CHAPTER 3

AFFECTED ENVIRONMENT

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CHAPTER 3 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter describes the existing environment, including the physical environment, natural environment, and human-made resources and uses, which would be affected by the Proposed Action and Action Alternatives.

All figures referenced in the text of this chapter are found in the Figures section of Volume II.

3.1.1 General Setting of Project Area

The Project Area is within the North American Deserts Ecoregion (Level I division) (Commission for Environmental Cooperation n.d.) and the Sonoran Basin and Range subdivision (Level III division) (EPA 2010a, 2011a). The subregion is distinguished by paloverde-cactus vegetation including saguaro, cholla, and agave cacti.

The Project Area is within the Basin and Range Physiographic Province. The climate of the province is characterized by being the driest in the United States. The topography is characterized by mountain ranges that are roughly parallel. The basins between the ranges are relatively flat plains with gentle slopes next to the mountains (Fenneman 1931). The Project Area is in the Sonoran Desert subdivision of the physiographic province. The subdivision is characterized by being approximately 20 percent mountains and 80 percent plains. The mountains vary from hills and buttes up to mountains rising 4,000 feet above sea level. The desert plains mostly lie below 2,000 feet elevation (Fenneman 1931).

The economy of the region has historically been based on irrigated agriculture, livestock grazing, and mining (Commission for Environmental Cooperation 1997). Today federal and ASLD land includes commercial, recreational, range, and vacant lands. Private land includes residential, commercial, and industrial areas. The primary types of residential land adjacent to the Study Areas are low- to medium-density suburban and rural areas. Commercial areas are sparse within the Project Area, although some recreational lands include a commercial component. The industrial land is mainly used for manufacturing, landfill, and mining operations (URS 2012a). The Project location is shown in **Figure 1.1-1**.

3.1.2 Resource Values and Uses Brought Forward for Analysis

Based on internal (agency and cooperator) and external (public) scoping, or issue identification, a number of issues and concerns were identified for analysis in this EIS (see **Section 1.8**). In order to analyze and respond to the issues and concerns, the resource values and uses of the affected environment must be identified and described. For this EIS analysis, the following resources and uses are brought forward for analysis and are presented in this chapter.

- Air Quality and Climate Change, presented in **Section 3.2**
- Cultural Resources, presented in **Section 3.3**

- Geology and Minerals, presented in **Section 3.4**
- Hazardous Materials and Hazardous and Solid Waste, presented in **Section 3.5**
- Land Use and Range Resources, presented in **Section 3.6**
- Public Health and Safety, presented in **Section 3.7**
- Paleontology, presented in **Section 3.8**
- Recreation and Special Designations, presented in **Section 3.9**
- Socioeconomics and Environmental Justice, presented in **Section 3.10**
- Soils, presented in **Section 3.11**
- Transportation and Traffic, presented in **Section 3.12**
- Vegetation Resources, Including Noxious and Invasive Weeds and Special-status Plants; presented in **Section 3.13**
- Visual Resources, presented in **Section 3.14**
- Water Resources, presented in **Section 3.15**
- Wildlife Resources, Including Special-status Species, presented in **Section 3.16**

3.1.3 Analysis Area

The analysis area varies by resource value or use, depending on the geographic extent of the resource or use and the extent of the effects of the Proposed Action and Action Alternatives on a resource or use. In some cases the analysis area is the Project Area (e.g., paleontological resources), because that is the extent of the effects of the Project on the resource. In other cases the analysis area is much larger, encompassing larger administrative or natural boundaries (e.g., social and economic conditions, or wildlife and habitat), because the effects on the resource extend beyond the Project Area boundary. The analysis area is typically referred to as the Study Area.

3.2 AIR QUALITY AND CLIMATE CHANGE

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Air Quality and Climate Change Sun Valley to Morgan 500/230 kV Transmission Line Project* (URS 2012b). The contents of that report are used essentially verbatim below and without specific reference. Further, references made in that report are repeated herein without independent review.

3.2.1 Laws, Ordinances, Regulations, and Standards

3.2.1.1 State and Local Air Quality Regulations

In Arizona, the EPA has delegated authority to the Arizona Department of Environmental Quality (ADEQ) and three Arizona counties to regulate sources of air pollution in the state. Maricopa, Pima, and Pinal counties have authority over air pollution control programs for

sources within their boundaries; ADEQ regulates certain source categories (specified in state statutes) within those three counties, and all sources throughout the rest of the state. The Project is located within Maricopa County. The following section summarizes the county rules that implement the Clean Air Act (CAA) of 1990 and may be applicable to the Project.

Maricopa County Air Pollution Control Rules

Maricopa County has adopted numerous air pollution control rules and regulations. The following paragraphs identify specific rules that would likely apply to one or more aspects of Project construction activities.

Rule 100 - General Provisions and Definitions: Discusses the legal authority for the Air Pollution Rules and Regulations and includes definitions of terms used in all Maricopa County Air Pollution Control Rules.

Rule 110 - Violations: Describes the classifications of violations that apply when the requirements of the rules are not met.

Rule 200 - Permit Requirements: Outlines the types of permits issued by the Air Pollution Control Division including Title V Permits, Non-Title V Permits, General Permits, Dust Control Permits, and Permits to Burn. The applicability of each permit is provided in Section 302 through Section 305 and Section 307 of this rule.

Transmission line projects are unlikely to trigger a requirement to obtain an operating permit, as equipment installed at these facilities is typically exempt. Prior to the commencement of construction, a Dust Control Permit would be required to comply with the requirements of Rule 310 discussed below. Equipment typically used by APS during construction such as concrete batch plants (CBP), crushing, screening, and wash plants (CSWPs) or portable (but not mobile) diesel engines (such as engines for electrical generators or water pumps) would be eligible for coverage under an ADEQ General Permit. The ADEQ CBP General Permit limits concrete production to 930 cubic yards per day for CBPs operating under generator power in non-attainment areas. If a CBP is co-located with a CSWP, the ADEQ permit for CSWP can include the associated concrete plant.

Rule 230 - General Permits: This type of permit is intended for facilities and equipment that represent a large number of sources that are similar in nature, have similar emissions, and are typically subject to the same requirements for operating, emissions control, monitoring, reporting, or recordkeeping.

Rule 280 - Fees: This rule outlines fees required for applications, permits, and emissions for owners and operators of sources of air pollution. An application fee and annual administrative fees are required for sources applying for coverage and operating under general permits. Fees for dust control permits are based upon the total surface area to be disturbed in acres. (See Section 310.1 of the rule.)

Rule 300 - Visible Emissions: This rule establishes limits for visible emissions and opacity from sources for which no source-specific opacity requirements apply. In general, air contaminants, other than uncombined water, may not be discharged from any single emission source in excess of 20 percent opacity. (Opacity is a condition under which air pollution

obscures the view of an observer.) Equipment associated with transmission lines does not typically cause visible emissions.

Rule 310 - Fugitive Dust from Dust-Generating Operations: This rule limits emissions of particulate matter into the air from any property, operation, or activity that emits fugitive dust. Fugitive dust is commonly generated by vehicles and equipment used during earthmoving activities, by blasting operations, and by wind blowing in areas where natural vegetation has been removed or disturbed. The various sections of this rule establish standards for dust-generating operations, discuss dust control permits, opacity limits, stabilization requirements, available control measures, and signage requirements, describe the process for writing and submitting a dust control plan, and outline recordkeeping requirements.

Rule 310.01 - Fugitive Dust from Non-Traditional Sources of Fugitive Dust: The rule applies to open areas, vacant lots, unpaved parking lots, and unpaved roadways which are not included in the provisions of Rule 310. This rule and the control measures cited to reduce particulate matter emissions from these sources were developed in response to the county's PM_{10} non-attainment status.

Rule 311 - Particulate Matter from Process Industries: This rule limits particulate matter emissions by establishing emission rates based on process weight for operations not subject to a rule applicable to specific source categories. For the Project, this rule would apply to CBPs or CSWPs used near the construction site to supply the concrete needed for transmission tower foundations.

Rule 312 - Abrasive Blasting: This rule establishes limits for particulate matter generated during abrasive blasting operations that use solid substances such as sand, slag, steel, shot, garnet, walnut shells, or carbon dioxide pellets to mechanically erode surfaces.

Rule 315 - Spray Coat Operations: This rule addresses particulate matter emitted during spray coating and requires that coating equipment is operated inside enclosures that meet specific requirements. Spray booths or enclosures with forced air exhaust are required to have overspray filters with an average removal efficiency of 92 percent. If the booth or enclosure uses a water curtain or similar device, 92 percent of particulate matter must be removed. This rule would apply to any spray painting activities performed on or near the Project site.

Rule 316 - Nonmetallic Mineral Processing: This rule regulates emissions from activities related to commercial and/or industrial mineral or rock processing plants including excavating, crushing, grinding, screening, conveying, transferring, bagging, storing, loading, and dumping from vehicles. CBP's and CSWPs are examples of equipment that would be subject to this rule during construction of the Project.

Rule 320 - Odors and Gaseous Contaminants: This rule limits emissions of odorous and gaseous contaminants and defines high sulfur and low sulfur fuels and prohibits use of high sulfur fuels. Due to the fact that most fuels (that are used in generators/engines) meet the low sulfur standard (set forth in federal regulations) it is unlikely that there would be a regulatory impact on the Project. The rule does specify a 0.03 parts per million by volume (ppmv) (30-min average) fence line hydrogen sulfide limit.

Rule 324 - Stationary Internal Combustion Engines: This rule sets fuel standards, good combustion practices, and carbon monoxide (CO), nitrogen oxide (NOx), volatile organic compounds (VOC), and particulate emission standards for existing and new stationary reciprocating internal combustion engines (both spark and compression ignition) greater than 250 brake horsepower (bhp) or a combination of engines greater than 50 bhp whose maximum aggregate brake horsepower is greater than 250 hp. This rule may apply to engines used for power generation on the Project.

Rule 335 - Architectural Coatings: This rule limits VOCs emitted during the use of architectural coatings which are applied to stationary structures, pavements, and curbs associated with construction of the Project. It provides limits on the pounds of VOC-containing material per gallon of coating for a variety of commonly used materials.

Rule 360 - New Source Performance Standards: This rule discusses design and performance criteria for specified new or modified emission sources. Although the rule does not include standards for transmission of electricity, there are parts that may be applicable to the construction phase. Refer to the New Source Performance Standards under the Federal Rules section below.

Rule 370 - Federal Hazardous Air Pollutant Program: This rule establishes emissions standards for federally listed hazardous air pollutants (HAPs). The rule incorporates by reference federal requirements applicable to HAPs included in 40 CFR Parts 61 and 63, including all appendices. The rules do not contain specific standards addressing the transmission of electricity. Subpart ZZZZ of 40 CFR Part 63, "National Emission Standards for Hazardous Air Pollutants for Stationary Reciprocating Internal Combustion Engines," may apply to an electrical generator utilized as a power source for a construction trailer, CBP, crushing and screening plant. Maricopa County considers the engine a stationary source subject to regulation if the duration of construction is greater than 12 months.

Rule 510 - Air Quality Standards: This rule establishes the maximum levels of air pollutants in ambient air necessary to protect human health and the environment. Both primary and secondary air quality standards are included. Pollutants addressed in the rule are: $PM_{2.5}$, PM_{10}, sulfur dioxide, ozone, CO, NOx, and lead. In addition to the NAAQS, emissions of these pollutants potentially caused by construction activities associated with this Project may not cause or contribute to an exceedance of these ambient standards.

3.2.1.2 Federal Rules

New Source Performance Standards

40 CFR Part 60 Subpart IIII - Performance Standards for Stationary Compression Ignition Internal Combustion Engines apply to diesel engines modified, constructed, or reconstructed after July 11, 2005, and diesel engines manufactured after April 1, 2006. Subpart IIII specifies extensive requirements for sulfur fuel content, cetane index requirements, performance testing and recordkeeping requirements, emission limits for NOx, CO, hydrocarbons, and particulate matter. This would most likely apply to diesel engines used for power during construction activities.

Some engines may qualify for non-road engine status (under 40 CFR 1068.30). Engines that qualify for non-road engine status, however, must comply with the non-road engine requirements of 40 CFR 89.112, and 40 CFR parts 90, 1039, 1048 or 1054.

40 CFR Part 60 Subpart JJJJ - Performance Standards for Spark Ignition Internal Combustion Engines (SI ICE): This standard sets limits on NOx, CO, VOC, and specifies a sulfur limit for gasoline fuel. This regulation applies to all new, modified, and reconstructed SI ICE (e.g., gasoline engines) which commenced construction (usually the date the engine was ordered by the owner/operator) after June 12, 2006, and manufactured after dates specified in the rule (depending on engine size/type), the earliest of which is July 1, 2007.

EPA's Greenhouse Gas Mandatory Reporting Rule

The EPA issued a mandatory reporting rule for large sources and suppliers of GHGs in 2009. Subpart D of the rule addresses requirements for electric generating facilities. The applicability of Subpart D is limited to sources in this category subject to 40 CFR Part 75, "Continuous Emission Monitoring." Transmission lines would not include equipment subject to this rule. Certain electric generating units are covered under Subpart C, "General Stationary Fuel Combustion." However, the reporting threshold for this category is a combined 25,000 metric tons of carbon dioxide equivalent (CO_2e) emissions or more per year which equates to an estimated 30 million British thermal units (MMBtu) per hour of heat input capacity. The Project would not include combustion equipment that would trigger the reporting threshold. Emergency equipment and emergency generators are excluded from a facility's aggregate heat input rating under Subpart C.

EPA's Prevention of Significant Deterioration Tailoring Rule

The *Prevention of Significant Deterioration and Title V Greenhouse Gas Tailoring Rule* was finalized by EPA on May 13, 2010. The rule is being implemented in phases, the first of which began in January 2011 and applied to sources that were already regulated under the Prevention of Significant Deterioration (PSD) and Title V permitting programs because they emit other criteria pollutants in quantities greater than the permitting thresholds established under those rules. These sources became subject to the rule only if they increased GHG emissions by 75,000 tons per year (tpy) CO_2e.

In July 2011, the second phase of implementation began. The second phase applies to newly constructed facilities that emit more than 100,000 tpy CO_2e and modifications to existing facilities that increase GHG emissions by 75,000 tpy CO_2e. Although an effective date has not been established for Phase 3, the rule states that EPA does not intend to require permitting for sources that emit less than 50,000 tpy CO_2e and that this phase will not occur prior to April 30, 2016 (EPA 2010b).

Maricopa County's Greenhouse Gas Regulations

The MCAQD applies the EPA's PSD Tailoring Rule to sources that trigger applicability under the rule. As outlined above, the Project would not be regulated under the current rule. There are no additional climate change laws, ordinances, regulations or standards in Maricopa County.

3.2.2 Study Area

The Study Area is located within the northwest portion of Maricopa County. The Study Area is primarily located within a valley which is roughly bounded by the Hieroglyphic Mountains to the north, the White Tank Mountains to the south, and the Agua Fria and Hassayampa Rivers to the east and west, respectively. The elevation of the Study Area ranges from approximately 1,700 to 2,000 feet above mean sea level (amsl) along the western and northern areas to 1,400 feet amsl along the eastern boundary.

The eastern termination point of the Project at Morgan Substation is approximately 30 miles northwest of Phoenix. The elevation in this area is 1,580 feet above sea level (asl). The elevation at the western termination point of the Project in the Town of Buckeye is approximately 1,560 feet asl.

During the winter months, weather systems bringing precipitation to the Phoenix area typically originate from the Pacific Ocean. During the summer wet season, known as "monsoon season," storms generally enter Arizona from the southeast and often originate in the Gulf of Mexico. Monsoon storms occur when this moisture is lifted in the atmosphere forming thunderstorms. **Table 3.2-1** contains average precipitation and temperature data for two meteorological stations near the Project Area.

Table 3.2-1 Meteorological Conditions Near the Project Area

AVERAGE HISTORICAL MONTHLY TEMPERATURES (˚F) AND AVERAGE PRECIPITATION (INCHES)												
	Jan	Feb	Mar	Apr	May	June	July	Aug	Sept	Oct	Nov	Dec
Wittmann, AZ 029464 (12/1/1923 to 12/31/2010)												
Average Max Temp	63.6	66.9	73.4	82.3	91.8	100.6	105.4	102.6	97.6	86.5	74.0	65.0
Average Min Temp	36.6	39.7	43.2	50.0	58.6	67.1	76.8	75.5	68.7	56.3	44.6	38.3
Average Precipitation	0.95	1.15	0.73	0.51	0.13	0.05	0.93	1.40	0.97	0.48	0.57	1.21
Youngtown, AZ 020660 (10/1/1964 to 12/31/10)												
Average Max Temp	67.3	71.5	77.2	85.3	94.6	103.4	106.2	104.5	99.5	88.6	75.6	66.4
Average Min Temp	40.3	43.5	47.6	53.2	62.3	70.7	78.6	77.3	70.4	58.1	46.5	39.7
Average Precipitation	1.02	1.19	1.09	0.32	0.12	0.06	0.81	1.11	0.82	0.64	0.65	1.12

Source: Western Regional Climate Center 2011a.

Precipitation totals are lowest on average in the months of May and June with annual rainfall totals averaging approximately nine inches.

3.2.3 Study Area Overview

The Study Area is located within the northwest portion of Maricopa County. The Study Area is primarily located within a valley which is roughly bounded by the Hieroglyphic Mountains to the north, the White Tank Mountains to the south, and the Agua Fria and Hassayampa Rivers to the east and west, respectively. The elevation of the Study Area ranges from approximately 1,700 to 2,000 feet amsl along the western and northern areas to 1,400 feet amsl along the eastern boundary.

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3.2.4 Existing Air and Climate Quality

Air quality is characterized by the concentration of specified pollutants in the atmosphere in ppm or micrograms per cubic meter ($\mu g/m^3$). The significance of the concentration of each pollutant is determined through comparison with applicable air quality standards. For the Project, predicted emissions will be compared to NAAQS, as identified in the federal CAA and regulated by the EPA (see **Table 3.2-2**).

The process for establishing NAAQS is exhaustive and thorough. Federal regulations require the NAAQS be evaluated periodically to ensure they remain health protective. Each of these evaluations represents an extensive process including a detailed examination of available health data and assessing whether the existing ambient pollutant concentration standard is adequately health-protective. In addition, an independent committee of non-EPA experts conducts peer review of the EPA's work and provides the EPA Administrator with advice and recommendations regarding the scientific adequacy of EPA's evaluation.

3.2.4.1 National Ambient Air Quality Standards

Since 1970, the federal CAA and subsequent amendments have provided the authority and framework for EPA regulation of air emission sources. The EPA regulations promulgated pursuant to the authority provided in the CAA serve to establish requirements for the monitoring, control, and documentation of activities that will affect ambient concentrations of certain pollutants that may endanger public health or welfare. In particular, these regulations have the overall objective of achieving and maintaining adherence to appropriate standards for ambient air quality.

As an enforcement tool, the CAA establishes the NAAQS, which currently apply to the following criteria pollutants. They include:

- sulfur dioxide (SO_2),
- carbon monoxide (CO),
- nitrogen dioxide (NO_2)
- particulate matter equal to or less than 10 microns in diameter (PM_{10}),
- particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$),
- ozone (O_3), and
- lead (Pb).

The CAA established two types of NAAQS: primary standards to protect public health, including the health of sensitive populations such as individuals with respiratory conditions, children, and the elderly; and secondary standards to set limits that protect public welfare, including protection against decreased visibility, damage to animals, crops, vegetation, and buildings. These standards are defined in terms of threshold concentration (e.g., ppm and $\mu g/m^3$) measured as an average for specified periods of time (averaging times). Short-term standards (i.e., 1-hour, 8-hour, or 24-hour averaging times) were established for pollutants with acute health effects, while long-term standards (i.e., annual averaging times) were established for pollutants with chronic health effects. The NAAQS are listed in **Table 3.2-2** (EPA 2011b).

Table 3.2-2 National Ambient Air Quality Standards

POLLUTANT	PRIMARY STANDARD		SECONDARY STANDARD	
	LEVEL	AVERAGING TIME	LEVEL	AVERAGING TIME
SO_2	75 ppb	1-hour[1]	0.5 ppm	3-hour[2]
	0.14 ppm	24-hour		
	0.03 ppm	Annual		
PM_{10}	150 µg/m^3	24-hour[3]	Same as Primary	
$PM_{2.5}$	35 µg/m^3	24-hour[4]	Same as Primary	
	15 µg/m^3	Annual[5]	Same as Primary	
CO	35 ppm	1-hour[2]	—	
	9 ppm	8-hour[2]	—	
NO_2	0.053 ppm	Annual	Same as Primary	
	0.100 ppm	1-hour[6]	Same as Primary	
Pb	0.15 µg/m^3	Rolling 3 month Average[7]	Same as Primary	
O_3	0.12 ppm	1-hour[8]	Same as Primary	
	0.08 ppm (1997 std)	8-hour[9]	Same as Primary	
	0.075 ppm (2008 std)	8-hour[10]	Same as Primary	

Source: EPA 2011b

Notes: µg/m^3 = micrograms per cubic meter; ppm = parts per million

[1]Final rule signed June 2, 2010. The 1971 annual and 24-hour SO2 standards were revoked in that same rulemaking. However, these standards remain in effect until one year after an area is designated for the 2010 standard, except in areas designated non-attainment for the 1971 standards, where the 1971 standards remain in effect until implementation plans to attain or maintain the 2010 standard are approved.

[2]Not to be exceeded more than once per year.

[3]Not to be exceeded more than once per year on average over 3 years.

[4]To attain this standard, the 3-year average of the weighted annual mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 15.0 µg/m^3.

[5]To attain this standard, the 3-year average of the 98th percentile of 24-hour concentrations at each population-oriented monitor within an area must not exceed 35 µg/m^3 (effective December 17, 2006).

[6]To attain this standard, the 3-year average of the 98th percentile of the daily maximum 1-hour average at each monitor within an area must not exceed 0.100 ppm (effective January 22, 2010).

[7]Final rule signed October 15, 2008.

[8](a) EPA revoked the 1-hour ozone standard in all areas, although some areas have continuing obligations under that standard ("anti-backsliding").
(b) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is $\leq$ 1.

[9](a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.08 ppm.
(b) The 1997 standard—and the implementation rules for that standard—will remain in place for implementation purposes as EPA undertakes rulemaking to address the transition from the 1997 ozone standard to the 2008 ozone standard.
(c) EPA is in the process of reconsidering these standards (set in March 2008).

[10]To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average ozone concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).

3.2.4.2 Clean Air Act Attainment Status

The EPA assigns classifications to geographic areas based upon monitored air quality conditions. An area is classified for each of the criteria pollutants as one of three categories:

- Attainment - an area that meets that national primary and secondary ambient air quality standard for the pollutant,
- Non-attainment - an area that does not meet (or contributes to ambient air quality in an area that does not meet) that national and secondary standard for the pollutant, or
- Unclassified - an area that cannot be classified on the basis of available information as meeting or not meeting the national primary and secondary ambient air quality standard for the pollutant; with respect to air quality permitting requirements, unclassified areas are treated as attainment areas.

Sufficient monitoring data must be available for the EPA to designate an area as attainment or non-attainment. Areas in which air pollutant concentrations exceed the NAAQS are designated as non-attainment for specific pollutants and averaging times. Typically, non-attainment areas are urban regions and/or areas with higher-density industrial development. Since an area's attainment status is designated separately for each criteria pollutant, one geographic area may have all three classifications. **Figure 3.2-1** is a map of Arizona showing county boundaries and areas throughout the state that have been classified as non-attainment or attainment with a maintenance plan.

- As shown in **Figure 3.2-1**, areas of Maricopa County have been designated as non-attainment for PM_{10} and ozone. There is also a carbon dioxide attainment area with a maintenance plan.
- Particulate Matter is made up of solid and liquid particles of various sizes found in the air. These particles can include acids, organic chemicals, metals, and soil or dust. The size of the particle is important in determining the potential for health problems in the human body. The smaller particles, less than 10 and 2.5 microns in diameter (PM_{10} and $PM_{2.5}$, respectively), can enter the lungs and potentially cause serious health effects, especially in sensitive populations.

Carbon monoxide is the most commonly occurring air pollutant, but does not remain in the atmosphere for long periods because it is easily converted into carbon dioxide (CO_2). The largest source of CO in urban areas is tailpipe emissions from motor vehicles, but it is also produced during other types of fuel combustion. In outdoor areas where high concentrations of CO exist, people with heart disease can experience chest pains and healthy people experience increased fatigue.

Ground-level ozone is not emitted directly from air pollutant sources, but is formed through a chemical reaction of VOCs, NO_x, and other toxic pollutants in the presence of heat and sunlight. Common sources of VOCs and NO_x include motor vehicle exhaust and emissions from combustion equipment at industrial facilities. VOCs are present in chemical solvents and consumer products. Exposure to unhealthy levels of ozone at ground level can affect the respiratory system, causing symptoms such as coughing, throat irritation, chest tightness, and shortness of breath.

The PM_{10} classification in Maricopa County is categorized as serious non-attainment. Although the MAG has implemented numerous control measures to reduce the levels of PM_{10} in the air, the county has been unable to comply with the 24-hour standard. The county submitted a revision to the State Implementation Plan (SIP) to the EPA in 2007 to comply with the requirements in Section 189(d) of the CAA which requires annual reduction of PM_{10} or PM_{10} precursors by five percent of the most recent emission inventory. Particulate matter sources of concern include construction activities, paved road dust, unpaved roads and parking lots, agricultural activities, windblown dust from disturbed vacant lots, construction sites, and agricultural fields, fires and open burning, dust from off-road recreational vehicles, leaf blowers, and exhaust from cars. **Figure 3.2-2** shows the PM_{10} non-attainment area for Maricopa County. The Proposed Action route and all other Action Alternatives, from the eastern termination point at Morgan Substation, to the area south of Dove Valley Road and west of the 259th Avenue alignment is within the PM_{10} non-attainment area. The western portion of the route, similar to the Proposed Action and all Action Alternatives, is outside of the PM_{10} non-attainment area.

The CO attainment status was revised to attainment with a maintenance plan in April of 2005. This means that the county demonstrated to the EPA through monitoring data and control measures included in a maintenance plan that the CO standard would be met in future years. According to the SIP section of Maricopa County's website, there has not been an exceedance of the CO standard in the county since 1996. Carbon monoxide is emitted during the combustion fuel used in vehicles and industrial equipment, as well as during wildfires.

Maricopa County is designated as non-attainment for ozone. In February 2008, the EPA lowered the ozone NAAQS from 0.08 ppm to 0.075 ppm. In March of 2009, the state submitted 8-hour ozone standard recommendations to EPA for areas of the state, exclusive of Indian Country. **Figure 3.2-3** depicts the recommended 8-hour ozone non-attainment area boundary which encompasses a significant portion of Maricopa County (State of Arizona 2009). The Proposed Action route and all other Action Alternatives are located within both the existing and proposed ozone non-attainment areas.

3.2.5 Climate Change

Greenhouse gases (GHG) are chemical compounds in the Earth's atmosphere that allow incoming short-wave solar radiation but absorb long-wave infrared radiation re-emitted from the Earth's surface, trapping heat. Most studies indicate that the Earth's climate has warmed over the past century due to increased emissions of GHGs and that human activities affecting emissions to the atmosphere are likely an important contributing factor (US Energy Information Administration 2009).

Computer-based modeling suggests that rising GHG concentrations generally produce an increase in the average temperature of the Earth, which may produce changes in sea levels, rainfall patterns, and intensity and frequency of extreme weather events. Collectively, these effects are referred to as "climate change." The Intergovernmental Panel on Climate Change (IPCC), in its Fourth Assessment Report, stated that warming of the Earth's climate system is unequivocal and that warming is very likely due to anthropogenic GHG concentrations (IPCC 2007).

Climate is the composite of a region's generally prevailing weather conditions throughout the year, averaged over a series of years. Historical weather patterns within the Study Area are characterized by mild winters, hot summers, and low levels of rainfall consistent with the Sonoran Desert's arid climate. Temperatures in the Study Area show a consistent warming trend since recording began in 1896 (National Weather Service Forecast Office 2009), and recent warming in the Southwest has been "among the most rapid in the nation" (US Global Change Research Program 2010). Across the West, the increase in average temperature during the past five years has been 70 percent higher than in the world as a whole (Saunders et al. 2008). In Arizona, average temperature increases during winter and spring months have been greater than during the summer or fall, and increases in daily minimum temperatures have been more common than increases in daily maximum temperatures. Winter minimum temperatures in the Sonoran Desert now are higher, and freeze-free periods are longer, than at any time during the 20th century, a trend likely to continue into the future (Weiss and Overpeck 2005). Climate models' projections for the future of the western US consistently predict higher temperatures. Increases of 3.6 Fahrenheit (°F) (2°C) in both summer and winter are likely by 2050, as are annual increases of 7.2 to 9°F (4-5°C) by 2099 (Garfin et al. 2007).

3.2.5.1 Emission Sources

Greenhouse gases include CO_2, CH_4, N_2O, water vapor, and several trace gases. Some GHGs, such as CO_2, occur naturally and are emitted into the atmosphere through both natural processes and human activities, while others are created and emitted solely through human activities. The GHGs that enter the atmosphere due to human activities include CO_2 from the burning of fossil fuels, solid waste, and trees and wood products; CH_4 emitted during the production and transport of coal, natural gas, and oil, as well as by livestock, deforestation, and agricultural practices; N_2O from agricultural and industrial activities and the combustion of fossil fuels and solid waste; and fluorinated gases that result from a variety of industrial processes.

Total GHG emissions in the US rose 14.7 percent from 1990 to 2006. The primary GHG emitted by human activities in the United States is CO_2. It totals approximately 84.8 percent of all GHG emissions, with the largest source being fossil fuel combustion. According to the EPA Inventory of US Greenhouse Gas Emissions and Sinks (EPA 2008), CO_2 emitted in the US totaled 7,054.2 teragrams in 2006. These GHG emissions are partly offset by carbon sequestration in forests, trees, urban areas, and agricultural soils, which, in aggregate, offset 12.5 percent of total US emissions in 2006 (EPA 2008).

3.2.5.2 Global Effects

Global mean surface temperatures have increased nearly 1.8 °F from 1890 to 2006. Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24°N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8°F increase since 1970 alone. The Intergovernmental Panel on Climate Change (IPCC) indicated that by the year 2100, global average surface temperatures would increase 2.5°F to 10.4°F above 1990 levels (IPCC 2007).

The National Academy of Sciences has confirmed these findings but also has indicated there are uncertainties regarding how climate change may affect different regions. Computer model predictions indicate that increases in temperature will not be equally distributed but are likely to be accentuated at higher latitudes. Warming during the winter months is expected to be greater than during the summer, and increases in daily minimum temperatures is more likely than increases in daily maximum temperatures. Increases in temperatures would increase water vapor in the atmosphere, and reduce soil moisture, increasing generalized drought conditions, while at the same time enhancing heavy storm events (IPCC 2007).

The U.S. Climate Change Science Program (CCSP) coordinates climate change research conducted by the U.S. Government. In May of 2008 as a part of this program, an assessment was published entitled, "*The Effects of Climate Change on Agriculture, Land Resources, Water Resources, and Biodiversity*" (CCSP 2008). The assessment report indicates that temperature increases, higher CO_2 levels in the atmosphere, and changes to patterns of precipitation will have significant effects on the resources in the western United States. This may impact:

- snowpack levels and timing of spring runoff,
- frequency of drought conditions and wildfires,
- moisture levels in soils,
- changes to growing seasons,
- species of plants, weeds, and insects present, and
- land use decisions.

3.2.5.3 Regional Effects

The average temperature in the Southwest has already increased approximately 1.5°F (0.83°C) above a baseline period of 1960-1990 and is projected to rise 4.0-10.0°F (2.2°C-5.6°C) by the end of the century (Justus and Fletcher 2007). It is not possible to predict with certainty the effects of climate change on local- or regional-scale ecosystems, but climate change is certain to affect natural and human systems within the Study Area and is likely to have a large impact on BLM management strategies. The 2007 Government Accountability Office (GAO) Report on Climate Change states:

Federal land and water resources are vulnerable to a wide range of effects from climate change, some of which are already occurring. These effects include, among others:

- Physical effects, such as droughts, floods, glacial melting, and sea level rise;
- Biological effects, such as increases in insect and disease infestations, shifts in species distribution, and changes in the timing of natural events; and,
- Economic and social effects, such as adverse impacts on tourism, infrastructure, fishing, and other resource uses (GAO 2007).

In the Sonoran Desert, the most likely effects of climate change include the following:

- Higher average temperatures, particularly at night;
- Scarcer water supplies due to lower overall rainfall and earlier melting of upstream snowpack, resulting in earlier peak stream flows in the Salt, Verde, Gila, and Colorado Rivers in spring and potentially reduced flows in summer;
- More variable precipitation patterns than what is observed currently, including longer, more frequent droughts and more intense storms bringing increased flooding;
- Higher rates of soil erosion;
- Increased invasive plant species, particularly non-native annual grasses;
- Increased frequency and intensity of wildfires;
- Shifting habitats for wildlife, including the development of "novel" ecosystems in which species that have been geographically separate in the past begin to share habitat; and,
- Worsening air pollution problems as increased temperatures and drought contribute to ozone and PM_{10} production.

3.2.5.4 Water Supplies

The most important way climate change is likely to affect the Study Area is by decreasing already scarce water resources. Drought and flood cycles lasting months, years, or even decades are already a regular occurrence in the Sonoran Desert. An extended drought has gripped Arizona since the 1990s, and the total amount of water available for all uses—including wildlife and plants, ecosystem services, and human needs—is expected to decline as climate change advances (US Global Change Research Program 2010).

Currently, annual precipitation in Phoenix, which is adjacent to the Study Area, averages 7.63 inches, with wide seasonal variations. Historically, most rain falls during the summer monsoon and winter rainy seasons, while the spring and fall "shoulder" seasons may see no rain at all. The monsoon season, typically mid-July to mid-September, is defined by a shift in wind patterns that brings moisture up from the Gulf of California, the Gulf of Mexico, and the eastern Pacific.

Average rainfall increases during this time from just over a tenth of an inch in June to an inch or more in July (0.97 inch), August (1.03 inch), and September (0.84 inch) (National Weather Service Forecast Office 2009). The other half of the region's rain typically falls from December through March, when the winter rainy season brings in storms from the west and northwest. On average, these storms drop between three-quarters to one inch of rain per month, with December posting the highest monthly average (0.93 inch) from 1896-2008 (National Weather Service Forecast Office 2009). However, yearly rainfall is highly variable and rarely fits the "average" pattern (Sheppard et al. 2002). Under most climate change scenarios, storm intensity and attendant flooding are likely to become more common as the timing, location, and, potentially, the amount of precipitation shifts (Archer and Predick

2008). Nonetheless, the effect climate change will have on the overall amount of precipitation in Arizona is not clear.

The effect that higher temperatures, both observed and projected, will have on the region's water supplies is much clearer. Snowpack currently supplies approximately 70 percent of all water in the West (Saunders et al. 2008) and almost all the water to the rivers that flow into or adjacent to the Study Area. The timing and capacity of these supplies are dependent on overall precipitation and temperature, which determines when the snowpack melts. Recent years have seen snowmelt push the timing of peak stream flows in spring as much as a month earlier than normal, thereby reducing flows in the summer and fall, when demand typically peaks (Saunders et al. 2008; US Global Change Research Program 2010). Reduced stream flows in the summer will leave ecosystems more dependent on increasingly uncertain summertime rains. Further exacerbating this vulnerability is the increasing tendency of rain to fall during infrequent, large-scale events that drain quickly and cause flooding and soil erosion. Such changes to the hydrologic cycle of the Sonoran Desert could have massive impacts on the region's wildlife and vegetation.

