodplain and agricultural landscapes along Link A140 are similar to impacts along Link E180 (Subroute 1A1). However, Link A140 crosses more Class B scenery (approximately 1.3 miles of floodplain and 1.0 mile of agricultural lands) than is crossed by Link E180 (approximately 0.7 mile of floodplain and 0.3 mile of agricultural lands). Other Class B scenery associated with this segment includes the Chupadera Mountains, juniper and grassland hills, and rolling juniper-woodland savanna where modifications are limited to unpaved roads. Moderate-high impacts are anticipated along Link A160, where the Project would cross Class B scenery associated with the Chupadera Mountains and isolated portions crossing moderate to steep terrain. For portions of this segment associated with Class B piñon-juniper vegetation, landscape contrast would be reduced by implementing SE 14, which would selectively remove vegetation to blend the edge of the right-of-way into adjacent vegetation patterns, as is practicable and appropriate. Low-moderate impacts are anticipated along this subroute where it crosses Class C scenery associated with level valley plains (links E90 and A90). In addition, existing access adjacent to and crossing links E90 and A90 would minimize ground disturbance and vegetation clearing required for new access roads, thus reducing landscape contrast.

Impacts to scenery along Subroute 1B1 would be similar to Subroute 1A between the SunZia East Substation and Link E80d, and Link A161 and Midpoint Substation (see Subroute 1A).

Subroute 1B2: The majority of impacts (approximately 43.6 percent) along the entire subroute are anticipated to be moderate; moderate-high impacts (approximately 8.9 percent) are anticipated to occur along this subroute in Class A (Rio Grande) and Class B (Rio Grande

Floodplain, Chupadera Mountains, and Rio Grande Valley) scenery; low-moderate impacts (approximately 32.5 percent) are anticipated in Class B and Class C scenery; and low impacts (approximately 14.8 percent) are anticipated in Class C scenery, typically where the Project would parallel existing linear features. High impacts are not anticipated. Impacts for Subroute 1B2 between the SunZia East Substation and Link A60 are anticipated to be primarily moderate, when crossing Class B scenery with few existing transmission lines and linear facilities. Impacts to Class B and C scenery associated with rolling juniper woodland-savanna and rolling savanna plains are similar to Subroute 1B1, ranging from moderate to moderate-high. Subroute 1B2 crosses less Class B scenery associated with rolling savanna plains; however, some portions appear more natural with fewer cultural modifications such as roads. Landform contrast may be slightly higher than Subroute 1B1, because more vegetation clearing and ground disturbance would be required for new access roads. Landscape contrast for Subroute 1B2 in Class C scenery (Link A60) would be higher, because the Project would require new access roads, whereas most of Subroute 1B1 (Link E90) would parallel an existing road.

Impacts to scenery along Subroute 1B2 would be similar to Subroute 1A between Link A161 and Midpoint Substation (see Subroute 1A), and Subroute 1B1 between links A90 and A160 (see Subroute 1B1).

Subroute 1B3: The majority of impacts (approximately 44.3 percent) along this entire subroute are anticipated to be moderate; moderate-high impacts are anticipated along approximately 10.2 percent of this subroute; low-moderate impacts are anticipated along 30.5 percent; and low impacts are anticipated along 15.1 percent of this subroute. High impacts are not anticipated. Subroute 1B3, between the SunZia East Substation and Link A161, crosses similar Class B and Class C scenery, including rolling juniper-woodland savanna and rolling savanna plains, as does Subroute 1B2. Moderate to moderate-strong contrast is anticipated from the construction and operation of new access roads and right-of-way clearing on moderate to steep terrain within Class B scenery, associated with rolling juniper-woodland savanna (portions of links A40 and A41). There are no existing access roads paralleling these links; therefore, moderate-high impacts along links A40 and A41 are anticipated. A portion of Link A41 parallels an existing unpaved road through Class B scenery associated with rolling savanna plains. The use of existing roads would minimize ground disturbance and vegetation clearing needed for access, thus reducing landscape contrast. Portions of links A50 and A60 in Subroute 1B2 through similar Class B scenery do not parallel existing roads, and therefore contrast from vegetation clearing would be higher for those segments. Impacts along Link A80 would be similar to Subroute 1B2 through similar Class C scenery (moderate-low). US Route 380 parallels Link A80 approximately 0.8 mile to the south.

Impacts to scenery along Subroute 1B3 would be similar to Subroute 1A between Link A161 and the Midpoint Substation (see Subroute 1A), and Subroute 1B2 between the SunZia East Substation and Link A30, and between Link A111 and Link A160.

Viewing Locations and KOPs

Subroute 1B1: Impacts to viewing locations and KOPs along Subroute 1B1 would be similar to Subroute 1A1 between Link A161 and the Midpoint Substation. Impacts to viewers are described

for links that occur between the SunZia East Substation and Link A161 (links E90, A90, A111, A112, A140, A143, and A160).

Residential

Subroute 1B1 would generally have limited impacts to high concern residential viewers, because few residences occur within 0.5 mile of the Project. Residences in this area are generally dispersed with a small group of residences associated with the outskirts of San Antonio. North of San Antonio, high impacts are anticipated for residences with unobstructed views of the Project within 0.5 mile in natural and agricultural landscape settings (see Visual Contrast Rating Worksheet SO20 and associated Simulation 9).

Moderate impacts to residential viewers east of San Antonio (see Visual Contrast Rating Worksheet SO8) would occur where the Project would be viewed beyond 0.5 mile in relatively flat terrain. Adjacent terrain near Link A90 would provide a background condition where SE 7 could be applied to reduce structure contrast. Low-moderate to low impacts are anticipated for residences with views of the Project 0.75 mile and beyond residences (see Visual Contrast Rating Worksheet SO5 and SO21), and where the Project would be partially screened by vegetation.

In addition to impacts discussed for existing high concern residential viewers above, impacts were identified for the future development of Whispering Mountain Ranches (immediately east of Willow Springs), which has plat approved parcels. Moderate impacts are anticipated along the northern boundary of the future development in a natural landscape setting through rough to rolling terrain. SE 7 would reduce contrast where views of the Project would be backdropped by adjacent terrain near Link A160.

Recreation

Low-moderate impacts are anticipated for high concern recreation viewers associated with the Stallion WSA, Little San Pascual Wilderness, Chupadera Wilderness, and the Trinity Historic Marker (see Visual Contrast Rating Worksheet SO10), because the Project would be visible beyond 1.0 mile while crossing flat terrain. Low impacts are anticipated for viewers associated with the Bosque del Apache NWR south of San Antonio, where the Project would be viewed in context with a modified setting (i.e., agricultural and residential development) approximately 5 miles from Link A140 (see Visual Contrast Rating Worksheet SO23).

Travel Routes

The Project would also cross El Camino Real National Scenic Byway, which was classified as a high concern level for travel route viewers. High impacts are anticipated when the Project would cross this route where unobstructed views of the Project would occur within 0.5 mile. Low-moderate impacts are anticipated for viewers along the Quebradas Back Country Byway, where the Project would be visible in a setting with minimal modifications and viewed beyond 1 mile while crossing flat terrain (see Visual Contrast Rating Worksheet SO9 and associated Simulation 3).

Travel routes associated with a moderate level of concern include portions of I-25 that are not designated scenic, US Route 380, and US Route 54. Moderate-high impacts would occur as the Project crosses I-25, with moderate to low-moderate impacts for links A111 and A112, which would parallel US Route 380, approximately 1 mile north of this corridor (see Visual Contrast Rating Worksheet SO22 and associated Simulation 10). Views from US Route 380 would be intermittently screened by topography, thereby reducing contrast.

SE 10 could be applied for areas of high, moderate-high, and moderate impacts to reduce contrast as the Project crosses the travel routes identified above.

Subroute 1B2: Impacts to viewing locations and KOPs along Subroute 1B2 are identical to Subroute 1A1 between Link A161 and Midpoint Substation. Impacts to viewers are described for links that occur between the SunZia East Substation and Link A161 (links A30, A50, and A60). Impacts to viewers at the San Antonio Crossing (links A111, A112, A140, and A160) are identical to Subroute 1B1.

Residential

Subroute 1B2 would generally have limited impacts to high concern residential viewers, because few residences occur within 0.5 mile. High to moderate-high impacts are anticipated for residences west of US Route 54 (see Visual Contrast Rating Worksheet RO1) and along Warm Springs Road southwest of Claunch. Residential views would be unobstructed in flat to rolling terrain; however, the Project would be viewed in a landscape with minimal modifications, resulting in stronger contrast. Moderate impacts to residential viewers associated with this subroute would occur where the Project would be viewed 0.5 to 1 mile in a minimally modified landscape (see Visual Contrast Rating Worksheet SO6). Low-moderate to low impacts are anticipated where the Project would be viewed from residences beyond 1 mile.

Travel Routes

Impacts are anticipated to be moderate-high for US Route 54 and SR 55, where the Project crosses this moderate sensitivity travel route in a natural landscape setting through rolling terrain (see Visual Contrast Rating Worksheet RO2). SE 10 would be applied to reduce contrast as the Project crosses these travel routes.

Subroute 1B3: Impacts to viewing locations and KOPs along Subroute 1B3 are identical to Subroute 1A1 between Link A161 and Midpoint Substation. Impacts to viewers will be discussed for links that occur between the SunZia East Substation and Link A161 (links A40, A41, and A80). Impacts to viewers at the San Antonio Crossing (links A111, A112, A140, and A160) are identical to Subroute 1B1.

Residential

High impacts that are anticipated would occur for residences north of Bingham where structures would be visible within 0.5 mile in a landscape setting with minimal modifications. Moderate impacts would occur for residences with potential views of the Project within 0.5 to 1 mile. Low to low-moderate impacts would occur where the Project would be viewed at 1 mile or beyond (see Visual Contrast Rating Worksheet SO7).

Recreation

Low-moderate impacts are anticipated for high concern viewers associated with the Trinity Historic Marker (see Visual Contrast Rating Worksheet SO10), because the Project would be visible at 1.0 mile where crossing flat terrain in a landscape setting with minimal modifications.

Travel Routes

This subroute parallels US Route 380 (offset by 1.0 mile to the north), which has been identified as a moderate concern level for travel route viewers. Impacts are anticipated to be low-moderate where the proposed structures would be intermittently screened by topography.

Compliance

Subroute 1B1: Subroute 1B1 crosses 5.2 miles of BLM land not in VRM compliance in the Socorro Field Office (4.1 miles of Class II and 1.1 miles of Class III), or approximately 2.3 percent of BLM land crossed by this subroute.

The following is a discussion of the individual areas of noncompliance:

- *Link A90* – A residence near WSMR Route 18 would have views of moderate-strong project contrast as Link A90 crosses VRM Class III land. Selective mitigation measures would not reduce project contrast to a moderate level; thus, Link A90 would not conform to VRM Class III.
- *Links A111, A112, and A140* – An area where high to moderate-strong project contrast and high to moderate concern viewers occur, as the Project crosses VRM Class II land. The application of selective mitigation would not be able to reduce project contrast to a moderate level. Therefore, it would not be in compliance with VRM objectives.

Subroute 1B2: Compliance with VRM objectives for Subroute 1B2 would be the same as those discussed for subroute 1B1. The remainder of BLM land crossed by Subroute 1B2 is in compliance with VRM objectives.

Subroute 1B3: Subroute 1B3 crosses 4.4 miles of BLM land not in VRM compliance in the Socorro Field Office and Las Cruces District Office (4.1 miles of Class II and 0.3 mile of Class III), or approximately 2.1 percent of BLM land crossed by this subroute. The remainder of BLM land crossed by Subroute 1B3 is in compliance with VRM objectives.

Local Alternative and Crossover Links for Route Group 1

Scenery

Local Alternative Links for 1A and 1B – Gran Quivira: Impacts along local alternative links E81, E83, and E82-E84-E85, are similar to Subroute 1A (moderate to moderate-high) crossing Class B scenery associated with rolling juniper-woodland savanna and rolling savanna plains.

More occurrences of moderate-strong impacts are anticipated to occur along links E81 and E85 through rolling juniper-woodland savanna, because new access roads would require ground disturbance on moderate to steep terrain and the removal of dense vegetation, resulting in strong landscape contrast. Portions of links E83 and E82 cross rolling juniper-woodland savanna while parallel to an existing pipeline, which has already modified the landscape; therefore, impacts would be reduced. Contrast would be reduced by implementing SE 14, which would limit the amount of permanent clearing of piñon-juniper vegetation and selectively removing vegetation to blend the edge of the right-of-way into adjacent vegetation patterns, as practicable and appropriate. Moderate impacts are anticipated to occur where the local alternative links cross rolling savanna plains, some of which have been modified into ranches. Regionally, existing modifications include a windfarm, located to the northeast approximately 14 miles from these local alternative links.

Local Alternative Links for 1A, 1B1, 1B2, 1B3: Impacts range from moderate-high to low-moderate along local alternative links A161b and A361-A430-A481. Moderate-strong landscape contrast would result from the construction of new access roads and structure pads on moderate to steep terrain within Class B scenery associated with undulating bajadas and southern foothills of the Magdalena Mountains (Link A161b) and the northern and southern foothills of the Sierra de las Uvas Mountains (Link A481). Landscape contrast along Link A260 and portions of Link A361 would be similar to Subroute 1A, where it crosses the Rio Grande Valley. The proposed structures would introduce strong structure contrast into the landscape (links A161b, A361-A430-A481, and a portion of Link A260) where there are no existing transmission line structures. Low-moderate impacts are anticipated along local alternative links A430 and A481 and portions of A361, which cross Class C scenery associated with desert valley plains. Due to the level terrain of the valley plain, little disturbance to landform would occur; therefore, weak-moderate to weak landscape contrast is anticipated. Structure contrast would be reduced to moderate-strong, where Link A260 occurs within the DOE West-wide Energy Corridor (approximately 9.4 miles) and parallels an existing 115 kV transmission line.

Crossover Links 1B2, 1B3: Crossover Link A70 has similar impacts as Subroute 1B2 crossing Class B scenery associated with rolling savanna.

Local Alternative Links for 1A and 1B – Gran Quivira

Viewing Locations and KOPs

Residential

High impacts would be limited to a few residences near Local Alternative Link E84, where unobstructed views of the Project would occur within 0.5 mile in a landscape setting with limited modifications. Links E81 and E83-E84 would result in limited areas of moderate impacts where the Project would be viewed within 0.5 to 1 mile in a setting with minimal modifications (see Visual Contrast Rating Worksheet RP2). Low-moderate to low impacts are anticipated for high concern residences where each of these local alternative links would be viewed beyond 1 mile.

Recreation

Low-moderate impacts are anticipated for Link E81, approximately 2 miles south of viewers associated with Gran Quivira, where superior views of the Project would occur in a setting with minimal modifications (see Visual Contrast Rating Worksheet SO2b and associated Simulation 1b). Contrast would be greater where access and new structures would be introduced; however, the Project would be completely backdropped by adjacent terrain, which would reduce structure contrast. Some vegetation clearing may be visible at this distance, although access may be partially to totally screened where juniper woodland vegetation is dense.

Low-moderate impacts are anticipated for Link E83, approximately 2 miles to the north, which would be visible to viewers associated with Gran Quivira with superior views of the surrounding landscape. Existing visible modifications to the north of Gran Quivira include residences associated with ranching, two pipelines, unpaved roads, and a wind farm (see Visual Contrast Rating Worksheet SO31a and associated Simulation 47a). In addition, the Project would be partially skylined for viewers where Link E83 crosses rolling to hilly terrain; however, the majority of the Project visible to viewers at Gran Quivira would be backdropped by adjacent terrain. Some vegetation clearing may be visible at this distance, although access may be partially to totally screened where juniper woodland vegetation is dense.

Impacts for Link E84 would be the same as the BLM preferred alternative, Subroute 1A2.

Travel Route

Local alternative links E81, E82, and E83 cross the Salt Missions Scenic Byway, which is associated with SR 55 north of Gran Quivira. High impacts are anticipated where the Project would cross the Salt Missions Scenic Byway (links E83-E84) (see Visual Contrast Rating Worksheet RP1) where unobstructed views would occur in a landscape with few modifications. SE 10 could be applied to moderately reduce contrast. Moderate-high impacts are anticipated where Link E81 crosses SR 55 (without scenic designation) in a landscape with minimal modifications.

Local Alternative Links for 1A, 1B1, 1B2, 1B3

Viewing Locations and KOPs

Residential

Limited portions of Link A161b would result in high to moderate-high impacts for residential viewers near the northern and western boundaries of the Willow Springs development. Structures and portions of access would be visible within 0.5 mile and occur in a natural landscape setting through rolling terrain. Moderate impacts are anticipated for the majority of Link A161b along the western boundary, where structures would be visible to residences beyond 0.5 mile. Similar to Subroute 1A, impacts for future development of Willow Springs would be considered moderate along the northern and western boundaries of the future development. SE 7 would be applied to reduce contrast, because the varying landform and vegetation would provide a background condition for the structures.

Moderate-high impacts are anticipated for residential viewers near Link A260 where the Project would be viewed within 0.5 mile (west of Elephant Butte State Park). These impacts would occur where structures would be visible in moderately steep to flat terrain, and viewed in context with a 115 kV transmission line.

Links A361-A430-A481 would generally have limited impacts to high concern residential viewers where dispersed residences in the Uvas Valley would have views of the Project within 0.5 mile. The Project would be viewed in an agricultural landscape setting with few modifications. Residences with views of the Project between 0.5 and 1 mile are anticipated to have moderate impacts in similar viewing conditions. Low-moderate to low impacts would occur where the Project would be viewed 1.0 mile and beyond (see Visual Contrast Rating Worksheet LC14).

Recreation

Moderate-high impacts are anticipated for moderate concern viewers associated with the Ladron Mountain/Devil's Backbone Complex ACEC along the eastern boundary of the ACEC. Dispersed recreation viewers within the ACEC would have views of Link A161b crossing rolling terrain in a minimally modified landscape setting. The Project would be backdropped for portions of Link A161b by adjacent terrain. Implementation of SE 7 could reduce structure contrast for these recreation viewers.

Low impacts are anticipated for high concern recreation viewers associated with the Elephant Butte State Park because the Project would be screened. Link A260 parallels an existing 115 kV transmission line, approximately 3.0 miles from potential recreation viewers at Elephant Butte State Park; however, adjacent topography would screen the Project from potential viewers within the park (see Visual Contrast Rating Worksheet LC20), resulting in low impacts.

There are no designated recreation areas or facilities associated with local alternative links A361-A430-A481.

Travel Route

Link A161b crosses SR 178/Cienega Camp Road, a moderate concern level travel, which provides access to the southern portion of the Magdalena Mountains. Impacts are considered moderate-high where the Project crosses this travel route in a natural landscape setting through rolling terrain. SE 10 could be applied to moderately reduce contrast as the Project crosses this travel route.

Link A260 crosses the El Camino Real National Scenic Byway, which has been identified as having a high concern for travel route viewers. High impacts would occur where the Project crosses this route west of Elephant Butte State Park (see Visual Contrast Rating Worksheet LC19 and associated Simulation 23). Views of Link A260 crossing this scenic route would be skylined, resulting in high impacts. SE 10 would reduce contrast; however, views of the Project would be unobstructed and remain skylined. Moderate-high impacts are anticipated where Link A260 would be viewed within 0.5 mile of this scenic travel route. This portion of Link A260 parallels an existing 115 kV transmission line; therefore, structure contrast would be reduced.

Link A260 also crosses SR 142, a travel route that has been identified as a moderate concern level, which provides local access to dispersed residences along this travel route. Impacts are considered moderate-high where the Project crosses this travel route in a relatively flat, natural landscape setting with few modifications. SE 10 could be applied to reduce contrast as Link A260 crosses the travel routes identified above.

Links A361-A430-A481 cross SR 26, a travel route associated with a moderate concern level, which provides local access to Hatch and Deming. Impacts are anticipated to be moderate-high where the Project would cross this travel route; however, the Project would be viewed in context with existing modifications, including 115 kV and 345 kV transmission lines crossing flat terrain.

Crossover Links 1B2, 1B3

Residential

High impacts are anticipated for high concern residential viewers of this crossover link north of Bingham. Moderate to low-moderate impacts are anticipated for residences with views of Link A70, beyond 0.5 mile in a landscape setting with few modifications.

There are no recreation or travel route viewers associated with this crossover link.

Compliance

Local Alternative Links for 1A and 1B – Gran Quivira: Local alternative links E83-E84 cross 1.3 miles of BLM land in the Rio Puerco Field Office, which are designated as VRM Class IV. The Project would be compliant with BLM Class IV objectives. BLM land is not crossed by local alternative links E81, E82, or E85.

Local Alternative Links for 1A, 1B1, 1B2, 1B3: Links A361-A430-A481 would be compliant with BLM VRM Class III and Class IV objectives. Local alternative links A161b and A260 cross 4.5 miles of BLM land not in initial VRM compliance in the Socorro Field Office and Las Cruces District Office (Class III).

Following is a discussion of these individual areas of noncompliance, including existing landscape conditions and selective mitigation measures that could be applied to reduce contrast for compliance with visual resource management objectives.

- *Link A161b* – Moderate-strong project contrast would be viewed by existing residences as Link A161b crosses VRM Class III lands. The application of SE 3 and SE 5 would reduce contrast to a moderate level for compliance with VRM Class III.
- *Link A260* – High concern viewers associated with the El Camino Real National Scenic Byway and residences would have views of strong to moderate-strong project contrast, as Link A260 crosses VRM Class III lands. Compliance with VRM Class III objectives is anticipated, because viewers associated with El Camino Real National Scenic Byway would experience short viewing durations of the Project. The remainder of Link A260

parallels an existing 115 kV transmission line; thus, compliance with VRM Class III is anticipated.

Crossover Links 1B2, 1B3: Crossover Link A70 is in compliance with VRM Class III.

4.9.3.2 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A2 – BLM Preferred Alternative

Scenery

The majority of impacts (approximately 66 percent) along Subroute 3A2 are anticipated to be low-moderate in Class C scenery associated with the Animas and San Simon valleys; moderate-high and moderate impacts (approximately 0.5 percent and 2 percent, respectively) are anticipated to occur along this subroute in Class B scenery associated with foothills; and low impacts are anticipated along this subroute in Class C scenery within valley plains, where the Project would parallel existing transmission line routes (approximately 31.5 percent). No Class A scenery is crossed by this subroute.

Moderate-strong landscape contrast would result for portions of the Project crossing moderate to steep terrain within Class B scenery associated with the foothills of the Peloncillo Mountains (Link 150a), resulting in moderate to moderate-high impacts.

Portions of the Project crossing level terrain associated with the valley plains would result in weak-moderate to weak landscape contrast. Landscape contrast would be reduced in areas where the Project would parallel an existing road(s), resulting in low-moderate impacts to Class C scenery. Impacts would be reduced to low in areas where the Project would parallel existing 345 kV transmission lines (portions of links B120b, B121, and B170) and 115 kV transmission lines (Link B120b and a small portion of Link B121) where vertical elements have been introduced into the landscape, therefore reducing structure contrast.

Viewing Locations and KOPs

Residential

Subroute 3A2 would generally have limited areas of high impacts to high concern residential viewers within 0.5 mile of the Project near Deming. The portion of Subroute 3A2 to the east would be farther from larger concentrations of residences in Deming and Lordsburg; thus impacts are anticipated to be low to low-moderate. Portions of this subroute parallel an existing 345 kV transmission line, which greatly reduces contrast. High impacts would occur north of Deming (Link B90), in an area where existing transmission lines are not present and where the Project is located in close proximity to residences in a largely intact natural landscape. These residences would have an unobstructed view of the proposed structures (within 0.5 mile), but landscape contrast associated with access roads may be screened by vegetation in flat terrain.

Moderate impacts associated with this subroute would occur where the Project is beyond 0.5 mile (Link B90), where the proposed structures would be visible in relatively flat terrain and where associated access would not be visible. Low-moderate to low impacts would occur where the Project would be viewed from residences 1.0 mile and beyond, or would be viewed in context with the existing 345 kV transmission line.

Recreation

High-moderate impacts for high concern recreation viewers associated with the CDNST are anticipated where the Project would cross this trail. Viewers here would view the Project in context with an existing 345 kV line and multiple 115 kV lines converging at the existing Hidalgo Substation (Link B121 and B120b) within 0.5 mile of the crossing of the CDNST and the Project; therefore, contrast would be reduced (see Visual Contrast Rating Worksheet LC33 and associated Simulation 50). High impacts to viewers associated with the Peloncillo Mountains Wilderness are anticipated to occur near the northern boundary. Recreation viewers may have unobstructed views for portions of the Project; however, access views may be screened and structures would be backdropped by adjacent terrain. Implementation of SE 7 would reduce contrast in this area. High impacts are anticipated for recreation viewers associated with the CDTS Route where level unobstructed views of the Project would occur when crossed in a landscape setting with few modifications (Link B90). SE 10 could be applied to reduce contrast when crossing recreation trails. Low-moderate impacts are anticipated for high concern recreation viewers associated with the Hot Well Dunes Recreation Area – SRMA/Campground, and would be concentrated along the southern portion of the recreation area where dispersed camping and OHV use could occur (near Link B160d). These viewers would have views of the structures within 2.75 miles; however, access would be screened by existing vegetation in flat terrain.

Travel Routes

The Project would cross routes inventoried as a moderate level of concern for travel route viewers. Impacts would typically be moderate-high where the Project would cross these routes without existing transmission (US Route 180) in a setting with few modifications. Moderate impacts are anticipated for SR 90, SR 464, and US Route 70, where the Project would be viewed in the context of existing transmission lines (see Visual Contrast Rating Work Sheet LC29). SE 10 could be applied for areas of moderate-high and moderate impacts, to reduce contrast at travel route crossings.

Compliance

BLM lands crossed by Subroute 3A2 are in compliance with VRM objectives.

Subroute 3A – North

Scenery

Overall, Subroute 3A would have low (approximately 31.8 percent), low-moderate (approximately 65.7 percent), moderate (approximately 2.0 percent), and moderate-high (approximately 0.5 percent) impacts; high impacts to scenery are not anticipated. Impacts to scenery for Subroute 3A would be similar to Subroute 3A2 from Midpoint Substation to the end of Link B170. Low impacts are anticipated to be low along Link 160a, where the Project would parallel an existing 345 kV transmission line in Class C scenery. The majority of the route would have low-moderate impacts, with a small area of moderate to moderate-high impacts along Link B160b associated with the foothills of the Peloncillo Mountains.

Viewing Locations and KOPs

Impacts to viewing locations and KOPs along Subroute 3A would be similar to Subroute 3A2 from Midpoint Substation to Link B170.

Residential

There are few dispersed residences along links B160a and B160b. Low to low-moderate impacts are anticipated for residences with views of the Project 1 mile and beyond. Cultural modifications along these links are minimal; however, access would be screened by existing vegetation in flat terrain, resulting in reduced contrast.

Recreation

Similar to Subroute 3A2, high impacts to viewers associated with the Peloncillo Mountains Wilderness are anticipated to occur near the northern boundary. High impacts are anticipated for recreation viewers associated with the CDTS Route where level unobstructed views of the Project would occur when crossed by the Project in a landscape setting with few modifications (Link B90). High impacts are anticipated for high concern recreation viewers associated with the Hot Well Dunes Recreation Area – SRMA/Campground, and would be concentrated along the southern portion of the recreation area where dispersed camping and OHV use could occur (along Link B160b). These viewers would have unobstructed views of the structures within 0.5 mile; however, access would be screened by existing vegetation in flat terrain.

Travel Routes

The Project would also cross travel routes inventoried as a moderate level of concern for travel route viewers. Impacts would typically be moderate-high where the Project crosses these routes without existing transmission (Hackel Road) (see Visual Contrast Rating Work Sheet SA3) in a setting with few modifications. SE 10 could be applied for areas of moderate-high and moderate impacts to reduce contrast at travel route crossings.

Compliance

BLM lands crossed by Subroute 3A are in compliance with VRM objectives.

Subroute 3B – South

Scenery

The majority of impacts (approximately 92.7 percent) along Subroute 3B are anticipated to be low-moderate in Class C scenery associated with the Animas and San Simon valleys. Moderate-high and moderate impacts (approximately 1.6 percent and 4.3 percent, respectively) are anticipated to occur in Class B scenery associated with the foothills of the Pyramid and Peloncillo mountains. Low impacts (approximately 1.3 percent) are anticipated to occur in Class C scenery, where the Project would parallel existing transmission line routes. High impacts to scenery are not anticipated along this subroute.

Impacts to scenery along this Subroute 3B are similar to Subroute 3A; however, more occurrences of moderate to moderate-high impacts within Class B scenery would occur along Subroute 3B (links B112 and B150a). The landscape setting within the foothills of the Peloncillo Mountains crossed by this subroute (Link B150a) has been modified by multiple pipeline routes. Strong structure contrast would result through the introduction of this Project; therefore, impacts would be moderate to moderate-high. Although Link B112 would not parallel existing pipeline routes through the foothills of the Pyramid Mountains, the landscape setting has been modified by mining operations, pipeline routes (which would cross Link B112), and other development associated with Lordsburg. Moderate impacts to Class B scenery associated with these regional modifications are anticipated for links B112 and B150a. There are also more occurrences of low-moderate impacts and fewer occurrences of low impacts Subroute 3B through the Animas and San Simon valleys (Class C scenery) than Subroute 3A. Although this subroute parallels more existing pipeline routes, it does not directly parallel existing transmission lines; therefore, structure contrast would be strong. Landform and structure contrast could be further reduced by implementing selective mitigation measures that would reduce ground disturbance by minimizing the separation between the Project (links B110a, B110b, B112, and B150a) and existing transmission lines and pipeline routes, to the extent practicable (SE 16).

Approximately 7.9 miles of the subroute (portions of links B110a, B110b, B112, and B150a) in Class B and Class C scenery would occur within the DOE West-wide Energy Corridor, where the Project would parallel existing 345 kV transmission lines and pipeline routes.

Viewing Locations and KOPs

Residential

Subroute 3B would have impacts to high concern residential viewers; however, it would be closer in proximity to Deming, Lordsburg, San Simon, and I-10 Corridor residences. Similar to Subroute 3A, portions of Subroute 3B parallel an existing 345 kV transmission line, resulting in reduced structure contrast. High to moderate-high impacts are anticipated for residences

northwest of Deming, south of Lordsburg, and in San Simon (links B150a and B150b). In these locations, Subroute 3B does not parallel existing transmission lines and is within 0.5 mile of residences, with views of a largely intact natural landscape (see Visual Contrast Rating Worksheet SA2). Residential views would be primarily unobstructed; however, access would be screened by vegetation in flat terrain. Moderate impacts associated with this subroute would occur near Lordsburg, where the Project would be viewed within 0.5 to 1 mile in relatively flat terrain where access would be screened by vegetation (see Visual Contrast Rating Worksheet LC30 and associated Simulation 30).

Recreation

Impacts are also anticipated for high concern recreation viewers associated with the CDNST. High impacts would be concentrated where the Project would cross the trail in the Pyramid Mountains, south of Lordsburg (Link B112). Recreation viewers would have unobstructed views of the Project crossing the trail; however, access views would be partially screened (see Visual Contrast Rating Worksheet LC31 and associated Simulation 31). SE 10 could be applied to maximize distance of the span of structures at the trail crossing.

High impacts to viewers associated with the Peloncillo Mountains Wilderness are anticipated to occur near the southern boundary near West Doubtful Canyon Road, which provides access to the wilderness and would be crossed by Link 150a. Recreation viewers may have unobstructed views for portions of the Project; however, views of access may be screened and structures would be backdropped by adjacent terrain (see Visual Contrast Rating Worksheet SA1).

Moderate-high impacts are anticipated for viewers associated with the Shakespeare Ghost Town, where the Project would be viewed crossing rolling terrain in a natural landscape setting (Link B112) (see Visual Contrast Rating Worksheet LC32). The Project would be backdropped by adjacent terrain, reducing structure contrast. Implementation of SE 7 could reduce contrast of the proposed structures.

Travel Routes

Impacts would typically be moderate-high where the Project would cross US Route 180 and I-10, associated with a moderate level of concern for travel route viewers (see Visual Contrast Rating Worksheet LC27 and associated Simulation 28) where there are no existing transmission lines. SE 10 would be applied for areas of moderate-high impacts to moderately reduce contrast where the Project would cross the travel routes identified above.

Compliance

Portions of Subroute 3B would not initially be in compliance with VRM Class II lands, where strong to moderate-strong project contrast would occur in conjunction with high concern viewers; nor would it initially be in compliance with VRM Class III lands, where moderate-high project contrast would occur in conjunction with residential viewers and moderate concern travel routes.

The following is a discussion of these individual areas of noncompliance, including the areas where existing landscape conditions and selective mitigation measures that could be applied to reduce contrast would bring these portions of Subroute 3B into compliance with VRM objectives:

- *Link B112* – High concern level recreation viewers associated with the CDNST would have views of strong to moderate-strong project contrast as Link B112 crosses VRM Class II land. Existing regional modifications along this portion of the subroute include mining operations, multiple gas pipelines, a distribution line, water tanks, communication towers, access roads, and the town of Lordsburg. From the trail, these modifications are seen in the middleground or background distance zone and may appear co-dominant to subordinate in the landscape. Although the Project would be viewed in context with these existing modifications, it would still dominate views from the trail when crossing the CDNST. SE 10 would be implemented to maximize structure spans when crossing the trail, which would reduce project contrast from moderate-high to moderate. Link B112 would remain noncompliant with VRM Class II objectives. Note that the long viewing duration associated with a slower rate of travel for hikers, horseback riders, and mountain cyclists is why, even with industrial type visual modifications, the Project would still not comply with VRM class II objectives.

  Views of moderate-strong project contrast would be visible to travel route viewers associated with I-10, as Link B112 crosses VRM Class III land. The Project would be viewed for a relatively short duration (due to the high rate of speed of I-10) and in context with other linear features and modifications. In addition, SE 10 would be employed to maximize the span of the Project where it crosses the interstate; therefore, project contrast would be reduced to moderate and compliance with VRM Class III objectives is anticipated.

- *Link B150b* – An area where moderate-high project contrast and dispersed residential viewers near San Simon, Arizona occur, as the Project crosses VRM Class III land. The application of SE 16 would reduce contrast for residential viewers to a moderate level, thereby bringing this portion of the subroute into compliance with VRM objectives by moving it next to the adjacent pipeline to the north.

<u>Local Alternative and Crossover Links for Route Group 3</u>

Scenery

Crossover Links 3A, 3B: Crossover links B111 and B140 cross Class C scenery similar to Subroute 3A. Link B111 would have lower overall impacts than Link B140, because it would parallel an existing 115 kV transmission line; therefore, vertical elements have already been introduced into the landscape and structure contrast would be reduced. In addition, construction disturbance for access would not be necessary, due to the existing access road that would parallel the link.

Viewing Locations and KOPs

Crossover Links 3A, 3B: Low-moderate to low impacts are anticipated for residential viewers within 1 to 2 miles of crossover links B111 and B140. There are no recreation or travel route viewers associated with these crossover links.

Compliance

Crossover Links 3A, 3B: BLM lands crossed by crossover links B111 and B140 are in compliance with VRM objectives.

4.9.3.3 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

Scenery

The majority of impacts (approximately 43.2 percent) along Subroute 4A are anticipated to be moderate within high quality Class B scenery. Moderate-high impacts (approximately 30.9 percent) are anticipated to occur along this subroute in Class A and Class B scenery associated with the San Pedro River, and foothills and bajadas, respectively. Low-moderate impacts (approximately 16.9 percent) are anticipated to occur in moderate quality Class B and low quality Class C scenery, associated with valley plains. Low impacts (approximately 8.9 percent) are anticipated within Class C scenery, where the subroute would parallel existing transmission lines. High impacts are not anticipated along this subroute.

Moderate-high impacts are anticipated to occur, where new access roads would be required on level terrain within Class A scenery associated with the San Pedro River and adjacent floodplain (Link C592). Landscape contrast would be weak to weak-moderate on level terrain with modifications, including travel routes (e.g., SR 77 and unpaved roads) and a pipeline. Landscape contrast may increase at the river crossing where riparian vegetation may be denser, resulting in higher contrast where right-of-way clearing is required. SE 14 would reduce impacts by limiting the amount of permanent clearing of riparian vegetation and selectively removing vegetation to blend the edge of the right-of-way into adjacent vegetation patterns, as practicable and appropriate. Strong structure contrast is anticipated for the river crossing where there are no existing transmission lines, and could be reduced by allowing conductors to span sensitive areas such as the river and floodplain within the limits of standard tower design. Thus, residual impacts to high quality Class A scenery would be reduced to moderate.

Moderate-high to moderate impacts are anticipated along Subroute 4A, where Class B scenery would be crossed by gently to moderately rolling bajadas, transitional foothills associated with the Galiuro Mountains, and the Sonoran Desert Valley. Overall, the introduction of vertical elements to a predominantly natural landscape setting would create strong structure contrast, regardless of terrain. Strong to moderate landscape contrast would occur for portions of this subroute east of the San Pedro River where the landscape is more topographically diverse (i.e., heavily dissected with steeper terrain), resulting in moderate-high impacts. West of the San

Pedro River the terrain is less steep, with more rolling hills to flat valleys; landscape contrast is anticipated to be primarily moderate to weak-moderate. In addition, the presence of cultural modifications such as major travel routes (e.g., SR 79), unpaved roads, and multiple pipeline routes reduce landscape contrast, resulting in moderate impacts to Class B scenery. Contrast would be reduced by implementing SE 14, which would limit the amount of permanent clearing of piñon-juniper and oak woodland (links C153b, C170, and C178), and Sonoran Desert vegetation (links C173, C595, C620, C760, C780, C830, and C840). Contrast would be further reduced by minimizing the separation between links C760, C780, C830, and C840, and existing pipeline routes to the extent practicable, limiting ground disturbance and vegetation clearing required for new access roads (SE 16).

Low-moderate impacts are anticipated to occur along this subroute in Class C scenery associated with the San Simon Valley (B153a), Bear Springs Flat north of the Pinaleño Mountains (Link B153b), and valley plains northwest of the Picacho Mountains (Link C850). Impacts would be reduced to low along Link 153a, where the Project would parallel an existing 230 kV transmission line, US Route 191, and a pipeline route. Low impacts are also anticipated along Link C880a near the Pinal Central Substation, where the Project would parallel an existing 500 kV transmission line and 115 kV transmission lines, to be located less than 1 mile from the subroute.

Viewing Locations and KOPs

Residential

Generally, Subroute 4A would have limited areas of high impacts to residential viewers with views of the Project within close proximity (approximately 0.5 mile). Residential impacts along Subroute 4A from Link C170 to the Pinal Central Substation are primarily dispersed and associated with Klondyke, Mammoth, Eloy, and La Palma. High to moderate-high impacts are anticipated where existing transmission lines are not present and where the Project would be viewed within 0.5 mile for residences near Klondyke and Mammoth. Eloy and La Palma residences are primarily associated with agriculture and other modifications, including several transmission lines and the Pinal Central Substation. Impacts are anticipated to be high for residences immediately adjacent to the Project (within 0.5 mile) where existing transmission lines are not present, and moderate when parallel to existing transmission lines (see Visual Contrast Rating Worksheet TU33 and associated Simulation 46a). The majority of this subroute segment would have low-moderate to low impacts for dispersed residences with views of the Project beyond 2 miles.

Impacts for residences between the Willow-500 kV Substation and Link C170 are concentrated near Swift Trail Junction, Safford, and Pima. Links B153a and B153b would traverse flat to rolling terrain where there are no existing transmission lines, resulting in strong to moderate-strong contrast. Residences with views of these links would have isolated areas of high to moderate-high impacts where the Project would be viewed within 0.4 mile (see Visual Contrast Rating Worksheet SA4 and associated Simulation 32). Moderate impacts are anticipated for residences with views of the Project, between 0.5 mile and 1 mile, crossing relatively flat terrain where associated access would be screened and structures would be backdropped by adjacent terrain, thus reducing contrast. Residential KOPs associated with moderate impacts along this

subroute include Lebanon and Mammoth residences (see Visual Contrast Rating Worksheet TU1). Low to low-moderate impacts are anticipated for the majority of links B153a and B153b where the Project would be viewed beyond 1 mile (see Visual Contrast Rating Worksheet SA6). A portion of Link B153a would parallel an existing 230 kV transmission line, which would reduce project contrast for a few dispersed residences with views of the Project within 2 miles, resulting in low impacts.

Generally, adjacent terrain would backdrop the structures and the implementation of SE 7 could reduce structure contrast for links B153a and C170.

Recreation

High impacts are anticipated where the Project would cross the Arizona National Scenic Trail in the Black Hills, northwest of Mammoth (Link C620). The Project would cross rolling to steep terrain where views would range between unobstructed to completely screened (see Visual Contrast Rating Worksheet TU3) for Arizona Trail users. SE 10 would be applied to maximize distance of the span of structures and modify the tower design to SSL (SE 7), to reduce contrast at the trail crossing.

Moderate impacts are anticipated for high concern recreation viewers associated with the Bear Springs Badlands ACEC, because Link B153b would be within 0.75 mile of the southern ACEC boundary. Along Tripp Canyon Road/County Road 286, which parallels the southern boundary, recreation viewers would have unobstructed views of the Project crossing flat to rolling terrain; however, it would be backdropped by adjacent terrain, thereby reducing contrast (see Visual Contrast Rating Worksheet SA8). Implementation of SE 7 along Link B153b could reduce structure contrast.

Moderate-high impacts are anticipated for the Tom Mix Memorial Rest Area, where the Project would be visible in a relatively flat terrain with existing 115 kV transmission structures (see Visual Contrast Rating Worksheet TU31). Impacts would range between moderate and low-moderate for Cluff Ranch Wildlife Area. In this setting, where modifications are minimal, views of the Project would be intermittently screened by vegetation and terrain for viewers within 0.75 mile (see Visual Contrast rating Worksheet SA7).

Low impacts are anticipated for the Santa Teresa Wilderness and Aravaipa Canyon Wilderness area, where the Project would be screened by vegetation and terrain for viewers within 3.75 miles. Limited views of the Project may occur from superior views (i.e., mountain ridges); however, project contrast would be reduced at this distance. Impacts to Rug Road, a travel route used to access Aravaipa Canyon Wilderness, are described below.

Travel Routes

High to moderate-high impacts would be concentrated where the Project crosses or is within close proximity to the following routes: US Route 191, SR 266, SR 366/Swift Trail Parkway (see Visual Contrast Rating Worksheet SA5 and associated Simulation 33a and 33b), Ash Creek Road (Concern Level 1 Route), portions of Klondyke Road (see Visual Contrast Rating Worksheet SA12), Rug Road (see Visual Contrast Rating Worksheet SA14 and associated Simulation 34a and 34b), and the Pinal Pioneer Parkway (see Visual Contrast Rating Worksheet

TU30). High impacts are anticipated for viewers along Swift Trail Parkway, Ash Creek Road, Klondyke Road, and Rug Road, with unobstructed views of Subroute 4A crossing these scenic designated travel routes where modifications are minimal.

Impacts are anticipated to be moderate where the Project would cross or is within close proximity to moderate concern level travel routes, including Tripp Canyon Road/FR 286, portions of Klondyke Road (see Visual Contrast Rating Worksheet SA13), 4 Mile Road, SR 77 (see Visual Contrast Rating Worksheet TU2 and associated Simulation 35), and Freeman Road (see Visual Contrast Rating Worksheet TU36).

SE 10 would reduce contrast where travel routes associated with high to moderate impacts are crossed. SE 7 would reduce contrast where adjacent terrain would backdrop the Project. The use of SE 11 and (potentially) SE 13 in the Rug Road area would also reduce landscape contrast associated with access roads and structure sites.

Other

Low impacts are anticipated for the St. Anthony's Greek Orthodox Monastery, as the Project would be located beyond 3 miles in a natural landscape setting (see Visual Contrast Rating Worksheet TU32).

Compliance

A portion of Subroute 4A (along Link C620) would result in high to moderate-high project contrast, which would not initially comply with VRM Class III objectives. However, viewers associated with Freeman Road would have a relatively short viewing duration. In addition, the Project would be partially screened and viewed in context with an existing pipeline; therefore, this portion of Subroute 4A would be compliance with VRM Class III objectives.

Subroute 4B – Sulphur Springs Valley

Scenery

Impacts along Subroute 4B are identical to Subroute 4A from Link C170 to Pinal Central Substation. Impacts along Subroute 4B, where it diverges from Subroute 4A, are similar through Class B and Class C scenery. The majority of impacts (approximately 34.1 percent) along this subroute are anticipated to be moderate-high; moderate impacts (approximately 36.2 percent) are anticipated to occur within high quality Class B scenery; low-moderate impacts (approximately 25.3 percent) are anticipated to occur within moderate quality Class B and low quality Class C scenery; and low impacts (approximately 4.3 percent) are anticipated to occur within Class C scenery where the subroute would parallel existing transmission lines. High impacts are not anticipated.

Moderate-high to moderate impacts would occur where this subroute crosses Class B scenery associated with bajadas south of the Pinaleño Mountains (Link C90) and north of the Sulphur Springs Valley (Link C130b). Removal of vegetation for the construction of new access roads

would create moderate to moderate-high landscape contrast. Structure contrast would be strong along links C130b and C90, due to the introduction of vertical elements into a predominantly natural landscape setting, resulting in moderate-high to moderate impacts. Impacts would be reduced to low-moderate along Link C130a and portions of Link C90 within the Sulphur Springs Valley, where the landscape has been modified by roads and agricultural development, thereby reducing landscape contrast.

Low-moderate impacts are anticipated along Link C71, which would cross Class B scenery associated with the southern foothills of the Pinaleño Mountains. Structure contrast would be reduced where it would parallel two existing 345 kV transmission lines (approximately 0.35 mile to the north). Structure contrast would also be reduced along Link C72, crossing similar Class B scenery, when immediately adjacent to the two 345 kV transmission lines, resulting in low impacts. Contrast along Link C71 would be reduced by minimizing the separation of the Project to the existing 345 kV transmission lines, to the extent practicable, limiting ground disturbance and vegetation clearing required for new access roads within Class B scenery (SE 16).

Viewing Locations and KOPs

The majority of Subroute 4B is similar to Subroute 4A, thus impacts to viewers will be discussed for links that occur primarily in the Sulphur Springs Valley and that are not similar to Subroute 4A (links C71, C72, C90, C130a, and C130b).

Residential

Residences in this area are generally dispersed throughout the Sulphur Springs Valley and south of the Pinaleño Mountains. Limited areas of moderate impacts are anticipated for these residences where the Project would be viewed within 1 to 2 miles in a setting with minimal modifications. Low-moderate to low impacts are anticipated for the majority of links C90, C130a, and C130b, where the Project would be viewed beyond 1.0 mile in relatively flat terrain and/or where the Project would be viewed in context with an existing 345 kV transmission line. There are no recreation viewers associated with links C71, C72, C90, C130a, and C130b.

Travel Routes

Scenic or high concern level travel routes crossed by or within close proximity of Subroute 4B include Bonita Aravaipa Road (see Visual Contrast Rating Worksheet SA11). High impacts are anticipated for viewers along this road, with unobstructed views of Subroute 4B crossing these scenic designated travel routes where modifications are minimal. Impacts would be low-moderate for travel route viewers along Bonita Aravaipa Road where the Project would be viewed beyond 3 miles in relatively flat terrain (see Visual Contrast Rating Worksheet SA9).

Subroute 4B also crosses Fort Grant Road and High Creek Road, travel routes associated with a moderate concern level; impacts are anticipated to be moderate-high. This subroute would cross flat to rolling terrain with minimal modifications.

SE 10 would reduce contrast at these travel route crossings, and SE 7 would reduce contrast for portions of the Project backdropped by adjacent terrain.

Compliance

Compliance with visual resource management objectives for Subroute 4B would be the same as those discussed for Subroute 4A.

Subroute 4C2c – BLM Preferred Alternative

Scenery

The majority of impacts (approximately 31.7 percent) along this subroute are anticipated to be moderate in Class B scenery associated with the San Pedro River Valley, transitional bajadas, and Sonoran Palo Verde Desert plains; moderate-high impacts (approximately 17.8 percent) are also anticipated within the San Pedro River Valley; and low-moderate and low impacts (approximately 25.9 percent and 24.6 percent, respectively) are anticipated to occur within Class B scenery associated with Sonoran Palo Verde Desert plains and Class C scenery. High impacts to scenery are not anticipated along this subroute.

Low-moderate impacts are anticipated to occur within Class B scenery associated with the southern foothills of the Pinaleño Mountains (links C71 and C71a) and bajadas (Link C110). These links parallel two existing 345 kV transmission lines. Low-moderate impacts would also occur within low quality Class C scenery associated with valley plains south of the Winchester Mountains (Link C260). Impacts would be reduced to low, where the subroute parallels two existing 345 kV transmission lines within Class B scenery (agricultural lands) and Class C scenery associated with the Sulphur Springs Valley (Link C110). Contrast could be reduced by minimizing the separation of the Project (links C71a, C110, and C212) to existing transmission line routes, to the extent practicable; limiting ground disturbance and vegetation clearing within Class B scenery (SE 16).

Moderate-high to moderate impacts are anticipated to occur along Subroute 4C2c, where it crosses Class B scenery associated with the west side of the San Pedro River Valley. Along the west side, the terrain is not as steep or as highly dissected as the east side of the river valley; thus, moderate impacts are anticipated for the majority of links C441 and C450. In addition, there are several existing roads and pipeline routes paralleling Link C450, which modify the landscape setting. Contrast along Link C450 could be further reduced by minimizing the separation of the Project to the existing pipeline route, to the extent practicable, limiting ground disturbance and vegetation clearing within Class B scenery (SE 16).

Impacts in Class B and Class C scenery associated with Link C680 are anticipated to be moderate to low, because it would parallel multiple transmission lines, ranging from one to two 115 kV transmission lines, to a 500 kV transmission line and a 115 kV transmission line. In addition to reduced structure contrast, landscape contrast would be reduced where access roads exist for these transmission lines.

Viewing Locations and KOPs

Residential

Subroute 4C2c residential viewers include the Sulfur Springs Valley (near Willcox), San Pedro Valley (including Redington, and San Manuel), Oracle, the Red Rock/Longhoen Trail area, Eloy, and La Palma. High impacts to residences are anticipated near La Palma with views of strong project contrast while immediately adjacent to the proposed Project. Moderate impacts are anticipated for residences near Sulfur Springs Valley (see Visual Contrast Rating Worksheet SA10) and Oracle (see Visual Contrast Rating Worksheet TU4 and associated Simulation 36), where the Project would cross flat to rolling terrain and would be viewed in context with existing linear facilities within 1 mile. Moderate impacts associated with this subroute would occur throughout the San Pedro River Valley and west of San Manuel, where the proposed structures would be visible in relatively flat to rolling terrain in natural landscape settings. In similar conditions, low-moderate to low impacts would occur where the Project would be viewed 1 mile and beyond from residences (see Visual Contrast Rating Worksheets TU9 and TU7). Landscape contrast associated with access may be visible from these superior views; however, the structures would be backdropped by adjacent terrain, which would reduce project contrast. Low-moderate impacts are anticipated for residences with views of the Project in context with several existing transmission lines in flat terrain (see Visual Contrast Rating Worksheet TU28 and TU33).

Recreation

High impacts are anticipated for users of the Arizona National Scenic Tail near the Tiger Mine Trailhead, where Subroute 4C2c crosses the trail, northeast of Oracle (Link C670). The Project would cross rolling terrain where unobstructed views would occur for high sensitivity viewers along the trail (see Visual Contrast Rating Worksheet for TU5 and associated Simulation 37a and 37b). SE 10 would be applied to maximize distance of the span of structures at the trail crossing; and SE 7 would be applied to reduce contrast. Moderate-high to moderate impacts are anticipated for recreation viewers Buehman Canyon Trail. The Project would be visible within 1 mile of these moderate concern level viewers in a landscape with few modifications. Low impacts are anticipated for high sensitivity viewers at Oracle State Park (and associated trails/visitor areas) and Saddlebrook Ranch Golf Club because the Project would be viewed within 1 mile; however, terrain and vegetation would screen the Project, thereby reducing contrast. Low impacts are anticipated for viewers associated with the Biosphere, where views of the Project would occur beyond 2.5 miles in a setting with limited modifications (see Visual Contrast Rating Worksheet TU27). Impacts are anticipated to be low-moderate to low for dispersed recreation users associated with the Rincon Mountains Wilderness, Saguaro National Park (East), and CNF (and associated trails/trailheads), where views of the Project would occur 2 miles and beyond. Visual contrast would be reduced because views of the Project may be screened and/or backdropped by terrain.

Travel Routes

The Project would cross the Redington Road Scenic Drive (a high concern travel route) south of Redington (Link C441). High impacts would occur at this crossing where access may be visible in rolling terrain with minimal modifications. Low-moderate impacts are anticipated for the Pinal

Pioneer Parkway, where Link C680 crosses this route while paralleling multiple transmission lines (see Visual Contrast Rating Worksheet TU35). Low impacts are anticipated for the Mount Lemmon Road, as views of the Project would be beyond 3 miles (see Visual Contrast Rating Worksheet TU8).

Generally, impacts to moderate sensitivity travel routes are anticipated to be moderate-high when crossed by Subroute 4C2. Travel routes crossed by this subroute include SR 77, Cascabel Road (see Visual Resource Contrast Rating Worksheet TU11), Muleshoe Ranch Road (see Visual Contrast Rating Worksheet SA15), Black Hills Mine Road/Catalina Ridge, Webb Road, North Redington Road, and Park Link Drive (see Visual Resource Contrast Rating Worksheet TU29). Moderate-high impacts for moderate concern travel routes are anticipated for viewers associated with SR 77 (see Visual Contrast Rating Worksheet TU34), Cascabel Road, and Muleshoe Ranch Road. Travel route viewers would have unobstructed views of moderate-strong project contrast in landscapes with few modifications. Low impacts are anticipated for the Tom Mix Memorial Rest Area, approximately 1.5 miles from the Project, because it would be screened by vegetation in relatively flat terrain with existing 115 kV transmission structures (see Visual Contrast Rating Worksheet TU31).

Implementation of SE 10 in areas of high to moderate impacts would reduce contrast for travel route crossings. In addition, SE 7 would reduce contrast in areas where varying landform would provide a background condition for the Project.

Other

Low impacts are anticipated for the St. Anthony's Greek Orthodox Monastery, as the Project would be located beyond 3 miles in a natural landscape setting (see Visual Contrast Rating Worksheet TU32).

Compliance

A portion of the BLM preferred alternative route (along links C818 and C820) would not initially be in compliance with VRM Class III objectives where moderate-strong contrast would occur in conjunction with moderate concern viewers associated with Park Link Road. However, based on landscape considerations in this area, the Project could be considered compliant with VRM objectives because of the relatively short viewing duration of the Project and the amount of vegetative screening near this crossing.

Subroute 4C1 – East of San Pedro River

Scenery

The majority of impacts (approximately 45.9 percent) along this subroute are anticipated to be moderate in Class B scenery associated with the San Pedro River Valley, transitional bajadas, and Sonoran Palo Verde Desert plains. Moderate-high impacts (approximately 25.3 percent) are also anticipated along this subroute. Low-moderate and low impacts (approximately 15.1 percent and 12.2 percent, respectively) are anticipated to occur within Class B scenery associated with

Sonoran Palo Verde Desert plains and Class C scenery, where the Project would parallel existing transmission lines. High impacts (approximately 1.5 percent) are anticipated to occur within Class A scenery within the San Pedro River Valley.