3.2.5.5 Wildfires

Climate change-related shifts from desert to grassland ecosystems will also increase the risk of wildfire throughout the Sonoran Desert (GAO 2007; Archer and Predick 2008). Higher winter temperatures and earlier peaks in spring snowmelt runoff already have led to increases in both the frequency and intensity of wildfires in higher elevations of the Rocky Mountains (Westerling et al. 2006).

3.2.5.6 Species Migration and Extinction

Current conditions in the Sonoran Desert represent the extreme range for many plant species, and the combination of increasing temperatures and decreasing water availability is likely to shift the range of many plants and animals northward or even cause them to become extinct (Saunders et al. 2008; Weiss and Overpeck 2005). Increasing CO_2 concentrations also lead to fertilization and growth of specific plant species. Such shifts could bring the woody, herbaceous plants common to northern Mexico into areas now dominated by iconic succulents such as the saguaro cactus and native grasses (Saunders et al. 2008; Weiss and Overpeck 2005).

The "novel" ecosystems created by climate change-induced habitat shifts also could lead to significant management challenges as plants and animals that once were geographically distinct combine in new ways.

3.2.5.7 Air Pollution

As climate change causes an increase in air temperatures in the Study Area, pollutants such as O_3 and PM_{10} that are formed more readily in warm air are likely to increase and cause a decline in air quality. The Phoenix Metropolitan Area has already been designated as non-attainment for the eight-hour O_3 standard, and the Phoenix Area and Western Pinal County are non-attainment areas for PM_{10} standards. In Spring 2012, the EPA plans to designate the Phoenix-Mesa area as non-attainment for the revised primary eight-hour O_3 standard issued in 2008. As air quality decreases further due to climate change, there is a possibility that

additional areas within Arizona and the Study Area could be designated as non-attainment areas for these pollutants.

3.2.6 Visibility

The federal PSD program is part of a larger pre-construction review and approval program called New Source Review (NSR). The overall purpose of the PSD Permitting Program, which applies to major sources of pollutants in areas currently meeting the NAAQS for those pollutants, is to: (1) protect public health and welfare from the effects of air pollution or exposure to pollutants that originated in the air and preserve attainment and maintenance of the NAAQS; (2) preserve, protect, and enhance air quality and visibility in national parks, national wilderness areas and other areas of special natural, recreational, scenic, or historic value; (3) provide for economic growth while preserving clean air resources; (4) prevent emissions from any source from interfering with objectives in any implementation plan aimed at preventing significant deterioration of air quality; and (5) assure that decisions to allow increased air pollution are made only after evaluating the related consequences and providing opportunities for public participation in the process (EPA 2010c). The federal NSR/PSD regulations are codified at 40 CFR §51.166 and §52.21. These requirements are incorporated into Arizona air quality permitting regulations, under Arizona Administrative Code (A.A.C.), Title 18, Chapter 2, Article 4.

Areas meeting criteria for relatively pristine air quality (and unique natural features on a national level) receive the highest level of air quality protection. International parks, national parks larger than 6,000 acres, national memorial parks larger than 5,000 acres, and national wilderness areas larger than 5,000 acres are designated as Class I areas. Class III is assigned to attainment areas where maximum industrial growth is allowed as long as the NAAQS are not exceeded (to date, no Class III areas have been designated). All other areas in the United States are designated Class II. **Figure 3.2-4** shows the Arizona Class I areas.

There are no Class I areas near the Study Area. The Superstition Wilderness and the Mazatzal Wilderness are both partially located in Maricopa County. These U.S. Forest Service Class I areas are located approximately 50 miles and 35 miles, respectively, from the eastern end of the Proposed Action route.

There are several BLM Wilderness Areas, National Monuments, and National Conservation Areas, designated as Class II areas in the vicinity of the Study Area. These include the Hassayampa River Canyon Wilderness, Hells Canyon Wilderness, North Maricopa Mountains Wilderness, Sierra Estrella Wilderness, Harquahala Wilderness, Hummingbird Springs Wilderness, Big Horn Mountains Wilderness, Agua Fria National Monument, and Sonoran Desert National Monument. These areas are protected under the CAA, but to a lesser extent than Class I areas. However, since electrical transmission lines are not typically a major source of air pollutants, a PSD impact analysis is unlikely to be required.

3.2.7 Emissions Status

Maricopa County has an ambient air monitoring network that is used to measure quantities of air pollution at monitored locations. These data are used for air modeling exercises and to evaluate the effectiveness of control measures that are implemented. There are three air quality monitors located near the Study Area. The Glendale monitor, located at 59th Avenue and West Olive, and the Dysart monitor, located at Bell Road and Dysart Road, collect ozone, CO, and PM_{10} data while the Zuni Hills monitor, located at 109th Avenue and Deer Valley Road, collects PM_{10} data only. The data presented in **Table 3.2-3** below were published in "2010 Air Monitoring Network Review," by the MCAQD (2011).

Table 3.2-3 Summary of Monitoring Network Data at Selected Sites

SITE	CO 1-HOUR AVERAGE MAX (PPM)	CO 8-HOUR AVERAGE MAX (PPM)	OZONE 8-HOUR MAX (PPM)	OZONE 3-YEAR AVERAGE OF 4TH HIGHEST 8-HOUR (PPM)	PM_{10} 24-HOUR AVERAGE MAX ($\mu G/M^3$)	PM_{10} ANNUAL AVERAGE ($\mu G/M^3$)	NUMBER OF 24-HOUR NAAQS EXCEED-ANCES PM_{10}
Glendale	9.0	3.0	0.083	0.072	92[1]	22.9[3]	0
Dysart	2.0	0.9	0.082	0.069	81[2]	21.5[3]	0
Zuni Hills	-	-	-	-	70	20.7[4]	0

[1] The second highest 24-hour average value was 62 $\mu g/m^3$.
[2] The second highest 24-hour average value was 63 $\mu g/m^3$.
[3] Based upon 8648 samples.
[4] Based upon 8697 samples.

3.2.8 Existing Emissions Intensity of Grid Electricity

Greenhouse gases are emitted by fossil-fuel fired power plants as they produce electricity. The intensity of grid electricity is measured in units of tons of CO_2 equivalents per megawatt hour (MWh) of electricity generated. Information on intensity of grid electricity is collected by the EPA by subregion in the Emissions & Generation Resource Integrated Database (eGRID).The Project is located in the Arizona-New Mexico (AZNM) WECC southwest subregion. According to the EPA Clean Energy section, the fuel mix of the electricity generated in the Study Area (supplied by APS) results in CO_2 emissions of 1,253 lb per MWh compared to the national average of 1,293 lb per MWh (EPA 2007). The mix of power generating technologies in the WECC Southwest Region includes 40.2 percent coal, 36.2 percent natural gas, 14.8 percent nuclear, 5.9 percent hydroelectric, 2.7 percent other renewables, and 0.1 percent oil (EPA 2011d).

3.3 CULTURAL RESOURCES

3.3.1 Laws, Ordinances, Regulations, and Standards

Potential impacts on the cultural environment were assessed pursuant to Section 101(b)(4) of NEPA, which directs federal agencies to preserve important historical and cultural aspects of our nation's heritage. Other applicable federal laws and regulations also were addressed, particularly Section 106 of the National Historic Preservation Act, which directs federal agencies to consider the effects of their undertakings on properties listed in or eligible for the National Register of Historic Places (National Register), in consultation with the Advisory Council on Historic Preservation, SHPO, and other interested parties, including tribes with traditional cultural affiliation with the Study Area. To be eligible for the National Register (Title 36, Code of Federal Regulations, Part 60), properties must be 50 years old (unless they are exceptionally important) and have national, state, or local significance in American history, architecture, archaeology, engineering, or culture. Historic properties may include places of traditional, religious, and cultural importance. They also must possess integrity of location, design, setting, materials, workmanship, feeling, and association, and meet at least one of four criteria:

- Criterion A: be associated with significant historical events or trends
- Criterion B: be associated with historically significant people
- Criterion C: have distinctive characteristics of a style or type, or have artistic value, or represent a significant entity whose components may lack individual distinction
- Criterion D: have yielded or have potential to yield important information

BLM also complies with the Archeological Resources Protection Act of 1979 (ARPA), the Native American Graves Protection and Repatriation Act of 1990 (NAGPRA),), and the AIRFA when authorizing uses of public land. ARPA prohibits the collection of archaeological resources from public lands (and Indian lands) without a permit issued by the land managing agency, and establishes criminal and civil penalties for removal, sale, purchase, exchange, transportation, receipt, or offering of any archaeological resource obtained from public lands (or Indian lands) in violation of any provision, rule, regulation, ordinance, or permit under the act, or under any federal, state, or local law. BLM follows the ARPA implementing regulations (Title 43, Code of Federal Regulations, Part 7).

NAGPRA establishes rights of Indian tribes to claim ownership and repatriation of human remains, funerary objects, sacred objects, and objects of cultural patrimony held or controlled by federal agencies and museums that receive federal funds. Intentional excavations and inadvertent discoveries of such items must follow plans developed in consultation with Native Americans. BLM follows the NAGPRA regulations (Title 43, Code of Federal Regulations, Part 10).

AIRFA established a policy to protect and preserve for American Indians the inherent right of freedom to believe, express, and exercise their traditional religions, including but not limited to access to religious sites, use and possession of sacred objects, and freedom to worship through ceremonials and traditional rites. BLM complies with AIRFA by obtaining

and considering the views of Indian leaders when a proposed land use might conflict with traditional Indian religious beliefs or practices, and by avoiding unnecessary interference with Indian religious practices as projects are implemented.

Because the transmission line route crosses State Trust land, the cultural resource studies also support ASLD compliance with the State Historic Preservation Act, which requires consultation with the SHPO about projects that could affect properties listed in or eligible for the Arizona Register of Historic places (Arizona Register). The criteria for listing in the Arizona Register, which is maintained by the Arizona SHPO, are identical to those for the National Register. The inventory of cultural resources also supports ASLD compliance with the Arizona Antiquities Act, which directs persons in charge of activities on state lands to report the discovery of archaeological, paleontological, and historical sites or objects that are at least 50 years old to the director of the Arizona State Museum, and to conduct studies of cultural resources on state land in accordance with permits issued by the museum.

On State, County, city, and municipal lands, Arizona Revised Statute 41-844 protects human remains and associated funerary objects in unmarked graves and abandoned cemeteries that exceed 50 years in age. This statute also protects sacred ceremonial objects and objects of cultural patrimony on State lands that have special importance to American Indians. On private lands, Arizona Revised Statute 41-865 provides similar protection. In the event of discovery of such remains, the Director of the Arizona State Museum must be notified and is required to consult with Indian tribes, direct kin, or groups that can show a relationship to human remains through cultural affinity in order to determine the appropriate treatment of the remains and materials.

3.3.2 Region of Influence (Area of Potential Effect)

The region of influence for NEPA analyses is the geographic area within which a proposed project and analyzed alternative actions may affect resources. The concept is similar to the Area of Potential Effects (APE), which is defined by regulations implementing Section 106 of the National Historic Preservation Act (Title 36, Code of Federal Regulations, Part 800) as the geographic area or areas within which an undertaking may alter the character or use of a property listed in or eligible for the National Register. The APE can vary for each type of potential direct, indirect, and cumulative impact on the cultural environment.

Ground disturbing activities associated with construction have the highest potential for disturbing or destroying significant cultural resources. Accordingly, the APE for direct impacts was defined to include the construction zones of the Project, which would be confined to the ROW acquired for the Project, access roads that might extend outside the ROW, and any temporary construction easements. The exact and final ROW width has yet to be determined, but is expected to be 125 to 200 feet wide. Access roads for construction and maintenance would be within the ROW unless topography requires deviations, which would not be determined until final designs are prepared after conclusion of the EIS process. Similarly, the need for temporary construction easements would not be determined until final designs are prepared, but it can be anticipated that extra workspace could be required for pulling and tensioning the conductors where the line turns.

In regards of defining the APE, potential indirect impacts could result from (1) visual changes stemming from the introduction of transmission line structures and conductors into the settings of cultural resources, and (2) disturbance or vandalism due to increased public use resulting from vegetation clearing or new roads that enhance vehicle access to currently inaccessible areas.

Archaeological sites that are primarily important for their potential to yield important information may not be affected by visual changes. The integrity of setting and feeling of some sites types, such as historic trails and roads, historic buildings and structures, and traditional cultural resources, can be important aspects of their historic values, which could be affected by visual changes. Through analyses conducted in accordance with the BLM's visual resource management system, potential effects on cultural resources generally are evaluated at foreground and middle ground distances, which are defined as extending three to five miles. In conformance with that practice, the APE for cultural resources as related to visual impacts was defined as extending up to five miles beyond the Project Area. If warranted, this distance could be extended beyond five miles to analyze effects on specific sites or locations.

Studies have demonstrated that, in rural settings, unauthorized artifact collectors and vandals are much more likely to have diminished the integrity of archaeological and historical sites near roads than sites in more remote settings (Ahlstrom et al. 1992; Nickens et al. 1981; Simms 1986; Spangler 2006; Spangler et al. 2006). Although the impacts of unauthorized collection and vandalism vary with distances from roads, the types and visibility of sites also are important factors. For example, historic structures are more vulnerable than artifact scatters. It is anticipated that the potential for such impacts would be greatest within 300 to 600 feet of existing or new roads.

3.3.3 Cultural History

The cultural history of south-central Arizona is summarized in this section to provide a context for evaluating the cultural resources that could be affected by the Project (supporting technical reports include Kirvan et al. 2012; Rogge and Erickson 2007; Rogge et al. 2011). The cultural history of the area can be divided into several periods that reflect changing adaptations and lifeways, including Paleoindian, Archaic, Early Agricultural, Early Ceramic, Hohokam, Protohistoric, Ethnohistoric, and historic Euro-American periods.

The earliest human occupation of southern Arizona by Paleoindian hunters and gatherers dates to approximately 11,000 to 12,000 B.C. Paleoindian populations migrated seasonally, exploiting indigenous plants for food and hunting game that included now extinct megafauna, such as mammoths, bison, horses, and camels. Evidence of Paleoindian occupation in south-central Arizona is limited to isolated spear points, but significant Clovis culture sites of the Paleoindian period have been found along the San Pedro River in southeast Arizona. Archaeological sites of the subsequent Archaic period (circa 7500 to 2100 B.C.) are more common and have been documented in the valleys and foothills north of Phoenix. The Archaic period represents a continuation of a nomadic hunting and gathering lifeway, but one adapted to the climate of the Holocene period, which was warmer and dryer

than the late Ice Age climate of the Paleoindian period. Archaic subsistence strategies targeted a wide variety of animal and plant resources.

During the Late Archaic/Early Agricultural period (circa 2100 B.C. to A.D. 50) some local populations in south-central Arizona began to grow domesticated crops, particularly maize, as early as 2100 B.C. Early farmers also encouraged the growth of a variety of other local seed-bearing plants, such as amaranth and goosefoot, but continued to rely heavily on hunting game and gathering indigenous plants for food. Although sizeable villages dating to this period have been found along the Santa Cruz River in the Tucson Basin, they may not have been occupied year round. Few comparable sites have been found in the Phoenix Basin.

During the subsequent Early Ceramic period (A.D. 50 to 500), use of plain ware pottery containers became widespread, probably reflecting adoption of a more sedentary lifestyle. Around A.D. 500, red ware pottery began to be made, and villages of numerous pit houses were built around central plazas indicating multiple kin groups made a commitment to live together. That pattern seems to reflect increased reliance on farming, adoption of a more sedentary way of life, and the beginning of the Hohokam culture that occupied the region for about a millennium.

The remains of the village-dwelling Hohokam farmers overwhelmingly dominate the archaeological record of south-central Arizona, including areas along the Agua Fria River in the Project Area. The Hohokam culture is noted for extensive irrigation systems built along the Salt and Gila rivers. Canals were much more limited along the Agua Fria River, but fields with terraces and "waffle gardens" marked by rock walls and alignments are common. The Hohokam occupation is divided into a Classic period (circa A.D. 1150 to 1450) and three earlier pre-Classic periods, each of which are subdivided into phases based on changing styles of artifacts, houses, and burials. The Hohokam culture collapsed or changed so drastically that it disappeared from the archaeological record 500 to 600 years ago, for reasons that are not yet fully understood. Archaeological evidence of the subsequent Protohistoric period (circa A.D. 1450 to 1700) in south-central Arizona is meager.

Prehistoric archaeological sites within and near the Project Area are concentrated along the floodplain and terraces of the Agua Fria River and include village sites such as the Beardsley Canal site and Palo Verde Ruin, as well as remnants of agricultural fields and irrigation canals. Occupation appears to have been most intensive during the Hohokam pre-Classic period. Sites are sparser in upland areas away from the river and are limited primarily to artifact scatters and occasional rockshelters that reflect hunting and gathering of plant foods and raw materials, as well as travel through the region and short-term camps.

Spanish explorers first passed through southeastern Arizona in the early sixteenth century, but did not stay, and subsequent colonization in the late sixteenth century focused on the northern Rio Grande River valley in New Mexico. The Ethnohistoric period of south-central Arizona began in the late 1600s when Jesuit priests and soldiers traveled north from Colonial Spanish settlements in Mexico. They found Tohono O'odham (Papago) and Sobaipuri living in the Tucson Basin and surrounding uplands, and about a half dozen villages occupied by the closely related Akimel O'odham (Pima) on the middle Gila River. Groups that came to be known as the Pee Posh (Maricopa) lived along the lower Gila and Colorado River Valleys, and they migrated upriver to join the Akimel O'odham during the nineteenth century. The

Salt River Valley within the Phoenix Basin was not intensively inhabited or used at that time because it was a contested zone between the territories of the Akimel O'odham villagers and their adversaries to the north and east—the Yavapai and Western Apache. Ethnohistoric evidence indicates that Yavapai occupied a vast territory overlapping the Project Area, stretching from Flagstaff in the northeast to Yuma in the southwest and Globe in the southeast, with the territories of three Yavapai subtribes (Tolkapaya, Kewevkapaya, and Wipukpaya) bordering each other in the vicinity of Lake Pleasant (Khera and Mariella 1983). Archaeological evidence of the protohistoric and early historic period in the Project vicinity is limited, but several artifact scatters near Lake Pleasant have been dated to that period. Those artifact scatters are sometimes associated with rockshelters and have been identified as Yavapai sites on the basis of distinctive types of pottery, small arrow points, and slab metates (Stokes 2011; Telles and McConnell 2000).

The pace of settlement quickened after 1848, when land north of the Gila River was ceded to the United States at the end of the United States-Mexican War and was designated the New Mexico Territory. The United States acquired more land south of the Gila River in 1854 with the Gadsden Purchase. The Akimel O'odham and Pee Posh expanded their farms along the Gila River to supply food to the new immigrants, and, by the mid-1800s, they were an economic force and virtually the only effective military resistance against the Apache.

The 1860s brought a mining boom and an end to the isolation of the territory. While Mexican and Anglo miners feuded with each other over access to gold deposits, water, and timber, they were united in their hostility toward the Apache and Yavapai who resisted the newcomers. In 1863, during the Civil War, the Arizona Territory was separated from the New Mexico Territory. In 1865, Fort McDowell was established in the lower Verde River Valley to subdue the Apache and Yavapai. The U.S. Army stimulated settlement by protecting miners and farmers and creating a market for food and supplies. The conflict with the Apache and Yavapai lasted more than a decade until the 1870s, when most of the resisting groups surrendered and were moved to reservations.

In addition to mining, historical Euro-American interests in south-central Arizona focused on ranching, farming, and associated development of roads and railroads. Although Euro-Americans had lived in the Tucson Basin since the Colonial Spanish era, they did not establish settlements in the Salt River Valley until the late 1860s when farmers began excavating irrigation canals in the Hohokam fields that had lain abandoned for about four centuries. Jack Swilling, with the backing of some residents of Wickenburg, a mining community 50 miles northwest of the Salt River Valley, organized the Swilling Irrigating and Canal Company and in 1867 began digging a canal following the traces of remnant Hohokam canals in an area that is now at the northeastern edge of Sky Harbor International Airport. The success of the first settlers along the canal brought others to the valley. Swilling often is called the Father of Phoenix because of his efforts to restore the agricultural splendor of the aboriginal Hohokam culture.

Settlement of the Phoenix Basin was based primarily on irrigation agriculture, but Phoenix grew to be a commercial and governmental center and was designated as the capital of the Arizona Territory in 1889, after being in Prescott (1863-1867, 1877-1889) and Tucson (1867-1877). Settlement in the western part of the Phoenix Basin near the Project Area

followed settlement of the Phoenix area by a decade or two and also was based on farming. Early agricultural development was largely confined to the areas irrigated centuries before by the Hohokam along the lower Salt River and Gila River. The Buckeye Canal was in operation by 1886 and was the stimulus for the founding of the Town of Buckeye (originally called Sydney) in 1889 and the community of Liberty in 1895. The construction of the Arizona Canal led to the founding of other farming communities, including Peoria in 1888 and Glendale in 1891. The completion of Roosevelt Dam on the Salt River in 1911 stimulated further development by providing a more stable supply of water for irrigation and protection from floods that damaged canal headings.

Agricultural development in the western Phoenix Basin north of the Buckeye Canal was thwarted by the limited availability of water, but attempts to develop an irrigation project along the lower Agua Fria River valley began in the 1880s. In the 1890s, William Beardsley and the Agua Fria Water and Land Company began building a diversion dam south of a stage stop called Frog Tanks (now beneath Lake Pleasant), but the structure was left unfinished until 1927 when it was completed in conjunction with the construction of Waddell Dam and the Beardsley Canal.

The Santa Fe, Prescott & Phoenix Railway reached Phoenix in 1895, providing another link to a transcontinental railroad. Morristown was founded along the railroad as Vulture Siding and served the Vulture Mine southwest of Wickenburg. By 1897, the siding was being used by passengers traveling to Castle Hot Springs and the name was changed to Hot Springs Junction, and a post office was established. The name was subsequently changed to Morristown, to honor George Morris, the first local inhabitant who discovered the Mack Morris Mine.

Wittmann originated as a flag stop along the railroad. The place was originally called Nada or Nadaburg, which was derived from the Spanish word *nada*, meaning nothing. A post office was established at Nada in 1920. As a community gradually developed, the name was changed in 1929 to Wittmann to honor one of the financial backers for rebuilding Walnut Grove Dam on the upper Hassayampa River after it was washed out by a flood.

World War I gave a boost to agricultural development in the general Project Area when the supply of long-staple cotton from Egypt and Sudan was cut off and supplies from Georgia declined due to boll weevil infestation. Long-staple cotton was essential for manufacturing rubber tires and the war greatly increased the demand for tires. The Goodyear Tire & Rubber Company of Akron, Ohio, purchased 24,000 acres (more than an entire township) of undeveloped land west of the Agua Fria River and embarked on raising cotton for the company's tire plants. Thousands of Mexican nationals and American Indians were recruited to work in the fields. Paul Litchfield managed Southwest Cotton, a wholly owned subsidiary of Goodyear, and the World War I farm headquarters and labor camps grew into a community that was named Litchfield Park. The town of Goodyear also was founded at that time.

Cotton prices plummeted and production shrank after the war ended. A dispute over water rights between the upstream Waddell Dam project and Southwest Cotton was resolved in the mid-1930s in favor of the upstream project, and farmland irrigated by the Beardsley Canal continued to be developed. The onset of World War II again stimulated development in the

region. The Goodyear Aircraft Corporation built an aircraft plant employing 7,500 employees (mostly women) as wartime production peaked. The Litchfield Naval Air Facility was established to test and deliver aircraft produced by Goodyear. During World War II, Luke Air Field also was established north of Litchfield Park, stimulating additional growth. The base trained more than 13,500 advanced pilots during the war, making it the largest such training facility in the country.

Today LAFB continues to train fighter pilots, and farming continues to be pursued, but agricultural lands and undeveloped grazing lands in the western Phoenix Basin are now being rapidly urbanized. After World War II, Sunbelt retirement communities were developed. Youngtown, established in 1954, led the way, but Del Webb soon followed with Sun City, Sun City West, and most recently Sun City Grand. Circle City, an unincorporated development along US 60, is another of those retirement communities. El Mirage and Surprise are post-World War II towns that continue to grow. The sale of Goodyear Farms to the SunCor Development Company in 1987 is representative of the conversion of farmland to residential and commercial urban uses, facilitated by the completion of Interstate 10 and other freeways that have reduced driving times to the urban center of Phoenix. Upscale developers have turned their attention to the western Phoenix metropolitan area that is continuing to expand north toward Lake Pleasant and even to the west side of the White Tank Mountains and north of Sun City and Peoria.

In summary, the cultural history of the region is long and complex. The Project Area; however, is arid with few reliable water sources, with the exception of the Agua Fria River, or other types of natural resources and did not occupy center stage for much of that history.

3.3.4 Inventory Methods

Initial studies to inventory and evaluate archaeological, historical, and traditional cultural resources in the APE were conducted in conjunction with siting studies for the transmission line and preparation of an application for the ACC. Those studies involved preparation of a cultural resource overview that compiled information about prior cultural resource studies and cultural resources recorded within a study area that covered approximately 400 square miles (Rogge and Erickson 2007). That overview was based primarily on information about prior studies and recorded cultural resources documented in the AZSITE Arizona Archaeological Site and Survey Database (AZSITE), which is a geographic information system database that includes records of the AZSITE Consortium members (Arizona State Museum (ASM), Arizona State University (ASU), Museum of Northern Arizona, and SHPO), and participating agencies such as BLM. The listing of National Register properties and selected reports of prior studies also were reviewed. The compiled information was considered in evaluating alternatives during the initial siting studies.

Once the ACC route was certificated, a detailed records review (Class I inventory) compiled information about prior studies and recorded resources within two-mile wide corridors centered on the Proposed Action route within the ACC-certificated route for which a CEC was issued, and for two alternative routes addressed in this report. That information included AZSITE data as well as the results of other surveys and information on file at the BLM HFO and USBR Phoenix Area Office that has not yet been included in the AZSITE database.

General Land Office plats on file at the BLM State Office also were reviewed for indications of potential unrecorded historical resources.

An intensive pedestrian (Class III) cultural resource survey of a study corridor 400 feet wide was conducted along the routes of the Proposed Action and Alternative 2 on public land adjacent to SR 74, as well as the route of the Proposed Action and the Sub-alternative. The required ROW is anticipated to be no more than 200 feet wide, but a wider area was surveyed to take into account potential mapping errors of prior surveys and to provide flexibility in siting the ROW to facilitate avoidance of impacts to cultural resources. No survey was conducted on public land along the Hayden-Rhodes Aqueduct of the CAP at the southwestern end of the Project because it had been intensively surveyed and subjected to data recovery investigations before the aqueduct was constructed. Because APS did not seek rights-of-entry to private lands at this phase of planning, no field survey was conducted on private lands. To fulfill its responsibilities under Section 106 and as a condition of a ROW grant, BLM would require Class III inventories of private lands to identify and assess the effects on any historic properties prior to development.

3.3.5 Known Cultural Resources

During the siting study for the Project and preparation of the CEC application, a cultural resource constraints analysis was conducted for an approximately 400-square-mile area (Rogge and Erickson 2007). Review of the AZSITE database identified 299 prior cultural resource studies, which included cultural resource surveys that covered approximately 20 percent of the siting study area. The review identified 541 previously recorded archaeological and historical sites within the large siting area. Most of the prehistoric archaeological sites are scatters of artifacts representing short-term uses or temporary camps, but also included a major ground stone quarry and a few large habitation sites, including the Casa Piedras, Eastwing, and Beardsley Canal sites. Historic sites included trash scatters and sites related to mining, transportation, ranching, and farming, including the historic Beardsley Canal. Those sites reflect settlement of the area during the late nineteenth century and the first half of the twentieth century. Only one of those resources—the Morristown Store—is listed in the National Register or Arizona Register, but a large percentage of the other resources may be eligible for listing, primarily for their potential to yield important information about the prehistory and history of the area.

A Class I inventory was prepared to update the earlier records review for an area encompassing the routes of the Proposed Action and Action Alternatives and a surrounding one-mile-wide buffer. Intensive pedestrian survey (Class III inventory) was conducted along the routes of the Proposed Action and Alternative 2 on public land managed by BLM adjacent to SR 74 and along the Proposed Action and Sub-alternative routes on State Trust land.

3.3.5.1 Proposed Action

The Class III survey of BLM and State Trust lands, in combination with prior surveys that overlap some of the private lands along the alignment, cover about 97 percent of a study corridor 400 feet wide along the Proposed Action route, leaving 64 acres on private land unsurveyed (Kirvan et al. 2012). About four percent of the prior survey coverage (68 acres)

was walked at intervals of 100 feet rather than 65 feet, which is currently considered a maximum interval for complete coverage.

A total of 23 archaeological and historical sites have been identified within the 200-foot wide Proposed Action route ROW (**Table 3.3-1**). The sites include six prehistoric sites, 15 historic sites, and two sites with both prehistoric and historic components. Five of the sites are on public land managed by BLM, 17 are on state land, and one is on privately owned land.

Final determination of National Register eligibility will be based on the results of Section 106 consultations with the SHPO, ASLD, Indian tribes, and other interested parties, but it is recommended that nine of these sites be considered eligible for the National Register. Four of the six prehistoric sites and the two prehistoric components of the multi-component sites AZ T:3:350(ASM) and AZ T:3:351(ASM) are recommended eligible for the National Register under Criterion D for their potential to yield important information about the prehistoric occupation of the region. Prior data recovery studies at the most substantial of these sites, AZ T:3:10(ASM), documented evidence of habitation (two pit houses, one cobble structure, and abundant trash) and recovered three secondary cremations. That site, which is located on a terrace of the Agua Fria River, was interpreted as a seasonal Hohokam farmstead occupied intermittently between the Colonial and early Classic periods (circa A.D. 800 to 1300) (Green 1989). Although data recovery studies were conducted at that site in the 1980s, parts of the site likely remain intact. Three other Hohokam sites along the Agua Fria River, including sites AZ T:3:11 and multicomponent sites AZ T:3:350, and 351(ASM) also might have buried habitation features or could be temporary, limited activity sites.

The Hohokam also probably intermittently occupied a rockshelter at site AZ T:3:325(ASM) in the uplands west of the river. Excavations at similar rockshelters in the vicinity indicate the Yavapai also commonly used these rockshelters long after the Hohokam era.

There are two prehistoric sites in the uplands west of the Agua Fria River. Site AZ T:3:348(ASM) is a small outcropping of fine-grained basalt that was exploited for toolstone. All the artifacts at the site, except for a single potsherd, are flaked stone knapping debris. It is estimated that the site could contain several thousand artifacts. This site is considered eligible for the National Register under Criterion D for its potential to yield information on the use of raw material sources and initial manufacturing techniques for stone artifacts. The other site is a very sparse scatter of flaked stone without features, AZ T:3:349(ASM), and is ineligible for the National Register.

Another prehistoric site, AZ T:6:42(ASM), had a rock ring, a rock pile, three scatters of flaked stone, and 13 isolated occurrences of artifacts dispersed across approximately 500 acres along the east side of the Hassayampa River. Data recovery studies were conducted at the site before the Hayden-Rhodes Aqueduct and Hassayampa Pumping Plant, components of the CAP, were constructed. All or most of the site was subsequently disturbed or destroyed, and it is no longer considered eligible for the National Register.

Three of the 15 historic resources, all previously recorded, are eligible for the National Register. The Santa Fe, Prescott & Phoenix Railway, which was completed from the Santa Fe main line at Ash Fork to Prescott in 1893 and between Prescott and Phoenix in 1895, was previously evaluated as eligible under Criterion A for its association with the history of

railroad transportation in Arizona. BNSF Railway continues to operate the line and historic materials have been replaced and the railroad has the appearance of a modern railroad.

The Beardsley Canal also was previously evaluated as eligible for the National Register under Criterion A for its association with development of irrigation systems in the Phoenix Basin. Construction of the canal began in 1892 in conjunction with the construction of the Dyer Diversion Dam on the Agua Fria River, but construction of the dam and canal stopped in 1895 due to flooding and financial difficulties. The canal was completed in 1926 and 1927 in conjunction with construction of the Frog Tanks Dam (subsequently renamed Waddell Dam). The proposed route also would span the historic Beardsley Canal (three times).

US 60/70/89 was previously evaluated as eligible for the National Register under Criterion D, for its potential to yield important information about the historic state highway system developed between 1921 and 1955. In 1913, the precursor of the highway was described as a very bad road parallel to the Santa Fe, Prescott & Phoenix Railway, but by 1922 it was categorized as an improved gravel road and was paved and designated a state highway by 1935.

The other 12 historical sites are evaluated as ineligible for the National Register. Four of those sites are dumps or scatters of domestic trash with no features other than artifact concentrations: AZ T:2:145, 146, 147(ASM), and AZ T:3:347(ASM). Another scatter of domestic trash at site AZ T:2:144(ASM) is associated with a small concrete-lined basin of undetermined function. The trash at those sites dates between the 1920s and 1960s, and the origin of the trash is unknown. The three rock features at the historic component of site AZ T:3:350(ASM) are enigmatic and the trash is limited. Further study of those sites is unlikely to yield important information and no other historic values warranting preservation have been identified. The trash scatter at the multi-component site AZ T:3:351(ASM) is older, dating from circa 1880 to 1910, and may relate to the first attempt to construct the Beardsley Canal. Because further study of the historic component (and the prehistoric component) has potential to yield important historical information, the site is evaluated as eligible for the National Register under Criterion D.

Six of the remaining historic resources are roads. No artifacts have been recorded along two of those: AZ T:3:200 and 201(ASM). A few artifacts have been recorded along segments of the four other two-track roads: AZ T:2:148(ASM), AZ T:3:344, 346, and 352(ASM). Those minor local roads probably date to the first half of the twentieth century. Further study of those roads is unlikely to yield important information and no other historic values warranting preservation have been identified.

Site AZ T:3:345(ASM) has a prospect shaft approximately 20 feet deep and a few cans. The site appears to postdate 1940. Further study of the site is unlikely to yield important information and no other historic values warranting preservation have been identified.

3.3.5.2 Alternative 1

In addition to granting a ROW for the Proposed Action route, Alternative 1 would amend the BLM Bradshaw-Harquahala RMP to designate a 0.5-mile wide multiuse utility corridor on BLM-managed public land crossed by the Proposed Action route along the north side of SR 74, as well as the entire BLM parcel crossed by the Proposed Action route south of SR

74. Twenty-one prior cultural resource surveys have covered an estimated 32 percent of the land in the proposed multiuse utility corridor on the north side of SR 74 and seven prior surveys covered approximately 28 percent of the proposed multiuse utility corridor south of SR 74 outside the 400-foot-wide study corridor surveyed along the routes of the Proposed Action and Alternative 2.

Those prior surveys discovered one historical site (**Table 3.3-1**) in addition to the five sites encountered by the Class III survey (AZ T:3:325, 345, 346, 347, and T:3:348(ASM)). Site AZ T:3:331(ASM), located on the north side of SR 74, is a scatter of 1930s to 1940s trash that might represent an ephemeral camp. The site was previously evaluated as having no historic values that would make it eligible for the National Register. In addition, the historic road designated AZ T:3:201(ASM) is crossed by the Proposed Action route south of SR 74, but continues into the proposed multiuse utility corridor on the north side of the highway.

These seven sites within the 0.5-mile wide multiuse utility corridor are in addition to the other 17 sites along the Proposed Action route, under Alternative 1.

3.3.5.3 Alternative 2

Thirty-six prior surveys in combination with the Class III survey for the Proposed Action route covered an estimated 90 percent of a study corridor 400 feet wide along the Alternative 2 route (leaving approximately 172 acres unsurveyed).