High impacts are anticipated to occur within high quality Class A scenery associated with Hot Springs Canyon (Link C331) and the Redfield Canyon (Link C470). New access roads and construction disturbance on the steep slopes would introduce strong landscape contrast within a natural, unmodified landscape setting. Overall, strong structure contrast is anticipated in these high-quality, unmodified landscape settings where the Project would introduce vertical elements. Contrast would be reduced by implementing selective mitigation measures that would allow conductors to span the canyons within the limits of standard tower design, thus reducing disturbance on steep slopes (SE 8 and 10). Moderate-high to moderate impacts are also anticipated along Link C660 in Class A scenery associated with the San Pedro River and floodplain. Weak to weak-moderate landscape contrast would occur where there are several existing roads, and an existing transmission line would reduce structure contrast. In addition, this crossing would be immediately adjacent to the San Manuel Copper Mine Complex to the west, which significantly modifies the existing landscape setting. Therefore, impacts to Class A scenery associated with the San Pedro River and floodplain are anticipated to be moderate.

Moderate-high to moderate impacts are anticipated to occur along Subroute 4C1 where it crosses Class B scenery associated with the east side of the San Pedro River Valley. Strong landscape contrast is anticipated along Link C470 (south of Redfield Canyon) where the Project would cross highly dissected bajadas with steep terrain. In addition, there are no existing roads along this portion of the subroute; therefore, new access would be required for construction. North of the Redfield Canyon (also along Link C470), landscape contrast would be reduced to moderate, where the terrain is less steep and where existing roads cross or parallel this subroute. Overall, strong structure contrast is anticipated in landscape settings with minimal modifications where the Project would introduce vertical elements, resulting in moderate-high to moderate impacts for Class B scenery. Impacts along the west side of the San Pedro River Valley for Subroute 4C1 (links C660, C661, C670, C690, C691, and C693) would be moderate-high to moderate in Class B scenery associated with gently to moderately rolling transitional bajadas and Sonoran Desert Valley. Landscape contrast would be reduced to moderate where links C690, C691, and C693 parallel existing pipelines that have modified the landscape. Contrast could be reduced by minimizing the separation of the Project to existing pipeline routes to the extent practicable, limiting ground disturbance and vegetation clearing within Class B scenery (SE 16).

Low-moderate impacts are anticipated to occur within Class B scenery associated with the southern foothills of the Pinaleño Mountains (links C71 and C71a) and bajadas (Link C110). These links parallel two existing 345 kV transmission lines. Low-moderate impacts would also occur within low quality Class C scenery associated with valley plains south of the Rincon Mountains (Link C270). Impacts would be reduced to low where the subroute parallels two existing 345 kV transmission lines within Class B scenery (agricultural lands) and Class C scenery associated with the Sulphur Springs Valley (Link C110). Contrast could be reduced by minimizing the separation of the Project (links C71a, C110, and C212) to existing transmission line routes, to the extent practicable, limiting ground disturbance and vegetation clearing within Class B scenery (SE 16).

Viewing Locations and KOPs

Residential

Moderate impacts are anticipated for high concern residential viewers in the Sulphur Springs Valley (see Visual Contrast Rating Worksheet SA10), San Manuel, and dispersed residences within the San Pedro River Valley (see Visual Contrast Rating Worksheet TU6 and associated Simulation 38), where structures and portions of access may be visible to residences beyond 1 mile in flat to fairly rugged terrain with few modifications.

Low-moderate to low impacts are anticipated for residences with views 1 mile and beyond or where viewed parallel to existing transmission lines. In addition to impacts discussed for existing high concern residential viewers, impacts were identified for the Willow Springs planned development (Link C691). Impacts are anticipated to be low-moderate in relatively flat terrain in a natural landscape setting.

Recreation

High impacts are anticipated for users of the Arizona National Scenic Tail near the Tiger Mine Trailhead, where Subroute 4C1 crosses the trail, northeast of Oracle (Link C670). The Project would cross rolling terrain where unobstructed views would occur for high sensitivity viewers along the trail (see Visual Contrast Rating Worksheet for TU5 and associated Simulation 37a and 37b). SE 10 would be applied to maximize distance of the span of structures at the trail crossing, and SE 7 would be applied using SSL instead of guyed-"V" structures to reduce contrast. Impacts for high concern recreational viewers associated with Redfield Canyon Wilderness are anticipated to be moderate, where views of the Project may occur within 2 miles. The Project would cross rolling terrain in an unmodified landscape setting; however, views may be partially to completely screened for dispersed recreation viewers. Low-moderate impacts are anticipated for trails associated with the Muleshoe Ranch, where the Project may be intermittently screened by topography and vegetation.

Travel Routes

Moderate-high impacts for high concern travel routes are anticipated for viewers associated with the Pinal Pioneer Parkway, which is crossed by Subroute 4C1. Impacts are anticipated to be low-moderate to low for areas where structures would be visible beyond 1 mile in a natural landscape setting (see Visual Contrast Rating Worksheet TU30).

Impacts for moderate concern travel routes are also anticipated for viewers associated with Muleshoe Ranch Road, San Pedro River Road, North Redington Road/SR 76, SR 77 (see Visual Contrast Rating Worksheet TU34), and Freeman Road (see Visual Contrast Rating Worksheet TU36). Impacts are anticipated to be moderate-high when crossed by this subroute in a landscape with limited modifications. SE 10 would reduce contrast at these travel route crossings by maximizing structure span.

Compliance

Portions of this subroute would not initially be in compliance with VRM Class II land, where high to moderate-strong contrast would occur in conjunction with viewers associated with high concern recreation viewers and dispersed residences. In addition, portions of this subroute would not initially be in compliance with VRM Class III land in conditions similar to those discussed for subroutes 4A and 4B.

The following is a discussion of these individual areas of initial noncompliance, including existing landscape conditions and selective mitigation measures that could be applied to reduce contrast and bring these portions of the subroute into compliance with VRM objectives:

- *Links C331 and C361* – An area where high to moderate-strong contrast and high concern viewers associated with high concern recreation viewers in the Muleshoe Ranch Area and dispersed residences occur as the Project would cross VRM Class II land; contrast could be reduced through the application of SE 5 and SE 7. In addition, consideration of landscape conditions that provide large portions of screening of the Project would bring this portion of the subroute into compliance with VRM objectives.
- *Link C693* – This condition is similar to that discussed for subroutes 4A and 4B, with the exception of being closer to the pipeline that occurs in this area, and is anticipated to be in compliance with BLM VRM Class III (default) land.

<u>Subroute 4C2 – West of San Pedro River</u>

Scenery

Moderate impacts (approximately 35.2 percent) are anticipated along the majority of this subroute within Class B scenery, including the San Pedro River Valley. Moderate-high impacts (approximately 19.8 percent) are also anticipated within the San Pedro River Valley. Low to low-moderate impacts (approximately 20.4 percent and 24.2 percent, respectively) are anticipated within Class B scenery associated with gently rolling bajadas and the Sonoran Desert Valley. High impacts are not anticipated along this subroute.

Moderate-high impacts anticipated along Link C276 where it crosses Class A scenery associated with the San Pedro River and floodplain are similar to Subroute 4A (Link C592), except less Class A scenery would be crossed (approximately 0.33 mile) as compared to Subroute 4A (approximately 0.86 mile).

Moderate-high to moderate impacts are anticipated to occur along Subroute 4C2 where it crosses Class B scenery associated with the west side of the San Pedro River Valley. Along the west side, the terrain is not as steep or as highly dissected as along Subroute 4C1 on the east side, thus moderate impacts are anticipated for the majority of links C441 and C450. In addition, there are several existing roads near this subroute and pipeline routes that parallel Link C450, which modify the landscape setting. Contrast along Link C450 could be further reduced by minimizing the separation of the Project to the existing pipeline route, to the extent practicable, limiting ground disturbance and vegetation clearing within Class B scenery (SE 16).

Class B and Class C scenery associated with Link C680 are similar to Subroute 4C1. Impacts along Link C680 are anticipated to be moderate to low because it parallels multiple transmission lines. In addition to reduced structure contrast, landscape contrast would be reduced where access roads exist for these transmission lines.

Viewing Locations and KOPs

Residential

Subroute 4C2 residential viewers include the San Pedro Valley (including Cascabel, Redington, and San Manuel), Oracle, and the Red Rock/Longhoen Trail area. This subroute would have limited high to moderate-high impacts for residences near Cascabel. Link C276 crosses flat to rolling terrain associated with the San Pedro River Valley, which has been minimally modified. Residential views of strong to moderate-strong contrast may be partially screened by vegetation; however, a portion of Link C276 would also be skylined when crossing the escarpment.

Moderate impacts are anticipated for residences near Oracle (see Visual Contrast Rating Worksheet TU4 and associated Simulation 36), where the Project would cross rolling terrain and would be viewed in context with existing transmission lines and a pipeline corridor within 1 mile. Moderate impacts associated with this subroute would occur throughout the San Pedro River Valley and west of San Manuel, where the proposed structures would be visible in relatively flat to rolling terrain in natural landscape settings. In similar conditions, low-moderate to low impacts would occur where the Project would be viewed 1 mile and beyond from residences (see Visual Contrast Rating Worksheets TU9 and TU7).

Recreation

Moderate-high to moderate impacts are anticipated for recreation viewers along Buehman Canyon Trail. The Project would be visible within 1 mile of these moderate concern level viewers in a landscape with few modifications. Low impacts are anticipated for viewers associated with Saddlebrook Ranch Golf Club and the Biosphere No. 2, where views of the Project would occur beyond 2.5 miles in a setting with limited modifications (see Visual Contrast Rating Worksheet TU27). Impacts are anticipated to be low-moderate to low for dispersed recreation users associated with Oracle State Park and CNF, where views of the Project would occur 2 miles and beyond. Visual contrast would be reduced because views of the Project may be screened and/or backdropped by terrain.

Travel Routes

The Project would cross the Redington Road Scenic Drive (a high concern travel route) south of Redington (Link C441). High impacts would occur at this crossing where access may be visible in rolling terrain with minimal modifications. Low-moderate impacts are anticipated for the Pinal Pioneer Parkway, where Link C680 crosses this route while parallel to multiple transmission lines (see Visual Contrast Rating Worksheet TU35). Low impacts are anticipated for the Mount Lemmon Road, as views of the Project would be beyond 3 miles (see Visual Contrast Rating Worksheet TU8).

Generally, impacts to moderate sensitivity travel routes are anticipated to be moderate-high when crossed by Subroute 4C2. Travel routes crossed by this subroute include Cascabel Road (see Visual Resource Contrast Rating Worksheet TU10 and associated Simulation 39) and Muleshoe Ranch Road, Black Hills Mine Road/Catalina Ridge, Webb Road, North Redington Road, and Park Link Drive (see Visual Resource Contrast Rating Worksheet TU29). Moderate-high impacts for moderate concern travel routes are anticipated for viewers associated with Cascabel Road and Muleshoe Ranch Road. Travel route viewers would have unobstructed views of moderate-strong project contrast in landscapes with few modifications.

Implementation of SE 10 in areas of high to moderate impacts would reduce contrast for travel route crossings. In addition, SE 7 would reduce contrast in areas where varying landform would provide a background condition for the Project.

Compliance

Compliance would be similar to Subroute 4C2c.

<u>Subroute 4C3 – Tucson</u>

Scenery

Impacts along Subroute 4C3 are identical to Subroute 4C2, from Willow-500 kV Substation to Link C212, and from Link C820 to where it would terminate at the Pinal Central Substation. The majority of impacts along this subroute are anticipated to range between low and low-moderate (approximately 36.7 percent and 29.0 percent, respectively), within Class B and Class C scenery where the subroute would parallel existing transmission lines and pipeline routes. Moderate-high impacts (approximately 3.2 percent) are anticipated where the subroute crosses high quality Class A scenery associated with the San Pedro River and Cienega Creek. Moderate impacts are anticipated along this subroute through Class B scenery (approximately 20.3 percent). Approximately 10.7 percent of this subroute crosses developed areas associated with the Tucson metropolitan area. High impacts to scenery are not anticipated along Subroute 4C3.

Moderate-high impacts are anticipated along Link F600 where it crosses the Cienega Creek Natural Preserve (Class A scenery). Existing linear features, such as pipeline routes (approximately 0.10 mile north of the subroute), travel routes (e.g., I-10), a railroad corridor, and trails have introduced contrast adjacent to this landscape setting. Disturbance to riparian vegetation for right-of-way clearing would create landscape contrast. Proposed structures would introduce vertical elements into the landscape, resulting in strong structure contrast. SE 14 would reduce impacts by selective removal of overstory riparian vegetation and the blending of harsh lines created for access. SE 10 would maximize tower spans to avoid sensitive areas such as the creek, where feasible and within engineering limits. Therefore, impacts to high quality Class A scenery associated with Cienega creek would be moderate. Class A scenery associated with the San Pedro River would have moderate impacts because Link F40a parallels two existing 345 kV transmission lines. Contrast would be further reduced by allowing structures to span sensitive areas such as the river and to selectively clear riparian vegetation (SE 10 and SE 14).

Moderate-high to moderate impacts are anticipated to occur along this subroute where Class B scenery associated with moderate rolling bajadas south of the Rincon Mountains would be crossed by portions of Link F600. In this setting, modifications are limited to existing access roads; however, varied terrain would result in stronger landscape contrast for portions of this link crossing south of these mountains. Structure contrast would be reduced to moderate and weak-moderate where the subroute parallels existing transmission lines, reducing project contrast. Contrast would further be reduced by minimizing the separation of the Project to the existing transmission lines, to the extent practicable, limiting ground disturbance and vegetation clearing required for new access roads within Class B scenery (SE 16).

Impacts are anticipated to be low or low-moderate where this subroute parallels one or more existing transmission lines through Class B and Class C scenery (links F40a, F600, F60b, F82, F80, F540, C810, and C810a). Contrast would be reduced by minimizing the separation of the Project to the existing transmission lines, to the extent practicable, limiting ground disturbance and vegetation clearing required for new access roads within Class B and Class C scenery (SE 16).

The landscape setting adjacent to links F111, F112, and F510 has been heavily modified by development associated with the Tucson metropolitan area. In addition, the subroute would parallel existing transmission lines, travel routes (e.g., I-10), railroad corridors, and pipeline routes within the developed area. Thus, contrast to the landscape would be negligible in these highly developed areas.

Viewing Locations and KOPs

Residential

Subroute 4C3 would have higher occurrences of impacts to residential viewers associated with the Tucson metropolitan area (e.g., I-10 corridor). Residences generally occur from the Benson/San Pedro River Valley area west-northwest through the Tucson metropolitan area. Portions of this subroute would have reduced contrast where the Project would parallel existing transmission lines/corridors. High to moderate-high impacts are anticipated for residences immediately adjacent to this subroute (less than 0.5 mile), where the Project would be viewed in both natural landscape settings and highly modified urban settings (see Visual Contrast Rating Worksheet TU24 and TU17). Moderate impacts are anticipated for residential viewers beyond 0.5 mile (see Visual Contrast Rating Worksheet TU12) and/or viewed in context with existing transmission lines. Low-moderate to low impacts would occur when viewed by residences beyond 1 mile and/or when viewed in context with existing transmission lines (see Visual Contrast Rating Worksheet TU28).

Recreation

High to moderate-high impacts are anticipated for the Cienega Creek Preserve, Augie Acuña-Los Niños Park, portions of the Santa Cruz River Park and Juan Bautista de Anza Historic Trail (see Visual Contrast Rating Worksheet TU19 and associated Simulation 43), and Arizona National Scenic Trail at Davidson Canyon (see Visual contrast Rating Worksheet TU37) where the Project would be immediately adjacent to and/or would cross these high concern level recreation

areas. These viewers would have unobstructed views of the Project, primarily structures, with limited views of associated access in both natural landscape settings and in urban development.

Moderate impact recreational viewers include Sentinel Peak Park, portions of the Santa Cruz River Park, and portions of the Juan Bautista de Anza Historic Trail where the Project would be viewed within close proximity; however, contrast would be reduced when viewed in context with existing transmission lines. Low-moderate to low impacts are anticipated for other sensitive recreation viewers that would typically view the Project crossing natural and urban landscape settings, while parallel to existing transmission lines. This includes Saguaro National Park West (see Visual Contrast Rating Worksheet TU25 and associated Simulation 45).

Travel Routes

High to moderate-high impacts would be concentrated where the Project crosses travel routes, and would be viewed within close proximity (less than 0.5 mile) and/or where parallel to existing transmission lines. These travel routes include portions of I-10 (see Visual Contrast Rating Worksheet TU14 and associated Simulation 41), Marsh Station Road, Old Sonoita Highway, Colossal Cave Road, and Valencia Road. Low impacts are anticipated for scenic roadways located within Tucson, with views of the Project beyond 2 miles. In addition, the Project may be partially to completely screened from viewers along these scenic routes and would be viewed in the context of an urban setting (see Visual Contrast Rating Worksheet TU18).

Impacts are anticipated to be moderate-high where the Project crosses or is viewed within close proximity (less than 0.5 mile) of the following moderate concern level travel routes: Cascabel Road (see Visual Resource Contrast Rating Worksheet TU11), Ocotillo Road, and portions of I-10 and I-19. Moderate impacts would occur for viewers along Muleshoe Ranch Road where the Project would parallel an existing transmission line (see Visual Contrast Rating Worksheet SA15).

In areas of high, moderate-high, and moderate impacts discussed above, SE 10 would reduce contrast at these travel route crossings.

Other

Low impacts are anticipated for the Ritz Carlton Resort, as the Project would be located beyond 3 miles in a partially modified landscape setting (see Visual Contrast Rating Worksheet TU26).

Compliance

Compliance with VRM objectives for this subroute would be similar as those discussed for Subroute 4C2, with the exception of additional consideration of a dispersed residential viewer near Link C817. A high concern residential viewer would have views of strong to moderate-strong project contrast in VRM Class III (default) land. Selective mitigation measures would not reduce contrast to a moderate level, thus Link C817 would not conform.

Local Alternative and Crossover Links for Route Group 4

Scenery

Local Alternative Link for 4A, 4B, 4C1: Impacts along Local Alternative Link C790 are similar to Subroute 4A (links C780 and C830). Moderate impacts are anticipated where Link C790 crosses Class B scenery associated with the Sonoran Desert Valley. Impacts are reduced to low-moderate along the portion of Link C790 that parallels an existing 115 kV transmission line and US Route 79.

Local Alternatives Links for 4A, 4B, 4C1, 4C2, 4C3 (Pinal Central Substation): Local alternative subroute links C860, C870, and C890 are anticipated to have similar impacts as Subroute 4A crossing similar Class B and Class C scenery.

Local Alternative Link for 4C1: Local alternative Link C692 crosses similar Class B scenery as Subroute 4C1 (Link C691); however, it does not parallel existing pipeline routes. Similar to Subroute 4C1, strong structure contrast would occur where there are no existing transmission lines, resulting in moderate impacts.

Local Alternative Links for 4C2 (Winchester Substation): Impacts along local alternative subroute links C260 and C261 would be identical to impacts along Subroute 4C3. Impacts along Link C201 would range from moderate to moderate-high, where the link crosses Class B scenery associated with rolling bajadas and the eastern foothills of the Rincon Mountains. In moderate to steep terrain, strong landscape contrast would occur where new access would be required. Landscape contrast would be reduced for portions of this link where there is existing access. The Project would also be introducing vertical elements into a landscape setting where cultural modifications are absent; therefore, strong structure contrast would result.

Local Alternative Links for 4C2 (Tortolita Substation): Impacts along Local Alternative Link C812 are anticipated to be higher (moderate to low-moderate) than impacts anticipated for Subroute 4C3 (Link C810) in similar Class B and C scenery. Landscape contrast would be similar (low-moderate) where both links parallel existing roads. Link C810, however, parallels existing transmission lines, reducing structure contrast to weak, thereby resulting in overall low impacts. Link C812 does not parallel existing structures; therefore, structure contrast would be strong and result in higher impacts. Impacts along local alternative subroute links C810, C810a, C812, C813, and C816 would be identical to impacts anticipated along Subroute 4C3. Local alternative subroute links C814, C815, and C680b would have similar impacts (moderate and low) as Subroute 4C2 (links C680 and C818) crossing similar Class B scenery associated with Sonoran Valley plains.

Local Alternative Links for 4C3 (Pantano-Rillito): Impacts along this local alternative subroute are similar to Subroute 4C3, except this alternative would have lower impacts through similar Class A and Class B scenery associated with Cienega Creek (Link F51) and bajadas south of the Rincon Mountains (Link F40b), respectively.

Moderate impacts are anticipated along Link F51 where it crosses Cienega Creek (Class A). Although more Class A scenery would be crossed by this alternative subroute (approximately 0.6 mile) as opposed to the Subroute 4C3 crossing (approximately 0.3 mile), overall impacts would

be lower. Landscape contrast is similar to Subroute 4C3 (weak-moderate) where existing cultural modifications have introduced linear features into the landscape—including existing pipeline routes, railroad corridor, and trails—creating contrast to landform elements of form, line, and color. Moderate structure contrast is anticipated due to the presence of two existing 345 kV transmission lines, approximately 0.35 mile north of the subroute. SE 14 would reduce impacts by decreasing landscape contrast created by the removal of overstory riparian vegetation and the hard line created by the cleared right-of-way/riparian edge. Contrast would be further reduced by allowing conductors to span sensitive areas, such as the creek, within the limits of standard tower design (SE 8).

More occurrences of low to low-moderate impacts are anticipated along this subroute (links F40b, F51, and F60a) than for Subroute 4C3 (Link F600) in similar Class B scenery south of the Rincon Mountains, where the subroute parallels two existing 345 kV transmission lines. Structure contrast is reduced to moderate, due to the presence of similar structure elements of form, line, color, and texture within the landscape. Contrast would further be reduced by minimizing the separation of the Project to the existing transmission lines, to the extent practicable, limiting ground disturbance and vegetation clearing required for new access roads within Class B scenery (SE 16).

Links F81a and F81b cross the developed Tucson metropolitan area. Link F81b parallels an existing 138 kV transmission line. Overall, this local alternative subroute does not parallel as many vertical features (i.e., transmission lines) or horizontal features (i.e., travel routes, pipelines, and railroad corridors) as Subroute 4C3.

Local Alternative Links for 4C3 (Tortolita Substation): Impacts along this local alternative subroute are identical to impacts anticipated for the local alternative links for 4C3 (links F40b, F51, F60a, and F81a) and 4C2 (C812).

Local Alternative Links for 4C1, 4C2, 4C3: Alternative links C90 and C121 cross similar Class B scenery (agricultural landscapes and bajadas) and Class C scenery (Sulphur Springs Valley) as Subroute 4C2; however, impacts are anticipated to range from moderate-high to low-moderate. Structure contrast would be strong for links C90 and C121 where the Project would not parallel existing transmission lines. Local alternative links C72 and C211 parallel two existing 345 kV transmission lines in Class B scenery, resulting in low impacts because contrast would be reduced.

Crossover Links for 4A, 4B, 4C: Moderate impacts are anticipated along the majority of Link C671 crossing Class B scenery on the western side of the San Pedro River Valley, where existing modifications include a pipeline. In addition, Link C671 is adjacent to the Tiger Mine, which has significantly modified the landscape setting.

Crossover Links for 4A, 4B, 4C1, 4C2: Impacts to crossover links C500, C501, C502, and C174 would be similar to those for Subroute 4C1, ranging from moderate-high to moderate, when crossing similar Class B scenery on the east side of the San Pedro River Valley.

Viewing Locations and KOPs

Residential

Local Alternative Link for 4A, 4B, 4C1: Impacts along Local Alternative Link C790 would be similar to those for Subroute 4A (links C780 and C830). Residences within 2 to 3 miles are anticipated to have low-moderate impacts, where views of the Project crossing flat terrain would occur in a setting without existing transmission lines.

Local Alternatives Links for 4A, 4B, 4C1, 4C2, 4C3 (Pinal Central Substation): Impacts for sensitive viewers would be similar to those for viewers in the La Palma area discussed for Subroute 4A.

Local Alternative Link for 4C1: There are no existing residences associated with this local alternative link. However, impacts are anticipated to be similar to Subroute 4C1 (Link C691) for the future Willow Springs development.

Winchester Substation: Moderate impacts to high concern residential viewers associated with Local Alternative Link C201 would occur in similar conditions to those discussed for subroutes 4C2 and 4C3 in the San Pedro River Valley.

Low-moderate to low impacts are anticipated for residential viewers with views of the Project beyond 1 mile in similar conditions discussed for subroutes 4C2 and 4C3.

Local Alternative Links for 4C2 (Tortolita Substation): Portions of the Tortolita Substation local alternative are similar to Subroute 4C3 and its associated local alternative; thus impacts to viewers for this local alternative are described for links C814, C815, and C680b that are not similar to Subroute 4C3.

Moderate impacts for high concern residential viewers, within 0.5 to 1 mile of this local alternative, would occur where the Project would be viewed in context with existing modifications, including transmission lines, a power station, and substation. Low-moderate to low impacts would generally occur where the proposed structures would be viewed beyond 1 mile in similar conditions.

Local Alternative Links for 4C3 (Pantano-Rillito): High to moderate-high impacts are anticipated to occur along this subroute in both natural landscape settings and highly modified urban settings, where the proposed structures would be visible paralleling existing transmission or where the structures would be seen in areas without existing transmission.

Moderate impacts to high concern residential viewers associated with this subroute would occur in similar conditions to those discussed above, with the exception of where the Project is 0.5 mile and beyond residences in areas where the proposed structures would be visible in relatively flat to rolling terrain, and/or within 0.5 mile parallel to existing transmission lines (see Visual Contrast Rating Worksheet TU15). Low-moderate impacts are anticipated where the Project would be viewed beyond 1 mile or would be viewed while parallel to existing transmission lines.

Local Alternative Links for 4C3 (Tortolita Substation): Impacts to local alternative links (F40b, F51, F60a, F81a, and F81b) would be the same as for Pantano-Rillito local alternative links.

Moderate impacts for high concern residential viewers associated with Local Alternative Link C812 would occur where the proposed structures would be visible in relatively flat terrain in natural landscape settings.

Local Alternative Links 4C1, 4C2, 4C3: High impacts are anticipated for this local alternative (Link 121) where the Project would be viewed within 0.5 mile of Sulphur Springs Valley residences. Moderate impacts are anticipated for residences with views of the Project within 0.5 to 1 mile of Link C121, where the Project would be viewed in context with agricultural development.

Crossover Links for 4A, 4B, 4C1: Impacts from these crossover links for high concern residential viewers east and west of Mammoth would be considered low-moderate to low, and generally occur where the proposed structures would be viewed beyond 1 mile in flat to rolling terrain in a natural landscape setting.

Crossover Links for 4A, 4B, 4C1, 4C2: Low impacts are anticipated for Local Alternative Link C671, for high concern residential viewers near Mammoth, where proposed structures would be viewed beyond 3 miles in moderately rolling terrain in a natural landscape setting.

Recreation

Local Alternative Link for 4A, 4B, 4C1: There are no recreation viewers associated with Local Alternative Link C790.

Local Alternative Links for 4A, 4B, 4C1, 4C2, 4C3 (Pinal Central Substation): There are no recreation viewers associated with these local alternative links.

Local Alternative Link for 4C1: There are no recreation viewers associated with this local alternative.

Local Alternative Links for 4C2 (Winchester Substation): There are no recreation viewers associated with these local alternative links.

Local Alternative Links for 4C2 (Tortolita Substation): There are no recreation viewers associated with these local alternative links, except Link C680. Impacts to Local Alternative Link C680 would be the same as for Subroute 4C2.

Local Alternative Links for 4C3 (Pantano-Rillito): Impacts are anticipated for high concern recreation viewers by which this local alternative would be located. High to moderate-high impacts are anticipated for portions of Colossal Cave Mountain Park, Michael Perry Park, Morris K. Udall Regional Park, and portions of the Rillito River (including Mehl Park) (see Visual Contrast Rating Worksheet TU21 and associated Simulation 44). These impacts would be concentrated where the proposed structures would be visible adjacent to and/or where the Project would cross these features. These viewers would have unobstructed close proximity views of the

structures, with limited views of associated access in both natural landscape settings and in a highly modified urban development landscape.

Moderate impacts are also anticipated in this area, typically were the Project would be in close proximity to recreational viewers, with existing EHV transmission nearby. Moderate impact recreational viewers include Rincon Mountain Wilderness, and portions of Colossal Cave Mountain Park and Cienega Creek Natural Preserve.

Low-moderate to low impacts are anticipated for other sensitive recreation viewers that would typically view the proposed structures in natural and urban landscape settings with existing EHV transmission present. This includes the Arizona National Scenic Trail and portions of Cienega Creek Natural Preserve and east Saguaro National Park (see Visual Contrast Rating Worksheet TU13 and associated Simulation 40a and 40b, TU16 and associated Simulation 42).

In addition to impacts discussed for high concern recreational viewers above, impacts were identified for the future developments of the Urban Loop Trail and Pantano River Park Systems. Impacts are considered to be moderate where the proposed Project would be located near these future facilities.

Local Alternative Links for 4C3 (Tortolita Substation): Impacts to local alternative links (F40b, F51, F60a, F81a, and F81b) would be the same as for Pantano-Rillito local alternative links.

Moderate impacts for high concern recreation viewers associated with the CAP National Recreation Trail would occur, where the Project would parallel the trail in a partially modified setting with multiple transmission lines in the vicinity of Local Alternative Link C812.

Local Alternative Links for 4C1, 4C2, 4C3: There are no recreation viewers associated these with local alternative links.

Crossover Links for 4A, 4B, 4C1: There are no recreation viewers associated these with local alternative links.

Crossover Links for 4A, 4B, 4C1, 4C2: Similar to Subroute 4C1, high impacts are anticipated for viewers along the Arizona National Scenic Tail, where the Project would cross rolling terrain with minimal modifications. Link C671 parallels this scenic trail for a short duration, resulting in unobstructed views to recreation users.

Travel Routes

Local Alternative Link for 4A, 4B, 4C1: High impacts are anticipated for viewers associated with the Pinal Pioneer Parkway, a high concern travel route, which is crossed by Link C790. SE 10 would reduce contrast for this travel route crossing.

Local Alternative Links for 4A, 4B, 4C1, 4C2, 4C3 (Pinal Central Substation): Impacts to the Pinal Central Substation local alternative links would be similar as for Subroute 4A.

Local Alternative Link for 4C1: Similar to Subroute 4C1, impacts were identified for the future conceptual development of Willow Springs (Link C692). Impacts are considered to be low-moderate in relatively flat terrain in a natural landscape setting, where this local alternative crosses the southern and western boundaries of the conceptual development.

Local Alternative Links for 4C2 (Winchester Substation): Impacts to links C260 and C261 would be identical as for Subroute 4C3. Impacts are anticipated to be moderate-high for Link C201, which crosses Ocotillo Road, a moderate concern level travel route. Unobstructed views of the Project would occur for this moderate concern-level travel route in the San Pedro River Valley. SE 10 would reduce contrast at this crossing.

Local Alternative Links for 4C2 (Tortolita Substation): Impacts along these alternative links are identical to impacts anticipated for Subroute 4C2 (Link C680) and 4C3 (links C810, C810a, C813, C816, and C817).

Local Alternative Links for 4C3 (Pantano-Rillito): Similar to Subroute 4C3, this local alternative crosses within close proximity to high concern level travel routes (scenic and other recreation access roads). High to moderate-high impacts occur in similar conditions as discussed for Subroute 4C3. These travel routes include Colossal Cave Road, South Pantano Parkway, Kolb Road, Swan Road, River Road (see Visual Contrast Rating Worksheet TU22), and I-10. SE 10 would reduce contrast at the crossings identified above. Low impacts are anticipated for scenic roadways that are located throughout the foothills in the eastern edge of the valley, where the Project would be viewed in an urban setting and/or screened by development (see Visual Contrast Rating Worksheet TU20 and TU23).

Local Alternative Links for 4C3 (Tortolita Substation): Impacts to these local alternative links are identical to impacts anticipated for the Pantano-Rillito local alternative links (F40b, F51, F60a, F81a, and F81b). There are no travel route viewers associated with Local Alternative Link C812.

Local Alternative Links 4C1, 4C2, 4C3: Fort Grant Road, a moderate concern level travel route, is crossed by Link C121 of this local alternative. Impacts are anticipated to be moderate-high where the Project would cross the travel route; however, the Project would be viewed in context with a modified setting, primarily agriculture and residences. SE 10 would reduce contrast at this crossing by maximizing structure span.

Crossover Links for 4A, 4B, 4C1: Impacts are anticipated to be moderate-high where links C174 and C501 cross Copper Creek Road, associated with a moderate concern level; and where the Project would traverse rolling terrain in a natural landscape setting east of Mammoth. SE 10 would moderately reduce contrast at this crossing.

Crossover Links for 4A, 4B, 4C1, 4C2: There are no travel route viewers associated with crossover Link C671.

Compliance

Local Alternative Link for 4A, 4B, 4C1: No BLM lands are crossed by this local alternative.

Local Alternatives Links for 4A, 4B, 4C1, 4C2, 4C3 (Pinal Central Substation): No BLM lands are crossed by this local alternative.

Local Alternative Link for 4C1: No BLM lands are crossed by this local alternative.

Local Alternative Links for 4C2 (Winchester Substation): No BLM lands are crossed by this local alternative.

Local Alternative Links for 4C2 (Tortolita Substation): BLM lands crossed by this local alternative are in compliance with VRM objectives.

Local Alternative Links for 4C3 (Pantano-Rillito): No BLM lands are crossed by this local alternative.

Local Alternative Links for 4C3 (Tortolita Substation): No BLM lands are crossed by this local alternative.

Local Alternative Links for 4C1, 4C2, 4C3: No BLM lands are crossed by this local alternative.

Crossover Links for 4A, 4B, 4C1: No BLM lands are crossed by this local alternative.

Crossover Links for 4A, 4B, 4C1, 4C2: No BLM lands are crossed by this local alternative.

4.9.3.4 Conformance with Applicable RMPs

An assessment of contrast from agency-approved viewing locations and KOPs indicates that a majority of the Project alternatives would not be in compliance with VRM objectives. In Route Group 1, Subroute 1B3 proportionately has the least amount of noncompliance; whereas Subroute 1A has the greatest amount of noncompliance. In Route Group 3, Subroute 3A has no areas of noncompliance, whereas Subroute 3B has the greatest amount of noncompliance. In Route Group 4, Subroute 4C2 proportionately has the least amount of noncompliance; whereas Subroute 4C1 has the greatest amount of noncompliance. In locations of noncompliance, applied mitigation would not reduce visual contrast to levels consistent with VRM objectives; therefore, these alternatives would not conform to applicable RMPs. Table 4-22 provides a summary by alternative of miles of noncompliance and associated nonconformance, by RMP. A plan amendment would be required for the Project to be in compliance with VRM objectives and to conform to applicable RMPs (Table 4-23).

4.9.3.5 Summary of BLM Preferred Alternative

Based on results of the preceding analysis, the following potentially significant impacts to visual resources may occur with construction and operation of the BLM preferred alternative:

- The introduction of the transmission lines would primarily result in moderate-high impacts to Class B scenery, which is characterized by a minimally modified setting (subroutes 1A2, 3A2, and 4C2c). A limited portion of Class A scenery associated with

the Rio Grande would result in high impacts because the landscape setting is primarily unmodified at this crossing (Subroute 1A2). High impacts to scenery are not anticipated for subroutes 3A2 and 4C2c.

- High to moderate-high impacts would occur for residential viewers near Socorro, Willow Springs (existing and future residences), and other dispersed residences immediately adjacent to the Project (Subroute 1A2). Limited areas of high impacts are anticipated for residences near Deming when immediately adjacent to the Project (Subroute 3A2). Near La Palma, high impacts to residences are anticipated because the Project would be immediately adjacent to these high concern level viewers (Subroute 4C2c).
- Recreation viewers associated with the Stallion WSA, Veranito WSA, Sevilleta NWR, Johnson (Gordy's) Hill SRMA, and the Rio Grande would have high to moderate-high impacts because the Project would be viewed within 0.5 mile where modifications are minimal (Subroute 1A2). Recreation viewers associated with high to moderate-high impacts include the Arizona National Scenic Trail and Buehman Canyon Trail, because the Project would be viewed in a landscape with few modifications (Subroute 4C2c).
- High to moderate-high impacts would occur for travel route viewers along Salt Missions Trail Scenic Byway, WSMR Route 3607, WSMR Route 5, US Route 54, SR 55, Quebradas Back Country Byway SRMA, El Camino Real (SR 408 and I-25), Geronimo National Scenic Byway, Lake Valley Back Country Byway (Subroute 1A2), US Route 180 (Subroute 3A2), Cascabel Road, Redington Road, SR 77, Muleshoe Ranch Road, Black Hills Mine Road/Catalina Ridge, Webb Road, and Park Link Drive (Subroute 4C2c).
- KOPs associated with high to moderate-high impacts for **Subroute 1A2** include RO1 – County Road A020 Residence, RO2 – US Route 54 and Rest Area, RP4 – County Road B001 Residence, SO11 – WSMR S Route 3607, SO13 – Route 5, SO14 – Johnson (Gordy's) Hill SRMA, SO15 – Quebradas Back Country Byway SRMA, SO16 – Rio Grande, SO17 – El Camino Real/SR 408, SO24 – Willow Springs and Whispering Mountain Ranches, LC19 – El Camino Real/I-25, LC21 – Geronimo National Scenic Byway, and LC22 – Lake Valley Back Country Byway/Geronimo National Scenic Byway. High to moderate-high impacts for KOPs associated with **Subroute 3A2** include SA2 – Hackel Road. **Subroute 4C2c** KOPs associated with high to moderate-high impacts include TU5 – Arizona National Scenic Trail at the Tiger Mine Trailhead, TU11 – Cascabel Road, TU29 – Park Link Drive, and TU34 – SR 77.
- Noncompliance with BLM VRM Classifications is anticipated for Class II designations and Class III designations (Subroute 1A2). Subroute 3A2 and 4C2c would be in compliance with Class II and Class III designations.

Table 4-22. VRM Resource Compliance						
Route Group	**Alternative Subroute**	**Length (miles)**	**VRM Compliance (miles)**			**VRM Noncompliance Classification and RMP Nonconformance Route Links** **=unique to subroute*
			Non-BLM	**Compliant**	**Non-compliant**	
Route Group 1: SunZia East Substation to Midpoint Substation	**Subroute 1A1**	228.8	118.7	96.0	13.9	• *E101a: Class III (0.1 mile), Socorro RMP 2009 • *E101b:Class II (5.3 miles) and Class III (3.9 miles), Socorro RMP 2009 • *E133:Class II (2.4 miles) and Class III (2.2 miles), Socorro RMP 2009
	Subroute 1A2 – BLM Preferred Alternative	230.3	122.2	94.2	13.8	• *E101b: Class II (5.3 miles) and Class III (3.9 miles) • *E133: Class II (2.4 miles) and Class III (2.2 miles)
	Subroute 1A – North River Crossing	219.5	114.6	90.8	14.1	• *E101:Class II (5.5 miles) and Class III (4 miles), Socorro RMP 2009 • *E133:Class II (2.4 miles) and Class III (2.2 miles), Socorro RMP 2009
	Subroute 1B – San Antonio Crossing					
	Subroute 1B1	223.6	109.6	108.8	5.2	• A90:Class III (0.8 mile), Socorro RMP 2009 • A111:Class II (2.1 miles) and Class III (0.3 mile), Socorro RMP 2009 • A112:Class II (1.6 miles), Socorro RMP 2009 • A140:Class II (0.4 mile), Socorro RMP 2009
	Subroute 1B2	209.2	89.1	114.9	5.2	• A90:Class III (0.8 mile), Socorro RMP 2009 • A111:Class II (2.1 miles) and Class III (0.3 mile), Socorro RMP 2009 • A112:Class II (1.6 miles), Socorro RMP 2009 • A140:Class II (0.4 mile), Socorro RMP 2009
	Subroute 1B3	206.3	84.0	117.9	4.4	• A111:Class II (2.1 miles) and Class III (0.3 mile), Socorro RMP 2009 • A112:Class II (1.6 miles), Socorro RMP 2009 • A140:Class II (0.4 mile), Socorro RMP 2009
	Local Alternative and Crossover Links for Route Group 1					
	Local Alternative Links for 1A, 1B1, 1B2, 1B3					
	A161b	18.6	10.1	8.5	—	
	A260	28.4	4.7	23.7	—	
	Crossover Link s 1B2, 1B3					

Table 4-22. VRM Resource Compliance						
Route Group	**Alternative Subroute**	**Length (miles)**	**VRM Compliance (miles)**			**VRM Noncompliance Classification and RMP Nonconformance Route Links** **=unique to subroute*
			Non-BLM	**Compliant**	**Non-compliant**	
Route Group 3: Midpoint Substation to Willow-500 kV Substation	**Subroute 3A2 – BLM Preferred Alternative**	123.9	61.5	62.4	—	
	Subroute 3A – North	123.4	65.3	58.1	—	
	Subroute 3B – South	128.6	72.8	55.8	—	B112:Class II (0.8 mile), also associated with BLM avoidance area, Mimbres RMP 1993
Route Group 4: Willow-500 kV Substation to Pinal Central Substation	**Subroute 4A – North of Mt. Graham**	132.9	121.9	11.0	—	
	Subroute 4B – Sulphur Springs Valley	133.0	128.0	5.0	—	
	Subroute 4C					
	Subroute 4C2c – BLM Preferred Alternative	161.2	146.4	14.8	—	
	Subroute 4C1 – San Pedro Valley	139.0	133.7	5.3	—	
	Subroute 4C2 – San Pedro Valley	151.8	137.0	14.8	—	
	Subroute 4C3 – Tucson	172.9	159.7	12.7	0.5	• C817: Class III (0.5 mile), Phoenix RMP 1988
	Local Alternative Links for 4C2 – Winchester and Tortolita Substations					
	C817	1.8	0.7	0.6	0.5	• C817: Class III (0.5 mile), Phoenix RMP 1988

Table 4-23. Proposed Plan Amendments for VRI Classifications and VRM Classifications																
Links with VRM Nonconformance for Subroute 1A2	**Visual Resource Inventory Classifications Data within VRM Plan Amendment Area for Socorro FO**											**Visual Resource Management Classifications Data within Proposed Plan Amendment Area for Socorro FO**				**Total Percent Resource Change in Socorro FO**
	Scenic Quality Rating Unit (acres)			**Sensitivity Level Rating Unit (acres)**			**Distance Zone (acres)**		**VRIC (acres)***			**Proposed Plan Amendment Area within 400-foot-wide corridor (acres)**	**VRM Classifications within 400-foot-wide corridor**		**Total Percent Resource Change by Link VRM Classifications in Socorro FO Class I: 28,718 Class II: 510,945 Class III: 448,612 Class IV: 517,330**	Class I: No Change Class II: Reduced by 0.07% Class III: Reduced by 0.06% Class IV: Increased by 0.13%
	A	**B**	**C**	**H**	**M**	**L**	**FG/MG**	**BG/SS**	**Class II**	**Class III**	**Class IV**		**Socorro RMP Existing VRM Class**	**Proposed Plan Amendment VRM Class**		
E101b	0	268	0	0	1	267	268	0	0	1	267	268	Class II	Class IV	Class II: Reduced by 0.05% Class IV: Increased by 0.05%	
	0	188	0	0	0	188	188	0	0	0	188	188	Class III	Class IV	Class III: Reduced by 0.04% Class IV: Increased by 0.04%	
E133	0	116	0	0	0	116	116	0	0	116	0	116	Class II	Class IV	Class II: Reduced by 0.02% Class IV: Increased by 0.02%	
	0	107	0	0	107	0	107	0	0	107	0	107	Class III	Class IV	Class III: Reduced by 0.02% Class IV: Increased by 0.02%	

*The VRI Classifications are a factor in the final VRM Classifications; however, the resulting VRM Classifications may include other resource management objectives (i.e., cultural, recreation, or geological resources) as defined in the RMP/EIS.

4.10 LAND USE AND RECREATION RESOURCES

4.10.1 Introduction

This section describes and evaluates the potential impacts to land and resource uses that would result from the construction and operation of the proposed transmission lines and substations, and summarizes the assessment results, including the identification of mitigation measures that would be implemented to minimize potential adverse impacts to land and resource uses.

4.10.1.1 Impact Assessment Methodology

An impact assessment methodology was developed to identify and evaluate potential impacts to land and resource uses associated with the proposed action. This methodology consisted of assigning sensitivity classifications to land and resource uses that occur in the study area, identifying initial impact levels based on resource sensitivity and Project-related impacts, developing resource-specific mitigation measures to minimize adverse impacts, and incorporating mitigation measures to assign final impact levels for each Project alternative.

4.10.2 Impact Criteria

Impact levels—high, high-moderate, moderate, low-moderate, and low—were established to determine the impact the Project would have on various land and resource uses. Significant impacts related to land use would be the result of high impacts from the Project that cannot be effectively mitigated. Table 4-24 summarizes the impact criteria used to assign impact levels to the existing land use resources.

Table 4-24. Impact Criteria for Land Use and Recreation Resources

Impact Level	Impact Criteria
High	• Areas where the Project would create a direct long-term conflict with existing residential, commercial, industrial, military, and agricultural uses (e.g., displacement of homes, businesses, or industrial facilities) • Areas where the Project would physically conflict with any designated recreation or preservation use area • Areas where the Project would physically conflict with any officially adopted policies or goals of the affected land-managing agency • Residential areas where the Project would physically conflict with planned subdivisions at the final plat approval stage • Areas where the Project may require extensive efforts beyond standard construction practices, to ensure public or worker safety
High-Moderate	• Areas where the Project is adjacent to existing residential, commercial, industrial, or agricultural uses • Areas where the Project would be adjacent to any designated recreation or preservation use areas

Table 4-24. Impact Criteria for Land Use and Recreation Resources	
Impact Level	**Impact Criteria**
Moderate	• Areas where the Project would create an indirect conflict with residential, commercial, and agriculture uses • Areas where the Project would create short-term impacts to agricultural operations • Areas where the transmission line would require new or expansion of existing right-of-way in a designated recreation area or residential areas (existing and proposed conceptual plans) • BLM right-of-way avoidance areas
Low-Moderate	• Areas where the Project would have an indirect land use impact, or conflict with, and be adjacent to land uses that are compatible with a transmission line • Land uses that were determined to be compatible with a transmission line, but have a lower sensitivity than moderate due to mitigating factors
Low	• Areas where land use is compatible with a transmission line; these areas were found throughout the study corridor and are not detailed in the summary of the analysis

4.10.3 Conformance with Applicable BLM Resource Management Plans

BLM RMPs outline specific management guidelines for their areas, including what development can occur on the lands. In general, areas designated as right-of-way avoidance areas are those that should be avoided, unless there are no viable alternatives. Right-of-way exclusion areas are designated so as not to allow any new rights-of-way across a specific area. To cross a right-of-way exclusion area would require the Applicant to request, and the BLM to approve, an amendment to the RMP, so that the Project would conform to the respective planning decisions (see Section 4.18 for additional information on proposed amendments, and Table 2-16 for alternatives that may require an amendment).

4.10.4 Mitigation Planning

After the application of standard mitigation, selective mitigation would then be applied to effectively reduce impacts where practicable. Specific applications of selective mitigation are described in the impact analysis results below.

4.10.5 Summary of Impact Analysis Results

Impacts to existing and future land uses are summarized in this section. The results of the impact analysis are included in tables H-10 and H-11 of Appendix H, and shown as color-coded centerlines on figures M 10-1 and M 10-2 (see Map Volume). Figures M 10-3 and M 10-4 (see Map Volume) also include baseline information that was used for the impact assessment (see Table 4-20 for a discussion of the impact criteria used to determine the level of impact, and Section 4.10.4 for mitigation planning). Further, the existing land use table and map include impacts to special designations, which are described in Section 4.11.

The BLM preferred and alternative subroutes cross portions of various irrigation and drainage canals and related facilities within agricultural areas of New Mexico and Arizona. The Middle Rio Grande Conservation District and BOR administer canals (including the Rio Grande Conveyance Channel) along the river. The Central Arizona Water Conservation District manages

the CAP facilities on federal lands administered by the BOR in Arizona. The San Carlos Irrigation and Drainage District administers the San Carlos Irrigation Project facilities (under BIA jurisdiction), also in Arizona. Where necessary to construct transmission facilities across canals or other conveyance systems, the transmission Project would be constructed to allow conductors to span these facilities, resulting in low or minimal impacts. An encroachment permit would be required by the BOR or BIA to cross these facilities in accordance with the NEPA and other federal regulations.

The subroutes may cross private and public conservation easements within both New Mexico and Arizona, particularly near the Rio Grande and San Pedro River. Existing conservation easements, to the extent practicable, have generally been avoided by the alternative routes being considered in the EIS. However, some specific conservation easement crossings may not be identified until the final routing is selected and right-of-way acquisition begins. Negotiations with the particular land owner/easement manager would address specific requirements of the conservation easement.

The subroutes may cross lands associated with the Redington and Winkelman NRCDs, both of which have adopted policies to oppose the construction of any new major energy, transportation, or communication corridors through or across the respective district land. Should a route be selected that crosses land within one or both NRCDs, the Project would be inconsistent with the established policies of the NRCDs.

Individual grazing lessees/permittees of record on public lands will be notified if the BLM authorizes the transmission line right-of-way on public lands. The grazing lessee/permittee will have an opportunity to discuss the potential loss of forage and AUM reduction within their respective allotment with the authorized BLM Field/District Office Manager.

4.10.5.1 No Action Alternative

Under the No Action alternative, the BLM would not grant right-of-way for construction and operation of the proposed Project; and Project facilities, including transmission lines and substations, would not be built and existing land uses in the Project study area would continue. There would be no new impacts to land uses occurring within the study area. Under the No Action alternative, it is assumed that current actions and activities in the study area would continue.

4.10.5.2 Route Group 1: SunZia East Substation to Midpoint Substation

<u>Subroute 1A1 – North River Crossing</u>

Existing Land Use

There would be 24.9 miles of moderate impact, 67.3 miles of low-moderate impact, and 136.6 miles of low impact for Subroute 1A1. The subroute crosses approximately 5 miles of the EMRTC range, but is approximately 0.75 mile from active testing areas. The subroute may be adjusted within the study corridor to further accommodate testing activities within the EMRTC. A portion of the low-moderate impacts occur where the subroute crosses approximately 0.3 mile

(Link E180) of irrigated agricultural lands. After the application of standard mitigation, SE 7 would be applied to minimize impacts to agricultural operations. Approximately 1.8 miles and 1.9 miles of moderate impacts would occur where links A440 and A530, respectively, cross the Las Cruces District Office right-of-way avoidance areas; and approximately 10.1 miles, 5.8 miles, and 5.3 miles of moderate impacts would occur where links E211, E101b, and E133, respectively, cross the Socorro Field Office right-of-way avoidance areas.

Future Land Use

Future land use impacts would include 12.4 miles of low-moderate impact and 216.4 miles of low impact.

Grazing

Impacts to BLM grazing would include the removal of approximately 181 acres of BLM land within the Las Cruces District Office area, which is approximately 0.00004 percent of available grazing land, and the removal of approximately 151 acres of BLM land within the Socorro Field Office area, which is approximately 0.0001 percent of available grazing land. No BLM land would be removed within the Rio Puerco Field Office.

Impacts to New Mexico state grazing lands would include the removal of approximately: 11 acres (0.00003 percent) from state lands in Lincoln County; 21 acres (0.00003 percent) from state lands in Luna County; 62 acres (0.001 percent) from state land in Sierra County; 101 acres (0.0002 percent) from state lands in Socorro County; and 29 acres (0.00006 percent) from state lands in Torrance County. The total amount of grazing lands removed for this alternative is approximately 224 acres or 0.0001 percent.

<u>Subroute 1A2 – BLM Preferred Alternative</u>

Existing Land Use

There would be 24.9 miles of moderate impact, 76.5 miles of low-moderate impact, and 128.9 miles of low impact for Subroute 1A2. The subroute crosses approximately 5 miles of the EMRTC range, but is approximately 0.75 mile from active testing areas. A portion of the low-moderate impacts would occur where the subroute crosses approximately 0.3 mile (Link E180) of irrigated agricultural lands. After the application of standard mitigation, SE 7 would be applied to minimize impacts to agricultural operations. Approximately 1.8 miles and 1.9 miles of moderate impacts would occur where links A440 and A530, respectively, cross the Las Cruces District Office right-of-way avoidance areas; and approximately 10.1 miles, 5.8 miles, and 5.3 miles of moderate impacts would occur where links E211, E101b, and E133, respectively, cross the Socorro Field Office right-of-way avoidance areas.

Future Land Use

Future land use impacts would include 12.4 miles of low-moderate impact and 217.9 miles of low impact.

Grazing

Impacts to BLM grazing would include the removal of approximately 181 acres of BLM land within the Las Cruces District Field Office, which is approximately 0.00003 percent of available grazing land, and the removal of approximately 151 acres of BLM land within the Socorro Field Office, which is approximately 0.0001 percent of available grazing land. No BLM land would be removed within the Rio Puerco Field Office.

Impacts to New Mexico state grazing lands would include the removal of approximately: 11 acres (0.00003 percent) from state lands in Lincoln County; 21 acres (0.00003 percent) from state lands in Luna County; 62 acres (0.001 percent) from state land in Sierra County; 64 acres (0.00009 percent) from state lands in Socorro County; and 84 acres (0.0002 percent) from state lands in Torrance County. The total amount of grazing lands removed for this alternative is approximately 242 acres or 0.0001 percent.

Subroute 1A – North River Crossing

Existing Land Use

There would be 24.9 miles of moderate impact, 79.0 miles of low-moderate impact, and 115.6 miles of low impact for Subroute 1A. Approximately 1.8 miles and 1.9 miles of moderate impacts would occur where links A440 and A530, respectively, cross the Las Cruces District Office right-of-way avoidance areas; and approximately 10.1 miles, 5.8 miles, and 5.3 miles of moderate impacts would occur where links E211, E101, and E133, respectively, cross the Socorro Field Office right-of-way avoidance areas. The subroute crosses approximately 5 miles of the EMRTC range, but is at least 0.75 mile from any active testing areas.

Future Land Use

Future land use impacts would include 12.4 miles of low-moderate and 207.1 miles of low impacts.

Grazing

Impacts to grazing would include the removal of between 200 and 220 acres of BLM land within the Las Cruces District Office area, which is approximately 0.005 percent of available grazing land; the removal of approximately 165 acres of BLM land within the Socorro Field Office area, which is approximately 0.015 percent of available grazing land; and the removal of between 0 and 4 acres of BLM land within the Rio Puerco Field Office area, which is between 0 and 0.0004 percent of available grazing land.

Impacts to New Mexico state grazing lands would include the removal of approximately: 15 acres (0.00004 percent) from state lands in Lincoln County; 21 acres (0.00003 percent) from state lands in Luna County; 64 acres (0.001 percent) from state land in Sierra County; and 149 acres (0.0002 percent) from state lands in Socorro County. The total amount of grazing lands removed for this alternative is approximately 249 acres or 0.0001 percent.

Subroute 1B – San Antonio Crossing

Existing Land Use

For subroutes 1B1, 1B2, and 1B3, impacts would include 14.5 to 17.0 miles of moderate impacts, 66.1 to 79.4 miles of low-moderate impacts, and 122.3 to 129.7 miles of low impacts. Moderate impacts associated with the Las Cruces District Office right-of-way avoidance areas would occur on Link A530 for 1.9 miles and Link A440 for 1.8 miles. Additional moderate impacts in Subroute 1B are associated with the Socorro Field Office right-of-way avoidance areas that are crossed by links A111, A112, A140, A160, and A80 for 2.1 miles, 2.3 miles, 0.4 mile, 6.0 miles, and 3.0 miles, respectively. Mitigation measures SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in agriculture areas for Link A140 (mileposts 1 to 3).