Nineteen archaeological sites and historical resources were identified along the 200-foot wide Alternative 2 route (**Table 3.3-1**). No additional sites have been recorded along the segment of the Alternative 2 route south of SR 74 that diverges from the Proposed Action route.

Like Alternative 1, Alternative 2 also would designate the entire BLM parcel crossed by Alternative 2 south of SR 74 as a multiuse utility corridor. About 28 percent of that proposed multiuse utility corridor has been surveyed for cultural resources, and none have been found.

3.3.5.4 Alternative 3

Thirty-nine prior surveys in combination with the Class III survey for the Proposed Action route covered an estimated 77 percent of a study corridor 400 feet wide along the Alternative 3 route (leaving approximately 407 acres unsurveyed). Sixteen archaeological and historical resources have been recorded within the 200-foot-wide ROW along the Alternative 3 route, including 4 prehistoric sites and 12 historic resources (**Table 3.3-1**).

The prehistoric sites include one that also is along the Proposed Action and Alternative 2 routes, AZ T:6:42(ASM). As described above, data recovery studies were conducted at that site before the Hayden-Rhodes Aqueduct and Hassayampa Pumping Plant, components of the CAP, were constructed and all or most of the site was subsequently disturbed or destroyed and it is no longer considered eligible for the National Register.

The other prehistoric sites are Hohokam farmsteads, T:3:19(ASM), T:3:20(ASM), and T:3:21(ASM), are located near the Agua Fria River. These sites are considered eligible for the National Register for their potential to yield important information. Data recovery studies

were conducted at T:3:21(ASM) in the 1980s, but it was only partially excavated and parts of the site probably remain partially intact (Green 1989).

All 12 historical resources are also along the Proposed Action route and are described above. Those resources include the National Register-eligible Santa Fe, Prescott & Phoenix Railway, Beardsley Canal, and US 60/70/89. The other nine historical resources are evaluated as ineligible for the National Register because further study is unlikely to yield important information and no other historic values warranting preservation of those resources have been identified. Those ineligible historic resources include four dumps or scatters of circa 1920s to 1960s domestic trash: AZ T:2:144, 145, 146, and 147(ASM). Five of the other ineligible historic resources are minor local roads, AZ T:2:148(ASM), AZ T:3:200, 201, 344, and 352(ASM). Sites AZ T:3:200 and 201(ASM) were previously recorded near SR 74, but maps indicate that the roads extend 2 miles to the south and cross the Alternative 3 route.

3.3.5.5 State Trust Land Route Variation Sub-alternative

A records review of the four-mile-long State Trust lands Route Variation Sub-alternative identified no prior cultural resource survey within a 400-foot-wide study corridor along that Sub-alternative, and no prior cultural resource studies within one mile of the route variation in addition to those identified by the records review for the Proposed Action and Action Alternative routes. The records review also identified no additional archaeological or historical sites recorded in the 400-foot-wide study corridor or within one mile.

The State Trust lands Route Variation Sub-alternative was defined after the Class III field survey was completed, and therefore it has not been intensively surveyed for cultural resources. It is estimated that about 86 percent of the Proposed Action route using the State Lands Route Variation Sub-alternative, rather than the originally proposed alignment (Primary Segment), has been surveyed for cultural resources, leaving about 194 acres of State Trust land and 64 acres on private land unsurveyed. One historic resource, AZ T:2:144(ASM), has been recorded along this route (**Table 3.3-1**). This site is not eligible for the National Register and was described under the Proposed Action.

3.3.5.6 Primary Segment Common to All Action Alternatives

There are four sites along the Primary Segment (AZ T:2:144, 145, 146, and 147). These are discussed under the Proposed Action and presented in **Table 3.3-1**. All are historic sites not eligible for inclusion on the National Register.

Table 3.3-1 Known Cultural Resource Sites along the Proposed Action and Action Alternative Routes, including the Sub-alternative

SITE NUMBER / NAME	SITE TYPE	NATIONAL REGISTER STATUS	PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3
AZ T:3:331(ASM)	Historic camp	Not eligible		X		
Santa Fe, Prescott & Phoenix Railway AZ N:3:32(ASM)	Historic railroad	Eligible, Criterion A	X	+	X	X
AZ T:3:10(ASM) AZ T:3:9(ASU)	Prehistoric farmstead	Eligible Criterion D, data recovery conducted in 1980s	X	+	X	
AZ T:3:11(ASM)	Prehistoric artifact scatter	Eligible, Criterion D	X	+	X	
AZ T:3:19(ASM) AZ T:3:17(ASM)	Prehistoric farmstead	Eligible, Criterion D				X
AZ T:3:20(ASM) AZ T:3:18(ASM)	Prehistoric farmstead	Eligible, Criterion D				X
AZ T:3:21(ASM) AZ T:3:6(ASM) AZ T:3:6(ASU)	Prehistoric farmstead	Eligible Criterion D, data recovery conducted in 1980s				X
Beardsley Canal AZ T:3:55(ASM)	Historic irrigation canal	Eligible, Criterion A	X	+	X	X
AZ T:3:200(ASM)	Historic road	Not eligible	X	+	X	X
AZ T:3:201(ASM)	Historic road	Not eligible	X	X	X	X
AZ T:3:325(ASM) SVM-13	Prehistoric rock shelter with artifacts	Eligible, Criterion D	X	X	X	
AZ T:2:144(ASM) SVM-1	Historic concrete basin with artifacts	Not eligible	X**	+	X**	X**
AZ T:2:145(ASM) SVM-2	Historic domestic trash	Not eligible	X*	+	X*	X*
AZ T:2:146(ASM) SVM-3	Historic domestic trash	Not eligible	X*	+	X*	X*
AZ T:2:147(ASM) SVM-4	Historic domestic trash	Not eligible	X*	+	X*	X*

SITE NUMBER / NAME	SITE TYPE	NATIONAL REGISTER STATUS	PROPOSED ACTION	ALT. 1	ALT. 2	ALT. 3
AZ T:2:148(ASM) SVM-7	Historic road with artifacts	Not eligible	X	+	X	X
AZ T:3:344(ASM) SVM-8	Historic/modern roads with artifacts	Not eligible	X	+	X	X
AZ T:3:345(ASM) SVM-9	Historic/modern prospecting	Not eligible	X	X		
AZ T:3:346(ASM) SVM-10	Historic road with artifacts	Not eligible	X	X		
AZ T:3:347(ASM) SVM-11	Historic domestic trash	Not eligible	X	X		
AZ T:3:348(ASM) SVM-12	Prehistoric toolstone procurement site	Eligible, Criterion D	X	X		
AZ T:3:349(ASM) SVM-14	Prehistoric artifact scatter	Not eligible	X	+	X	
AZ T:3:350(ASM) SVM-16	Prehistoric artifact scatter and historic rock features with artifact scatter	Eligible, Criterion D	X	+	X	
AZ T:3:351(ASM) SVM-17	Prehistoric and historic artifact scatters	Eligible, Criterion D	X	+	X	
AZ T:3:352(ASM) SVM-18	Historic road with artifacts	Not eligible	X	+	X	X
AZ T:6:42(ASM) AZ T:6:2(ASU)	Prehistoric rock features with artifacts	Data recovery completed, site likely destroyed	X	+	X	X
US 60/70/89 AZ V:2:101(ASM) AZ C:2:174(ASM) AZ I:3:10(ASM)	Component of historic state highway system	Eligible, Criterion D	X	+	X	X
Total			**23**	**7+**	**19**	**16**

*These three sites are along the Primary Segment Sub-alternative
**This site is along both the State Trust Land Route Variation Sub-alternative and the Primary Segment
+These sites are within the 0.5-mile wide multiuse utility corridor only; this alternative also includes the Proposed Action route and 17 associated sites outside the proposed 0.5-mile corridor

3.3.6 Cultural Resources Sensitive to Indirect Visual Impacts

Some types of cultural resources outside the direct construction impact zones could be sensitive to visual impacts of a new transmission line if their settings are an important aspect of their historic values. Such resources could include historic properties with special designations to promote their preservation, such as BLM-designated areas of critical environmental concern; properties listed in the National Register or Arizona Register; and interpretive sites or other properties for which there is substantial agency, tribal, or public sentiment for preservation of the property and its setting. Resources potentially sensitive to visual impacts were identified to a distance of five miles from the Proposed Action and Action Alternative routes by reviewing the AZSITE Cultural Resources Inventory, National Register listings, maps of the Project vicinity, and selected prior studies, particularly a study conducted to identify the 20 prehistoric and historic resources that best illustrate the heritage of the western Phoenix Basin (Rodgers and Dallett 2000). In addition to the Beardsley Canal and the Santa Fe, Prescott & Phoenix Railway identified in the records review for the routes of the Proposed Action and Alternatives 2 and 3, the review identified six other resources within the 5-mile visual APE (**Table 3.3-2**).

As discussed above, prior evaluations have concluded that the Santa Fe, Prescott & Phoenix Railway and the Beardsley Canal are eligible for the National Register under Criterion A. The BNSF Railway continues to operate the railroad, which has been upgraded and original materials have been replaced and the adjacent US 60/70/89, which has been upgraded and has the appearance of a modern highway, has altered the setting of the railroad within the visual APE, which crosses relatively level terrain and does not exhibit any of the topographic engineering challenges of the northern part of the line, which led the railroad to be nicknamed the Peavine.

The Maricopa Water District continues to operate the Beardsley Canal, which has been upgraded and has the appearance of a modern irrigation canal in the APE. The setting of the canal has been altered by the parallel modern CAP New Waddell Canal that transports water in and out of Lake Pleasant from the Hayden-Rhodes Aqueduct.

The Morristown Store is on the northeast side of US 60/70/89 about four miles northwest of where a common segment of the routes of the Proposed Action and Alternatives 2 and 3 would cross the highway. The store was built in the 1890s and is located along the Santa Fe, Prescott & Phoenix Railway near the railroad's junction with Castle Hot Springs Road. The building was used at times as a department store, hotel, boarding house, and post office, and was listed in the National Register in 1991 under Criterion A.

The Surly site is the remnants of a Hohokam field and irrigation canal system that used water from the western channel of New River. The site, which is about three miles southeast of the Morgan Substation, covers about 110 acres and was evaluated as eligible for the National Register for its potential to yield important information (Criterion D). Data recovery studies were conducted to mitigate the impacts of potential inundation of the site behind New River Dam, a flood control structure built by the U.S. Army Corps of Engineers. Those studies documented that the site probably was used seasonally during the Sedentary period (circa A.D. 1000 to 1150). The Hayden-Rhodes Aqueduct was subsequently built along the northern edge of the field system.

Table 3.3-2 Cultural Resources Potentially Sensitive to Visual Impacts

SITE NAME/NUMBER		DESCRIPTION	NATIONAL REGISTER ELIGIBILITY
1	Santa Fe, Prescott & Phoenix Railway AZ N:3:32 (ASM)	Historical railroad, completed between Prescott and Phoenix in 1895	Eligible, Criterion A
2	Beardsley Canal AZ T:3:55(ASM)	Main irrigation canal of Maricopa Water District completed in 1927 in conjunction with construction of Waddell Dam	Eligible, Criterion A
3	Morristown Store	1890s building used at various times as department store, hotel, boarding house, and post office	Listed 1991, Criterion A
4	Surly Site AZ T:4:13(ASM)	Small intact Hohokam irrigation system that used water from the western channel of New River	Eligible, Criterion D
5	Calderwood Butte Archaeological District	Cluster of prehistoric archaeological sites in vicinity of Calderwood Butte, including large Hohokam village sites of Casa de Piedras	Recommended eligible, Criterion D; nomination drafted in 1970s but not submitted for listing
6	Seymour III AZ T:2:27(ASM)	Circa 1879-1880 mining settlement with stamp mill that processed ore from Vulture Mine	Recommended eligible, presumably Criterion D
7	New Waddell Dam, CAP	Dam built between 1987 and 1992 to store and regulate Colorado River water imported by the Hayden-Rhodes Aqueduct	Not yet of historic age
8	Agua Fria and New River Siphons, CAP	Features of the Hayden-Rhodes Aqueduct built between 1975 and 1978 to transport flows of aqueduct beneath the Agua Fria River and New River	Not yet of historic age

Note: These sites are along or within five miles of the routes of the Proposed Action, the Action Alternatives, and the Sub-alternative.

In the 1970s, a cluster of prehistoric archaeological sites along the Agua Fria River approximately four to five miles south of the Project Area was defined as the Calderwood Butte Archaeological District. A National Register nomination was drafted for the district but never submitted for listing. The City of Peoria has designated the butte as a preserve, but housing developments have been built at the southern and eastern bases of the butte. The largest of the many sites within the district appears to be a large Hohokam village site known as Casa de Piedras. That site and others within the district have been damaged by unauthorized excavation, but many sites in the district are still likely to retain sufficient integrity that they could yield important information about the prehistoric occupation of the area and therefore are eligible for the National Register under Criterion D.

The Seymour III site is the relatively well preserved archaeological remnants of a historic mining settlement about four miles northwest of a segment of the transmission line common to the Proposed Action and Alternatives 2 and 3. Between 1879 and 1880, a stamp mill was operated at Seymour to process gold ore from the famous Vulture Mine. The site has remnants of the stamp mill foundation, two blacksmith work areas, and a large scatter of historical artifacts. The site recorder recommended that the site be considered eligible for the National Register under Criterion D for its potential to yield important information.

Three of the 20 prehistoric archaeological and historical resources that Rodgers and Dallett (2000) identified as best illustrating the cultural heritage of the western Phoenix Basin included features of the CAP: New Waddell Dam and the Agua Fria and New River siphons of the Hayden-Rhodes Aqueduct. The New Waddell Dam, constructed between 1987 and 1992, replaced the original, smaller Waddell Dam and was designed to store and regulate water imported from the Colorado River by the Hayden-Rhodes Aqueduct. The Agua Fria and New River siphons, built between 1975 and 1978, are features of the Hayden-Rhodes Aqueduct that transport water flows beneath the Agua Fria River and New River to avoid damage by flood flows. The siphons reflect one of the many challenges that had to be met during the design and construction of the CAP, which provides a water supply vital for the growing Phoenix and Tucson metropolitan areas and the agricultural economy of south-central Arizona. Those structures might very well be considered historically significant in the future, but they are not yet of historic age (50 years old or older).

3.3.7 Native American Land Use and Cultural Affiliation

The BLM is consulting with federally recognized Indian tribes that have a cultural affiliation based on traditional use, ancestral ties, and/or oral histories associated with the Study Area. These tribes include O'odham groups who currently reside at the Salt River Pima-Maricopa Indian Community, Gila River Indian Community, Ak-Chin Indian Community and Tohono O'odham Nation; Yavapai residing at the Yavapai Prescott Indian Tribe, Fort McDowell Yavapai Nation, and Yavapai-Apache Nation; and the Hopi Tribe.

O'odham people who lived in the Salt River Valley during historic times were also known as the Pima or Akimel O'odham. Pima settlements were concentrated along the Salt and Gila Rivers, but their inhabitants frequently traveled into the desert to hunt game and gather wild plant foods (Fontana 1983). The Study Area was at the northwestern edge of Pima territory, where people hunted deer and rabbits and gathered cactus fruits and other natural resources.

Groups of the Southeastern Yavapai inhabited portions of the Bradshaw Mountains and Hieroglyphic Mountains to the north of the Study Area and likely traveled into the area to hunt game and gather wild plant foods (Khera and Mariella 1983). The Yavapai were more mobile than the Pima and traveled widely to exploit a variety of food resources. They also grew crops at locations with sufficient water, such as the Castle Hot Springs area northwest of present-day Lake Pleasant. Archaeological surveys and investigations have documented Yavapai sites in areas near Lake Pleasant (Keller et al. 1998; Stokes 2011).

The "Four Southern Tribes" (O'odham and Pee Posh), which include the Ak-Chin Indian Community, Gila River Indian Community, Salt River Pima-Maricopa Indian Community, and Tohono O'odham Nation are recognized as being culturally affiliated with the prehistoric

late Archaic Transition and Hohokam cultures of the Phoenix Basin. The Hopi Tribe also claims cultural affiliation with the Archaic and Hohokam cultures because traditional stories of some Hopi clans indicate they migrated to the current Hopi villages from the south. The Pee Posh (Maricopa) are recognized as having cultural affiliation with the prehistoric Patayan culture of the lower Gila River valley.

The Yavapai are recognized as having cultural affiliation with the prehistoric Patayan culture of upland desert areas of west-central Arizona. Early Euro-American explorers, as well as ethnohistorians and ethnologists documented that the project area was at the southern margins of the territory occupied by the Yavapai during the historic period.

3.4 GEOLOGY AND MINERALS

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Geology and Minerals, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012c). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

3.4.1 Laws, Ordinances, Regulations, and Standards

Permitted activities that may affect or be affected by geologic resources and geologic hazards are governed primarily by local jurisdictions. The conservation elements and seismic safety elements of city and county general plans contain policies for protection of geologic features and avoidance of hazards, but do not specifically address transmission line construction projects. Local grading ordinances establish detailed procedures for construction. The following section provides a summary of international, federal, state, and local laws, regulations, and standards that govern permitted activities that may affect or be affected by geology and minerals in the Study Area.

International Building Code – The 2006 International Building Code (IBC) is a model building code developed by the International Code Council (ICC). The IBC sets rules specifying the minimum acceptable level of safety for constructed objects such as buildings. It has been adopted throughout most of the United States. The IBC has no legal status until it is adopted or adapted by government regulation. The IBC was developed to consolidate existing building codes into one uniform code that provides minimum standards to ensure the public safety, health, and welfare insofar as they are affected by building construction and to secure safety to life and property from all hazards incident to the occupancy of buildings, structures, or premises. The IBC replaced the Uniform Building Code (UBC) in 2000.

Federal Land Policy and Management Act of 1976, as amended – FLPMA established policies and goals to be followed in the administration of public lands by the BLM. The intent of FLPMA is to protect and administer public lands within the framework of a program of multiple-use and sustained yield, and to maintain environmental quality. Particular emphasis is placed on protection of the quality of scientific, scenic, historic, ecological, environmental, air and atmospheric, water resources, and archeological values. FLPMA dictates how BLM regulates mineral resources extraction on BLM land.

Classification and Multiple Use Act of 1964 – This act authorized the Secretary of the Interior to classify and manage BLM land for retention or disposal and for multiple use, including specification of dominant uses and preclusion of inconsistent uses in an area.

Mining and Mineral Policy Act of 1970 – This act declared that the federal government policy is to encourage private enterprise in the development of a sound and stable domestic mineral industry and in orderly and economic development of mineral resources, research, and reclamation methods.

Other relevant laws and regulations include the following:

- Mining Law of 1872 as amended, 30 USC § 22 et seq.
- Public Law 167 of 1955, 30 USC § 601 et seq.
- National Materials and Minerals Policy Research Development Act of 1980
- Materials Act of 1947, 30 USC § 601, as amended
- Mineral Leasing Act of 1920, as amended, 30 USC § 181 et seq.
- Mineral Leasing Act for Acquired Lands of 1947, as amended, 30 USC § 351 et seq.
- Section 402 of Reorganization Plan No. 3 of 1946
- 43 CFR 3400, 3500, 3600, 3715, 3802, and 3809

3.4.2 Regional and Local Geology

The Basin and Range topography of central Arizona consists of broad alluvial valleys or basins, bordered by mountainous terrain of igneous, metamorphic, and sedimentary rocks. The basins are broad and low sloping. Beneath the basin floor are permeable unconsolidated to moderately consolidated alluvium or loosely compacted alluvial sand and gravel. Alluvium fills the basins to depths of as much as 10,000 feet. The valleys are deeply filled with alluvium that has eroded from adjacent mountains during the last 10 million years. This aggradation has been driven by tectonism and climate change, although regional tectonic stability within the last five million years suggests that climate change is the more recent dominant driving force (Arizona Geological Survey [AZGS] 1987; AZGS 1988a; AZGS 1988b) (see the Environmental Resource Report for Air Quality and Climate Change for additional information, URS 2012b).

The Project is located within the northwestern margin of the Phoenix Basin. Most of the bedrock exposed within the Study Area is confined to the Saddleback Mountain area of the southeastern Hieroglyphic Mountains. It is composed of schist, metamorphosed granite, and rhyolite with some outcrops of basalt (**Figure 3.4-1**). Landforms in this area include alluvial fans, pediments, and stream terraces that lie between the Agua Fria and Hassayampa Rivers (AZGS 1987; AZGS 1988a; AZGS 1988b). Ephemeral streams originating in the Hieroglyphic Mountains flow southward into the basin and then southeast toward the Agua Fria River. Other ephemeral streams flow southwest to the Hassayampa River. Drainages located near Wittmann originate on the tread of an early Pleistocene terrace of the Hassayampa River and flow southeastward toward the Agua Fria River (AZGS 1994).

Most of the Study Area is underlain by coalesced alluvial fans. Alluvial fans in the upper piedmont are moderately dissected by drainages resulting in topographically distinct landforms. In contrast, lower piedmont fan surfaces are less dissected by streams, and different aged deposits merge into one relatively smooth basin floor. The distribution of alluvial deposits in the Study Area is similar to that found throughout the Phoenix Basin: late Tertiary and early to middle Quaternary fan deposits (Qo) are located close to the mountain front whereas late Quaternary deposits are pervasive in the lower piedmont areas (Q) (**Table 3.4-1**). The oldest piedmont deposits tend to be river terraces found along the larger rivers (e.g., Salt, Agua Fria, and Hassayampa rivers) that are older than 1 million years. Younger landforms tend to be alluvial fans derived partly from degrading older fans in the upper piedmont. Throughout the Quaternary, the piedmonts have experienced overall degradation with episodic periods of aggradation or stability (AZGS 1994).

Table 3.4-1 Study Area Geologic Unit Symbol, Description, and Age

UNIT SYMBOL	UNIT DESCRIPTION	UNIT AGE
Q	Surficial deposits	Holocene to middle Pleistocene
Qo	Older surficial deposits	Middle Pleistocene to latest Pliocene
Tsy	Sedimentary rocks	Pliocene to middle Miocene
Tb	Basaltic rocks	Late to middle Miocene
Tsm	Sedimentary rocks	Middle Miocene to Oligocene
Tv	Volcanic rocks	Middle Miocene to Oligocene
Xms	Metamorphic rocks	Early Proterozoic
Xmv	Metavolcanics	Early Proterozoic
Xg	Granitoid rocks	Early Proterozoic

Near Morristown and southward is an area where basin deposits are highly dissected by tributary streams to the Hassayampa River. These are erosional landforms where overlying Quaternary deposits have been eroded exposing older sediments. These surface sedimentary rocks (Tsy) are composed of late Tertiary sediment. Stream cuts expose moderately sorted sands, gravels, cobbles, and boulders with gently dipping beds. These deposits are commonly cemented with calcium carbonate; some calcareous horizons are greater than 5 meters thick. These sediments were deposited after the waning stages of Basin and Range faulting (AZGS 1988a; AZGS 1988b).

The Middle Tertiary volcanic sequence includes basaltic or andesitic flows basaltic rocks (Tb), rhyolite, and tuff with interbedded sedimentary rocks (Tsm) derived from the sequence. Mafic flows occur near the base of the Tertiary section throughout the region (volcanic rocks) (Tv) (AZGS 1988a; AZGS 1988b). The basaltic to andesitic flows are depositionally overlain by a sequence of yellowish tuff and altered rhyolite. These rocks are slope forming

and probably correlative with the San Domingo rhyolite of the Vulture and Wickenburg Mountains west of the Study Area.

The oldest rocks in the Study Area are Proterozoic metaigneous and metasedimentary rocks that form outcrops above the extensive basin fill largely in the southern Hieroglyphic Mountains. These are as follows:

- Schist and phyllite derived from sedimentary rocks (Xms)
- Amphibolite derived from mafic igneous rocks (Xmv)
- Variably foliated granite and granodiorite (Xg) (AZGS 1988a; AZGS 1988b)

3.4.3 Geological Hazards

Geologic hazards in the Study Area are subsidence and related earth fissures, seismic events, and mass movements.

3.4.3.1 Subsidence and Earth Fissures

Subsidence

Subsidence is the settling of the ground surface due to compaction (consolidation) of underlying unconsolidated (loosely packed) sediments. Subsidence is most common in uncompacted soil, thick unconsolidated alluvial material, and improperly constructed artificial fill. Subsidence due to groundwater withdrawal is possible, particularly in the southeast portion of the Study Area, due to substantial pumping in the Phoenix Basin. Major cones of depression have developed where groundwater levels have declined more than 300 feet between LAFB and the White Tank Mountains. Continued and/or increased groundwater withdrawal or dewatering may cause an overdraft condition (where groundwater removal exceeds recharge), resulting in subsidence. If that occurs, signs of subsidence could be observed. Groundwater levels at most of the index wells in the Study Area show slightly increasing or decreasing trends. The increase or decrease in water level over time at these wells is 15 feet or less. Many years or decades may be needed for the effects of excessive removal of groundwater to be manifested.

Subsidence and earth fissures are geological events that are accelerated by long-term extraction of groundwater, and they represent a disruption of a natural equilibrium. The water table in various areas of the state has dropped significantly. South-central Arizona is the main area of the state affected by subsidence. The geological conditions of the area are such that an over pumping of the underlying stores of water can result in the settling of the land or subsidence. Subsidence occurs gradually and spreads over wide areas. Subsidence is more likely to be a problem in areas underlain by clay-bearing layers and where the water table has decreased 100 feet or more. Subsidence also results from oil and gas withdrawal, the removal of rock during underground mining operations, and the drainage of marshlands (Gelt 1992; AZGS 2007; AZGS 2011a; AZGS 2011b). The Environmental Resource Report for Water Resources (URS 2012c) does not indicate the water table has dropped 100 feet or more in the Study Area.

A related phenomenon, earth fissures are the most visible manifestation of land subsidence. They can then grow considerably by water erosion. Gullies or trenches may be up to 50 feet deep and 10 feet wide, with the fissure extending hundreds of feet below the surface. The fissure may range in length from a few hundred feet to over 8 miles. The average length of a fissure is measured in hundreds of feet (Gelt 1992).

Fissures develop because of differential subsidence or compaction. How the land settles depends upon characteristics of the underlying basin. The bedrock may include various irregularities such as ridges, hills, or fault scarps that are completely covered by alluvial fill of sand, gravel, and clay. The compaction of the alluvial fill over such bedrock features may be uneven and result in fissuring, especially if the bedrock is less than 300 meters below the surface. Fissuring may result from other conditions as well. A variation in the type and thickness of the alluvium might explain the occurrence of fissuring. These alluvium characteristics may vary within a basin. Variations in water-level decline can also influence fissuring. Once fissuring begins in an area the process tends to continue, increasing in number and length, with fissures forming adjacent and parallel to older fissures. Fissures spread at uneven rates and in various directions, sometimes forming complex patterns of multiple fissuring extending for miles (Gelt 1992).

Areas in Arizona affected by subsidence include the northwestern Avra Valley near Red Rock; the Harquahala Plains; areas northwest and southeast of Willcox; the Bowie and San Simon areas; a location near Tonopah in the lower Hassayampa area; and the Gila Bend basin. Most fissures are found in the counties of Pinal and Maricopa. (Gelt 1992; AZGS 2011b). Those areas affected closest to the Study Area are near Tonopah and on the Harquahala Plains.

Fault Rupture

A factor considered in the seismic (earthquake) design of Project structures is the location of active faults that may cross a transmission line route or affect a substation or other structures. Central Arizona is in a low to moderate earthquake hazard setting (Arrowsmith 1997). There are two faults in the northwestern portion of the Study Area, along the Proposed Action route, but these are mid-Tertiary features which have not been active in the Quaternary (Arrowsmith 1997). These are older Basin and Range detachment faults. Polished slip planes resulting from Basin and Range detachment faulting of mid-Tertiary volcaniclastics are well exposed at Lake Pleasant northeast of the Study Area. Middle Tertiary normal faulting and tilting has widely affected rocks of the area. The Tertiary volcanic belt has been tilted and the volcanic section is cut by several low- and high-angle angle normal faults (AZGS 2002; AZGS 1998a). The closest active fault to the Study Area is the Cave Creek Fault, approximately 10 miles east of the northeastern portion of the Study Area. It is 7 miles long, exposed, and shows middle and late Quaternary activity (Arrowsmith 1997). Further to the northeast, approximately 20 miles away, the Horseshoe Fault zone is as much as 12.5 miles long and the Horseshoe Reservoir section apparently shows Holocene activity. None of the faults have slip rates > 0.2 millimeters per year (AZGS 1998a).

No earthquake in recorded history has caused deaths or injuries in Arizona. In the past century or more, 14 tremors of intensity V to VII have centered within its borders. All of these shocks; however, were moderate in intensity, with one VII, one VI-VII, four VI, and

eight V intensity events. The largest historic earthquake felt in Phoenix was the 1887 Pitaycachi event in northern Sonora. Between 1906 and 1912, three VI events occurred in the Flagstaff area that were felt in Phoenix (U.S. Geological Survey [USGS] 1970).

Ground Shaking

The intensity of the seismic shaking (strong ground motion) during an earthquake in the Study Area would depend on the distance between the area and the earthquake's epicenter (point at the earth's surface directly above the initial movement of the fault at depth), the magnitude (seismic energy released) of the earthquake, and the geologic conditions underlying and surrounding the Study Area. Earthquakes occurring on faults closest to the Study Area would most likely generate the largest ground motion.

Liquefaction

Liquefaction occurs primarily in saturated, loose, fine- to medium-grained soils in areas where the groundwater table is within approximately 50 feet of the ground surface. Shaking causes the soils to lose strength (that is, lose their ability to stick together) and behave as a liquid. Liquefaction, which can include lateral spreading, subsidence, buoyancy effects, and loss of bearing strength (the ability to support a load such as a building foundation), is caused when these sediments temporarily lose their shear strength during strong ground shaking. Susceptibility to liquefaction is a function of the sediment density, water content, depth, and peak ground acceleration. Over the entire Study Area, liquefaction would be very unlikely due to groundwater depth (ranging from 150 feet below the surface in the Hieroglyphic Mountains to 660 feet in the West Salt River Valley). Geologic material in the Study Area includes substantial clay- and silt-rich units and areas with a high percentage of coarse sedimentary particles such as gravel, cobbles, and boulders (intermediate and older alluvial fans), and some units with calcium carbonate cementation (some intermediate and older alluvial fans). These materials are more prone to liquefaction but given the groundwater depth, as previously mentioned, the risk is very low.

Mass Movements

Landslides, rockfalls, and debris flows occur continuously on all slopes; some processes act very slowly, while others occur very suddenly, with potentially disastrous results. Rockfalls and debris flows are examples of earth movements that occur rapidly, often without warning. Landslides can occur rapidly without warning but often provide signs of movement before the slide occurs. Such movements can have damaging effects. Most of the Study Area is in low to moderately sloping topography containing sandy and gravelly alluvium that is not susceptible to landslide effects. No landslides have been designated on maps reviewed for the Study Area; however, minimal rockfall hazards may exist in the southern Hieroglyphic Mountains near the northeastern terminus of the Proposed Action route and could include blocks from a few feet to over 10 feet in diameter (AZGS 2002).

3.4.4 Mineral Resources

Mineral resources are defined by the USGS as a concentration of naturally occurring minerals in or on the Earth's crust in such form and amount that economic extraction of a commodity from the concentration is currently or potentially feasible (USGS 2012). Mineral

resources that occur within and adjacent to the Study Area consist primarily of sand and gravel, decorative stone, sodium, gold, oil, gas, and geothermal. BLM administers programs that allow production of three types of minerals and energy resources on public lands. These mineral assets fit into categories of saleable, locatable, and leasable minerals and are administered under different laws and regulations. Saleable minerals include sand, gravel, and other common variety minerals. These minerals are disposed of under the Mineral Materials Act of 1955 as amended, and related acts, through competitive or negotiated sales, establishment of Community Pits for local public use, or through establishment of Free Use Permits for government entities. Locatable minerals consist of precious metals such as gold and silver, as well as metals such as copper and iron, and some industrial minerals such as gypsum and clays with special properties. These minerals are managed by BLM primarily under the Mining Law of 1872 as amended (BLM 2008a). Rights to explore for and produce these locatable minerals are established by the staking, filing, and maintenance of mining claims. There are two types of mining claims; lode and placer. Lode claims are used for mineral deposits that occur in veins having well defined boundaries as well as for deposits of valuable minerals contained within in-place rock. Placer claims are used for minerals that are contained in unconsolidated layered or bedded deposits, such as sand and gravel (BLM 2011b). Oil, gas, geothermal, sodium, and certain other substances are managed as leasable minerals under the Mineral Leasing Act of 1920, as amended. Rights to explore for, develop, and produce these minerals are obtained through the issuance of a mineral lease by BLM, either non-competitively or competitively (BLM 2008a). Active mining claims, and authorized mineral leases or permits for mineral materials establish valid existing rights for access to the claim, lease or permitted area and to explore for, develop, and mine the applicable mineral commodity.

Management decisions for land use allocations documented in the Bradshaw-Harquahala ROD and approved RMP identify areas where mineral leasing, mineral material disposal actions, and locatable mineral activities are precluded on BLM-managed lands (BLM 2010a). These areas, identified as "Mineral Restrictions" on **Figure 3.4-2**, include existing segregations, administrative withdrawals, and legislatively withdrawn areas within and adjacent to the Study Area.

Publically available literature, maps, and online sources were used to evaluate the potential for the occurrence of mineral resources in the Study Area. Potential sand and gravel deposits occur along the north-south flowing Agua Fria and Hassayampa River drainages on the east and west margins of the Study Area, respectively. In addition a small north-south trending drainage approximately 3 miles east of Morristown in the north central portion of the Study Area has potential for the occurrence of sand and gravel deposits. This deposit also likely underlies all Action Alternative routes in a narrow north-south band in that area (BLM 2008a). A search of the BLM Land and Mineral Legacy Rehost 2000 System (LR2000) records shows no active sand and gravel or other saleable mineral sites on BLM-managed lands or mineral estate in the Study Area (BLM 2012a). The LR2000 records show one closed negotiated sale site for rhyolite decorative stone in Township 6 North, Range 2 West, Section 31, where 1,233 tons of rhyolite were removed from 640 acres (BLM 2012b). The records also show one closed Community Pit for sand and gravel, known as the Padelford Pit, covering 1,050 acres and located in Township 6 North, Range 1 West, Section 30 and

Township 6 North, Range 2 West, Section 25 (BLM 2012a). No active sand and gravel or other mineral material sites are known to exist on other land ownerships within the proposed ROWs for any of the Action Alternative routes.

The potential for locatable mineral deposits is moderate over a large portion of about the eastern third of the Study Area as well as in the northwest corner of the Study Area, but the remainder of the Study Area has low potential for locatable minerals (BLM 2008a). All or portions of seven metallic mining districts are located within the Study Area (**Figure 3.4-3**). Only one metallic mineral district occurs within the proposed ROWs for the Action Alternative routes and it is located in Township 6 North, Range 1 West, Sections 30 and 31. LR2000 records show there are 88 active lode and 26 active placer mining claims within the Study Area (BLM 2012c). Portions or all of three active lode mining claims located in Township 6 North, Range 2 West, Section 25, occur within the Proposed Action route ROW. In addition, portions or all 12 active lode mining claims located in Township 6 North, Range 1 West, Sections 30 and 31, and in Township 6 North, Range 2 West, Section 25 occur within the Alternative 1 ROW. However, records show that no Notices or Plans of Operations to conduct exploration operations are currently approved or pending action by BLM for these claims. Exploration activity is planned or occurring on some claims in the northwestern portion of the Study Area as two Notice Level operation permits (for less than five acres of disturbance) have been approved by the HFO in Township 6 North, Range 4 West, Section 22 and one Plan of Operations (for more than five acres of disturbance) in Township 6 North, Range 5 West, Section 25 is pending review by the HFO (BLM 2012d). The USGS Mineral Resource Data System (USGS 2011) indicates that there are 20 metallic mine sites and 10 non-metallic mine sites within the Study Area. However, no mining of metallic deposits have been identified within or adjacent to the proposed ROWs and for general reference, none closer than 1000 feet. There are also three mining districts just outside the Study Area: the Agua Fria Mining District southeast of Lake Pleasant, the Pikes Peak (Morgan City) District in the Hieroglyphic Mountains, and the San Domingo District southeast of Wickenburg (ABM 1961). With regard to leasable mineral potential, the Phoenix Basin in general has low to moderate geothermal, oil and gas, and sodium potential. While the Study Area is considered to have low potential for all of these leasable mineral resources, areas of moderate potential have been identified just south, southwest, and west of the Study Area. The northern boundary of an area of geothermal potential is located starting approximately three miles south of the Study Area and just east of the White Tank Mountains Regional Park. Starting approximately six miles south of the southern Study Area boundary, the northern boundaries of overlapping areas of potential for sodium and oil and gas occur, which also overlap with the area for geothermal potential. Approximately seven miles to the southwest of the Study Area, there are overlapping areas of potential for sodium and geothermal resources and approximately two miles to the west, an area of potential for geothermal resources occurs (BLM 2008a). The Luke-Litchfield area near Sun City has been identified as a potential geothermal resource (AZGS 1979).

3.5 HAZARDOUS MATERIALS AND HAZARDOUS AND SOLID WASTE

The information provided in the following subsections is taken from a report titled: *Environmental Resource Report for Hazardous Materials and Hazardous and Solid Waste, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012d). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

The Study Area for the hazardous materials (hazmat) survey includes the lands within and adjacent to the Proposed Action route, the ACC-certificated route, and the other Action Alternatives. The Study Area is described in detail in the Project Area Conditions section. The hazmat survey was performed to evaluate potential hazardous materials impacts from utilization of properties included in the Study Area. The purpose of the survey was to: (1) perform a screening-level assessment of the Study Area, (2) identify potential environmental concerns associated with individual properties within and adjacent to the Study Area, and (3) identify those properties requiring more detailed investigation. In addition, reviews were made of ADEQ, U.S. Department of Transportation (DOT), and EPA online databases for an approximate five-mile area surrounding the Study Area, as shown on **Figure 3.5-1**.

The hazmat survey included a limited visual reconnaissance of the Study Area to identify areas or properties of potential environmental concern with respect to hazardous materials and to aid in assessing sites identified from a review of regulatory agency databases. This utilized a four-wheel drive vehicle to traverse existing roads within the Study Area. Private properties were not accessed during the visual reconnaissance.

The hazmat survey was not intended to be a definitive investigation of possible contamination within the Study Area. The purpose and scope of the investigation was to determine if there is reason to suspect the possibility of contamination within the Study Area. The hazmat survey is not a Phase I Environmental Site Assessment, a regulatory compliance audit, or an evaluation of the efficiency of the use of any hazardous materials within the Study Area. No exploratory borings, soil or groundwater sampling, or laboratory analyses were performed within the Study Area and, therefore, the conclusions set forth herein are made without the benefit of such investigation. Given that the hazmat survey scope of services was limited, it is possible that currently unrecognized contamination may exist within the Study Area.

Certain chemicals and materials that would be used during the construction and operation of the Project are characterized as hazardous materials. In addition, transmission line construction and operation activities would generate certain hazardous and nonhazardous solid waste streams. This section discusses the following:

- Federal, state, and local laws, ordinances, regulations, and standards that would govern the management of hazardous materials and hazardous and nonhazardous waste generated from the Project;

- Existing conditions in the Study Area relevant to hazardous materials and hazardous and nonhazardous waste; and,
- Locations for disposal of hazardous materials and hazardous and solid waste.

3.5.1 Laws, Ordinances, Regulations, and Standards

Hazardous waste is defined by the Resource Conservation and Recovery Act (RCRA) and includes lists of specific wastes, as well as waste that exhibits a specific characteristic (e.g., it is ignitable, corrosive, reactive, or toxic in accordance with RCRA-specific definitions). Hazardous wastes and substances are defined herein as wastes or substances from production or operation activities that pose a substantial present or potential hazard to human health and the environment if improperly treated, stored, or disposed. The EPA uses the term "hazardous substance" for chemicals that, if released into the environment above a certain amount, must be reported. Depending on the threat to the environment, federal involvement in handling the incident can be authorized under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA). The ADEQ implements RCRA as it has been granted primacy by the EPA for the program. Relevant laws and regulations that apply to this Project include the following.

- NEPA of 1969, as amended
- CERCLA of 1980, as amended
- RCRA of 1986
- BLM Hazardous Materials Program and Policy

3.5.2 Study Area Conditions

Several small areas of illegal dumping (primarily furniture and other house-hold items) and wind-blown trash were observed in the vicinity of the Proposed Action route. No chemical containers, potential asbestos-containing materials, or other regulated materials were observed in the area. In addition, no staining or unusual odors were noted in the dumped material. Therefore, illegal dumping was not considered a significant environmental concern for the Study Area.

No commercial or residential development was observed within the Alternative 1 or 2 areas.

The Cow Town Paintball facility was observed on Old Carefree Highway on or adjacent to Alternative 3. Structures and areas of debris, including 55-gallon drums, were observed on this property. The Raceway Substation was observed on or adjacent to Alternative 3. Canyon Motocross race track and recreational vehicle park and a small air park were observed southeast of Alternative 3.

Areas of residential development exist on the private land to the south of the Cloud Road alignment, but there has been no development of the state land north of the Cloud Road alignment or west of 211th Avenue. Investigation of aerial photographs indicates the presence of a livestock corral along North English Wells Road northwest of the intersection of 211th Avenue and Cloud Road. Livestock corral operations can involve use of pesticides and fuels, but it is uncertain if these materials were used at the corral. It is unlikely that the sub-alternative would affect this corral area.

The online database search resulted in a reported Underground Storage Tank (UST)/ LUST site along 211th Avenue between the Cloud Road and Joy Ranch Road alignments (**Figure 3.5-1**). This is attributed to the ADEQ Facility ID #0-000584 and LUST ID#4109.01. It is a LUST reported in 1995 and the case was closed in 1996 with soils reportedly meeting Tier 1 cleanup levels. Groundwater was reportedly not affected. It is unlikely that this site would be affected by the sub-alternative.

As indicated for the description of the Proposed Action, other than several small areas of illegal solid waste dumping and wind-blown trash in the vicinity of the Proposed Action route, no chemical containers, potential asbestos-containing materials, or other regulated materials were observed in the area of the Primary Segment.

3.5.2.1 Hazardous Materials Sites

The locations of the sites summarized below are indicated on **Figure 3.5-1**. Although no hazardous materials sites were identified within the Study Area, the following was identified adjacent to the Study Area:

- According to ADEQ, a remediation area is located adjacent to the Proposed Action route and ACC-certificated route within Township 6 North, Range 2 West, Section 26. This site is located within land owned by the ASLD and was specifically located along the north side of SR 74 at approximately milepost 11. According to Mr. Bruce Campbell (ASLD), sixteen 5-gallon and five 1- and 2-gallon containers of used oil were removed from this area in August 2003. At that time, one 55-gallon drum of oil-impacted soil was also removed. The removal activities were conducted under the direction of ASLD and the site is considered closed. No evidence of this site was observed during the site reconnaissance. Based on this information, this site does not represent a significant environmental concern to the Study Area.

In addition, the following ADEQ-permitted facilities were identified within or adjacent to the Proposed Action route or the other Action Alternative routes:

- A firearms range located at 10402 West Carefree Highway, Township 5 North, Range 1 East, Section 5, on or adjacent to Alternative 3. This area was observed to be the Cow Town Paintball facility during the visual reconnaissance. Because this site is located on private land, it was observed from the site boundary. Areas of debris, including 55-gallon drums, were observed on this facility.
- The Vistancia subdivision located within Township 5 North, Range 1 West, Section 3, on or adjacent to Alternative 3. This area was not accessible during the

site reconnaissance; however, based on a review of the Maricopa County Assessor's online aerial photographs, this area appears to be vacant land.

- Natural gas pipelines cross the eastern portion of the Study Area in the vicinity of the Morgan Substation and in the mid-section of the Study Area at the intersection of the Proposed Action route and US 60. These pipelines are owned and/or operated by Transwestern Pipeline Company, El Paso Natural Gas Company, and Southwest Gas Company. Although no information reviewed indicates that these pipelines represent a significant environmental concern to the Study Area, their exact locations should be verified before any construction activities are conducted.

In addition to the Study Area, the ADEQ and EPA online databases were examined for an approximate 5-mile area surrounding the Study Area. Facilities identified within this broader area included the following:

- Registered USTs were identified within the following areas: Township 4 North, Range 4 West, Section 25; Township 5 North, Range 2 West, Sections 8 and 33; Township 5 North, Range 3 West, Section 13; Section 5 North, Range 4 West, Section 35; Township 6 North Range 1 East, Section 17; Township 6 North, Range 2 West, Section 31; Township 6 North, Range 3 West, Sections 29 and 33; and Township 6 North, Range 4 West, Section 13. Although registered USTs were not identified in Township 5 North, Range 2 West, Section 19, an active truck stop/gasoline station was identified in this area. LUST site incidents were identified at several of these locations. However, based on reviewed information, none of the UST/LUST sites are located within or immediately adjacent to the Study Area. Therefore, these USTs and LUSTs do not represent a significant environmental concern to the Study Area.

- Hazardous materials incidents and/or remediation projects were identified within the following areas: Township 5 North, Range 2 East, Section 7; Township 5 North, Range 1 West, Section 10; and Township 5 North, Range 5 West, Section 13. Based on limited information reviewed, these incidents and/or remediation projects do not represent a significant environmental concern to the Study Area.

- A closed solid waste landfill was identified within Township 6 North, Range 3 West, Section 19. Based on reviewed information, this closed landfill is located approximately 0.5-mile from the boundaries of the Study Area. Therefore, this landfill likely does not represent a significant environmental concern to the Study Area.

- Permitted facilities and/or projects identified included wastewater treatment plants, water reclamation facilities, wastewater reuse projects, subdivisions, schools, parks, residences, vacant lots, medical facilities, recreational vehicle and trailer parks, resorts, golf courses, a race and test track, construction projects, sand and gravel pits, a quarry, a rock crushing facility, a bank stabilization project, waste transfer and tire collection stations, siphons, and dams.

LAFB Auxiliary Field #1 (a.k.a. Wittmann Field) is located within the Study Area and the 5-mile records review area within Township 4 North, Range 2 West, Section 7, and Township 4 North, Range 3 West, Sections 1, 2 and 12. In addition, the accident potential zone extends from this area to the northwest and terminates within the Proposed Action route in Township 5 North, Range 4 West, Sections 13 and 14. According to the U.S. Air Force LAFB fact sheet, Auxiliary Field #1 is no longer used for landings, but is currently used for instrument approach procedures. LAFB Auxiliary Field #4 (a.k.a. Wickenburg Field) is located within the 5-mile records review area within Township 5 North, Range 4 West, Sections 25 and 26. No structures were observed in this area during the visual reconnaissance and this air field is listed as closed.

3.5.2.2 Hazardous Waste Disposal Sites

Wastes generated during the construction and operation of the Project would be accumulated and contained on-site, in accordance with applicable state and federal requirements. The types of wastes that would be generated are disclosed in detail in **Section 4.5**, **Chapter 4**. Under suitable manifest, such materials would be taken off-site by a licensed shipper to an existing, permitted treatment, storage, or disposal facility. Construction solid wastes are currently handled at the: City of Phoenix 7th Avenue Landfill and Transfer Station, Phoenix, AZ; Butterfield Station Landfill, Mobile, AZ; White Tanks Transfer Station, Buckeye, AZ; and Belmont Waste Disposal site, Buckeye, AZ. Hazardous wastes are currently managed at the Clean Harbors Arizona site in Phoenix. Sufficient capacity is present at these local, commercial waste management facilities so that the additional waste materials generated by the Project could be accommodated.

The Butterfield Station Landfill is a very large facility that historically accepts much of the industry-generated, nonhazardous wastes for the Phoenix metropolitan area. Clean Harbors Arizona operates a large hazardous waste treatment and disposal facility in west Phoenix that could accept the hazardous waste generated at the Project.

Transportation of wastes from the Project Area would use existing roadway routes that are suitable for waste transport.

3.6 LAND USE AND RANGE RESOURCES

3.6.1 Land Use and Range Resources

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Land Use, Recreation, and Special Designations, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012a). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

This section provides information on land use and range resources as they relate to the Project. The Study Area boundary for this analysis includes a 2-mile area surrounding the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes (**Figure 3.6-1**).

Although direct effects related to construction would likely occur within 500 feet of the routes, a broader area (out to two miles from the routes) was chosen to be consistent with what was considered in the CEC application. The following subsections discuss relevant laws and regulations, jurisdictional boundaries, and land use within the Study Area and surrounding vicinity.

3.6.2 Laws, Ordinances, Regulations and Standards

The Action Alternatives would traverse federal, state, and local agency jurisdictions that have adopted land use plans and regulations which guide the type and intensity of land use (**Figures 3.6-1** and **3.6-2**, **Table 3.6-1**). To determine whether the Proposed Action route and other Action Alternative routes are consistent with these government plans and policies, a thorough review of all applicable policies was conducted. The following discussion summarizes the relevant land use regulations, plans, and policies that would apply to land use and range resources. Because of the nature of these regulations, plans and policies, this discussion also covers those that would apply to recreation and special designations, which is addressed in **Section 3.9**.

3.6.2.1 Federal

FLPMA of 1976, as amended - FLPMA and the regulations contained in 43 CFR Part 1600 govern the BLM planning process. Land Use Plans ensure that public lands are managed in accordance with the intent of Congress as stated in FLPMA, under the principles of multiple use and sustained yield. "Multiple use" is a concept that directs management of public lands and their resource values in a way that best meets the present and future needs of Americans, defined as a combination of balanced and diverse resource uses that takes into account the long-term needs of future generations for renewable and nonrenewable resources (FLMPA, 1976 as amended). As required by FLPMA, public lands must be managed in a manner that protects the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values and that will provide for outdoor recreation and human occupancy and use by encouraging collaboration and public participation throughout the planning process.

Taylor Grazing Act of 1934, as amended and supplemented - The Taylor Grazing Act provided parameters for livestock grazing in the form of grazing allotments, regulation of number and type of livestock (i.e., cattle, sheep, and horses), and season of use. Grazing permits are required for livestock use on public lands. Section 3 of the Taylor Grazing Act concerns grazing permits issued on public lands within grazing districts established under the Act. It gave leasing preference to landowners and homesteaders in or adjacent to the grazing district lands. Permits are generally in place for 10 years and outline terms and conditions for annual grazing utilization (BLM 2010b).

FAA Regulations - FAA regulations address potential aircraft obstruction for structures taller than 200 feet or within 20,000 feet of an airport. Specifically, Federal Regulation Title 14, Part 77, established standards and notification requirements for objects that have the potential to affect navigable airspace. In 1993, Part 77.13(a)(5)(ii) was revised to include only those airports under construction and excluded proposed airports (FAA 1993).

Nonetheless, the Part 77 standards are intended to (1) evaluate the effect of the construction or alteration of structures on airport operating procedures; (2) determine if there is a potential hazard to air navigation; and (3) identify measures to enhance safety. Specifically, the FAA requires notification through the filing of FAA Form 7460, Notice of Proposed Construction or Alteration, if a structure is over 200 feet in height or closer than 20,000 feet to an existing airport or airport under construction (Title 23 14, Part 77.13).

The Wild Free-Roaming Horses and Burros Act of 1971 (Public Law 92-195) - This Act requires the protection, management, and control of wild free-roaming horses and burros on public lands. The policy states that wild free-roaming horses and burros shall be protected from capture, branding, harassment, or death; and to accomplish this they are to be considered in the area where presently found, as an integral part of the natural system of the public lands.

3.6.3 Land Ownership, Planning, and Management

Existing land ownership within and adjacent to the Study Area is characterized by a mix of public and private land holdings (**Figure 3.6-2**). Public lands within the Study Area include lands administered by the Department of Defense (LAFB), BLM, and the USBR; State Trust lands administered by the ASLD; land owned and administered by Maricopa County; and lands that are privately held. BLM administers large areas of land to the west of Lake Pleasant Regional Park, north of SR 74, and a small area south of SR 74. The BLM also administers several small and isolated parcels along the CAP canal, the Agua Fria River, and in the northwest portion of the Study Area along the Hassayampa River. The USBR primarily manages the lands along the CAP canal and within or adjacent to Lake Pleasant Regional Park.

Table 3.6-1 presents the number of surface acres for each of these management categories out to two miles from the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes. Agencies with federal jurisdiction include the BLM, USBR, and the Department of Defense. State jurisdiction includes the ASLD. Maricopa County manages parks, open spaces, and vacant lands within the Study Area. Privately owned land includes residential, commercial, and industrial areas.

Table 3.6-1 Surface Management and Ownership within the Study Area

SURFACE MANAGEMENT	TOTAL ACRES	PERCENTAGE OF TOTAL (%)
Federal	17,510	14
State	54,163	43
Private	53,765	43
County	485	<0.1
Total	125,923	100

3.6.3.1 Federal Plans

BLM Bradshaw-Harquahala Resource Management Plan

The BLM HFO manages approximately 1 million acres of land within Maricopa and Yavapai counties. This includes land north of Interstate 10, and an additional 725,000 acres of subsurface mineral estate, including the Agua Fria National Monument. Public lands within the HFO jurisdiction are located near developed and expanding communities and are heavily used. The lands are managed for multiple uses including recreation, mining, wildlife habitat, livestock grazing, and wilderness. The field office also manages five wilderness areas, one river segment suitable for Wild and Scenic River designation, and one Area of Critical Environmental Concern (ACEC) (see **Section 3.9**).

The HFO also manages public lands within the Bradshaw-Harquahala Planning Area as presented in the Bradshaw-Harquahala RMP. The Bradshaw-Harquahala planning area is bound on the southeast by the Phoenix metropolitan area. Moving north, the RMP's boundary follows Interstate 17 to Cordes Junction, then turns northwest toward Prescott and extends west to encompass portions of the Harcuvar and Harquahala mountain ranges (BLM 2010a). The southern boundary follows Interstate 10 between the Harquahala Valley and Phoenix. Major communities within the RMP's planning boundaries include Peoria, Anthem, New River, Black Canyon City, Prescott, Wickenburg, and Buckeye.

The Bradshaw-Harquahala Planning Area includes remote, undeveloped areas, as well as wildland-urban interface zones. It encompasses mountain ranges and deserts of the Basin and Range physiographic province in the Sonoran Desert, as well as transitional and chaparral zones at higher elevations (BLM 2010a). The area features diverse land uses including mining, livestock grazing, recreation, major transportation routes, utility corridors, communication sites and wilderness areas (BLM 2010a).

The following Bradshaw-Harquahala RMP utility and transportation corridor management decisions would apply to the Study Area and are summarized from the RMP below.

- LR-2 - Utility corridors are designated to meet future expected demands for energy, natural gas, water, and transmission facilities. These corridors are shown on Map 9, Utility & Transportation Corridors and Communication Sites, of the Bradshaw-Harquahala RMP. These designations conform to the utility regulations of the ACC and are consistent with the Approved Resource Management Plan Amendments and Record of Decision for Designation of Energy Corridors on Bureau of Land Management-Administered Lands in the 11 Western States (BLM 2009a). Facilities significant enough to be the basis for corridor designation are natural gas and other pipelines at least 10 inches in diameter, electric transmission facilities accommodating 115 kV lines or greater voltage, and significant canals delivering water to urban areas.
- LR-15 - All major utilities should be routed through designated corridors and new ROWs within designated corridors will be encouraged to promote the maximum use of existing routes. Joint use will be encouraged whenever possible.

- LR-16 - Co-locate smaller utility lines needed for local service near corridors or within a corridor unless doing so would limit the opportunity to co-locate other major utility lines in the corridor.
- LR-18 - Whenever possible, design or route utility transmission lines to minimize adverse visual impacts to the surrounding lands and vistas.

Central Arizona Project

The CAP, owned and constructed by the USBR, is a 336-mile long system of aqueducts, tunnels, pumping plants, and pipelines that carry water across Arizona from Lake Havasu to southwest of Tucson. Designed to bring 1.5 million acre-feet of Colorado River water per year to Pima, Pinal, and Maricopa Counties, the CAP is the largest single renewable water resource in the state. While the CAP is federally owned and occupies USBR lands within the Study Area, it is managed by the CAWCD.

3.6.3.2 State Plans

Arizona Corporation Commission

The ACC has jurisdiction over the construction, maintenance, and operation of public utilities in the State of Arizona. The ACC has issued a CEC as part of its evaluation of the Project.

Arizona State Land Department

The ASLD manages 9.28 million surface acres and 9 million subsurface acres of State Trust lands in Arizona. State Trust lands are diverse in character, ranging from Sonoran Desert lands, desert grasslands, and riparian areas in the southern half of the state, to the mountains, forests, and Colorado Plateau regions of northern Arizona. The majority of the State Trust lands are located in rural areas of the state with more than one million acres located within or adjacent to urbanized areas (ASLD 2011a). State Trust lands constitute approximately 13 percent of land ownership in Arizona. Parcels of State Trust land are dispersed throughout the Study Area, totaling 54,163 acres.

ROWs are granted across State Trust lands for a variety of uses, such as access roads, infrastructure, power lines, communication lines, and public roadways. ROWs are granted for periods of one year to perpetuity. The period of time approved for a ROW grant is determined by analyzing the proposed use, local jurisdictional permit approvals, and its compatibility with the existing and/or anticipated use of adjacent State Trust land. The ASLD will review the application to evaluate the necessity for the ROW and the suitability of the proposed use and alignment. If considered acceptable, the application is processed. The ASLD would then complete a field inspection of the proposed alignment and a determination of a ROW grant would then be made.

Central Arizona Water Conservation District

In 1971, the CAWCD was created to not only provide a means for Arizona to repay the federal government for the reimbursable costs of construction, but to also assume the responsibility for the care, operation, maintenance, and management of the system.

The CAWCD Land Department is responsible for managing all land associated with the CAP for the benefit of CAWCD and its water customers. Water delivery is CAWCD's primary mission; therefore all proposed uses of CAP land (utility crossings, roadways, communication sites, etc.) are evaluated to determine the overall effect on the CAP.

3.6.3.3 Local Plans

Maricopa County Comprehensive Plan

Maricopa County has comprehensive planning and zoning authority for over 3,000 square miles of land. The Comprehensive General Plan establishes goals and policies for the management of county resources. The goals and policies of the Land Use Element of Maricopa County's Comprehensive Plan is to promote efficient land development that is compatible with adjacent land uses, is well integrated with the transportation system, and is sensitive to the natural environment (Maricopa County 2002). The following policies would be applicable to the Proposed Action route, and all other Action Alternative routes.

- Policy L11.3 - Encourage protection of ridgelines, foothills, significant mountainous areas, wildlife habitat, native vegetation, and riparian areas.

Maricopa County Regional Trail Plan

The Maricopa County Regional Trail System Plan represents a comprehensive system of non-motorized trail corridors under the jurisdiction and control of many different agencies. The plan recognizes the importance of the Sun Circle Trail, establishes the Maricopa Trail, and identifies future trail corridors throughout the county (Maricopa County 2004). The plan creates a mandate which allows Maricopa County to meet four specific objectives outlined in the land use element of the Comprehensive Plan. These objectives include:

- Objective L7 - Ensure provision of adequate public facilities and promote an inter connected open space system.
- Objective L9 - Integrate transportation planning with land use.
- Objective L10 - Promote the balance of conservation and development.
- Objective L11 - Promote an interconnected open space system.

City of Surprise General Plan

The Surprise Planning Area is 309 square miles while the City's current incorporated land boundaries are approximately 93.76 square miles (City of Surprise 2008a). Land use designations in the planning area include residential, commercial, business/industrial, mixed use, activity centers, master planned communities, parks and open space, and public use categories. The majority of the land use in the planning area is low-density residential, suburban residential, and rural residential. The ASLD administers substantial holdings throughout the planning area within the city limits. Surprise land use patterns are implemented through more detailed village and city-specific plans, land use codes, and other regulatory measures. The following policies would be applicable to portions of the Proposed Action and Action Alternative routes that cross the Surprise Planning Area:

- Preserve the balance of land uses when making land use changes.

- Coordinate with private utility companies and other public services to plan infrastructure, facilities, and services in undeveloped parts of the Planning Area.
- Coordinate with other jurisdictions when utility corridors cross jurisdictional boundaries.
- Encourage utility providers to fully utilize existing corridors before planning alignments for new corridors.
- Planning and alignment selection for new corridors should be done in full cooperation between utility companies, local jurisdictions, and area stakeholders.
- Require various utility providers to share existing corridors before developing new corridors.

City of Peoria General Plan

The City of Peoria's General Plan (City of Peoria 2010) covers approximately 234 square miles of public, private, and State Trust lands. The Land Use Element of the Peoria General Plan describes how the City anticipates addressing future population and employment growth while promoting a development pattern that promotes a pedestrian-friendly environment; and integrates natural and manmade features in a manner consistent with the vision for the City of Peoria. The following policies would be applicable to portions of the Study Area that occur with the City of Peoria's jurisdiction:

- Policy 3.B.4: Promote the use of existing utility and major transportation corridors for new overhead utility siting to minimize visual and environmental impacts.

City of Peoria Parks, Recreation, Open Space, and Trails Master Plan (PROST)

The PROST provides a framework to identify, acquire, and enhance a system of open space areas, recreation facilities, and trails within the Peoria Planning Area. The system is intended to provide an appropriate level of open space and parks acreage. Connectivity and linkages necessary to serve existing and future residents of the City through the rivers and trails corridors, canals, utility corridors, and pathways provide both passive and active recreation areas allowing the use of alternative transportation modes that enhance social interaction (City of Peoria 2006). This plan also recognizes the value of regional destinations which create linkages with neighboring jurisdictions to support a seamless system of open spaces and recreation facilities.

Town of Buckeye General Plan

The Buckeye Planning Area encompasses approximately 600 square miles of land and is a mosaic of public, private, and federal land ownership as well as parcels of State Trust lands managed by ASLD. Land use designations in the Planning Area include residential, mixed use, commercial, industrial, agriculture, military, and open space. A majority of the land in the Planning Area is designated as low- to medium-density residential. The following policies would be applicable to portions of the Proposed Action and alternative routes in the Buckeye Planning Area (Town of Buckeye 2008):

- Encourage compatible, sustainable, and environmentally sensitive land uses.

- Discourage incompatible land uses or intensity of developments not in keeping with surrounding land uses.
- Provide proper planning of utility corridors in order to mitigate environmental impacts on sensitive landscapes and natural resources.
- Promote unique and specific land uses that can take advantage of the distinctive physical characteristics.

3.6.3.4 Future Planned Land Use

Future and planned land uses in the Study Area include residential, mixed use, commercial development, and parks and open space (**Figure 3.6-2**). These future uses are defined under the general plans for the area (Maricopa County 2002; City of Peoria 2010; City of Surprise 2008a; Town of Buckeye 2008).

Planned residential developments in the Town of Buckeye, unincorporated Maricopa County, and the cities of Surprise and Peoria that are located within two miles of the Proposed Action route, ACC-certificated route, and all other Action Alternative routes are listed in **Table 3.6-2**.

Table 3.6-2 Planned Residential Developments within the Study Area

TOWN OF BUCKEYE	CITY OF SURPRISE
Douglas Ranch	Grand Vista
Festival by Lyle Anderson	Marisol Ranch
Sun Valley Villages I and II	
Spurlock Ranch	
UNINCORPORATED MARICOPA COUNTY	**CITY OF PEORIA**
Coyote Trails	Saddleback Heights
Asante West	Quintero
Broadstone Ranch	Vistancia
Warrick Properties	Estates at Lakeside
Roesner Ranch	Lake Pleasant Heights
Lake Pleasant	
Grande Oasis	
Peak View Estates Unit 2 and 3	
Trail of Light	
Walden Ranch	
Rancho Maria	
Rancho Cabrillo	

Source: Maricopa County 2012

Utilities

A 230kV transmission line is approved, but not yet constructed and will be situated east-west between the future Sun Valley Substation and the future Trilby Wash Substation, parallel to the existing east-west running 500kV transmission lines generally to the south of the Study Area.

Open Space

Future open space areas have been identified in the northeast and southwest portions of the Study Area. The area west of the Hassayampa River is designated as open space. There are also open space areas identified south of the ACC-certificated route in the northeast portion of the Study Area. These areas are designated as open space within future residential developments.

3.6.4 Existing Land Use

Existing land uses include residential, mixed use, commercial and industrial development; vacant/undeveloped; recreational (parks and open space), and range (**Figure 3.6-3**).

3.6.4.1 Residential

Low- to medium-density residential nodes are the primary developed land use within and adjacent to the Study Area. These occur in dispersed areas within master-planned communities in the planning boundaries of the cities of Surprise and Peoria and the Town of Buckeye. These communities are located in the central, south, and southeastern portions of the Study Area. Master-planned suburban residential developments are located in the southeastern, southwestern, and western portions of the Study Area. Master-planned golf course communities are located within the Town of Buckeye and in the eastern portion of the Study Area in the City of Peoria.

Within unincorporated Maricopa County, there are several well-established communities including Circle City, Wittmann, and Morristown, which are primarily composed of low- to medium-density residential areas. Dispersed rural or large-lot (lots equal to or greater than 1 acre) residential developments are located throughout the Study Area in unincorporated Maricopa County. Some of the rural residential homes are considered ranches and include associated agricultural structures (e.g., barns) and/or private airstrips.

3.6.4.2 Commercial

Very little commercial development occurs within the Study Area. The commercial development that does exist is located primarily along US 60 and along Lake Pleasant Road between Dixileta Drive and Cloud Road. Many of the developed recreation facilities, such as golf courses, OHV tracks, and paintball facilities, also include a commercial component.

3.6.4.3 Recreation

Recreation uses within and adjacent to the Study Area include golf courses (Copper Canyon and Quintero Golf clubs), OHV areas (located south of the Raceway Substation and the Boulders Staging Area west of Lake Pleasant), and paintball facilities. Further discussion related to recreation is provided in **Section 3.9**.

3.6.4.4 Industrial

Industrial uses within and adjacent to the Study Area include automotive proving grounds, a regional landfill, mining operations, and manufacturing facilities. Two operational automotive proving grounds managed by Chrysler and Volvo Arizona are located in the north-central portion of the Study Area. The Northwest Regional Landfill, approximately 1,200 acres in size, is located south of the Study Area, just southeast of LAFB Auxiliary Field No. 1. Stone, sand, and gravel mining operations generally occur along the Hassayampa River near the Sun Valley Substation.

3.6.4.5 Utilities

Major transmission lines are located in the Study Area. A Western Area Power Administration (WAPA) 500kV transmission line originates from the northwest and extends east along the southern portion of the Study Area to the Westwing Substation. Two 500kV transmission lines operated by Salt River Project originate to the south of the Study Area and then extend east, parallel to the WAPA, to the Westwing Substation. Two 500kV transmission lines originate to the north of the Study Area and cross the eastern portion, extending south and passing the Morgan and Raceway Substations before terminating at the Westwing Substation.

In addition, one 230kV transmission line originates at the Humbug substation near Lake Pleasant and continues south, passing the Morgan and Raceway Substations before terminating at the Westwing Substation. Two 69kV transmission lines are present within the Study Area, primarily in developed and rural-residential areas along portions of US 60 and parallel to the Sun Valley Parkway.

There are 12 existing or future substations in the vicinity of the Study Area and the following seven substations are located within two miles of the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes.

- Raceway Substation near SR 74 and 99th Avenue (Existing)
- Humbug Substation near SR 74 and 99th Avenue (Existing)
- Morgan Substation west of New River Road along Cloud Road (Existing)
- Lakeside Substation north of Cloud Road along New River Road (Existing)
- Oberlin Substation near Patton Road and 243rd Avenue (Temporary)
- Morristown Substation near 251st Avenue and US 60 (Existing)
- Sun Valley Substation northwest of Sun Valley Parkway

Communication sites are scattered throughout the region. Four of the sites are located in the White Tank Mountains. Underground pipelines and other utility lines (e.g., power, telephone, cable, fiber-optic) also occur in the Study Area, primarily in developed areas (BLM 2010a). One cellular tower is located within two miles of the Proposed Action route, ACC-certificated route, and the Action Alternative routes, south of Lake Pleasant.

The CAP canal is a multi-purpose water resource development and management project that delivers Colorado River water from Lake Havasu on Arizona's western border to agricultural land in Maricopa, Pinal, and Pima counties, and to several Arizona communities, including the metropolitan areas of Phoenix and Tucson. The CAP canal is a 336-mile system of aqueducts, tunnels, pumping plants, and pipelines and is operated and maintained by the CAWCD. In addition to the water supply, the project also provides power, flood control, outdoor recreation, and fish and wildlife habitat benefits. Approximately 15 miles of the CAP canal are located within two miles of the Proposed Action route, ACC-certificated route, and the Action Alternative routes.

Near the northern portion of the Study Area, along SR 74, the ADOT, along with local municipalities, currently have many leases for roads and highways. The Quintero Golf and Country Club also lease easements for utilities servicing their facilities (BLM 2000).

3.6.4.6 Mining

Approximately 51 existing sites that have been mined in the past and all or portions of seven mining districts are scattered throughout the Study Area with most being concentrated in the northwest and eastern portions. Sand and gravel and other saleable minerals are located in the eastern, western, and southwestern portions of the Study Area. However, there are currently no active saleable mineral operations on BLM-managed lands (BLM 2012a). Metallic and other locatable minerals occur in the northwest and eastern portion of the Study Area (URS 2012c). There are 88 active lode mining claims and 26 active placer mining claims distributed between those areas (BLM 2012c). Portions or all of some mining claims located in Township 6 North, Range 1 West, Sections 30 and 31, as well as in Township 6 North, Range 2 West, Sections 25 and 26 may underlie parts of the Proposed Action and Action Alternative routes. There are currently two approved BLM Notice level permits for exploration operations on mining claims in Township 6 North, Range 4 West, Section 22 and one Plan of Operations pending approval in Township 6 North, Range 5 West, Section 25 (BLM 2012d).

3.6.4.7 Rights-of-Way

The USBR has multiple ROWs for transmission lines and access roads for the CAP. There are also numerous pipelines and telecommunication lines in the Study Area. Existing ROWs on BLM-managed land that occur within the Study Area are listed in **Table 3.6-3**. The ROWs consist of various transmission, distribution, and communication lines; roads, and easements.