Future Land Use

Future land use impacts would include 13.1 miles of low-moderate and 193.2 to 210.5 miles of low impacts.

Grazing

Impacts to grazing would include the removal of between 200 and 220 acres of BLM land within the Las Cruces District Office area, which is approximately 0.005 percent of available grazing land; the removal of between 200 and 225 acres of BLM land within the Socorro Field Office area, which is approximately 0.02 percent of available grazing land; and the removal of approximately 6 acres of BLM land within the Roswell Field Office area, which is approximately 0.0004 percent of available grazing land.

Impacts to New Mexico state grazing lands would include the removal of approximately: 15 to 45 acres (0.00004 to 0.0001 percent) from state lands in Lincoln County; 21 acres (0.00003 percent) from state lands in Luna County; 62 to 64 acres (0.001 percent) from state land in Sierra County; and 59 to 148 acres (0.00009 to 0.0002 percent) from state lands in Socorro County.

Local Alternative and Crossover Links for Route Group 1

Existing Land Use

Local alternative links for subroutes 1A, 1B1, 1B2, and 1B3 would have 5.0 miles of moderate impacts, 50.7 miles of low-moderate, and 39.3 miles of low impacts. There are no high-moderate or high impacts for existing land use. Link A161b crosses 5.0 miles of a Socorro Field Office right-of-way avoidance area.

Mitigation measures SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in agriculture areas for Link A430 (mileposts 4 to 7).

Future Land Use

Future land use impacts for local alternative links for subroutes 1A, 1B1, 1B2, and 1B3 would be low-moderate (3.1 miles) and low (91.9 miles).

SunZia East Substation

The proposed SunZia East Substation footprint would encompass approximately 41 acres of private land, for which the primary land use is livestock grazing. The proposed substation would result in the permanent disturbance of up to 85 acres, affecting the resources available for livestock grazing. The land surrounding the proposed substation is vacant.

4.10.5.3 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A2 – BLM Preferred Alternative

Existing Land Use

Subroute 3A2 would include 0.3 mile of moderate impact, 65.3 miles of low-moderate impact, and 58.3 miles of low impact. Moderate impacts associated with existing land use would occur along Link B120b, where it crosses a Las Cruces District Office right-of-way avoidance area for approximately 0.3 mile.

Future Land Use

Future land use impacts for Subroute 3A2 would include 0.8 mile of low-moderate impact and 123.1 miles of low impact.

Grazing

Impacts to grazing would include the removal of approximately 95 acres of BLM land within the Las Cruces District Office area, which is approximately 0.002 percent of available grazing land; and the removal of 124 acres of BLM land within the Safford Field Office area, which is 0.01 percent of available grazing land.

Impacts to New Mexico state grazing lands would include the removal of approximately: 63 acres (0.001 percent) from state land in Grant County; 60 acres (0.0001 percent) from state lands in Hidalgo County; and 139 acres (0.0002 percent) from state lands in Luna County. The total amount of grazing lands removed for this alternative is approximately 262 acres or 0.0002 percent.

Impacts to Arizona state grazing lands would include the removal of approximately 12 acres (0.00002 percent) from state land in Graham County. Based on fiscal 2011 figures, this would result in a $2.76 loss in grazing revenue.

Subroute 3A – North

Existing Land Use

Existing land use impacts for Subroute 3A would include 0.6 mile of moderate, 60.7 miles of low-moderate, and 62.1 miles of low impacts. There are no high-moderate or high impacts for existing land use. Impacts would occur along Link B120b, which has 0.3 mile of moderate impacts where it crosses a Las Cruces District Office right-of-way avoidance area. Link B160b has 0.3 mile of moderate impacts, where the transmission lines would cross the southern portion of the Hot Well Dunes OHV Recreation area. To mitigate the potential of unauthorized OHV use of new transmission line access roads, the roads would be closed to public access through the use of fences and locked gates. Structures or guywires would be marked with high-visibility devices as required per ST 12, to increase user safety.

Future Land Use

Future land use impacts would include 0.8 mile of low-moderate and 122.6 miles of low impacts.

Grazing

Impacts to grazing would include the removal of approximately 95 acres of BLM land within the Las Cruces District Office area, which is approximately 0.002 percent of available grazing land; and the removal of 110 acres of BLM land within the Safford Field Office area, which is 0.009 percent of available grazing land.

Impacts to New Mexico state grazing lands would include the removal of approximately: 63 acres (0.001 percent) from state land in Grant County; 60 acres (0.0001 percent) from state lands in Hidalgo County; and 149 acres (0.0002 percent) from state lands in Luna County. The total amount of grazing lands removed for this alternative is approximately 272 acres or 0.0002 percent.

Impacts to Arizona state grazing lands would include the removal of approximately 28 acres (0.00006 percent) from state land in Graham County. Based on fiscal year 2011 figures, this would result in an $8.28 loss in grazing revenue.

Subroute 3B – South

Existing Land Use

Impacts associated with existing land use would include moderate impacts along Link B110a for 0.3 mile and Link B112 for 1.5 miles, where the links cross multiple Las Cruces District Office right-of-way avoidance areas. Mitigation measures SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in agriculture areas for Link B80 (mileposts 3 to 4) and Link B112 (mileposts 5 to 6).

Future Land Use

Future land use impacts would include 0.5 mile of low-moderate and 128.1 miles of low impacts.

Grazing

Impacts to grazing would include the removal of approximately 60 acres of BLM land available for grazing within the Las Cruces District Office area, which is approximately 0.001 percent of available grazing land; and the removal of approximately 140 acres of BLM land available for grazing within the Safford Field Office area, which is approximately 0.01 percent of available grazing land.

Impacts to New Mexico state grazing lands would include the removal of approximately: 42 acres (0.0007 percent) from state land in Grant County; 28 acres (0.00006 percent) from state lands in Hidalgo County; and 135 acres (0.0002 percent) from state lands in Luna County. The total amount of grazing lands removed for this alternative is approximately 205 acres or 0.0002 percent.

Impacts to Arizona state grazing lands would include the removal of approximately 12 acres (0.00002 percent) from state land in Graham County. Based on fiscal year 2011 figures, this would result in a $2.76 loss in grazing revenue.

Local Alternative and Crossover Links for Route Group 3

Existing Land Use

Crossover links for 3A and 3B would have moderate impacts associated with existing land use along Link B140, where it crosses approximately 1.0 mile of a Las Cruces District Office right-of-way avoidance area. There are no high-moderate or high impacts for existing land use.

Future Land Use

Future land use impacts would include 1.7 miles of low-moderate and 13.5 miles of low impacts.

Midpoint Substation

The proposed Midpoint Substation footprint would encompass approximately 60 acres of private land, for which the primary land use in the area is vacant undeveloped land used for livestock grazing. The proposed substation would result in the permanent disturbance of up to 60 acres, primarily affecting the resources available for livestock grazing. The land surrounding the proposed substation is vacant land.

Lordsburg Substation

The proposed Lordsburg Substation footprint would encompass approximately 35 to 40 acres of private land, for which the primary land use in the area is vacant undeveloped land used for

livestock grazing. The proposed substation would result in the permanent disturbance of up to 40 acres (Option A), primarily affecting the resources available for livestock grazing. The land surrounding the proposed substation is vacant.

4.10.5.4 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

Existing Land Use and Future Land Use

Existing land use for Subroute 4A would have 70.7 miles of low-moderate impacts and 62.2 miles of low impacts. Future land use would have 4.8 miles of low-moderate impacts and 128.1 miles of low impacts. There are no moderate, high-moderate, or high impacts for existing or future land use.

Mitigation measures SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in agriculture areas for Link C110 (mileposts 10 to 14), Link C880 (milepost 1 to the end of the link), and Link C880a (entire link).

Grazing

Impacts to grazing would include the removal of approximately 21 acres of BLM land available for grazing within the Safford Field Office area, which is approximately 0.002 percent of available grazing land; and the removal of approximately 18 acres of BLM land available for grazing within the Tucson Field Office area, which is approximately 0.004 percent of available grazing land.

Impacts to Arizona state grazing lands would include the removal of approximately 339 acres (0.0007 percent) from state lands in Graham County and 330 acres (0.0003 percent) from state lands in Pinal County. The total amount of grazing lands removed for this alternative is approximately 669 acres or 0.0004 percent. Based on fiscal year 2011 figures, this would result in a $180.78 loss in grazing revenue.

Subroute 4B – Sulphur Springs Valley

Existing Land Use and Future Land Use

Existing land use for Subroute 4B would have 80.8 miles of low-moderate impacts and 52.2 miles of low impacts. There are no moderate, high-moderate, or high impacts for existing and future land use. Future land use has 4.8 miles of low-moderate impacts and 128.2 miles of low impacts. Mitigation measures SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in agriculture areas for Link C880 (milepost 1 to the end of the link).

Grazing

Impacts to grazing include the removal of approximately 18 acres of BLM land available for grazing within the Tucson Field Office area, which is approximately 0.004 percent of available grazing land.

Impacts to Arizona state grazing lands include the removal of approximately 387 acres (0.0008 percent) from state lands in Graham County, and the removal of approximately 330 acres (0.0003 percent) from state lands in Pinal County. The total amount of grazing lands removed for this alternative is approximately 717 acres or 0.0005 percent. Based on fiscal year 2011 figures, this would result in a $225.98 loss in grazing revenue.

Subroute 4C2c – BLM Preferred Alternative

Existing Land Use and Future Land Use

Existing land use would have 82.2 miles of low-moderate impact and 79.0 miles of low impact, and future land use would have 10.3 miles of low-moderate impact and 150.9 miles of low impact. There are no moderate, high-moderate, or high impacts for existing or future land use.

Mitigation measures SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in agriculture areas for Link C110 (mileposts 10 to 14), Link C880 (milepost 1 to the end of the link), and Link C880a (entire link).

Grazing

Impacts to grazing would include the removal of approximately 50 acres of BLM land available for grazing within the Tucson Field Office area, which is approximately 0.01 percent of available grazing land.

Impacts to Arizona state grazing lands would include the removal of approximately: 334 acres (0.0003 percent) from state lands in Cochise County; 37 acres (0.00008 percent) from state lands in Graham County; 97 acres (0.0001 percent) from state lands in Pima County; and 303 acres (0.0003 percent) from state lands in Pinal County. The total amount of grazing lands removed for this alternative is approximately 771 acres or 0.0002 percent. Based on fiscal year 2011 figures, this would result in a $206.60 loss in grazing revenue.

Subroute 4C1 – East of San Pedro River

Existing Land Use

Subroute 4C1 would have 0.1 mile of high-moderate impacts, 1.3 miles of moderate impacts, 80.0 miles of low-moderate impacts, and 57.6 miles of low impacts. Subroute 4C1 would cross high-moderate impacts along Link C331 for approximately 0.1 mile where it crosses the Muleshoe Ranch CMA and Swamp Springs-Hot Springs Watershed ACEC, and 1.3 miles of moderate impact where it crosses the Muleshoe Ecosystem Planning Boundary. Subroute 4C1

would have similar mitigation measures applied to the same links as Subroute 4C2c, as described above.

Future Land Use

Future land use impacts for this subroute would include 0.5 mile of high-moderate impacts, 2.5 miles of moderate impacts, 8.7 miles of low-moderate impacts, and 127.3 miles of low impacts. High-moderate impacts would be associated with Link C691 for 0.5 mile, due to new access that would be needed for the subroute to cross land approved for the future Willow Springs residential development. Link C691 would also be associated with 2.5 miles of moderate impact, due to the proposed future Willow Springs residential development.

Grazing

Impacts to grazing would include the removal of approximately 14 acres of BLM land available for grazing within the Tucson Field Office area, which is approximately 0.003 percent of available grazing land.

Impacts to Arizona state grazing lands would include the removal of approximately: 274 acres (0.0002 percent) from state lands in Cochise County; 88 acres (0.0002 percent) from state lands in Graham County; and 309 acres (0.0003 percent) from state lands in Pinal County. The total amount of grazing lands removed for this alternative is approximately 671 acres or 0.0002 percent. Based on fiscal year 2011 figures, this would result in a $166.05 loss in grazing revenue.

<u>Subroute 4C2 – West of San Pedro River</u>

Existing Land Use

For Subroute 4C2, there would be 75.7 miles of low-moderate and 76.1 miles of low impacts. There are no moderate, high-moderate, or high impacts for existing land use. Subroute 4C2 would have similar mitigation measures applied to the same links as subroutes 4C2c and 4C1, as described above.

Future Land Use

For Subroute 4C2, there would be 10.3 miles of low-moderate and 141.5 miles of low impacts. There are no moderate, high-moderate, or high impacts for future land use.

Grazing

Impacts to grazing would be similar to Subroute 4C2c, as described above.

Impacts to Arizona state grazing lands would include the removal of approximately: 271 acres (0.0002 percent) from state lands in Cochise County; 37 acres (0.00008 percent) from state lands in Graham County; 97 acres (0.0001 percent) from state lands in Pima County; and 303 acres (0.0003 percent) from state lands in Pinal County. The total amount of grazing lands removed for

this alternative is approximately 708 acres or 0.0002 percent. Based on fiscal year 2011 figures, this would result in a $206.60 loss in grazing revenue.

Subroute 4C3 – Tucson

Existing Land Use

Existing land use impacts for this subroute would include 2.6 miles of high impacts, 0.1 mile of high-moderate impacts, 5.8 miles of moderate impacts, 69.2 miles of low-moderate impacts, and 95.2 miles of low impacts. The high impacts are associated with Link F111 for 0.6 mile as the subroute crosses several homes in a manufactured home park, a neighborhood/community recreation area for the manufactured home park, and a commercial business; and 0.1 mile of high impact where it crosses residences and a commercial use property. High impacts would occur for 1.0 mile where Link F112 crosses a residential development. Link F510 has 0.9 mile of high impacts where it crosses Pima County Preserved Lands, designated the Avra Valley I-10 Wildlife Corridor.

High-moderate impacts for Link F112 would occur where this link crosses 0.1 mile along Pima County Floodprone Land Acquisition Program (FLAP) preserved land. Link F111 would have moderate impacts for 0.2 mile where it crosses a neighborhood/community park and 0.1 mile where it crosses the Santa Cruz River Park. Link F112 would have a total of 5.5 miles of moderate impacts where it crosses the Santa Cruz River Park, a residential development, and Silverbell Regional Park.

Table E-4 (Appendix E) breaks the high impacts down by link, the specific land uses crossed, and the general location of these land uses.

For Subroute 4C3, approximately 216 residences and lots, 37 commercial/light industrial buildings, and a rental community recreation center with a playground, pool, and basketball court would be impacted. These structures are located throughout the subroute and would have to be acquired and removed due to the density of development in the area.

Mitigation measures SE 7 and SE 8 (see Section 4.10.4) would be applied to the same links as Subroute 4C2c, as well as Link F540 (mileposts 0 to 1 and 2 to 3), Link F510 (milepost 3 to the end of the link), Link F112 (mileposts 0 to 9), and Link F111 (mileposts 14 to 15), to reduce the amount of land occupied by structures within the recreation area.

Future Land Use

Future land use impacts would include 0.3 mile of high-moderate impacts, 6.9 miles of moderate impacts, 15.6 of low-moderate impacts, and 150.1 miles of low impacts. Link F112 has high-moderate impacts for 0.2 mile, where it crosses an area designated by Pima County for residential use that already has existing residences. Link F111 has high-moderate impacts for 0.1 mile, where it crosses a designated residential area with existing residences. Moderate impacts are associated with 6.2 miles of Link F112 and 0.7 mile of Link F111 where land designated for parks and preservation by Pima County is crossed.

Grazing

Impacts to grazing would include the removal of between 7 and 50 acres of BLM land available for grazing within the Tucson Field Office area, which is between 0.002 and 0.01 percent of available grazing land.

Impacts to Arizona state grazing lands would include the removal of approximately: 254 acres (0.0002 percent) from state lands in Cochise County; 37 acres (0.00008 percent) from state lands in Graham County; 211 acres (0.0003 percent) from state lands in Pima County; and 112 acres (0.0001 percent) from state lands in Pinal County. The total amount of grazing lands removed for this alternative is approximately 614 acres or 0.0002 percent. Based on fiscal year 2011 figures, this would result in a $206.60 loss in grazing revenue.

Local Alternative and Crossover Links for Route Group 4

Existing Land Use

SE 7 and SE 8 would be effective in reducing impacts to irrigated agriculture for local alternative links for 4A, 4B, 4C2c, 4C1, 4C2, and 4C3.

Local alternative links for 4C3 would have impacts of 6.8 miles of high, 6.2 miles of moderate, 7.2 miles of low-moderate, and 26.4 miles of low impacts. The high impacts are associated with Link F40b where it crosses near residences for 0.4 mile and designated Pima County Preserved Lands for 0.5 mile. Link F51 has high impacts for 0.7 mile where it crosses the Pima County Preserved Lands designated as the Cienega Creek Natural Preserve. Link F81a has high impacts for 0.3 mile and Link F81b for 4.9 miles, where the links cross the Pima County FLAP. Moderate impacts are associated with Link F81b for 6.2 miles, as the link crosses through Rillito River Park. SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in recreation areas for Link F51 (milepost 1 to 2) and Link F81b (milepost 3 to the end of link).

Local Alternative Link C121 for 4C1, 4C2, and 4C3 would have moderate impacts for approximately 1.1 mile, due to the link crossing near residences and agricultural lands. SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in agriculture areas for Link C121 (mileposts 3 to 7 and 9 to 12).

Table E-5 (Appendix E) breaks the high impacts down by link for local alternative links F81a and F81b, the specific land uses crossed, and the general location of these land uses.

Local alternative links F81a and F81b to Subroute 4C3 would have high impacts to properties. There are approximately 119 residences, 48 commercial/light industrial buildings, and 4 recreation/community centers that would be impacted. These structures, located throughout the length of the links, would have to be acquired and removed due to the density of development in the area.

Future Land Use

Impacts for 4C3 local alternative links would include 0.9 mile of high-moderate, 10.7 miles of moderate, 2.6 miles of low-moderate, and 32.3 miles of low impacts. Although not depicted in the table, impacts detailed in *Existing Land Use* are expected to persist into the future, thus consideration of these impacts must also be taken into account for any potential future land use. Link F81b has 0.1 mile of high-moderate impacts where the link crosses private land. High-moderate impacts occur along Link F51 for 0.6 mile, due to land being used for areas designated by Pima County as parks and preservation, as well as Pima County Preserved Lands Cienega Creek Natural Preserve, as described above. In addition, high-moderate impacts occur along Link F40b, where it crosses 0.2 mile of a Pima County designated residential area, adjacent to two existing residences. Moderate impacts include links F51 where it crosses 0.1 mile of land designated by Pima County for future residences; there are existing residences near the link. Link F81a and Link F81b also have moderate impacts for 0.3 mile and 10.3 miles, respectively, where they cross areas designated by Pima County for parks and preservation and as part of the Pima County FLAP.

Local Alternative Link C121 for 4C1, 4C2, and 4C3 would have moderate impacts for approximately 1.1 miles, due to the link crossing land designated for low-density residential/rural preservation development in Cochise County.

Willow-500 kV Substation

The proposed Willow-500 kV Substation footprint would encompass approximately 25 acres of Arizona State Trust land, for which the primary land use in the area is vacant land used for livestock grazing. The proposed substation would result in the permanent disturbance of up to 35 acres, primarily affecting the resources available for livestock grazing.

Pinal Central Substation

The planned Pinal Central Substation footprint would encompass approximately 33 acres of private land, for which the primary land use in the area is agriculture. The planned substation would result in the permanent disturbance of up to 45 acres, primarily affecting resources available for the cultivation of crops.

4.10.5.5 Summary

Based on results of the preceding analysis, significant impacts are not expected; however, the following potential impacts to land use were identified for the BLM preferred alternative:

- Route Group 1: Subroute 1A2 crosses four BLM right-of-way avoidance areas; two south of the Sevilleta NWR with links E101b and E133, and one west of Socorro with Link E211. These right-of-way avoidance areas are designated for VRM Class II in the Socorro RMP. In the Mimbres RMP, Link A440 crosses a right-of-way avoidance area designated for the Butterfield Trail, and Link A530 crosses a right-of-way avoidance area designated for VRM Class II, both north of Deming, New Mexico.

- Route Group 3: Subroute 3A2 crosses one BLM right-of-way avoidance areas in the Mimbres RMP, approximately midway between Lordsburg and Deming (Link B120b).
- Route Group 4: Subroute 4C2c has potential impacts to agricultural operations, but mitigation measures SE 7 and SE 8 (see Section 4.10.4) would be applied to reduce the amount of land occupied by structures in these areas for links C110, C880, and C880a.

There would be few impacts to land uses throughout the study corridor, because a major portion of the preferred alternative would be constructed along established utility corridors or other linear features, where existing access is available. Approximately 53 percent (273 miles) of the route is parallel to existing or designated utility corridors, including 229 miles parallel to existing transmission lines.

4.10.6 Impacts to Military Operations

4.10.6.1 Introduction

This section provides a summary of impacts to military operations that could result from the construction and operation of the proposed Project. Representatives of the various military installations located within the Project study area have submitted a series of comments to the BLM, which included the military's assessment of potential impacts to flight operations, missile testing, and other testing and training activities conducted by the DOD. The affected areas within which military activities are conducted are described in Section 3.10.3.6. Military designations are also shown on Figure M 10-3 (see Map Volume) and summarized below.

New Mexico

The Northern Call-up Area is located north of the WSMR and contains approximately 1.5 million acres comprising BLM, state, and private lands within Socorro County. The airspace over this land is used for flight operations and training by Holloman and Kirtland AFBs. There is a missile launch facility located approximately 23 miles north of US Route 380 and approximately 14 miles south of US Route 60, in the northern portion of the Northern Call-up Area. Holloman AFB also identified three different airspaces used for low-level flight operations (R5107H, R5107C, and R5107J) located directly north of the WSMR over the Northern Call-up Area. The New Mexico Air National Guard unit based at Kirtland AFB also uses these airspaces for helicopter and tilt-rotor aircraft training operations. Other airspaces west of the WSMR (R5113, R5119, and R5107E) are also used for low-level flight operations. The military has jurisdiction, along with the FAA, over the restricted airspace above the Northern Call-up Area and west of the WSMR, where Holloman AFB routinely conducts low-level flight training operations as low as 100 feet above the ground.

In a letter to the BLM[1], the DOD identified several routes that would have significant adverse effects on the DOD's test mission concerning the WSMR, including the subroutes crossing Fort Bliss McGregor Range, the Northern Call-up Area nearest the WSMR, and the subroute near the LC 94 cruise missile launch facility. In lieu of these routes, the WSMR provided the BLM with a set of alternative routes that were analyzed for feasibility and carried forward for further analysis where appropriate in this EIS. The DOD requested that all routes farthest from the northern border of the WSMR be carried forward for further evaluation. The DOD clarified in their letter that a portion of the WSMR proposed "Route 2" (also named Subroute 1A) would need to be moved farther north to avoid impacts to "critical test profiles," or otherwise would need significant mitigation to "preserve WSMR's unique test capabilities…" Subroutes 1A, 1A1, and 1A2 are approximately 28 miles north of the WSMR.

Arizona

The Electronic Proving Ground is a facility headquartered at Fort Huachuca in Sierra Vista, Arizona that conducts noise tests for electronic combat and electronic warfare equipment. As part of the U.S. Army mission, existing facilities within the Electronic Proving Ground study area, such as power lines, cell phone towers, radio stations, and other "emitters," have been measured and taken into account to form a "zero point" for testing purposes.

Davis Monthan AFB and Pinal Airpark are located in the Tucson metropolitan area. Airspace north of the city is used by the Army National Guard to conduct flight training operations. There are multiple military training routes throughout southern Arizona, with many converging near the town of Redington. The Jackal Low Military Operations Area is located near Aravaipa Canyon, with the lowest altitude of operation at 100 feet above ground level. The Army National Guard trains helicopter pilots near the Pinal Airpark and Picacho Mountains.

4.10.6.2 Summary of Impacts to Military Operations by Subroute

The DOD and representatives of the military installations provided the description of impacts to the affected military operations areas, which are discussed in relation to the Project alternatives in the following section. Potential impacts to military flight operations in restricted airspace could occur if aircraft were to collide with transmission line facilities. In order to avoid potential collisions with transmission line conductors or structures (typical height of 135 feet), pilots would have to adjust the flight altitudes for their low-level training missions to acceptable and safer heights in these areas.

The adjustments to flight operations could be minimized to the extent that mitigation to reduce the heights of the transmission line facilities would be effective. Other mitigation measures proposed by military pilots would include lights placed on towers to make the transmission facilities more visible at night, where indicated.

[1] DOD letter to BLM, signed by Dorothy Robyn, Deputy Under Secretary of Defense (Installations and Environment); Samuel Kleinman, Deputy Under Secretary of Defense (Readiness); and David Duma, Principal Deputy Director (Operational Test and Evaluation). May 11, 2011.

Special Use Airspace designations, including restricted airspace associated with the WSMR, are considered joint-use between the WSMR and FAA. The restricted airspace is designated to protect the safety of nonparticipatory aircraft and persons, but the FAA ultimately maintains control of the airspace. The FAA does not have regulatory control over the placement of structures on the ground, but does have the regulatory control over lighting of any structures considered hazards or structures more than 200 feet in height above ground. The proposed transmission towers are not proposed to exceed 200 feet in height above ground, and therefore construction and operation of the Project would not affect the restricted airspace in a manner inconsistent with the Special Use Airspace designations near the WSMR. As the decision-making authority over issuance of a right-of-way across public lands, the BLM would consider impacts to DOD missions that could be impacted by the Project.

The WSMR test-fires missiles over the Northern Call-up Area onto the WSMR. In the event that a missile may malfunction after it is launched, it would be destroyed by detonation in order to prevent major damage to property and structures within the fallout zone. The fallout zone is an estimated area where debris would be expected to land and is determined by, among other things, the height and location of the missile at the point of detonation. There is the potential for damage to occur to transmission line facilities should a missile be detonated shortly after it is launched that is dependent on distance from the launch site, although the extent of this risk is uncertain.

Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 is located within a portion of the Northern Call-up Area and the R5107C/R5107H airspace used for flight operations. Subroute 1A1 is located up to 10 miles north of Subroute 1A, and approximately 4 miles north of the Gran Quivira. Because this subroute (Link E80d) is located approximately 2 miles north of LC 94, WSMR has stated that potential missile launch malfunctions could create a higher risk of potential damage to the transmission lines.

Subroute 1A2 (BLM preferred alternative) is located 3 miles farther north than Subroute 1A1 and 5 miles north of LC 94 within a portion of the Northern Call-up Area, and is on the northern edge of the R5107C/R5107H airspace used for flight operations. Subroute 1A2 is located up to 3 miles north of Subroute 1A1, and approximately 4 miles north of the Gran Quivira. This subroute is 3 miles farther north of LC 94 than Subroute 1A1; however, WSMR has stated that potential missile launch malfunctions could still create a risk of potential damage to the transmission lines.

Subroute 1A is similar to subroutes 1A1 and 1A2, with the exception of the segment south of the Gran Quivira (links A22 and E80c) in place of the segment north of the Gran Quivira (links E82, E84a, E84b, E85, and E86a) and the segment west of I-25 (Link A270 in place of Link A260). As stated by the DOD, construction and operation of the Project with this subroute could impact "critical test profiles," and a higher risk of potential conflict with flight training operations.

The majority of the east-west portion of Subroute 1B1 across the Northern Call-up Area is approximately 28.5 miles north of the WSMR. This alternative was aligned to avoid the LC 94 site that is located in the Northern Call-up Area, to the west of Link E90 and approximately 2 miles south of Link E80d. According to the WSMR, there would be a higher risk of potential

conflict with flight training operations for this alternative because links E81, E80d, E90, A90, and A111 bisect lands below the airspace.

The east/west portion of subroutes 1B2 and 1B2a is approximately 12 miles north of the WSMR. This subroute crosses safety areas (fans) established by the WSMR that extend north into the Northern Call-up Area, potentially leaving the Project susceptible to damage from military tests. According to the WSMR, this subroute may potentially preclude the use of LC 94, resulting in potential significant impacts to the WSMR's testing program. While there are no direct land use impacts to public, private, or military lands crossed by these subroutes, the transmission lines would be constructed on lands below the restricted airspace.

Subroute 1B3 is the closest to the WSMR through the Northern Call-up Area, and would have impacts similar to those noted for subroutes 1B1 and 1B2. In addition, Link A41 may require that the right-of-way cross 1 mile of DOD land where it meets links A70 and A80; impacts to this land have not been determined. The east-west portion of this subroute is approximately 6 miles north of the WSMR.

Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A2 (BLM preferred alternative) crosses approximately 20 miles of land below restricted airspace.

Subroute 3A crosses approximately 20 miles of land below restricted airspace.

Subroute 3B crosses approximately 5 miles of land below restricted airspace.

Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A crosses approximately 36 miles of the Jackal Low Military Operations Area, approximately 71 miles of the Silver Bell Army Heliport training area, and approximately 47 miles of lands below other restricted airspace. It is parallel to approximately 14 miles of the Newman Peak Silver Bell Army Heliport military training route.

Subroute 4B crosses approximately 38 miles of the Jackal Low Military Operations Area, approximately 71 miles of the Silver Bell Army Heliport training area, and approximately 25 miles of lands below other restricted airspace. It is parallel to approximately 14 miles of the Newman Peak Silver Bell Army Heliport military training route.

Subroute 4C2c (BLM preferred alternative) does not cross any restricted airspace. The alternative subroute is parallel to the existing TEP 345 kV lines where it crosses 18 miles of the Electronic Proving Ground, a DOD testing program area. The testing program could be potentially affected by the operation of new transmission lines; however, the effects have not been described or quantified. Subroute 4C2c crosses approximately 86 miles of the Silver Bell Army Heliport training area, and would also parallel approximately 10 miles of the Newman Peak Silver Bell Army Heliport military training route.

Subroute 4C1 does not cross any restricted airspace, but does cross approximately 9.5 miles of the Electronic Proving Ground. Subroute 4C1 crosses approximately 80 miles of the Silver Bell Army Heliport training area, and is parallel to approximately 14 miles of the Newman Peak Silver Bell Army Heliport military training route.

Subroute 4C2 does not cross any restricted airspace, but does cross approximately 9.5 miles of the Electronic Proving Ground. Subroute 4C2 crosses approximately 86 miles of the Silver Bell Army Heliport training area, and is parallel to approximately 10 miles of the Newman Peak Silver Bell Army Heliport military training route.

Subroute 4C2a does not cross any restricted airspace, but does cross approximately 9.5 miles of the Electronic Proving Ground. Subroute 4C2a crosses approximately 72 miles of the Silver Bell Army Heliport training area, and is parallel to approximately 14 miles of the Newman Peak Silver Bell Army Heliport military training route.

Subroute 4C2b does not cross any restricted airspace, but does cross approximately 18 miles of the Electronic Proving Ground. Subroute 4C2b crosses approximately 72 miles of the Silver Bell Army Heliport training area, and is parallel to approximately 14 miles of the Newman Peak Silver Bell Army Heliport military training route.

Subroute 4C3 does not cross any restricted airspace, but does cross approximately 16 miles of the Electronic Proving Ground. Subroute 4C3 crosses approximately 62 miles of the Silver Bell Army Heliport training area, and it parallels approximately 10 miles of the Newman Peak Silver Bell Army Heliport military training route. Davis-Monthan AFB is located north of Link F111, a portion of which is parallel with the runway northwest of the base. While there are commercial and industrial properties adjacent to this portion of the subroute, the potential exists for collision with the transmission line with an aircraft taking off or landing at the base.

4.11 BLM SPECIAL DESIGNATIONS

4.11.1 Introduction

This section describes and evaluates the potential impacts to special designations in the study area that would result from the construction and operation of the proposed transmission lines and substations. Impacts to wilderness, wilderness study areas, and lands with wilderness characteristics are described in Section 4.12.

4.11.2 Impact Assessment Methodology

Special designations within the study area were identified and described in Section 3.11 and Figure M 10-1 (see Map Volume). BLM special designations include congressionally designated national wild and/or scenic rivers; national conservation areas; national byways; and national scenic, historic, or recreation trails. Administrative designations include ACEC and SRMAs. Direct impacts would occur if the Project right-of-way or facilities would be located on lands within the boundaries of a special designation. Indirect and cumulative impacts to special designations, which may include impacts to air quality, earth, water, visual, wilderness, lands

with wilderness characteristics, or other resources, are described in their respective resource sections in this chapter.

4.11.2.1 No Action Alternative

Under the No Action alternative, the BLM would not grant right-of-way for construction and operation of the proposed Project; and Project facilities, including transmission lines and substations, would not be built and existing land uses in the Project study area would continue. There would be no new impacts to special designation areas within the study area. Under the No Action alternative, it is assumed that current actions and activities in the study area would continue.

4.11.2.2 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Subroute 1A1 crosses two areas of the Johnson (Gordy's) Hill SRMA (links E180 and E133) used for OHV recreation, within 700 feet of existing roads. Structures or guywires would be marked with high-visibility devices as required per ST 12, to increase user safety. There would be no direct impacts to other special designations for this subroute.

Subroute 1A2 – BLM Preferred Alternative

Impacts to Subroute 1A2 would be similar to those for Subroute 1A1. Subroute 1A – North River Crossing

Impacts to Subroute 1A would be similar to those for Subroute 1A1 and Subroute 1A2, the BLM preferred alternative.

Subroute 1B – San Antonio Crossing

For Subroute 1B, there would be no direct impacts to special designations for this subroute.

Local Alternative and Crossover Links for Route Group 1

There would be no direct impacts to special designations by the local alternatives and crossover links for Route Group 1.

4.11.2.3 Route Group 3: Midpoint Substation to Willow-500 kV Substation

There would be no direct impacts to special designations for this subroute.

4.11.2.4 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

There would be no direct impacts to special designations for this subroute.

Subroute 4B – Sulphur Springs Valley

There would be no direct impacts to special designations for this subroute.

Subroute 4C2c – BLM Preferred Alternative

There would be no direct impacts to special designations for this subroute.

Subroute 4C1 – East of San Pedro River

High-moderate impacts may occur along Link C331 for 0.1 mile where it crosses the southwestern corner of the Muleshoe Ranch CMA and Swamp Springs-Hot Springs Watershed ACEC, and along 1.3 miles of moderate impact where it crosses the southwestern edge of the Muleshoe Ecosystem Planning Boundary.

Subroute 4C2 – West of San Pedro River

There would be no direct impacts to special designations for this subroute.

Subroute 4C3 –Tucson

There would be no direct impacts to special designations for this subroute.

Local Alternative and Crossover Links for Route Group 4

There would be no direct impacts to special designations by the local alternatives and crossover links for Route Group 4.

4.12 WILDERNESS, WILDERNESS STUDY AREAS, AND LANDS WITH WILDERNESS CHARACTERISTICS

4.12.1 Introduction

This section describes and evaluates the potential direct and/or indirect impacts to wilderness, WSA, and agency identified lands with wilderness characteristics inventory units within the Project study area that would result from the construction and operation of the proposed transmission lines and substations.

4.12.2 Impact Assessment Methodology

An impact assessment methodology was developed to identify and evaluate potential direct and/or indirect impacts to wilderness, WSA, and lands with wilderness characteristics inventory units that would result from the Project. Per BLM New Mexico State Office direction, direct impacts would occur for portions of the Project where components (including access, structures, and ancillary facilities) would cross lands with wilderness characteristics inventory units or lands designated as wilderness or WSA. The latter condition (i.e., the Project crossing wilderness or WSA) does not occur in the context of the Project. Direct impacts to lands with wilderness characteristics inventory units were characterized by the number of acres that would no longer qualify as potential lands with wilderness characteristics.

Although significant impacts are not expected, indirect impacts may occur for portions of the Project where components would be visible from within wilderness, WSA, and lands with wilderness characteristics inventory units. Per BLM direction, visibility of the proposed facilities could affect outstanding opportunities for solitude and/or primitive and unconfined recreation. In order to assess these indirect impacts, a viewshed analysis was conducted using GIS, to identify potential locations and areas (in acres) within wilderness, WSA, and lands with wilderness characteristics inventory units where proposed Project structures would potentially be visible. The viewshed analysis included proposed Project alternatives that are located 3 miles or less from wilderness, WSA, or lands with wilderness characteristics inventory units. As described in the visual resource study for the Project (see Section 4.9), it has been determined that the visual influence (dominance) of the proposed Project would diminish considerably at a distance of 3 miles. Therefore, wilderness, WSA, and lands with wilderness characteristics inventory units beyond 3 miles from Project alternatives were not assessed. Citizen's Wilderness Inventory Units have been reviewed as part of the inventory of Lands with Wilderness Characteristics on BLM lands.

Following are general descriptions of anticipated direct and indirect impacts to lands with wilderness characteristics inventory units, and indirect impacts to wilderness and WSA that would result from the construction and operation of the Project.

4.12.3 Summary of Impact Analysis Results for Wilderness Areas

4.12.3.1 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

No wilderness areas are located within 3 miles of this subroute; therefore, no indirect impacts were identified.

Subroute 1A2 – BLM Preferred Alternative

The impacts from this subroute would be similar to Subroute 1A1.

Subroute 1A – North River Crossing

The impacts from this subroute would be similar to subroutes 1A1 and 1A2.

Subroute 1B – San Antonio Crossing

Link A111 would be visible from approximately 9,891 acres (50 percent) of the Little San Pascual Wilderness Area. The visibility of the proposed link, located approximately 2.5 miles north of the wilderness area boundary, would have an indirect impact affecting the outstanding opportunities for solitude within the wilderness area. The proposed alternative link would also be seen in the context of US Route 380.

Link A160 would be visible from 513 acres (10 percent) of the Indian Wells Wilderness Area. The visibility of the proposed link, located approximately 2 miles northwest of the wilderness area boundary, would have an indirect impact affecting the outstanding opportunities for solitude within the wilderness area.

Local Alternative and Crossover Links for Route Group 1

No wilderness areas are located within 3 miles of local alternatives or crossover links for Route Group 1.

4.12.3.2 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A2 – BLM Preferred Alternative

No wilderness areas are located within 3 miles of Subroute 3A2; therefore, no indirect impacts were identified.

Subroute 3A – North

No wilderness areas are located within 3 miles of Subroute 3A; therefore, no indirect impacts were identified.

Subroute 3B – South

The impacts resulting from this subroute would be similar to Subroute 3A1.

Local Alternative and Crossover Links for Route Group 3

No wilderness areas are located within 3 miles of local alternatives or crossover links for Route Group 3.

4.12.3.3 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

Link C170 would be visible from approximately 2,046 acres (8 percent) of the Santa Teresa Wilderness Area and approximately 2,474 (13 percent) of the Aravaipa Canyon Wilderness Area. The visibility of the proposed link, located approximately 2.9 miles south of the Santa Teresa Wilderness Area boundary and 3.75 miles south of the Aravaipa Canyon Wilderness Area boundary, would have minimal indirect impacts affecting the outstanding opportunities for solitude within the wilderness area. Due to the size and rugged terrain of the wilderness areas, there would still be ample opportunity for solitude within these wilderness areas.

Subroute 4B – Sulphur Springs Valley

Indirect impacts along Subroute 4B would be similar to Subroute 4A along Link C170.

Subroute 4C2c – BLM Preferred Alternative

Links C441 and C201 would be visible from approximately 6,389 acres (17 percent) of the Rincon Mountain Wilderness Area. The visibility of these proposed links, located 2 to 2.5 miles northeast of the wilderness area boundary, respectively, would have minimal indirect impacts affecting the outstanding opportunities for solitude within the wilderness area. Although the proposed Project would be visible, due to the size and rugged terrain of the wilderness area, there would still be ample opportunity for solitude.

Subroute 4C1 – East of San Pedro River

Link C470 would be visible from approximately 8,683 acres (11 percent) of the Galiuro Wilderness Area. The visibility of the proposed link, located approximately 2.3 miles west of the wilderness area boundary, would have minimal indirect impacts affecting the outstanding opportunities for solitude within the wilderness area. Due to the size and rugged terrain of the wilderness area, there would still be ample opportunity for solitude within it.

Link C470 would also be visible from approximately 340 acres (17 percent) of the Redfield Canyon Wilderness Area. The visibility of the proposed link, located approximately 1.5 miles west of the wilderness area boundary, would have minimal indirect impacts affecting the outstanding opportunities for solitude within the wilderness area.

Subroute 4C2 – West of San Pedro River

Links C441 and C276 would be visible from approximately 5,297 acres (14 percent) of the Rincon Mountain Wilderness Area. The visibility of these proposed links, located approximately 2 and 2.5 miles northeast of the wilderness area boundary, respectively, would have minimal indirect impacts affecting the outstanding opportunities for solitude within the wilderness area. Although the proposed Project would be visible, due to the size and rugged terrain of the wilderness area, there would still be ample opportunity for solitude.

Subroute 4C3 – Tucson

Links F40a and F600 would be visible from approximately 8,923 acres (24 percent) of the Rincon Mountain Wilderness Area. The visibility of these proposed links, located approximately 0.6 and 0.7 mile, respectively, would have minimal indirect impacts to outstanding opportunities for solitude because the proposed links would be seen in the context of two existing HVTL. The existing transmission lines are located north of the proposed alternative links, and a portion of these lines parallels the southern boundary of the wilderness area. Due to the size and rugged terrain of the wilderness area, there would still be ample opportunity for solitude.

Link F510 would be visible from approximately 1,979 acres (15 percent) of the West Saguaro Wilderness Area. The visibility of the proposed link, located approximately 2.7 miles northeast of the wilderness area boundary, would have minimal indirect impacts affecting outstanding opportunities for solitude because the proposed alternative link would be seen in the context of existing development associated with the Tucson metropolitan area. Due to the size and rugged terrain of the wilderness area, there would still be ample opportunity for solitude.

Local Alternative and Crossover Links for Route Group 4

Link C201 would be visible from approximately 6,389 acres (17 percent) of the Rincon Mountains Wilderness Area. The visibility of the proposed link, located approximately 2.5 miles east of the wilderness boundary, would have a greater indirect impact to outstanding opportunities for solitude than Subroute 4C2.

Link F40b would be visible from approximately 11,357 acres (31 percent) of the Rincon Mountain Wilderness Area. The visibility of the proposed link, located approximately 0.3 mile south of the wilderness area boundary, would have a greater indirect impact to outstanding opportunities for solitude than Subroute 4C3.

Link F81a would be visible from approximately 21,750 acres (37 percent) of the East Saguaro Wilderness Area. The visibility of this proposed link, located approximately 1.5 miles west of the wilderness area boundary, would have minimal indirect impacts to outstanding opportunities for solitude, because the proposed link would be seen in the context of existing development associated with the Tucson metropolitan area. Due to the size and rugged terrain of the wilderness area, there would still be ample opportunity for solitude.

4.12.4 Summary of Impact Analysis Results for Wilderness Study Areas

4.12.4.1 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Links E101a and E101b would be visible from approximately 4,741 acres (20 percent) of the Stallion WSA. The visibility of the proposed link, located less than 0.5 mile north of the WSA boundary, would have an indirect impact to outstanding opportunities for solitude. Although the

alternative would be visible, due to the size and rugged terrain of the Stallion WSA, there would still be ample opportunity for solitude.

Link E133 would be visible from approximately 5,064 acres (70 percent) of the Veranito WSA. The proposed link is located along the southern boundary of the WSA, with some areas of the alternative within 0.15 mile of the boundary.

Links E133 and E180 would be visible from approximately 1,211 acres (15 percent) of the Presilla WSA. The visibility of the proposed links, located approximately 2.5 miles north of the WSA boundary, would have indirect impacts to outstanding opportunities for solitude. Although the proposed links would be visible, due to the size and varying terrain of the WSA, there would still be ample opportunity for solitude. Link A161 is more than 5 miles from the WSA boundary; therefore, no indirect impacts were identified.

Subroute 1A2 – BLM Preferred Alternative

The impacts resulting from Subroute 1A2, the BLM preferred alternative, would be similar to Subroute 1A1.

Subroute 1A – North River Crossing

The impacts resulting from this subroute would be similar to subroutes 1A1 and 1A2.

Subroute 1B – San Antonio Crossing

Links E90 and A90 of Subroute 1B1 would be visible from approximately 6,742 acres (28 percent) of the Stallion WSA. The proposed links are located to the east and south of the WSA boundary and would have a greater indirect impact to outstanding opportunities for solitude than Subroute 1A. Links A60 and A90 of Subroute 1B2 would be visible from approximately 5,244 acres (22 percent) of the Stallion WSA. The proposed links, located approximately 2 miles south of the WSA boundary, would have a greater indirect impact to outstanding opportunities for solitude than Subroute 1B1.

Link A111 of subroutes 1B1, 1B2, and 1B3 would be visible from approximately 15,601 acres (76 percent) of the Antelope WSA. The proposed link, located approximately 2.5 miles north of the WSA boundary, would have indirect impacts to outstanding opportunities for solitude. The proposed alternative link would also be seen in the context of US Route 380.

Local Alternative and Crossover Links for Route Group 1

Local Alternative Link 161b would be visible from approximately 1,840 acres (19 percent) of the Devil's Backbone WSA. The proposed link, located approximately 2 miles east of the WSA, would have a greater indirect impact to outstanding opportunities for solitude than Link A161 of Subroute 1B1, which is located more than 5 miles from the WSA boundary.

4.12.4.2 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A2 – BLM Preferred Alternative

No WSA are located within 3 miles of Subroute 3A2; therefore, no indirect impacts were identified.

Subroute 3A – North

No WSA are located within 3 miles of Subroute 3A; therefore, no indirect impacts were identified.

Subroute 3B – South

Link B150a would be visible from approximately 217 acres (5 percent) of the Peloncillo Mountains WSA. The BLM preferred alternative, located approximately 2.5 miles south of the WSA boundary, would have minimal impacts to outstanding opportunities for solitude. Although the Project would be visible, due to the size and varying terrain of the WSA, there would still be ample opportunities for solitude.

Local Alternative and Crossover Links for Route Group 3

No WSA are located within 3 miles of local alternative or crossover links for Route Group 3; therefore, no indirect impacts were identified.

4.12.4.3 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

No WSA are located within 3 miles of Route Group 4; therefore, no indirect impacts were identified.

4.12.5 Summary of Impact Analysis Results for Lands with Wilderness Characteristics

4.12.5.1 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A1 – North River Crossing

Links E101a and E101b would have direct impacts to the pending lands with wilderness characteristics inventory unit adjacent to Stallion WSA, where they cross approximately 2.1 miles of the northern portion of the unit. This unit contains approximately 1,788 acres of BLM-managed land identified as having wilderness characteristics. Construction and operation of the proposed Project would reduce the inventory unit by approximately 102 acres. Direct impacts to the inventory unit could be minimized by relocating links E101a and E101b (SE 8).

Link A400 would be visible from approximately 3,728 acres (41 percent) of the Nutt Grassland inventory unit. The proposed alternative link, located approximately 400 feet west of the inventory unit's northwestern boundary, would have minimal indirect impacts to outstanding

opportunities for solitude because it would be seen in the context of an existing HVTL that is located east of the proposed alternative link. A portion of the existing HVTL runs immediately adjacent to a portion of the inventory unit's western boundary. Due to the size and varying terrain of the inventory unit, there would still be opportunity for solitude. There are no direct impacts to the Nutt Grassland inventory unit for this subroute.

Subroute 1A2 – BLM Preferred Alternative

The impacts resulting from the BLM preferred alternative would be similar to Subroute 1A1.

Subroute 1A – North River Crossing

The impacts resulting from Subroute 1A would be similar to subroutes 1A1 and 1A2.

Subroute 1B – San Antonio Crossing

Link A160 of subroutes 1B1, 1B2, and 1B3, would be visible from approximately 488 acres (79 percent) of the Chupadera inventory unit. The proposed link, located approximately 1.9 miles northwest of the inventory unit's boundary, would have indirect impacts to outstanding opportunities for solitude. There are no direct impacts to the Chupadera inventory unit for subroutes 1B1, 1B2, or 1B3.

Indirect impacts to the Nutt Grassland inventory unit for subroutes 1B1, 1B2, and 1B3 would be similar to impacts identified for Subroute 1A along Link A400. There are no direct impacts to the Nutt Grassland inventory unit for subroutes 1B1, 1B2, and 1B3.

Local Alternative and Crossover Links for Route Group 1

Link A361 would have a direct impact to the Nutt Grassland inventory unit where it crosses approximately 0.2 mile of the northeastern-most portion of the unit. This unit contains approximately 9,192 acres of BLM-managed land identified as having wilderness characteristics. Construction and operation of the proposed Project would reduce the inventory unit by approximately 8 acres. Direct impacts to the inventory unit could be minimized by relocating Link A361 (SE 8).

Link A361 and A430 would be visible from approximately 8,283 acres (90 percent) of the Nutt Grassland inventory unit. The proposed links, located within the inventory unit boundary (Link A361) and approximately 1.5 miles to the east of the unit boundary (Link A430), would have minimal indirect impacts to outstanding opportunities for solitude, because Link A430 would be seen in the context of an existing HVTL that is located west of the proposed alternative link, which comes within 300 feet of the inventory unit's southeastern boundary.

4.12.5.2 Route Group 3: Midpoint Substation to Willow-500 kV Substation

There are no direct or indirect impacts to lands with wilderness characteristics inventory units for Route Group 3.

4.12.5.3 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

There are no direct or indirect impacts to lands with wilderness characteristics inventory units for this subroute.

Subroute 4B – Sulphur Springs Valley

There are no direct or indirect impacts to lands with wilderness characteristics inventory units for this subroute.

Subroute 4C2c – BLM Preferred Alternative

There are no direct or indirect impacts to lands with wilderness characteristics inventory units for this subroute.

Subroute 4C1 – East of San Pedro River

Links C331 and C361 would have a direct impact to the Muleshoe/4-90 inventory unit where it would cross approximately 1.3 miles of its southwestern portion. This unit contains approximately 6,600 acres of BLM-managed land identified as having wilderness characteristics. Construction and operation of the Project would reduce the inventory unit by approximately 110 acres. Direct impacts to the unit could be minimized by relocating links C331 and C361 to the south, in order to avoid crossing the inventory unit (SE8). Links C331 and C361 would be visible from approximately 3,141 acres (48 percent) of the Muleshoe/4-90 inventory unit. The proposed Project links, located between 400 and 500 feet north of the unit's southwest boundary, would have indirect impacts to outstanding opportunities for solitude.

Subroute 4C2 – West of San Pedro River

Links C271 and C266 would be visible from approximately 991 acres (15 percent) of the Muleshoe/4-90 inventory unit. The proposed alternative links, located approximately 2.5 miles south of the inventory unit's boundary, would have indirect impacts to outstanding opportunities for solitude. Although the proposed link would be visible, due to the size and varying terrain of the inventory unit, there would still be ample opportunity for solitude. There are no direct impacts to the Muleshoe inventory unit for this subroute.

Subroute 4C3 – Tucson

There are no direct or indirect impacts to lands with wilderness characteristics inventory units for this subroute.

Local Alternative and Crossover Links for Route Group 4

There are no direct or indirect impacts to lands with wilderness characteristics inventory units for this subroute.

Summary of BLM Preferred Alternative

- Although subroutes 1A2 and 3A2 would result in indirect impacts to outstanding opportunities for solitude for portions of the Stallion WSA, Veranito WSA, Presilla WSA, and Peloncillo Mountains WSA, due to their size and rugged terrain, there would still be ample opportunity for solitude.
- There would be direct impacts to lands with wilderness characteristics for Subroute 1A2 near Stallion WSA.
- Subroute 3A2 would result in indirect impacts to the Peloncillo Mountains Wilderness Area and Rincon Mountains Wilderness Area, which occur 0.5 mile to 2 miles from the boundary, respectively; affecting the outstanding opportunities for solitude within the wilderness area. Although the Project would be visible, there would still be ample opportunity for solitude due to the size and rugged terrain of the wilderness area.
- There would be no direct or indirect impacts to lands with wilderness characteristics for Subroute 4C2c.

4.13 SOCIAL AND ECONOMIC CONDITIONS

4.13.1 Introduction

This section describes the potential effects or impacts to social and economic resources that would result from the construction and operation of the proposed Project. These effects are discussed by subroute and the potential transmission line options (see Chapter 2).

The impact analysis evaluates how the social and economic effects of the construction and operation phases of the Project would be distributed across several counties at different periods; including short-term and long-term impacts. Short-term impacts are considered to be 3 years or less (construction phase), while long-term impacts are considered to be greater than 3 years, extending through the life of the Project (operation phase).

Regulations state that "[e]ffects include…cultural, economic, social, or health, whether direct, indirect, or cumulative. Effects may also include those resulting from actions which may have both beneficial and detrimental effects, even if on balance the agency believes that the effect would be beneficial" (40 CFR 1508.8). In addition, indirect effects may include those that are growth-inducing and others related to induced changes in the pattern of land use, population density, or growth rates.

4.13.2 Impact Assessment Methodology

The socioeconomic assessment method is based largely on a Project-specific study conducted by the UA, Economic and Business Research Center, and NMSU Arrowhead Center (2009). The SunZia Southwest Transmission Project EIA was developed to support this EIS (Charney et al. 2012a; Appendix G-1). Components addressed in this study include basic socioeconomic characteristics of the affected counties (population, density, and per capita income); revenue impacts (expected property tax, sales tax, and state-shared sales tax); and economic impacts (number of jobs created [direct and indirect], labor income, and county-equivalent gross domestic product). Using economic modeling software IMPLAN[1], the study estimated impacts across eight New Mexico and five Arizona counties.

Because the length of each alternative subroute is directly proportional to its estimated economic effect, multipliers (based on the results of the EIA) were calculated for each county and applied to each alternative subroute on a per mile basis. The economic impacts resulting from construction and operation of the proposed substations have been incorporated in the estimates of impact for each of the transmission line alternatives associated with the affected counties. Social impacts related to population increases, housing, and emergency services are qualitatively discussed and quantified where possible.

The methodology used to assess economic impacts includes the following measurements (detailed analysis is included in Appendix G-1 and G-2):

- Labor income (also referred to as wages or salary) is measured in dollars. Consists of wages and salaries, including benefits and proprietor income.
- Employment is measured in terms of number of job years. For example, three jobs could refer to three people working 1 year or one person working for 3 years. Jobs refer to both full- and part-time employment, but not full-time equivalent positions. Most of the direct employment associated with the construction and operations of the transmission lines and substations is full-time or greater (construction workers typically work more than 40 hours per week), while many of the jobs created for service sector industries are more likely to be part-time. Most economic impact studies incorporate the discussion of three types of impacts: direct, indirect, and induced. For the purposes of this analysis, indirect and induced impacts are referred to as indirect employment effects.
    - Direct employment effects are the initial changes determined to be a result of the activity under study. In the present context, direct employment effects of construction spending on the transmission lines are the jobs, income, and sales directly associated with construction spending. As presented in Appendix G-1 and G-2, direct employment effects are divided into those associated with labor expenditures (estimated numbers of construction workers, expected labor costs, etc.) and other construction expenditures (the result of purchases of equipment and materials).

[1] IMPLAN is a national input-output model created by the U.S. Bureau of Economic Analysis.

- Indirect employment effects are the impact of local industries supplying goods and services to a project or activity under study, and the effects of the resultant labor earnings being used for purchasing local goods and services. These purchases include groceries, gasoline (not for work purposes), and other typical household spending items.