Table 3.6-3 ROWs Crossed by the Proposed Action and Action Alternatives

ROW SERIAL #	ROW HOLDER	DESCRIPTION
AZA 000390	ADOT	Road
AZA 000624	ADOT	Road
AZA 006105	ADOT	Road
AZA 010224	City of Peoria	Road
AZA 023254FD	Seven West Prop.	Patent
AZA 027843	Larry W. White	Section 302 FLPMA
AZA 033383	Accipiter Communications	Fiber Optic Facilities
AZA 03338301	Accipiter Communications	Fiber Optic Facilities
AZA 035079	APS	Other Energy Facilities
AZA 013875	BLM Lake Havasu Field Office	Other Energy Facilities
AZA 017813	BLM Lake Havasu Field Office	Road
AZA 021410FD	Arizona White Tank Association	Patent
AZA 022075	BLM Lake Havasu Field Office	Water Facility
AZA 030349	West Maricopa Combine, Inc.	Water Facility
AZA 033224	Town of Buckeye	Road
AZA 033449	Town of Buckeye	Recreation
AZA 033510	APS	Other Energy Facilities
AZA 033551	Southwest Gas Corp.	Oil and Gas Facilities
AZA 033552	Accipiter Communications	Fiber Optic Facilities
AZA 033554	Lyle Anderson Dev. Co.	Other Energy Facilities
AZA 033569	APS	Other Energy Facilities
AZA 035079	APS	Other Energy Facilities

Source: BLM 2012e

3.6.4.8 Air Transportation Facilities

Air transportation facilities include a Department of Defense airport (LAFB Auxiliary Field No. 1 in the south-central portion of the Study Area), a public airport (Pleasant Valley Airport), and four private airstrips (refer to **Figure 3-12-1**). LAFB Auxiliary Field No. 1 is located 15 miles southeast of the main base in the City of Surprise. Auxiliary Field No. 1 consists of 400 acres of federally owned land and approximately 705 acres leased from the State of Arizona. A portion of Auxiliary Field No. 1 is located within the ACC-certificated route at 267th Avenue and Lone Mountain Road. LAFB has defined APZs associated with Auxiliary Field No. 1, where above-ground facilities or land uses are limited due to potential impacts on or interference with flight operations (Department of Defense 2007).

3.6.4.9 Zoning

Maricopa County

There is one zoning district within the Study Area for Maricopa County. It is classified as Residential, One Acre Per Dwelling Unit (du) (Ru-43).

City of Peoria

There are multiple zoning classifications within the Study Area for the City of Peoria. All residential zoning districts in the Study Area are classified as Suburban Ranch (SR-43). There is a small portion of the Study Area classified as Intermediate Commercial (C2). Multiple special districts occur throughout the Study Area, including:

- General Agriculture (AG)
- Planned Community Development (PCD)
- Special Use (SU)
- Flood Plain (FP)
- Planned Unit Development Option (PUD)

City of Surprise

There are two zoning classifications within the Study Area for the City of Surprise. The area north of Dove Valley Road is zoned as a Planned Area Development (PAD). A very small portion of the city limits north of Beardsley Road west of 243rd Avenue is located in the Study Area and is zoned R1-43 Residential.

Town of Buckeye

The portion of the town limits that lies within the Study Area is categorized as Planned Community.

3.6.5 Range Resources

Historic grazing practices in northwest Arizona, including within the Study Area, are similar to those employed in the northwest and southwest U.S. prior to the mid-twentieth century. Enactment of the Taylor Grazing Act of 1934 provided parameters for livestock grazing in the form of grazing allotments, regulation of number and type of livestock (i.e., cattle, sheep,

and horses), and season of use. BLM uses monitoring studies and rangeland health assessments to determine if proper grazing management will meet public land health standards as outlined in the *Arizona Standards for Rangeland Health and Guidelines for Grazing Administration (*BLM 1997*).*

Grazing permits are required for livestock use on public lands. Permits are generally authorized for 10 years and outline terms and conditions for annual grazing utilization. Grazing allocations in terms of animal unit months (the amount of forage needed to sustain one cow, five sheep, or five goats for a month), season of use, and number and type of livestock are among the mandatory terms and conditions put forth in each permit. Other terms and conditions include methods to meet management objectives. Annual adjustments to a grazing system are possible if the livestock operator (permittee) has met the terms and conditions of his/her permit.

Livestock grazing is permitted on approximately 39,802 acres of BLM land and 85,308 acres of State Trust land within the Study Area (**Table 3.6-4**, **Figure 3.6-4**). Grazing allotments are classified according to the type of forage available for livestock. Two classifications are used: perennial and ephemeral. Perennial forage is available consistently each year through perennially producing grasses, forbs, and shrubs. Ephemeral forage consists of annual grasses and forbs that become productive only in response to adequate spring moisture and warm temperatures. On ephemeral allotments, grazing is authorized only when ephemeral forage is abundant. All grazing allotments within the Study Area are designated as ephemeral. Cattle, horse, and sheep grazing operations occur within the Study Area.

Table 3.6-4 BLM and State Trust Land Grazing Allotments within the Study Area

ALLOTMENT NAME	ALLOTMENT ACRES WITHIN STUDY AREA	PERCENTAGE OF ALLOTMENT LOCATED WITHIN STUDY AREA
BLM Land		
Douglas	12,929	18
Lower Bo Nine	13,188	65
Bo Nine	12,485	60
West Wing Mountain	688	18
Ridgeway-Kong	42	100
Lockett	106	47
Desert Hills	365	7
Total on BLM Land	**39,803**	
State Trust Land		
Douglas	11,836	23
Lockett	1,383	5
Desert Hills	3,248	7
Maughan	1,423	58
Durbano 5-1227	19,270	71
Durbano 5-95000	5,047	55
McGuire	13,929	60
Sheep Springs	3,774	46
Widow Snell	5,857	26
Unknown 5-308	3,554	48
Unknown	14,428	9
Total on State Land	**83,749**	

Sources: BLM 2012f; ASLD 2012c.

3.7 PUBLIC HEALTH AND SAFETY

This and the following subsections provide information on noise, electromagnetic fields, and fire and fuels management as the topics relate to public health and safety associated with the Project. The Study Area boundaries for this assessment include lands within and in proximity to the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes. However, a specific Study Area associated with each resource is defined in the sections that follow.

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Public Health and Safety, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012e). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

3.7.1 Noise

This subsection presents an assessment of the existing outdoor ambient sound environment in the vicinity of the Study Area. With respect to noise assessment, the Study Area of interest includes an area out to two miles from the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes.

In general, this Project Study Area encompasses the northern portion of Maricopa County, Arizona, immediately northwest of and adjacent to the Phoenix metropolitan area that includes communities such as the City of Peoria, Sun City, Sun City West, and the Town of El Mirage. Bisected by US 60 that parallels the northwest-southeast aligned Burlington Northern Santa Fe Railway (BNSF) rail line, the Study Area could reasonably be characterized as a mixture of sparsely developed and undeveloped land, with a few densely developed communities such as Festival Ranch, Patton Place Estates, Arizona Traditions, Corte Bella, Rancho Cabrillo, Vistancia, Wittmann, and Circle City. The Study Area is approximately bounded to the north by SR 74 and to the south by Loop 303.

The ambient sound environment of this Study Area would generally be expected to vary with proximity to the major aforementioned surface transportation routes and developed areas with greater than average population density. This subsection describes the anticipated dominant and/or likely noise sources of (i.e., contributors to) the ambient sound environment, an estimate of the probable range of sound levels expected in this environment, and a comparison with recent (i.e., within three years of this report) measurements of outdoor sound at occupied locations in Maricopa County that are external to the Study Area, but might nevertheless be considered reasonably comparable.

3.7.1.1 Laws, Ordinances, Regulations, and Standards

Federal

There are no federal LORS that directly affect this Project with respect to noise. However, there are guidelines at the federal level that direct the consideration of a broad range of noise issues as listed below:

- National Environmental Policy Act (42 USC 4321, et seq.) (Public Law-91-190) (40 CFR § 1506.5)
- Noise Control Act (NCA) of 1972 (42 USC 4910)
- U.S. Department of Housing and Urban Development Noise Guidelines 24 CFR § 51 subpart B

Environmental Protection Agency

The EPA has published a guideline that specifically addresses issues of community noise (EPA 1974). This guideline, commonly referred to as the "levels document," contains goals for noise levels affecting residential land use of day-night average sound level (L_{dn}) <55 A-weighted decibel (dBA) for exterior levels and L_{dn} <45 dBA for interior levels.

Occupational Safety and Health Administration

Worksite noise levels are regulated by the Occupational Safety and Health Act of 1970 (29 CFR § 1910.95). The noise exposure level of workers is limited to 90 dBA, over a time-weighted average eight-hour work shift ($TWA_{8\text{-hour}}$) to protect hearing. If there are workers exposed to a $TWA_{8\text{-hour}}$ above 85 dBA (i.e., the OSHA Action Level), then the regulations call for a worker hearing protection program that includes baseline and periodic hearing testing, availability of hearing protection devices, and training in hearing damage prevention.

Department of Housing and Urban Development (HUD)

The U.S. Department of Housing and Urban Development Noise Guidebook Chapter 2 (24 CFR Section 51.101(a)(8)) also recommends that exterior areas of frequent human use follow the EPA guideline of 55 dBA L_{dn}. However, the same Section 51.101(a)(8) indicates that a noise level of up to 65 dBA L_{dn} could be considered acceptable.

State

Arizona Corporation Commission

For power plant projects, the ACC states in its Rules of Practice and Procedure R14-3-219:

> *"Describe the anticipated noise emission levels and any interference with communication signals which will emanate from the proposed facilities."*

Exhibit I, as part of an ACC CEC application, is where such anticipated noise emission levels and potential interference with communication signals are discussed.

Arizona Division of Safety and Health

The Arizona Occupational Safety and Health Act of 1972 provides safety and health protection for employees in Arizona. The act requires each employer to furnish his or her employees with a place of employment free from recognized hazards that might cause serious injury or death. The Act further requires that employers and employees comply with all workplace safety and health standards, rules, and regulations promulgated by the Industrial Commission. The Arizona Division of Occupational Safety and Health, a division of the Industrial Commission of Arizona, administers and enforces the requirements of the act. With respect to noise exposure to workers, the Arizona OSHA regulations closely mirror

the federal OSHA regulations described above and, for practical implementation, are herein considered to be equivalent.

Local

Under Environment and Environmental Effects within its 2020 Comprehensive Plan Elements, Maricopa County broadly considers noise as a potential adverse effect and the consequence of increasing development and its accompanying sound sources (Maricopa County 2002). At the same time, it acknowledges that the NCA of 1972 has no enforcement means, and describes reliance on proper community planning, and other agencies such as the Federal Aviation Administration that can influence noise controls and land use development that is compatible with nearby aviation facilities (e.g., LAFB and Williams Gateway Airport).

While there is a Maricopa County Noise Ordinance "P-23," its Public Disturbances context is qualitative, based on audibility of a noise heard from within a closed residential structure that is within 500 feet of the boundary of the offending noise-producing property (Maricopa County 2006). Further, it appears that construction and "power plant equipment" during normal operations is exempt from this disturbance criterion.

3.7.1.2 Fundamentals of Acoustics

Noise is generally defined as loud, unpleasant, unexpected, or undesired sound that is typically associated with human activity and that interferes with or disrupts normal activities. Although prolonged exposure to high noise levels has been demonstrated to cause hearing loss, the principal human response to environmental noise is annoyance. The response of individuals to similar noise events is diverse and influenced by the type of noise; the perceived importance of the noise, and its appropriateness in the setting; the time of day and the type of activity during which the noise occurs; and the sensitivity of the individual.

Noise may also affect wildlife, as potentially demonstrated by apparent disruption of resting, foraging, migrating, and other life-cycle activities; however, sensitivity to noise varies with species. Further, wildlife observed in proximity to human activities and land uses have likely developed habituation (to a degree that allows their life-cycle activities to continue without significant effect) to continuous, intermittent, and even impulsive man-made sounds.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and are sensed by the human ear. Sound is generally characterized by several variables, including frequency and intensity. Frequency describes the pitch of the sound and is measured in Hertz (Hz), while intensity describes the sound's loudness and is measured in decibels (dB). dB are measured using a logarithmic scale. A sound level of zero dB is approximately the threshold of human hearing and is barely audible under extremely quiet listening conditions. Normal speech has a sound level of approximately 60 dB. Sound levels in the range of approximately 110 to 120 dB can be felt inside the human ear as discomfort, while levels between 130 to 140 dB are felt as pain (Berglund and Lindvall 1995). The minimum change in the sound level of individual events that an average human ear can detect is about one to two dB. A three to five dB change is readily perceived. A change in sound level of about 10 dB is usually perceived by the average person as a doubling (or if decreasing by 10 dB, halving) of the sound's loudness.

Due to the logarithmic nature of the decibel unit, sound levels cannot be added or subtracted directly and are somewhat cumbersome to handle mathematically; however, some simple rules are useful in dealing with sound levels. For instance, if a sound's energy is doubled, the sound level increases by three dB, regardless of the initial sound level. By way of example, if a sound intensity of 60 dB is doubled, the new intensity will be 63 dB; likewise, if a sound intensity level of 80 dB is doubled, the new intensity will be 83 dB.

Sound level is usually expressed by reference to a known standard. This section refers to sound pressure level (SPL, or L_p) and sound power level (PWL, or L_q). In expressing sound pressure on a logarithmic scale, the sound pressure is compared to a reference value of 20 micropascals (µPa). SPL depends not only on the power of the source, but also on the distance from the source and on the acoustical characteristics of the space surrounding the source. PWL, on the other hand, is independent of these environmental factors. To help distinguish the two descriptors, one may use a lighting analogy: the wattage of a light bulb when turned on will be a constant 100 watts, but the brightness or intensity of the light changes with receiver distance and other parameters (e.g., are the room walls painted white, which is reflective, or an absorptive black color).

Sound from a tuning fork contains a single frequency (a pure tone), but most sounds one hears in the environment do not consist of a single frequency and instead are composed of a broad band of frequencies differing in sound level. The method commonly used to quantify environmental sounds consists of evaluating all frequencies of a sound according to a weighting system that reflects the typical frequency-dependent sensitivity of average healthy human hearing. This is called "A-weighting," and the decibel level measured is referred to as dBA. In practice, the level of a noise source is conveniently measured using a sound level meter that includes a filter corresponding to the dBA "curve" of decibel adjustment per octave band center frequency (OBCF) to a "flat" or unweighted SPL.

Although sound level value may adequately indicate the level of environmental noise at any instant in time, community noise levels vary continuously. Most environmental noise includes a mixture of noise from distant sources that creates a relatively steady background noise in which no particular source is identifiable. A single descriptor, the L_{eq}, may be used to describe sound that is changing in level. L_{eq} is the energy-mean dBA during a measured time interval. It is the "equivalent" constant sound level that would have to be produced by a given source to equal the acoustic energy contained in the fluctuating sound level measured. In addition to the energy-average level, it is often desirable to know the acoustic range of the noise source being measured. This is accomplished through the maximum L_{eq} (L_{max}) and minimum L_{eq} (L_{min}) indicators that represent the root-mean-square maximum and minimum noise levels measured during the monitoring interval. The L_{min} value obtained for a particular monitoring location is often called the acoustic floor for that location.

To describe time-varying character of environmental noise, the statistical noise descriptors L_{10}, L_{50}, and L_{90} are commonly used. They are the noise levels exceeded 10 percent, 50 percent, and 90 percent of the measured time interval. Sound levels associated with the L_{10} typically describe transient or short-term events. Half of the sounds during the measurement interval are softer than L_{50} and half are louder, so it is often called the

"median" sound level. Levels associated with L_{90} often describe background noise conditions and/or continuous, steady-state sound sources.

Day-night sound level (L_{dn}) is defined as the L_{eq} (in dBA) for a 24-hour day with a 10 dB penalty added to nighttime sound levels (10:00 p.m. to 7:00 a.m.) in order to compensate for increased sensitivity to noise during usually quieter nighttime hours. The CNEL is also defined as the L_{eq} for a 24-hour day. It is calculated by adding a 5 dB penalty to sound levels in the evening (7:00 p.m. to 10:00 p.m.) and a 10 dB penalty to sound levels at night (10:00 p.m. to 7:00 a.m.), thus providing somewhat greater compensation than L_{dn} for increased sensitivity during such time periods when a quiet environment is expected.

Sound levels of typical noise sources and environments are provided in **Table 3.7-1** to provide the reader a frame of reference.

Table 3.7-1 Sound Pressure Levels of Typical Noise Sources and Noise Environments

COMMON OUTDOOR ACTIVITIES	NOISE LEVEL (dBA)	COMMON INDOOR ACTIVITIES
Jet Fly-over at 1000 ft (300 meters [m])	110-100	Rock Band
Gas Lawn Mower at 3 ft (1 m)	100-90	
Diesel Truck at 50 ft (15 m), at 50 mph (80 km/hr)	90-80	Food Blender at 3 ft (1 m)
Commercial Area, Gas Lawn Mower at 100 ft (30 m)	70	Vacuum Cleaner at 10 ft (3 m)
Heavy Traffic at 300 ft (90 m)	60	Normal Speech at 3 ft (1 m)
Quiet Urban Daytime	50-40	Large Business Office
Quiet Urban/Suburban Nighttime	40-30	Theater, Large Conference Room (Background)
Quiet Rural Nighttime	30-20	Library, Bedroom at Night, Concert Hall (Background)
	20-10	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	0	

Source: California Department of Transportation 2009

3.7.1.3 Existing Noise Sources in the Study Area

Man-made sources of noise primarily include roadway and rail traffic, aviation, commercial and industrial operations (including agricultural activity and equipment), human activities (e.g., children at play, off-road vehicle operation, property landscaping or maintenance, irrigation, etc.) as well as operating heating, ventilation, and air conditioning (HVAC) equipment at residences or agricultural land uses where such activities occur. The flows of water in canals, along with operating pumps and other equipment, can also be a significant source of continuous noise.

Table 3.7-2 illustrates the proximity of residential communities within the Study Area to the Action Alternative routes and the existing likely sources of dominant noise that currently contribute to the ambient sound setting.

Table 3.7-2 Proximity of Project Alternatives and Anticipated Dominant Existing Ambient Noise Sources to Identified Residential Communities in Study Area

Identified Nearby Residential Community (direction from and approximate closest distance to Proposed Action and Action Alternatives ROW Centerline, in miles)						Anticipated Existing Dominant Noise Source (direction from and approx. distance to Identified Nearby Residential Community
PROPOSED ACTION	**ALT. 1**	**ALT. 2**	**ALT. 3**	**PRIMARY SEGMENT FOR SUB-ALTERNATIVE**	**SUB-ALTERNATIVE**	
Sun City Festival (east, 0.5 mile)				Sun City Festival (southwest, 11 miles)		Sun Valley Parkway (south, 0.5 mile)
Residences on West Myers St. near N. 235th Ave. (east, < 0.25 mile)				Residences on West Myers St. near N. 235th Ave. (south, 2.5 miles)		BNSF rail, US 60 (both northeast, 2 miles)
Circle City (west, 0.5 mile)					Circle City (west-northwest, 0.5 mile)	BNSF rail, US 60 (both east, < 0.25 mile)
Thunder Ridge Airpark (west, 0.5 mile)					Thunder Ridge Airpark (north-northwest, 0.5 mile)	BNSF rail, US 60 (both southwest, < 0.25 mile)
Residences on West Maddock Road (south, 0.5 mile)				Residences on West Maddock Road (east, 10 miles)		SR 74 (north, 1.5 miles)
Quintero Golf & Country Club (north, <1 mile)		Quintero Golf & Country Club (north, 1 mile)	Quintero Golf & Country Club (north, 3 miles)	Quintero Golf & Country Club (east-northeast, 5 miles)		SR 74 (south, < 1 mile)

Identified Nearby Residential Community (direction from and approximate closest distance to Proposed Action and Action Alternatives ROW Centerline, in miles)						Anticipated Existing Dominant Noise Source (direction from and approx. distance to Identified Nearby Residential Community
PROPOSED ACTION	**ALT. 1**	**ALT. 2**	**ALT. 3**	**PRIMARY SEGMENT FOR SUB-ALTERNATIVE**	**SUB-ALTERNATIVE**	
Lake Pleasant camping sites and facilities (north, 1.5 miles)			Lake Pleasant camping sites and facilities (north, 3.5 miles)	Lake Pleasant camping sites and facilities (east, 14 miles)		SR 74 (south, 1.5 miles)
Residences on West Dove Valley Road between N. 171st and 163rd Ave. (south, 3 miles)			Residences on West Dove Valley Road between N. 171st and 163rd Ave. (south, 1 mile)	Residences on West Dove Valley Road between N. 171st and 163rd Ave. (southwest, 6 miles)		SR 74 (north, 3 miles) Evaporative ponds north of AZ Canal * (south, 1.5 miles)

*View of online aerial photos suggests there are aerator pumps in these ponds, which if true and were running would cause a fairly continuous source of noise emission.

Natural sounds would be expected to include seasonal or year-round contribution from present wildlife species, with examples such as birdsong and insect activity (e.g., cricket or beetle chirps). Livestock and domesticated animals (e.g., horses, dogs, etc.), while associated with human activity, might also be considered part of the natural sound environment. Wind passing through ground vegetation also produces audible sound contribution, which can even dominate a background sound environment when sustained average wind speeds are of sufficient magnitude.

3.7.1.4 Baseline/Ambient Noise Level

The U.S. DOT, Federal Transit Administration (FTA) provides guidance for coarsely estimating ambient outdoor sound level based on either proximity to roadways or rail, or population density (U.S. DOT FTA 2006). Using the former, and based on the distances between the road and/or rail sources and the identified nearby residential communities as indicated in **Table 3.7-2**, ambient sound level in terms of L_{dn} could be expected to range from 45 to 60 dBA.

Based on a county-wide population density of approximately 334 persons per square mile, the estimated daytime and nighttime average sound levels would be 45 and 35 dBA L_{eq}, respectively, and per FTA guidance. Given the sensitivity penalty applied to nighttime hours,

the effective L_{dn} would be approximately 45 dBA per the same FTA guidance and consistent with the lower end of the range derived from the road/rail proximity estimation method.

This 45 to 60 dBA L_{dn} estimated outdoor ambient sound level range is also generally consistent with measured environmental noise levels at other Maricopa County locations sharing similar characteristics such as distance to major and minor roadways, desert landscape, and the proximity of sparsely distributed occupied residences and human activities. For example, in the vicinity of Rainbow Valley, southwest of the Phoenix metropolitan area and bounded by the Buckeye Hills to the west and the North Maricopa Mountains to the south, 24-hour duration measurements conducted in August 2009 at three representative locations resulted in day-night levels ranging from 45 to 50 L_{dn}, as reported in the Sonoran Solar Energy Project Final EIS (BLM 2011c). In another example, 24-hour ambient outdoor sound level monitoring results at two representative locations in the vicinity of a primarily rural/agricultural area 75 miles west of Phoenix and 1.5 to 3.5 miles south of Interstate 10 (I-10) were 54 and 60 dBA L_{dn}, respectively, as reported in the Starwood Solar I CEC (Starwood Solar I LLC 2009). These sample levels are summarized in **Table 3.7-3**.

Table 3.7-3 Sample Long-term Measurements from Previous Ambient Sound Surveys

PROJECT	"LONG-TERM" AMBIENT SOUND MEASUREMENT LOCATION	DAY-NIGHT NOISE LEVEL (L_{DN})
Sonoran Solar Energy Project	Hayes Road	49.7
	Baseline Road	49.8
	Sonoran Desert National Monument	45.4
Starwood Solar I	491st Ave. and Willetta St.	53
	49025 W. Pierson	60

Sources: BLM 2011a, Starwood Solar I LLC 2009

3.7.2 Electromagnetic Fields

The following subsections comprise an assessment of human Electro Magnetic Field (EMF) issues associated with the Project. The Study Area for this assessment includes the lands within and adjacent to the Proposed Action route, the ACC-certificated route, and the other Action Alternative routes.

The purpose of the EMF assessment was to (1) review and summarize current and best available information regarding EMF; (2) describe the typical electric and magnetic field levels associated with common appliances, devices, transmission lines, and substations; and (3) identify those properties requiring more detailed investigation.

The EMF assessment included a review of literature relating to EMF, power transmission lines and substations, and human health risks associated with EMF; and a review of documentation, maps, and satellite images of the Study Area.

Following a discussion of the pertinent state, national, and international standards pertaining to EMF, potential human risks from exposure to EMFs are presented in the context of the Project.

3.7.2.1 Laws, Ordinances, Regulations, and Standards

State and National

Several organizations have developed guidelines for EMF exposure, including individual states, the Federal Communications Commission (FCC), the Institute of Electrical and Electronics Engineers (IEEE), and the American Conference of Governmental Industrial Hygienists (ACGIH).

Neither the Arizona government nor the United States government has regulations limiting EMF exposure from power transmission lines.

At the national level, the IEEE standard C95.6 outlines public and occupational exposure limits for magnetic fields. The IEEE standard is outlined in **Table 3.7-4** below (IEEE 2002), with the areas for 60 Hz EMF highlighted in red text. Because electric power within the United States is provided at 60 Hz, the EMF limits at 60 Hz are of most importance. (Note that harmonics of 60 Hz, such as 120 Hz, 180 Hz, may also have elevated EMF levels. However, the highest EMF levels are expected at 60 Hz). Note that the IEEE levels are recommendations only, not regulations.

Table 3.7-4 IEEE Magnetic Field Exposure Levels for the General Public

BODY PART	FREQUENCY RANGE (HZ)	B FIELD (MG)
Head & Torso	20 – 759	9.04×10^3
	759 – 3,000	$6.87 \times 10^6/f$
Arms or Legs	< 10.7	3.53×10^6
	10.7 – 3,000	$3.79 \times 10^7/f$
	60	632,000

Notes: /f = divide by the frequency, mG = milliGauss, Hz = hertz

The FCC standards are mandatory for occupational exposure to EMFs for FCC-licensees and grantees and only cover the frequency range from 300 kilohertz (kHz) to 100 gigahertz (GHz) (FCC 1999).

The ACGIH provides that occupational exposures should not exceed 10 Gauss (G) (10,000 mG), which corresponds to 1 milliTesla (mT). ACGIH additionally recommends that workers with pacemakers should not exceed 1,000 mG (0.1 mT). The ACGIH 10,000 mG guideline level is intended to prevent effects, such as induced currents in cells or nerve

stimulation. However, the ACGIH guidelines are for occupational exposure, not general public exposure (Patterson et al. 1998).

International

Internationally, many countries have developed their own EMF guidelines. Most of these regulations are based on the International Commission on Non-Ionizing Radiation Protection (ICNIRP) recommendations, including the European Union (EU).

The ICNIRP has made a series of recommendations for limiting EMF exposure to humans based on the epidemiological data available from verifiable research studies (ICNIRP 1998). Based on ICNIRP's work, the EU has adopted these same standards for EMF exposure (European Council Recommendation 1999). These standards are summarized in **Table 3.7-5**. While the guidelines are voluntary, the levels are designed to prevent undue health risks associated with EMF exposure. The United States does not have any regulations on EMF exposure. Also note that the magnetic fields associated with transmission lines are less than the ACGIH and ICNIRP limits.

Table 3.7-5 Summary of ICNIRP EMF Exposure Limits

FREQUENCY	ELECTRIC FIELD STRENGTH (V/m)	MAGNETIC FIELD (µT)
Occupational: 0.025 to 0.82 kHz	500 /f	25 /f
Occupational: 60 Hz	8,333	416
Public: 0.025 to 0.82 kHz	250 /f	5 /f
Public: 60 Hz	4,167	200 µ00 7 2,000 mG

V/m = volts per meter; µT = microtesla

3.7.2.2 Overview of Electromagnetic Fields

EMF Basics

Electromagnetic (EM) radiation is a term given to a wide range of invisible waves, including X-rays, ultraviolet light, visible light, radio waves, and microwaves. EM radiation is classified based on either the wavelength, measured in meters, or the frequency (how fast the wave is moving), measured in Hertz (also known as cycles per second).

While a familiar form of EM radiation is visible light, visible light is only one part of the entire EM spectrum. Humans also use other forms within the spectrum (e.g., radio waves for communication, infrared [IR] waves for night-vision goggles, and microwaves for cooking food).

For power transmission lines and substations, frequencies are around 60 Hz, primarily because the alternating current (AC) is generated at 60 Hz. These extremely low frequencies

(ELF) are the specific region that this assessment focuses on. ELF spans from 3 Hz to 3,000 Hz (or 3 kHz).

The distinguishing characteristic of EM radiation is that all EM radiation has two components: an electric field and a magnetic field. These components can be thought of as two separate but related waves, which propagate at 90 degrees to each other.

The Link between Electricity and Magnetism

Electricity and magnetism are inherently linked through EM radiation. Electricity is the motion of electrons. Whenever an electron moves, a magnetic field will also be produced. When electrons move through a wire, the electrons generate both electric and magnetic waves. The opposite is also true: electric fields can be generated by magnets. The electromagnet—making a magnet out of a battery, a nail, and some wire—is an example of this principle.

The electric and magnetic fields are generated at right angles to one another. The electric field and magnetic field generated are inclusively classified as EMFs. Extrapolating this concept out to the flow of electrons through a wire, as the electrons flow, carrying the electricity through the wire, a wave of EMFs are generated in all directions that are perpendicular to the flow of electrons. This results in EMFs arranged concentrically around the wire and emanating outward. The EMF waves emanate out in all directions from the wire, dissipating as the EMF waves move farther away from the wire. The wire itself does not move, although the electrons within the wire do move. As a result, the EMFs associated with the electric current extend the entire length of the wire. The EMF field strength is highest closest to the wire and drops off as a function of the inverse of the square of the distance. Thus, the EMF field strength at two feet away from the wire is one-quarter of the strength at 1 foot away from the wire.

Note that this is a simplified case for one wire in space. When multiple wires, or other EMF generating sources, are involved, the EMFs generated from each source can interact with each other. The interactions can be either additive, creating larger EMFs, or subtractive, cancelling each other out all or part of the way.

Since electricity and magnetism are inherently related, the stronger the electrical current, the stronger the magnetic field. The larger the amount of current, the larger the magnitude of EMFs generated. EMF strength is also proportional to proximity: the closer to the source of the EMFs, the stronger the EMF field. The relationship between the strength of the EMF and the distance from the source is a function of the inverse of the square of the distance.

Measuring EMFs

EMFs can be measured in a variety of ways. For a given electric field of strength **E**, the electric field exerts a force on an electric charge. This force is expressed in Volts per meter (V/m). Likewise, magnetic fields can exert a force on a moving electric charge. The magnetic field can be described in two ways: as a magnetic flux density, **B** (expressed in units of Tesla or Gauss), or as a magnetic field strength, **H** (expressed in units of Amps per meter [A/m]).

TESLA (T)	GAUSS (G)
1	1×10^4

In most EMF studies, the magnetic flux density, **B**, is measured using a special type of detector, called a Gauss meter. The Gauss meter works on the same principles just described, only backwards: the magnetic field induces an electric current in the detector, which is directly proportional to the strength of the field. The strength of the EMF can thus be calculated. Measurements on the Gauss meter are reported in Gauss or Tesla. For conversion purposes, one T is equal to 1×10^4 G. Typically, magnetic fields in the literature are reported in either mG or microTesla (μT), where 1 G = 1×10^3 mG and 1 T = 1×10^6 μT.

Within this context, many different instruments are available for measuring the magnetic field of an EMF. These detectors usually have been calibrated for a specific set of frequencies.

3.7.2.3 Electromagnetic Fields Health Overview

All EMFs have the potential to interact with the human body in three different ways, each of which is discussed in further detail below.

Electric Field Interactions

Time-varying electric fields may cause ions (either positively or negatively charged molecules or atoms within the human body) to flow, may cause the reorientation of polar molecules within the body, and may cause the formation of polar molecules that would otherwise be non-polar. The magnitude of the effects depends on the part of the body that is exposed (for example, the brain and blood contain a large number of ions), the frequency of the EMFs, and the magnitude of the electric field (ICNIRP 1998). In order to potentially cause adverse health effects, the power density of the EMF must be in the range of 10-100 mA/m. This value is not achieved under power transmission lines.

Certain chemical reactions within the body generate charged molecules, called free radicals, which are susceptible to electric fields. The electric fields may affect how many free radicals are generated, the orientation of the free radicals in space, or the orientation of the electrons within the free radical. These phenomena may, in turn, affect the amount or type of biochemicals that result from a chemical reaction within the body (ICNIRP 1994).

Magnetic Field Interactions

Time-varying magnetic fields couple with the human body and result in induced electric fields, which in turn result in electric currents within the body. The magnitude of the effect

depends on the strength of the magnetic field, the size of the person, and the type of tissue exposed (ICNIRP 1998).

Certain portions of the body are more susceptible to magnetic fields. Blood, for example, is made up of many charged particles, called electrolytes, flowing through the body. These electrolytes can interact with a magnetic field, thereby causing an electric current within the body as the blood flows. The effect is compounded when human beings move within the magnetic fields, which causes more variation of the magnetic field strength, which in turn causes variations of the induced electric current (ICNIRP 1994). A review of recent research by the ICNIRP (2010) has resulted in a shift in their recommendations regarding the biological effects of EMF. The new ICNIRP recommendations for EMF exposure are based on induced internal electric fields, not on induced current density. Previous recommendations were based on the current density, but induced electric fields have been identified as the value that determines the biological effect. Note that the strength of the induced electric field, and hence the strength of the time-varying magnetic field, has to be relatively high in order to observe biological effects, on the order of 10,000 mG (several milliTesla) (ICNIRP 1998). Such high levels will not be present near the transmission lines associated with this Project.

Magnetic Field Energy Transfer

When exposed to stationary magnetic fields (magnetic fields that do not vary with time), the human body can absorb energy from the fields, causing an increase in body temperature. The energy is absorbed as the ions within the human body attempt to align themselves with the magnetic field, much as a compass needle attempts to orient itself with the Earth's magnetic field (ICNIRP 1994). However, this effect is only significant for EMFs with frequencies above 100 kHz (ICNIRP 1998). For this Project, EMF frequencies would be approximately 60 Hz, which is substantially lower than the 100 kHz threshold required to increase body temperature.

3.7.2.4 Health Effects of Electromagnetic Fields

Scholarly journals and the Internet are replete with studies reporting the health effects of EMFs. Because this Project research is focusing on the ramifications of locating transmission lines and substations, this assessment will focus specifically on ELF EMFs, which is the region of the EMF spectrum that power lines and substations generate.

The publications can be classified in several different ways:

Based on Positive or Negative Impacts

Some research on ELF EMFs has concluded that negative health effects may be linked to exposure to ELF EMFs (Genuis 2008; Hamza et al. 2005; Kheifets et al. 2006; Raz 2006;). However, the research is not in agreement on what type(s) of negative health effects may result from EMF exposure. In addition, the research has found a weak association between any health effects and EMF exposure.

Several recent studies have focused on the potential medical treatment benefits of using EMFs under controlled conditions (Zorzi et al. 2007; Selvam et al. 2007). These research papers claim that localized use of specific EMFs can result in beneficial anti-inflammatory results, especially post-surgery.

Based on Location/Country

Many studies have been conducted within the United States and are summarized by ICNIRP (2001). The ICNIRP was very discriminating in their selection of published articles considered for review. Namely, the ICNIRP accepted only those papers published in peer-reviewed, scholarly articles with sufficiently large sample sizes to calculate an effect. The ICNIRP did not accept anecdotal evidence, case studies, or research that had questionable controls or scientific methods. Based on these criteria, the ICNIRP has concluded that a potential exists for adverse health effects from both adult and childhood exposure to high level ELF EMFs. As a result, the ICNIRP has set forth guidelines for EMF exposure, which were discussed previously in this assessment. The ICNIRP focused on health effects that had a high correlation to incidence of disease, such as leukemia and cardiovascular disease. Adult cancer, however, was not as thoroughly discussed in the ICNIRP paper. Reasons cited for questioning EMF cancer studies include the following:

1. Cancer can manifest itself years after exposure, making cancer difficult to directly correlate to EMF exposure.
2. Many other confounding variables within a person's lifetime may increase the likelihood for cancer (i.e., chemical exposure, smoking, or exposure to ionizing radiation).
3. Cancer has many forms. Usually, one variable (i.e., chemical exposure to benzene) results in a specific, identifiable type of manifesting cancer. However, studies that attempted to draw a link between EMF exposure and cancer were not consistent in the type of cancer that EMF exposure allegedly increased.