4.13.2.1 Significant Impacts

For the purposes of this analysis, a significant impact on social and economic values could result if any of the following were to occur from construction or operation of the Project:

- Increase in population that could create shortages of housing and place an excessive burden on local government and community facilities and services
- Increase in revenue for local and state governments
- Creation of a substantial number of jobs, both skilled and unskilled
- Existing properties, including residential, commercial, and industrial units, are taken for right-of-way acquisition and the construction of the Project

4.13.3 Mitigation Planning

Mitigation planning for adverse effects to socioeconomic resources would include standard mitigation measures (see Table 2-10). For example, avoidance of residential properties, public facilities, and other sensitive use areas could reduce impacts to socioeconomic resources. In addition, standard mitigation measures could reduce impacts to quality of life factors, such as reducing visual contrast in sensitive settings.

4.13.4 Summary of Impact Analysis Results

Under the No Action alternative, the BLM would not approve the Applicant's right-of-way application, and would continue to manage the land within the Project corridor consistent with existing field office RMPs. No new structures or facilities associated with the Project would be constructed or operated, and the Project would not cause changes to population, employment or revenues. As a result, no socioeconomic impacts would occur.

4.13.4.1 Population Impacts

Construction

The construction of the transmission lines and substations is expected to take place over a span of 2 to 3 years at various locations throughout the study area, and will employ a maximum of 206 workers per transmission line and 55 workers per substation site (see Section 2.4.10.11). Approximately three to five crews would likely be working at any one time; the locations of these crews are expected to vary significantly depending on mitigation measures and areas that must be avoided during certain times of the year (e.g., avoidance of breeding seasons for nesting eagles) (personal communication, Bedillion 2011). Population growth beyond that caused by direct construction employment is expected to be minimal, because indirect industries (e.g.,

support industries such as restaurant and hotel/lodging) typically employ workers who are already present in local economies.

Approximately 30 percent of all construction workers are expected to come from Arizona or New Mexico, with 10 percent of all workers anticipated to be hired locally within the counties where construction will take place (Charney et al. 2012a, Appendix G1). An assumption is made that all local workers and most in-state workers would commute to the construction site from their homes and therefore would not contribute to population growth. The remaining 70 percent of workers would temporarily relocate within proximity of individual construction sites. Because construction employment would be temporary in nature and developed linearly in New Mexico and Arizona, it is unlikely that relocated workers would also relocate their families. Based on these assumptions, including the likelihood that multiple crews along a 500-mile corridor would be in close proximity to one another, no significant impacts related to population increases are expected from temporary population increases of a few hundred people.

Operations

Because operational employment would be minimal and spread between three cities in New Mexico and Arizona, population increases are expected to be negligible. Not including the surrounding metropolitan areas, the Las Cruces, Tucson, and Phoenix populations in 2009 totaled approximately 100,000; 500,000; and 1,500,000 respectively (U.S. Census 2005-2009b).

4.13.4.2 Housing Impacts

Construction

The temporary population increase during the construction of the proposed Project is expected to have little to no impact on housing availability, because the number of construction workers onsite at any one time would not be significant (less than 206 for transmission line construction and 55 for each substation). Construction workers are expected to temporarily locate across the Project study area. Workers would reside in hotels, campgrounds, and other short-term living options (personal communication, Bedillion 2011). In addition, some would commute from their existing residences in nearby counties. Counties within proximity to where construction would take place in New Mexico and Arizona have a high number of vacant housing units, with nearly 28,000 and 86,000 vacancies, respectively.

There would be no direct impacts to residences for right-of-way acquisition among any alternatives in Route Group 1 or Route Group 3; subroutes 4A, 4B, 4C1, or 4C2; as well as the BLM preferred alternative subroutes. However, the construction of the Project using Subroute 4C3 could result in significant impacts due to the take of approximately 216 residences (in addition to 48 commercial and industrial properties along links F111 and F112 in South Tucson). Local alternative links F81a-F81b would also result in significant impacts to residential properties, resulting in the take of approximately 120 residences (in addition to 37 commercial and industrial properties). The locations of potential right-of-way acquisition are described in Section 4.10.5.3. Residential displacement could cause homeowners to experience a temporary hardship of having to find new housing; however, residents are expected to receive ample notice

to find new housing and would be compensated fair market value for their homes. Even after standard mitigation measures are applied, significant impacts to residents would result from the construction of the Project and acquisition of right-of-way for Subroute 4C3 or the local alternative (F81a-F81b).

Operations

Based on the estimated population increases presented above, no shortage of housing or other impacts are expected to result from the housing demands of people relocating to New Mexico and Arizona during operations. Tables 3-61 and 3-62 (see Chapter 3) illustrate the abundance of vacant housing units within the New Mexico and Arizona counties where construction would take place.

The BLM preferred alternative would not require the acquisition of any homes. However, impacts remaining from the acquisition of homes from right-of-way acquisition for Subroute 4C3 could extend beyond the construction phase into operations. The displacement of homes where communities have existed for many years, and where residents have deep social ties, may result in impacts that cannot be mitigated by fair market value compensation. For these reasons, it is very likely that strong opposition to Subroute 4C3 would result. In addition, long-term property tax revenues generated by the use of the land for a utility right-of-way could be lower than the property taxes generated by existing homes and businesses in the affected area. The resulting tax revenue would depend on the condition of the affected properties and other economic variables specific to Tucson and Pima County.

4.13.4.3 Economic Impacts

The following section focuses on direct and indirect impacts associated with the construction of the Project for each alternative subroute. Because economic impacts for transmission line construction are, for the most part, directly proportional to the length of the transmission line route, only major differences between subroutes are discussed. Transmission line Option A and Option B present similar impacts within route groups, because each involves the development of two parallel transmission lines (see Section 2.4.1). Since the construction of converter stations needed for a DC line (Option B) is more time consuming and requires more expensive materials than that for an AC line, a greater number of jobs and wages are expected to result from the construction of this option. Results are summarized to include a range between the two options, and total county impacts for alternative subroutes within the group. Tax revenue impacts would vary for options A and B, and are dependent on the rates within each state and county.

The estimate of employment and income associated with Project development includes only the construction phase, because operations employment would likely be based in only three counties: Doña Ana County in New Mexico, and Pima and Maricopa counties in Arizona. (It is noted that none of the Project facilities would be constructed in Doña Ana or Maricopa County.)

Employment and Income

The results of the employment and income analysis for construction are based on a number of key assumptions:

- Approximately 10 percent of all construction workers, on average, would be hired locally in all counties as subcontractors.
- An additional 20 percent of workers would be hired within New Mexico or Arizona, but from outside the county in which work takes place.
- In-state hires would spend 40 percent of their income in-county, and 60 percent elsewhere in the state.
- Workers from out-of-state would spend 40 percent of their income in the county they are living and working, an additional 40 percent elsewhere in the state, and 20 percent outside of the state.
- All construction workers would receive per diem for living expenses equal to 15 percent of their total labor income. This additional money would be spent on items such as lodging, food, restaurants, entertainment, and fuel.

State and Local Sales and Income Tax Revenue

The construction and operation phases for each alternative presented for the proposed Project would result in state and local tax revenue in New Mexico and Arizona. In addition to revenue generated by direct spending on materials and labor, revenue would also be generated by workers who spend their income throughout New Mexico and Arizona. Similar to employment and income impacts previously discussed, tax revenue is directly related to the length of the transmission lines.

The following summarizes the various direct and induced tax revenue sources.

Direct Sales Tax (New Mexico and Arizona): Direct sales taxes paid as a result of construction or operation of the facilities. Sales tax is the only direct tax in New Mexico.

Direct State-Shared Sales Tax (Arizona): Direct sales tax collected by the state and shared with all cities and counties.

Induced Local Sales Tax (New Mexico and Arizona): Locally imposed sales tax paid when workers earn and spend money locally.

Induced State-Shared Sales Tax (Arizona only): Sales tax collected when workers earn and spend money anywhere in the state.

Induced State-Shared Income Tax (Arizona only): Income tax shared with cities and towns, including those that may not be impacted. Arizona state-shared income tax revenue is distributed 2 years after collection.

Property Tax Revenues

The average expected property tax revenues by route group for New Mexico and Arizona were evaluated for both the construction and operation phases. Property taxes in New Mexico are levied at the local government level. For the purposes of this Project, the evaluation of taxable improvements is done at the state level, since SunZia is a multiple-county project. Property taxes from construction of the Project would be collected through an estimated 3-year construction period, depending on which development option is selected. Property taxes collected during the operations phase would take place beginning in 2016 through the life of the Project, expected to be at least 50 years.

The largest amount of property tax revenues are expected to result in 2016, the year in which construction of the transmission lines and substations are to be completed. New Mexico is expected to receive a greater amount of property tax revenue, because most of the construction would take place across the state. Between approximately $5 million and $9.4 million per year would benefit New Mexico beginning in 2016. Arizona is expected to receive between $1 million and $5.3 million during this same time. Every year following 2016 would yield approximately 4 percent less revenue in New Mexico and Arizona, due to depreciation.

Route Group 1: SunZia East Substation to Midpoint Substation

Job creation, labor income, and tax revenue estimates vary slightly between subroutes within Route Group 1, including Subroute 1A2, the BLM preferred alternative. Economically, Socorro and Sierra counties would benefit the most from the construction and operation phases of the Project, because the two counties contain a majority of all subroute mileage. Direct and indirect economic impacts would result in communities such as the city of Carrizozo in Lincoln County (largest city in proximity to the proposed SunZia East Substation); the town of Mountainair in Torrance County[1]; Socorro and the unincorporated community of San Antonio in Socorro County; Elephant Butte, Truth or Consequences, and Williamsburg in Sierra County; and Deming in Luna County. Operations employment would likely have the greatest impact in Doña Ana County, and not in the actual location of the transmission line and substation facilities.

The approximate range (between Option A and Option B) of direct and indirect jobs, income tax revenue, and property tax revenue that could be created in New Mexico is summarized as follows:

- Jobs (job years) generated from construction of transmission lines: 2,108 to 2,206 (1,212 to 1,275 direct and 896 to 931 indirect)
- Income tax revenues generated during construction (not including substations): $33.1 to $32.4 million
- Property tax revenues generated during construction: $9.4 million to $13.7 million
- Property tax revenues during operations: $26.3 million to $49.8 million

[1] Calculations used in the EIA included Subroute 1A in Socorro County, but Subroute 1A2 crosses 28 miles in Torrance County.

Route Group 3: Midpoint Substation to Willow-500 kV Substation

Similar to Route Group 1, economic impacts for alternative subroutes within Route Group 3 also vary slightly. Subroute 3A and 3A2 the BLM preferred alternative, are expected to create a slightly larger economic impact than Subroute 3B, because it is approximately 5 miles longer. Luna and Hidalgo counties would experience a majority of the benefits of job creation, labor income, and tax revenue. The communities of Deming in Luna County, Lordsburg in Hidalgo County, and Silver City in Grant County would experience the greatest impacts from the Project.

In Arizona, economic impacts associated with alternative subroutes within Route Group 3 are expected to benefit the communities of Bowie and Willcox in Cochise County and Safford in Graham County, as well as small unincorporated rural communities in the vicinity of the Project. Shared impacts would also be created across the state.

The approximate range of direct and indirect jobs, income tax revenue, and property tax revenue that could be created in New Mexico and Arizona is summarized below.

New Mexico:

- Jobs (job years) generated from construction of transmission lines: 829 to 868 (476 to 501 direct and 353 to 367 indirect)
- Income tax revenue generated during construction (not including substations): $13 million to $12.7 million
- Property tax revenues during construction: $3.5 million to $3.9 million
- Property tax revenues generated during operations: $8.6 million to $9.9 million

Arizona:

- Jobs (job years) generated from construction of transmission lines: 426 to 556 (200 to 264 direct and 226 to 292 indirect)
- Income tax revenue generated during construction (not including substations): $3.9 million to $4.8 million
- Property tax revenues during construction: $1.2 million to $2.3 million
- Property tax revenues generated during operations: $1.6 million to $2.7 million

Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroutes 4A and 4B would result in similar economic impacts, due to each route crossing similar distances in Graham and Pinal counties. Subroutes 4A and 4B would benefit Safford in Graham County; San Manuel, Mammoth, Oracle, and Casa Grande in Pinal County; and a small portion of north Pima County. Subroute 4C2c, the BLM preferred alternative, and subroutes 4C1 and 4C2 would have similar economic impacts, because each crosses mostly undeveloped land and passes near rural communities.

A greater number of construction jobs and tax revenues would be generated from the development of Subroute 4C3, relative to other subroutes, because of its length. However, due to

its large population and workforce, Pima County and the Tucson metropolitan area are anticipated to benefit from the construction of any subroute included in Route Group 4. Given the potentially higher costs of acquiring residential, commercial, and industrial properties for the right-of-way to construct Subroute 4C3, tax revenues relative to the total Project cost (proportional to the distance of alternatives) would be greater for Subroute 4C3 than for the other subroutes, including the BLM preferred alternative. In addition, there would be a greater local indirect economic effect associated with economic activity (e.g., employment income, and sales taxes from purchases) generated with services associated with property acquisition and urban infrastructure construction.

The approximate range of direct and indirect jobs, income tax revenue, and property tax revenue that could be created in Arizona for all alternatives is summarized below.

Arizona:

- Jobs (job years) generated from construction of transmission lines: 1,552 to 1,768 (823 to 851 direct and 729 to 917 indirect)
- Income tax revenue generated during construction (not including substations): $14.1 million to $14.5 million
- Property tax revenue during construction: $3.3 million to $11.1 million
- Property tax revenue generated during operations: $6.6 million to $22.8 million

4.13.4.4 Emergency Services

Construction of Transmission Lines and Substations

Fire Services

Without standard mitigation measures, the construction of power lines and substations in remote, rural locations could create an increased risk of fire danger. For existing populations, areas in proximity to subroutes 1B2 and 1B3 are underserved relative to Subroute 1B1, with the closest fire departments located in the city of Socorro to the west and the small community of Mountainair to the north in Torrance County. Fire services along I-25 between San Antonio and Truth or Consequences are also sparse; more than 50 miles of this stretch are characterized as undeveloped vacant land. The nearest fire services along this route would come from the communities of San Antonio or Elephant Butte. Links A330a and A330b (present in subroutes 1A1, 1A2, 1A, 1B1, 1B2, and 1B3) are within proximity to fire departments in the communities of Elephant Butte, Truth or Consequences, Arrey, and Hillsboro; however, access to these links may be difficult given the terrain and the presence of few roads from I-25 west toward the links. Fire service to links A400 and A440 (present in subroutes 1A, 1B1, 1B2, and 1B3), which cross Sierra and Luna counties, would either come from Hatch to the east or Deming southwest of the routes. Local alternative links A361 and A430 are within closer proximity to fire services than are A400 and A440. A small portion of subroutes 3A or 3A2, and 3B, and links B110b and B120b (which cross Grant County) may be underserved and would depend on fire services from

Lordsburg to the west or Deming to the east. All other routes between Lordsburg and the Arizona border would depend on services from Lordsburg.

In the eastern portion of the study corridor, the Bowie Volunteer Fire District would serve the eastern portion of Arizona and is within closer proximity to the links in Subroute 3B than in 3A. Links C130a and C130b within Subroute 4B are not within close proximity to fire services; services to both of these areas would come from the BLM Fire Department in Safford. Link C620 within subroutes 4A and 4B just north and west of Mammoth is among the most underserved portion of Pinal County due to its remote location. Link C820 within subroutes 4C2, 4C2c, and 4C3 crosses a desolate area that is underserved by fire services. Much of the routes southeast of the planned Pinal Central Substation are not in proximity to fire services.

While gaps in fire services are present across portions of New Mexico and Arizona, the construction of any Project alternative would require a Fire Marshal to be onsite when construction activity is in progress, and any additional periods where fire safety is an issue (Section 2.2.2, Appendix A4 of the POD). The Fire Marshal is responsible for arranging the dispatch of fire suppression personnel and equipment to the Project site within 15 minutes. With these mitigation measures in place, no impacts are expected to result from the construction of transmission lines and substations across all route alternatives.

Medical Services

Some locations in New Mexico and Arizona are not in proximity to trauma services; however, helicopter services may be available to respond in cases where advanced levels of trauma services are needed (see Section 3.13.8.2, Medical Services). The availability of these expedited trauma services at multiple hospitals in these cities indicates that minimal impacts are expected to result to medical services throughout the study area.

Operations

When compared to the estimated number of residents living in Las Cruces, Tucson, and Phoenix in 2009, impacts to local government services would be minimal due to negligible population increases resulting from the Project. The operation of the transmission lines and substations is not expected to impact existing medical and emergency services and will not require the development of new facilities for public services such as fire, medical, or police enforcement. Section 3.13.8 and Appendix A8 of the SunZia POD (specifically Table A8-1) present lists of emergency providers that could be used during operations**.**

4.13.4.5 Other Impacts

Other potential social and economic impacts that have been identified as public concerns include effects to associated grazing and ranching operations, recreation and tourism, and property values that could occur during construction or operation of the Project.

Impacts to grazing lands that could occur as a result of loss of vegetation from Project construction have been estimated and included in the assessment of land use impacts for BLM

lands (see Section 2.4 and Section 4.10.5). Grazing and ranching operations could be temporarily affected by Project construction, where access is restricted by construction activities. Mitigation measures would be applied to minimize the impacts during construction in coordination with land owners and managers, such as structure installation and repair of fences and gates. Overall, permanent ground disturbance would be approximately 6 acres per mile of right-of-way. Typically, grazing could continue within the Project right-of-way during operation of the transmission lines, and more than 80 percent of the vegetation within the right-of-way would not likely be disturbed by construction of these facilities, and would remain open for grazing.

Impacts to recreation and tourism have been identified by the public during the scoping process. The description of land use impacts to recreation areas or trails resulting from Project construction or operation have been described in Section 4.10.5 and visual impacts to recreation users have been described in Section 4.9.3. The Project would not substantially change the use of recreation areas or trails, and the number or type of recreation users would not be likely to change; therefore, economic effects to recreation are not anticipated. Changes in the tourist economy are not anticipated.

Studies have been reviewed regarding the potential effects to property values in proximity to HVTLs. These studies examine a range of contributing factors to real-estate value impacts from HVTLs, such as the effects of visibility and their extent of encumbrance (e.g., restrictions, easements, and encroachments), while controlling for general market factors, property types, and site-specific conditions. The studies have found that often no effect to property values occur based on the presence of HVTLs; in studies where effects were found, the effects generally resulted in a 10 percent or smaller reduction in property value (Chalmers et al. 2009; Delaney and Timmons 1992; Jackson 2010; Jackson et al. 2010).

4.13.4.6 Summary of Impacts for the BLM Preferred Alternative

This section summarizes the social and economic impacts in New Mexico and Arizona for the BLM preferred alternative, including subroutes 1A2, 3A2, and 4C2c. Overall, the economic impacts resulting from the construction and operation of the Project do not vary greatly within each route group, and an estimated range of effects for the BLM preferred alternative is provided below. The greatest variance in the level of impacts across alternatives would result from the development of two AC lines (Option A) versus one AC and one DC line (Option B). The BLM preferred alternative, as a combination of subroutes and local alternatives, is approximately 9 miles (2 percent) longer than the longest route evaluated in the EIA[1]. This increase in length is assumed to be within the accuracy of analysis presented in the EIA, and the estimated range of economic effects provided below.

Population impacts are expected to be minimal during construction and operations; construction crews are expected to be dispersed across a large construction corridor, while operations employment will be based in established, populated cities in New Mexico and Arizona.

[1] Tax revenues for Torrance County are not included.

The total number of jobs (job years) that would be created in New Mexico and Arizona during construction of the proposed Project would range between 5,822 and 6,357 (including transmission lines and substations between Option A and Option B). Between 127 and 150 jobs would be created by the operation of the transmission lines and substations. The following is a summary of the estimated employment and revenue by state.

New Mexico:

- Jobs (job years) generated from construction of transmission lines: 3,044 to 3,186 (1,750 to 1,840 direct and 1,294 to 1,346 indirect)
- Jobs (job years) generated from construction of substations: approximately 690 (470 direct and 220 indirect)
- Operations jobs: 41 to 50 (25 to 31 direct and 16 to 19 indirect)
- Income tax revenues generated during construction (includes transmission line and substations): $60.0 million to $93.5 million
- Yearly income tax revenues from operations: $200,000 to $400,000
- Property tax revenues from construction: $12.9 million to $17.6 million
- Property tax revenues during operations: $34.9 million to $59.7 million

Arizona:

- Jobs (job years) generated from construction of transmission lines: 2,387 to 2,514 (1,133 to 1,207 direct and 1,254 to 1,307 indirect)
- Jobs (job years) generated from construction of substations: 220 to 270 (110 to 130 direct and 110 to 140 indirect)
- Operations jobs: 86 to 100 (41 to 47 direct and 45 to 53 indirect)
- Income tax revenues generated during construction(includes transmission line and substations): $24.6 million to $28.0 million
- Yearly income tax revenues from operations: $300,000 to $700,000
- Property tax revenues from construction: $6.3 million to $12.9 million
- Property tax revenues during operations: $10.1 million to $25.5 million

4.14 ENVIRONMENTAL JUSTICE

4.14.1 Introduction

An environmental justice population is defined as one that exceeds 50 percent of the entire population of an affected area, or for the purposes of this EIS, as an affected area in which populations have an equal or greater percentage of residents living below the poverty level of or New Mexico or Arizona. A description of the geographic distribution of environmental justice populations is presented in Section 3.14, by census tracts located within approximately 3 miles of each proposed subroute. Once a potential environmental justice population is identified,

according to EO 12898, further analysis must take place to determine whether a project's impacts would be significant and disproportionately affect an environmental justice population.

This section focuses on the identification and characterization of environmental justice impacts associated with the Project; the general methodology for impact assessment; impact levels for environmental justice populations; and the presentation of the analysis of impacts by route group, including impacts that are common to all routes.

For this analysis, impact levels to potential environmental justice populations can be categorized as high, moderate, low, or no impacts. Table 4-25 summarizes the impact criteria used to assign impact levels to potential environmental justice populations; these levels are assessed based on the distance from the environmental justice population to the proposed alternative routes.

Table 4-25. Impact Criteria Summary

Impact Level	Impact Criteria
High	High impacts occur in areas where the Project could create direct, long-term, and significant impacts to existing environmental justice populations. These impacts include the condemnation of residential, commercial, industrial or other properties, and visual impacts to residences or public places in rural or urban areas. High impacts to environmental justice populations are experienced where property condemnation is disproportionate (occurs at a much higher rate) compared to condemnation experienced by non-environmental justice populations. High impacts are likely to occur most frequently in dense urban areas because these properties are more difficult to avoid than in rural areas.
Moderate	Areas where the Project would create a direct or indirect, short- or long-term impact to existing environmental justice populations. These impacts could include potential visual impacts in a rural or urban area. Short-term impacts are typically associated with construction and could include noise and dust generation as well as temporary traffic congestion. Long-term impacts could result from the permanent alteration of residential views. Overall, moderate impacts to environmental justice populations can typically be characterized as areas within close proximity to the line (usually 1 mile or less) that will experience similar long-term impacts as non-environmental justice populations. The presence of moderate impacts does not mean that an environmental justice population is disproportionately impacted when compared to other populations.
Low	Areas where the Project would create a direct or indirect, short- or long-term impact to existing environmental justice populations. Long-term impacts could include visual impacts at greater distances. Similar to moderate impacts, short-term impacts are typically associated with construction and could include noise and dust generation as well as temporary traffic congestion; but to a lesser degree than residents living close to the lines. Generally, low impacts to environmental justice populations would be located between 1 and 3 miles from any Project alternative or just beyond. The presence of low impacts does not mean that an environmental justice population is disproportionately impacted when compared to other populations.
No Impacts	Areas where no potential environmental justice populations have been identified within 3 miles of the Project alternatives.

4.14.2 Impact Assessment Methodology

An impact, or effect, is defined as a modification to the environment brought about by an outside action. These impacts can be positive or negative and may be short- or long-term in nature. Impacts can also be direct or indirect. An example of an indirect, short-term impact to an environmental justice population would be an increase in available low-skilled, service sector

jobs to supply goods and services to construction workers that would not last beyond the duration of a project's construction.

Environmental justice populations for the Project were geographically identified by census tract, within a 3-mile radius on either side of a subroute. Census tracts were used, rather than smaller areas of geographic data (i.e., census blocks or block groups), because estimates for smaller geographies were not available at the time of the study. In rural areas, census tracts could cover large areas with low population densities. If census tracts in rural and urban areas were identified to be an environmental justice population, land use inventory data (such as field verification and aerial photography) were used to confirm the specific type of land uses that could be impacted by a route. Although the type of impacts to rural and urban areas would be similar in most cases (e.g., the condemnation of a residence), the level of impact was also determined according to the proximity and density of the environmental justice population to the potential impact. For example, rural residential properties could experience moderate impacts from a distance of 2 miles of the transmission lines, while a residence just outside 1 mile from the lines could experience low impacts due to existing lines or the presence of other structures commonly associated with a built urban environment.

Standard mitigation measures for related resources such as land use, visual, biological, and public safety would serve as mitigation measures for environmental justice populations. Examples of these measures include the use of structures that minimize visual impacts, compliance with local air quality standards for dust, and the minimization of corona to reduce interference with radio and television signals.

4.14.3 Summary of Impact Analysis Results

4.14.3.1 No Action Alternative

Under the No Action alternative, the BLM would not approve the Applicant's right-of-way application, and would continue to manage the land within the Project corridor consistent with existing field office RMPs. The land along the Project corridor would be expected to remain in its existing condition, with no new structures or facilities constructed or operated. As a result, no new environmental justice impacts would occur. In the absence of this Project, other projects may be constructed that would have similar impacts in other locations.

4.14.3.2 Route Group 1: SunZia East Substation to Midpoint Substation

Subroute 1A, 1A1 (North River Crossing) and 1A2 – BLM Preferred Alternative

Six potential environmental justice tracts across three counties are crossed by subroutes 1A, 1A1, and 1A2, the BLM preferred alternative. Of the six, one tract in Lincoln County, one tract in Torrance County, and three tracts in Socorro County could experience low to moderate impacts. Census tracts 9602 and 9637 located in Lincoln and Torrance counties are characterized by low-density residential properties, and subroutes 1A, 1A1, and 1A2 cross within 0.5 mile of potential environmental justice populations within these tracts. Subroutes 1A, 1A1, and 1A2 also cross within a 0.25 mile of low-density residential properties and agricultural areas near the

community of Escondida, just north of the city of Socorro. Proximity to these properties indicates the potential for moderate impacts. Higher density environmental justice populations located 1 mile south in Socorro could experience low impacts, because of their distance from the line. Table 4-26 contains the numbers of Hispanic, other minority, and low-income populations (see Section 3.14 for descriptions of these populations) located in each census tract crossed by Subroute 1A2. However, because these populations are spread across many square miles of land, the number of individuals that could be impacted would be much less.

Table 4-26. Impacts to Environmental Justice Populations – Route Group 1

County	Census Tract	High Impact	Moderate Impact	Low Impact	Population Density[1]	Total Population[2]	Hispanic	Hispanic Percent of Total	Other Minority	Other Percent of Total	Low-income[3]	Low-income Percent of Total[3]
Lincoln	9602		●		0.7	1,826	625	34.2	68	0.0	315	20.0
Torrance	9637		●		1.1	2,294	1,120	48.8	81	0.0	542	31.2
Socorro	978100	—		●	1.6	4,741	2,274	48.0	642	13.5	1,031	21.7
Socorro	978301	—	●		43.3	2,981	1,785	59.9	580	19.5	1,207	40.5
Socorro	978302	—		●	2,089.60	3,863	1,644	42.6	801	20.7	1,110	28.7
Socorro	978303	—	●		179.3	3,624	2,318	64.0	837	23.1	1,010	27.9

[1] Number of people per square mile
[2] Represents total population and does not equal total of races or ethnicities presented in other columns.
[3] Population with income in the past 12 months below poverty level for whom poverty status is determined.
Source: U.S. Census 2011a and 2011b

Subroute 1B – San Antonio Crossing

Subroutes 1B1, 1B2, and 1B3 cross similar environmental justice populations as Subroute 1A2, but are differentiated by proximity to the community of San Antonio. Table 4-26 is representative of the impact levels expected to result from each subroute variation within Subroute 1B. Link A140, which crosses the Rio Grande (present in each subroute), crosses within approximately 0.1 mile of an existing residential property and within a 0.5 mile of approximately 25 rural residential properties.

4.14.3.3 Route Group 3: Midpoint Substation to Willow-500 kV Substation

Subroute 3A North and 3A2 – BLM Preferred Alternative

Low to moderate impacts could occur to potential environmental justice populations in New Mexico as a result of the construction and operation of Subroute 3A or Subroute 3A2. Potential environmental justice populations within census tracts 5 and 9700 in Luna and Hidalgo counties could experience low to moderate impacts due to residences located within 0.5 to 2.0 miles of these subroutes (Table 4-27). Residential development in these areas is characterized as low-density residential development.

Subroute 3B – South

Subroute 3B crosses a majority of the same census tracts in New Mexico as subroutes 3A and 3A2, resulting in similar impacts. In addition, Subroute 3B is within closer proximity to residences. Within census tract 5 in Luna County, Link B80 crosses agricultural properties and comes within less than 0.5 mile to a rural residential development located north of the city of Deming. Impacts to this portion of Luna County are expected to be moderate, because no residential properties are directly crossed by this subroute; however, indirect impacts to these populations could possibly result. Census tracts 9700 and 9882 in Hidalgo County are expected to experience low to moderate impacts, respectively. Link B112 crosses agricultural property southeast of Lordsburg and continues directly south, coming within 3 miles of nearly all residential properties in the city. Overall, a majority of Subroute 3B does not come within proximity to any environmental justice populations (Table 4-27).

Table 4-27. Impacts to Environmental Justice Populations – Route Group 3

County	Census Tract	High Impact	Moderate Impact	Low Impact	Population Density[1]	Total Population[2]	Hispanic	Hispanic Percent of Total	Other Minority	Other Percent of Total	Low-income[3]	Low-income Percent of Total[3]
Luna	5	—	●		2.6	4,643	2,426	52.3	273	5.9	1,542	33.2
Hidalgo	9700	—		●	0.7	2,195	684	31.7	467	19.3	455	28.1
Hidalgo	9882	—	●		614.7	2,579	1,997	77.4	934	36.2	584	22.6

[1] Number of people per square mile
[2] Represents total population and does not equal total of races or ethnicities presented in other columns.
[3] Population with income in the past 12 months below poverty level for whom poverty status is determined.
Source: U.S. Census 2011a and U.S. Census 2011b

4.14.3.4 Route Group 4: Willow-500 kV Substation to Pinal Central Substation

Subroute 4A – North of Mt. Graham

Subroute 4A crosses Graham, Cochise, Pima, and Pinal counties, and is largely characterized by undeveloped land and scattered rural residential developments. Some developed portions of Pinal County are the only areas along this route that are expected to impact environmental justice populations (Table 4-28). Hispanic, other minority, and low-income populations in Mammoth (census tract 6.01) are expected to experience moderate impacts, because a majority of the community is within proximity to Subroute 4A. Nearly all residential developments in this census tract fall within 1 to 3 miles of the subroute.

Subroute 4B – Sulphur Springs

Impacts would be similar to Subroute 4A.

Subroute 4C2c – BLM Preferred Alternative

Moderate impacts could occur to environmental justice populations within 3 miles of the Project in Cochise County (census tract 2), and in Oracle and San Manual (census tract 6.01) (Table 4-28).

Populations within census tracts 12 and 20, located in the vicinity of the Pinal Central Substation, could experience low to moderate impacts. Link C880a, which connects to the planned Pinal Central Substation, is located within 0.75 mile of more than 200 residential homes and multiple agricultural properties.

Link C880a (which connects to the planned Pinal Central Substation) is common to all subroutes within Route Group 4, and is located within 0.75 mile of more than 200 residential homes and multiple agricultural properties.

Table 4-28. Impacts to Environmental Justice Populations – Subroutes 4A, 4B, 4C1, 4C2, 4C2c

County	Census Tract	High Impact	Moderate Impact	Low Impact	Population Density[1]	Total Population[2]	Hispanic	Hispanic Percent of Total	Other Minority	Other Percent of Total	Low-income	Low-income Percent of Total
Cochise	2	—	●		14.8	10,090	2,958	29.3	706	7.0	1,780	17.6
Pinal	6.01	—	●		11.2	7,490	4,221	56.4	2,567	34.3	1,967	26.3
Pinal	12	—	●		42	5,176	2,057	39.7	1,539	29.7	1,352	26.1
Pinal	20	—		●	208.2	10,782	8,253	76.5	5,183	48.1	2,908	27.0

[1] Number of people per square mile
[2] Represents total population and does not equal total of races or ethnicities presented in other columns.
Source: U.S. Census 2005-2009 ACS

Subroute 4C1 – East of San Pedro River

Subroute 4C1 crosses environmental justice populations similar to subroutes 4A and 4B. Northeast of Willcox in Cochise County (census tract 2), Link C110 crosses two residential properties and comes within immediate proximity to approximately 12 rural residences located on large agricultural properties, a majority of which are less than 0.1 mile from the line. In addition, environmental justice populations within the town of Oracle (census tract 6.01) could be impacted by Subroute 4C1 (Table 4-28).

Subroute 4C2 – West of San Pedro River

Impacts would be similar to Subroute 4C2c, the BLM preferred alternative.

Subroute 4C3 – Tucson

Subroute 4C3 crosses the most densely populated portion of the study corridor, passing through the city of Tucson. The average population density of census tracts that are crossed or fall within

1 mile of the subroute is 3,780 people per square mile (Table 4-29). Chapter 3 identified a large number of potential environmental justice populations throughout Tucson.

As indicated in Section 3.10, up to 216 residential, 37 commercial or industrial, and 6 other properties in Tucson could be displaced (condemned) as part of the right-of-way acquisition for links F111 and F112. All potential condemnations are located within 13 environmental justice census tracts, resulting in the largest disproportionate share of potential impacts to these populations when compared to all other Route Group 4 subroutes; these tracts are likely to experience the highest level of impacts in southern Tucson. Displacement would not be the only potential economic impact on these residences and surrounding neighborhoods, as construction in these areas could jeopardize the social cohesion of neighborhoods by creating both physical and perceptual boundaries of separation between homes and commonly visited places, including commercial businesses and public gathering places. These potential high and moderate impacts may result in strong opposition from tight-knit communities throughout Tucson if there is a widespread perception of injustice. The total population of the tracts that may experience high impacts is approximately 76,500; approximately 62 percent of these residents are Hispanic and nearly 30 percent are below Arizona's poverty level.

Table 4-29. Impacts to Environmental Justice Populations within 1 mile of Subroute 4C3

County	Census Tract	High Impact	Moderate Impact	Low Impact	Population Density[1]	Total Population[2]	Hispanic	Hispanic Percent of Total	Other Minority	Other Percent of Total	Low-income	Low-income Percent of Total
Pinal	12		●		42	5,176	2,057	39.7	1,539	29.7	1,352	26.1
	20			●	208.2	10,782	8,253	76.5	5,183	48.1	2,908	27.0
Pima	1	●			1,823.30	442	144	32.6	131	29.6	240	54.3
	2	●			6,573.30	4,178	3,014	72.1	1,609	38.5	1,194	28.6
	3		●		3,290.20	1,320	468	35.5	517	39.2	507	38.4
	4		●		4,790.30	3,001	583	19.4	445	14.8	953	31.8
	9		●		6,230.00	3,511	1,535	43.7	1,434	40.8	1,440	41.0
	10		●		2,017.80	1,056	723	68.5	619	58.6	335	31.7
	11	●			6,283.70	2,704	2,414	89.3	1,729	63.9	707	26.1
	12		●		2,573.70	3,619	2,517	69.5	2,168	59.9	1,180	32.6
	13.02		●		3,716.90	2,411	1,225	50.8	1,066	44.2	1,183	49.1
	21		●		3,013.10	6,038	4,565	75.6	3,031	50.2	1,538	25.5
	22	●			2,637.40	7,916	6,085	76.9	4,245	53.6	2,445	30.9
	23	●			5,545.00	5,918	4,258	71.9	2,357	39.8	3,157	53.3
	24	●			5,080.60	7,228	5,822	80.5	3,783	52.3	2,575	35.6
	25.01	●			2,350.40	6,045	3,864	63.9	2,558	42.3	1,014	16.8
	25.03	●			3,618.30	3,721	2,538	68.2	1,520	40.8	847	22.8
	41.04	●			5,536.30	9,824	6,229	63.4	5,031	51.2	3,493	35.6
	41.1		●		7,828.60	3,838	3,028	78.9	2,299	59.9	748	19.5
	41.11	●			3,299.70	8,912	6,634	74.4	4,543	51.0	2,387	26.8

Table 4-29. Impacts to Environmental Justice Populations within 1 mile of Subroute 4C3												
County	Census Tract	High Impact	Moderate Impact	Low Impact	Population Density[1]	Total Population[2]	Hispanic	Hispanic Percent of Total	Other Minority	Other Percent of Total	Low-income	Low-income Percent of Total
	41.12		●		3,761.70	3,518	2,465	70.1	986	28.0	822	23.4
	44.07		●		4,370.10	6,668	4,274	64.1	4,178	62.7	1,780	26.7
	44.12	●			3,761.70	3,480	1,405	40.4	886	25.5	548	15.7
	44.14		●		4,787.30	3,707	2,174	58.6	1,396	37.7	330	8.9
	44.15		●		627.1	1,669	843	50.5	464	27.8	221	13.2
	44.18	●			334.5	4,100	360	8.8	518	12.6	685	16.7
	45.04	●			1,844.60	6,985	3,557	50.9	2,111	30.2	2,071	29.6
	45.06	●			3,924.80	5,060	1,616	31.9	677	13.4	1,127	22.3
	45.09		●		6,127.40	8,350	3,006	36.0	2,682	32.1	2,910	34.9
Totals					**3,778.2[3]**	**130,395**	**77,403**	59.4	**54,522**	41.8	**37,790**	29.0

[1] Number of people per square mile
[2] Represents total population and does not equal total of races or ethnicities presented in other columns.
[3] Represents average population density per square mile for all census tracts combined.
Source: U.S. Census 2005-2009 ACS

Low impacts to environmental justice populations are expected to take place between 1 and 3 miles of links F111 and F112 (Table 4-30). Impacts would be direct, and both temporary and permanent. Direct impacts that may result include permanent scenic impacts and temporary issues associated with construction of the transmission line, such as increased traffic congestion.

Table 4-30. Impacts to Environmental Justice Populations between 1 and 3 miles of Subroute 4C3												
County	Census Tract	High Impact	Moderate Impact	Low Impact	Population Density[1]	Total Population[2]	Hispanic	Hispanic Percent of Total	Other Minority	Other Percent of Total	Low-income	Low-income Percent of Total
Pinal	21			●	20.5	5,559	1,618	29.1	1,117	20.1	975	17.5
Pima	5			●	10,455.90	6,879	854	12.4	1,232	17.9	2,953	42.9
	6			●	4,341.30	5,323	854	16.0	690	13.0	1,304	24.5
	7			●	4,116.90	5,189	2,122	40.9	1,433	27.6	861	16.6
	8			●	1,497.60	1,732	967	55.8	635	36.7	384	22.2
	13.01			●	9,022.00	8,529	5,097	59.8	2,834	33.2	3,464	40.6
	14			●	7,145.60	6,286	1,818	28.9	2,559	40.7	2,888	45.9
	15			●	4,935.80	4,447	496	11.2	884	19.9	1,373	30.9
	16			●	4,291.10	3,376	443	13.1	343	10.2	558	16.5
	20			●	4,117.70	7,320	4,637	63.3	2,751	37.6	1,705	23.3
	25.04			●	5,920.50	5,667	4,046	71.4	2,376	41.9	1,471	26.0

Table 4-30. Impacts to Environmental Justice Populations between 1 and 3 miles of Subroute 4C3												
County	**Census Tract**	**High Impact**	**Moderate Impact**	**Low Impact**	**Population Density[1]**	**Total Population[2]**	**Hispanic**	**Hispanic Percent of Total**	**Other Minority**	**Other Percent of Total**	**Low-income**	**Low-income Percent of Total**
	26.01			●	5,481.30	6,494	3,819	58.8	2,816	43.4	3,096	47.7
	26.02			●	6,776.50	5,184	1,851	35.7	1,445	27.9	1,663	32.1
	27.01			●	5,490.30	6,066	1,409	23.2	1,677	27.6	1,273	21.0
	35.01			●	7,289.70	8,112	5,096	62.8	3,808	46.9	2,670	32.9
	37.01			●	8,721.60	9,192	7,720	84.0	4,266	46.4	2,840	30.9
	37.02			●	6,534.20	7,912	6,952	87.9	4,500	56.9	3,818	48.3
	37.04			●	8,012.50	5,296	4,813	90.9	3,216	60.7	1,511	28.5
	38.01			●	10,184.40	3,871	3,458	89.3	1,892	48.9	1,052	27.2
	38.02			●	5,075.00	5,608	5,236	93.4	2,661	47.5	2,052	36.6
	39.01			●	3,128.60	2,196	2,110	96.1	911	41.5	337	15.3
	39.02			●	3,769.10	2,752	2,393	87.0	978	35.5	739	26.9
	41.06			●	169.8	8,125	4,762	58.6	3,617	44.5	2,095	25.8
	43.1			●	446.1	1,623	1,008	62.1	893	55.0	229	14.1
	44.11			●	1,042.30	6,940	2,222	32.0	2,207	31.8	1,837	26.5
	44.14			●	4,787.30	3,707	2,174	58.6	1,396	37.7	330	8.9
	44.19			●	191.9	7,084	1,990	28.1	1,398	19.7	1,117	15.8
	44.2			●	144.5	5,272	1,712	32.5	1,438	27.3	991	18.8
	45.07			●	4,062.30	7,954	2,120	26.7	1,202	15.1	1,766	22.2
	45.08			●	3,950.40	5,120	1,621	31.7	710	13.9	1,166	22.8
	46.26			●	5,915.60	3,415	751	22.0	861	25.2	588	17.2
Totals					**4743.2[3]**	**172,230**	**86,169**	**50.0**	**58,746**	**34.1**	**49,106**	**28.5**

[1] Number of people per square mile
[2] Represents total population and does not equal total of races or ethnicities presented in other columns.
[3] Represents average population density per square mile for all census tracts combined.
Source: U.S. Census 2005-2009 ACS

The average population in these areas is 4,743.2 people per square mile, with a population total of approximately 172,000 residents. Approximately 50 percent of the residents are Hispanic and 30 percent are below the poverty level.

Local Alternative Links

Alternative links F81a and F81b north of Subroute 4C3 could experience high impacts to environmental justice populations; though impacts are expected to be slightly less disproportional than expected for links F111 and F112. Section 3.10 identified 119 residences, 48 commercial and industrial, and 4 other properties that could be acquired. Only 23 of these properties (13.5 percent) were located in census tracts that did not contain environmental justice populations. Of the 23 properties, only 2 were residences; signifying that 117 of the 119 residences (98.3 percent) were located in low-income environmental justice census tracts.

Approximately three-fourths of the commercial (including office) properties (76.2 percent) were located in environmental justice census tracts.

Impacts across these 10 census tracts are expected to be high[1]. The same type of public opposition discussed for south Tucson routes may result from low-, medium-, and high-income residents within proximity to north Tucson routes.

Route Group 4 – Summary of Impacts

Impacts are expected to be the highest in the Tucson metropolitan area (Subroute 4C3), where large numbers of environmental justice populations are expected to be disproportionately impacted by a large amount of residential, commercial, and industrial property condemnation. The local alternative links for Subroute 4C3 would result in fewer impacts to environmental justice populations, but would still result in a disproportionate impact to these populations. Moderate impacts are expected to result from Subroute 4C1 and 4C2 near the communities of San Manuel, Mammoth, and Oracle; however, these impacts are not expected to be disproportionate and therefore are not considered significant impacts to environmental justice populations. The fewest impacts to environmental justice populations are expected to take place along subroutes 4A and 4B.

4.14.3.5 Overhead Transmission Line Options and Substations

Of the two design options presented for the Project, impacts to environmental justice populations are expected to be similar for Option A and Option B. The type of overhead transmission line system determines the size of each substation that would need to be constructed. The planned Pinal Central Substation (located in census tract 12) is the only substation located in proximity to potential environmental justice populations. Construction of Option A is expected to result in 5 acres of temporary disturbance and no permanent disturbance. Because expected disturbance for this option is minimal, additional impacts to environmental justice populations are not anticipated in census tract 12, beyond construction of the transmission lines. The construction of the DC line presented in Option B would require the temporary disturbance of 10 acres and permanent disturbance of 45 acres associated with the expansion of the planned Pinal Central Substation. This disturbance would further impact environmental justice populations. Therefore, in some places, impacts could increase from moderate to high for populations located closest to the substation.

4.14.3.6 Summary of BLM Preferred Alternative

No significant impacts to environmental justice populations are expected to result from the construction and operation of the BLM preferred alternative.

[1] Due to proximity (less than 3 miles), links F111 and F112 (southern Tucson routes) and local alternatives F81a and F81b (northern Tucson routes) have the potential to impact the same census tracts. The Pima County environmental census tracts along links F81a and F81b are not included in a table and consist of only low-income census tracts. These tracts include tracts 27.01, 27.02, 28.01, 29.03, 30.01, 40.10, 45.06, 45.07, 45.08, and 45.09.

4.15 HEALTH AND SAFETY/HAZARDOUS MATERIALS

4.15.1 Introduction

This section describes the potential impacts from EMFs, audible noise, radio and television interference, environmental contamination, and hazardous materials related to construction, operation, and decommissioning of the proposed Project. Potential emissions of pollutants considered harmful to public health and the environment are discussed in Section 4.2, Climate and Air Quality (also see Table 3-2, Ambient Air Quality Standards).

4.15.2 Impact Assessment Methodology

A *Preliminary EMF and Corona Effects Study* was prepared for the Project (Schaerer et al. 2011). This study analyzed the two different options that may be implemented under the Proposed Action, Option A and Option B.

EMFs and corona effects were analyzed using the Bonneville Power Administration's Corona and Field Effects Program software, for a variety of conductor configurations and minimum conductor heights relating to options A and B. EMF, audible noise, and radio and television interference from a transmission line are based on the electrical and physical characteristics of the transmission line. The Corona and Field Effects Program uses the electrical and physical characteristics of the transmission line to calculate resulting fields and interference effects. Once values were calculated, they were compared to recommended limits for EMF based on the International Commission on Non-Ionizing Radiation Protection (ICNIRP).

The impacts for Option B (one 500 kV AC line and one 500 kV DC line) that would yield the maximum level of effect are described below.

The ADEQ monitors hazardous waste in Arizona (AAC Title 18, Chapter 8 describes hazardous waste management for Arizona); and the NMED monitors hazardous waste in New Mexico (NMAC Title 20, Chapter 4 describes hazardous waste management for New Mexico).

A variety of chemicals and hazardous substances would be used during construction of the Project. The storage, handling, and use of all chemicals would be conducted in accordance with applicable laws, ordinances, and regulations.

4.15.2.1 Significant Impacts

Under the NEPA, significant effects on public health and safety or from hazardous materials would occur if the Project would:

- expose people residing or working in the vicinity of the Project area or structures to safety hazards or a significant risk of loss, injury, or death
- use, store, or dispose of petroleum products or hazardous materials in a manner that results in a release to the aquatic or terrestrial environment in an amount equal to or

greater than the acceptable quantity for that material, or creates a substantial risk to human health

- mobilize contaminants currently existing in the soil, groundwater, or underground storage tanks, creating potential pathways of exposure to humans or wildlife that would result in exposure to contaminants at levels that could be harmful
- expose workers to contaminated or hazardous materials at levels in excess of those permitted by OSHA in 29 CFR §1910, or expose members of the public to direct or indirect contact with hazardous materials from the Project's construction or operation

4.15.3 Impact Analysis Results

4.15.3.1 No Action Alternative

Under the No Action alternative, the BLM would not approve the Applicant's right-of-way application and would continue to manage the land encompassing the Project area. It is expected that the site would continue to remain in its existing condition, with no new structures or facilities constructed or operated on the site. As a result, no hazardous materials would be used and no impacts related to the use of hazardous materials would occur.

4.15.3.2 Action Alternatives

Electric and Magnetic Fields

Since neither Arizona nor New Mexico has any established limits on EMF levels, this analysis defers to the ICNIRP (1998), which publishes recommended limits for EMF based on a collaboration of international scientists. These guidelines are more stringent than the guidelines presented by the IEEE. The ICNIRP and IEEE values are expressed as reference exposure limits for both occupational and general public exposure.

Electric Field

The electric field strength is a measure of the force per unit charge at a given point in space relative to a charged object, and is measured in kilovolts per meter (kV/m). ICNIRP reference levels for electric field strength are 8.33 kV/m for occupational exposure and 4.16 kV/m for general public exposure. At the edge of the right-of-way, electric field levels are 2.6 kV/m, which is well below the reference level for general public exposure. The average electric field level within the right-of-way is 5.6 kV/m, which is above the general public exposure reference level but below the level for occupational exposure. The maximum potential electric field level within the right-of-way is 12.0 kV/m, which is above the reference level for both occupational and general public exposure. It should be noted that this electric field level is applicable only to Option B (see 4.15.2). During periods of outage on one of the DC line conductors, the electric current at ground-surface level resulting from ground electrode use would remain at essentially zero. Should both lines use AC, the maximum electric field level within the right-of-way would

be 9.1 kV/m, with an average level of 5.3 kV/m. The electric field levels at the right-of-way are projected to be well below the reference levels, at 2.6 kV/m (Schaerer et al. 2011).

Magnetic Field

Magnetic field values are the magnetic flux density at a given point in space, which is measured in milligauss (mG). ICNIRP reference levels for magnetic flux density are 4,167 mG for occupational exposure and 833 mG for general public exposure. Under all potential alignment configurations, all magnetic field levels are projected to be well under the ICNIRP reference level for general public exposure. The maximum potential level within the right-of-way would be 496.6 mG (Schaerer et al. 2011).

Audible Noise

Construction Noise

During construction, noise would be generated by the equipment used for grading (access roads, structures, and substations), assembly and erection of towers, wire pulling and splicing, equipment installation (substations), and rehabilitation activities (Table 4-31). Estimates of noise from these activities are complicated by the fact that noise levels continuously rise and fall (i.e., the quantity, distribution, and usage of equipment vary with the type of activity). The closest sensitive receptors are residences within 200 feet of the proposed centerline.

Table 4-31. Typical Noise Levels for Construction Equipment

Equipment	Typical Noise Levels (dBA from 50 feet)
Front loaders	85
Backhoes, excavators	80-85
Tractors, dozers	83-89
Graders, scrapers	85-89
Trucks	88
Concrete pumps, mixers	82-85
Cranes (movable)	83
Cranes (derrick)	88
Forklifts	76-82
Pumps	76
Generators	81
Compressors	83
Pneumatic tools	85
Jack hammers, rock drills	98
Pavers	89
Compactors	82
Drill rigs	70-85
Source: CPUC and BLM 2006	

In determining the impacts of noise, the important factor is the proximity of the activity to wildlife and the persons detecting the sound. The Project area is primarily located in rural open space with background noise typical of such settings. Wildlife most likely would avoid temporary construction disturbance. Where construction would occur near more populated areas, the noise from IEEE construction (and subsequent maintenance) might be audible and could result in temporary high impacts; however, such noise would be short-term and possibly considered only as a nuisance. Given the temporary nature of construction of the Project, impacts from noise are anticipated to be negligible.

Transmission Line and Substation Noise

Audible noise is measured as dBA and calculated at a height of 5 feet above the ground, per IEEE Standard 656-1992. There are no national or state regulations for audible noise levels from transmission lines; however, EPA guidelines recommend levels below 55 dBA for a day-night average in the outdoors. When applied to transmission lines, this is often measured at the edge of the right-of-way. Conductors are most audible when wet. Therefore, analysis was conducted assuming foul weather conditions. Based on these conditions, audible noise levels are under the EPA recommended level of 55 dBA. The highest noise level within the right-of-way was 49.3 dBA, with an average of 47.7 dBA (Schaerer et al. 2011). Therefore, noise levels would be well below the EPA recommended levels of 55 dBA, once the lines are operable.

Noise Ordinances

The City of Tucson adopted the Neighborhood Preservation Ordinance (NPO)—including Section 16-31, Excessive Noise—which addresses limits to residential, commercial, and industrial properties and provides limits to sound levels that carry beyond the property line. Audible noise produced by substations and transmission lines would fall well below the strictest threshold of 62 dBA within residential areas established in the NPO. Noise related to construction activities is exempt from the NPO from sunrise to 8:00 p.m., Monday to Saturday, except legal holidays.

Interference

Radio and television interference is the degradation of a radio signal by radio frequency electromagnetic disturbances, and is reported as the field strength of the interference. This interference is measured in decibels of one microvolt per meter (dBμV/m).

Radio Interference

The Radio Noise Design Guide recommends a radio interference limit of 38 dBμV/m for HVTLs. Within the right-of-way, interference would have an average level of 40.7 dBμV/m, with a possible maximum of 50.0 dBμV/m. At the edge of the right-of-way, the level of interference is predicted to be at or below the recommended 38 dBμV/m (Schaerer et al. 2011).

Television Interference

Television interference due to transmission lines has not been heavily studied under the new digital television program. There are currently no set guidelines established; however, the Federal Communication Commission has indicated that a signal-to-random noise ratio of 17 dB or greater should be sufficient for reception. Based on this information, a rough limit of 19 dBμV/m was given for television interference for this Project. The predicted average interference within the right-of-way is 22.1 dBμV/m, with a maximum of 30.5 dBμV/m. At the edge of the right-of-way, the interference is predicted to be below the limit of 19 dBμV/m (Schaerer et al. 2011).

Hazardous Materials

Construction and operations activities would comply with all applicable federal, state, and local regulations regarding the use of hazardous substances. Hazardous materials would not be drained onto the ground or into streams or drainage areas. Totally enclosed containment would be provided for all trash. All construction waste, including trash, litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials, would be removed and transported to a disposal facility authorized to accept such materials.

The construction or maintenance supervisor would ensure that all applicable federal, state, and local laws are obeyed. These include, but are not limited to, the RCRA; CERCLA; Toxic Substance Control Act; state regulations; Clean Air Act; CWA; and emergency planning and community right-to-know. In addition, regulations of the OSHA would be followed. Health and safety procedures to respond to accidental release of hazardous materials would be developed as part of the POD, during the engineering design phase of the Project. The Applicant would coordinate with the land-management agencies to incorporate specific agency requirements into the POD.

Petroleum products such as gasoline, diesel fuel, crankcase oil, lubricants, and cleaning solvents would be present onsite during construction. These products would be used to fuel, lubricate, and clean vehicles and equipment, and would be contained within fuel trucks or in approved containers. When not in use, such materials would be stored properly to prevent drainage or accidents.

Sulfur Hexafluoride

SF_6 is an inorganic compound that is colorless, odorless, nontoxic, and nonflammable (under standard conditions). It is generally transported as a liquefied compressed gas. SF_6 is used in a number of applications, including as a gaseous dielectric medium in the electrical industry for insulation and current interruption in electric transmission and distribution equipment; it is a gaseous dielectric medium for high-voltage (345 kV and greater) circuit breakers, switchgear, and other electrical equipment. SF_6 gas under pressure is used as an insulator in gas-insulated switchgear, because it has a much higher dielectric strength than air or dry N_2, making it possible to significantly reduce the size of electrical gear. This makes gas-insulated switchgear more suitable for certain purposes such as indoor placement, as opposed to air-insulated electrical gear, which takes up considerably more room. Gas-insulated electrical gear is also more resistant

to the effects of pollution and climate, as well as being more reliable in long-term operation because of its controlled operating environment.