Many studies have been conducted within Europe (Frija et al. 2006; San Segundo & Roig 2008; Hamza et al. 2005; Ahlbom 2008), largely because the European Council has acknowledged a weak association between childhood leukemia and exposure to ELF EMFs (Scientific Committee on Toxicity, Ecotoxicity and the Environment [SCTEE] 2001; European Council Recommendation 1999). The basis for this decision was largely from research concluding that ELF EMF exposure to children caused a statistically significant increased incidence of childhood leukemia (SCTEE 2001). The result has been a European Council Recommendation (1999) that set EMF exposure limits for public exposure to all EMFs. The European Council's recommendations are based on the ICNIRP guidelines for EMF exposure. Note that in 2010, the ICNIRP modified their recommendations for EMF exposure and stance on the link between childhood leukemia and EMF. The ICNIRP (2010) states that the results that came out of the research on childhood leukemia and EMF could be attributed to "a combination of selection bias, some degree of confounding, and chance." Note also that all EMF levels expected for this Project are well below current ICNIRP exposure limits.

Residential Exposure

The largest portions of the published work on EMFs and human health are from studies of the general public (SCTEE 2001; Genuis 2008; Kheifets et al. 2006; Raz 2006; SCENIHR 2008; Singh et al. 2008). These studies focused on the health implications to human beings living near high-voltage transmission lines, from 115 kV and above. EMF sources of

exposure, however, varied in these studies, from power transmission lines to electric toothbrushes. The adverse health effects reported in these studies varied as well, from headaches to insomnia to behavioral disorders (Genuis 2008). One study published in the British Medical Journal (Draper et al. 2005) studied the occurrence of childhood leukemia as a function of distance from power distribution lines. The study concluded that children living within 600 meters (1,800 feet) were statistically more likely to have leukemia than those living father away from the power lines. The study also concluded that children living even closer (200 meters or 600 feet) were at an increased risk of childhood leukemia. One study (Tenenbaum 2000) has postulated that the reason ELF EMF has been implicated in various forms of cancer is because the EMF exposure can induce cancer in cells within the body that have already been mutated by other means. These studies have been called into question based on the scientific design and the magnitude of the statistical significance.

A similar study to the Draper research that was conducted in Russia in 2003 (Tikhonova et al. 2003) found no statistically significant adverse health effects linked to living close to power transmission lines. In addition, most EMF research investigating the potential effect of power lines on human beings has been conducted outside the United States, either in Europe or Asia. Because this research is conducted in regions where 50 Hz power is used (versus 60 Hz power in the United States), these studies may not be applicable to the United States. Very limited research has been conducted within the United States on power line EMF and health effects.

Based on Type of Health Effects Studied

The literature and Internet contain myriad reports of adverse health effects of EMF exposure. The casual reader can find reports claiming that EMF exposure can cause anything from rashes to cancer, and everything in between. In order to make an informed decision, readers must be aware of certain caveats when reading any literature relating to EMFs.

1. First, consider the source. Anyone can publish anything on the Internet. This makes Internet sources suspect, unless the source is a reputable authority on the subject, such as the World Health Organization (WHO) or the ICNIRP. Likewise, not all scientific journals are of the same caliber. Some journals, such as the *Journal of Physical Chemistry*, have stringent requirements for publication as well as a rigorous peer-review system to ensure the validity and quality of the articles published. Other journals, such as *Electric Power Systems Research*, have different standards.
2. Any research should be based on sound scientific principles, control for all variables, and have an experimental design that includes a study and control group.
3. All reliable research is repeatable. If a study reports findings that cannot be verified by an independent group, the results and conclusions are suspect.
4. A large sample size helps to ensure the applicability of the results. In other words, a small sample size (20 people or less, for example) makes the results and conclusions of the study difficult to generalize to the entire human population. Similarly, anecdotal evidence from one person may be relevant to that one person only, and not to the entire human population. On the other hand, the larger the sample size (300 or

more people, for example), the more applicable the results may be to a similar population.

Given these caveats, only reliable literature sources were consulted and sited in this assessment. Based on a thorough review and evaluation of reliable scientific research, analyses, and reports, the ICNIRP (2001) concluded that a weak association exists between childhood leukemia and exposure to ELF EMF. The ICNIRP also evaluated the current research related to EMF exposure and the following health effects (ICNIRP 2001):

1. Childhood cancer
2. Adult leukemia
3. Brain tumors
4. Breast cancer
5. Cardiovascular disease
6. Neurological disorders (depression and suicide)

Based on their review, the ICNIRP (2001) concluded that insufficient reliable research exists to determine if a link is possible between the adverse health effects above and long-term, elevated EMF exposure. The ICNIRP stated that more research is necessary in these areas.

Note that although case studies are not applicable (n/a) to the entire population, the European Union has acknowledged that a certain portion of the population may be susceptible to a disorder called "EMF hypersensitivity" (World Health Organization 2004). Such individuals appear to suffer adverse health effects from exposure to much smaller EMF doses than the general population. There is much scrutiny of this condition in general, with many scientists suggesting that the root cause of the problem is not EMF, but something else. Because of this, EMF hypersensitivity is not acknowledged within the United States.

The U.S. National Institutes of Health tasked the National Institute of Environmental Health Sciences (NIEHS) with studying and making recommendations on EMF and human health. NIEHS has put out a series of reports outlining their interpretations and recommendations (NIEHS 1998, 1999a and b; 2002). The NIEHS concludes that for most health outcomes, there is no evidence that EMF exposures have adverse health effects. The NIEHS calls for more studies and continued education on ways of reducing exposures.

3.7.2.5 Electromagnetic Fields in Context

Not all EMFs raise health concerns. In fact, the Earth has a natural magnetic field that human beings are constantly exposed to. The strength of the Earth's field ranges from less than 30 μT (0.3 G) to over 60 μT (0.6 G). In Buckeye, Arizona, the total magnetic field is approximately 0.33 Gauss (33 μT), according to the National Geophysical Data Center (2011).

In a study that measured EMF exposure in 1,000 homes in the United States, 50 percent had average EMF levels of 0.6 mG (0.06 μT) or less, and 95 percent had average EMF levels below 3 mG (0.3 μT) (Connecticut Department of Public Health 2008).

Many everyday electrical objects emit relatively high EMFs when turned on, but the ICNIRP has determined that these items are not responsible for causing health problems (ICNIRP 2001). Some of these values exceed the ICNIRP standard, but the devices are still considered safe. **Table 3.7-6** illustrates the magnitude that some common electrical devices are capable of outputting (EMF-Link 2000).

Table 3.7-6 Example EMF Sources

SOURCE	MAGNETIC FIELD 6 INCHES AWAY (µT)
Microwave Oven	30
Mixer	60
Hair Dryer	70
Vacuum Cleaner	70
Can Opener	150

3.7.2.6 Electromagnetic Fields and Transmission Lines

Of particular relevance to this Project is a research study conducted in Arizona of the EMF generated by two existing 69kV power substations in the Phoenix area for the Salt River Project. The study evaluated EMF levels within the substation as well as in adjacent residential areas. The study (Ma et al. 2011) found that all EMF levels were below both IEEE and ICNIRP recommended levels.

The Environmental Law Centre (Wu 2005) compiled a relevant review and summary of international precedents related to EMFs and power transmission lines. The document was meant as a quick resource for attorneys; however, the document is written in "plain English" and, as such, provides a relatively thorough summary of all regulations around the world.

A study of the ELF EMF exposure in residential settings outside the ROW of power transmission lines in Malaysia (Tukimin et al. 2007) documented that the ELF EMF strengths for both electric and magnetic fields were well below ICNIRP recommendations: the maximum field strength that the study observed was less than 60 percent of the ICNIRP standard. Similarly, Rahman et al. (2009) documented low electric and magnetic fields at the edge of the ROW for a variety of pole configurations in India.

Similarly, a study of EMF strength in power substations in Egypt (Hossum-Eldin 2010) found that EMF values within the substation were generally at or below the public exposure limit, except immediately around the transformers. Additionally, a study in Kuwait attempted to simulate the ELF EMF experienced by a car travelling near power transmission lines (Al-Sayegh and Qabazard 2007). The study stated that the EMF level for a car approximately 200 feet from a 260 megawatt power transmission line was approximately 70 mG. This level was simulated at the lowest sag of the transmission lines. Note that this level is well under the

ICNIRP recommended limit. However, the study did note that additional simulation and refinement of the model were needed.

3.7.2.7 Electromagnetic Fields and the Project

EMF Levels

Based on EMF data models prepared in 2008 for the APS Application for a CEC (URS 2008), **Table 3.7-7** compares the modeled EMF levels for the Study Area with ICNIRP recommended limits. While the data for the Application were not created for this specific Project, the overall set-up and load on the transmission lines for this Project is expected to be similar. Therefore, these data were used as the basis of comparison. However, future EMF data models for this specific Project may result in slightly different values.

ICNIRP was chosen as the basis of comparison because the ICNIRP limits are used internationally and are relatively conservative limits compared to the IEEE limits. The "Distance From Structure" is the distance from the nearest transmission line to the edge of the ROW, taken off the modeled data from the 2008 report. Both the electric and magnetic field components are summarized.

Table 3.7-7 Comparison of APS Projected EMFs to ICNIRP Limits

SECTION	DISTANCE FROM STRUCTURE	EXPECTED E FIELD (KV/M)	EXPECTED MAGNETIC FIELD (MG)
1 – Paralleling Planned West Valley North 230kV Project	50	0.25	8
2 – Paralleling Existing Mead-Phoenix 500kV Line	100	2	20
3 – No other Paralleling Lines	60	1.5	9
ICNIRP (2010) Public Limits at 60 Hz		*4.17*	*2,000*

The Proposed Action route would cross several existing power transmission lines (URS 2012e), including the:

- Mead-Phoenix 500kV line,
- 69kV line along Patton Road,
- 69kV line along US 60,
- Western Area Power Administration Raceway – Waddell 230kV line, and
- 69kV line west of Morgan Substation.

As stated previously, EMFs from multiple sources have the potential to act by either cancelling each other out, thereby minimizing the EMF in the surrounding area, or by adding together, thereby increasing the EMF in the surrounding area.

3.7.2.8 Summary

The ICNIRP acknowledges a weak association between high EMF exposure and childhood leukemia. The ICNIRP concluded that insufficient evidence exists to link EMF exposure to any other health effects. Note that the health effects studies reviewed by the ICNIRP focused primarily on the magnetic field portion of EMF, not the electric fields.

Based upon the technical research, the ICNIRP has made a series of recommendations for limiting EMF exposure to human beings: public exposure for electric fields should be limited to 4.17kV/m and magnetic fields should be limited to 2,000 mG (200 mT) (ICNIRP 2010). While the guidelines are voluntary, the levels are designed to prevent undue health risks associated with EMF exposure.

Based on modeling prepared for the APS Application for a CEC (URS 2008), EMF data were compared to the ICNIRP standards. The magnetic and electric fields at the edge of the ROW were all substantially below the ICNIRP public exposure limits.

3.7.3 Fire

This section provides information on fire and fuels management as it relates to the Project. The Study Area for the assessment of fire and fuels management includes the lands within and adjacent to the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes (including access roads [temporary and permanent], staging areas, etc.). A portion of the Study Area is located within the Castle Hot Springs Management Unit of the Bradshaw-Harquahala Planning Area on BLM-managed lands. It was determined that the best area to focus the assessment of fire and fuels management for this Project would be the BLM Phoenix District Fire Management Unit 2 (FMU 2; BLM 2009b). This FMU encompasses all lands within its boundary and is not specific to BLM. The jurisdiction of other lands within FMU 2 (the Study Area) includes State Trust lands, private, U.S. Forest Service, USBR, and a small portion of Indian lands in the southeast portion of the FMU. The entire FMU is approximately 718,229 acres (BLM 2009b). Only BLM, State Trust, private, or USBR lands are likely to be affected by the Proposed Action route and the Action Alternatives.

The Study Area falls within Arizona land use allocation 2: Initial Action is Suppression (areas not suitable for managing fire to achieve resource objectives) (BLM 2010a). These lands are not typically fire adapted, and using wildfire to meet resource objectives is not an appropriate action on these lands. This allocation includes areas where mitigation and suppression are required to prevent direct threats to life or property (BLM 2010a). The present BLM policy is to maintain full fire suppression in all land use allocation 2 areas (BLM 2010a).

The Study Area is located within the Sonoran Basin and Range Ecoregion of Arizona. This ecoregion is similar in topography to the Mojave Basin and Range to the north. However, the Sonoran Basin and Range is slightly hotter than the Mojave and contains large areas of palo verde-cactus shrub and giant saguaro cactus (EPA 2010a). Winter rainfall decreases from west to east, while summer rainfall decreases from east to west. The Sonoran Desert Ecoregion is characterized by an arid climate. Annual precipitation varies from 3 to 10 inches

with slightly more rainfall at the higher elevations. Winters are mild while summers are hot and dry. The two main periods of rainfall occur during the last half of summer and in early winter.

The following subsections serve to provide a picture of the existing fire conditions in the Study Area and develop a basis for the fire management impact analysis.

3.7.3.1 Laws, Ordinances, Regulations, and Standards

The BLM coordinates its fire management activities with the actions of related federal and state agencies responsible for fire management. The 1995 Federal Wildland Fire Policy is a collaborative effort that includes the BLM, U.S. Forest Service, National Park Service, US FWS, Bureau of Indian Affairs, the National Biological Service, and state wildfire management organizations (DOI 1995). The 1995 policy has undergone several reviews and additional guidance and policy has been developed based on those reviews. The BLM is currently following fire management guidance provided in the Guidance for Implementation of Federal Wildland Fire Management Policy (DOI 2009b). The BLM also addresses fire management issues in fire management plans and resource management plans, including: the 2009 Phoenix District Fire Management Plan (BLM 2009b), and the Bradshaw-Harquahala RMP (BLM 2010a).

3.7.3.2 Fire History and Data

Fire has not historically played a large role in the development and maintenance of the ecosystem in this Study Area (see **Figure 3.7-1**) and the fire return intervals (i.e., the length of time between wildland fires occurring in a specific area) have been very long. This area also includes wildland-urban interface (WUI) areas, where an unplanned ignition could have negative effects to the ecosystem unless some form of mitigation takes place. Mitigation could include several different means to reduce the hazardous effects of unplanned wildland fires, including: mechanical, biological, chemical, or prescribed fire (BLM 2010a).

The following fire history data are taken from the 1980-2009 records of fire events that occurred within five miles of the Project routes (not within 5 miles of the FMU). During this period, 39 separate fires burned a total of 1,359 acres. Fire extents have been highly variable, ranging from zero acres in years when fire was completely absent, to 1,223 acres during 1983. The average number of acres burned per year in the area from 1980 to 2009 was 35 acres. These figures reflect all burned acres, regardless of land ownership or jurisdiction.

3.7.3.3 Fuel Types

Various vegetation communities make up the fuel components of the Study Area. Vegetation communities are described in the URS Environmental Resource Report for Biological Resources (URS 2012i), but generally fall into Fire Behavior Prediction System (FBPS) Fuel Model GR1, and National Fire Danger Rating System (NFDRS) Fuel Model A (BLM 2009b). Fuel models utilize the physical characteristics of a plant community to characterize and predict fire behavior. Fuel Model GR1 is described by Scott and Burgan (2005), and Fuel Model A is described by Schlobohm and Brain (2002). The two fuel models are summarized below:

FBPS Fuel Model GR1 (Short, Sparse Dry Climate Grasses) - The primary carrier of fire in GR1 is sparse grass; though small amounts of fine dead duel may be present. The grass in GR1 is generally short, either naturally or by grazing, and may be sparse or discontinuous. The moisture content of the fuel is very low and indicative of a dry climate.

NFDRS Fuel Model A (Annuals) - This fuel model represents western grasslands vegetated by annual grasses and forbs. Brush or trees may be present but are very sparse, occupying less than one-third of the area. The quantity and continuity of the ground fuels can vary greatly with rainfall from year to year.

3.7.3.4 Fire Regimes

Fire regimes associated with the major vegetation cover types within the Study Area have been documented in terms of fire frequency (i.e., the number of years between fires in the same area) and fire severity (i.e., percent of dominant overstory vegetation removed). This Study Area is primarily vegetated with Sonoran Desert scrub and is classified as being within Fire Regime III. Fires historically occur every 35 to 100+ years under Fire Regime III and the severity of the fires is mixed. Each Fire Regime can be further separated into Condition Classes, which are discussed further in the following section.

3.7.3.5 Fire Regime Condition Class

National and state BLM fire policy requires current and desired resource conditions related to fire management be described in terms of three condition classes. These condition classifications are referred to as Fire Regime Condition Classes. A Condition Class is a classification of the amount of departure from the historic fire regime (which was discussed previously). Following is a description of the two condition classes that are present within FMU 2. The fire regimes and the condition classes were determined using Landfire data (Landfire 2012).

Condition Class 1 – Fire regimes in this class are within the historical range. The risk of losing key ecosystem components from the occurrence of fire remains relatively low. Maintenance management such as prescribed fire, mechanical treatments, or preventing the invasion of non-native species, is required to prevent these lands from becoming degraded. Low elevation (below 2,000 feet) areas within this unit are primarily Condition Class 1 (BLM 2009b).

Condition Class 2 – Fire regimes in this class have been moderately altered from their historical range by either increased or decreased fire frequency. A moderate risk of losing key ecosystem components has been identified on these lands. To restore their historic fire regime, the lands may require some level of restoration through prescribed fire, mechanical or chemical treatments, and subsequent reintroduction of native plants. Most of the areas above 2,000 feet in elevation within this FMU are now in Condition Class 2 (BLM 2009b) due to the presence of exotic annual grasses in upland areas and saltcedar/tamarisk along riparian corridors.

Figure 3.7-2 shows the distribution of the condition classes in the Study Area.

3.7.3.6 Fire Management

Fire management utilizes an integrated approach to reduce the danger to firefighters, improve the productivity of public lands, protect public and private property from devastating fire and, over the long term, reduce fire suppression costs. Fire management integrates five main components as follows:

General Fire Management – National Fire Plan. The National Fire Plan is not a singular document, but rather a compilation of concepts, documents, and policies which guide fire management and began with the Federal Wildland Fire Management Policy and Program (DOI 1995a). Firefighter and public safety is the first priority in all fire management and suppression actions.

Fuels Management – Includes hazardous fuels reduction, prescribed fire, and fuels management.

Fire Prevention – Includes education, community assistance, and prevention programs.

Fire Suppression – Composed of preparedness, the mobilization and management of fire suppression crews for fire suppression, and the actual suppression of fires.

Fire Rehabilitation – Includes emergency stabilization and rehabilitation efforts in the post fire environment to reduce hazards to the public and ecosystem values. Rehabilitation efforts are generally undertaken in the post-fire environment to protect and sustain ecosystems, public health and safety, and to help communities protect infrastructure. Typical efforts involve soil stabilization, flood control, and rehabilitation of vegetation structure and function in an attempt to keep cheat grass and other undesirable plants out of disturbed areas.

According to the Bradshaw-Harquahala ROD the lands within the Study Area are not fire adapted and unplanned ignitions should be suppressed (BLM 2010a). Vegetation types in the Study Area are not considered dependent on, or even adapted to, fire. The vegetation in this area (saguaro cactus, palo verde, organ pipe cactus, and creosote) could take as long as a century to reestablish after a fire.

There are several communities (i.e., towns and cities) within the FMU boundaries. There are also recreation sites, range improvements, railways, roadways, utility lines, substations and communication sites in the FMU. Communities and infrastructure associated with these features can make fire suppression activities more difficult and dangerous for firefighting personnel. As part of community protection and community assistance programs, the BLM utilizes local news media to provide information and updates to the public. The BLM also may participate in school presentations, attend events/parades, and develop partnerships with homeowner organizations, permittees, and other groups to assist communities in reducing the risk from wildfire through public awareness (BLM 2009b).

Suppression strategies and tactics in this FMU usually involve direct attack on wild fires using hand crews, engines where possible, and aerial support to knock down the fire edge. As a result, fires in this area are usually quickly contained.

3.8 PALEONTOLOGY

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Paleontology, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012f). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

Paleontological resources are fossilized remains of past life including invertebrate and vertebrate animals and multi-cellular plants, including imprints. These resources are non-renewable and therefore are considered sensitive. Due to their paucity, fossils are important records of ancient life, particularly vertebrate fossils.

The Study Area covered by the paleontological records search included a one-mile buffer around the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes. In general, any paleontological resources known for Maricopa County were also compiled. The paleontological assessment for the Study Area was based on a review of data gathered from the Arizona Geological Survey, the USGS, the Arizona Museum of Natural History, and paleontological and geologic literature. No site visit was conducted.

3.8.1 Laws, Ordinances, Regulations, and Standards

Protections of paleontological resources are provided under federal legislation which requires federal agencies to take into consideration surface disturbing federal actions that may cause direct adverse impacts to paleontological resources through the damage or destruction of fossils or the disturbance of the stratigraphic context in which they are located. Indirect adverse impacts may be created from increased accessibility to fossils leading to looting or vandalism activities. Under FLPMA and NEPA, federal actions and land tenure adjustments that may impact or result in a loss of paleontological resources are evaluated, and necessary mitigation is identified. As the footprint of the Project includes federal lands, the following federal laws will apply to the paleontological resources within the Project footprint.

Antiquities Act of 1906 - The Antiquities Act of 1906 has historically been used as the basis for federal protection of paleontological resources on federal lands. The act authorizes the government to regulate the disturbance of objects of antiquity on federal lands through the responsible managing agency and to prosecute individuals responsible for the unauthorized damage or removal of such objects.

National Environmental Policy Act of 1969 - NEPA establishes a public, interdisciplinary framework for federal agencies reviewing projects under their jurisdiction to consider environmental impacts. NEPA's basic policy is to assure that all branches of government give proper consideration to the environment prior to undertaking any major federal action that significantly affects the environment.

Federal Land Policy Management Act of 1976 - The FLPMA of 1976 (P.L. 94-579; 90 Stat. 2743, USC §§ 1701-1782) requires that public lands be managed in a manner that protects the quality of their scientific values.

Paleontological Resources Preservation Act of 2009 - The most explicit federal protection for paleontological resources, enacted in 2009, is the Paleontological Resources Preservation Act. This act regulates who may collect fossils on public lands and where such fossils must be curated. It also provides for prosecution of violators.

Bureau of Land Management Instruction Memorandum 2009-11 - This Instruction Memorandum (IM) provides guidelines for assessing potential impacts to paleontological resources in order to determine mitigation steps for federal actions on public lands under FLPMA and NEPA. These guidelines also apply where a federal action impacts split-estate lands. In addition, this IM provides field survey and monitoring procedures to help minimize impacts to paleontological resources from federal actions in the case where it is determined that significant paleontological resources will be adversely affected by a federal action.

3.8.2 Study Area Conditions

The Study Area lies in the Basin and Range geologic province within Arizona (Wilson and Moore 1959; Anderson et al. 1992). The basins in the Arizona portion of the Basin and Range province were created by structural disturbances between 15 and 10 million years ago (Anderson 1995). Minimal detailed geologic mapping exists for the area. Wilson et al. (1957) mapped the entire county of Maricopa and showed the Study Area to be largely Quaternary and Tertiary sand, gravel, and conglomerate with the ACC-certificated route passing through Precambrian schist and Quaternary basalt near its eastern end. Anderson et al. (1992) mapped the area as being mostly middle Tertiary and younger sediments with some middle Tertiary crystalline rocks and some middle Tertiary and younger volcanic rocks toward the east end. Huckleberry (1994) mapped the Wittmann and Hieroglyphic Mountains Southwest 7.5' quadrangles at a 1:24,000 scale. Where the Project crosses those quadrangles, the sediments are relatively young alluvial fans, very young Pleistocene fans, and older Pleistocene fan surfaces. Pearthree et al. (2004) mapped the Daggs Tank 7.5' quadrangle at a 1:24,000 scale. Where the Project crosses that quadrangle, the sediments are Holocene alluvium, early Pleistocene river deposits, and Plio-Pleistocene river deposits.

3.8.3 Paleontological Potential

Assessment of paleontological data was made using the Society of Vertebrate Paleontology Assessment of the Paleontological Potential of Rock Units, the Potential Fossil Yield Classification (PFYC) system and through a review of the published and unpublished paleontological literature for the region (McCord 2011). The determination of a site's (or rock unit's) degree of paleontological potential, according to the Society of Vertebrate Paleontology (SVP 1995), is first founded on a review of pertinent geological and paleontological literature and on locality records of specimens deposited in institutions. This preliminary review may suggest particular areas of known high potential. If an area of high potential cannot be delimited from the literature search and specimen records, a surface survey would determine the fossiliferous potential and extent of the sedimentary units within a specific project. The field survey may extend outside the defined project to areas where rock units are better exposed. If an area is determined to have a high potential for containing paleontologic resources, a program to mitigate impacts is developed. In areas of high sensitivity, a pre-excavation survey prior to excavation is recommended to locate surface

concentrations of fossils which might need special salvage methods. The sensitivity of rock units in which fossils occur may be divided into three operational categories:

High Potential - Rock units from which vertebrate or significant invertebrate fossils or significant suites of plant fossils have been recovered are considered to have a potential for containing significant non-renewable fossiliferous resources. These units include but are not limited to sedimentary formations and some volcanic formations which contain significant nonrenewable paleontological resources anywhere within their geographical extent, and sedimentary rock units temporally or lithologically suitable for the preservation of fossils. Sensitivity comprises both (a) the potential for yielding abundant or significant vertebrate fossils or for yielding a few significant fossils, large or small, vertebrate, invertebrate, or botanical; and (b) the importance of recovered evidence for new and significant taxonomic, phylogenetic, ecologic, or stratigraphic data. Areas which contain potentially datable organic remains older than Recent (usually used as synonymous with Holocene Epoch, which is generally regarded as having begun 10,000 radiocarbon years, or the last 11,500 calibrated (i.e. calendar years, before present (1950)), including deposits associated with nests or middens, and areas which may contain new vertebrate deposits, traces, or trackways are also classified as significant.

Undetermined Potential - Specific areas underlain by sedimentary rock units for which little information is available are considered to have undetermined fossiliferous potentials. Field surveys by a qualified vertebrate paleontologist to specifically determine the potentials of the rock units are required before programs of impact mitigation for such areas may be developed.

Low Potential - Reports in the paleontological literature or field surveys by a qualified vertebrate paleontologist may allow determination that some areas or units have low potentials for yielding significant fossils. Such units will be poorly represented by specimens in institutional collections. These deposits generally will not require protection or salvage operations.

The PFYC is a system for categorizing the probability of geologic units to contain scientifically significant paleontological resources or noteworthy fossil occurrences. It has five levels or Classes, with Class 1 applied to geologic units that are not likely to contain significant fossils through Class 5 for geologic formations that have a high potential to yield scientifically significant fossils on a regular basis.

If the results of the preliminary analysis determine that a project will only affect geologic units not likely to contain significant fossils or that have a very low or low potential for significant fossils (PFYC Class 1 or 2), and no scientifically important localities are known to occur in the area, the project file should be documented, and no additional paleontology assessment is necessary.

The results of an analysis of a project may indicate the potential to disturb PFYC Class 3, 4, or 5 formations or potentially fossil-bearing alluvium, or known significant localities, which may then suggest the need for field surveys and/or other mitigation measures. The results may also identify areas where little or nothing is known of the fossil record so that additional attention may be given to these areas during field survey. The analysis should consider the

likely impacts on the known or potential fossil resource and should be the basis for determining the need for or level of additional assessment.

Project Area Potential

Geologic mapping of the area (Wilson et al. 1957) indicate that the only potentially fossiliferous deposits in the area to be Quaternary and Tertiary gravels, sand, and silts. These deposits are not typically productive with surface deposits, but some localities in eastern Maricopa County (Lindsay and Tessman 1974; Mead 2005) have produced Pleistocene faunas where down-cutting or excavation has occurred.

The paleontological potential of the Precambrian schist and Quaternary basalt in the eastern portion of the Study Area is low in the Society of Vertebrate Paleontology system; in terms of the PFYC system, these would be rated Class 1 – very low. The paleontological records search report suggests that surficial sediments are unlikely to produce paleontological resources, but that deeper sediments are more sensitive. At least in the active drainages, the surficial sediments would be geologically young. In terms of the Society of Vertebrate Paleontology system, their sensitivity would be rated low; in terms of the PFYC system, they would rated Class 2 – low. Given that some of the sediments which the Proposed Action route and other Action Alternatives would cross are middle Tertiary age or younger, and that several vertebrate fossils of Pleistocene and possibly Pliocene age are known from Maricopa County, the paleontological potential of these Pleistocene and Pliocene sediments should be regarded as unknown until other sources of evidence, such as a systematic survey (which is not required for this project), can be obtained. In the PFYC system, they would be rated Class 3 – moderate or unknown.

3.8.4 Known Paleontological Resources

Four publications dealt with known paleontological sources near the Project. The publications of paleontological resources in the Study Area seem to have been prompted by individual scientists' research interests or chance finds. Lindsay and Tessman (1974) recorded an oreodont from Oligocene deposits in eastern Maricopa County. There are no other Paleogene vertebrate fossils recorded for the county (Lucas and Morgan 2005a). Morgan and White (2005) showed no Miocene or Pliocene vertebrate fossil localities in Maricopa County. Mead (2005) showed no Late Pleistocene reptile or amphibian records from Maricopa County. However, McCord (1994) listed three Pleistocene records of the Bolson tortoise (*Gopherus flavomarginatus*) from between the Salt and Agua Fria Rivers near Phoenix. The El Mirage locality is 12 miles south of the Project near the Morgan Substation. The Las Colina locality is 31 to 42 miles to the southeast, and the Lehi record is 38 to 51 miles southeast of the Project. Lucas and Morgan (2005b) listed two Pleistocene mammal localities from eastern Maricopa County. Pasenko (2007) described the cranium of a *Stegomastodon* (a gomphotherium proboscidean) from "north of Morristown" which is within 5 miles of the nearest portion of the Project. The specimen is problematic because where the specimen was collected is not definitively known. Pasenko concluded that it was of late Pliocene or early Pleistocene age.

The results of the paleontological records search were provided by Dr. Robert McCord (2011). That report incorporates information from the AZMNH, the Museum of Northern Arizona (MNA), the collection of the Northern Arizona University Quaternary Studies Program (a former Northern Arizona University collection, recently transferred to AZMNH), and the University of Arizona. The report included information on an unpublished record of *Gopherus* from Peoria, 15 miles south of the eastern end of the Project near Morgan Substation. The paleontological records search report concludes that there are no known vertebrate fossil localities within one mile of the Project Area.

3.9 RECREATION AND SPECIAL DESIGNATIONS

Portions of the information provided in the following subsections is taken from a report titled *Environmental Resource Report for Land Use, Recreation and Special Designations, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012a). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review. The information taken from the resource report has been supplemented with additional research.

The Study Area boundary for recreation and special designations includes a two mile area surrounding the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes (**Figure 3.9-1**). Although direct effects related to construction would likely occur within 500 feet of the routes, a broader area (out to two miles from the routes) was chosen to be consistent with what was considered in the CEC application. The following sections discuss relevant laws and regulations, recreation, and special designations within the Study Area and surrounding vicinity.

3.9.1 Laws, Ordinances, Regulations, and Standards

The Action Alternatives would traverse federal, state, and local agency jurisdictions that have adopted land use plans and regulations which guide the type and intensity of land use (see **Figure 3.6-1**). **Section 3.6 - Land Use and Range Resources**, provides a discussion of the laws, ordinances, regulations, and standards that includes those applicable to recreation and special designations.

3.9.2 Recreation Overview

Both developed and undeveloped recreational uses are located within the Study Area. Developed recreational opportunities are provided by three golf courses (located within residential communities), regional and neighborhood parks/playgrounds, campground/picnic facilities, recreational trails, rodeo arenas, a paintball facility, a soaring school/glider port, and a designated OHV staging area. With exception of the designated OHV staging area, the developed recreational opportunities in the Study Area would be largely unaffected by the proposed Project, and are therefore not discussed in detail in this document. Undeveloped recreational opportunities include hiking, geocaching, mountain biking, horseback riding, hunting, wildlife viewing, target shooting, and dispersed OHV use. Heavy, dispersed, undeveloped recreational activity occurring north of SR 74 would be impacted by the proposed Project, and is therefore the focus of this section.

3.9.3 Recreation Management

3.9.3.1 Bureau of Land Management

Recreation Opportunity Spectrum

The BLM uses a planning tool known as the Recreation Opportunity Spectrum (ROS) that inventories, classifies, and maps public lands according to their suitability for various types of recreational activity based on the presence of physical setting characteristics. The system defines six classes of recreation opportunity ranging from natural, low-use areas to highly developed, intensive use areas: these include Primitive, Semi-Primitive Non-Motorized, Semi-Primitive Motorized, Roaded Natural, Rural, and Urban. The classes are defined by setting, the types of recreational activities appropriate to that setting, and the types of recreation experience the setting offers to visitors. BLM-managed lands within two miles of the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes contain the three ROS classes (**Figure 3.9-1**) described below.

Semi-primitive motorized - This setting is a mostly natural landscape of moderate to large scale, within one-half mile of primitive roads and two-track vehicle trails. The setting offers a moderate degree of isolation from others; contact with others remains low to moderate and there are few management controls. The use of motorized recreational equipment is allowed. Recreationists can experience a high degree of interaction with the natural environment while enjoying activities such as hunting, climbing, vehicle trail riding, backcountry driving, mountain biking, and hiking.

Roaded Natural - This setting consists of areas near improved and maintained roads. While these areas are mostly natural in appearance, some human modifications are evident, with moderate numbers of people, visible management controls, and developments. Activities include wood gathering, downhill skiing, fishing, off-highway vehicle driving, interpretive uses, picnicking, and vehicle camping. The experience provides for a sense of security through the moderate number of visitors and developments, and some personal risk-taking and challenges.

Rural - This setting is characterized by a substantially modified natural environment. Resource modification, development, and use are obvious. Human presence is readily evident, and interaction between users is often moderate to high. Activities consist mostly of facility/vehicle dependent recreation and generally include vehicle sightseeing, horseback riding, on-road biking, golf, swimming, picnicking, and outdoor games. The experience provides for modern visitor conveniences, moderate to high levels of interactions with others, and a feeling of security from personal risk.

Special Recreation Management Areas

BLM designates SRMAs to help direct management priorities in areas with a high amount of recreational activity and increased resource values and public concern. There are two SRMAs located near the Study Area and one located within two miles of the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes.

The southern portion of the Castle Hot Springs SRMA (112,430 acres) is located within the Study Area and is located mainly north of SR 74 and west of Lake Pleasant Regional Park

(**Figure 3.9-2**) although it does extend south of SR 74 on the public land paralleling SR 74. The SRMA contains the Hieroglyphic Mountains RMZ (16,510 acres), Sheep Mountain RMZ (4,270 acres), and the Baldy Mountain RMZ (6,550 acres). The Castle Hot Springs SRMA is managed for motorized and non-motorized recreation and provides opportunities for developed camping, OHV use with single- and two-track routes for general motorized recreation use, and organized OHV events, horseback riding, bicycling, hiking, and picnicking.

The Black Canyon SRMA (68,730 acres) is located approximately two miles northeast of the Study Area (**Figure 3.9-2**). The SRMA contains the Black Canyon Hiking and Equestrian RMZ (8,325 acres) and the Table Mesa RMZ (11,050 acres). The Black Canyon SRMA contains the Black Canyon National Recreation Trail which provides high quality non-motorized recreation opportunities for hikers, equestrians, and mountain bikers through the Black Canyon Corridor. The Table Mesa RMZ provides for intensive motorized recreation in Semi-primitive to Roaded Natural recreation settings.