SF_6 is considered a highly potent GHG with a global warming potential greater than that of CO_2, when compared over a 100-year period. The EPA (2008) is concerned that if SF_6 should leak from electrical equipment, it would contribute to global warming. Currently, the EPA is collaborating with the electric power industry by forming the SF_6 Emission Reduction Partnership for Electric Power Systems, with the goal of identifying and implementing cost-effective solutions to reduce the use of this GHG.

The circuit breakers at each of the substations would be filled with SF_6. There would be a small amount of ongoing leakage of SF_6 over time, resulting in emissions of this pollutant.

4.16 EFFECTS OF THE UNDERGROUND MITIGATION ALTERNATIVE

4.16.1 Introduction

In response to public concerns about the risk of migratory birds colliding with overhead transmission lines crossing the Rio Grande, the feasibility of building the proposed transmission lines underground was evaluated. Two studies were completed in order to evaluate whether burying a segment of the proposed transmission lines beneath the river crossing would be warranted for the Project. The first study, which was conducted between 2009 and 2010, concluded that there would be a minimal risk of mortality to Sandhill Cranes and other waterfowl as a result of collisions with overhead transmission lines. The results of this study are summarized in the biological resource impact analysis (Section 4.6.4.4). A technical feasibility study was also conducted to evaluate the operational, economic and other environmental factors associated with underground transmission lines, and is described below (SunZia 2011).

The feasibility study included a comparison of the estimated costs associated with undergrounding and the costs for equivalent overhead transmission line facilities. Two segment distances for the representative underground cable river crossing were evaluated as follows:

- Approximately 1,650 feet, which represents the minimum underground distance required to cross the river and adjacent canals. This crossing would require 1,800 feet of cable in order to transition from under the river to the surface-level transition stations.
- Approximately 12,000 feet (2.3 miles), which would be the distance necessary to cross the river and adjacent floodplain, agriculture, and densely vegetated areas.

The cost analysis identified low- and high-range cost estimates for various Project options associated with potential underground cable systems. The majority of underground transmission projects in recent years have used XLPE technology, and that system was evaluated because it is likely the most technically feasible option.[1] For comparison, estimates of typical overhead

[1] The alternative transmission line cable system technologies are described in Chapter 2, Section 2.3.3.2. The cost analysis is based on 500 kV AC cables, because 500 kV DC cables using XLPE insulation are presently not feasible. The low-range cost represents the lowest manufacturer estimate for materials, does not include circuit breakers within the transition stations, and

transmission line construction costs and underground transmission line costs are included in Table 4-32.

Table 4-32. Cost Estimate Ranges

Length and Cost Range	Underground		Overhead[1]	
	One Circuit	Two Circuits	One Circuit	Two Circuits
1,650-foot Low Range	$15,921,130	$31,453,275	$407,694	$815,388
1,650-foot High Range	$21,730,882	$43,081,519	—	—
12,000-foot Low Range	$44,965,163	$90,093,136	$2,729,462	$5,458,924
12,000-foot High Range	$56,667,285	$113,490,595	—	—

[1] A range of cost estimates is not necessary to evaluate estimated overhead line costs, because overhead 500 kV transmission line construction is a common practice and costs are better known.

The cost of a 1,650-foot underground segment of 500 kV transmission line would be approximately 39 to 52 times greater than the cost of a similar length of overhead 500 kV transmission line. The cost of a 12,000-foot underground segment of 500 kV transmission line would be approximately 16 to 21 times greater than a similar length of overhead 500 kV transmission line.

In addition, the risk of operational problems for underground transmission lines is greater, and the repair time for outages is normally much longer than that for overhead transmission lines. Outages on overhead transmission lines are most often caused by weather-related events (e.g., lightning or strong storms) or accidental collisions with conductors or structures. Outages on an overhead transmission line are typically repaired within 24 hours, because the damaged areas are relatively easy to locate, access, and repair. Outages on underground transmission lines are most often the result of ground excavation in the vicinity of the buried cables, or a failure of accessories such as terminations and splices. The typical time needed to repair failure of accessories such as terminations and splices is often lengthy, because additional effort is required to identify, access, expose, and repair the damaged component; possibly taking several days or weeks to fully restore service. The worst-case scenario for a 500 kV underground transmission line is that it could take months to repair if new cables need to be manufactured. A consistently operating transmission line is necessary to maintain the overall integrity of the regional transmission system and to provide power to consumers. The potential long-term outages associated with an underground 500 kV transmission line would be unacceptable for a circuit carrying bulk power to major load centers.

As discussed above, the costs to safely install underground transmission lines would be considerably higher than comparable overhead line construction. Operational risks and maintenance concerns would also be greater with underground transmission than with overhead lines.

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does not include an in-service spare cable. The high-range cost represents the highest manufacturer estimate for materials, includes circuit breakers within the transition stations, and includes an in-service spare cable. The in-service spare cable would be intended to reduce outage times in the event of a cable failure. It would represent approximately 6 percent of the total cost for the 1,650-foot scenario, and approximately 8 percent of the total cost for the 12,000-foot scenario.

The XLPE cables are typically placed in duct banks in an excavated trench up to approximately 10 feet deep, with manhole access to vaults for cable splicing and maintenance placed approximately every 1,500 to 1,700 feet. Crossing under the Rio Grande would require Horizontal Directional Drilling (HDD), placing the duct banks at a depth of approximately 20 feet below the riverbed. The underground alternative's two 500 kV XLPE cable system circuits would require a total of four duct banks, all within a 100-foot right-of-way when trenches are used, and 140 feet wide in the HDD section. Transition stations are required to connect the XLPE cables to overhead lines, and to transition from the excavated trenches to the HDD river crossing. Transition stations are superficially similar to electrical substations, and each would be approximately 350 feet by 600 feet (4.8 acres). Work areas approximately 350 feet by 600 feet would also be required adjacent to each transition station.

Overhead transmission and two underground alternatives for crossing the Rio Grande floodplain are discussed in this section, for each proposed crossing location. The HDD-only alternative includes overhead transmission lines located within the floodplain connecting to one transition station on each side of the river, and an HDD crossing under the river and adjacent canals. The full-floodplain alternative includes transition stations at the outer edges of the floodplain and at each riverbank for a total of four, and an HDD crossing under the river and canals.

The San Antonio Crossing would require an HDD length of 1,650 feet. The full-floodplain alternative is approximately 12,000 feet long, requiring approximately 7,950 feet of excavated trench to connect the four transition stations. The North Crossing would require an HDD length of 1,750 feet. The full-floodplain alternative is approximately 6,500 feet long, requiring approximately 2,350 feet of excavated trench to connect the four transition stations. Engineering has not been completed for the North Crossing, and the floodplain may not be wide enough at this point for the four transition stations needed in the full-floodplain alternative. However, the estimated configuration is included in the discussion to allow comparison of all alternatives.

All underground or overhead alternatives would result in temporary and permanent disturbance to agricultural fields and riparian vegetation (Table 4-33). Much of the Rio Grande floodplain is occupied by cultivated farmland, where new sources of temporary ground disturbance would have a low impact on many sensitive resources, although land use and deeply buried cultural artifacts may be affected. Overhead lines in the remainder of the floodplain are required to reach the HDD transition stations near the river in the HDD-only alternatives. Disturbance associated with those overhead lines is included in the acreage estimate in Table 4-33, so that all estimates are for comparable lengths of transmission line across the entire floodplain.

Table 4-33. Ground Disturbance for Rio Grande Crossing Alternatives

Alternative	Ground Disturbance (Acres)[1]		
	Disturbance within Native Vegetation	Disturbance within Farmland	Total Ground Disturbance
North Crossing			
Overhead alternative	9.5	8.7	18.2
HDD-only alternative (1,750 feet underground)	14.2	13.3	27.5
Full-floodplain alternative (6,500 feet underground)	23.4	20.4	43.8

Table 4-33. Ground Disturbance for Rio Grande Crossing Alternatives			
Alternative	Ground Disturbance (Acres)[1]		
	Disturbance within Native Vegetation	Disturbance within Farmland	Total Ground Disturbance
San Antonio Crossing			
Overhead alternative	10.1	15.4	25.5
HDD-only alternative (1,650 feet underground)	18.9	18.6	37.5
Full-floodplain alternative (12,000 feet underground)	21.9	32.8	54.7
[1] A portion of this total is temporary disturbance that may be restored			

4.16.2 Soil Resources

At the San Antonio Crossing, the HDD-only alternative would occur over approximately 1,650 feet, include two transition stations, and require 9.6 acres of permanent disturbance. The open-trenching alternative would occur over approximately 12,000 feet, include open trenching and four transition stations, and require 19.5 acres of permanent disturbance. The permanently disturbed area under both alternatives, including the acreage occupied by the transition stations, could result in disturbance of soils that are moderately to highly susceptible to water erosion and moderately susceptible to wind erosion. Mitigation measures applied elsewhere in the Project area where surface disturbance would occur, would minimize permanent residual impacts to soil resources.

At the North Crossing (Link E180), the HDD-only alternative would occur over approximately 1,750 feet and would include two transition stations, resulting in permanent disturbance of 10.2 acres. The open-trenching alternative would occur over approximately 6,500 feet and include open trenching and four transition stations. The permanently disturbed 13-acre area would be trenched and occupied by transition stations. Both alternatives could result in disturbance of soils that are moderately to highly susceptible to water erosion and moderately susceptible to wind erosion. Mitigation measures applied elsewhere in the Project area where surface disturbance would occur would minimize permanent residual impacts to soil resources.

No designated Prime or Unique Farmland soils are present within the areas of effect for either underground crossing method.

4.16.3 Paleontological Resources

No fossil localities were identified within 1 mile of the centerline for Link A140, including at either crossing. The closest fossil locality is an early Pleistocene locality within 1 mile of Link A112, which is approximately 2 miles from the eastern end of the proposed underground cable system.

The Underground Transmission Line would have a greater potential to impact paleontological Resources at the North Crossing. The centerline for Link E180 crosses two areas with a PFYC of 4 that are less than 1 mile from the Rio Grande. The open-trench alternative has the potential to have the greatest impact to paleontological resources, since it would have a greater area of disturbance than the HDD-only alternative.

4.16.4 Water Resources

A potentially significant impact to water resources for both the North Crossing and the San Antonio Crossing would be to the Rio Grande, which is considered impaired and has restrictions for discharges from nonpoint sources. Project construction would require CWA Section 402 and Section 404 permits, as well as Section 401 Water Quality Certification. There may also be impacts from trenching in areas with shallow groundwater, close to the Rio Grande. The horizontal drilling method could also impact shallow groundwater. Trenching or drilling into shallow groundwater may provide a way for contamination to enter the aquifer. There are no other perennial streams, wells, or springs within 600 feet of the centerline for links E180 or A140 within 1 mile on either side of the Rio Grande.

4.16.5 Biological Resources

An underground crossing of the Rio Grande has the potential to affect two ESA-listed species: the Southwestern Willow Flycatcher and the Rio Grande Silvery Minnow. Critical habitat for both species is present at the San Antonio Crossing and the North River Crossing..

The most substantial terrestrial impacts would be associated with trenching to bury the line in the Rio Grande floodplain. The trenched area would disturb a 100-foot width for the length of the trench. Part of the permanent disturbance would result from construction of underground vaults and associated manholes. In addition, two transition stations (four for the longer alternatives) would disturb an area 350 feet by 600 feet, and two laydown areas each would require 350 feet by 600 feet of disturbed area. These areas of disturbance would be unique to the underground line. In contrast, the overhead line would have ground disturbance associated with the transmission structures, and vegetation maintenance may occur within an approximate 400-foot-wide corridor. Access roads would be required for both underground and overhead alternatives.

The greatest impact to Southwestern Willow Flycatcher critical habitat would be habitat loss resulting from vegetation management required for each of the alternatives. Vegetation management for overhead transmission lines requires the trimming or removal of large trees, but shrubs and low-growing trees may be allowed within the right-of-way under some conditions. Vegetation management for the safety of the duct banks for the underground alternative precludes any trees or plants with deep, invasive roots in the vicinity of the right-of-way. The overhead alternative, then, may require moderate levels of vegetation management in a 400-foot-wide right-of-way; while the underground alternative would require very aggressive vegetation management within a more narrow corridor, perhaps 200 feet wide (Table 4-34). In addition, a transition station would be partially located within riparian woodlands on the east bank of the Rio Grande for all of the underground alternatives.

Table 4-34. Affected Southwestern Willow Flycatcher Critical Habitat			
Alternative	Critical Habitat affected (acres)		
	Ground disturbance	Vegetation management	Total
North Crossing[1]			
Overhead alternative	5.7	15.9	21.6
HDD-only alternative (1,750 feet underground)	7.1	6.4	13.5
Full-floodplain alternative (6,500 feet underground)	7.5	4.7	12.2
San Antonio Crossing (all designated critical habitat)			
Overhead alternative	10.1	14.1	25.5
HDD-only alternative (1,650 feet underground)	18.9	18.6	37.5
Full-floodplain alternative (12,000 feet underground)	21.9	32.8	54.7
San Antonio Crossing (presently suitable nesting habitat only)[2]			
Overhead alternative	1.9	8.0	9.9
HDD-only alternative (1,650 feet underground)	2.8	3.3	6.1
Full-floodplain alternative (12,000 feet underground)	2.8	3.3	6.1

[1]Estimates of ground disturbance and vegetation management for the overhead alternative at the North Crossing are based on preliminary engineering that was completed for the BLM preferred alternative. Estimates at the San Antonio Crossing are based on typical conditions presented in the Project description.
[2] Suitable Southwestern Willow Flycatcher nesting habitat in riparian woodland only occurs at the San Antonio crossing at present.

While future vegetation management could permit suitable Southwestern Willow Flycatcher nesting habitat to recover within the floodplain, there is currently only a small area of dense willows and large cottonwoods at the San Antonio Crossing. Much of the eastern side of the San Antonio Crossing floodplain within designated critical habitat, formerly a large stand of tamarisk, burned in 2005 and is now dominated by weeds and annual grasses. Vegetation at the North Crossing consists of an open-canopy forest dominated by cottonwoods and Russian olives, with small numbers of tamarisk, willows, and other trees. Dense, suitable nesting habitat is present only in very small areas, if at all. The extent of future riparian woodland recovery cannot be estimated at this time at either crossing; however, effects to future recovery of critical habitat would be fully considered during Section 7 consultation with the USFWS.

The active channel of the Rio Grande and 300 feet of the adjacent floodplain (unless bounded by levees nearer than 300 feet) were designated as critical habitat for the Rio Grande Silvery Minnow. Ground disturbance in the surrounding floodplain may result in runoff carrying increased amounts of sediment into the river, thus affecting critical habitat for the minnow. Potential effects to critical habitat for this species would therefore increase with the amount of ground disturbance within the entire floodplain, as presented in Table 4-34. Any increase in erosion and sedimentation could also affect all other species present in the Rio Grande, such as aquatic birds, fish, reptiles, and amphibians.

The underground transmission line crossing the Rio Grande would affect other organisms, especially riparian birds, mammals, invertebrates, and plants. An example would be the Yellow-billed Cuckoo, a candidate for listing under the ESA; but there are many other species with no special status. Desert riparian systems are centers of biodiversity, largely because they contain unique assemblages of plants and animals dependent on them for water, a scarce resource throughout much of the Southwest.

A potential benefit of underground transmission lines is that the risk of bird collisions with overhead transmission lines is reduced or avoided. The risk of avian collision with power lines is dependent on site-specific conditions, including land use and proximity to feeding or roost sites. In the case of this Project, where the species of highest concern are Sandhill Cranes, Snow Geese, and other waterfowl, mortality from collision with transmission lines (EPG 2011) would be a very small addition to the natural mortality and hunting that these species withstand (see Section 4.17.4.6). Although the underground alternatives may reduce collision risk, impacts to the Southwestern Willow Flycatcher and other riparian species would increase with the intensive vegetation management needed for duct bank safety and the siting of transition stations in the floodplain.

4.16.6 Cultural Resources

The 1,650-foot (San Antonio Crossing) and 1,750-foot (North Crossing) segments would involve installation underneath the river for the HDD-only alternatives. Based on the preliminary design work, it is anticipated that the HDD installation under the river could extend up to 20 feet below the river grade, with a right-of-way width of 140 feet. Evidence of past land use would most likely be buried by silt deposits as the the river may have shifted over time. It is possible that buried features associated with resource procurement may be located within the flood plain. Currently, no known sites are recorded in this location, although the San Antonio irrigation ditch may be historic. The proposed HDD alternatives would most likely avoid impacting the feature. Cultural resource impacts for the HDD-only alternatives would most likely occur from buried sites that are currently unknown.

The longer 12,000-foot (San Antonio Crossing) and 6,500-foot (North Crossing) segments would involve HDD installation underneath the river and excavation of trenches to bury the transmission line the remainder (6,000 to 10,000 feet) of the distance. As mentioned above, the HDD-only alternative currently has no known sites recorded in this location, although some of the linear features may be historic. The trench excavation is anticipated to disturb a corridor 100 feet wide, with a trench depth between 6 and 10 feet. Depending on the termination of the longer segment, there is a possibility of impacting El Camino Real Trail, linear canal features that may be historic, and possibly some known archaeological sites. Other impacts to cultural resources could occur through unanticipated discoveries identified during the trench excavations. Types of cultural resources that may be present in the floodplain include resource procurement and temporary habitation features.

4.16.7 Visual Resources

Generally, the HDD-only alternatives would remove riparian vegetation for two transition areas that would be needed on each side of the river. The HDD-only alternatives would minimize landscape contrast (when compared to the open-trenching alternatives), because clearing of riparian vegetation would be limited to areas immediately adjacent to the river associated with the transition areas. Additional floodplain clearing would be required (for both riparian and agriculture vegetation) for the open-trenching alternative, which would result in greater landscape contrast than the HDD-only alternative. Overall, the overhead transmission line alternative would have lower landscape contrast than both underground alternatives because vegetation clearing at riparian crossings would be spanned to the extent practicable. Vegetation removal along the river and within the floodplain would be limited to structure pad areas and spur roads.

Transition areas would be required for both underground alternatives and would be similar to a switchyard or substation facility. Although a total of four transition areas would be required for the open-trenching alternative, structure contrast would be reduced as compared to the HDD-only and overhead transmission line alternatives. The HDD-only alternative would underground the transmission line for a short duration to cross the river, whereas the open-trenching alternative would underground the line for the entire floodplain.

Near Socorro, the Rio Grande is associated with Class A scenery and Class B scenery is primarily associated with the adjacent floodplain and agricultural areas. Although the Rio Grande has been channelized in this area, riparian vegetation is abundant along the river and extends beyond the river banks into the adjacent floodplain. Due to the presence of dense, tall riparian vegetation, strong landscape contrast would be introduced where riparian vegetation would be completely removed to accommodate clearing associated with the underground portion of either alternative. Recreation viewers associated with KOP SO16 (Rio Grande) would have views of both underground alternatives within the foreground distance zone. Vegetation clearing may be apparent for these viewers; however, the transition areas may be screened by riparian vegetation from this viewpoint, which would reduce visual contrast. Vegetation clearing associated with the overhead transmission would not be as substantial; however, the structures would be visible above the riparian vegetation when crossing the river. Travel route viewers along SR 408 (SO17 and SO18) would have views of the open-trenching alternative and transition areas that would traverse the floodplain. Structure contrast would be reduced when undergrounded and removal of vegetation would primarily occur within agricultural land; thus, landscape contrast would be reduced. The open-trenching alternative may reduce impacts for residences with views of the entire floodplain near Socorro, because structure contrast would be reduced. Residences with views of the HDD-only alternative would have views of structure contrast and landscape contrast associated with the transition areas and overhead transmission lines crossing the floodplain. When compared with the overhead transmission line alternative, the HDD-only may result in greater visual contrast due to the presence of both overhead transmission line and transition area facilities and clearing associated with riparian vegetation.

The crossing near San Antonio is also associated with Class A and B scenery similar to the northern crossing; however, riparian vegetation is not as abundant along the river and the adjacent floodplains have been converted to agriculture. Resulting contrast would be strong

where riparian vegetation would be removed to allow underground construction, although vegetation removal would not be as extensive as the northern crossing. Residential viewers associated with KOPs SO20 and SO21 would have views of the open-trenching alternative and transition areas that would traverse the floodplain. Structure contrast would be reduced when undergrounded, and removal of vegetation would primarily occur within agricultural land; thus, landscape contrast would be reduced. Residences with views of the HDD-only alternative would have views of structure contrast and landscape contrast associated with the transition areas and overhead transmission lines crossing the floodplain. Riparian vegetation clearing at the San Antonio Crossing would not be as substantial as the Northern Crossing; thus, impacts to scenery and viewing locations would be lower for the underground alternatives.

4.16.8 Land Use

All impacts to land use within the Rio Grande floodplain for any of the crossing alternatives are restricted to temporary or permanent loss of production in flood-irrigated agricultural fields. Although guyed-"V" structures are the standard design proposed for the Project, tubular steel monopole structures would be used in agricultural fields as a mitigation measure to minimize loss of production. Each structure would still require a 200-foot by 200-foot work area, but 25 to 50 percent of this area could be cultivated following construction. For the purposes of this discussion, the entire work areas are included as permanent loss of production as the area still useable for farming activities depends on details of structure siting, cultivation techniques, and configuration of the surrounding field.

Preliminary engineering indicates that some farming activities may be restricted or changed, but not completely eliminated, within the 100-foot right-of-way used for the excavated trench in the full-floodplain alternative. Crops with shallow roots, and those that do not need deep cultivation, may be allowed within the right-of-way. Light farm equipment may not be restricted, although heavy equipment, storage of large volumes of materials such as hay bales, and permanent structures would not be permitted.

In the HDD-only alternative at the San Antonio Crossing, permanent impacts to existing land use would result from the siting of 10 overhead transmission structures and one transition station in flood-irrigated agricultural fields, resulting in a total permanent disturbance of approximately 14 acres. Preliminary engineering for overhead structures indicates that no additional access roads would be required, and that all ground disturbance would be contained within a 200-foot by 200-foot work area. Temporary disturbance within farmland may include a work area 350 feet by 600 feet associated with construction of the transition station, which would result in a net temporary loss of approximately 4.8 acres of production.

In the full-floodplain alternative at the San Antonio Crossing, the direct land use impacts would include crossing six agricultural fields. Two transition stations sited in agricultural fields would result in a permanent disturbance and loss of production of up to 9.6 acres. Three manholes would be required within farmland, totaling approximately 0.14 acre of permanent disturbance. An existing access road is located within approximately 200 feet of the Project centerline. From this existing road, a 24-foot-wide spur road could be constructed to each manhole, resulting in permanent disturbance of up to 0.24 acre. Temporary disturbance associated with the excavated trench would occur for approximately 4,100 feet in a right-of-way 100 feet wide, resulting in a

temporary loss of production of 9.4 acres. Two work areas could be associated with the transition stations, resulting in an additional 9.6 acres of temporary loss of production. The total permanent disturbance to farmland for this option would be approximately 10 acres, and temporary disturbance would be approximately 19.1 acres.

The overhead alternative would require a total of 12 transmission structures, each with an associated work area 200 by 200 feet, for a total potential permanent loss of 11 acres of production. The work areas may extend to nearby existing roads, possibly eliminating the need for spur roads.

In the HDD-only alternative at the North Crossing, permanent impacts to existing land use would result from the siting of four overhead transmission structures and one transition station in flood-irrigated agricultural fields, resulting in a total permanent disturbance of approximately 8.5 acres. Similar to the San Antonio Crossing, existing access is likely to be adequate and no additional roads would be required. Temporary disturbance within farmland may include a work area 350 feet by 600 feet associated with construction of the transition station, which would result in a net temporary loss of approximately 4.8 acres of production.

In the full-floodplain alternative at the North Crossing, the direct land use impacts would include crossing three agricultural fields, all of which are west of the Rio Grande. Two transition stations sited in agricultural fields would result in a permanent disturbance and loss of production of up to 9.6 acres, although one transition station may be located west of the agricultural fields. No manholes would be required in agricultural fields for this alternative, as the distance between transition stations could be spanned with a single reel of XLPE cable. One manhole may be required east of the Rio Grande, depending on final siting of the easternmost transition station, but the manhole location would not affect current land use. Temporary disturbance associated with the excavated trench would occur for approximately 500 feet in a right-of-way 100 feet wide, resulting in a temporary loss of production of 1.1 acres. Two work areas could be associated with the transition stations, resulting in an additional 9.6 acres of temporary loss of production. The total permanent disturbance to farmland for this option would be approximately 9.6 acres, and temporary disturbance would be approximately 10.8 acres.

The overhead alternative would require a total of four transmission structures, each with an associated work area 200 by 200 feet, for a total potentially permanent loss of 3.7 acres of production. The work areas may extend to nearby existing roads, possibly eliminating the need for spur roads.

4.17 CUMULATIVE EFFECTS

4.17.1 Introduction

This section addresses the cumulative effects of the proposed action that would result from the construction and operation of the Project, combined with other reasonably foreseeable future actions.

A cumulative impact, as defined by the CEQ (40 CFR 1508.7), is the impact on the environment that results from the incremental impact of an action when added to other past, present, and

reasonably foreseeable future actions, regardless of what agency (federal or nonfederal) or person undertakes such actions. Cumulative impacts can result from individually minor but collectively significant actions taking place over time. Reasonably foreseeable future actions, while not part of the proposed action, refer to future projections or estimates of what is likely to take place when a proposed action is implemented. This allows for future impacts, cumulative and otherwise, to be estimated as required by the NEPA. Cumulative impacts are interdisciplinary, multijurisdictional, and usually do not conform to political boundaries.

The analyses for potential cumulative effects are presented in the following sections:

Process and Methods of Analysis identifies the general methods and analysis used in analyzing the potential cumulative effects for the Project.

Past, Present, Future, and Reasonably Foreseeable Future Actions identifies land uses, activities, and projects within the Project cumulative areas of analysis; and includes an Energy Development Forecast Analysis that describes potential energy development scenarios. As indicated in this forecast, the projected ground disturbance associated with up to 4,500 MW of potential electrical generation development would be 40,270 acres. Estimates for potential ground disturbance would vary based on site specific conditions, design, and technologies.

Cumulative Effects by Resource analyzes potential cumulative effects by resources for both the Project and energy development scenarios.

4.17.2 Process and Methods of Analysis

Impacts and effects are terms that are recognized to be synonymous by the CEQ (40 CFR 1508.8) and according to the CEQ's *Considering Cumulative Effects under the National Environmental Policy Act* (CEQ 1997b). For this analysis, projects that could result in similar cumulative effects include linear projects such as roads, transmission lines, and pipelines; and large area developments such as military installations, planned area developments, substations, conventional and fossil-fueled power plants, and renewable energy developments.

This analysis evaluates the significance of the proposed action's contribution to cumulative effects, which are assessed in three basic steps. The first step is to identify the cumulative effects' study area, or area of analysis, for each resource and relevant period; the second step is to identify and describe past, present, future, and reasonably foreseeable future actions that are similar in kind and effect as the proposed action, or have considerable impact to environmental resources to which the proposed action's effects will cumulatively contribute; and the third step is to evaluate the proposed action for the potential to have cumulative contributions to environmental effects that could significantly affect the environment. It is assumed that mitigation measures as those identified for the SunZia Project could be utilized for similar future or reasonably foreseeable future projects.

The alternative routes for the Project traverse various ecological zones and jurisdictions, both natural and man-made features, and lands with several different owners. Quantitative data describing potential effects of reasonably foreseeable future actions or development were used where available. Where reliable quantitative data could not be found, qualitative data were used

to best assess the cumulative effects of the proposed action, according to the assessment of resource specialists.

The methods used to assess cumulative effects are resource dependent, and include the following:

- *Scoping meetings, interviews, and comments on the Draft EIS* used to identify proposed projects, development plans, environmental resources, local knowledge, and community concerns. Fourteen scoping meetings occurred throughout the Project area, along with numerous interviews with local experts, stakeholders, and various agency staff.
- *Trend analysis* used quantitatively where data allowed, such as for renewable energy development; and qualitatively used when interviewing local experts, such as with land use and development patterns.
- *GIS overlays and impact analysis* used to understand spatial and temporal relationships of the proposed action with past, present, and reasonably foreseeable future actions. In addition, a GIS impact analysis was used to analyze direct and indirect effects of the proposed action's alternatives.
- *Energy development forecast analysis* used to forecast reasonably foreseeable future renewable energy development based on RMPs, local plans, existing and planned energy development projects, typical energy development units (EDU), and transmission facility configurations.

4.17.2.1 Scoping and Project Issues

Numerous issues were identified during the scoping process that resulted in the desire of agencies and residents to expand the study area and range of alternatives. The major areas of concern included the San Pedro River Valley, Aravaipa/Klondyke, Mount Graham/Safford, Bosque del Apache and Sevilleta NWRs, Rio Grande corridor, and military installations.

In addition, a large volume of scoping comments and comments on the Draft EIS identified environmental resources within the study area; especially relating to migratory birds, listed species, habitat fragmentation, preservation of wilderness and wilderness-like areas, cultural resources, aesthetics, private property, property values, and local economies. A thorough review of environmental resources was conducted. Existing conditions are documented in Chapter 3, and include the following:

- Climate and Air Quality
- Earth Resources
- Paleontological Resources
- Water Resources
- Biological Resources
- Wildland Fire Ecology and Management
- Cultural Resources
- Visual Resources
- Land Use and Recreation Resources
- Special Designations

- Wilderness, Wilderness Study Areas, and Wilderness Characteristics
- Social and Economic Conditions
- Environmental Justice Conditions
- Health and Safety/Hazardous Materials

4.17.3 Past, Present, Future, and Reasonably Foreseeable Future Actions

Throughout this portion of Chapter 4, the terms past, present, future, and reasonably foreseeable future are used to apply to projects or any actions within the cumulative area of analysis for a particular resource(s). These terms are defined as follows:

- *Past* refers to a project or other action that resulted in impacts that occurred prior to the preparation of this EIS.
- *Present* refers to a project or other action that would have impacts occurring during the preparation of this EIS.
- *Future* refers to any project or other action that is currently planned for development. Although a project may be designated as "future," this designation does not necessarily mean that it would be constructed and operate in the "reasonably foreseeable" future. The effects of future projects that are currently speculative or unknown, such that there is not enough concrete or finite information allowing for the analysis of the effects associated with the future action, are not fully analyzed herein.
- *Reasonably foreseeable future* refers to future actions or projects "for which there are existing decisions, funding, formal proposals, or which are highly probable, based on known opportunities or trends" (BLM NEPA Handbook at § 6.8.3.4.). To constitute a reasonably foreseeable future action, a project must be concrete enough that consideration of its effects would be useful to the decision-maker.

4.17.3.1 Parameters

Timeframe

Past, present, future, and reasonably foreseeable future actions are relative to the baseline conditions established for the proposed Project. The baseline conditions for the cumulative effects analysis are defined as the No Action alternative. The No Action alternative indicates the BLM would not grant right-of-way; Project facilities, including transmission lines and substations, would not be built; and the existing environmental conditions (including the identification of past and present actions, events, and occurrences as described in Chapter 3) would persist.

Evaluating the proposed action against the baseline conditions provides a reference point in time to gauge cumulative effects. Overall, the timeframe for the cumulative effects analysis is based on the lifespan of the proposed action, which could exceed 50 years; however, it is difficult to forecast future actions with certainty. Reasonably foreseeable future actions are those that are currently identified, and could potentially be actualized within a standard planning time horizon. Typically, city and county comprehensive or general plans, BLM RMPs, utility transmission

plans, etc., are updated every 10 years to identify planning and infrastructure priorities, directions, and budgets for the foreseeable future. For this reason, 10 years is a reasonable horizon and represents the furthest point from which to anticipate future actions. The Project would result in different impacts during construction and operation. This cumulative impacts analysis includes identification of the potential cumulative impacts that could occur during the construction and operation periods for the Project. Decommissioning of the Project would occur well beyond the 10-year horizon for the cumulative impacts analysis, and the scope of potential impacts during the timeframe of decommissioning are considered speculative and cannot be meaningfully analyzed.

Identification of Geographic Area of Effect by Resource

The geographic extent of cumulative effects varies according to the affected resource. For example, cumulative effects to air quality and social and economic conditions have regional importance, whereas cumulative effects to visual resources are more site-specific and tend to have a more narrowly affected geography. The geographic area of effect is identified within each resource section in this analysis.

4.17.3.2 Identification of Past, Present, Future, and Reasonably Foreseeable Future Actions, Land Uses, and Projects

Past and present activities and land uses within the study area are described in detail in Section 3.10. These include agriculture, grazing, mining, and general recreation; residential, industrial, and commercial development; transportation and utility corridors; conservation easements, parks, and open space; and military installations.

Future and reasonably foreseeable future actions include those projects or proposed developments that have been identified either in a plan or through public records searches, conversations with local officials, and general research. Table 4-35 and Figure 4-1 summarize the known past, present, future, and reasonably foreseeable future activities; land uses; and projects considered in the cumulative effects assessment[1]. Land uses or activities with a status of "present" are included in the baseline conditions and impacts analysis, presented in chapters 3 and 4 respectively. Facilities associated with the proposed Project are not included in this list.

For this analysis, reasonably foreseeable future actions were identified within the Project study area, including renewable energy generation projects outside of the study area that could feasibly interconnect with facilities provided by existing local utility owners or the proposed Project. Projects defined as "future," although not reasonably foreseeable future, have been identified and listed in Table 4-35.

Transmission Lines

In addition to the proposed Project, there are plans for other interstate transmission lines that could be constructed in New Mexico and Arizona (see Table 4-35).

[1] The map of Cumulative Effects Activity Locations, Figure 4-1 is not all inclusive of activities listed in Table 4-35 due to scale limitations.

The High Plains Express transmission line system is proposed to provide a new 500 kV AC interconnection between Wyoming and Arizona, through Colorado and New Mexico. Although various alternatives have been evaluated in feasibility studies, the project routes cannot be reasonably identified and therefore cannot be meaningfully evaluated in this analysis.

The Southline Transmission Project is proposed as a 225-mile, 345 kV transmission line system between Afton, New Mexico and the Apache (Power Plant) Substation in Cochise County, Arizona, and would also require upgrades to existing transmission lines between Apache and the Saguaro Substation in Pinal County. Southline submitted a right-of-way application to the BLM and will be subject to its own NEPA process.

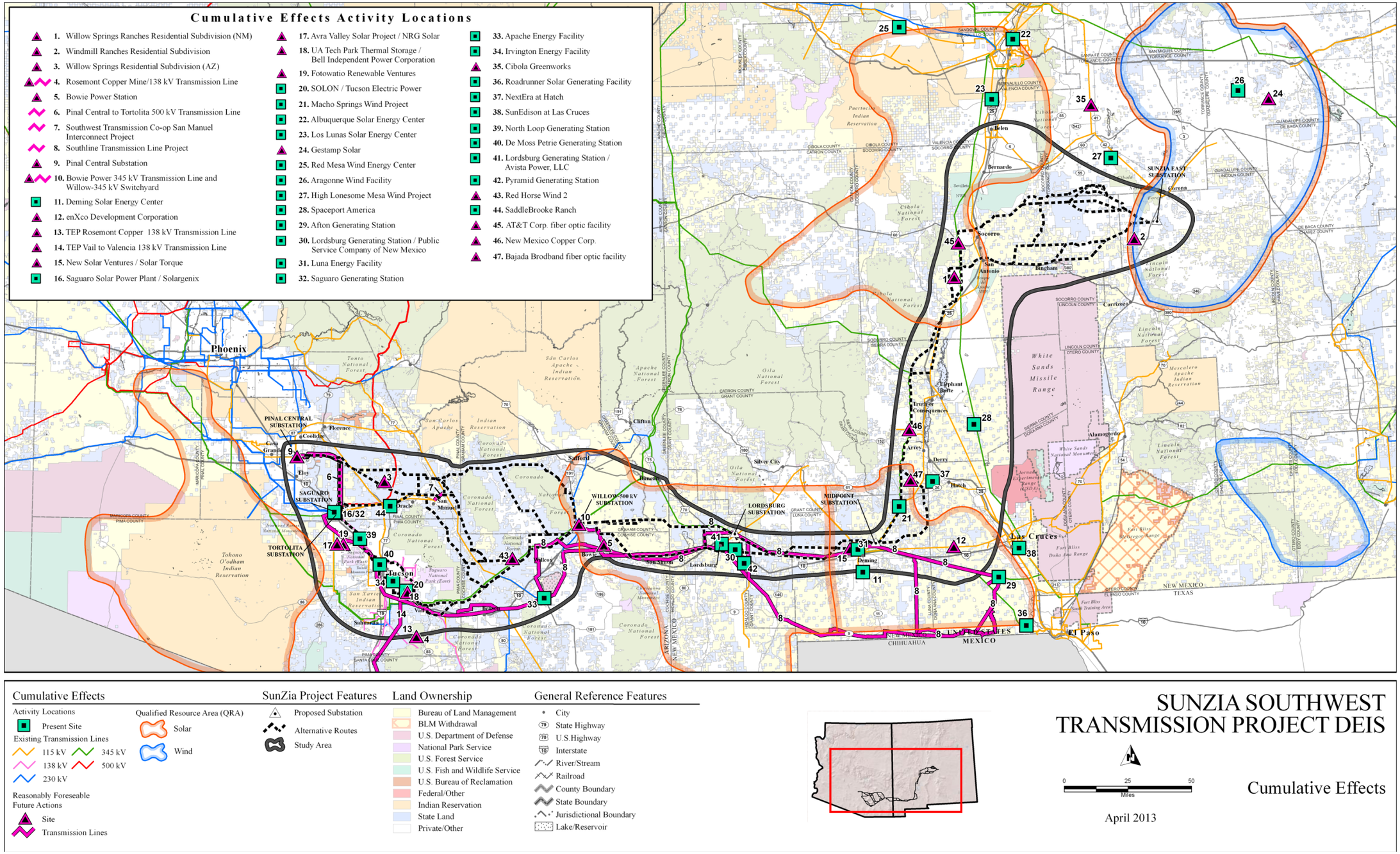

Figure 4-1. Cumulative Effects

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Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Land Development Subdivisions											
Rural residential development	Dispersed throughout the study area	Present	All Counties	●	●	●	●	●	●	All Counties	●
New Mexico											
Willow Springs Ranches Residential subdivision, NM	Plat-approved 50,000 acres of new residential development. Approximately 26 miles south of Socorro, west of I-25 (Socorro County)	Present and RFF	Socorro	●	●	●	●	●	●	Socorro	●
Windmill Ranches residential subdivision	Plat approved 16,000 acres of new residential development, approximately 20 miles north of Carrizozo, west of US Highway 54 (Lincoln County)	Present and RFF	Lincoln	●	●	●	●	●	●	Lincoln	
Arizona											
Willow Springs residential subdivision	Tentative plat approval 4,600 acres (not contiguous) of new residential development, approximately 6 miles northeast of SR 79, 13 miles northwest of Oracle (Pima County)	RFF	Pinal	●	●	●	●	●	●	Pinal	
SaddleBrooke Ranch residential subdivision	Residential subdivision, partially constructed, approximately 9 miles west of Oracle (Pima County)	Present and RFF	Pima	●	●	●	●	●	●	Pima	●
Agriculture and Range											
Farming	Cultivated private land throughout the study area	Present	All Counties	●	●	●	●	●	●	All Counties	●
Grazing	Dispersed throughout the study area	Present	All Counties	●	●	●	●	●	●	All Counties	●
Conservation Easements	Dispersed throughout the study area, with concentrations along the Rio Grande, San Pedro River, and Pima County, Arizona	Present and RFF	All Counties	●	●	●	●	●	●	All Counties	

[1] Cumulative analysis areas for Climate and Air resources, and Social and Economic resources include counties listed for each project.

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Transportation and Access											
I-10	East-west alignment, major interstate highway through NM and AZ	Present	Doña Ana Luna Hidalgo Cochise Pima			●	●	●	●	Doña Ana Luna Hidalgo Cochise Pima	●
US Route 70	East-west alignment parallels I-10, beginning just south of Las Cruces, NM	Present	Otero Doña Ana Luna Hidalgo Greenlee Graham			●	●	●	●	Otero Doña Ana Luna Hidalgo Greenlee Graham	●
Union Pacific Railroad	East-west alignment, adjacent to I-10 in NM and AZ, crossing southern portions of the study area	Present	Doña Ana Luna Hidalgo Cochise Pima			●	●	●	●	Doña Ana Luna Hidalgo Cochise Pima	●
New Mexico											
I-25	North-south alignment runs through western portion of study area, connecting Las Cruces, Truth or Consequences, and Socorro	Present	Socorro Sierra Doña Ana			●	●	●	●	Doña Ana Luna Hidalgo Cochise Pima	●
US Route 54	Northeast-southwest alignment, crossing the eastern portion of the study area	Present	Torrance Lincoln			●	●	●	●	Torrance Lincoln	●
US Route 60	North-south alignment, north of Socorro, crossing the northwestern portion the study area	Present	Socorro			●	●	●	●	Socorro	●

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
US Route 180	East-west alignment, parallels I-10 within the NM portion of the study area, proceeding west past Las Cruces to Deming, then turning north	Present	Luna Grant			●	●	●	●	Luna Grant	●
US Route 380	East-west alignment connecting into US Route 85, just north of San Antonio	Present	Socorro Lincoln			●	●	●	●	Socorro Lincoln	
SR 1	North-south alignment, paralleling I-25 to the south before ending at Truth or Consequences	Present	Socorro Sierra			●	●	●	●	Socorro Sierra	●
SR 26	North-south alignment, west side of I-25 just south of Derry, connecting to US Route 180, just north of Deming	Present	Sierra Doña Ana Luna			●	●	●	●	Socorro Sierra	●
SR 51	East-west alignment, south of Elephant Butte Reservoir	Present	Sierra			●	●			Sierra	●
SR 52	East-west alignment, north of Truth or Consequences Municipal Airport; proceeds west from I-25	Present	Socorro Sierra			●	●	●	●	Socorro Sierra	●
SR 55	Northwest-southeast alignment turning northwest from US Route 54, crossing through the northeastern portion of the study area	Present	Torrance Lincoln Socorro			●	●	●	●	Torrance Lincoln Socorro	●
Atchison, Topeka, and Santa Fe Railroad	North-south alignment paralleling I-25 in the northeastern portion of the study area	Present	Socorro Sierra Doña Ana			●	●	●	●	Socorro Sierra Doña Ana	●
Burlington Northern Santa Fe Railroad	North-south alignment along I-25 in NM	Present	Socorro Sierra Doña Ana			●	●	●	●	Socorro Sierra Doña Ana	●
Arizona											
I-19	North-south alignment, major interstate highway from Tucson, AZ to Mexico	Present	Pima			●	●	●	●	Pima	●
US Route 191	North-south alignment, southern portion of the study area, east of Cochise, before connecting to I-10	Present	Graham Cochise			●	●	●	●	Graham Cochise	●

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
SR 77	North-south alignment, east of the Tortolita Substation, adjacent to the Coronado National Forest	Present	Pima Pinal			●	●	●	●	Pima Pinal	●
SR 79	Northwest-southeast alignment, east of Pinal Central, connects to SR 77 east of Tortolita Substation	Present	Pinal			●	●	●	●	Pinal	●
SR 87	North-south alignment crossing the study area south of Coolidge	Present	Pinal			●	●	●	●	Pinal	●
SR 287	East-west alignment, south of Coolidge	Present	Pinal			●	●	●	●	Pinal	●
Freeway between US Route 60 and I-10 near Picacho Peak State Park	North-south alignment, future transportation corridor just east of planned Pinal Central Substation	Future				●					
Arizona Eastern Railroad	North-south alignment connecting Safford and Bowie	Present	Graham Cochise			●	●	●	●	Graham Cochise	●
Airports											
New Mexico											
Alamogordo White Sands Regional Airport	4 miles southwest of Alamogordo	Present	Otero				●			Otero	
Lordsburg Municipal Airport	0.5 mile southeast of Lordsburg	Present	Hidalgo				●	●	●	Hidalgo	
Carrizozo Municipal Airport	1 mile northwest of Carrizozo	Present	Lincoln				●			Lincoln	
Deming Municipal Airport	2 miles east of Deming	Present	Luna				●			Luna	
Socorro Municipal Airport	3 miles south of the town of Socorro	Present	Socorro				●			Socorro	
Truth or Consequences Municipal Airport	Adjacent to I-25, 7 miles north of Truth or Consequences	Present	Sierra				●			Sierra	
Hatch Municipal Airport	3 miles west of Hatch	Present	Doña Ana				●			Doña Ana	

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Arizona											
Benson Municipal Airport	3 miles northwest of Benson	Present	Cochise				●			Cochise	
Marana Regional Airport	3 miles west of Marana	Present	Pima				●			Pima	
Marana Airport/Pinal Airpark (Western Army National Guard Aviation Training Site)	7 miles northwest of Marana, west of I-10	Present	Pima				●			Pima	
San Manuel Airport	3 miles north of San Manuel	Present	Graham				●	●	●	Graham	
Tucson International Airport	6 miles south of Tucson	Present	Pima				●	●	●	Pima	
Private Airstrips	Dispersed throughout the study area	Present	All Counties			●	●	●	●	All Counties	●
Mining and Minerals											
New Mexico											
Alley Gypsum Mine	Gypsum mine approximately 30 miles north of Las Cruces	Present	Doña Ana	●						Doña Ana	
Caballo Project	Aggregate mine approximately 14 miles southwest of Truth or Consequences	Present	Sierra	●						Sierra	
Chivo Pit	Aggregate pit approximately 6 miles northwest of Truth or Consequences	Present	Sierra	●			●	●	●	Sierra	
Cotton City Gravel Pit	Aggregate pit approximately 20 miles southwest of Lordsburg	Present	Hidalgo	●						Hidalgo	
Coyote Cliff No. 1 Mine	Zeolites mine approximately 18 miles south of Truth or Consequences	Present	Grant	●			●			Grant	
Coyote Cliff No. 2 Mine	Zeolites mine approximately 18 miles south of Truth or Consequences	Present	Grant	●			●			Grant	

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Cuchillo Pit	Aggregate pit approximately 3 miles north of Truth or Consequences	Present	Grant	●			●			Grant	
Florida Mine	Aggregate mine approximately 14 miles southeast of Deming	Present	Luna	●			●			Luna	
Fort Seldon Quarry	Aggregate and caliche mine approximately 13 miles northwest of Las Cruces	Present	Doña Ana	●			●			Doña Ana	
Frank Smyer Pit	Aggregate pit approximately 13 miles east of Deming	Present	Luna	●			●	●	●	Luna	
Gary/Lordsburg Pit	Aggregate pit approximately 8 miles southwest of Lordsburg	Present		●			●				
Hill Pit – Doña Ana County Transportation Division	Aggregate pit approximately 8 miles northwest of Las Cruces	Present	Hidalgo	●			●	●	●	Hidalgo	
Hopper Quarry	Aggregate mine approximately 10 miles southwest of Deming	Present	Luna	●						Luna	
Lordsburg Aggregate Production Facility	Aggregate and other approximately 4 miles southwest of Lordsburg	Present	Hidalgo	●			●	●	●	Hidalgo	
Luchini Pit	Aggregate pit approximately 13 miles north of Truth or Consequences	Present	Sierra	●			●	●	●	Sierra	
Luna HA-0175 Pit	Aggregate pit approximately 31 miles west of Las Cruces	Present	Doña Ana Luna	●			●	●	●	Doña Ana Luna	
Mimbres K-13	Aggregate mine approximately 13 miles northwest of Deming	Present	Luna	●						Luna	
Mimbres Pit	Aggregate pit approximately 19 miles northwest of Deming	Present	Luna	●						Luna	
Mesilla Valley Cobble Quarry	Aggregate mine approximately 25 miles northeast of Las Cruces	Present	Doña Ana	●						Doña Ana	
Morgan Pit	Aggregate pit approximately 2 miles southwest of Truth or Consequences	Present	Sierra	●			●			Sierra	
New Mexico Copper Corp.	Pending authorization 6 miles west of Caballo	RFF	Sierra	●	●	●	●	●	●	Sierra	●
North Lemitar Pit	Aggregate pit approximately 8 miles north of Socorro	Present	Socorro	●			●	●	●	Socorro	
O'Kelly Quarry	Aggregate mine approximately 6 miles south of Deming	Present	Luna	●			●			Luna	

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Picacho Peak Pit	Aggregate pit approximately 6 miles northwest of Las Cruces	Present	Doña Ana	●						Doña Ana	
Rainbow Mine	Calcite mine approximately 16 miles northwest of Las Cruces	Present	Doña Ana	●			●			Doña Ana	
Socorro Perlite Quarry	Perlite mine approximately 4 miles southwest of Socorro	Present	Socorro	●			●	●	●	Socorro	
South Socorro I-25 Pit	Aggregate pit approximately 5 miles southwest of Socorro	Present	Socorro	●			●	●	●	Socorro	
T.E.A.A No. 3	Gemstone mine approximately 34 miles southeast of Socorro	Present	Socorro	●						Socorro	
Wallin Material Source	Aggregate mine approximately 23 miles southeast of Truth or Consequences	Present	Sierra	●						Sierra	
Arizona											
Johnson Camp Mine	Copper mine approximately 65 miles east of Tucson	Present	Cochise	●						Cochise	
Mission Mine	Copper, moly mine approximately 20 miles southwest of Tucson	Present	Pima	●		●	●			Pima	
Rillito Mine	Cement mine approximately 20 miles northwest of Tucson	Present	Pima	●		●	●			Pima	
Rosemont Mine	Copper mine approximately 30 miles southeast of Tucson	RFF	Pima	●	●	●	●			Pima	
Safford Mine	Copper mine approximately 8 miles north of Safford	Present	Graham	●		●				Graham	
Sierrita Mine	Copper, moly mine approximately 25 miles south of Tucson	Present	Pima	●		●	●			Pima	
Mining Claims	Dispersed throughout the study area	Present	All Counties	●	●	●	●	●	●	All Counties	●
Leaking Underground Storage Tanks and CERCLIS Sites											
Leaking Underground Storage Tanks	35 sites, within Tucson city limits	Present/Past	Pima		●	●	●	●	●	Pima	●
CERCLIS	3 sites, within Tucson city limits	Present/Past	Pima		●	●	●	●	●	Pima	●
Communication Facilities											
Baja Broadband	Pending fiber optic facility approximately 15 miles west of Hatch	RFF	Sierra	●	●	●	●	●	●	Sierra	●
AT&T Corp.	Pending fiber optic facility 8 miles west of Socorro	RFF	Socorro	●	●	●	●	●	●	Socorro	●

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Military Installations and Airspace											
New Mexico											
Northern Call-up Area	Private and public land along the northern boundary of WSMR that is evacuated and closed during live missile launches from WSMR—approximately 690,560 acres	Present	Socorro Torrance			●	●		●	Socorro Torrance	●
Restricted Airspace	Surrounding WSMR (see map M-10-3E Military Designations)	Present	Socorro Lincoln Torrance							Socorro Lincoln Torrance	●
Stallion Army Air Field	18 miles southeast of Socorro; manages airborne assets in the northern portion of WSMR	Present	Socorro							Socorro	
White Sands Missile Range	10 miles east of I-25 and approximately 3 miles east of Bosque del Apache NWR—approximately 2.2 million acres	Present	Socorro Lincoln Sierra Doña Ana			●				Socorro Lincoln Sierra Doña Ana	
Arizona											
Davis-Monthan AFB	2 miles southeast of Tucson	Present	Pima				●	●	●	Pima	●
Fort Huachuca (Electronic Proving Ground)	Noise tests for electronic combat and electronic warfare equipment; area covers the San Pedro River Valley, and portions of Pima, Santa Cruz, and Cochise counties	Present							●	Pima Santa Cruz Cochise	
Restricted Airspace	Within areas of Graham, Pinal, and Cochise counties (see map M-10-3W Military Designations).	Present	Graham, Pinal Cochise							Graham, Pinal Cochise	●
Buffalo Soldier Electronic Test Range	Within Pima and Cochise counties	Present	Pima and Cochise							Pima and Cochise	●
Pinal Airpark	See Marana Airport above.										