The Hassayampa SRMA (181,910 acres) is located approximately two miles northwest of the Study Area (**Figure 3.9-2**) and contains the Stanton (6,050 acres), Wickenburg Community, Box (72,040 acres), San Domingo (16,040 acres), and Vulture Mine (30,100 acres) RMZs. Recreation opportunities within the Hassayampa SRMA include hiking, horseback riding, picnicking, camping, mountain biking, and OHV use.

Special Recreation Permits

BLM issues Special Recreation Permits (SRPs) for commercial and competitive uses, organized group events and activities, and vending operations conducted on public lands. The permits can be for one-time events, such as an OHV race or horse ride, or for on-going commercial uses such as jeep tours. BLM issues SRPs on a case-by-case basis.

In areas near and north of the Study Area, the BLM issues SRPs for horse trail rides, competitive motorized and non-motorized events, orienteering, OHV tours, and permits for outfitter and guide activities such as big game hunting (BLM 2010a). BLM has issued 18 commercial permits and 3 competitive permits in the Study Area (BLM Outdoor Recreation Planner, personal communication, January 26, 2012).

Special Designations

There are no BLM special designations within the Study Area.

3.9.3.2 Other Entities

State of Arizona

The Statewide Planning Unit of Arizona State Parks prepared the 2008 Arizona State Comprehensive Outdoor Recreation Plan (SCORP). The SCORP is Arizona's outdoor recreation policy plan. It is intended to guide outdoor recreation managers and decision-makers on policy and funding issues and is updated every five years. The BLM was represented on the 2008 SCORP Workgroup, which served as the steering committee for the SCORP planning process and drafted the grant rating criteria for the federal Land and Water Conservation Fund (LWCF) and the Arizona Heritage Fund Local, Regional and State Parks

grant programs. The SCORP is prepared in accordance with the provisions of the LWCF Act, which was enacted in 1964 to encourage the provision of greater recreation opportunities for American citizens. Arizona receives annual congressional appropriations from LWCF administered through the Arizona State Parks Board to fund state and local government sponsored outdoor recreation projects. Two key uses of the SCORP, as they relate to the proposed Project are:

- Establish outdoor recreation priorities for Arizona that will help outdoor recreation and natural resource managers at all levels of government, the state legislature, and the executive branch make decisions about the state's outdoor recreation sites, programs and infrastructure.
- Encourage a better, highly integrated outdoor recreation system throughout Arizona that balances recreation and protection of natural and cultural resources. (Arizona State Parks 2007).

Arizona's SCORP identifies outdoor recreation issues of statewide importance based upon, but not limited to, input from the public. The State identified nine priority issues for outdoor recreation in Arizona of which the following three would be applicable to the proposed Project:

- Plan for Growth/Secure Open Space - As Arizona's population increases, the demand for recreational opportunities and open space grows, but the land to provide those opportunities is decreasing due to changing land uses and explosive residential and commercial development. State Trust land is a key variable for Arizona's growth. Identifying key lands and their access points and acquiring them before development should be an integral part of growth planning, providing a foundation for parks and other outdoor recreation facilities, open space and natural areas, and is typically less expensive than acquiring them later.

  Goal: The goal is "Smart Growth;" *growing smarter* is about creating and sustaining healthy landscapes, livable communities and vibrant economies. This type of proactive planning is to ensure Arizona's desirability as a place that combines incredible resources with a dynamic economy, through integration of quality of life with quality growth in our everyday lives and expectations for future growth and development.

  Action Strategies that apply to the proposed Project:

  2. Look holistically across geographic boundaries, disciplines, governments, private interests, and generations, and examine all benefits and costs, not just fiscal costs.

  4. Do proactive and visionary planning, not just react to situations as they become critical.

  6. Determine the type, size and condition of the lands needed for parks and open space before enacting planning and zoning policies, ordinances or development set-asides.

- Resolve Conflicts - As the sheer numbers of recreationists increase and demand for different activities grows, managing the resource impacts and conflicts that develop between these uses will become an increasingly important issue of public policy.

  Goal: The goal is implementing a well-planned balance of land uses including recreational opportunities that adhere to set carrying capacities and result in harmonious interactions between recreational users and between landowners and recreationists, and, protected and sustainable natural and cultural resources.

  Action Strategies:

  2. Proactively involve all affected parties when deciding on strategies to resolve conflicts.

  8. Provide for OHV use on public lands but manage it properly, to reduce conflicts with other recreation users and minimize the activity's impacts on natural and cultural resources, as is done for other recreational activities.

- Fill Gaps between Supply and Demand - Increasing population, rapid development and leapfrog communities are expanding towns and cities ahead of their ability to provide necessary infrastructure and desired amenities such as parks, trails and open space.

  Goal: The goal is to expand and improve the range, quality and quantity of outdoor recreation opportunities in local communities and throughout Arizona that meet the needs of Arizona's diverse residents and visitors.

  Action Strategies:

  4. State and federal agencies should implement coordinated interagency planning efforts for new recreational areas and trail systems to ensure an equitable regional distribution of desired recreational opportunities and access to natural environments.

Maricopa County Parks and Recreation Department

Maricopa County Parks and Recreation Department manages the United States' largest county park system, with 10 regional parks totaling approximately 120,000 acres. A combination of leased and purchased land has allowed Maricopa County to develop a regional park system that preserves natural open spaces. The park system provides residents with the opportunity to enjoy natural and cultural resources and to participate in a variety of recreational activities. White Tank Mountain and Lake Pleasant Regional Parks are located closest to the Study Area.

Lake Pleasant Regional Park is located 15 miles west of Interstate 17 on SR 74, 30 miles from Phoenix and within the city limits of Peoria. It is located in the northeast portion of the Study Area and just south of the Yavapai/Maricopa County boundary. The park is accessed from SR 74 via Castle Hot Springs Road. The park is extremely popular for boating, fishing, water skiing, jet skiing, sailing, and other water sports, and contains developed campgrounds. White Tank Mountain Regional Park is located north of the Town of Buckeye, east of the City of Surprise, and southwest of the Study Area, and encompasses approximately 30,000 acres. A portion of the Maricopa Trail which is part of the Maricopa County Regional Trail

Plan is located within the Study Area. The trail begins at the Agua Fria trailhead located approximately 1.5 miles south of Lake Pleasant. Maricopa County has also proposed four future trails that would be located within the Study Area (see **Section 3.6**). These trails have been approved by the Maricopa County Board of Supervisors, but their exact locations could shift.

There are also several community parks located near the Study Area in Surprise, Buckeye, and Peoria that provide a variety of recreational facilities and opportunities. As discussed in **Section 3.6.3**, planned communities have identified areas of open space that would be available for recreational use, such as hiking and wildlife observation.

3.9.4 Recreational Use

The SCORP breaks the state into six planning units, one of which is Maricopa County.

In preparation of the 2008 SCORP (Arizona State Parks 2007), public surveys were conducted in 2006. The survey asked respondents to rate how often they currently participate in 22 different outdoor recreation activity categories, and if they will participate more, less, or the same in these activities over the next five years. Approximately 25 percent of Maricopa County respondents participate in OHV activities. Maricopa County respondents indicated they participated in OHV activities an average of four times last year (occasions, not days) in OHV activities, and approximately 22 percent indicated they expect their future participation level to increase.

3.9.4.1 OHV Recreation

The primary recreational use within the Study Area is OHV recreation. Within Maricopa County, there are three major areas for OHV recreation: The Tunnel-Cave Creek area, the Sycamore Creek/Rolls area, and The Boulders Staging Area/Hieroglyphic Mountains, which is within the Study Area. Of the three areas in the county, The Boulders/Hieroglyphic Mountains area receives proportionally more use than the other two areas – approximately 40 percent (T. Bickauskas, BLM, personal communication August 3, 2012).

The Hieroglyphic Mountains area (BLM managed public lands) contains two-track trails used for 4-wheel OHVs and single-track trails used primarily by motorcyclists. Mountain bikers and hikers also use the area, but the area recreational use is predominantly motorized. The topography of the area is low rolling hills, gradually gaining in elevation as the trails travel north from The Boulders Staging Area. The area is sparsely vegetated, with forests of saguaro cactus at higher elevations. As recreationists travel on the trails to the north, the area offers sweeping views of the valley to the south, with the suburbs of Phoenix visible in the distance. SR 74 is barely visible and difficult to locate in the view. The area feels very natural and remote. Occasionally trails and other riders are visible, but the presence of trails does not diminish the natural feeling of the surroundings.

The Boulders Staging Area is reached via a short access road north from SR 74. The Staging Area was constructed approximately five years ago to consolidate staging activities in one location, reducing resource impacts (T. Bickauskas, BLM, personal communication August 3, 2012). The Boulders Staging Area itself is a developed facility located on BLM managed land within the Hieroglyphics RMZ and north of SR 74. The Boulders Staging Area provides

access to OHV trails ranging in difficulty that traverse the area between Lake Pleasant to the east, Wickenburg to the west, and Prescott National Forest to the north (AGFD 2011a). All OHV travel is limited to existing trails. Amenities within the staging area facility include camping facilities, a rest room, and an information kiosk that provides a map showing riding trails, OHV guidelines, and safety information. OHV recreationists basing from The Boulders Staging Area are able to access trails within the Castle Hot Springs SRMA, Hieroglyphic Mountains RMZ, and Baldy Mountain RMZ.

Visitation statistics for The Boulders Staging Area are presented in **Table 3.9-1**.

Table 3.9-1 Visitation Statistics for The Boulders Staging Area

FISCAL YEAR	VISITOR DAYS
2009	26,050
2010	39,759
2011	48,584

Source: M. Skordinski, BLM, personal communication September 5, 2012.

Counts for visitor days at The Boulders Staging Area began when the area was completed in 2008. Visitor use of the area increased dramatically as a result of:

- The site being publicized by local businesses
- BLM manning the site with a host, which led to increased safety and good visitor behavior
- Discontinuation of recreational use of State Trust lands south of SR 74 (T. Bickauskas, BLM, personal communication September 5, 2012).

A recreation permit is required to access State Trust lands north of SR 74; State Trust lands south of SR 74 were closed to OHV recreation approximately four years ago. At that time recreational use at The Boulders Staging Area approximately tripled. Recreational use at The Boulders Staging Area now reaches capacity on many holiday weekends. (T. Bickauskas, BLM, personal communication August 3, 2012).

Approximately half of the OHV riders basing out of The Boulders Staging Area stay in relatively close proximity to the Staging Area. OHV riders seeking casual, less challenging routes, as well as riders seeking a more challenging experience, use this southern portion of the SRMA, in relatively close proximity to SR 74. Casual riders tend to prefer riding in the sandy wash bottoms of this area. Riders seeking a more challenging experience tend to venture north, further away from the staging area and the proposed Project (T. Bickauskas, BLM, personal communication August 13, 2012).

An area of State Trust lands is contained within the Castle Hot Springs SRMA north of The Boulders Staging Area and can be accessed for OHV recreation; however, an additional

permit from the State is required. OHV recreation on State Trust lands south of SR 74 is not authorized (T. Bickauskas, BLM, personal communication August 3, 2012).

The BLM HFO has identified preliminary route designations through the Route Evaluation Process for existing roads, primitive roads, and trails used for OHV recreation. The preliminary routes that have been identified in the Study Area generally occur north of SR 74 (**Figure 3.9-3**). The single-track routes in the Study Area receive moderate use and the tertiary unpaved routes receive moderate to heavy use. The miles of routes and the route designations that occur within the Study Area are described in **Table 3.9-2**.

Table 3.9-2 Preliminary Route Designations within the Study Area

ROUTE DESIGNATION	MILES
Primary Road Paved: Major/minor highway. Provides access between major points. Serves a large area, with many roads branching from it.	7.8
Secondary Road Unpaved: Generally a regularly maintained one-lane road, with other roads of lesser quality branching from it. Connects primary roads and major points.	3.5
Tertiary Road Unpaved: Generally a two-track that may or may not be usable by a two-wheel drive vehicle. Generally, formal maintenance is not performed on this type of route.	44.3
Single Track: Hiking and biking; too narrow for a truck and, most times, an ATV. Can be up to 0.5 meter wide, not allowing ATVs or trucks.	12.2
Reclaiming: Has not been used enough so that there is intact woody vegetation growing that would be damaged by the passage of a vehicle. Erosion and vegetation may block way, cause vehicle to get stuck and/or cause damage to vehicle.	5.2
Total	**73.0**

Source: BLM 2010a

The Route Evaluation Process did not identify all OHV routes used in the area managed by the BLM; there are other existing routes that are used but are not identified on the map or assigned a route designation.

Single-track trails differ from two-track trails in the type of riding experience they offer. While motorcycle users may travel two-track trails to reach an area, they ride single-track trails for the recreation experience. Conversion of single-track to two-track trails changes the nature of the trail and the experience for the single-track rider, and leads to user conflicts. A portion of the OHV area east of The Boulders Staging Area and north of SR 74 is managed by the BLM for single-track use. Four-wheel OHVs are prohibited from accessing the single-track area in order to protect the single-track trails from conversion to two-track and to prevent user conflicts (T. Bickauskas, BLM, personal communication August 3, 2012).

Four-wheel OHV users are looking for a variety of experiences in their recreational use of the area. Despite the relatively close proximity of SR 74 to the trails, the highway is not visible, and the area feels remote. Some OHV recreationists use their OHVs to travel long

distances and access areas where they can then hike. Also routes close to The Boulders Staging Area and SR 74 are sometimes used for hiking.

3.9.4.2 Target Shooting

Target shooting is a popular recreation activity in the Study Area, and frequently occurs on Church Road on BLM managed public lands (T. Bickauskas, BLM, personal communication August 3, 2012). The Bradshaw-Harquahala RMP specifies that target shooting be conducted in accordance with State law, which prohibits firing weapons at a residence or across a road. The RMP specifies that weapons are not to be fired within ¼-mile of any residence or occupied structure (BLM 2010a).

3.10 SOCIOECONOMICS AND ENVIRONMENTAL JUSTICE

3.10.1 Overview

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Socioeconomics and Environmental Justice, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012g). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

3.10.2 Applicable Laws, Rules, and Standards

Several county and local jurisdictions would be crossed by the Proposed Action route and other Action Alternative routes. Many of the goals, objectives, and policies set forth in the plans associated with these jurisdictions are related to socioeconomics.

As directed in Executive Order 12898, signed by President Clinton in 1994, Environmental Justice (EJ) is concerned with the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic groups, should bear a disproportionate share of negative environmental consequences resulting from industrial, municipal, utility, or commercial operations. The objective of EJ analysis is to identify minority and low-income populations potentially affected by a proposed project in order to determine whether a disproportionate impact to these populations may result.

The Bradshaw-Harquahala RMP/EIS (BLM 2008c) identified relevant human resource units (HRUs) for communities in the area, which are used in the analysis. A higher resolution analysis is then performed based on U.S. Census tract block groups.

3.10.3 Socioeconomic and Environmental Justice Study Areas

3.10.3.1 Socioeconomics

The Study Area for socioeconomics is located within Maricopa County, wherein any potential impacts of Project decisions would likely occur. The Bradshaw-Harquahala RMP/EIS (BLM 2008c) examined potential socioeconomic impacts in this same area and identified relevant HRUs for communities in the area (Kent and Preister 1999). Communities located within the same HRU are assumed to have a shared sense of place and sense of

identity with respect to the land and people. This leads to a shared sense of understanding of the priorities surrounding how the resources of their HRU should be managed. The Study Area spans three HRUs—Wickenburg, Lake Pleasant, and Buckeye, as adopted in the Bradshaw-Harquahala RMP/EIS and shown in **Figure 3.10-1**. These HRUs are primarily located within Maricopa County (the county with the highest population in the State of Arizona, and the fourth most populous county in the United States). Furthermore, Arizona's largest and most economically important city (Phoenix) is located within Maricopa County.

Nine communities have been identified within these three HRUs. These communities are either incorporated or unincorporated cities and intersect or are in close geographic proximity to the Proposed Action and Action Alternative routes (**Figure 3.10-1**). Within the Pleasant Lake HRU, the communities identified are Peoria, Surprise, Sun City West, El Mirage, Wittmann, and Circle City. Buckeye was identified as the only community within the Buckeye HRU. The Wickenburg HRU includes the communities of Wickenburg and Morristown.

Data sources used to characterize these communities include the 2000 and 2010 Census and the 2005-2009 and 2006-2010 American Community Survey (ACS)[1] as well as data from the Bureau of Labor Statistics, Arizona Department of Commerce, and Arizona Office of Employment and Population Statistics. For the communities of Wittmann, Circle City, and Morristown, some information was not directly available because they are not defined as municipalities or a Census place. Therefore, these areas were approximated using Census blocks. However, Census block level data are only available for the 2000 and 2010 Census, so these communities had to be combined and examined within a single Census tract when ACS data were used.

3.10.3.2 Environmental Justice

The Study Area for EJ is referred to as the three-mile Study Area and is defined as all Census tracts that fall within a three-mile radius of the Proposed Action and all Action Alternative routes. This area is assumed to encompass the potential impact area (see **Figure 3.10-1**). The HRU's used in the analyses in **Sections 3.10.8.1** and **3.10.8.2** are informative, but a better fit for the three-mile Study Area was conducted using Census 2010 census tract block groups, which use smaller groups and provide finer resolution data. All of the census tract block groups that are wholly or partly within the three-mile Study Area were analyzed for low income and minority populations. The results of this analysis are in **Section 3.10.8.3**.

3.10.4 Socioeconomic Conditions

3.10.4.1 Populations

Population estimates and projections for the Study Area were collected from the U.S. Census Bureau (U.S. Census) and the Arizona Office of Employment and Population Statistics. **Table 3.10-1** summarizes these population data.

[1] 2006-2010 ACS data are a representation of the average value over a five-year period.

Table 3.10-1 Population and Population Growth

PLACE	TOTAL POPULATION			PERCENT GROWTH	
	2000[a]	2010[a]	2030[b]	2000-2010	2010-2030
United States	281,421,906	308,745,538	363,584,435[c]	9.7%	15.1%[c]
Arizona	5,130,632	6,392,017	10,347,543	24.6%	61.9%
Maricopa County	3,072,149	3,817,117	6,135,000	24.2%	60.7%
Lake Pleasant HRU					
Peoria	108,364	154,065	306,070	42.2%	98.7%
Surprise	30,848	117,517	401,458	281.0%	241.6%
Sun City West	26,344	24,535	NA	-6.9%	NA
El Mirage	7,609	31,797	38,717	317.9%	21.8%
Wittmann	670	763	NA	13.9%	NA
Circle City	528	518	NA	-1.9%	NA
Buckeye HRU					
Buckeye	6,537	50,876	419,146	678.3%	723.9%
Wickenburg HRU					
Morristown	112	227	NA	102.7%	NA
Wickenburg	5,082	6,363	17,732	25.2%	178.7%

Sources: [a] U.S. Census Bureau 2000, 2010a, [b] Arizona Office of Employment and Population Statistics 2007. [c] U.S. Census Bureau 2005.
NA – Projections not available.

Between the years 2000 and 2010, the community of Buckeye within the Buckeye HRU experienced the fastest growth, with an increase of 678 percent as shown in **Table 3.10-1**. This growth is much higher than the growth experienced in the state (24.6 percent), Maricopa County (24.2 percent), and nation (9.7 percent) as a whole. Additionally, some of the identified communities within the Lake Pleasant HRU also experienced this rapid growth including Surprise (281 percent) and El Mirage (318 percent).

As shown in **Table 3.10-1**, projected population growth in the Study Area is expected to continue at a rapid rate into 2030. All communities where data were available are expected to grow at a faster rate than the state and county, except for the City of El Mirage.

3.10.4.2 Employment and Earnings

Employment and earnings data by industry are available from the Bureau of Economic Analysis by Metropolitan Statistical Area (MSA) and for the county as a whole, which limits the ability to compare differences across the HRUs. Given that portions of the Study Area lie outside the Phoenix MSA, only data for Maricopa County are presented in **Table 3.10-2**.

Within Maricopa County, the largest and most highly compensated economic sector is the Finance, Insurance, and Real Estate sector. This sector accounted for 30.4 percent of all employment and 31.8 percent of all wages earned in 2009. The second largest sector of the county's economy is the Trade sector, which includes both retail and wholesale trade activities. In 2009, Trade accounted for 15.5 percent of all employment and 14.1 percent of all wages earned.

Major changes in the county's economic sectors from 2001 to 2009 include a decline in the percentage of people employed, as well as earnings, in the construction sector. Employment and earnings in the Manufacturing sector also decreased falling from 8.2 percent of employment in the county in 2001 to 5.4 percent in 2009.

In contrast, the Health Care sector experienced an increase in total employment and earnings, growing from 7.5 percent of employment in 2001 to 9.9 percent in 2009. Earnings in this sector, as share of total earnings in the county, increased from 7.9 percent in 2001 11.6 percent in 2009.

Employment and earnings in other sectors remained relatively constant.

Table 3.10-2 Employment and Earnings by Industry Sector for 2001 and 2009

SECTOR	MARICOPA COUNTY			
	2001	2009	2001	2009
TOTALS (IN DOLLARS AND EMPLOYEES)	**$79,177,485**	**$108,045,920**	**1,896,642**	**2,148,540**
	EARNINGS BY %		**EMPLOYMENT BY %**	
Farm, Agricultural Services, Forestry, and Other	0.5%	0.2%	0.6%	0.4%
Mining	0.2%	0.4%	0.2%	0.3%
Construction	9.7%	6.7%	7.9%	5.9%
Manufacturing	11.8%	8.5%	8.2%	5.4%
Transportation and Public Utilities	4.3%	4.4%	3.6%	3.5%
Retail and Wholesale Trade	14.7%	14.1%	15.8%	15.5%
Finance, Insurance, and Real Estate	31.0%	30.4%	30.8%	31.8%
Education	0.8%	1.7%	1.2%	2.1%
Health Care	7.9%	11.6%	7.5%	9.9%
Arts, Hospitality and Other	8.0%	8.2%	13.9%	14.3%
Government	11.3%	13.8%	10.3%	10.9%

Sources: Bureau of Economic Analysis 2001, 2009

Levels of unemployment provide an understanding of community character. Unemployment data for the smaller communities in the Study Area such as Sun City West, Wittmann, Circle City, Morristown, and Wickenburg were not available for the year 2010. The older data sources available were all pre-2008 and would not demonstrate the effects of the current economic recession and therefore do not serve as a viable substitute in this instance.

Unemployment rates in Arizona and Maricopa County are currently high with both having an unemployment rate over nine percent in 2010 (see **Table 3.10-3**). Of all the communities within the Lake Pleasant HRU, only Peoria has an unemployment rate below that of the state and county averages. Therefore, it is not unreasonable to assume similar trends for the communities where current unemployment data were not available.

Table 3.10-3 Number Employed and Unemployment Rate

PLACE	EMPLOYED	UNEMPLOYMENT RATE
United States	139,064,000	9.6%
Arizona	2,859,967	10.0%
Maricopa County	1,816,882	9.1%
Lake Pleasant HRU		
Peoria	72,873	6.5%
Surprise	31,322	11.3%
Sun City West	N/A	N/A
El Mirage	9,894	13.6%
Wittmann and Circle City	N/A	N/A
Buckeye HRU		
Buckeye	19,070	11.4%
Wickenburg HRU		
Morristown	N/A	N/A
Wickenburg	N/A	N/A

Source: Bureau of Labor Statistics 2010
N/A = Not Available

3.10.4.3 Housing Values

Median housing values within the Study Area, as well as throughout the State of Arizona, have substantially increased from the year 2000, even considering the housing price decline at the end of the previous decade. In 2010, the median housing value in Maricopa County was $180,800, 40 percent higher than values in the year 2000 (U.S. Census Bureau 2010a). Data are only available at the community level for 2005-2009. To get a sense of the difference between 2010 and 2005-2009 data, the 2005-2009 median housing value for Maricopa County was $243,300 or 35 percent higher than the 2010 median housing value. This decrease in median housing value between 2005-2009 and 2010 is related to the general economic conditions that affected housing values nationwide. With this decrease in mind, the

2005-2009 housing values for communities are presented in **Table 3-10.4**, and while high on an absolute level, they provide an accurate relative comparison of values between these communities.

Overall, communities within the Wickenburg HRU experienced the smallest increase in median housing values as a whole when compared to the other HRUs. However, housing values within the Wickenburg HRU communities were generally higher than in the other HRUs. The communities of Buckeye and El Mirage experienced the highest increase in housing values, which is most likely correlated to the large increase in population experienced in these communities.

Table 3.10-4 Housing Values 2000 and 2005-2009

PLACE	VALUE 2000	VALUE 2005-2009	CHANGE IN VALUE
United States	$119,600	$185,400	55.0%
Arizona	$121,300	$218,400	80.0%
Maricopa County	$129,200	$243,300	88.3%
Lake Pleasant HRU			
Peoria	$127,000	$244,800	92.8%
Surprise	$128,300	$247,300	92.8%
Sun City West	$142,900	$216,400	51.4%
El Mirage	$82,700	$186,200	125.2%
Wittmann and Circle City*	$167,300	$272,800	63.1%
Buckeye HRU			
Buckeye	$86,400	$210,500	143.6%
Wickenburg HRU			
Morristown*	$167,300	$272,800	63.1%
Wickenburg	$150,100	$243,900	62.5%

Sources: U.S. Census Bureau 2000; U.S. Census Bureau 2005-2009 American Community Survey
*Information was not available at the Census block or block group level, so Census tracts were used to most closely approximate the characteristics of these communities. Given the close proximity of these communities, all three are within the same Census tract.

3.10.5 Fiscal Conditions

The key fiscal conditions examined below are property taxes and State Trust lands. An understating of the primary revenue resources for local governments is important so that the context of any effects to these revenues sources can be identified. The transfer of land ownership from either the federal government or the ASLD is not anticipated. Rather, APS

would secure an easement on the land required for the Proposed Action or the Action Alternative routes.

3.10.5.1 Property Taxes

The primary sources of tax revenue for Maricopa County include property taxes, state shared sales tax, licenses, permits, fees and charges for services, and grant payments from other governments.

Of the $2.3 billion budget for Maricopa County for the fiscal year 2012, property taxes, penalties, and interest account for 21.3 percent (Arizona Department of Revenue 2010). Approximately $1.23 billion or 52.8 percent of the total budget is allocated for public safety. For the 2010 tax year, the net property valuation for Maricopa County was approximately $46,842 million. The net property valuation for the state was approximately $71,371 million for that same year.

Table 3.10-5 presents the property tax rates for six of the nine communities identified within the Study Area (information was not available for Wittmann, Circle City, and Morristown). Tax rate distributions for revenues to school districts, city/county fire, and countywide were collected for each of the six communities. These values were averaged to obtain an overall average for the Study Area.

Table 3.10-5 Average Property Tax Rate Calculations (Percent)

PLACE	PROPERTY TAX CATEGORY			TOTAL
	School District	City/County Fire	Countywide	
Buckeye	2.90	0.90	2.33	6.13
El Mirage	5.62	0.98	2.33	8.93
Peoria	5.72	1.44	2.33	9.49
Sun City West	5.60	1.76	2.33	9.69
Surprise	4.75	0.61	2.33	7.69
Wickenburg	4.75	0.48	2.33	7.56
Average	**4.89**	**1.03**	**2.33**	**8.25**

Source: Arizona Department of Commerce 2009

Table 3-10.6 provides estimates of tax revenues of the private property potentially affected by the Proposed Action and Action Alternative routes. Assuming an average tax rate of 8.25 percent, from above, the maximum annual tax income generated from the private properties would be approximately $289,151 for the Proposed Action and ranges up to $919,151 for Alternative 3.

Table 3.10-6 Private Land Characteristics

	LENGTH (MILES)*	ACREAGE (ACRES)	VALUE	TAX REVENUE
Proposed Action	4.4	106.67	$3,504,856	$289,151
Alternative 1	4.4	106.67	$3,504,856	$289,151
Alternative 2	7.6	184.22	$7,573,319	$624,799
Alternative 3	9.3	255.43	$11,020,016	$919,151

Source: APS 2011a

*This distance represents the number of Project miles crossing privately owned land.

3.10.5.2 State Trust Land

The Arizona State Trust land is managed by the ASLD. The ASLD's mission is to manage the State Trust lands and to maximize its revenues for the beneficiaries. Out of a total of approximately 9.2 million acres, common schools[2] are the beneficiaries for about 8.1 million acres, or 87 percent of the State Trust lands. Other beneficiaries include normal school grants, agricultural and mechanical colleges, School of Mines Grant, and the University Land Code (ASLD 2011b). While public use of State Trust land is not prohibited, it is regulated to ensure protection of the land and to reimburse the beneficiaries for its use.

In order to generate revenue, State Trust land is either leased for its highest and best use or sold to the highest bidder at public auction, which is mandated by law. Most of State Trust lands are currently usable only for livestock grazing purposes.

Approximately 8.4 million acres of State Trust land is leased for livestock grazing, often as part of a ranching operation with associated private and federal land. State Trust land grazing leases are issued for a term of 10 years or less, and some have been held by ranching families for multiple generations. Today the ASLD's urban lands lease and sale program is the largest revenue producer for the Trust. Nearly all of the most valuable urban State Trust lands are located around the northern border of the Phoenix metropolitan area and common schools are the beneficiaries (ASLD 2011b).

The beneficiaries of the revenue generated by these activities are common schools in the state. The total revenue generated from State Trust lands in 2010 was $9,258,071. The common schools in Arizona received $2,042,615 in revenue generated from grazing leases on State Trust land in 2010 (Maricopa County 2011).

[2] The ASLD defines common schools as all public schools K-12 and normal schools as schools that train teachers (ASLD 2011b).

3.10.6 Recreation Expenditures

Open space, parks, and recreational opportunities are very important to Arizona residents and the Arizona economy. In Arizona, 5.5 million active outdoor recreation participants generate approximately $350 million in state tax revenue, $5 billion in retail services, and support 82,000 jobs across the state every year (Outdoor Industry Foundation 2010). Recreational activities on public lands, which make up 40 percent of the state, contribute about $2 billion to Arizona's economy (DOI 2011). The estimated recreational use of public lands managed by the BLM in Arizona was 5,581,000 visits in 2010 (BLM 2010b). Approximately 2.3 million people visit Arizona state parks each year, and state residents account for about half of visitors, while 43 percent are from out of state, and 7 percent are international tourists (ASU 2009).

A telephone survey conducted by Arizona State University in 2006 revealed that the Maricopa County Parks system received 1,255,733 visits that year (ASU 2006). The Project Area is just south of The Boulders Staging Area (discussed in **Section 3.9**), which has 30,000 visitor-days per year. It is estimated that 25 to 50 percent of visitors to this site use the southern trails that extend into the Project Area (T. Bickauskas, BLM, personal communication, February 2012).

The Environmental Resource Report for Land Use, Recreation, and Special Designations (URS 2012a) describes how recreational land has both developed and undeveloped uses, including golf courses, parks, campgrounds, and trails. These areas provide a variety of recreational opportunities such as hiking, wildlife viewing, and OHV use. All of the federally managed lands within the Study Area allow recreationists a high degree of interaction with the natural environment through hiking, hunting, and the use of motorized equipment. The adjacent lands are characterized by the large presence of human activity dependent on facility or vehicle use, such as vehicle sightseeing, horseback riding, golf, and swimming. These land types attract many visitors due to the OHV recreation opportunities. In Maricopa County, OHV recreation activities produced $1.4 billion for the local economy and supported 13,111 jobs in the region in 2003 (Arizona State Parks 2003).

The state parks found within the Study Area are White Tank Mountain and Lake Pleasant Regional Parks (URS 2012a). In the fiscal year of 2010, Lake Pleasant Regional Park attracted 623,294 visitors who participate in boating, fishing, water sports, as well as hiking, camping, and wildlife viewing. No OHV use is allowed in Lake Pleasant Regional Park. White Tank Mountain Regional Park had 188,911 visitors who use the park trails for recreational activities such as hiking, biking, horseback riding, and camping. There is one island of State Trust lands within the Castle Hot Springs SRMA and OHV recreationists would access that area by basing out of The Boulders Staging Area; however, a separate permit is required. See **Section 3.9 Recreation**.

3.10.7 Property and Land Values

Given the importance of concerns related to property-value impacts resulting from the Project, a literature review was conducted to summarize related research and empirical studies on the impact of transmission lines on property values. The results of all the studies cited in this section are provided in **Appendix 3A**.

Studies on the implications of transmission lines identified three main factors that affect property values. These are health and safety concerns, visual impacts, and proximity to the transmission line.

3.10.7.1 Health and Safety Concerns and Impacts on Property Values

Many of the research surveys outlined in **Appendix 3A** show that some survey respondents mentioned health and safety as a top concern regarding a property near a transmission line (BLM 2011d, Delaney and Timmons 1992, Kung and Seagle 1992, Priestly and Evans 1996, Bond and Hopkins 2000). These studies indicate the evidence of a substantial direct effect on property values is uncorroborated. However, a literature review of studies relating to the topics of EMFs and stray voltage and public perception indicates a "fear" of high voltage power lines, citing health concerns as the primary factor (Kielisch 2011).

3.10.7.2 Visual Impacts

The visual impact of transmission lines is another factor to evaluate when examining the effects on property values. A review of the literature shows no definitive pattern between visual impacts and property values.

Many respondents to survey-based studies and participants in the 2011 Public Scoping Report were concerned with how the visual obstruction to scenic views caused by the transmission line would negatively affect the aesthetics of the surrounding area and the property values of those closest to the lines (BLM 2011d, Priestly and Evans 1996, Solum 1985, Delaney and Timmons 1992, Kung and Seagle 1992, Rhodeside & Harwell 1988, Economics Consultants Northwest 1990, Beauregard Conseil Enr 1990, Bond and Hopkins 2000, Pitts and Jackson 2007). Residents of Vistancia, in particular, expressed concern about the extent to which the transmission line would obscure their scenic views.

In comparison, some studies have shown that removal of existing vegetation during the construction of the transmission line improves visual clearance, and is viewed by the property owner as a positive outcome, depending on how the lines blend in with the characteristics of the surrounding topography (Des Rosiers 2002). A third perspective in case studies on the effects of visual impacts and property values is one that does not find the transmission lines disruptive to the aesthetics of the area (Public Service Commission of Wisconsin 2011). Therefore, the extent of visual impacts of transmission lines and changes in property values is largely dependent on the perspective of the individual property owner and does not produce identical behavior in every location or situation.

The attitudinal case studies that focus on the perceived effects of visual and health concerns of transmission lines are generally regarded as less sophisticated than the regression-based research because they over-estimate the negative impacts and do not accurately quantify the market behavior of property buyers (Kroll and Priestly 1991). This is because perceptions about transmission lines are diverse and result in varying financial responses. The significant concerns about the impact of transmission lines voiced by appraisers and property owners (the stated preferences) do not always correspond with actual property sales data (the revealed preferences) because the adverse impacts may be offset by a number of other factors related to pricing decisions (Jackson and Pitts 2010).

3.10.7.3 Proximity and Property Values

Proximity of a property to a transmission line could be a significant factor for impacts on property values. As seen in **Appendix 3A**, about half of the reviewed studies found that proximity had little to no effect on actual property sales (Rigdon 1991, Jackson 2010, Chalmers and Voorvaart 2009, Wolverton and Bottemiller 2003, Kinnard and Dickey 1995). However, some studies did find that proximity had a significant impact on property values with varying levels of negative effects: properties close to a transmission line lost between 2.8 percent and 30 percent of their value (Bond and Hopkins 2000, Colwell 1990, Hamilton and Schwann 1995, Des Rosiers 2002, Boyer 1978, Goodrich-Mahoney 2003, Davis 2008, Davis 2010, Bolton and Sick 1999).