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Designated Utility Corridors, Transmission Lines, and Energy Facilities											
Utility Corridors in Arizona and New Mexico											
West-wide Energy Corridors	Designated by the DOE Section 368 of the Energy Policy Act of 2005—the western portion of the NM alternatives follow the corridor to the south, approximately mid-way down, where the corridor proceeds to the southeast stopping at the southernmost point of the NM alternatives; the corridor then proceeds west, terminating just after crossing into AZ, with the alternatives following the corridor until its termination	Present	Socorro Sierra Doña Ana Luna Hidalgo Cochise			●	●	●	●	Socorro Sierra Doña Ana Luna Hidalgo Cochise	
BLM Socorro Field Office RMP designated utility corridors	A utility corridor generally two miles wide established along the Interstate 25 corridor	Present	Socorro	●	●	●	●	●	●	Socorro	●
Transmission Lines in Arizona and New Mexico											
Arizona Public Service Co. 115 kV Transmission Line	San Manuel Substation west to the Saguaro Substation	Present	Pinal			●	●	●	●	Pinal	●
Arizona Public Service Co. 230 kV Transmission Line	South of Eloy, AZ, west of I-10 to the southeast, before turning to the east-southeast into the Saguaro Substation	Present	Pinal			●	●	●	●	Pinal	●
Arizona Public Service Co. 345 kV Transmission Line	Western edge of the study area near the Ironwood Forest National Monument; turns northeast, terminating at the Saguaro Substation	Present	Pinal			●	●	●	●	Pinal	●
Arizona Public Service Co. 500 kV Transmission Line	Northern edge of the study area south, crossing over SR 79 before terminating at the Saguaro Substation near I-10	Present	Pinal			●	●	●	●	Pinal	●
Bureau of Reclamation 138 kV Transmission Line	Southwest and west of the Saguaro National Park, south of the Saguaro Substation in AZ	Present	Pima			●	●	●	●	Pima	●

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
El Paso Electric 345 kV Transmission Lines	Northern portion of the study area to the southwest of I-25 and US Route 60, parallel to I-25 east of Las Cruces, NM	Present	Socorro Sierra Luna			●	●	●	●	Socorro Sierra Luna	●
Public Service Co. of New Mexico 345 kV Transmission Lines	North of Luna Substation, west past the Hidalgo and Lordsburg substations; parallels US Route 70	Present	Luna Grant Hidalgo			●	●	●	●	Luna Grant Hidalgo	●
Salt River Project 500 kV Transmission Line	Northern boundary of the study area, south of Coolidge, AZ	Present	Pinal			●	●	●	●	Pinal	●
Southwest Transmission Co-op Inc. 115 kV Transmission Line	Northern boundary of study area to the southeast into the Winchester Substation and out of the study area	Present	Pinal Cochise			●	●	●	●	Pinal Cochise	●
Southwest Transmission Co-op Inc.230 kV Transmission Line	Northeast of Safford, AZ to the south; parallels a portion of US Route 191	Present	Graham Cochise			●	●	●	●	Graham Cochise	●
Tri-State G & T Association, Inc. 115 kV Transmission Lines	West of Belen, NM and south, paralleling US Route 60 and I-25 west of Socorro, NM; splits with one segment proceeding west to Truth or Consequences, NM and terminating at Luna Substation, west of Deming, NM	Present	Socorro Sierra Luna			●	●	●	●	Socorro Sierra Luna	●
Tucson Electric Power Co. 138 kV Transmission Line	Northwest to north crossing I-10 and Davis-Monthan AFB, proceeding northwest to the north of Tucson to the Saguaro Substation, in AZ	Present	Pima Pinal			●	●	●	●	Pima Pinal	●
Tucson Electric Power Co. 161 kV Transmission Line	North of the Saguaro National Park northwest to the Saguaro Substation in AZ	Present	Pima Pinal			●	●	●	●	Pima Pinal	●
Tucson Electric Power Co. 345 kV Transmission Line	West of the Willow-500 kV and Winchester substations, crossing I-10 and the southwest corner of the San Xavier Indian Reservation	Present	Graham Cochise Pima			●	●	●	●	Graham Cochise Pima	●

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Western Area Power Administration 115 kV Transmission Lines	Saguaro-Tucson segment along I-10 corridor in Pinal and Pima counties, and Tucson-Apache, southwest of Willcox, Arizona, segment crosses San Pedro River north of Benson in Cochise County.	Present	Pinal Pima Cochise			●	●	●	●	Pinal Pima Cochise	●
Bowie 345 kV Transmission Line(s)	Two proposed 345 kV generation tie-lines between proposed Bowie Power Plant (Cochise County) and proposed Willow-345 kV Substation (Graham County)	RFF	Cochise Graham	●	●	●	●	●	●	Cochise Graham	●
Tucson Electric Power Co. Pinal Central Substation to Tortolita Substation	Proposed 500 kV transmission line located between the planned Pinal Central Substation and the Tortolita Substation, adjacent to the Saguaro Power Plant east of I-10	RFF	Pinal	●	●	●	●	●	●	Pinal	●
Southwest Transmission Co-op Inc., San Manuel Interconnect Project	Proposed 230 kV transmission line that proceeds southwest from an existing Southwest Transmission Co-op Inc. line to the San Manuel Substation south of Mammoth, AZ, northeast of San Manuel, AZ	RFF	Pinal	●	●	●	●	●	●	Pinal	●
Southline Transmission Line Project	Proposed 345 kV transmission line corridor that will run from El Paso, TX into southeastern AZ, near the Palo Verde Hub	RFF	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal	●	●	●	●	●	●	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal	●
Tucson Electric Power Co. Rosemont Copper 138 kV Transmission Line Project	Permitted 138 kV transmission line located in Pima County between a proposed substation near Sierrita to the proposed Rosemont Mine	RFF	Pima	●	●	●	●	●	●	Pima	●

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Tucson Electric Power Co. Vail to Valencia 138 kV Transmission Line	Permitted 138 kV transmission line located in Pima and Santa Cruz counties.	RFF	Pima Santa Cruz	●	●	●	●	●	●	Pima Santa Cruz	●
High Plains Express Transmission Project	Proposed 500 kV high-voltage transmission line through WY, CO, NM, and AZ	Future	Lincoln Socorro Catron Greenlee Graham Pinal			●				Lincoln Socorro Catron Greenlee Graham Pinal	
Pipelines in Arizona and New Mexico											
Chevron Pipeline Co. 8-inch and 6-inch Product El Paso Albuquerque Terminal Pipeline	East of Belen, NM, south through the Sevilleta NWR, east of Socorro, crossing the Bosque del Apache NWR before continuing east of Las Cruces and I-10	Present	Socorro Sierra Doña Ana			●	●	●	●	Socorro Sierra Doña Ana	●
El Paso Gas Co. California System Main and Branch Pipelines	Southern boundary of the study area, south of Las Cruces and north along US Route 191	Present	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal			●	●	●	●	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal	●

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
El Paso Gas Co. El Paso System Branch Pipelines	West along the southern boundary of the study area, south of Las Cruces	Present	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal			●	●	●	●	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal	●
El Paso Gas Co. California High Pressure System Main Line Pipeline	West along the southern boundary of the study area, south of Las Cruces	Present	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal			●	●	●	●	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal	●
El Paso Natural Gas Co. Permian-San Juan Pipeline	Northeast corner of the study area, southeast of Corona, NM, near the proposed SunZia East Substation	Present	Lincoln Socorro			●	●	●	●	Lincoln Socorro	●
Kinder Morgan SFPP L.P. El Paso to Tucson to Phoenix Pipeline	West along the southern boundary of the study area, south of Las Cruces; follows I-10 to Eloy, AZ	Present	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal			●	●	●	●	Doña Ana Luna Hidalgo Grant Cochise Pima Pinal	●
TransWestern Pipeline Co. and Enron Mainline and Mainline Loop Pipelines	Northeast corner of the study area, southeast of Corona, NM, near the proposed SunZia East Substation	Present	Lincoln Socorro			●	●	●	●	Lincoln Socorro	●

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Minor and Branch Pipelines	Dispersed throughout the study corridor	Present	All Counties			●	●	●	●	All Counties	●
Substations in New Mexico											
Hidalgo Substation	Located north of I-10, northeast of Lordsburg	Present	Hidalgo			●	●	●	●	Hidalgo	●
Luna Substation	Located west of Deming, north of I-10	Present	Luna							Luna	
Substations in Arizona											
Pinal Central Substation (permitted)	Planned 500 kV substation, east of Casa Grande, north of Eloy, and south of Coolidge in Pinal County	RFF	Pinal	●	●	●	●	●	●	Pinal	●
Tortolita Substation	500 kV substation, southeast of Eloy in Pinal County (TEP)	Present	Pinal			●	●	●	●	Pinal	●
Willow-345 kV Substation	345 kV substation interconnecting planned Bowie Power Plant with TEP 345 kV transmission lines northwest of Bowie, and south of Safford in Graham County.	RFF	Graham	●	●	●	●	●	●	Graham	●
Vail Substation	South of I-10 and the Davis-Monthan AFB, east of the San Xavier Indian Reservation in Pima County	Present	Pima							Pima	
Winchester Substation	North of I-10, east of the San Pedro River in Cochise County	Present	Cochise			●	●	●	●	Cochise	●
Minor Distribution Substations	Dispersed throughout the study corridor	Present	All Counties			●	●	●	●	All Counties	●
Power Plants in New Mexico											
Afton Generating Station Power Plant	275 MW natural gas power plant west of I-10, northwest of El Paso	Present	Doña Ana		●					Doña Ana	
Pyramid Generating Station	160 MW natural gas power plant 30 miles southeast of Lordsburg	Present	Hidalgo		●					Hidalgo	
El Paso Electric Company	350 MW natural gas power plant in Sunland Park, within Doña Ana County	Present	Doña Ana		●					Doña Ana	
Lordsburg Generating Station	80 MW natural gas power plant north of I-10, east of Lordsburg	Present	Hidalgo		●	●	●	●	●	Hidalgo	

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Luna Energy Facility	600 MW natural gas power plant, northwest of the Luna Substation, east of Deming	Present	Luna		●	●	●	●	●	Luna	
Estancia Basin Biomass Facility	35 MW biomass power generation plant located on 50 acres, approximately six miles south of Estancia	Future	Torrance								
Power Plants in Arizona											
Apache Power Plant	400 MW coal-fired power plant near Benson Arizona, east of Highway 19, south of I-10	Present	Cochise		●		●			Cochise	
DeMoss Petrie Generating Station	85 MW natural gas power plant near I-10 and Grant Road within Tucson	Present	Pima		●	●	●	●	●	Pima	
North Loop Generating Station	108 MW natural gas power plant near I-10, approximately 14 miles southeast of the Saguaro Substation in Pima County	Present	Pima		●		●	●	●	Pima	
Irvington Power Plant	496 MW coal fired, liquid fuel (oil), and natural gas power plant west of Davis-Monthan AFB within Pima County	Present	Pima		●		●	●	●	Pima	
Saguaro Power Plant	395 MW natural gas and 1 MW solar power plant adjacent to the Saguaro Substation and NW of Tortolita Substation, within Pinal County	Present	Pinal		●	●	●	●	●	Pinal	
Sundance Generating Station	450 MW natural gas power plant within the City of Coolidge, Pinal County	Present	Pinal		●		●			Pinal	
Coolidge Generating Station	575 MW natural gas-fired power plant in the City of Coolidge, Pinal County	Present	Pinal		●		●			Pinal	
Bowie Power Station	Planned 1,000 MW natural gas fired power station in Cochise County	RFF	Cochise		●		●			Cochise	
Renewable Energy in New Mexico and Arizona											
Roadrunner Solar Electric Facility PV	20 MW Solar Project	Present	Doña Ana		●					Doña Ana	
NextEra at Hatch CPV	5 MW Solar Project	Present	Doña Ana		●	●	●	●	●	Doña Ana	

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Sun Edison at Las Cruces	12 MW Solar Project	Present	Doña Ana							Doña Ana	
Cibola Green Works	50 MW Solar Project	RFF	Torrance		●		●			Torrance	
BP Solar (PV)/Energy Novo	22 MW Solar Project	Future									
Deming Solar Energy Center	5 MW Solar Project	Present	Luna		●	●	●		●	Luna	
enXco Development Corp.	600 MW Solar Project	RFF	Doña Ana	●	●	●	●		●	Doña Ana	
Bright Source Energy	Solar Project	Future	Luna							Luna	
Gestamp Solar	11 MW Solar Project	RFF	Guadalupe							Guadalupe	
Bright Source Energy	Solar Project	Future	Hidalgo							Hidalgo	
First Solar, Next Light Renewable Power, LLC	Solar Project	Future	Doña Ana							Doña Ana	
Warm Springs Renewable Energy Corp.	Solar Project	Future	Sierra							Sierra	
Edge Renewable Energy, LLC	Solar Project	Future	Luna							Luna	
SolarReserve, LLC	Solar Project	Future	Luna							Luna	
New Solar Ventures/Solar Torque	300 MW Solar Project	RFF	Luna	●	●	●	●	●	●	Luna	
Saguaro Solar Power Plant/Solargenix (Solar Trough)	1 MW Solar Project	Present	Pinal	●	●	●	●	●	●	Pinal	
Avra Valley Solar Project	20 MW Solar Project	RFF	Pima			●	●		●	Pima	

Table 4-35. Past, Present, Future, and Reasonably Foreseeable Future Activities within Cumulative Area of Analysis											
Land Use/Activity	**Location/Description**	**Status**	**Climate and Air Resources[1]**	**Earth Resources**	**Water Resources**	**Biological Resources**	**Cultural Resources**	**Visual Resources**	**Land Use & Recreation Resources**	**Social and Economic Conditions[1]**	**Health & Safety/ Hazardous Materials**
Pioneer Green Inc. (near Red Rock)	Solar Project	Future	Pinal							Pinal	
Pioneer Green Inc.	Solar Project	Future	Pinal							Pinal	
Safford Solar Energy Center	Solar Project	Future	Cochise							Cochise	
UA Tech Park Thermal Storage Demonstration Project; Bell Independent Power Corp.	5 MW Solar Project	RFF	Pima	●	●	●	●	●	●	Pima	
Fotowatio Renewable Ventures	25 MW Solar Project	RFF	Pima			●	●		●	Pima	
SOLON/Tucson Electric Power	1.6 MW Solar Project	Present	Pima	●	●	●	●	●	●	Pima	
Macho Springs	50 MW Wind Project	Present	Luna			●	●	●	●	Luna	●
Gallo Canyon Wind, LLC/First Wind	Wind Project	Future	Lincoln							Lincoln	
Macho Springs Power, LLC/Element Power	Wind Project	Future	Luna							Luna	
Type 2 Wind Application; Tucson BLM Field Office	Wind Project	Future	Pinal							Pinal	
Red Horse Wind 2	Wind Project	RFF	Cochise							Cochise	
Lighting Dock (Raser Technologies)	Geothermal Project	Future	Hidalgo							Hidalgo	

RFF – reasonably foreseeable future
[1] The same renewable energy projects are also identified in Table 4-38, Existing Renewable Energy Projects within the Cumulative Analysis Area

Renewable Energy Development

Table 4-36 identifies present, future, and reasonably foreseeable future renewable energy development projects within the cumulative areas of analysis.

Table 4-36. Present, Future, and Reasonably Foreseeable Future Renewable Energy Projects

Name	County	Land Area (acres)	Generation (MW)	Status
Solar Projects – New Mexico				
Albuquerque Solar Energy Center	Bernalillo	20	2	Present
NextEra at Hatch	Doña Ana	39	5	Present
Roadrunner Solar Electric Facility PV[1]	Doña Ana	182	20	Present
Sun Edison at Las Cruces	Doña Ana	100	12	Present
Deming Solar Energy Center[1]	Luna	50	5	Present
Las Lunas Solar Energy Center	Valencia	50	5	Present
Gestamp Solar	Bernalillo	76	11	RFF
enXco Development Corp.[1]	Doña Ana	3,000	600	RFF
New Solar Ventures/Solar Torque[1]	Luna	3,840	300	RFF
Cibola Green Works	Torrance	160	50	RFF
First Solar, Next Light Renewable Power, LLC[1]	Doña Ana	640	N/A	Future
GA Solar (PV)	Guadalupe	2,500	300	Future
Bright Source Energy[1]	Hidalgo	6,573	N/A	Future
Bright Source Energy[1]	Luna	7,520	N/A	Future
Edge Renewable Energy, LLC[1]	Luna	6,183	N/A	Future
SolarReserve, LLC[1]	Luna	3,840	N/A	Future
BP Solar (PV)/Energy Novo[1]	Sierra	160	22	Future
Warm Springs Renewable Energy Corp.[1]	Sierra	3,158	20	Future
First Solar, Next Light Renewable Power, LLC	Valencia	865	—	Future
Monzano Energy Park (Solar Array)	Valencia	300	18	Future
Solar Projects – Arizona				
SOLON/Tucson Electric Power[1]	Pima	14	1.6	Present
Saguaro Solar Power Plant/Solargenix (Solar Trough)[1]	Pinal	7	1	Present
Avra Valley Solar Project[1]	Pima	300	20	RFF
Fotowatio Renewable Ventures[1]	Pima	305	25	RFF
UA Tech Park Thermal Storage Demonstration Project; Bell Independent Power Corp.[1]	Pima	200	5	RFF
Pioneer Green Inc.[1]	Pinal	960	N/A	Future
Pioneer Green Inc. (near Red Rock)[1]	Pinal	640	N/A	Future
Safford Solar Energy Center[1]	Cochise	22,891	250	Future
Wind Projects – New Mexico				
Red Mesa Wind Energy Center	Cibola	5,000	102	Present
Aragone Wind Facility	Guadalupe	9,600	90	Present
Macho Springs[1]	Luna	1,900	50	Present
High Lonesome Mesa	Torrance	4,626	100	Present
Vaughn Wind, LLC/First Wind	Guadalupe	7,363	N/A	Future
Gallo Canyon Wind, LLC/First Wind[1]	Lincoln	36,553	N/A	Future
Macho Springs Power, LLC/Element Power[1]	Luna	1,119	N/A	Future

Table 4-36. Present, Future, and Reasonably Foreseeable Future Renewable Energy Projects				
Name	**County**	**Land Area (acres)**	**Generation (MW)**	**Status**
La Sierrita Wind, LLC/Invenergy	San Miguel	5,783	N/A	Future
Cedar Hills Wind, LLC/First Wind	Torrance	4,640	N/A	Future
Red Canyon Wind, LLC/First Wind	Torrance	12,576	N/A	Future
New Mexico Renewable, LLC	Union, Torrance, and Chaves	21,429	N/A	Future
Wind Projects – Arizona				
Type 2 Wind Application; Tucson BLM Field Office[1]	Pinal	10,115	N/A	Future
Red Horse Wind 2	Cochise	5,760	51	RFF
Geothermal Projects – New Mexico				
Lighting Dock (Raser Technologies)[1]	Hidalgo	N/A	10	Future

[1] These projects are also included in Table 4-35. Some of these projects are located outside of the project area but within a resource cumulative analysis area
N/A indicates information is not available
PV – photovoltaic
RFF – reasonably foreseeable future

Along with the existing and planned renewable energy projects identified above, transmission facilities other than the proposed Project could be built. For these projects, land area requirements for access roads and transmission facilities should be considered for cumulative effects.

Land area for access roads for transmission facilities could range from 1.6 acres per mile up to 6.7 acres per mile, depending on slope and distance to existing access roads.

Land area for transmission facilities, which includes construction yards, concrete batch plants, laydown sites, wire pulling and tensioning sites, and wire splicing sites for 115 kV line, is assumed to be 3 acres per mile.

4.17.3.3 Energy Development Forecast Analysis

As identified in Chapter 1, the Project is proposed to increase transfer capability in an electrical grid that is currently insufficient to support the development, access, and transport of additional energy-generating resources, including renewable energy, in New Mexico and Arizona. It is the intent of the Applicant to provide infrastructure to increase transfer capability in areas of potential renewable energy generation. Increasing interstate transfer capability and access to renewable resources is needed to meet federal energy policy objectives, such as the EPAct of 2005, as well as state RPS.

The Applicant's purpose for the proposed Project is to provide access to renewable energy resources in the Southwest and to increase general reliability. At this time, the Applicant is not accepting, reviewing, or processing any interconnection requests. In addition, the BLM is unaware of any generators planning to interconnect with the SunZia Project. In light of the Applicant's stated purpose, an attempt to provide an analytical tool has been developed herein to

provide a means to assess the cumulative effects of the types of renewable energy projects that may ultimately interconnect with the Project. These development scenarios are offered as analytical tools, and not meant to imply that there are currently specific or known cumulative effects from generators.

A Final Wind PEIS (BLM 2005) and a Final Solar PEIS (BLM and DOE 2012) have been used to assess cumulative impacts, alternatives, and mitigation measures associated with wind and solar energy development on BLM-administered land. The Restoration Design Energy Project completed by the Arizona State BLM Office, intended to identify suitable areas for renewable energy development in Arizona, was also assessed during the cumulative analysis.

Renewable Energy Development Setting

New Mexico

Wind: New Mexico ranks seventeenth in total wind capacity installed in the United States, and twelfth in wind potential; with an annual potential estimated to be 435 million MWh (AWEA 2011; New Mexico Energy 2011a). Current wind development within New Mexico is located primarily on its central and eastern plains. New Mexico has the potential to produce many times its own electrical need, which puts it in a position to export wind electricity.

Solar: New Mexico contains some of the best potential for solar energy development, and ranks second for potential solar power in the United States (New Mexico Energy 2011b).

Geothermal: In New Mexico, low (less than 190 degrees Fahrenheit), moderate (190 to 300 degrees Fahrenheit), and high (greater than 350 degrees Fahrenheit) temperatures for geothermal resources can be found in many locations throughout the state (Bland 2010). Areas along the Rio Grande corridor and the southwest corner of the state provide some of the best geothermal resources, but few areas in these locations have been developed. The majority of current geothermal uses in New Mexico are for spas, space heating, greenhouses, and fish farms.

Arizona

Wind: A 2003 wind energy survey conducted by the National Renewable Energy Laboratory (NREL) identified several areas in the state as having commercial-grade wind resources. According to NREL Data, wind speeds and conditions are greater in the northern portion of the state. The potential for wind development for the state of Arizona is more than 30 million MWh (AWEA 2011); annual wind speed averages at 50 meters above the ground greater than 16 mph (NAU 2011).

Solar: Arizona is among the four states with the highest concentrations of solar resources (NREL, WREZ 2009). There is a large potential for solar energy development in Arizona due to land availability, identified solar resources, and the state's goal of accelerating renewable energy development through incentives and the ACC-mandated renewable energy standards (RES). The land and water resources in Arizona are sufficient to support the amount of solar generation that would be required to meet RES requirements for the next 20 years (Frisvold 2009).

Geothermal: These resources are present in Arizona, especially in the south. While Arizona does not contain any high (greater than 350 degrees Fahrenheit) temperatures for geothermal resources, there is substantial heat flow that could be used. Arizona geothermal potential is in the low-to-moderate range, which is excellent for geothermal heat pumps and space heating, as opposed to electricity generation, which requires a higher temperature resource (Allison 2011).

Qualified Resource Areas

Qualified Resource Areas (QRA) were developed using the Western Renewable Energy Zones (WREZ) (WGA and DOE 2009) (Table 4-37; Figure 4-1, Figure 4-2 and Figure 4-3). The WREZ were developed in 2008 by the Western Governors' Association and the DOE, with the Zone Identification and Technical Analysis (ZITA) workgroup (WGA and DOE 2009).

Table 4-37. Potential Renewable Energy Resource Capacity by QRA in MW

QRA	Solar[1]	Wind[1]	Geothermal[1]
AZ-SO	6,623	0	—[2]
NM-CT	3,183	0	—[2]
NM-EA	83	11,290	—[2]
NM-SE[3]	0	1,894	—[2]
NM-SO	4,347	0	—[2]
NM-SW	6,149	0	—[2]
Total	**20,385**	**13,184**	**2,527**

[1] Source: Western Governors' Association. "Western Renewable Energy Zones-Phase One Report: Table 1 Renewable Energy Generating Capacity Summary." June 2009. Available at www.westgov.org/wga/publicat/WREZ09.pdf
[2] Geothermal sources are believed to exist within the study areas, because of the presence of geological systems that have been correlated with geothermal resource potential in other areas; but specific locations have not been identified.
[3] Although it is possible for the proposed Project to interconnect with NM-SE, the QRA is located at a distance that would make the feasibility of interconnection unlikely, and would only contribute marginally to the energy potential of the region when compared to the larger NM-EA QRA.

The criteria used in developing the WREZ for wind and solar included: (1) locations where NREL wind power class is 3 or greater, at 50 meters above the ground, and slope is less than 20 percent; (2) solar is greater than 6.5 kilowatt hours per square meter per day of direct normal insolation[1], and slope is greater than 2 percent. The QRA boundaries were defined to encompass areas within which future renewable energy generation projects could feasibly interconnect with facilities provided by existing local utility owners or the proposed Project.

Overall Potential of Renewable Resources within Qualified Resource Areas

Table 4-38 lists the overall potential generation capacities (in total megawatts) of renewable resources within QRAs that are within the vicinity of the proposed Project.

Summary of Present and Reasonably Foreseeable Future Renewable Energy Projects

Table 4-38 is a summary of the generating capacities and land areas of present renewable energy projects. Approximately 2,600 MW of solar power developments have been identified as

[1] The rate of delivery of direct solar radiation per unit of horizontal surface.

reasonably foreseeable future projects. According to available records, future wind development projects have been identified that could comprise more than 119,000 acres (see Table 4-36), primarily consisting of leases or options on New Mexico state lands.

It is assumed that large land leases will not be developed in their entirety; facility siting processes and future demand will determine the specific development configurations of wind generation facilities. These projects fall within or near the QRAs identified on Figure 4-2 and Figure 4-3, and in Table 4-37; and could interconnect with facilities provided by existing local utility owners or the proposed Project. Specific information is not available to determine the individual generating capacities, configuration, development timing, or impacts of these future wind projects. However, it is reasonable to assume that between 5,000 and 10,000 MW of wind generation capacity will be developed in the future, given the large land areas that have been leased or optioned, and the combined renewable energy potential of over 13,000 MW within these areas (Table 4-38).

Table 4-38. Existing Renewable Energy Projects within the Project Area[1,2]

		Wind	Solar
New Mexico	MW	342	49
	Land Area (acres)	Up to 17,000	Up to 500
Arizona	MW	0	2.6
	Land Area (acres)	0	Up to 21

[1] Includes projects that are currently in production of electricity or under construction within the study area and in proximity to the QRAs (see Figure 4-1)
[2] Megawatt total is based on existing Project information

Methods

A potentially large number of wind, solar, and geothermal development combinations could be considered; but for the purposes of this analysis, three energy development scenarios are provided, based on (1) the overall potential for renewable resources, (2) two transmission facility scenarios, and (3) typical renewable EDUs.

Overall Potential for Renewable Resources

A reasonable overall potential for renewable resources is estimated based on the following four factors:

- **Physical potential** areas identified within the western United States that exhibit the necessary qualities of raw renewable resource potential (WGA and DOE 2009)
- **Renewable portfolio standards** adopted by individual states that provide market-based mechanisms to increase renewable energy generation (EPA 2009)
- **Development applications** for leases to site individual renewable energy generation facilities on public land.
- **Interconnection requests** (contractual or transactional) for potential generation projects to interconnect with existing transmission owners (see Table 1-2, Summary of Generation Interconnection Requests to Existing Transmission Owners within the Project Area).

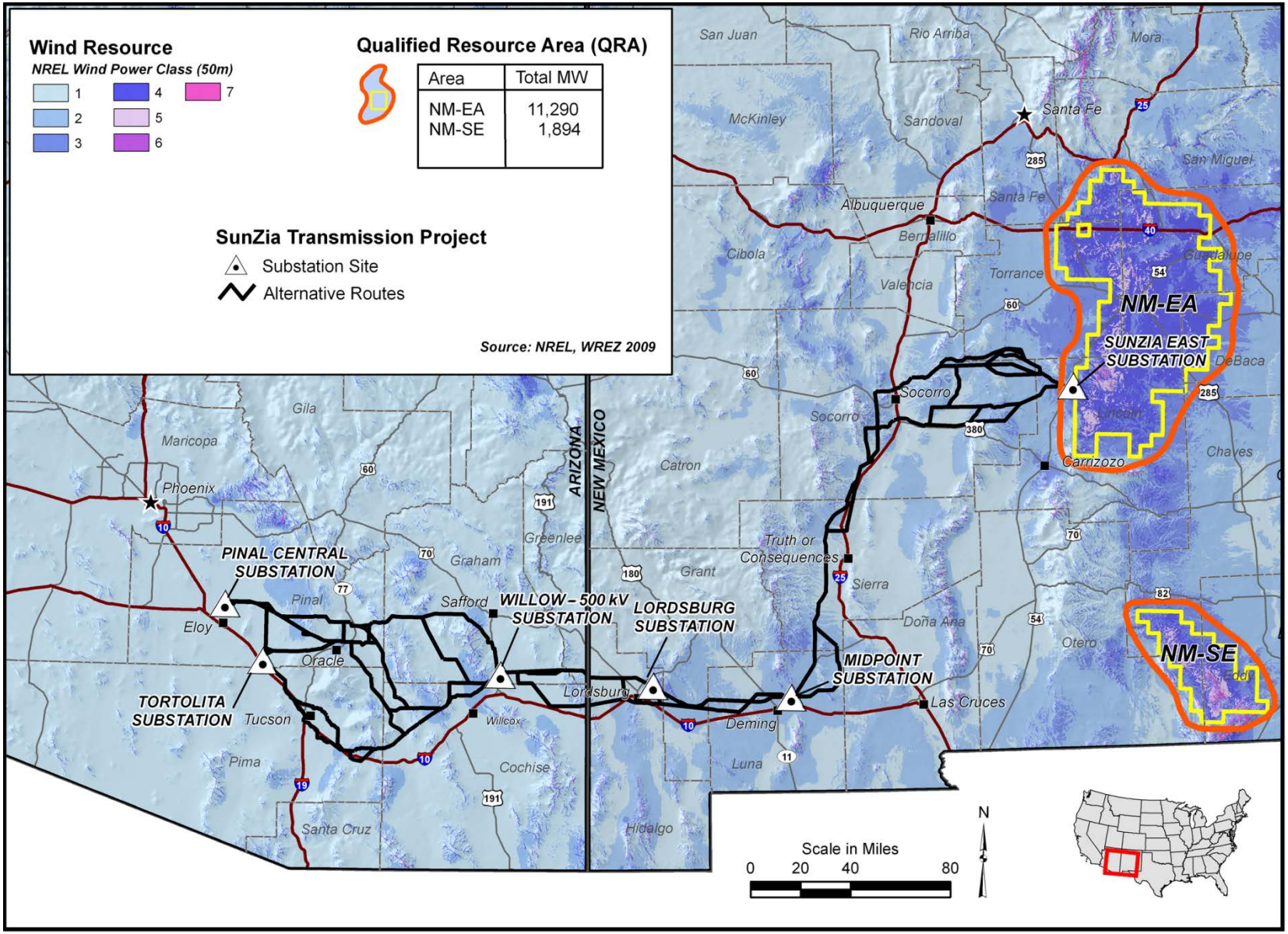

Figure 4-2. Qualified Resource Areas for Wind

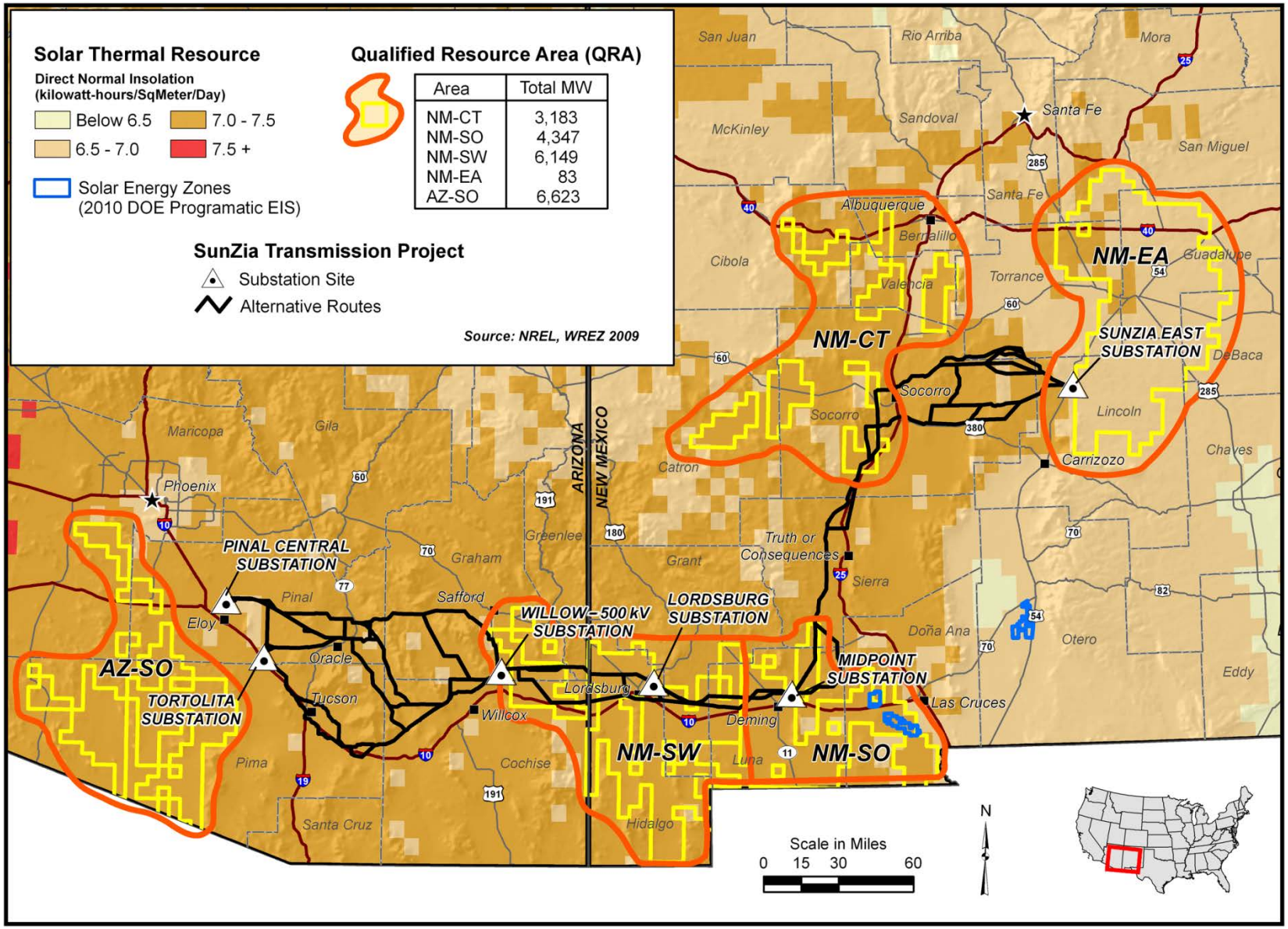

Figure 4-3. Qualified Resource Areas for Solar

Transmission Facility Scenarios

The following two combinations of transmission facilities are considered by the proposed Project:

- *Option A* – Construction of two 1,500 MW AC transmission facilities, with a combined total of 3,000 MW transmission capability
- *Option B* – Construction of one 1,500 MW AC and one 3,000 MW DC transmission facility, with a combined total of 4,500 MW transmission capability

Typical Potential Renewable Energy Development Units

Renewable EDUs represent the likely incremental building blocks of renewable energy projects that could be economically constructed. Individual renewable energy projects could consist of multiple EDUs. Four potential types of renewable EDUs that could interconnect with the SunZia transmission lines include a 100 MW solar PV facility, a 160 MW solar thermal facility, a 100 MW wind facility, and a 50 MW geothermal facility.

Energy Development Scenarios

Using the overall potential for renewable resources, two different transmission facility scenarios identified for the proposed Project, and the EDUs identified above, two energy development scenarios were developed and are described below (options A and B). Option A is based on the assumption that two AC lines would be built with a combined total of 3,000 MW of transmission capability, and on the assumption that a total of 24 EDUs would be constructed: 6 in Arizona (4 solar PV, 1 solar thermal, and 1 geothermal) and 18 in New Mexico (4 solar PV, 1 solar thermal, 12 wind, and 1 geothermal). These projects would use 2,420 MW of the 3,000 MW of transmission capability built in Option A, with the remaining 580 MW being used by other existing types of generation facilities.

Option B is based on the assumption that one AC line and one DC line would be built with a combined total of 4,500 MW of transmission capability, and on the assumption that 42 EDUs would be built: 3 in Arizona (2 solar PV and 1 solar thermal) and 39 in New Mexico (36 wind, 2 solar PV, and 1 geothermal). These projects would use 4,210 MW of the 4,500 MW of transmission capability built in Option B, with the remaining 290 MW being used by other existing types of generation facilities.

In developing these scenarios, it is assumed that some portion of the Project's transfer capability would be utilized by nonrenewable generation resources. As previously discussed, FERC Order 888 compels transmission owners to provide open access to its facilities without discrimination, including discrimination as to type of generation requesting interconnection and transmission service.

Further, renewable generation (depending on type, location, local and regional meteorology, and other factors) exhibits certain patterns of availability and intermittency. Should buyers of renewable generation so desire, they may arrange for regulation generation services from other

sources on the grid, or from within their own inventory of generation assets. Some of the generation noted above in the two options that is indicated to come from "other types of generation facilities" might be comprised from such regulation generation services and may, in fact, flow over and across all or part of the Project's transmission facilities.

Although no specific existing or planned project is identified to interconnect with the proposed Project, probable areas are estimated for any of the potential renewable energy projects, based on the amount of potential energy resources identified by QRA.

Potential land area requirements per energy development scenario were calculated based on the percentage of renewable energy production by type per QRA, and the energy mix determined above for options A and B, which yielded a potential capacity per QRA for each option. The results were then calculated with the assumed land area per megawatt to yield the total land area estimate per QRA per option. The results can be found in Table 4-39.

Table 4-39. Potentially Affected Land Area for the Energy Development Scenario

QRA	Wind (MW)	Solar (MW)	Geothermal (MW)	Total Land Area[1] (Acres)
Option A				
NM-CT	—	100	—	700
NM-SO	—	200	—	1,400
NM-SW	—	260	50	2,170
NM-EA	1,200	—	—	12,000
NM-SE	—	—	—	—
AZ-SO	—	560	50	4,270
Option B				
NM-CT	—	—	—	—
NM-SO	—	100	—	700
NM-SW	—	100	50	1,050
NM-EA	3,600	—	—	36,000
NM-SE	—	—	—	—
AZ-SO	—	360	—	2,520

[1] Land area calculations are based on 7 acres per MW for solar energy development and 10 acres per MW for wind energy development, and is an estimate for area of potential ground disturbance.

As indicated in this forecast, the projected ground disturbance associated with up to 4,500 MW of potential electrical generation development would be 40,270 acres. Estimates for potential ground disturbance would vary based on site-specific conditions, design, and technologies.

4.17.4 Cumulative Effects by Resource

4.17.4.1 Introduction

The results of the cumulative effects analysis are presented below for each of the resources. Cumulative effects were evaluated with respect to each of two scenarios, described as follows.

- **Scenario 1: SunZia Project** – The proposed Project alternatives, including the construction and operation of two adjacent 500 kV transmission lines within one right-of-way, up to 1,000 feet wide, that would occur within a specific geographic area as defined for each resource
- **Scenario 2: Energy Development Scenario** – The energy development scenario is defined to include the construction and operation of future renewable energy generation facilities, which could include reasonably foreseeable future projects as defined in Section 4.17.3.3.

The greatest amount of renewable energy development that would be accessible for potential interconnection with the Project is in the QRA NM-EA, adjacent to the eastern terminus of the Project, as indicated on Figure 4-2, and Table 3-31. Compared with Option B, impacts could occur from the development of additional renewable energy projects located where interconnection with intermediate substations is provided with Option A, in addition to potential impacts within QRA NM-EA. However, Option B was used as a basis for the energy development scenario analysis because it would likely represent the greater overall amount of resource impacts relative to the amount of generation.

Cumulative impacts resulting from all of the past, present, or reasonably foreseeable future actions would be relevant to any of the alternative subroutes. However, there would be variation according to site-specific project development. The analysis of cumulative impacts is generalized to address the range of past, present, and reasonably foreseeable future actions with respect to each resource study and cumulative analysis area.

The analysis also addresses secondary or indirect impacts that could occur from facilities constructed beyond the Project area of analysis (e.g., new wind turbines and associated gen-tie transmission lines in Guadalupe County, New Mexico). In addition, other energy projects that might be developed in the long-term (not reasonably foreseeable) future are briefly discussed, although cumulative impacts of these future actions cannot be analyzed in detail because there is insufficient information about such projects at this time.

Past, present, and reasonably foreseeable future actions that were considered for this analysis are described in Table 4-35. Following is a summary of cumulative effects for the Project and energy development scenarios during construction and operation.

4.17.4.2 Climate and Air Quality

<u>Cumulative Effects Analysis for SunZia</u>

Area of Analysis

The area of analysis for the cumulative air quality effects associated with the Project comprises the counties that are included in the study area: Doña Ana, Lincoln, Socorro, Sierra, Luna, Grant, and Hidalgo counties in New Mexico, and Graham, Greenlee, Cochise, Pima, and Pinal counties in Arizona. In addition, the Project will emit GHGs, which are implicated in the global issue of climate change.

Construction

As described in Section 4.2, transmission line and substation construction could result in air pollutant emissions from fugitive dust, traffic, construction equipment, travel on paved and unpaved roads, helicopters, and the construction and operation of several concrete batch plants. None of the impacts is expected to exceed any federal, state, or local ambient standards, and impacts would be localized and temporary. Appropriate mitigation measures would be used to minimize emissions according to federal, state, and local permits to be issued by the relevant authorities.

Cumulative ambient impacts from the construction phase of the Project and other existing sources of air pollutant emissions have been quantified in Appendix F. Estimated ambient impacts resulting from the proposed Project that are below EPA-designated SILs include impacts from CO and SO_2 for both transmission line and substation construction for all averaging periods. The impacts would be considered temporary in nature, and would not significantly impact air quality, regardless of other sources of air pollutant emissions that may impact the same geographic area.

In cases where estimated Project impacts exceed the SILs, the Project impact was added to a representative background concentration and then compared with ambient standards. Background concentrations represent monitored pollutant concentrations due to all existing pollutant sources. With the exception of PM_{10} within the West Pinal County PM_{10} nonattainment area, projected impacts plus background concentrations are below all ambient standard limitations. Because of high background concentrations of PM_{10} within the West Pinal County PM_{10} nonattainment area, maximum total 24-hour PM_{10} impacts (Project + background) from transmission line and Pinal Central Substation construction were projected to potentially exceed the numerical value of the PM_{10} standards; although an actual exceedance of the standard due to Project activities is unlikely because this is based on a worst-case analysis, as explained in Section 4.2.3.5.

With respect to reasonably foreseeable future actions, estimated Project impacts that are below SILs would be considered insignificant contributors to any future cumulative effects. For projected impacts above SILs, the likelihood of overlap with other development impacts is slight, because the proposed Project impacts would be relatively small, temporary, and localized. Emissions related to transmission line construction would affect different areas as the construction activity progresses, and substation emissions would affect the immediate area of the substation. In addition, transmission line or substation construction emissions—such as dust or emissions from construction equipment that are emitted near ground level—do not produce measurable impacts at regional scales. Project-related traffic would represent a negligible portion of total traffic on public roads.

Because Project construction impacts will be temporary and localized, other reasonably foreseeable projects whose air quality impacts are primarily related to their construction, rather than operation, were not analyzed further. Construction impacts from wind and solar projects, subdivisions, transmission lines, and substations would also be temporary and localized, and would thus be unlikely to overlap in time and space with Project construction impacts.

Two reasonably foreseeable future projects were considered to have the type of ongoing air pollutant emissions that could potentially overlap with Project construction emissions to impact air quality. The proposed Bowie Power Station and Rosemont Copper Project would have ongoing emissions during operation, unlike other types of future activities (listed in Table 4-35) such as subdivisions, transmission lines, oil pipelines, and substations that primarily emit during temporary construction periods. At this time, it is uncertain whether either of these projects were to be operational when SunZia would be constructed.

Bowie Power Station submitted an application to the ADEQ for a combined construction/operating permit in October 2010 for a 525 MW natural gas-fired, combined cycle power plant. The power station would be located approximately 2 miles north of Bowie, Arizona, in Cochise County. Subroute 3B would be located approximately 4 miles north of the proposed power project.

The Rosemont Copper Project is a proposed open pit copper/molybdenum/silver mine, located 30 miles south of Tucson, Arizona, in Pima County. Subroute 4C3 would be located approximately 8 to 10 miles northeast of the mine.

The potential for cumulative impacts of SunZia construction emissions with Bowie Power Station operation emissions was examined. As noted above, impacts modeled for SunZia were below the SILs, temporary in nature, and considered insignificant contributors to any future cumulative effects. Therefore, only NO_2, PM_{10}, and $PM_{2.5}$ were considered because impacts from SunZia construction activities are projected to be below SILs for all other modeled pollutants (see Appendix F). The Bowie Power Station permit application (Bowie Power Station 2010) shows modeled impacts for criteria pollutants that will be emitted from the power station. Maximum projected Bowie impacts were combined with maximum projected impacts from SunZia transmission line construction and from construction of the Willow-500 kV Substation for comparison with ambient standards. When added to a representative background concentration, all combined impacts would be within ambient standard limitations.

An estimate of the cumulative impacts of SunZia transmission line construction and operation of the Rosemont Copper Project is based on the Draft Technical Support Document for Air Quality Permit No 55223, issued by the ADEQ (2012). The addition of worst-case impacts resulting from Project construction of the transmission lines using Subroute 4C3 within Pima County, and to a lesser extent for other alternatives, to maximum predicted impacts from Rosemont could potentially exceed the numerical value of the 24-hour PM_{10} and $PM_{2.5}$ standards, but would show compliance with the 1-hour NO_2 standard.

An actual violation of any of the particulate matter standards due to the additional impact of SunZia transmission line construction when added to operation impacts from the Rosemont Copper Project and other local sources would be unlikely for a number of reasons. Maximum impacts from both projects would occur close to the emission sources and rapidly decrease with distance. In addition, the screening method used to estimate SunZia impacts is highly conservative and represents worst-case 1-hour impacts, even for the 24-hour PM_{10} and $PM_{2.5}$ averaging periods. Longer averaging periods result in lower actual concentrations because of increased wind meander that spreads and dilutes the plume. Furthermore, the 24-hour PM_{10} and $PM_{2.5}$ standards are all based on 3-year averages of sub-maximum concentrations (e.g., 98th

percentile or high, second high impacts, etc.). The screening model used for the SunZia modeling calculates only maximum concentrations and the SunZia transmission line impacts will only occur for a short period of time (days to weeks) in the vicinity of Rosemont.

With respect to GHGs, emissions from construction of the Project will total between 4,300 and 105,000 tons of CO_2e per year, depending on timing and phasing of construction. Maximum emissions would total approximately 289,000 tons of CO_2e over the construction period. In contrast, the United States' energy-related CO_2 emissions totaled 6,215 million tons in 2010 (EIA 2011a); energy related CO_2 constitutes approximately 80 percent of total U.S. man-made GHG emissions (EIA 2011b). The maximum annual GHG emissions from Project construction would represent approximately 0.0017 percent of annual United States energy related emissions, a minor additional contribution to cumulative emissions.

Operation

Emissions and impacts from operation of substations and transmission lines would be qualitatively similar to those from construction, but in much lower quantities. In addition, a negligible amount of SF_6, a GHG, could be emitted from circuit breakers during substation operation.

Under Option B, approximately 198 tons of CO_2e (as SF_6) per year would be emitted from operation of all the substations. The amount of CO_2e would be less for Option A. This represents 0.000003 percent of annual energy-related emissions in the United States, a negligible amount.

Global Climate Change

As discussed in Section 3.2, the climate of the Southwest has undergone profound changes over time. Climate change is a normal part of the aging and evolution of the Earth and of changes in the factors that control climate, such as solar intensity and ocean currents, that occur over multi-year to multi-decadal cycles. In recent years, however, concern has risen that human activities may be influencing climate in ways that have not occurred in the past.

According to the U.S. National Oceanic and Atmospheric Administration's National Climatic Data Center, the "greenhouse effect" is a natural process that helps to regulate the temperature of the planet. It results from heat absorption by certain gases in the atmosphere (GHGs) and the re-radiation downward of some of that heat. Water vapor is the most abundant GHG, followed by CO_2 and other trace gases. Without a natural greenhouse effect, the average temperature of the Earth would be approximately 0 degrees Fahrenheit (-18 degrees Celsius), instead of its present 57 degrees Fahrenheit (14 degrees Celsius). Thus, the concern is not with the greenhouse effect itself, but whether human activities are enhancing the effect through GHG emissions from fossil fuel combustion and deforestation (Easterling and Karl 2011).

Human activity has clearly been increasing the concentration of GHGs in the atmosphere in recent years (primarily CO_2 from the combustion of coal, oil, and gas). Pre-industrial levels of CO_2 were approximately 280 parts per million by volume (ppmv) and current levels are greater than 390 ppmv, increasing at a rate of 1.9 ppm per year since 2000. The global concentration of CO_2 in the atmosphere today far exceeds the natural range over the last 650,000 years of 180 to

300 ppmv. According to the United Nation's Intergovernmental Panel on Climate Change, by the end of the twenty-first century, CO_2 concentrations could be 75 to 350 percent above the pre-industrial concentration (*ibid*).

Global surface temperatures have increased approximately 0.74 degree Celsius (plus or minus 0.18 degree) since the late nineteenth century, and the linear trend for the past 50 years of 0.13 degree Celsius (plus or minus 0.03 degrees) per decade is nearly twice that for the past 100 years. However, the change in surface temperatures is not uniform. Recent warming trends have been greatest over North America and Eurasia between 40°N and 70°N. Indirect indicators of warming, such as borehole temperatures, snow cover, and glacier recession data, are in substantial agreement with the more direct indicators of recent warmth (*ibid*).

Precipitation changes have been spatially variable over the last century. On a regional basis, increases in annual precipitation have occurred in the higher latitudes of the Northern Hemisphere and southern South America and northern Australia. Decreases have occurred in the tropical region of Africa and southern Asia. Northern Hemisphere snow-cover extent has consistently remained below average since 1987 and has decreased by approximately 10 percent since 1966 (*ibid*).

With respect to the consequences for the climate of the Project area, federal and state land managers, scientists, stakeholders, and partners at an August 2010 workshop noted that climate change models for the southwestern deserts predict general warming and drying with increasing precipitation variability year to year, leading to increasing conflicts between competing water uses. Workshop attendees also agreed that increasing environmental stress is expected as a consequence of shifting ecosystem boundaries and species distributions, expansion of non-native species, and other potential effects leading to increasingly unstable biologic communities (Hughson et al. 2011).

Record-setting wildfires are likely due to rising temperatures and related reductions in spring snowpack and soil moisture. Increased frequency and altered timing of flooding will increase risks to people, ecosystems, and infrastructure. Ozone pollution, which in many areas of the Southwest increases as summer temperatures rise and clouds decrease, may also increase as a result of climate change (US Global Change Research Program 2012).

More intense, longer-lasting heat waves will result in increasing demands for air-conditioning, depleting electrical generation and distribution capacity, resulting in increased risks of brownouts and blackouts. In addition, electricity supply will be affected by changes in the timing of river flows and where hydroelectric systems have limited storage capacity and reservoirs, since increased year-to-year variability of precipitation is expected (US Global Change Research Program 2012).

Because GHG emissions from proposed projects contribute to climate change on a global scale, project-specific impacts of GHG missions on the local environment cannot be quantified. As a global pollutant, it is also important to consider GHG emissions with a broad view. While the proposed Project would emit GHGs during construction and a much smaller amount of GHGs during operation, the proposed transmission lines would also allow for the transport of power generated by renewable energy projects to western power markets and load centers. Both

Arizona and New Mexico have RES that require a certain percentage of electricity delivered by regulated utilities to come from renewable sources. The Arizona mandate is 15 percent by 2025, while the New Mexico mandate is 20 percent by 2050. The proposed Project would help to achieve these goals.

With respect to climate change, renewable energy such as wind and solar have limited GHG emissions, as compared with a conventional fossil fuel-fired generating facility. The renewable energy facilities that the Project is designed to serve could potentially replace a portion of the market demand currently served by older, fossil fuel-fired power plants, or displace a portion of future demand that might otherwise be served by facilities with higher GHG emissions.

Cumulative Effects Analysis, Including Energy Development Scenarios

Construction

Construction of renewable energy projects would be unlikely to contribute substantially to cumulative impacts with SunZia. As noted above, the major air pollution impacts resulting from the Project would occur during the construction phase of the transmission line and substations, and impacts would be localized and temporary. Similarly, emissions from the construction of other renewable energy projects would also have localized and temporary impacts that are unlikely to overlap in time and space with Project impacts.

Operation

One objective associated with the national goal of facilitating development of renewable energy is to replace a portion of market demand served by existing or new fossil-fueled power plants. The Project's objective, in part, is to achieve the national goal. Table 4-40 and Table 4-41 outline the direct emissions from combustion-related generation and outline the types of displacement of emissions that could occur if renewable energy ultimately replaces combustion related energy. Table 4-40 shows the direct emissions of SO_2, NO_x, mercury, and CO_2 from combustion-related generation (including coal, natural gas, and other fuels) that could be offset or displaced by solar or wind projects (assumed to have negligible emissions) on a "per MWhr" basis. The information presented in Table 4-40 represents composite emissions factors developed for the six-state area (Arizona, California, Colorado, Nevada, New Mexico, and Utah) considered in the Draft Solar PEIS (BLM and DOE 2010). Emissions displaced by a particular solar or wind energy facility could be estimated by multiplying the facility's annual output, in MWhr, by the emissions factors shown in Table 4-40. This would approximate the maximum amount of displaced emissions.

Table 4-41 shows a similar comparison of direct emissions from various types of power generation facilities for a number of pollutants. Assuming that an increase in availability of renewable energy would ultimately displace some combustion-related power generation, the likely result would be lower air pollutant emissions than if no new renewable energy would be available to serve the demands of the market. The estimated emissions, including GHGs that could contribute to climate change, are shown in both of these tables.

Table 4-40. Annual Emissions from Combustion-related Power Generation				
Combustion Emissions[1] (kilogram per year per MWhr)				
Pollutant	**SO_2**	**NO_x**	**Mercury**	**CO_2**
Annual Emissions	0.69	1.0	8.0 x 10-6	716

[1] Composite emission factors for a six-state study area based on individual state composites weighted by the power generated in each state; information derived from EPA's eGRID information system at www.epa.gov/cleanenergy/energyresources/egrd/index.html
Source: BLM and DOE 2010

Table 4-41. Annual Emissions for Various Power Generation Types (ton/MW)1					
Type of Energy Generation	**SO_2**	**NO_x**	**CO_2**	**Particulate Matter**	**CO**
Wind	0	0	0	0	0
Solar	0	0	0	0	0
Geothermal	0.8	0	700.8	0	0
Coal	8.6	21.6	8,843	1.3	1.5
Natural gas combined cycle	0.05	0.7	3,542–5,142	0.03	0.7–3.8
Oil combined cycle	2.4	1.8	6,220	1.4	NA
Nuclear	0	0	0	0	0
Wood-fired	0.5	9.0	11,959	1.7	17
Solid waste-fired	13.6	70.2	13,256	3.0	2.7

[1] Excludes construction-phase, maintenance activity, and incidental emissions
Source: BLM 2005

4.17.4.3 Earth Resources

Cumulative Effects Analysis for SunZia – Geology

Area of Analysis

The geographic scope of analysis is at the level of individual geomorphic features, such as basins and mountain ranges.

Construction

Cumulative effects to projects resulting from geological hazards relate to the siting of projects in areas that are prone to seismic activity, flooding, or fissures. Geological hazards could have cumulative effects on the construction of the Project through direct loss of equipment or injury to personnel because of seismic activity or flooding. Reasonably foreseeable future actions that would likely be affected by geological hazards include transmission lines, oil and gas pipelines, and power generation. As more projects are sited to avoid geological hazards, suitable siting

locations may become increasingly occupied, thereby forcing future projects towards areas of greater geological hazard.

Operation

Geological hazards could have cumulative effects on the operation of the Project, either through direct loss of equipment or injury to personnel, or indirect loss of transmission service, because of seismic activity, subsidence, or flooding. Subsidence in particular may have a cumulative effect on projects. The continual drawdown of groundwater in the Southwest, mostly for domestic and farming purposes, has resulted in subsidence of the ground surface in numerous areas.

Cumulative Effects Analysis, Including Energy Development Scenarios

Construction

The development of renewable energy projects within QRAs could result in 10,000 to 40,000 acres of developed land. The greater acreage occupied by renewable energy developments corresponds to a greater chance that one of the associated projects could be directly affected by geological hazards.

Operation

The development of renewable energy projects within QRAs could result in 10,000 to 40,000 acres of developed land. Groundwater supplies for cooling and maintenance of solar facilities could result in increased ground subsidence and cause the opening of fissures, thereby destabilizing the ground surface.

Cumulative Effects Analysis for SunZia – Mineral Resources

Area of Analysis

The geographic scope of analysis for mineral resources is considered for each individual geomorphic feature crossed by the Project (i.e., the Jornada del Muerto, Rio Grande Valley, Chupadera Mountains, Uvas Valley, Lordsburg Mesa, Animas Valley, Peloncillo Mountains, San Simon Valley, Sulphur Springs Valley, San Pedro Valley, Little Rincon Valley, Pantano Wash, and Santa Cruz Valley). Cumulative effects to mineral resources are generally localized and are unlikely to spread beyond a given geomorphic feature where the effects would occur; therefore, projects that do not occur in the same basins or mountain ranges as the proposed Project would not have cumulative effects to mineral resources associated with the Project.

Construction

Past, present, and foreseeable future projects within the Project study area could add to the cumulative effects to mineral resources. Cumulative effects to mineral resources would primarily

be associated with ground disturbance and surface occupation of mineral resource areas (such as copper, gold, or coal) that would remove or restrict access to mineral resources.

Examples of reasonably foreseeable future projects that may have cumulative effects on mineral resources include planned subdivisions and transmission lines. The Willow Springs and Windmill Ranches subdivisions are located in areas that are within close proximity to mining districts and mining leases that, when constructed, could add to the cumulative effects on mineral resources. Reasonably foreseeable future transmission line facilities that could potentially have cumulative effects on mineral resources include: (1) the Pinal Central Substation to Tortolita Substation line, which could cross areas with current mining claims and operations west of the Picacho Mountains; (2) the San Manuel Interconnect, which could cross areas with current mining claims and operations in the San Pedro River Valley; and (3) the Southline Transmission Line Project, which could cross areas with current mining claims and operations south of Lordsburg, New Mexico. Ground disturbance associated with expansions of any past or present projects could have cumulative effects to mineral resources. Active mines such as the zeolite mines near Truth or Consequences and the copper mines in the Tucson area could add to the cumulative effects to mineral resources.

Construction activities would occur in locally short-lived phases; therefore, construction-related interruptions to present mineral resource access and extraction would be minimal and limited in scope.

Operation

Cumulative effects to mineral resources associated with the operation of the Project include any change in land ownership or leasing rights associated with project-related land acquisitions that could prevent the present and future exploration for and mining of mineral resources. However, development of the Project and other reasonably foreseeable future projects could also lead to the discovery of new mineral resources.

Cumulative Effects Analysis, Including Energy Development Scenarios

Construction

Cumulative effects associated with construction of potential solar, wind, or geothermal renewable energy developments outside the study area that could tie into the transmission capability of the Project could potentially be positive relative to mineral resources, by increasing access to previously undisturbed areas. This makes it more economical to extract mineral resources from previously difficult to access areas. Reasonably foreseeable future solar renewable energy developments include projects being developed by Gestamp Solar, enXco Development Corporation, New Solar Ventures, Avra Valley Solar, Fotowatio Renewable Ventures, and UA Tech Park Thermal Storage Demonstration Project.

Operation

Cumulative effects would be associated with areas occupied by future renewable energy projects that may exclude present or future mineral resource exploration and extraction. Solar facilities are contiguous facilities that typically occupy their entire project footprint; whereas wind and geothermal facilities are spread out and would not limit mineral-resource extraction outside the footprint of the individual structures. In this way, the construction of separate towers and access roads for wind energy facilities has similar effects to mineral resources as those of transmission lines.

Although most fuels currently used in the operation of fossil-fueled power plants within the cumulative analysis area are supplied by natural gas or coal from distant sources, such fuels could potentially be extracted locally to supply power plants in the future. To the extent that such extraction and delivery of fuels would become economically feasible, cumulative impacts from mineral extraction could occur, subject to land and minerals management regulations and mitigation.

Cumulative Effects Analysis for SunZia – Soil Resources

Area of Analysis

The geographic scope of analysis for soil resources is considered to be the Project study area, within 1 mile of the study centerline. Cumulative effects to soil resources are generally localized and are unlikely to spread beyond a given local area where the effects would occur; therefore, projects that do not occur in the same localized area as the Project would not have cumulative effects to soil resources associated with the Project.

Construction

Cumulative effects to soil resources would result from present and reasonably foreseeable future projects. Ground-disturbing activities could cumulatively impact soil resources by exposing erosion-susceptible soils, thereby increasing erosion rates beyond natural levels. The impact of critical concern, as stated by citizen groups, is soil erosion associated with the creation or improvement of access roads (Cascabel Working Group 2010a). Access road plans that incorporate appropriate construction methods, including following natural landscape contours instead of running perpendicular to contours and erosion-control structures, would mitigate the potential for increasing erosion beyond natural levels.

The development or expansion of residential subdivisions, such as Willow Springs Ranches and Windmill Ranches in New Mexico and Willow Springs in Arizona, would have cumulative effects to soil resources; whereas proper management of present or future agriculture and grazing areas would prevent cumulative effects on soil resources. In addition, development of mining claims could have cumulative effects to soil resources as ground-disturbing activities occur. Reasonably foreseeable transmission line projects that may occur within the soil resource area of analysis include Bowie 345 kV Transmission Line, Pinal Central Substation to Tortolita Substation 500 kV Transmission Line, Southwest Transmission Co-op San Manuel Interconnect

Project, and Southline Transmission Line. Reasonably foreseeable future substation projects that would occur within the soil resource area of analysis include the Pinal Central Substation and Willow 345 kV Substation. Reasonably foreseeable future solar renewable energy developments include projects being developed by New Solar Ventures/Solar Torque, Saguaro Solar Power Plan/Solargenix, UA Tech Park Thermal Storage Demonstration Project, and SOLON/Tucson Electric Power.

Linear facilities, including transmission lines, pipelines, interstate highways, other roads, and railroads, have incremental effects to soil resources relative to their associated areas of ground disturbance (Table 4-42). Estimates for total land disturbance from a linear feature are estimated as 3 acres per mile for existing transmission lines, 3 acres per mile for pipelines 6 inches or greater in diameter, 24 acres per mile for interstate highways, 3 acres per mile for other roads, and 6 acres per mile for railroads. The Project would have a higher amount of ground disturbance (up to 5.8 acres per mile of permanent disturbance) relative to existing transmission facilities. The 460-mile length of the proposed Project would have approximately 2,700 acres of permanent ground disturbance that could result in impacts to soil resources. Colocating the proposed Project with existing linear facilities could reduce the cumulative effects to soil resources.

Table 4-42. Land Area of Disturbance for Linear Facilities

Linear Facilities	Total Distance (miles)	Land Area (acres)[1]	Percentage of Land Area within Study Area[2]
Existing Transmission Lines (115 kV and larger)	2,800	8,400	0.050
Pipelines (6 inches in diameter or bigger)	3,100	9,300	0.056
Interstate Highways	1,200	28,800	0.172
Other Roads	36,200	108,600	0.650
Railroads	1,000	6,000	0.036
Total	**44,300**	**161,100**	**0.964**

[1] These totals were calculated using the following average criteria of land area disturbance: existing transmission lines = 3 acres/mile; pipelines = 3 acres/mile; interstate highways = 24 acres/mile; other roads = 3 acres/mile; railroads = 6 acres/mile
[2] The total study area is 16,700,000 acres

The application of appropriate BMPs and mitigation measures during construction would reduce potential impacts to acceptable levels. Some examples of these mitigation methods include proper access road construction methods that limit water channelization and gully erosion, restoring landscapes to natural contours, and reseeding vegetation.

Operation

Cumulative effects to soil resources related to the operation of present or reasonably foreseeable future projects would most likely be caused by any ground disturbance associated with the expansion or maintenance of facilities. Maintenance activities associated with transmission lines, pipelines, and generating facilities would likely include removal of vegetation and could result in unauthorized use of Project access roads by OHVs, as reported for existing pipeline and

transmission line access roads (Cascabel Working Group 2010a). Incremental impacts from pipelines and modern transmission lines differ in that pipeline access roads hold closely to the pipeline alignment regardless of terrain, and transmission line access roads generally include spur roads that follow contours to structure sites off a main road leading to impacts that are more discontinuous. Removal of surface vegetation and unauthorized use of access roads could potentially lead to increased erosion rates; however, implementation of appropriate mitigation measures would reduce these effects.

Cumulative Effects Analysis, Including Energy Development Scenarios

Construction

Ground disturbance associated with the construction of future renewable energy projects would have cumulative effects to soil resources by potentially increasing soil erosion rates, resulting in a loss of the resource. Generally, the degree of cumulative effects would be determined by the amount of ground disturbance associated with a future project. Solar generation facilities have cumulative effects to soil resources over small, concentrated areas; whereas wind generation facilities have cumulative effects over large, more dispersed areas, resulting in greater total ground disturbance and cumulative effects to soil resources. Any reasonably foreseeable future renewable energy projects that occur outside of the Project study area would not have any cumulative effects to soil resources.

Operation

Ground disturbance associated with the operation of reasonably foreseeable future renewable energy projects would have cumulative effects to soil resources by potentially increasing soil erosion rates, resulting in loss of the resource. Generally, cumulative effects associated with the operation of these facilities would be less than facility construction.

4.17.4.4 Paleontological Resources

Cumulative Effects Analysis for SunZia

Area of Analysis

The geographic scope of analysis for paleontological resources is based on the extent of the geological formation. A particular geological formation may not be affected by different projects in the same region. In addition, not all geological formations contain paleontological resources. Formations composed mostly of volcanic rocks typically do not contain fossils, and paleontological resources typically are not found throughout a fossil-bearing geological formation.

Construction

Incremental impacts to paleontological resources would result from past, present, and reasonably foreseeable future projects that may be cumulatively associated with the Project during ground-disturbing activities in fossiliferous geological units. The construction phase of any new project could have the greatest impact to paleontological resources because of these ground-disturbing activities and possible direct loss of a paleontological resource. The construction of projects that encompasses one large contiguous area (e.g., subdivisions) could add to the cumulative effects to geological units at a local or broader level. For example, the proposed Willow Springs Ranches subdivision crosses a geological unit that has high potential for paleontological resources, and could have a greater cumulative effect when combined with the Project. However, the planned Windmill Ranches subdivision crosses an area that has low potential for paleontological resources and, therefore, would have little or no cumulative effects.

Ground disturbance associated with linear projects, such as transmission lines, pipelines, and roadways, could have cumulative effects on a broader scale, because of the greater distance covered and the higher chance of crossing numerous geological formations. For example, the proposed Southline Transmission Project closely parallels the proposed SunZia Project in southern New Mexico; possibly crossing the same geological formations, thus having a greater cumulative effect. In contrast, the proposed Centennial West Clean Line, which is north of the Project, could impact paleontological resources in different geological units, but may not have cumulative effects to some paleontological resources associated with the Project. Expansions to existing airports, or construction of new roads, could have cumulative effects to paleontological resources if ground-disturbing activities occur in geological formations with high PFYCs. The proposed freeway between US 60 and I-10 near Picacho State Park could impact paleontological resources, but only a small portion of this project overlaps SunZia; thus, the cumulative effects associated with SunZia would be small. Using BMPs and mitigation measures, cumulative effects and impacts to paleontological resources can be reduced.

Operation

There are no direct cumulative effects to paleontological resources from existing projects where no ground-disturbing activities are planned. These projects may have indirect cumulative effects from increased access to a possible paleontological resource by the use of access roads. However, SunZia could have incremental impacts to paleontological resources where these present projects are located. For example, the present I-25 and US Route 191 are located in areas having geological formations with high PFYCs; therefore, the SunZia Project could add to the cumulative effects on paleontological resources for these areas. The expansion or continued use of aggregate pits or mines in areas with high PFYCs could have cumulative impacts on paleontological resources. The proposed re-activation of the Copper Flat Mine, west of Caballo Reservoir, could have cumulative effects if expansions are proposed in areas with high PFYCs. The cumulative effects of the Project on paleontological resources associated with the operation of transmission lines and pipelines would be minimal, since impacts from existing projects would only result from repair of access roads and vegetation removal.

Cumulative Effects Analysis, Including Energy Development Scenarios

Construction

Reasonably foreseeable future projects that are most closely linked to the SunZia Project and likely to result in impacts to paleontological resources are renewable generation projects, including wind and solar. Currently planned wind generation projects in New Mexico and Arizona could potentially occupy up to 96,000 acres; whereas currently planned solar generation projects in New Mexico and Arizona could potentially occupy up to 42,000 acres (see Table 4-36). Renewable projects outside the geographical area could potentially have impacts to paleontological resources, but not cumulative effects associated with the Project. The construction of new renewable energy projects could have cumulative effects to paleontological resources if built in areas with high PFYCs.

Two hypothetical transmission scenarios, including transmission facilities and EDUs, were created to analyze cumulative effects from reasonably foreseeable future renewable energy projects developed to use the transfer capability of the Project. Under Option A, paleontological resources would potentially be impacted by future solar development in the NM-CT, NM-SW, and NM-SO QRAs and geothermal development in the NM-SW QRA, equaling approximately 4,270 acres of potential impact. Fossiliferous geological units and their contained paleontological resources in the NM-CT, NM-SW, and NM-SO QRAs include the Palomas and Baca formations, Gila Conglomerate, and 111 Ranch Beds. Under Option B, paleontological resources would potentially be impacted by future solar development in the NM-SW and NM-SO QRAs and geothermal development in the NM-SW QRA, equaling approximately 1,750 acres of potential impact. One reasonably foreseeable future solar project in the NM-SW and NM-SO is the New Solar Ventures/Solar Torque project. The AZ-SO QRA is outside the area of analysis for paleontological resources and therefore would not have cumulative effects associated with the Project, unless tie-ins to it were needed. It is possible that construction of the Project would help advance renewable energy projects that would need to tie-in to the SunZia Project, thus adding to the incremental impacts on paleontological resources.

Operations

After construction, renewable energy projects would not have cumulative effects to paleontological resources during routine operations, unless ground disturbance occurred in those areas with high fossil potential. However, the Project could add to the cumulative effects on paleontological resources in areas where existing solar and wind projects are located in areas with high PFYCs (e.g., Deming Solar Energy Center).

4.17.4.5 Water Resources

Cumulative Effects Analysis for SunZia

Cumulative effects to water resources may result from past, present, and reasonably foreseeable future projects that may require increased usage of groundwater or surface waters. These

cumulative effects could also result in the degradation of a water resource by increased sedimentation or additions of a contaminant.

Area of Analysis

The geographic scope of analysis for water resources is considered the local watershed (i.e., Rio Grande, Elephant Butte Reservoir, Mimbres River, Upper and Middle Gila River, San Pedro River, and Santa Cruz River watersheds). These watersheds cover large areas and, therefore, may be affected by numerous past, present, and foreseeable future projects.

Construction

The addition of new subdivisions (e.g., Willow Springs Ranches, Windmill Ranches, and Willow Springs) would increase the usage of water for culinary and irrigation purposes, thus increasing the drawdown of groundwater. The past, present, and future use of water for agricultural purposes will add to the cumulative effects in a watershed. For example, approximately 3,284 acres along the Lower San Pedro River were identified as being cleared for farming (Smith et al. 2006). Construction-related activities usually use water for dust control, which would incrementally increase with the size and duration of a project. This would have a temporary small increase in the usage of water for a given area. In addition, expansion of existing transportation features, such as airports, airfields, interstates, and highways, could have cumulative effects to water resources. The construction of new transmission lines, such as the Bowie 345 kV line and the Southline transmission line, is within close proximity to the proposed Project, possibly impacting the same water resources; therefore adding to the cumulative effects. Transmission line access roads typically cross, or are close to, perennial and intermittent streams. The construction of new access roads in the past has increased the erosion and sedimentation of an area that has impacted a water resource (Cascabel Working Group 2010). Construction of new pipelines could have cumulative effects to water resources in those areas with perennial and intermittent streams, water bodies, or wetlands. All construction activities within one watershed could result in incremental additions of contaminants to a water resource. However, the use of BMPs and mitigation measures would limit most cumulative effects and therefore not degrade conservation efforts, such as those at Three-Links Farm (*ibid*).

Operation

The operation of past, present, and future projects can have different cumulative effects than construction activities. Existing land used for agriculture will continue to use water; therefore, any use of water for the Project could have cumulative effects to water resources associated with farmlands. Existing pipelines and transmission lines have little impact on water resources once completed. Periodic vegetation removal or repair to access roads could have indirect effects because of soil erosion, increasing the sedimentation to a water resource. Operation of large power plants that use fossil fuels require a substantial amount of water for cooling and steam production for generating electricity. Natural gas-fueled plants within the study area include the Luna and Afton plants in New Mexico, the Saguaro Generating Station, and the future Bowie Power Station in Arizona. The Apache and Irvington coal-fired plants are also located in southern Arizona. A water-cooled, natural gas-fueled 500 MW generating plant would typically

use approximately 2,500 acre-feet per year, and a coal-fired plant may use greater quantities. The effluent discharge from water-cooled plants, or those producing steam for turbines, could produce incremental increases in contaminants to water resources. Some mining operations, such as those for extracting copper, use a large amount of water for leachate ponds. The reactivation of the Copper Flat Mine, west of Caballo Reservoir in Sierra County, could have cumulative impacts to water resources because of water usage and incremental increases in contaminants to water resources. The Copper Flat Mine lies within a watershed that is also crossed by the one of the SunZia alternative routes.

Cumulative Effects Analysis, Including Energy Development Scenarios

Construction

Reasonably foreseeable future projects that are most closely linked to the proposed Project and likely to result in cumulative effects to water resources are renewable generation projects. The construction of new wind power facilities could have cumulative effects if built in areas with water resources, such as perennial and intermittent streams. The construction of new solar and wind facilities, as well as their associated access roads and tie-ins to existing transmission lines could affect surface and groundwater flow systems, leading to increased erosion and sedimentation. There would also be an incremental increase of water usage during construction of wind-power and solar-power facilities. Ground-disturbing activities within QRAs could result in increased sedimentation into surface waters. There is only one QRA (north of Carrizozo, New Mexico) for wind facilities overlapping the Project that could have potential cumulative effects to water resources. There are four QRAs for solar facilities overlapping the Project that may have potential cumulative effects to water resources (NM-EA, NM-CT, NM-SO, and NM-SW), and another that may have a tie in to SunZia (AZ-SO). There are currently four reasonably foreseeable future solar projects in New Mexico totaling 7,076 acres, and three reasonably foreseeable future solar projects in Arizona totaling 805 acres that could have cumulative effects associated with SunZia.

Operation

Wind projects would have little impact to water resources after being built. Solar projects would require varying amounts of water, depending upon the type of generation technology. While PV or dish engine solar facilities require a relatively small amount of water to clean the panels, solar thermal installations using conventional wet-cooling require a large amount of water. According to the Draft Solar PEIS (BLM and DOE 2010), thermal solar facilities using wet-cooling technology may use up to 5.6 to 18.4 acre-feet/year/MW that would be withdrawn from either groundwater or municipal supplies for generation plants, where treated wastewater or other sources are not available. Therefore, development of solar thermal generation facilities may increase the local drawdown of groundwater. In some locations that have experienced historic aquifer declines from irrigation, added groundwater drawdown could increase the potential for land subsidence and earth fissures. This could have an indirect effect of increasing erosion and sedimentation. Typically, the parabolic-trough technology requires the least amount of acreage per megawatt (*ibid*). However, overall acreage for a solar facility can vary between right-of-way applications, depending upon various factors, including increased acreage due to avoidance of a

sensitive resource. Solar facilities using wet-cooling technology could produce wastewater that may be treated onsite in evaporation ponds or leach-fields. This wastewater, if discharged to surface waters after treatment, could increase the flow of ephemeral or intermittent streams, which could also increase erosion and sedimentation. The Project could add to the incremental impacts to water resources associated with present solar projects that are within the same watersheds, such as New Solar Ventures/Solar Torque in Luna County, New Mexico.

4.17.4.6 Biological Resources

This section discusses effects of the Project on biological resources, when viewed in the context of ongoing activities and future development in the region. In addition, the effects of future regional renewable energy development scenarios in the context of the proposed Project are considered.

Cumulative Effects Analysis for SunZia

Area of Analysis

The cumulative effects analysis area for biological resources could include the overall range of any population of wildlife that may be affected by the Project. For some migratory bird species, this could include much of North and South America. By necessity, the discussion in this section focuses on cumulative effects occurring within the Southwest, including effects on dispersal between populations. The limitations of available information, particularly regarding future actions, prevent this discussion from providing detail relating to all individual activities or affected species in the region. However, the Project may contribute to effects caused by past, present, and reasonably foreseeable future activities occurring in the following areas:

- The study corridor, extending 4 miles on each side of the centerline, used in the analysis of the affected environment for biological resources
- The Rio Grande bird migration corridor, a part of the Central Flyway
- The middle and lower San Pedro River Valley bird migration corridor
- Other major habitat blocks, flight paths, or bird concentration areas that would be crossed by the Project
  - Chupadera Mesa
  - Uvas Valley – lower Rio Grande
  - Willcox Playa – northern Sulphur Springs Valley

- Major watersheds, stream systems, or their tributaries if crossed by the Project
  - Middle Rio Grande
  - Middle and lower San Pedro River
  - Aravaipa Creek
  - Cienega Creek

- Contiguous habitat blocks that may be affected by the Project, such as mountain ranges or intermontane valleys

The majority of identified past, present, or reasonably foreseeable actions could be considered to share cumulative effects with any of the alternative subroutes, including the BLM preferred alternative.

Construction

Construction of the proposed Project would have several types of effects on biological resources in common with other current and future developments in the region. Ground disturbance and the resulting habitat loss is an effect common to all new development, and in most cases, results in additive cumulative effects to biological resources. Related direct effects restricted to the vicinity of construction areas include associated noise and disturbance of local wildlife. The proposed Project would contribute to ongoing loss of natural habitat in the cumulative effects analysis area where ground disturbance is required, although this is mitigated where possible by siting the proposed Project near existing areas of disturbance. Any future development may contribute to habitat loss, although most reasonably foreseeable actions within the cumulative effects analysis area are likely to be near previously disturbed areas. In general, most types of development avoid high-sensitivity habitats such as montane canyons and riparian woodlands.

Some indirect effects of construction can result in off-site effects that are greater than the additive effects of habitat loss within a construction area. Initially, invasion of noxious weeds and other non-native plants tend to concentrate around areas of recently disturbed ground, expanding outward into undisturbed habitat under favorable conditions. Each additional ground-disturbing activity provides a new potential foothold for invasive plants, and could allow effects to extend rapidly beyond the initial area of disturbance. Erosion, particularly where construction occurs in steep terrain or near surface water, may result in silt being carried downstream, potentially altering stream substrate and aquatic habitat. Although these effects may occur with current and future development in the cumulative effects analysis area, standard and selective mitigation measures for the proposed Project would minimize any contribution to these cumulative effects to the extent feasible.

Operation

The effects of operation of the proposed Project include those related to the presence of access roads and associated maintenance activities, and the presence of transmission structures and lines in the environment. In general, locating multiple linear utilities in the same area minimizes cumulative effects on biological resources. Total ground disturbance is reduced because access roads may serve multiple projects, and other effects to biological resources such as maintenance activities, recreational or other use of access roads, and risk of invasive plant spread would affect a smaller portion of the landscape than if utilities were widely separated. However, utility corridors may create edge effects or act as dispersal barriers, and so colocating utilities is not universally beneficial in these cases.

Cumulative effects are expected to vary with the species being considered. Wildlife sensitive to crossing open ground—including roads and areas subject to vegetation management such as rights-of-way for linear utilities—may cross small, open spaces, but avoid those above a certain width. For these species (often small mammals or forest birds), multiple utilities adjacent to one

another may create a substantial barrier to dispersal. Within the arid Southwest, most other species are adapted to relatively low vegetation cover with scattered open spaces, and "soft" barriers such as fences or utility access roads with low traffic may not prevent or substantially reduce dispersal (McGregor et al. 2003). Other "hard" barriers such as major highways, canals, railways, and similar features may nearly eliminate dispersal of some terrestrial animals (Garland and Bradley 1984; Riley et al. 2006) and even birds (Jacobson 2005). The net effect of all types of fragmentation can isolate populations in small patches, reducing genetic exchange with adjacent populations. Inbreeding depression or local extirpation can result, if a completely isolated patch does not support a population of sufficient size.

Some grassland species, including the ESA candidate Sprague's Pipit, tend to avoid areas near tall structures. Others, such as some small mammals and the Desert Tortoise, may not respond to the structures directly, but may suffer increased predation from raptors and ravens using the structures as nest sites or for foraging perches. Desert Tortoises are also highly susceptible to road mortality and harassment or illegal collection by humans. For these species, siting the Project near adjacent utility corridors with existing access would not result in a significant cumulative impact, as the effects described would already be ongoing. However, widely spaced transmission lines in habitat for these species can have a substantial cumulative impact, with effects extending well beyond the individual rights-of-way.

Each of the effects previously described may increase locally in intensity when multiple projects are sited adjacent to one another. Individual animals may be at greater risk of disturbance or mortality from concentrated activities. However, the benefits of reducing total ground disturbance when multiple linear utilities are colocated may outweigh the negative effects of locally increased intensity of disturbance in many cases.

Bird collision with transmission lines and other tall, man-made structures is a recognized problem, but the effect at the population or species level can be difficult to estimate (Manville 2009). Extrapolating local studies near mortality sources to observations of population-wide declines is problematic, given site-specific habitat differences, unusual weather events that cause mass mortality, biased mortality estimates in individual studies, or other factors. The estimated cumulative impact of all unintentional human-caused mortality sources is approximately one billion bird deaths annually, which is approximately 5 to 10 percent of the total land-bird population in North America (Erickson et al. 2005). Although some factors are ranked differently by various studies, collision with buildings is the greatest man-made cause of unintentional bird mortality, followed by transmission lines, domestic and feral cats, and perhaps pesticides. Transmission line collisions, estimated to cause 130 to 174 million (or 13 to 17 percent) of the annual human-caused bird deaths, represent between 0.6 and 1.7 percent of all land-birds in North America (Lilley and Firestone 2008).

For legally harvested species, hunting can be the largest human contribution to mortality, and perhaps the largest cause of mortality of any source for waterfowl. Annual harvest may total approximately 4 to 10 percent of the population for species with low reproductive rates such as the Sandhill Crane (Kruse et al. 2010), or more than 30 percent for some species of ducks and geese that produce large clutches annually. In 2009, approximately 13.1 million ducks were harvested from a population of approximately 40.9 million (Raftovich et al. 2010; USFWS 2010d). Within the Central Flyway, which includes the Rio Grande Valley, approximately 3.1

million waterfowl were harvested from a population estimated at 7.7 million in the winter of 2009-2010 (Kruse 2010).

Collision is primarily a population-level threat to species already at risk from other factors, or to long-lived species with low reproductive rates (Drewitt and Langston 2008). In the context of the threats discussed above, the Project would not be expected to present a collision risk significant at the population level to any species in the region. While the proposed Project would be a small contribution to the overall collision hazard for birds in the Southwest, the cumulative effect of all transmission lines may be substantial, particularly to migratory birds. These effects can often be mitigated with bird diverters or similar devices—an option particularly useful in important migratory bird corridors such as riparian areas. Colocated transmission lines may also have lower collision rates than isolated transmission lines, as the overall visibility of multiple lines in proximity aids visual detection and avoidance of the lines by birds.

The following examples represent known locations where the Project would be located adjacent to existing or planned transmission lines, in areas with the potential for an increased risk of bird collision. No portion of the Project would be located adjacent to existing transmission lines when crossing the Rio Grande. Two 345 kV lines are adjacent to the proposed location of Link C110 in the Sulphur Springs Valley, which is an important winter foraging area for Sandhill Cranes and raptors. Link C660 crosses the San Pedro River adjacent to the planned San Manuel Interconnect. Existing transmission lines are present along the Santa Cruz River near Sweetwater Wetlands, and the Pinal Central-Tortolita line would be located near the CAP and Picacho Reservoir. Each of these transmission lines would increase the risk of bird collision when sited individually, but as described above, colocation of multiple transmission lines can reduce the cumulative collision risk through increased visibility of the transmission corridor.

The effects of grazing, both past and present, can be cumulative with the effects of transmission line construction and operations. Much of the Project area is composed of grasslands, and grazing occurs on most federal and state lands. Historically, the amount of grasslands in the Southwest was greater than it is today. For example, 16 percent of the upper San Pedro River Valley grasslands were converted to mesquite woodland in just 20 years, from 1970 to 1990 (Kepner et al. 2000). Grazing and fire suppression can both favor shrubs at the expense of grasses under some conditions, and have contributed to the historic decline of the semi-desert grassland vegetation type. Transmission line construction, associated access roads, and ancillary facilities can remove large areas of potential grazing lands. Solar and wind facilities (see below) require even more land and greatly contribute to these ongoing cumulative impacts. Grazing wildlife such as the Pronghorn may be negatively impacted by the cumulative impact of barbed-wire fencing, cattle grazing and by transmission line construction, which can cause temporary disturbance and alter or reduce habitat.

Erosion resulting from road construction can be a substantial cumulative impact. The floodplains of many major rivers contain a variety of existing agricultural and residential activities, and surrounding uplands often contain extensive networks of formal and informal roads. Transmission line access roads and work areas create additional ground disturbance, adding to existing conditions that can result in unnaturally high levels of erosion. Access roads for transmission line maintenance can be washed out by capturing stormwater flow resulting from summer monsoons or winter rainstorms. Sediment can then enter washes, and eventually

perennial streams such as the San Pedro River, reducing water quality and degrading aquatic habitat for fish, reptiles, and amphibians. Soil erosion in uplands results in lower moisture-holding capacity and loss of nutrient-rich topsoil from the watershed. In addition to their direct contribution to erosion, access roads associated with transmission lines may open up previously roadless areas to future development and recreational users and the creation of additional roads (Cascabel Working Group 2010a).

The following examples represent some of the cumulative effects that may be shared between the proposed Project and wind generation facilities identified in the cumulative effects analysis area. The Macho Springs Wind Project, located northeast of Deming, New Mexico, may impact grassland species, such as the Aplomado Falcon and the Sprague's Pipit. All wind energy facilities would impact vegetation and wildlife.

The following examples represent some of the cumulative effects that may be shared between the proposed Project and solar generation facilities identified in the cumulative effects analysis area. The Deming Solar Energy Center is located in farmland and a low-density residential area, and would have minimal biological impacts. The New Solar Ventures-Solar Torque facility, also near Deming, New Mexico, may impact grassland species such as the Aplomado Falcon. The UA Tech Park Thermal Storage facility and SOLON-Tucson Electric Power facility are located in urban Tucson and would have minimal biological impacts, although there is a small amount of suitable Pima pineapple cactus habitat at the UA project site. The Avra Valley Solar Project and the Fotowatio Renewable Ventures facility are located outside of the urban area in undeveloped desertscrub habitat, where habitat for the Tucson Shovel-nosed Snake may be impacted. All solar facilities would impact vegetation and wildlife.

The SunZia Project may also share cumulative impacts with several existing natural gas and coal-fired power plants in the cumulative effects analysis area. The Luna Energy Facility, near Deming, New Mexico, is located in grassland habitat in an area containing agriculture and development. The area is now low-quality habitat for the Aplomado Falcon, but the power plant may have contributed to habitat degradation. The Lordsburg Generating Station is located in desertscrub that is marginal habitat for the Aplomado Falcon. The Apache Energy Facility is located adjacent to Willcox Playa; along with the SunZia Project, the Apache Energy Facility is likely to impact the population of Sandhill Cranes that fly daily between Willcox Playa and farmland farther north of the Sulphur Springs Valley. The Saguaro Generating Station, located in desertscrub near Red Rock, Arizona, may impact the Tucson Shovel-nosed Snake, the Lesser Long-nosed Bat, and the Cactus Ferruginous Pygmy Owl; these impacts would be cumulative with the proposed Project. All of these power plants would impact vegetation and wildlife other than special-status species.

The Rosemont Copper Mine, located south of Tucson, would have cumulative impacts shared with the proposed Project. The mine, with its associated transmission line and water pipeline, would directly affect the Lesser Long-nosed Bat, Chiricahua Leopard Frog, and the Pima pineapple cactus, and would affect the hydrology of Cienega Creek. This could result in effects to the Mexican Gartersnake, Gila Chub, Gila Topminnow, Huachuca water-umbel, and the high diversity of other wildlife dependent on the Cienega Creek system. In addition, the Santa Rita-Rincon wildlife linkage would be subject to the cumulative effects of the mine and the Project.

In the northwest portion of the Project area, the Pinal Central-Tortolita Transmission Line and the SunZia Transmission Line have the potential to cumulatively affect the Tucson Shovel-nosed Snake and the Sonoran Desert Tortoise, as well as the Southwestern Willow Flycatcher and Yuma Clapper Rail in wet years when water is present in Picacho Reservoir. In the San Pedro River Valley, the San Manuel Interconnect would cross Southwestern Willow Flycatcher critical habitat and may have the potential to cumulatively affect the Sonoran Desert Tortoise and incrementally increase the risk of bird-power line collisions. The Southline Transmission Line Project would cross the Sulphur Springs Valley, increasing the overall risk of collision for wintering Sandhill Cranes and other birds.

Urban expansion may encroach on conservation areas, such as where the City of Tucson borders Saguaro National Park. The Project would contribute to the cumulative loss of undeveloped land surrounding such areas. Several proposed housing developments may have cumulative impacts shared with the proposed Project. In Socorro County, New Mexico, the Willow Springs Ranches residential subdivision is located south of the transmission line, but would not affect the nearby Socorro Springsnail. The Windmill Ranches residential subdivision, south of the SunZia East Substation, likewise would not affect any listed species. In Arizona, the Willow Springs residential subdivision is located in Sonoran desertscrub habitat that may be suitable habitat for the Sonoran Desert Tortoise, the Cactus Ferruginous Pygmy-owl, and may provide foraging habitat for the Lesser Long-nosed Bat, although no known bat roosts would be directly affected by either project. These subdivisions would each have cumulative impacts with the Project on vegetation and wildlife.

Cumulative Effects Analysis, Including Energy Development Scenarios

The proposed Project would begin at the SunZia East Substation, located nearly at the divide between the Tularosa Basin and the Pecos River watershed, a point that marks a transition from vegetation communities associated with the Desert Southwest to those associated with the western Great Plains. As a result, species and vegetation communities affected by wind energy development in central or eastern New Mexico would often be different from those affected by the proposed Project. However, biological resources in desert valleys of western New Mexico and Arizona would be affected by both development of the proposed Project and future solar energy facilities. Impacts to species listed under the ESA could be cumulatively significant; however, future energy development projects would be subject to environmental review on a case-by-case basis, and each project on public land as well as projects funded or permitted by federal agencies would be required to minimize any effects to listed species through consultation under Section 7 of the ESA (BLM 2005). Private and other nonfederal actions are similarly required to minimize effects on listed species through the development of Habitat Conservation Plans (HCP) and other mitigation methods.

Wind Energy

Development and operation of wind energy facilities have several types of impacts in common with construction and operation of the proposed Project. Ground disturbance, maintenance activities, gen-tie transmission lines, the risk of invasive plant colonization, and construction activities are impacts associated with wind energy that are similar to the development of major

transmission lines (BLM 2005). Wind turbines and major transmission lines both create collision hazards for birds. However, the risk posed by transmission lines is relatively dispersed, except where a line would cross major migration corridors. Siting wind energy facilities away from major migration corridors reduces the collision risk to migratory birds, but may still affect resident birds.

Different species groups are also at risk with the two types of development (Erickson et al. 2005). Transmission lines appear to create the highest risk to large wading birds and waterfowl, and secondarily to migratory passerines; while wind turbines, usually sited in open uplands, primarily create the highest risk to passerines and raptors. Improvements in siting and turbine technology have continued to reduce collision risk for birds when compared with older wind energy facilities (Krijgsveld et al. 2009).

Bats can be killed by very low air pressure formed near the tips of moving wind turbine vanes, although wind energy facilities are generally sited in open habitat lacking bat roosts. In addition, both bats and their insect prey avoid windy conditions. The majority of bat mortality at wind facilities is restricted to a handful of migratory bat species (Arnett et al. 2008). Modifying turbine cut-in speeds to avoid operation at low to moderate wind speeds during sensitive seasons can reduce the mortality risk to foraging and migrating bats.

The USFWS has developed draft guidelines to reduce the impact of wind energy development on wildlife, and to assist developers in compliance with the MBTA, BGEPA, and ESA (USFWS 2011a). In part, the USFWS recommends a 3-tiered preconstruction site analysis to eliminate high-risk sites, develop site-specific mitigation, and establish baseline information to allow an assessment of the effects of a project through postconstruction monitoring. Postconstruction monitoring would indicate whether siting, design, and mitigation measures are adequate to eliminate significant effects on wildlife, or whether further mitigation and modification is recommended. Development of an Avian and Bat Protection Plan provides a framework for conducting and reporting these studies. The USFWS also developed draft guidelines to assist in the development of Eagle Conservation Plans for wind energy facilities (USFWS 2010e).

With the exception of bird collisions and bat mortality, the operation of wind energy facilities creates ongoing impacts to wildlife similar to those associated with transmission lines. The habitat between wind turbines is interspersed with access roads, and vegetation management is required around structure bases. However, the greater portion of the ground area remains undisturbed and is suitable for many terrestrial wildlife species. Some species that avoid vertical structures or are threatened by raptor predation, such as certain grassland bird species and prairie dogs, may avoid the vicinity of transmission lines or wind turbines. Nesting bird density can be lower near wind turbines (Pearce-Higgins et al. 2009), and large mammals or those that are sensitive to human presence would avoid the general area of a wind energy facility.

In 2011, the USFWS initiated the process of developing an EIS for a regional HCP in the Midwest, to address mitigation and permitting relating to “take” of ESA-listed and candidate species (USFWS 2011b). The area to be covered in the EIS and HCP was defined around the migration corridor for endangered Whooping Cranes (*Grus americana*) and the range of the candidate Lesser Prairie-chicken (*Tympanuchus pallidicinctus*). The range of the Lesser Prairie-chicken extends into the eastern portion of the wind energy QRA and the cumulative effects

analysis area for the energy development scenario. Lesser Prairie-chickens are a species that responds negatively to wind turbines, transmission lines, and other tall structures. The HCP, if issued, would prescribe mitigation to reduce collision risk and reduce the impacts to sensitive grassland birds.

Solar Energy

Impacts associated with solar development are much more intensive than those associated with wind energy or transmission lines. Solar fields are generally large and contiguous, from tens to hundreds of acres, and often require complete vegetation removal and elimination of all wildlife habitats within a project footprint (BLM and DOE 2010). Engineering constraints require placement of solar fields in large, level areas. Although sensitive montane and riparian habitats are not generally impacted by solar development, a number of species associated with level valley bottoms in the Sonoran Desert are threatened by ongoing urban and agricultural development of those areas. Solar energy development, when not located on previously disturbed land, contributes to the decline of those species.

Conclusion

Development of the proposed Project, in conjunction with other present and future projects, would contribute to the ongoing fragmentation and loss of natural habitats in the Southwest. All Project subroute alternatives, including the BLM preferred alternative, would have similar cumulative impacts. As discussed above, cumulative impacts would be reduced in most cases when linear utilities, including the proposed Project, are colocated. All transmission lines add to the bird collision risk created by existing transmission lines, communications towers, and other structures. Other types of future developments, particularly urban expansion and large-scale solar or wind energy development, are expected to result in the greatest loss of habitat in the region.

4.17.4.7 Wildland Fire Ecology and Management

Cumulative Effects of Increased Fire Risk

The human contribution to the occurrence of fires can be substantial, and can often result in fires occurring outside the natural fire season. Between 1980 and 2003, lightning ignited 1,548 fires and humans caused 1,157 fires on BLM-administered lands in New Mexico (BLM 2004a); and between 1983 and 2002, lightning ignited 426 fires and humans caused 372 fires on BLM-administered lands in Arizona (BLM 2004b). Fires caused by transmission lines are typically a very small percentage of human-caused fires, particularly in grasslands, desertscrub, and similar vegetation communities where plants rarely or never reach conductor height. However, the proposed Project would contribute minor, additive increases in the fire risk during construction and operation, and indirectly through the potential for vegetation change and by increasing access for recreational users. The potential contribution of any single factor to future fire risk cannot be assessed, but ongoing and future actions will continue to create an environment where multiple human-caused fires are expected to occur annually within the study area.

Cumulative Effects on Fire Management Planning

The BLM's four categories of desired fire management are based on the response of an ecosystem to fire and the presence of constraints to the use of fire for management. A single transmission line may not preclude the use of fire, depending on site-specific conditions. However, multiple transmission lines can create large corridors where suppression cannot occur due to the hazard to firefighters, unless the lines are de-energized. This may raise the risk that a controlled fire in that area would expand beyond desired boundaries, or increase beyond the desired intensity. Other types of developments may not create hazards for fire crews, but would further constrain planned fire use. The proposed Project, when considered with past, present, and reasonably foreseeable future actions, would contribute to the trend of an expanding WUI and the creation of a complex landscape where fire use by land managers is becoming increasingly difficult.

Cumulative Effects on Fire Suppression

The proposed Project would result in the addition of major infrastructure to wildlands and existing WUI. Firefighting resources must be allocated to containment of a fire as well as to the protection of life and property. The addition of a double-circuit transmission line would add further infrastructure that may receive fire protection, and would add further complexity to the challenges of fighting a fire in a WUI.

Construction of the proposed Project would result in a cumulative effect by adding hazards to fire suppression primarily where other transmission lines are parallel or nearby. Gas pipelines may require that heavy vehicle use be limited or avoided within the pipeline right-of-way, and valve or meter stations may contain flowing or residual gas in aboveground pipes. However, pipelines do not create linear hazards similar to those associated with transmission lines, such as the flashover risk or flight hazard.

Cumulative Effects Analysis, Including Energy Development Scenarios

Solar and wind energy developments typically share several types of effects relating to fire ecology and management. The risk of a fire igniting as a result of construction activities can exist anywhere internal-combustion engines, blasting, smoking, or metalwork occurs in proximity to flammable vegetation. Disturbed ground enhances the establishment of non-native plants, often those that alter the fire regime. All energy facilities would require additional transmission lines and possibly substations for interconnection with the power grid, with potential effects very similar to those discussed for the proposed Project.

Wind and solar energy facilities can differ in the degree of effects on fire ecology and management during operation. Wind facilities typically leave the majority of vegetation within a site intact, although broken by access roads to each tower. This vegetation could potentially carry a fire through the facility. Mechanical failure of a wind turbine, such as could occur in high winds, can result in a fire ignition as potentially flammable vegetation often surrounds each turbine. Solar facilities are often, but not always, maintained nearly devoid of vegetation. Solar facilities and many wind facilities are typically located on nearly level ground, frequently in vegetation communities with light, fine fuels. However, some wind facilities may be located on

ridgelines, or at higher elevations than is feasible for solar development, and fires of greater intensity may occur in these vegetation communities.

Wildland fire suppression would not typically be needed within a solar facility and would not be affected outside the facility, except near associated transmission lines. Ground suppression within a wind facility can take place with few constraints, as collector lines from each turbine to the facility's substation are typically buried. Aerial suppression may be impeded by the presence of the turbines.

4.17.4.8 Cultural Resources

Cumulative Effects Analysis for SunZia

Impacts to cultural resources consist of the loss of cultural artifacts, features, or sites that could yield important information about the past. Direct effects could occur through the removal of sites, damage to sites, or adding modern facilities to cultural landscapes or historic settings. Indirect effects could occur by providing access to otherwise remote or inaccessible areas, potentially increasing the likelihood of unintentional damage to sites by off-highway vehicles or vandalism. Because cultural resources are limited, finite, and nonrenewable, cumulative effects could occur through the incremental loss of culture-specific artifacts, loss of prehistoric or historic settings, or the incremental addition of information about specific cultural areas.

Mitigation of effects to cultural resources, such as through site avoidance or data recovery, can protect sites from further disturbance or provide opportunities to add important information about history or prehistory. In the Tucson Basin, data recovery projects provided information on cultural resources for which little was previously known (Ciolek-Torrello et al. 1998; Doelle 1984; Doelle and Fish 1988; Gregory et al. 2001; Thiel and Mabry 2006; Whittlesey et al. 1994b). It is reasonable to expect that similar efforts in support of the proposed Project could identify similar information important to our understanding of the past. The identification of new resources and any mitigation of these lesser known culture areas could cumulatively contribute toward the preservation and understanding of their cultural histories.

Cumulative effects for cultural resources would occur over the life of the Project. Past, present, and reasonably foreseeable future actions that were considered for this analysis are described in Table 4-35. Reasonably foreseeable future actions are applicable to all subroutes within each route group. Impacts to reasonably foreseeable future actions outside of the study area are addressed in the energy development scenarios section.

Area of Analysis

The area of analysis for cultural resources is defined as cultural group boundaries derived from archaeological investigations. Given the large scale of the cultural groups (i.e., Ancestral Pueblo includes parts of Arizona, Colorado, and New Mexico), the geographic extent of the area of analysis is the Project study area. The boundaries of the culture groups that inhabited the study area are as follows:

- The Hohokam (Desert and Riverine branches) – west end of the Project study area to the proposed Willow-500 kV Substation
- The Mogollon (San Simon, Mimbres, and Jornada branches) – proposed Willow-500 kV Substation to Truth or Consequences
- The Piro/Tompiro (Mogollon and Ancestral Pueblo) – Truth or Consequences north to the east end of the Project study area

A number of protohistoric and historic groups have occupied the Project study area, such as the Apache, O'odham, Spanish, and the Puebloan groups; many of which are descendants of Ancestral Pueblo and Mogollon cultural traditions. Culture areas are somewhat dynamic and vary chronologically as more information about an area is obtained; however, each culture area occupies a general region. For example, the Hohokam area is located principally around the Phoenix and Tucson areas, but their influence has been found as far away as Safford. The Mogollon area is located in southeastern Arizona and western New Mexico. The Ancestral Pueblo area is located in the Four Corners area; although toward the later part of their occupation, there is evidence for migration along the Rio Grande and into the Safford Area as well as along the San Pedro River. The Apache and other proto-historic tribal groups occupied areas away from historic rural communities, often within the nearby mountainous areas of southeastern Arizona and western New Mexico.

Previously Recorded Cultural Resources within the Project Corridor

The existing environmental conditions, including identification of past and present cultural groups and land uses, are described in Section 3.8. Direct and indirect effects of the Project alternatives are identified and discussed in Section 4.8. Evaluating cumulative effects of the Project involves a review of the known existing cultural resources within the Project corridor, an understanding of the previous development in the cumulative area of analysis, and assessments of reasonably foreseeable future actions.

Although an intensive pedestrian survey has not been completed, the records review has identified 699 known cultural resources within a 0.5-mile-wide corridor for all of the Project alternatives. These include a wide variety of historic districts, prehistoric habitation areas, historic trails, and artifact scatters.

A review of the Class I records indicates that there are 983 cultural resource surveys that were wholly or partially completed within the 0.5-mile-wide cultural study corridor. While some of these surveys were conducted for research purposes, the majority of the surveys were conducted at the request of other Project proponents to fulfill required environmental compliance. Some examples of the past projects similar to the SunZia Project and that are contained, wholly or partially, within the SunZia Class I study corridors include:

- Southern Pacific Pipeline: Hassayampa River to Yuma
- Tucson Gas and Electric 138 kV Transmission Line
- Western Area Power Administration Oracle-Tucson 115 kV Transmission Line
- Cholla-Saguaro Transmission Line Corridor
- AEPCO Project

- CAP – Tucson Aqueduct and Salt-Gila Aqueduct
- All American Pipeline
- Santa Fe Pacific Pipeline: Rillito Loop
- Link 3 of the AT&T NexGen/Core Project
- MCI Fiber Optic Cable Project: Rialto, California, to El Paso, Texas
- Petty-Ray Geophysical Seismic Testing Line
- Pyramid Generating Station and associated transmission lines
- Improvements and maintenance on SR 90 and I-10

Construction

Cumulative effects from impacts associated with the construction phase of the Project would be similar for all alternatives. Cultural resources could be destroyed by construction activities such as cleaning, grading, drilling, substation development, and access road construction. However, the location of projects may impact cultural resources, as the likelihood of encountering such resources increases near existing communities, along transportation corridors, or near sacred areas.

Incremental impacts to cultural resources result from past, present, and reasonably foreseeable future projects. Ground disturbance associated with linear facilities such as transportation corridors (e.g., I-10, UPRR, etc.) has had major incremental cumulative effects because many such corridors follow trails that were historically used. For example, portions of the El Camino Real NHT that parallels I-25 and the historic alignment of the Butterfield/Gila Trail that parallels a portion of US Route 191 may have been partially or wholly destroyed because of the development of transportation corridors. The BLM preferred alternative extends across segments of several historic trails of various levels of significance. Although the proposed transmission line would not physically impact the existing trails, the Project would extend across the trail perpendicularly, segmenting it into smaller components and causing potential visual impacts. While the Project would have a small incremental effect on historic trails as a whole, the cumulative effect of linear projects either crossing or paralleling historic trails would result in incremental degradation to the historic feeling and setting of these trails. Reasonably foreseeable future projects such as the Southline Transmission Line Project also extend across historic trails, potentially adding incremental impacts on cultural resources.

Existing transmission lines and the development of the West-wide Energy Corridor create opportunities in which other features could be colocated, potentially causing additional disturbance to cultural resources as new facilities are developed. Several transmission lines have already been constructed within the study area (APS 115 kV/500 kV Line, El Paso Electric 345 kV, Southwest Transmission Co-op 115 kV/230 kV Line, and Tucson Electric Power Co. 138 kV/345 kV). However, because transmission lines cause less ground disturbance than other linear features such as roads and pipelines, it is possible to avoid cultural resources by having structures span cultural resource sites. In addition, the selective placement of transmission structures provides an opportunity to preserve cultural resource sites from future development impacts within the right-of-way.

Traditional use areas are culturally sensitive areas for tribal groups. During the identification process, tribes will be consulted and invited to participate so that these resources may be

identified and avoided and protected. The Western Apaches consider Mount Graham (within the Pinaleño Mountains) one of their holiest mountains, and it was determined eligible for inclusion to the NRHP. Although none of the Project alternatives would directly impact Mount Graham, the construction of the Project in conjunction with present and future actions could have cumulative effects to the sacred area, given the sensitive issues surrounding the mountain. Other reasonably foreseeable future projects may potentially impact sacred areas, including the Cibola Greenworks Project, which is located near the Laguna del Perro Salt mines, a salt resource used by prehistoric communities.

Through the use of BMPs and selective mitigation measures, impacts to cultural resources and their cumulative effects can be reduced.

Operation

The operation of existing and reasonably foreseeable future projects increases access to remote areas and visually impacts historic viewsheds, which could create additional impacts to cultural resources.

New access roads into remote areas could present new opportunities for vandalism to occur, increase OHV recreation and, in turn, damage cultural resource sites by increasing erosion potential. Several habitation areas located on the east side of the Rio Grande in the Project vicinity have been severely damaged by wind and water erosion.

The expansion and continued use of transportation corridors such as I-10 could have incremental impacts on cultural resources. For example, significant prehistoric cultural resources were identified during the construction of the extra lane along I-10 within the Tucson area. However, while portions of these resources were destroyed, other portions of the sites were saved from future development through protective measures. Prior to their destruction, the adverse impacts to the sites were mitigated through data recovery, the results of which helped to define the current understanding of settlement along the Santa Cruz floodplain, pushing the timeframes for irrigation, ceremonial structures, and cemeteries further back into prehistory than was previously known.

Indirect cumulative effects from the operation of the Project include incremental impacts associated with visual impacts to historic properties. The proposed Project has the potential to visually affect several NRHP-listed properties and a National Monument. For example, several route alternatives were developed based on potential impacts to the Gran Quivira; a 610-acre cultural landscape consisting of ancient pueblo ruins and Spanish mission structures set atop a ridge that provides views and vistas of a landscape relatively unchanged since the Spanish Colonial Period. The incremental effect of the Project would be greater with respect to views to the south of the Gran Quivira. The setting to the North of Gran Quivira has been modified by development in this area, which includes the High Lonesome Mesa Wind project, residences, pipelines, roads, and the visitor center.

Other cultural resources that could be visually affected include several archaeological districts (e.g., Playas Pueblos, Mockingbird Gap, Oak Draw, and Marijilda Canyon Prehistoric), as well as several individual properties, including Sagrada Familia de Lemitar Church, Los Dulces

Nombres; Brown and Fitch Halls; Shakespeare Ghost Town; Hidalgo County Courthouse; Lordsburg-Hidalgo County Library; Bonita Store; Cienega Bridge; and Colossal Cave. In addition, several historic districts and individual properties would be affected by any of the alternatives in the Tucson area.

Portions of Subroute 4C3, within and adjacent to the City of Tucson, are in areas with extensive historic structures and historic districts. These historic features have been significantly impacted by the cumulative effects of modern urban development. The incremental effect of the Project to cultural resources within Tucson would contribute to the disturbance to the historic character or setting of the city.

Possible Mitigation Measures

Mitigation for direct impacts to cultural resources from the construction of the Project or additional transmission projects could include a variety of items, including avoidance of cultural resource sites through line siting, spanning sites with selective structure placement, or mitigation through data recovery of cultural sites that could not be avoided. Limiting entrance to undisturbed areas through Project access roads with locked gates may be an effective method to limit the damage to cultural resources in remote locations. Indirect impacts such as visual impacts to historic trails or other historic properties may be lessened by the modification of the proposed transmission structure type, color, and spacing, if parallel to an existing line. In addition, informational signs and other collaborative interactions with trails associations could provide alternative mitigation measures by providing awareness to sensitive cultural resources.

Cumulative Effects Analysis, Including Energy Development Scenarios

Cumulative effects from potential energy development projects identified as the Energy Development Scenarios could result in cumulative impacts to cultural resources. Impacts would be associated with the areas of development identified below.

Construction

The construction of new renewable energy projects could have cumulative effects to cultural resources depending on the types of renewable energy proposed, the anticipated amount of acreage for the project, and location of the project area. In general, wind resource projects include large dispersed areas of land with associated access roads, allowing for the potential to avoid impacting cultural resources. Solar resource projects generally include large block areas that have a greater potential for impacting sites since there are fewer opportunities for avoidance. In general, there is a direct relationship between the amount of project acreage, the location of the project, and the potential for impacting cultural resources.

Energy development scenario Option B involves the construction of one AC and one DC transmission line that would be constructed with a combined 4,500 MW of transfer capability, and represents the option with the greatest potential ground disturbance. Based on Option B, wind energy development in NM-EA QRA and solar energy development within NM-SW, NM-SO, and AZ-SO QRAs could total approximately 40,270 acres. Existing cultural resources are

known within the NM-EA, NM-SW, NM-SO, and AZ-SO QRAs, and include prehistoric habitation areas (rockshelters, pit houses, and roomblocks); artifact scatters with hearths, roasting pits, rock piles, or bedrock mortars; prehistoric lithic quarries; pictographs/petroglyphs; protohistoric Tohono O'odham villages; the Shuni Village; historic railroads and associated facilities; historic mining facilities; historic irrigation features; and trash scatters associated with historic structures.

Reasonably foreseeable future energy projects such as New Solar Ventures/Solar Torque and Gestamp Solar are located in culture areas that have limited information. The construction of these projects would provide opportunities to add to the cultural resources knowledge base.

Operation

Renewable energy projects would increase access to undeveloped areas. This increased access could present new opportunities for vandalism to occur.

Renewable energy projects such as wind are frequently located on mountaintops or ridges. Mountain ranges in the Southwest are often associated with areas of traditional cultural properties of the tribal groups in the area. The development of these types of projects may cause cumulative impacts to these sensitive resources.

Renewable energy projects such as geothermal, solar, and wind farm also have visual impacts on the landscape. Such projects could contribute to the incremental degradation of historical integrity to historic properties for which setting and feeling are a significant factor to a site's NRHP eligibility. An example of this includes the reasonably foreseeable EnXco Development project, located west of the Rio Grande, which has the potential to visually impact the Butterfield, General Cooke's Wagon Road/Mormon Battalion, and Gila trails. Two qualified resource zones for wind energy development are located to the west and east of Gran Quivira. Given the visual impact from the existing High Lonesome Mesa Wind Project, the development of additional wind generation would have a substantial impact on the cultural landscape of Gran Quivira.

Conclusions

Based on information obtained from the Class I cultural resource and land use inventories for the Project, the addition of the proposed Project is within an environment that has been previously disturbed through the development of other pipeline and transmission line projects. The cumulative effect of a new transmission line project in an area with several other linear facilities would be minimal.

Development of the proposed Project, in conjunction with other present and reasonably foreseeable future projects, could contribute to the loss of archaeological context and historical integrity of setting for sites located in these areas. Other types of large-scale block developments, such as solar and wind energy, are expected to result in greater loss to archaeological and historic resources. In order to locate and evaluate what types of significant sites might be present, intensive pedestrian surveys would need to be completed.

4.17.4.9 Visual Resources

Cumulative effects to visual resources relate to the modification of landscape scenery and the viewsheds associated with public viewing areas. Cumulative effects to visual resources could result from: (1) the incremental modification of landscape character in natural areas, and (2) altering the viewsheds associated with public viewing locations based on the construction and operation of the Project in context with past, present, and reasonably foreseeable future actions. Cumulative effects for visual resources would occur over the life of the Project. Past, present, and reasonably foreseeable future actions that were considered for this analysis are described in Table 4-35.

Cumulative Effects Analysis for SunZia

The visual resources section of Chapter 3 provides an overview of the existing landscape setting (scenery) and the potentially affected viewing locations and KOPs. Direct cumulative effects would occur if activities associated with the construction and operation of the Project and any of the reasonably foreseeable actions were to occur simultaneously within the area of analysis.

Area of Analysis

The geographical extent for the visual resource direct cumulative effects analysis for SunZia was generally associated with a 6-mile-wide corridor centered on the proposed Project reference centerline. Based on the occurrence of renewable energy development areas (QRA) for both wind and solar, the extent of the indirect cumulative effects study area was extended beyond the area of analysis for direct cumulative effects, as appropriate, to account for potential large-scale energy development. Direct and indirect cumulative effects were assessed for both construction and operation activities associated with the Project and energy development scenarios.

Construction and Operation

Generally, construction activities associated with the Project include: upgrading or construction of access roads, clearing and grading activities for the right-of-way, excavating and installation of foundations, assembling structures with temporary and permanent pad sites, stringing conductors and shield wires, and clean-up and reclamation of affected areas. Some activities associated with construction, such as access roads, pad sites, and staging areas (as identified in the POD), would be temporary. Areas disturbed by temporary construction activities (i.e., access roads, staging areas, temporary pad or pulling and tensioning sites) would not be required for routine maintenance activities during operation. These temporary areas will be identified in the POD and restored at the end of construction. Temporary construction activities would result in cumulative effects that would contribute incrementally from the reasonably foreseeable actions. Operation activities associated with the Project would be ongoing and long-term, and would occur along the right-of-way for the life of the Project. The proposed transmission line structures, substations, and associated long-term access would be permanent and require routine maintenance. Operation of the reasonably foreseeable actions would permanently alter the landscape and change the viewsheds associated with public viewing locations for the life of the Project.

Reasonably foreseeable actions that would likely have direct cumulative effects to visual resources during the construction of the proposed Project include residential development, agricultural development, airport and military infrastructure development, and transportation corridor development. Construction would require grading and/or removal of vegetation, which would introduce landscape contrast into the study area. These developments, when added to direct effects of the proposed Project (i.e., 6-mile-wide corridor centered on the proposed Project reference centerline), would incrementally convert the natural landscape into a developed or urban landscape that would adversely affect the scenery over time. Specific projects that would alter landscape scenery within the study area include the residential subdivision of Willow Springs Ranches (New Mexico), Windmill Ranches (New Mexico), SaddleBrooke Ranch (Arizona), and Willow Springs (Arizona). Other types of reasonably foreseeable actions within the study corridor that are more industrial include mining and mineral development, utility development such as HVTLs, power generation stations, and substations. These developments, when added to direct effects of the proposed Project, would incrementally convert natural landscapes into industrial landscapes, which overtime would adversely affect landscape scenery. In the context of the proposed Project, cumulative effects to visual resources occur based on the industrialization of naturally appearing landscapes and the modification of views from moderate to high concern viewing locations.

Specific projects that would have the greatest effect on landscape scenery include the Southline Transmission Line Project and the Pinal Central 500 kV Transmission Line Project. These projects would potentially be constructed in the same corridor as the proposed Project, and therefore would contribute to the modification of natural landscapes located within the study area. Cumulative effects during construction could be reduced if structure spans were matched (where feasible), potential right-of-way distance minimized, and restoration of temporary construction areas (i.e., access roads).

In addition to transmission line projects, power generation facilities located or proposed within the SunZia cumulative effects visual study area would contribute to cumulative impacts. Specifically, wind, solar, and conventional energy projects were identified within the 6-mile-wide study area and are described below.

The existing and proposed Macho Springs Wind Project, Saguaro Solar Power Plant/Solargenix, SOLON Solar Project, and Bowie Power Station Project would all contribute to the modification of the landscape in context with the proposed Project. Reasonably foreseeable actions within the SunZia study area that could contribute to cumulative effects include the Avra Valley Solar Project, Red Horse Wind 2, UA Tech Park Thermal Storage Demonstration Project, and Fotowatio Solar Project. These projects would result in construction modifications that would adversely affect landscape scenery by introducing numerous vertical and geometric structures within a largely flat and horizontal landscape. In addition to effects on scenery, the introduction of the proposed Project in context with these other projects would have a cumulative effect on viewers using local travel routes and recreation areas. The intensity of cumulative effect would vary based on distance from the viewer to the facility, presence of man-made features in the landscape, and Project visibility.

Other past, present, and reasonably foreseeable projects such as mines, transportation corridors, rail, fiber optic lines, and other land disturbing projects would result in adverse cumulative

effects to both landscape scenery and viewers. Cumulative effects could possibly be reduced by consolidating, to the extent practicable, like facilities and sharing access wherever possible.

Cumulative Effects Analysis, Including Energy Development Scenarios

Cumulative effects to visual resources also considered the potential for renewable energy development in the vicinity of the proposed Project. Figure 4-1 illustrates wind and solar resource development areas that were evaluated to disclose cumulative effects for visual resources. Although the visual influence of the proposed Project would not necessarily encompass the entirety of the renewable energy development areas (i.e., direct effects), the typical scale of renewable energy projects requires a large area of effect, as compared to transmission line projects. Therefore, it is reasonable to assess the potential renewable energy development zones in context with the Project from a cumulative effects aspect. Following are cumulative effects for construction and operation based on potential wind and solar energy development.

Construction and Operation

The majority of potential wind development (QRA) that could contribute to cumulative effects of the proposed Project occurs in New Mexico, to the northeast of the SunZia East Substation. This area is anticipated to generate up to 11,290 MW of power, which would require additional transmission lines beyond the proposed Project to transport the energy to market. If this area was built out (including associated transmission line), substantial cumulative effects to landscape scenery would occur. Because of the large footprint of such facilities and the large scale of wind turbines, cumulative effects would remain through decommissioning. Viewers in the vicinity of SunZia East would also be adversely affected by the potential wind development area. Other anticipated cumulative effects resulting from wind facilities per the Final Wind PEIS (BLM 2005) include effects to night skies associated with FAA illumination requirements (aircraft warning lights), landscape disturbance required for construction and operation of the wind turbines, and effects to viewsheds from sensitive public viewing locations.

Potential solar development could occur in both New Mexico and Arizona in the vicinity of the proposed Project (although the majority of potential solar development would occur in New Mexico). These types of development typically require surface disturbance that result in strong visual contrast. Based on current solar technology, vegetation would be removed within the footprint of potential solar facilities, which adversely effects landscape scenery. Over time, each additional solar facility (and associated transmission line) would incrementally convert the character of affected landscapes from natural to industrial. In addition, cumulative effects to viewers within the vicinity of the solar development areas would occur based on what type of solar technology would get implemented. PV technology has a relatively low profile, such that viewer impacts are reduced. Concentrating Solar Trough, or “Power Tower,” technologies have components that are typically high profile and increase potential impacts to viewers. Other anticipated cumulative effects resulting from potential solar facilities, per the Draft Solar PEIS (BLM and DOE 2010), include: effects to night skies associated with illumination requirements for maintenance and nighttime operation; effects to sensitive viewsheds, based on the introduction of glint and glare, depending on the type of solar technology developed; and effects to landscape setting, based on the formal geometric shapes associated with industrial-scale facilities.

4.17.4.10 Land Use and Recreation Resources

Cumulative Effects Analysis for SunZia

Area of Analysis

Cumulative land use impacts may occur as result of the construction and operation of the Project and other reasonably foreseeable projects listed in Table 4-35. The development of generation projects would impact land uses within the cumulative area of analysis. The cumulative area of analysis for land use and recreation resources includes all land uses identified within the Project study area, as well as within intersecting QRAs or within 100 miles of a Project subroute. Currently, there are no reasonably foreseeable future wind development projects planned within or near the study area; but approximately 37,500 acres of solar development are planned within or near the study area. (Land uses that make up the Project study area are detailed in Table 4-43.) The proposed Project and reasonably foreseeable future projects are located on federal, state, private, and other entities; with military lands accounting for approximately 15.5 percent of the study area, and six major cities and towns for approximately 1 percent of the study area. Existing linear facilities, including transmission lines, pipelines, roads, highways, and railroads, make up approximately 1 percent of the study area. According to the Energy Development Forecast, between 10,000 and 40,000 acres of land could be developed within the area of analysis.

Table 4-43. Land Uses in Study Area (acres)

Study Area[1]	16,700,000
Proposed SunZia Project	
Right-of-Way (400') and Substations	22,600
Existing Utilities[2]	
Transmission Lines (115 kV and greater)	42,000
Pipelines (6" in diameter and greater)	18,900
Existing Roads, Highways and Railroads[2]	144,200
Agricultural Areas[3]	327,000
Developed Areas[3]	246,800
Military[4]	2,600,000
Major Towns or Cities	178,000
Las Cruces, New Mexico	33,300
Socorro, New Mexico	9,200
Deming, New Mexico	10,394
Tucson, Arizona	124,200
Safford, Arizona	5,100

[1] Study area includes portions of 14 counties in NM and AZ as indicated in Figure 1-1 (Chapter 1)
[2] Includes estimated average size rights-of-way for existing facilities
[3] Source: 2006 USDA Forest Service Landfire existing vegetation dataset
[4] Includes WSMR (2,041,000 acres), Ft. Bliss (504,000 acres), and other military lands (54,000).

Construction

Cumulative direct and indirect impacts to land use and recreation resources may occur as a result of the construction of the Project, as well as from reasonably foreseeable future projects that could include development of new and temporary access roads, staging yards, and impacts to military operations. In addition to the actual construction activities, impacts to local jurisdictions could occur due to the onset of construction crews. Table 4-44 displays the reasonably foreseeable future projects in the area of analysis for land use, including any potential impacts resulting from construction and operation.

In addition to the existing features in the area, federal, state, and local plans were reviewed to research any planned or future development that may occur, including renewable energy developments. Planned residential subdivisions have been identified within the Project study area, including the Windmill Ranches to the southwest of the SunZia East Substation; Willow Springs Ranches residential subdivision located to the south-southeast of Link A161b; and Willow Springs residential subdivision located to the north of Link C691, which includes 4,600 noncontiguous acres. Increased traffic could occur near these subdivisions as they are populated and construction of the Project is occurring, causing strain on local road infrastructure and traffic in these areas.

Conservation initiatives and programs, described in detail in Chapter 3, may provide funding for multiple types of conservation projects. These projects can include, but are not limited to the acquisition of property for conservation easements; habitat restoration; vegetation removal; retirement of agricultural land; invasive species treatment; and educational uses. Potential impacts could include a reduction in agricultural uses along the river corridors, and an increase in recreational and educational uses in conservation areas.

Direct impacts to the area would result from the construction of access roads. Several existing transmission lines that cross through the analysis area are concentrated along I-10, and proceed north to the west of Tucson. These areas may already have existing access roads that could be upgraded and utilized during the construction and operation of the Project. This would also be true for the existing pipelines that traverse the analysis area, with concentrated areas in the northern portion of the Project, west of the planned SunZia East Substation and along I-10 proceeding north towards San Manuel, Arizona and to the west of Tucson. Reasonably foreseeable future projects that could also use these existing access routes and/or could share access with the Project include: (1) the Pinal Central to Tortolita 500 kV transmission line, between the Tortolita Substation and planned Pinal Central Substation to the east of Eloy, Arizona, and west of links C820, C830, C840, and C850; (2) the Bowie Power Station 345 kV transmission line; (3) the Southwest Transmission Co-op San Manuel Interconnect Project, located to the north of San Manuel, Arizona; and (4) the Southline transmission line, located in the southern portion of the study area.

New access roads adjacent to recreation areas have the potential to increase OHV use by enabling additional area access. If the route north of Lordsburg is chosen (Subroute 3A), there is a potential for increased impacts from the subroute crossing the Hot Well Dunes OHV Recreation Area. A portion of Subroute 3A, (Link B160b) crosses the southern edge of the recreation area. Any new access roads would open up previously closed areas to OHV use.

Indirect impacts could occur with other resources as well; particularly biological and cultural, with right-of-way maintenance causing habitat loss for wildlife or the introduction of invasive species and impacts to scenic viewsheds.

In addition to potential impacts from new access, the loss of land used for ranching and grazing, as well as other lands used for agricultural purposes, may result in impacts as well. Staging areas, housing camps, and temporary access roads would take a minimal amount of the land previously used for these activities. Once construction activities have commenced, reclamation can be performed to restore these areas to their previous use(s). In relation to the area of analysis, a minimal portion of land would be affected.

The cumulative effects to military operations and other air facilities during construction would be minor. Link E90, northeast of Socorro, New Mexico, is within 0.5 mile of LC 94. While there is no expected impact to the launch facility itself, there is a possibility that damage could occur during Project construction should there be a catastrophic failure of a missile shortly after launch. If the subroute near the cruise missile launch facility were selected, proper procedures would be followed to protect construction crews from potential injury from a catastrophic event.

Increased jobs, infrastructure, and economic development would also be considered indirect impacts from construction. A temporary economic boom in communities near the Project could occur during the construction phase, due to the onset of construction crews. Transportation infrastructure may be stressed and increased traffic could occur, requiring local jurisdictions to increase funding to manage these areas of their community.

Table 4-44. Reasonably Foreseeable Future Projects

Project	Potential Impacts
Substations and Power Stations	
Pinal Central Substation	Pinal Central Substation will be the terminus for the Project; the expansion for this facility is unknown
Bowie Power Station	Approximately 500 acres for a 1,000 MW natural gas fired power station in Cochise County.
Willow-345 kV Switchyard	Willow-345 kV Substation will be part of the Bowie 345 kV transmission line project; it will be located to the south of the proposed Willow-500 kV Substation, which is part of the Project
Transmission Projects	
Bowie 345 kV Transmission Line	Approximately 44 acres of new right-of-way access would need to extend from where the planned Bowie Substation site, east of Willcox, AZ to the north to connect into the Project alternative.
Tucson Electric Power Co. Pinal Central Substation to Tortolita Substation 500 kV Transmission Line	This 500 kV line could tie into the Project at either existing Tortolita Substation or planned Pinal Central Substation. Existing right-way access could be utilized with minimal additional access if needed.
Southwest Transmission Co-op Inc., 230 kV San Manuel Interconnect Project	Approximately 17 acres of new right-of-way access would need to extend the 230 kV line to tie to the Project
Southline 345 kV Transmission Line Project	Approximately 700 acres of new right-of-way would be constructed in addition to facilities constructed within existing right-of-way.

Table 4-44. Reasonably Foreseeable Future Projects	
Project	**Potential Impacts**
Solar Projects	
enXco Development Corporation	Approximately 73 acres of new right-of-way access with an additional transmission line to connect to the Project to the east of Deming
Lordsburg Mesa, Iberdrola Renewable	Approximately 20 acres of new right-of-way access with an additional transmission line to connect to the Project, west of the Lordsburg Substation, northwest of Lordsburg
New Solar Ventures/Solar Torque	Approximately 12 acres of new right-of-way access with an additional transmission line to connect to the Project west of Deming
Avra Valley Solar Project	Approximately 29 acres of new right-of-way access with an additional transmission line to connect to the Project, northwest of Tucson, north of Tucson Mountain Park. Shared access could occur if the Fotowatio Renewable Ventures Project also connected
UA Tech Park Thermal Storage Demonstration Project; Bell Independent Power Corp.	Approximately 12 acres of new right-of-way access with an additional transmission line to connect to the Project, southwest of Tucson
Fotowatio Renewable Ventures	Approximately 29 acres of new right-of-way access with an additional transmission line to connect to the Project, northwest of Tucson, north of Tucson Mountain Park. Shared access could occur if the Avra Valley Solar Project also connected
Gestamp Solar	Approximately 182 acres of new right-of-way access with an additional transmission line to connect to the Project, northeast of the planned SunZia East Substation

Operation

Cumulative direct and indirect impacts that could occur with the operation of the Project and reasonably foreseeable future projects could include permanent loss of land to physical structures, increased use, and traffic on local infrastructure and transportation systems; especially along transmission access roads, with potential for increased OHV use. Abandonment of structures built in communities to accommodate construction crews could also occur if local economies cannot support the facility. In addition, public lands could be removed permanently from users that may have traditionally used the area for recreation. This would be the same for private lands that would not be removed from development other than energy based. These impacts would last the life of the Project.

Permanent access roads could allow for increased OHV use in areas that may not have been used for this purpose in the past. In addition, permanent access could generate more movement in areas that would not have previously been accessible. Impacts from this permanent infrastructure could be minimized by having new facilities grouped in a way that allows for shared access roads and less disturbance to the area.

Agricultural fields and rangeland crossed by the Project would have impacts from permanent structure pad locations and structures, reducing the amount of crop land available for farming operations, or lands that were previously used for grazing. Depending on conditions unique to the individual grazing operation, reductions in permitted grazing would adversely affect the economic value of ranches. The areas removed would be for structure foundations (which would

vary), access roads approximately 24 feet wide, areas to be used for solar arrays (which would vary), and future substation sites that would be approximately 40 to 80 acres. This impact would affect the San Pedro River Valley and the Sulfur Springs Valley in Arizona, and along the Rio Grande in New Mexico, where existing agricultural plots occur. However, the amount of permanent disturbance and loss of agriculture and rangeland production associated with these projects would not be significant in the context of the region. Existing and future conservation easements may also be impacted, potentially reducing the amount of land currently being conserved; and depending on the final Project design, may fragment linear conservation easements in areas along the San Pedro River and the Rio Grande.

There are no expected impacts to military facilities, but LC 94 is located near Link E90. While there is no expected impact to the launch facility itself, should there be a catastrophic failure of a missile shortly after launch, there is a possibility that damage could occur to the Project from falling debris or blast destruction of the missile. The Project could impede low-level flight training operations within MOAs.

Cumulative Effects Analysis, Including Energy Development Scenarios

In addition to cumulative effects from the construction and operation of the Project as well as from other reasonably foreseeable future projects, cumulative effects of construction and operation of future energy development scenarios were examined. Projects that are being proposed include transportation, transmission, solar, and wind.

Construction

Direct and indirect impacts from construction of future projects would be similar to what is described above. The greatest difference is the potential scatter and density of projects, magnifying the impacts from construction. This would mean greater miles of access roads allowing for more OHV use; larger amount of lands developed for energy projects and less to be used for other development, such as recreation (both public and private); impacts to military and other air facilities; and increased impacts to local jurisdictions, especially transportation infrastructure.

Operation

As described in the section above, direct and indirect impacts from operation of these future projects, in addition to the SunZia Project, would be determined by the number of projects developed and how the facilities are grouped. This would include impacts from permanent access, which could be reduced if projects are grouped to allow for shared access. Impacts to military and air facilities would also be a consideration during the operation phase of any future projects, due to the visibility impacts that solar facilities can generate, and the possibility of collision with and damage to wind facility equipment and military aircraft, should low-level flight paths be located near potential wind development facilities. Another impact would be to local jurisdictions in the form of job creation during the operations phase. This could either help to stimulate local economies or stress infrastructure if there is no room to accommodate these additional workers.

Cumulative effects for the Project and cumulative effects analysis, including energy development scenarios in regards to land use, are expected to be similar between all subroutes, including the BLM preferred alternative, due to the interconnection points being the same for all routes.

4.17.4.11 Special Designations

Cumulative Effects Analysis for SunZia

Area of Analysis

The special designations area of analysis would be the Project study area.

Construction

Cumulative impacts to special designation areas during the construction phase of the Project and reasonably foreseeable future projects would be on a case-by-case basis, based on the type of designation held by area under construction, the proximity of construction, and potential mitigation to reduce these impacts. Specific impacts to special designations have not been identified, because there are no known projects that would affect the status of special designations within the Project study area.

Operation

Cumulative impacts to special designation areas resulting from the operation of the Project and other reasonably foreseeable future projects would also be on a case-by-case basis. For example, access roads could be minimized if facilities were to share infrastructure, resulting in fewer disturbances near or within a specially designated area. Mitigation measures, such as placing gates to limit access to Project roads, could be put in place at the commencement of construction in order to reduce impacts.

Cumulative Effects Analysis, Including Energy Development Scenarios

In addition to cumulative effects resulting from the construction and operation of the Project and other reasonably foreseeable future projects, cumulative effects of construction and operation of future energy development scenarios were evaluated. Proposed projects include transportation, transmission, solar, and wind.

Construction

Direct and indirect impacts to special designation areas resulting from construction of future energy projects would include disturbance to these areas if several projects were being constructed near an area designated for (1) scenic values, (2) recreation use, or (3) use with which construction activities may interfere, or in which the increased activity from the construction prevents the user from experiencing the designated area in its intended way; this can include recreation, visual, noise, and air impacts. Additional access could also allow for uses that

the specially designated area does not typically allow for, thus increasing the need for stringent management of the area during this phase of future projects.

Operation

Direct and indirect impacts from operation of future projects to special designations would include the impacts described above during construction. Operation impacts would also include development of future energy projects, if located near a specially designated area.

4.17.4.12 Wilderness, Wilderness Study Areas, and Lands with Wilderness Characteristics

Cumulative effects to wilderness areas, WSA, and lands with wilderness characteristics relate to the following wilderness characteristic criteria associated with these areas: size, naturalness, solitude, and primitive and unconfined recreation. Direct cumulative effects could result if past, present, future, and reasonably foreseeable future actions would be located on lands within the boundaries of lands with wilderness characteristics inventory units, thus reducing the size of the inventory unit and naturalness of the area by introducing man-made features into the landscape setting. There would be no direct cumulative effects to wilderness areas or WSA, due to their special designation and specific management prescriptions, which include the avoidance or exclusion of some activities or uses (i.e., right-of-way leases or grants) within their boundaries. Indirect cumulative effects could result from the incremental increase of areas within wilderness areas, WSA, and lands with wilderness characteristics, where past, present, future, and reasonably foreseeable future actions would be visible; thereby reducing outstanding opportunities for solitude. Cumulative effects to wilderness areas, WSA, and lands with wilderness characteristics would occur over the life of the Project. Past, present, and reasonably foreseeable future actions that were considered for this analysis are described in Table 4-35.

<u>Cumulative Effects Analysis for SunZia</u>

Area of Analysis

Wilderness areas, WSA, and lands with wilderness characteristics area of analysis is defined as the SunZia Project study area.

Construction and Operation

There would be no direct cumulative impacts to wilderness areas and WSA as a result of the construction and operation of the Project or reasonably foreseeable future projects, as no future actions could be developed within wilderness areas or WSA boundaries due to their special designation and specific management prescriptions. However, there could be direct cumulative impacts to lands with wilderness characteristics from the construction and operation of the Project. Direct impacts would occur where construction activities would take place within the boundaries of lands with wilderness characteristics inventory units. Construction activities associated with SunZia would include: upgrading or construction of new access roads, clearing

and grading activities for the right-of-way, excavation and installation of foundations, assembling structures with temporary and permanent pad sites, stringing conductors and shield wires, and clean-up and reclamation of affected areas. Some activities associated with the construction, such as access roads, pad sites, and staging areas (as identified in the POD), would be temporary. Other direct cumulative direct impacts associated with the construction of the Project could include noise and/or dust generated during construction activities. These impacts would, however, be short-term and mitigation measures could be implemented to reduce impacts to these areas during construction. Operation activities associated with the Project would be ongoing and long-term, occurring along the right-of-way for the life of the Project. The proposed transmission line structures, substations, and associated long-term access would be permanent and require routine maintenance. Operation of the Project would reduce the size of the inventory unit, as areas where the Project would cross would no longer be eligible for wilderness designation. There are no direct cumulative effects as a result of reasonably foreseeable actions, as none of the actions described in Table 4-35 would cross wilderness inventory units within the Project study area.

Indirect impacts would occur where construction activities would be visible from within the wilderness areas, WSA, and lands with wilderness characteristics inventory units, reducing the outstanding opportunities for solitude within these areas. Some activities associated with the construction, such as access roads, pad sites, and staging areas (as identified in the POD), would be temporary.

Indirect impacts would also occur where permanent project components (i.e., transmission line towers, substations, and permanent access roads) would be visible from within wilderness areas, WSA, and lands with wilderness characteristics inventory units. Past, present, future, and reasonably foreseeable projects, when added to the indirect effects of the proposed Project, would incrementally reduce opportunities for solitude within these areas. For example, when existing development (such as transmission lines, agricultural lands, and transportation corridors) located within 3 miles southeast of the Nutt Grassland inventory unit is added to indirect effects of the proposed Project (local alternative links A361 and A430), the outstanding opportunities for solitude may incrementally decrease (i.e., development would be seen from more areas within the inventory unit).

Cumulative Effects Analysis, Including Energy Development Scenarios

Cumulative effects to wilderness areas, WSA, and lands with wilderness characteristics would also result from the potential renewable energy development in the Project study area. Figure 4-1 illustrates resource development areas that were evaluated to identify cumulative effects for wilderness areas, WSA, and lands with wilderness characteristics.

Construction and Operation

There would be no direct cumulative impacts to wilderness areas and WSA as a result of potential wind or solar projects, as none of the actions would cross within their boundaries due to their special designation and specific management prescriptions. Direct cumulative impacts to

lands with wilderness characteristics from potential solar and wind projects would include impacts described above during construction and operation.

Cumulative indirect impacts to wilderness areas, WSA, and lands with wilderness characteristics as a result of potential solar and wind projects would include impacts described above, such as the reduction of opportunities for solitude within these areas. Specific impacts would be determined according to individual project evaluation when more information about such projects is available.

4.17.4.13 Social and Economic Conditions

Cumulative Effects Analysis for SunZia

This section discusses cumulative impacts to social and economic resources within the cumulative area of analysis, which includes all counties that would be affected by the proposed Project, energy development within counties containing QRAs, and other past, present, and reasonably foreseeable future projects.

Cumulative effects that could be expected to impact social and economic resources include the creation of jobs, generation of tax revenues, increases in the demand for local housing, transportation systems, businesses, and public services such as schools, emergency services, and various utilities. Social impacts apply to both areas of analysis presented in this section and are discussed in the summary of impacts due to the similarities of impacts for each area. Because the construction of renewable energy related projects requires a large number of workers compared to the operations phase, cumulative impacts are expected to be highest during construction. The timing of these effects is largely dependent on the construction of individual projects, which is uncertain; thus, impacts could vary greatly, especially if projects are developed simultaneously.

Areas of Analysis

Cumulative impacts to social and economic resources are presented for two areas of analysis. The first area of analysis includes the 13 SunZia study area counties as presented in Section 3.13; the second includes these same 13 counties as well as the surrounding counties that are analyzed in the *SunZia Transmission Line Economic Impact Assessment Supplement: Impacts of Potential Renewable Generation Facilities* study, referred to as the *SunZia Economic Supplement Study* (Charney et al. 2012b). The first area of analysis presents economic impacts that could result from the development of all reasonably foreseeable projects (over the next 10 years). The second area of analysis presents economic impacts expected to result if potential wind and solar generation projects are constructed in Arizona and New Mexico over the life of the SunZia Project (anticipated to be 50 years). The amount of energy that could be generated is based on the potential megawatt total identified for Arizona and New Mexico in the Final Wind PEIS (BLM 2005) and a Draft Solar PEIS (BLM and DOE 2010). For the second area of analysis, cumulative impacts are expected to occur within Cochise, Graham, Greenlee, Pima, and Pinal counties in Arizona; and Chavez, De Baca, Doña Ana, Eddy, Grant, Guadalupe, Hidalgo, Lincoln, Luna, Otero, Sierra, Socorro, and Torrance counties in New Mexico. Increases in the number of jobs and tax revenues are expected to result from renewable energy development in

the form of solar PV, solar thermal, wind, and geothermal resources; but impacts would also result from past, present, and other future developments, and renewable energy projects within the cumulative study area.

For both areas of analysis, the results of the *Economic Impact Assessment Supplement* are used to estimate job creation, labor income, and tax revenue impacts (Charney et al. 2012b). All numbers estimated for construction employment represent 1 year of labor. The number of operations jobs is permanent and expected to last 50 years, beginning at the first day a project begins its operations. All income and revenue amounts indicated are represented in 2010 dollars. Economic impacts for each area of analysis should be considered separately and cannot be added to one another, because some of the reasonably foreseeable future projects may be part of the QRAs first mentioned in Section 4.17.3.3. Other cumulative effects are discussed qualitatively, due to uncertainties associated with the nature of these elements.

Cumulative Effects Analysis, Including Energy Development Scenarios

The *SunZia Economic Supplement* Study forecasted potential energy development scenarios that could tie into the SunZia Project (*ibid*). The results of this study presented a range of economic impacts based on the generation of 3,000 to 4,500 MW of electricity. Construction and operation impacts of energy development scenarios are summarized below.

Construction

Within the the cumulative analysis area, over the next 10 years, a total of 2,500 MW of solar PV energy could be generated in New Mexico, and 50 MW could be generated in Arizona. The construction period for a single 100 MW project is estimated to last 1 year (*ibid*). It is important to note that projects such as SunZia could facilitate the transmission of a portion of power generated by these solar PV projects; however, the amount of energy from these specific projects that would ultimately be transmitted by SunZia is unknown. Other types of renewable energy projects, such as wind and geothermal, are not estimated because PV projects are the only projects forecasted to occur within the study area in the reasonably foreseeable future. Construction and operation impacts for these projects are summarized below.

In New Mexico, up to approximately 28,000 direct (approximately 21,500 construction-related) and 4,280 indirect jobs could be created across Doña Ana, Hidalgo, and Luna counties. Based on New Mexico's statewide total construction employment in the third quarter of 2010 (approximately 47,600), the creation of approximately 2,170 jobs per year represents a potential increase of more than 4.5 percent (University of New Mexico Bureau of Business and Economic Research [UNMBBER] 2010). This increase across three counties is greater than the projected 3 percent annual growth rate that is expected to take place across the entire state between 2013 and 2015 (*ibid*).

Labor income paid out over the next 10 years could total approximately $2.5 billion, or $250 million per year ($62.5 million quarterly) due to construction in Doña Ana, Hidalgo, and Luna counties; whereas the state of New Mexico experienced a $74 million decrease in construction labor income during the second quarter of 2011 (U.S. Bureau of Economic Analysis 2011). Tax

revenues (state and local sales, and property taxes) collected during construction could total approximately $71.9 million.

The construction of 50 MW of solar PV projects in Pima County, Arizona could result in the creation of up to 570 direct and 250 indirect jobs. Labor income paid out during the construction of the Project is expected to be approximately $53.7 million. Total tax revenues (state and local sales, and income taxes) during construction could be approximately $7.8 million. Unlike New Mexico, Arizona does not collect property taxes during the construction of renewable energy projects (Charney et al. 2012b). Based on the large population and economy found in Arizona, along with a smaller number of reasonably foreseeable renewable energy projects, the overall economic impact in Arizona should be less than the economic impacts witnessed in New Mexico. During the 2009 fiscal year, $379.6 million in individual income tax revenues and $5.5 billion in sales-related taxes were collected in Arizona (Arizona Department of Revenue 2011).

Operation

It is estimated that approximately 225 direct and 60 indirect long-term jobs could be created in New Mexico. Labor income paid out could total approximately $19.4 million per year in New Mexico. Total state sales, income, and property taxes collected over the first 10 years of operations could total $791 million ($79.1 million per year).

Pima County is expected to gain five direct and three indirect jobs throughout the operations phases of several solar PV projects. Total labor income paid out for these jobs is expected to be $480,000 annually. Total state sales, income, and property taxes over the first 10 years of operations could equal approximately $10.5 million ($1.05 million per year). Similar to construction impacts, Arizona is expected to experience only a small portion of the economic impacts witnessed in New Mexico during the same period.

Summary

The total cumulative economic impact of potential renewable energy development would be much greater than expected to result from the proposed Project alone. Wind and solar PV energy development would be the primary sources of job creation across New Mexico, while solar PV would be the primary source in Arizona.

Based on the high potential for the development of renewable energy identified as reasonably foreseeable future projects and on the BLM's programmatic studies (see Section 4.17.3.3), increases in jobs, income, and tax revenues are expected far beyond the amount of energy that could be carried by the Project.

In addition, plans for several large transmission projects within the vicinity of the SunZia corridors could serve as transmission paths for additional renewable energy developments, particularly with respect to wind energy in New Mexico and solar energy opportunities in Arizona and New Mexico. The High Plains Express Transmission Project and the Centennial West Clean Line Project are multistate transmission projects that could provide added potential electrical transmission paths originating in central and eastern New Mexico, respectively. The

proposed Southline Transmission Project (345 kV), located between southwestern New Mexico and southeastern Arizona, could transport additional electricity generated from sources in those areas; however, the purpose and need for the Southline project is different than for the SunZia Project. The Southline project's capacity would be limited according to the plan to construct portions of the proposed transmission lines within existing rights-of-way.

As other electrical transmission and generation projects continue to develop throughout the area, impacts to social and economic resources that accompany temporary and permanent population growth will occur. Depending on the timing of construction and location of each project, there would be a potential increase in the demand for local housing, transportation systems, businesses, and public services such as public schools, emergency services, and various utilities. Impacts would be highest during Project construction. Operations are also expected to impact housing and public services, but to a much lesser degree. Compared to the level of demand for these resources, the proposed Project would result in minimal incremental cumulative impacts during construction and operation due to the length of construction and the lower numbers of long-term, operational employment.

Other cumulative socioeconomic impacts could result from utility-scale solar or wind developments on public lands.

Livestock grazing on public lands is a meaningful source of income for many ranchers who use public lands for grazing. There are concerns that significant reductions in permitted grazing due to large-scale solar or wind developments on public lands could adversely affect the economic value of these ranches or may threaten their continued viability.

Cumulative impacts on recreational resources (e.g., hiking, biking, back country driving, hunting, bird watching, OHV use, and camping) could occur as a result of utility-scale solar and wind developments. These developments could preclude recreational uses from areas developed for solar energy production in some areas. In addition, indirect effects resulting in the reduction in recreational opportunities and natural experiences such as changes to the visual landscape, impacts on vegetation, development of roads, and displacement of wildlife species near solar or wind developments could occur.

4.17.4.14 Environmental Justice Conditions

Cumulative Effects Analysis for SunZia

Area of Analysis

Outside of the Tucson metropolitan area, the Project is not expected to have significant direct or indirect effects on environmental justice populations. Cumulative effects may occur or take place in communities within the 18 counties containing projects in proximity to SunZia, most notably in urban areas and particularly in residential areas where transmission lines are incompatible with residential land uses.

Construction

Impacts that could occur near environmental justice populations in these counties include the temporary creation of noise and dust from construction, traffic congestion, and obstruction of scenic views. Other effects could include access to direct and indirect job opportunities, and local tax revenue benefits that may result in infrastructure upgrades. If residential, commercial, or industrial properties could not be avoided through mitigation measures or alternative locations for a project, the taking of additional properties and structures could occur during construction of projects such as the High Plains Express Transmission and the Centennial West Clean Line projects.

Operation

The operation of future projects would result in the creation of direct and indirect employment across New Mexico and Arizona. Impacts that were experienced during construction, such as dust and noise during maintenance, traffic congestion, the obstruction of scenic views, and the taking of properties, could remain during the operation to a lesser degree. For properties that experience degradation of scenic views, devaluation could take place. For those whose properties are taken during construction, the impacts would be permanent. While fair compensation would be awarded, the use of the land would be changed from a previously identified use to a right-of-way for a new use. This occurrence would leave long-term, permanent impacts on neighborhoods and individuals affected.

Summary

The level at which environmental justice populations can be impacted is directly related to the proximity and concentration of the population to the areas that will be developed. The remoteness of most of these sites coupled with standard mitigation measures for land use, visual, cultural, and health and safety resources, is expected to reduce cumulative effects to environmental justice populations. Therefore, in most cases, the Project construction and operation activities would not cause or contribute substantially to cumulative effects with respect to environmental justice populations if standard mitigation measures are employed for future projects within proximity to communities.

4.17.4.15 Health and Safety/Hazardous Materials

Cumulative Effects Analysis for SunZia

Area of Analysis

The area of analysis includes the Project right-of-way and areas that would be affected by noise and electrical effects surrounding the right-of-way.

Construction and Operation

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 that the overall body of research does not indicate any disease or adverse health effects 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 an ordinary environment. EMF exposure resulting from the proposed transmission line would be well below exposure limits. With the addition of any future transmission lines or other electrical projects, 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 and noise levels would have to be reevaluated.

Cumulative Effects Analysis, Including Energy Development Scenarios

Construction and Operation

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 and the electric power industry, fatalities and injuries from on-the-job accidents could occur. It is assumed that all projects being constructed in the vicinity of the Project would use BMPs to minimize the potential for impacts to public health and safety. The proposed Project is not anticipated to contribute to cumulative impacts on the health and safety of workers or the public.

Summary

Proper design and implementation of safe material handling programs for the Project would reduce the potential for cumulative impacts from release of hazardous materials on the environment. Renewable energy facilities and mining facilities, in particular, typically store and use hazardous materials onsite. It is assumed that these facilities would comply independently with hazardous materials regulations, depending on their specific circumstances (e.g., nature and quantities of hazardous materials stored and used). In short, Project construction and operation activities would not cause or contribute substantially to significant cumulative impacts with respect to hazardous materials handling from a local or regional perspective.

4.17.5 Cumulative Effects from RMP Amendments

Cumulative effects were evaluated with respect to the plan amendment alternatives (see Section 2.6, Proposed Plan Amendments), which would amend the following affected RMPs:

- Socorro RMP, Socorro Field Office (2010)
- Mimbres RMP, Las Cruces District Office (1993)

- Final Safford District RMP and EIS, Safford District Office (1991)

Three RMP amendment alternatives were evaluated (1) No Action alternative, (2) Corridor–400 feet, and (3) Corridor–2,500 feet. The corridor amendments would include the proposed SunZia transmission line right-of-way, and other future rights-of-way, through BLM right-of-way avoidance and VRM noncompliance areas.

The corridor alternatives were identified in order to evaluate the environmental effects that would result from a reasonable range of plan amendment alternatives. It is assumed for purposes of this analysis that additional transmission lines or pipelines could be built within a common corridor with sufficient separation between facilities. The 400-foot width would allow a nonexclusive right-of-way for the Project as well as other potential rights-of-way within the corridor. The 2,500-foot-wide corridor would accommodate multiple rights-of-way. Any new rights-of-way would be subject to case-by-case evaluation according to future project applications; however, no reasonably foreseeable future projects have been identified.

4.18 ENVIRONMENTAL EFFECTS OF RMP AMENDMENTS

Direct and indirect effects of the Project have been described in the preceding resource sections. This section includes descriptions of the potential environmental impacts resulting from the proposed RMP amendments. Locations of the proposed RMP amendment corridors are identified on figures 2-36 through 2-38, and further description is provided in Table 4-45. As stated, the amendments would include the designation of corridors for conformance with RMPs, and construction and operation of other facilities within these corridors would require separate rights-of-way. However, because no project-specific applications for new rights-of-way (except for the SunZia Project) have been identified within these corridors, case-by-case analyses would be required to analyze the effects of actions that may occur for any future right-of-way grants[1]. Alternative plan amendments include the No Action alternative, a 400-foot-wide corridor, or a 2,500-foot-wide corridor. With the No Action alternative, plan amendments would not be implemented and would not result in any environmental impacts.

It is assumed that the environmental effects of the 400-foot-wide corridor amendment would be similar to the effects described for the Project action alternatives, because no other actions have been identified that would be implemented within the BLM preferred alternative corridor. The following discussion addresses impacts to the 2,500-foot-wide corridor alternative.

4.18.1 Air Quality

The utility corridor plan amendment alternative would not be expected to change the estimated impacts to air quality resulting from construction of the Project. Air quality impacts resulting from transmission line construction are expected to be temporary and localized and the area of impact would move as the transmission line construction progresses. Operation impacts to air quality would be negligible. Air quality impacts from construction of other utilities within the

[1] An alternative route has been identified for the Southline Transmission Project that would be located within the BLM preferred alternative route for the SunZia Project within the Mimbres RMP area.

corridor would be unlikely, because construction of other projects would not likely take place at the same time as the SunZia Project.

4.18.2 Earth Resources

Geological Hazards

One of the three RMP amendment alternatives includes the proposal of a corridor, which would involve amending the affected RMPs to allow a 2,500-foot-wide corridor to incorporate both the SunZia transmission line right-of-way and other future utility rights-of-ways. There would not be any cumulative effects from geological hazards resulting from amendments to the RMPs in the Project area (i.e., Socorro, Mimbres [Las Cruces], and Safford RMPs). Affected RMPs would be amended to allow a 2,500-foot-wide corridor that would include the SunZia transmission line right-of-way, as well as other future utility rights-of-way, through BLM right-of-way avoidance or exclusion areas. The designation of a new transmission right-of-way would not be impacted by geological hazards beyond the scope of the Project.

Mineral Resources

The proposed amendment to the Socorro RMP for a 2,500-foot-wide corridor through BLM right-of-way avoidance or exclusion areas would potentially increase the ground disturbance in these areas and, therefore, have a greater effect on mineral resources. The proposed wider utility corridor to accommodate future utility rights-of-ways would have incremental impacts to mineral resources east and west of San Antonio, where leases and coalfields are present. The proposed amendment to the Mimbres (Las Cruces) RMP for a 2,500-foot-wide corridor would have greater effects to mineral resources northeast of Deming along Link A530, where there is an active mine and an active mining lease. There would also be effects associated with the wider corridor in the Lordsburg area along Link B112, where there are active mines and mining leases. The proposed amendment to the Safford RMP would have no added effects from the 2,500-foot-wide corridor, as there are no mines or leases along the links in this area.

Soil Resources

Both direct and indirect effects to soil resources would result from amendments to RMPs in the SunZia Project area, including the Socorro, Mimbres (Las Cruces), and Safford RMPs. Additional project construction within the corridor would impact soils beyond the scope of the proposed Project and could affect previously undisturbed soil resources. An amendment to the Mimbres (Las Cruces) RMP allowing a 2,500-foot-wide corridor to cross avoidance areas would result in direct and indirect cumulative effects to soil resources that are susceptible to both water and wind erosion, especially in the Animas Valley. An amendment to the Safford RMP allowing a 2,500-foot-wide transmission corridor to cross previously designated avoidance and exclusion areas would result in direct and indirect cumulative effects to soil resources.

4.18.3 Paleontological Resources

The proposed amendment to the Socorro RMP for a 2,500-foot-wide corridor could potentially increase the ground disturbance in these areas with the addition of future projects, which could result in a greater cumulative effect to paleontological resources.

4.18.4 Water Resources

The proposed amendment to the Socorro RMP for a 2,500-foot-wide corridor through BLM right-of-way avoidance areas could potentially increase the ground disturbance in these areas, which could have a greater cumulative effect to water resources. However, direct impacts to rivers or streams would not be likely.

4.18.5 Biological Resources

Biological resources may be affected by plan amendments in four areas within Route Group 1. The San Pedro Proprietary SMA was identified as a utility right-of-way avoidance area to protect habitat for the Fugate's bluestar ACEC (Link A112), which could be affected by construction within the corridor. The Ladron Mountain/Devil's Backbone Complex ACEC is set aside to protect habitat for Desert Bighorn Sheep populations west of the Rio Grande (Local Alternative Link A161b). Expanded right-of-way associated with the corridor plan amendment alternative could affect Desert Bighorn Sheep populations through loss of foraging habitat and disturbance during sensitive seasons, including lambing or migration periods. Two right-of-way avoidance areas are crossed by Link A440, within suitable habitat for the Aplomado Falcon. Additional impacts to the Aplomado Falcon in these areas would occur if future development were to be implemented.

None of the areas requiring plan amendments within Route Group 3 have been designated to protect biological resources. However, an avoidance area is crossed by Link B120b within potential habitat for the Aplomado Falcon, and an avoidance area located at the edge of the Lordsburg Playa (Link B140) may contain sensitive plant populations.

An alternative corridor crosses a portion of the Swamp Springs-Hot Springs Watershed and Muleshoe Ranch CMA ACEC (Link C661), which was designated for ecosystem-level conservation and provides habitat for up to five ESA-listed fish. If additional construction were to take place within this corridor, impacts to important riparian habitat may occur.

Table 4-45. Proposed Resource Management Plan Amendments					
Resource Management Plan	**Subroute**	**Land Use Plan Area of Nonconformance**	**Link Number, Milepost**	**Proposed Amendment**	**Total Acres**
Socorro RMP	1A, 1A1, 1A2 (BLM preferred alternative)	BLM ROW Avoidance Area	E101b (MP 5.2-6.3, 6.8-10.5, 11.6-12.6), E133 (MP 0.2-1.4, 1.6-5.7)	No Action	0
				Corridor–400 feet	538
				Corridor–2,500 feet	3,364
	1A, 1A1, 1A2 (BLM preferred alternative)	BLM ROW Avoidance Area	E211 (1.4-2.4, 3.5-7.0, 8.5-14.1) A161 (MP 0.0-0.1)	No Action	0
				Corridor–400 feet	495
				Corridor–2,500 feet	3,091
	1B3	BLM ROW Avoidance Area	A80 (7.1-10.1)	No Action	0
				Corridor–400 feet	145
				Corridor–2,500 feet	909
	1B1, 1B2, 1B2a, 1B3	BLM ROW Avoidance Area	A111 (MP 4.8-5.4, 5.5-7.0), A112 (MP 0.0-2.3), A140 (MP 0.0-0.4)	No Action	0
				Corridor–400 feet	233
				Corridor–2,500 feet	1,455
	1B1, 1B2, 1B2a, 1B3	BLM ROW Avoidance Area	A160 (MP 1.7-3.0, 3.3-8.0), A161 (MP 0.0-0.1)	No Action	0
				Corridor–400 feet	296
				Corridor–2,500 feet	1,848
	1A, 1A1, 1A2 (BLM preferred alternative)	VRM Noncompliance: Class II and Class III	E101a (MP 5.8-5.9), E101b (MP 0.7-2.8, 2.9-5.0, 5.2-6.3, 6.9-7.6, 8.2-10.6, 11.6-12.6), E133 (MP 0.2-1.4, 1.6-5.0)	No Action	0
				Corridor–400 feet	684
				Corridor–2,500 feet	4,273
	1B1, 1B2, 1B2a	VRM Noncompliance: Class II and Class III	A90 (MP 4.3-5.1), A111 (MP 4.5-7), A112 (MP 0-0.8, 1.5-2.3), A140 (MP 0-0.4)	No Action	0
				Corridor–400 feet	257
				Corridor–2,500 feet	1,606
	Local Alternative for 1A, 1A1, 1A2 (BLM preferred alternative), 1B1, 1B2, 1B2a, 1B3,	BLM ROW Avoidance Area	A161b (MP 0.0-2.1, 2.4-5.2)	No Action	0
				Corridor–400 feet	238
				Corridor–2,500 feet	1,485

Table 4-45. Proposed Resource Management Plan Amendments					
Resource Management Plan	**Subroute**	**Land Use Plan Area of Nonconformance**	**Link Number, Milepost**	**Proposed Amendment**	**Total Acres**
Mimbres RMP	1A, 1A1, 1A2 (BLM preferred alternative), 1B1, 1B2, 1B2a, 1B3	BLM ROW Avoidance Area	A440 (MP 5.6-5.9, 6.2-6.8)	No Action	0
				Corridor–400 feet	44
				Corridor–2,500 feet	273
	1A, 1A1, 1A2 (BLM preferred alternative), 1B1, 1B2, 1B2a, 1B3	BLM ROW Avoidance Area	A440 (MP 11.5-12.4), A530 (MP 0.0-1.9)	No Action	0
				Corridor–400 feet	136
				Corridor–2,500 feet	848
	3A, 3A2 (BLM preferred alternative)	BLM ROW Avoidance Area	B120b (MP 7.6 – 7.9)	No Action	0
				Corridor–400 feet	15
				Corridor–2,500 feet	91
	3B	BLM ROW Avoidance Area	B110a (MP 16.6-16.9)	No Action	0
				Corridor–400 feet	15
				Corridor–2,500 feet	91
	3B	BLM ROW Avoidance Area	B112 (MP 10.2-11.2, 11.5-11.6, 11.9-12.1, 12.5-12.8)	No Action	0
				Corridor–400 feet	78
				Corridor–2,500 feet	485
	3B	VRM Noncompliance: Class II	B112 (MP 10.4-11.2)	No Action	0
				Corridor–400 feet	39
				Corridor–2,500 feet	242
	Crossover for 3A and 3B	BLM ROW Avoidance Area	B140 (MP 0.2-1.2)	No Action	0
				Corridor–400 feet	48
				Corridor–2,500 feet	303
Safford RMP	4C1	BLM ROW Avoidance Area: Swamp Springs and Hot Springs ACECs, within the Muleshoe Ranch CMA	C331 (MP 1.8-2.2), C361 (MP 0.0-1.0)	No Action	0
				Corridor–400 feet	68
				Corridor–2,500 feet	424

4.18.6 Wildland Fire Ecology and Management

The RMP amendments would affect Wildland Fire Ecology and Management if future development were to occur within the corridor. Potential effects are uncertain, but would be dependent on the type of construction and management activities during operation.

4.18.7 Cultural Resources

The corridor RMP amendment alternative would have direct and indirect effects. These corridors extend across two segments of the Butterfield Historic Trail, one segment of the El Camino Real Trail, and the middle portion of the Mockingbird Archaeological District. Known cultural resource sites located within the avoidance areas include 25 sites, excluding the trails and archaeological district.

The indirect effects may include the introduction of new access into areas that were previously unavailable to the public. The new access could allow for inadvertent damage from erosion brought about from OHV use and/or disturbance of sites through possible pot hunting. Additionally, the historic trails and other historic sites may be indirectly impacted by visual intrusions of modern facilities on historic viewsheds.

4.18.8 Visual Resources

Scenic quality impacts associated with the plan amendment corridor would be similar to the cumulative effects of the Project, although no reasonably foreseeable future projects have been identified within the alternative plan amendment corridors subject to VRM. Other linear facilities constructed within the corridor could comply with VRM objectives in the plan amendment area, if they were to be similar to the SunZia Project in form, line, color, and texture. Impacts resulting from the construction of other projects within the corridors could be reduced with shared access between the SunZia Project and other facilities constructed within the corridor.

4.18.9 Land Use and Recreation Resources

The six areas within Route Group 1 that would be subject to plan amendments cross BLM-designated right-of-way avoidance areas. The total area removed from avoidance areas in the Socorro RMP (342,363 acres) would be 12,212 acres; roughly 3.5 percent of the designated avoidance area in the Socorro Field Office. The total area removed from the land designated as avoidance areas in the Mimbres RMP (783,400 acres) would be 1,110 acres (less than 1.0 percent).

The four areas within Route Group 3 that would be subject to plan amendments cross BLM-designated right-of-way avoidance areas. The total removed from avoidance areas in the Mimbres RMP (783,400 acres) would be 669 acres; less than 1.0 percent of the avoidance areas in the Mimbres RMP. An alternative route being considered for the Southline Transmission Line Project also crosses 0.3 mile of an avoidance area (Link B120b), within the existing 345 kV transmission line corridor.

One area within Route Group 4 would be subject to a plan amendment, where alternative Subroute 4C1 crosses a right-of-way avoidance area, designated for the Swamp Springs-Hot Springs Watershed and Muleshoe Ranch CMA ACEC. The total area removed from this avoidance area in the Safford RMP (43,423 combined total acres of ACEC) would be 404 acres (less than 1 percent of the RMP area).

4.18.10 Special Designations

An alternative corridor crosses the San Pedro SMA, which would be subject to an amendment to the Socorro RMP. This SMA is 1,201 acres, and is designated to protect special status plants. The 2,500-foot-wide would displace approximately 24 acres of the SMA.

Plan amendments would not affect special designations within Route Group 3.

An alternative within Route Group 4 would be subject to a plan amendment where Subroute 4C1 crosses the Swamp Springs-Hot Springs Watershed and Muleshoe Ranch CMA ACEC, as described in Section 4.10.5.3.

4.18.11 Wilderness, Wilderness Study Areas, and Lands with Wilderness Characteristics

Rights-of-way are excluded from wilderness areas and WSAs. None of the RMP amendment alternatives would impact wilderness, WSAs, or lands with wilderness characteristics.

4.18.12 Social and Economic Conditions

Direct and indirect socioeconomic impacts to BLM lands are expected to be minimal as a result of the plan amendment corridors. If major utility projects were to be constructed, each state and its counties and communities could experience job creation and tax revenues, as well as increased demand for local housing, transportation systems, businesses, and public services. Impacts to population, housing, and community services would be greatest during construction because new populations would temporarily relocate for work. The construction of additional transmission lines within the plan amendment corridors could facilitate the development of renewable energy and other energy generation projects throughout New Mexico and Arizona. The effects from the development of these projects could create long-term economic benefits associated with job creation.

4.18.13 Environmental Justice Conditions

Environmental justice impacts are not expected to result from the plan amendment corridors in the Socorro, Las Cruces, or Safford RMPs, because BLM lands do not contain residential uses.

4.18.14 Health and Safety/Hazardous Materials

Health and safety impacts resulting from other projects within the plan amendment corridor could occur with construction or operation of those facilities. Mitigation or BMPs could

minimize impacts from noise, EMF, and other potential hazards to public safety, and would ensure that EMF and noise levels remain under the guidelines provided by the EPA.

4.19 IRREVERSIBLE AND IRRETRIEVABLE COMMITMENT OF RESOURCES

Resources committed to the proposed Project would be material and nonmaterial, including financial. An irreversible commitment of resources, for the purposes of this section, has been interpreted as resources that, once committed to the proposed Project, would continue to be committed throughout the 50-year life of the Project. An irretrievable commitment of resources has been interpreted as resources used, consumed, destroyed, or degraded during the construction and operation of the proposed Project, and that could not be retrieved or replaced for future use. Irreversible and irretrievable commitments of resources for the Project are summarized in Table 4-46.

Table 4-46. Irreversible and Irretrievable Commitment of Resources

Resource	Type of Commitment/Reason for Commitment	Irreversible	Irretrievable
Air Quality	• Degradation of air quality • Construction activities	No	Construction phase
Soils	• Soil loss and erosion • Construction activities	Yes	Yes
Water	• None (see Construction Materials and Fuels, below)	–	–
Biological	• Disturbance to and/or loss of vegetation, habitat, and wildlife species • Construction and operation	Yes	Project life
Archaeological and Historical Sites	• Disturbance or removal of sites • Construction and operation	Yes	Yes
Important Cultural Sites	• Disturbance or removal of sites, interference with visual setting • Construction and operation	Yes	Project life
Traditional Cultural Places	• Disturbance or removal of sites, interference with visual setting, aural disturbance • Construction and operation	Yes	Project life Construction phase
Paleontological Resources	• Disturbance or removal of fossils • Construction activities	Yes	Yes
Visual Resources	• Degradation of natural scenic quality, viewshed intrusion • Construction and operation	Yes	Project life
Land Use and Recreation Resources	• 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

Table 4-46. Irreversible and Irretrievable Commitment of Resources			
Resource	**Type of Commitment/Reason for Commitment**	**Irreversible**	**Irretrievable**
Public Health	• Potential adverse electrical effects • Operation	Unknown	Unknown
Noise	• Noise exceeding ambient levels • Construction and operation	No	Construction phase
Social and Economic Conditions	• Increased regional and local employment and revenues • Construction and operation	Yes	Project life
Construction Materials and Fuels (use of:)	• Aggregate	Yes	Yes
	• Water	Yes	Yes
	• Steel	Yes	No
	• Aluminum	Yes	No
	• Concrete	Yes	Yes
	• Wood	Yes	No
	• Fossil fuels	Yes	Yes