A pattern of specific distance impacts emerged from the studies that found proximity to have an effect on property values. Overall, properties within 50 feet of the transmission line experienced the most negative effect on price, while those 50 to 200 feet from the transmission line experienced small negative price effects, and the properties beyond 200 feet did not experience any negative price effects. The effects of proximity to a transmission line are therefore amplified within dense, urban settings where many properties will be close to the transmission line. This effect may not be as relevant to rural locations, such as the Project Area, where there are typically fewer properties within close proximity to each transmission line.

While most of the studies that examine effects on values focus on residential properties, a few have examined the effects on undeveloped and vacant land (Jackson 2010, Rigdon 1991, Solum 1985). These studies show that the relationship between sales price and proximity to a transmission line were not statistically significant. However, a study of large tracts of agricultural land in Southwest Indiana completed in 2010 showed that agricultural land located near transmission lines could be negatively affected with an impact range of -5 percent to -36 percent with an average of -20 percent (Kielisch 2011).

3.10.8 Nonmarket Values Associated with Health and Safety, Recreation Use, and Natural Amenities

The value of resource goods traded in a market can be obtained from information on the quantity sold and market price; however, markets do not exist for some resources, such as recreational opportunities and environmental services. Measuring their value is important, since without estimates, these resources may be implicitly undervalued and decisions regarding their use may not accurately reflect their true value to society. Because these recreational and environmental values are not traded in markets, they can be characterized as non-market values.

Some people may value BLM property that is associated with a transmission line less because of health concerns, visual obstruction, and changes to recreation. Others may value the benefits of increased access to adjacent lands or extra space and light that are a result of proximity to a transmission line (Furby et al. 1988). Besides improving access for recreational activities, transmission lines can impact the surrounding ecosystem in both beneficial and detrimental ways. The construction of a transmission line often involves

habitat disturbance and destruction. However, transmission lines can also provide bird habitats, wildlife corridors, and opportunities for vegetation growth.

3.10.8.1 Health and Safety Concerns

Health and safety was a major area of concern of the respondents in the 2011 Public Scoping Report (BLM 2011d) and other survey-based research studies. These concerns were primarily related to the potential health impacts resulting from exposure to EMFs. However, many commenters had mistakenly thought that the Proposed Action and/or the Action Alternatives for placement of the power line would be very near their existing dwellings, when in fact the line could be several miles distant.

Many scientific studies have attempted to determine whether there is a connection between exposure to electromagnetic radiation emitted by transmission lines and health hazards. The 1999 (a and b) NIEHS expert group research assessed the health effects of exposure to the EMFs emitted from transmission lines and concluded that evidence is not sufficient to establish a definitive cause and effect relationship. The International Agency for Research on Cancer came to a similar conclusion (Kheifets 2001). For some members of the general public, the potential health risks of exposure to EMFs, whether conclusive or not, remains a concern and affects their interest in properties near transmission lines.

3.10.8.2 Recreation Use

Non-market values, as they relate to recreation, can be broken down into two categories, use and non-use values. The use-value of a non-market good is the value to society from the direct use of the asset; within the Study Area this occurs through activities such as recreational fishing, hunting, and bird watching. The use of non-market goods often requires consumption of associated market goods, such as lodging, gas, and fishing equipment. Non-market use and non-use values can be distinguished by the methods used to estimate them. Use values are often estimated using revealed preference methods or stated preference methods while non-use values can only be estimated using hypothetical methods (willingness-to-pay or contingent valuation). While use and non-use values exist for the Study Area, an evaluation is not always feasible during the planning process. However, this does not preclude their consideration in the planning process.

Contingent Valuation

A study of OHV recreation activity in the Mojave National Preserve in California, showed recreationists visiting the area spent a total of $407 million in 2003 (Kroeger and Manalo 2007). The same study also reveals the net economic value of OHV recreation in Arizona was $61 per day. Contingent valuation estimates derived from OHV recreation in Utah showed net economic values are between $55.60 and $85.80 per trip (Jakus and Keith 2010). The research also showed that changing access to public lands used for OHV from “open” to “limited” resulted in relatively small welfare losses ($0.94 per trip), but that completely prohibiting access resulted in much larger welfare losses ($1.22 per trip) - a reduction of 1.4 percent to 2.2 percent per trip.

Another study examined contingent valuation of OHV recreation in Arizona and found high net economic values. A pooled sample of all types of OHV’s, including all-terrain vehicles,

dirt bikes, and dune buggies, show that the average Arizona net economic value per OHV trip was $68 (Silberman and Andereck 2006). These values are notable for the Project because they were gathered in Arizona, where more than 20 percent of the population participates in OHV recreation.

3.10.8.3 Natural Amenities

Natural amenities such as access to public lands have been shown to influence regional population distribution and economic growth. Research in migration trends over several decades appear to be tied to household preferences for amenities, which were determined to be just as important as employment opportunities (Mueser and Graves 1995). Location-specific amenities can also drive firm location decisions and the demand for labor in an area (Knapp and Graves 1989). The draw of natural amenities is especially powerful in rural counties, where population change and relocation of employers have been strongly related to the attractiveness as a place to live (McGranahan 1999). Studies undertaken in Arizona support these findings. Public surveys conducted in conjunction with the 2008 SCORP (Arizona State Parks 2007) described four different recreation settings:

- Large, nature-oriented parks with few buildings primarily used for hiking, picnicking, or camping
- Open spaces in natural settings with very little development
- Large, developed parks with many facilities and uses
- Small neighborhood parks that have only a few facilities.

Survey respondents were asked to rate the statements regarding the settings on a scale of 1 *not important* to 5 *extremely important*. When asked the importance of different recreation settings, survey respondents from Maricopa County ranked all four settings very high; however, the responses were noticeably higher in support of two settings: *large nature-oriented parks* (4.27) and *open spaces in a natural setting* (4.18).

When asked a series of issue statements, the statement, "If I bought a house in my community, having open space nearby would be a top priority" scored highest (3.93) by survey participants from Maricopa County.

However, an increase in recreational activity enabled by a transmission line may also result in expanded habitat degradation of endangered species. In *Center for Biological Diversity, et al., v Bureau of Land Management, et al.* (2005) the court ruled in favor of the environmental organizations that claimed BLM and the USFWS violated the ESA by failing to adequately protect the desert tortoise and Peirson's milk-vetch because the management plan for OHV recreation in the affected environment did not have adequate safeguards to ensure the species' continued existence. This is an important consideration for the Project because the transmission line would cross desert tortoise habitat and some respondents were concerned about the impacts on recreation and the surrounding ecosystem.

Overall, the impacts of a transmission line on the surrounding natural amenities and ecosystem services depend on the existing environmental conditions and land uses. Non-use values of a non-market good, such as natural amenities, reflect the value of an asset beyond any use. These can be described as existence, option, and bequest values. Existence values are the amount society is willing to pay to guarantee that an asset simply exists. An existence value of BLM lands within the an area might be the value of knowing that undisturbed archeological sites or San Joaquin Kit Fox habitat exists on BLM lands. Other non-use values are thought to originate in society's willingness to pay to preserve the option for future use; these are referred to as option values and bequest values. Option values exist for something that has not yet been discovered, such as the future value of a plant as medicine. In the Study Area, bequest and option values might exist for desert tortoise habitat.

3.10.9 Environmental Justice

3.10.9.1 Minority Populations within the HRUs and Nine Communities

As presented in **Table 3.10-7**, the percentage of minority populations in most of the communities within 10-miles of the Proposed Action and Action Alternatives is below that of both Arizona and Maricopa County. Minority populations in this analysis is defined as all individuals who identify themselves as Hispanic or one of the four racial minority groups used in the 2010 Census. Minority populations accounted for more than 40 percent of the population in both the state and the county. Hispanics were the largest minority group, comprising 29.6 percent of the total population in both the county and state. Within the HRUs examined, the fastest growing communities over the past 10 years (Buckeye and El Mirage) had the highest percentages of minority population. However, El Mirage falls well outside the three-mile Study Area. The Wickenburg HRU had the lowest overall percentage of minority representation compared across the HRUs. As in the state and county, the largest minority group in all nine communities was the Hispanic population.

Table 3.10-7 Minority Representation by Race and Ethnicity – 2010

PLACE	HISPANIC	NON-HISPANIC AFRICAN AMERICAN	NON-HISPANIC NATIVE AMERICAN	NON-HISPANIC ASIAN	NON-HISPANIC ALL OTHERS	TOTAL MINORITY
Arizona	29.6%	3.7%	4.0%	2.7%	2.1%	42.2%
Maricopa County	29.6%	4.6%	1.6%	3.4%	2.2%	41.3%
Lake Pleasant HRU						
Peoria	18.6%	3.2%	0.7%	3.1%	2.2%	27.8%
Surprise	18.5%	4.8%	0.5%	2.5%	2.6%	28.8%
Sun City West	1.2%	0.8%	0.1%	0.6%	0.5%	3.2%
El Mirage	47.6%	6.1%	1.0%	1.5%	2.6%	58.6%
Wittmann	39.2%	0.1%	1.7%	0.7%	1.8%	43.5%
Circle City	22.0%	0.2%	0.8%	1.9%	1.9%	26.8%
Buckeye HRU						
Buckeye	38.3%	6.7%	1.2%	1.7%	2.3%	50.1%
Wickenburg HRU						
Morristown	4.8%	0.0%	0.5%	0.0%	0.5%	5.8%
Wickenburg	13.4%	0.2%	1.2%	0.5%	1.0%	16.3%

Source: U.S. Census Bureau 2010b

3.10.9.2 Low-Income Populations within the HRUs and Nine Communities

As shown in **Table 3.10-8**, between 2005 and 2009, Maricopa County had a slightly lower level of persons living in poverty than the state as a whole,[3] as well as a slightly higher median household income. **Table 3.10-9** presents Federal poverty thresholds that were used by the U.S. Census Bureau in determining poverty status in 2009. The majority of the communities had a lower percentage of persons living in poverty and higher household incomes than both the state and county averages. Communities with a higher percentage of persons living in poverty than Maricopa County as a whole were also the communities with lower median household incomes, specifically El Mirage and Wickenburg.

[3] The Census Bureau uses a set of income thresholds to detect who is poor (see **Table 3.10-3**). If the total income falls below the relevant poverty threshold, then a classification of being below the poverty level is given.

Table 3.10-8 Poverty and Household Income (2005-2009)

PLACE	PERCENT OF PERSONS LIVING IN POVERTY	MEDIAN HOUSEHOLD INCOME
Arizona	14.7	$50,246
Maricopa County	13.3	$55,223
Lake Pleasant HRU		
Peoria	6.3	$65,400
Surprise	7.1	$61,208
Sun City West	3.8	$45,425
El Mirage	18.7	$50,411
Wittmann and Circle City*	7.8	$60,568
Buckeye HRU		
Buckeye	11.4	$61,481
Wickenburg HRU		
Morristown*	7.8	$60,658
Wickenburg	17.1	$42,417

Source: U.S. Census Bureau 2005-2009

*Information was not available at the Census block or block group level, so Census tracts were used to most closely approximate the characteristics of these communities. Given the close proximity of these communities, all three are within the same Census tract.

Table 3.10-9 Poverty Thresholds for 2009 by Size of Family and Number of Related Children Under 18 Years

SIZE OF FAMILY UNIT (# OF PERSONS)	INCOME THRESHOLD	RELATED CHILDREN UNDER 18 YEARS OLD								
		0	1	2	3	4	5	6	7	8 OR MORE
1	$10,956									
2	$13,991									
3	$17,098	$16,781	$17,268	$17,285						
4	$21,954	$22,128	$22,490	$21,756	$21,832					
5	$25,991	$26,686	$27,074	$26,245	$25,603	$25,211				
6	$29,405	$30,693	$30,815	$30,180	$29,571	$28,666	$28,130			
7	$33,372	$35,316	$35,537	$34,777	$34,247	$33,260	$32,108	$30,845		
8	$37,252	$39,498	$39,847	$39,130	$38,501	$37,610	$36,478	$35,300	$35,000	
9 or more	$44,366	$47,514	$47,744	$47,109	$46,576	$45,701	$44,497	$43,408	$43,138	$41,476

Source: U.S. Census Bureau 2012b

3.10.9.3 Environmental Justice Baseline Analysis

Because the HRUs do not provide a very high resolution image of the three-mile Study Area, a second analysis was conducted using Census 2010 census tract block groups. An area was determined to be an EJ community if it had a meaningfully higher percentage of minority or low-income individuals than the county. This was quantified as the Census block groups with minority or low-income populations that were twenty percent greater than the same county population; in addition, this minority population had to comprise at least ten percent of the total population of the block group. This second requirement was necessitated when the initial analysis, based only on the first requirement, was run; it resulted in a large number of minority populations which consisted of less than one percent of the block group populations, which was itself less than 1,000 people. This meant that ten or fewer people could constitute a minority population, which does not meet the standard of being "meaningful greater" population, although the standard is admittedly open to interpretation.

The fact that Census data can only be recorded to certain prescribed levels (e.g., Census block groups) suggests that pockets of minority or low-income communities smaller than block groups may be missed in a Census-based analysis. This restriction was instituted by the Census Bureau to preserve the anonymity of census respondents.

Table 3.10-15 presents the 2010 Census data for the percent of ethnic and racial minority populations by minority group; and 2006-2010 ACS estimates of the percentage of the population in living below the federal poverty level (**Table 3.10-3**) in the block group. The population in the three-mile Study Area is 21.59 percent minority, counting Hispanic, African American, Native American, Asian, and Pacific Islanders as minority groups; this omits the Census 2010 ethnic and racial categories for "Other" and "2 or more," which cannot be identified as specific minority groups. The concentrations of minority and low-income populations in the three mile Study Area are lower than those found in Maricopa County. The population of Maricopa County is 41.3 percent minority and 13.9 percent low-income (U.S. Census Bureau 2010b and U.S. Census Bureau 2006-2010).

Of the 17 block groups located wholly or partially within the three-mile Study Area, one block group was designated an EJ community (Tract Group 040517, Group 1) because it has a low-income population twenty percent above that of the county, and the low-income population constitutes at least ten percent of the total block group population. **Figure 3.10-1** provides the location of the EJ community with the low-income EJ population. The total 2010 census population within the 17 block groups is 39,754. Within the EJ community 710 of the 4,058 residents fell below the poverty threshold.

In **Table 3.10-10**, the minority population is shown in **bold** type.

Table 3.10-10 Minority and Low-Income Percentages in the Three-Mile Study Area

TRACT	BLOCK GROUP	TOTAL POPULATION	MINORITY POPULATION						% LOW INCOME
			% HISPANIC	% AFRICAN AMERICAN	% NATIVE AMERICAN	% ASIAN	% PACIFIC ISLANDS	% TOTAL	
State	AZ	6,392,017	29.65%	4.05%	4.64%	2.76%	0.20%	40.27%	14.70%
County	Maricopa	3,817,117	29.57%	4.99%	2.05%	3.46%	0.20%	41.3%	13.30%
040515	2	2,281	18.85%	0.35%	1.05%	0.75%	0.04%	21.04%	12.70%
040516	1	782	15.22%	1.53%	0.90%	0.90%	0.00%	18.55%	0%
040516	2	2,074	4.68%	2.03%	0.34%	0.92%	0.24%	8.21%	3.85%
040517	1	4,058	22.45%	0.62%	1.23%	0.94%	0.15%	25.39%	**17.50%**
040518	1	1,767	13.70%	0.11%	1.53%	0.17%	0.06%	15.57%	12.21%
040518	2	1,866	15.17%	0.27%	0.43%	0.38%	0.21%	16.46%	2.02%
040519	1	1,785	6.67%	2.07%	0.39%	3.92%	0.06%	13.11%	5.51%
040520	1	2,537	11.43%	3.39%	0.28%	2.80%	0.59%	18.49%	1.60%
040520	2	1,605	8.97%	2.68%	0.12%	5.48%	0.19%	17.44%	2.66%
040521	1	4,560	13.82%	2.08%	0.55%	2.26%	0.07%	18.78%	1.44%
050605	1	2,050	31.46%	4.34%	1.12%	1.61%	0.24%	38.77%	10.04%
050605	2	1,604	25.94%	8.98%	1.25%	2.43%	0.25%	38.85%	3.42%
050605	3	2,174	25.07%	3.91%	1.43%	2.67%	0.18%	33.26%	4.20%
610000	1	1,893	5.39%	0.63%	0.53%	0.69%	0.00%	7.24%	3.84%
610000	2	2,052	27.19%	9.45%	5.90%	1.46%	0.39%	44.39%	4.20%
610800	1	3,505	8.42%	1.74%	0.37%	7.90%	0.06%	18.49%	5.55%
610900	2	3,161	10.16%	2.12%	0.54%	2.94%	0.00%	15.76%	3.56 %

Source: U.S. Census Bureau 2012b and U.S. Census Bureau. 2006-2010.

3.11 SOILS

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Geology, Geologic Hazards, Minerals, and Soils, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012c). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

3.11.1 Laws, Ordinances, Regulations, and Standards

Soil resources and hazards are governed primarily by local jurisdictions. The conservation safety elements of city and county general plans contain policies for protection of geologic features and avoidance of hazards, but do not specifically address transmission line construction projects. Local grading ordinances establish detailed procedures for construction. The following section provides a summary of international, federal, state, and local laws, regulations, and standards that govern soils in the Study Area.

Federal Land Policy and Management Act of 1976, as amended - The FLPMA established policies and goals to be followed in the administration of public lands by the BLM. The intent of the FLPMA is to protect and administer public lands within the framework of a program of multiple-use and sustained yield, and to maintain environmental quality. Particular emphasis is placed on protection of the quality of scientific, scenic, historic, ecological, environmental, air and atmospheric, water resources, and archeological values. The FLPMA dictates how BLM regulates mineral resources extraction on BLM land.

Classification and Multiple Use Act of 1964 - This act authorized the Secretary of the Interior to classify and manage BLM land for retention or disposal and for multiple use, including specification of dominant uses and preclusion of inconsistent uses in an area.

International Building Code - The 2006 IBC is a model building code developed by the ICC. The IBC sets rules specifying the minimum acceptable level of safety for constructed objects such as buildings. It has been adopted throughout most of the United States. The IBC has no legal status until it is adopted or adapted by government regulation. The IBC was developed to consolidate existing building codes into one uniform code that provides minimum standards to ensure the public safety, health, and welfare insofar as they are affected by building construction and to secure safety to life and property from all hazards incident to the occupancy of buildings, structures, or premises. The IBC replaced the UBC in 2000.

Farmland Protection Policy Act of 1981 - The Farmland Protection Policy Act of 1981 is intended to minimize the impact federal programs have on the unnecessary and irreversible conversion of farmland to nonagricultural uses. It assures that—to the extent possible—federal programs are administered to be compatible with state, local units of government, and private programs and policies to protect farmland. Federal agencies are required to develop and review their policies and procedures to implement the Act every two years. For the purpose of the Act, farmland includes prime farmland, unique farmland, and land of statewide or local importance. Farmland subject to the Act's requirements does not have to be currently used for cropland.

Other relevant laws and regulations include the following:

- Public Law 167 of 1955, 30 USC § 601 et seq.
- National Materials and Minerals Policy Research Development Act of 1980
- Materials Act of 1947, 30 USC § 601, as amended
- Section 402 of Reorganization Plan No. 3 of 1946
- 43 CFR 3400, 3500, 3600, 3715, 3802, and 3809

3.11.2 Soil Types Present

The Study Area is characterized by a variety of soils with some mixed bedrock outcrops in the northeastern portion of the Study Area. These soil units are shown on **Figure 3.11-1** and in **Table 3.11-1**. Total acreage of each soil type within the Study Area is also provided in **Table 3.11-1**. The reclamation suitability and erosion potential of the soils is presented in **Table 3.11-2.** The soil types listed in **Table 3.11-1** and **3.11-2** are present within a 0.5-mile area surrounding the Proposed Action route, ACC-certificated route, and the other Action Alternative routes.

Table 3.11-1 Total Acreage of Each Soil Type Within 0.5-mile of All Action Alternative Routes

NUMBER	SOIL TYPE	ACRES
109	Schenco-Rock outcrop complex, 25 to 60 percent slopes	6,280
44	Ebon very gravelly loam, 1 to 8 percent slopes	3,706
45	Ebon very gravelly loam, 8 to 20 percent slopes	3,659
113	Tremant gravelly loams	3,590
52	Gachado-Lomitas-Rock outcrop complex, 7 to 55 percent slopes	2,887
51	Gachado-Lomitas complex, 8 to 25 percent slopes	2,713
98	Pinamt-Tremant complex, 1 to 10 percent slopes	2,210
53	Gadsden clay	2,014
112	Tremant gravelly sandy loams	1,950
74	Luke-Cipriano association, 1 to 15 percent slopes	1,904
22	Contine clay loam	1,405
108	Schenco-Rock outcrop complex, 3 to 25 percent slopes	1,361
75	Mohall loam	1,203
71	Gunsight-Rillito complex, low precipitation, 1 to 40 percent slopes	1,087
119	Tremant-Suncity complex, 1 to 8 percent slopes	1,000

NUMBER	SOIL TYPE	ACRES
48	Ebon-Pinamt complex, 3 to 20 percent slopes	963
58	Gilman-Momoli-Denure complex	876
110	Suncity-Cipriano complex, 1 to 7 percent slopes	870
70	Gunsight-Rillito complex, 1 to 25 percent slopes	829
11	Brios-Carrizo complex, low precipitation, 1 to 5 percent slopes	557
55	Gilman loams	502
76	Mohall loam, calcareous solum	481
3	Antho-Carrizo-Maripo complex	415
18	Cherioni-Rock outcrop complex, 5 to 60 percent slopes	403
13	Carefree-Beardsley complex	397
10	Brios-Carrizo complex, 1 to 5 percent slopes	377
46	Ebon-Contine complex, 1 to 8 percent slopes	354
12	Carefree cobbly clay loam, 1 to 8 percent slopes	338
29	Denure-Momoli-Carrizo complex	318
21	Cipriano very gravelly loam	166
49	Ebon-Pinamt complex, 20 to 40 percent slopes	151
31	Dixaleta-Rock outcrop complex, 25 to 65 percent slopes	83
78	Mohall clay loam, calcareous solum	70
115	Tremant-Antho complex, 1 to 5 percent slopes	49
103	Rock outcrop-Gachado complex, 5 to 55 percent slopes	42
80	Mohall-Tremant complex, 1 to 8 percent slopes	28
124	Valencia sandy loams	22
68	Gunsight-Cipriano complex, 1 to 7 percent slopes	17
23	Contine clay	10
47	Ebon-Gunsight-Cipriano association, 3 to 25 percent slopes	9
1	Antho sandy loams	7
77	Mohall clay loam	5

Source: NRCS (Natural Resources Conservation Service) 2011; SCS (Soil Conservation Service) 1972; SCS 1986

Table 3.11-2 Reclamation Suitability and Erosion Potential

NUMBER	SOIL TYPE	EROSION FACTOR *K*	EROSION POTENTIAL	RECLAMATION SUITABILITY
1	Antho sandy loams	.17-.20	Low	Good
3	Antho-Carrizo-Maripo complex	.02-.24	Low to Mod	Poor
10	Brios-Carrizo complex, 1 to 5 percent slopes	.02-.10	Low	Poor
11	Brios-Carrizo complex, low precipitation, 1 to 5 percent slopes	.02-.10	Low	Poor
12	Carefree cobbly clay loam, 1 to 8 percent slopes	.10-.24	Low to Mod	Poor
13	Carefree-Beardsley complex	.10-.28	Low to Mod	Poor
18	Cherioni-Rock outcrop complex, 5 to 60 percent slopes	N/A	N/A	N/A
21	Cipriano very gravelly loam	.20	Low to Mod	Poor
23	Contine clay	.15-.28	Low To Mod	Poor
22	Contine clay loam	.15-.28	Low To Mod	Fair
29	Denure-Momoli-Carrizo complex	.02-.24	Low To Mod	Poor
31	Dixaleta-Rock outcrop complex, 25 to 65 percent slopes	N/A	N/A	N/A
44	Ebon very gravelly loam, 1 to 8 percent slopes	.02-.10	Low	Poor
45	Ebon very gravelly loam, 8 to 20 percent slopes	.02-.10	Low	Poor
46	Ebon-Contine complex, 1 to 8 percent slopes	.02-.28	Low To Mod	Poor
47	Ebon-Gunsight-Cipriano association, 3 to 25 percent slopes	.02-.20	Low	Poor
48	Ebon-Pinamt complex, 3 to 20 percent slopes	.02-.15	Low	Poor
49	Ebon-Pinamt complex, 20 to 40 percent slopes	.02-.15	Low	Poor
51	Gachado-Lomitas complex, 8 to 25 percent slopes	.02-.15	Low	Poor
52	Gachado-Lomitas-Rock outcrop complex, 7 to 55 percent slopes	N/A	N/A	N/A
53	Gadsden clay	.32	Low To Mod	Poor
55	Gilman loams	.24-.55	Mod To High	Good

NUMBER	SOIL TYPE	EROSION FACTOR *K*	EROSION POTENTIAL	RECLAMATION SUITABILITY
58	Gilman-Momoli-Denure complex	.10-.55	Low To High	Good/Fair
68	Gunsight-Cipriano complex, 1 to 7 percent slopes	.10-.20	Low	Poor
70	Gunsight-Rillito complex, 1 to 25 percent slopes	.10-.32	Low To Mod	Poor
71	Gunsight-Rillito complex, low precipitation, 1 to 40 percent slopes	.10-.32	Low To Mod	Poor
74	Luke-Cipriano association, 1 to 15 percent slopes	.20-.37	Low To Mod	Poor/Fair
75	Mohall loam	.05-.32	Low to Mod	Fair
76	Mohall loam, calcareous solum	.05-.32	Low to Mod	Fair
77	Mohall clay loam	.05-.32	Low to Mod	Fair
78	Mohall clay loam, calcareous solum	.05-.32	Low to Mod	Fair
80	Mohall-Tremant complex, 1 to 8 percent slopes	.05-.32	Low to Mod	Fair/Poor
98	Pinamt-Tremant complex, 1 to 10 percent slopes	.05-.32	Low to Mod	Poor
103	Rock outcrop-Gachado complex, 5 to 55 percent slopes	N/A	N/A	N/A
108	Schenco-Rock outcrop complex, 3 to 25 percent slopes	N/A	N/A	N/A
109	Schenco-Rock outcrop complex, 25 to 60 percent slopes	N/A	N/A	N/A
110	Suncity-Cipriano complex, 1 to 7 percent slopes	.20-.32	Low to Mod	Poor
112	Tremant gravelly sandy loams	.28-.32	Mod	Poor
113	Tremant gravelly loams	.28-.32	Mod	Poor
115	Tremant-Antho complex, 1 to 5 percent slopes	.20-.32	Low to Mod	Poor/Good
119	Tremant-Suncity complex, 1 to 8 percent slopes	.10-.32	Low to Mod	Poor
124	Valencia sandy loams	.20-.32	Low to Mod	Good

Source: SCS 1986

3.11.3 Soil Hazards

3.11.3.1 Expansive (Shrink-Swell) Soils

Expansive soils shrink or swell with changes in moisture content. This characteristic is typically associated with high clay content soils. Changes in soil moisture could result from a number of factors, including rainfall, landscape irrigation, utility leakage, and/or perched groundwater. Expansive soils are typically very fine-grained with high to very high percentages of clay. In central Arizona, the soils encountered in the areas of the Project and Action Alternative routes exhibit expansion potential that is generally low or low to moderate (AZGS 2002). Damage to structures can be related to soil characteristics, with expansive (shrink-swell) soils and collapsing soils causing the most problems. The causes of soil expansion or collapse are related to the type and amount of clay minerals in the soil, conditions under which the clay originated, and original density of the soil. A change in the moisture content of a soil can cause clay minerals to swell like a sponge or to shrink and collapse. Clays that are high in sodium can expand as much as a thousand percent when water is added (note that high sodium clays are not present in the Study Area). Structures may be damaged when a soil expands by as little as five percent. Expansion of clay minerals can cause walls and foundations to crack and roads and sidewalks to warp, in a manner similar to frost heaving. Upon drying, expansive soil shrinks, forming large, deep cracks or "popcorn" texture in surface exposures. Popcorn texture is the result of repeated shrink-swell cycles, producing marble-sized pellets. In extreme cases, cracks formed by drying clay can be large enough to mimic earth fissures. However, desiccation cracks are not as long or deep as earth fissures (AZGS 2002).

Expansive clays in Arizona commonly originate from volcanic ash deposits or sediment and alluvium that contain volcanic debris. Expansive soils are scattered throughout the Phoenix area. Shrink/swell potential is moderate to high in soils in terraces along the Gila and Salt Rivers, old alluvial fan surfaces, and scattered areas in the valley plains (NRCS 2002). Two areas in the Study Area have high potential for shrink-swell soils: east and north of LAFB and west of US 60, and east of the Agua Fria River near the Morgan Substation (NRCS 2002). Clay-rich soils in the Study Area with high shrink-swell potential include the Carefree, Contine, Gadsden, Mohall, and Tremant types (SCS 1986). **Figure 3.11-2** shows the general areas with high potential for shrink-swell soils in the Study Area (NRCS 2002).

3.11.3.2 Collapsible Soils

Collapsible soils are those that decrease in volume and settle when soil structure changes due to wetting of partially saturated subsoil. Typically, collapsible soils occur predominantly at the base of mountains, where Holocene alluvial fan and wash sediments have been deposited during rapid runoff events. Moreover, seismically induced ground settlement can occur during strong ground shaking in alluvium if deposits have a low relative density and are dynamically compacted and their volume is thereby reduced. Differential settlement can damage structures placed across such susceptible areas (AZGS 2002). Collapsible soils may occur along the Proposed Action route and the Action Alternative routes near the base of the southern Hieroglyphic Mountains.

3.11.3.3 Hydrocompaction

Because infrequent rain in the desert Southwest seldom penetrates more than a foot or two and then quickly evaporates, near-surface deposits usually have very low moisture content. The clay and silt in some of these deposits act like a glue, holding sand grains in place but leaving space between them. Upon wetting, the silt and clay lose their cohesion, and the sand grains move closer together and take up less space. This process, referred to as hydrocompaction, is especially troublesome in soils that have large amounts of silt. Potential for compaction is increased when a load, such as a transmission tower, adds weight to the soil. Hydrocompaction can occur years or even decades after a structure is built. The problem of hydrocompaction is not to be confused with the common occurrence of settling of fill properly compacted during placement. Damage from this type of settling may be prevented by compaction during placement or by waiting a few months before building to allow the fill to compact on its own. Hydrocompaction can mimic earth fissures. Damage from hydrocompaction tends to be restricted, and is commonly circular in area; earth fissures are narrow and long, typically extending over several hundred yards. Floodplain deposits susceptible to hydrocompaction are present along the Gila and Salt Rivers in the Phoenix region. Soils formed on the fine-grained lower parts of alluvial fans emanating from mountains and piedmonts also have potential for hydrocompaction (AZGS 2002). Soils that may be subject to hydrocompaction along the Proposed Action and Action Alternative routes include those with abundant clay and silt, particularly the Gadsden type.

3.11.3.4 Erosive Soils

Soil erosion is the process of moving soil particles or sediment by flowing water, wind or raindrop splash. Soil particles include dissolved or suspended solids, and bedload (larger soil particles such as sand or gravel). Sedimentation occurs when the soil particles are deposited in a water course. In the arid and semiarid watersheds of Arizona, climate, soils, topography, vegetation cover and hydrology all influence soil erosion. Soil erosion occurs whenever the soil surface is disturbed and protective vegetative cover is removed, as from clearing, grading, tilling, overgrazing, road building or fire. Different soils are more susceptible to erosion than others. Soils high in organic matter are less erodible than non-organic soils like sandy or silty soil (University of Arizona 2011). Soils that may be considered erosive along the Proposed Action and Action Alternative routes include sandy soils and in particular the Schenco soil type. **Table 3.11-2** describes the erosion potential of the mapped soil units in the Study Area.

3.11.4 Prime and Unique Farmlands

Prime and unique farmlands are designations assigned by the USDA. The USDA keeps account of prime farmland and unique farmland of the nation in cooperation with other interested agencies at the national, state, and local levels of government. The objective of the account is to identify the extent and location of important rural lands that help in producing food, feed, fiber, forage, and oilseed crops.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing food, feed, forage, fiber, and oilseed crops, and is also available for these uses (the land could be cropland, pastureland, rangeland, forest land, or other land, but not urban

built-up land or water). It has the soil quality, growing season, and moisture supply needed to economically produce sustained high yields of crops when treated and managed, including water management, according to acceptable farming methods. In general, prime farmlands have an adequate and dependable water supply from precipitation or irrigation, a favorable temperature and growing season, acceptable acidity or alkalinity, acceptable salt and sodium content, and few or no rocks. They are permeable to water and air. Prime farmlands are not excessively erodible or saturated with water for a long period of time, and they either do not flood frequently or are protected from flooding.

According to 7 CFR 657.5, unique farmland is land other than prime farmland that is used for the production of specific high value food and fiber crops. It has the special combination of soil quality, location, growing season, and moisture supply needed to economically produce sustained high quality and/or high yields of a specific crop when treated and managed according to acceptable farming methods. Examples of such crops are citrus, tree nuts, olives, cranberries, fruit, and vegetables.

Farmland classification identifies map units as prime farmland, farmland of statewide importance, farmland of local importance, or unique farmland. It identifies the location and extent of the soils that are best suited to food, feed, fiber, forage, and oilseed crops. NRCS policy and procedures on prime and unique farmlands are published in the "Federal Register," Vol. 43, No. 21, January 31, 1978. Clayey and sandy loams of the following soils which occur in the Study Area are considered prime farmland, if irrigated (NRCS 2011) and these areas are shown in **Figure 3.11-1**:

- Contine
- Gilman
- Mohall
- Brios
- Tremant
- Rillito

3.12 TRANSPORTATION AND TRAFFIC

A portion of the information provided in the following subsections was provided by the Maricopa Association of Governments (MAG). MAG is a Council of Governments (COG) that serves as the regional agency for the metropolitan Phoenix area. MAG is the designated metropolitan planning organization (MPO) for transportation planning in the Maricopa County region. In addition to the data provided by MAG, information was taken from a report titled *Environmental Resource Report for Transportation and Traffic, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012h). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

This section provides information on transportation and traffic as they relate to the Project, including regional access routes, air transportation, and rail transportation. The Study Area

for this analysis includes the lands within and adjacent to the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes. The transportation and traffic Study Area, as shown on **Figure 3.12-1**, is bounded by the area approximately 4.5 miles north of SR 74 on the north, Bell Road to the south, approximately 51st Avenue to the east, and approximately the 323rd Avenue alignment to the west. Transportation and traffic data were obtained and collected through literature review and online research. There were no field surveys or traffic studies conducted as part of this analysis.

3.12.1 Laws, Ordinances, Regulations, and Standards

Federal regulations relevant to this Project include CFR Title 49, Sections 171 through 177 and Sections 350 through 399 related to transportation of hazardous materials and motor carrier safety and would be applicable to state and federal highways. CFR Part 77, in combination with FAA regulations, identify the safe, efficient use, and preservation of the navigable airspace.

State regulations relevant to this Project by the Arizona Motor Vehicle Division (MVD) include licensing of private, commercial, and OHV, and aircraft registration. The ARS Title 28 identifies rules and regulations imposed on transportation throughout Arizona.

The City of Surprise and City of Peoria General Plans and Circulation Plans establish requirements and standards for development within each city, including roadway classification, cross-sections, and design standards.

3.12.2 Study Area Conditions

The major transportation corridors that provide access to the Study Area are US 60, SR 74, and SR 303. US 60 connects the Atlantic Coast in Virginia to western Arizona. It serves the metropolitan Phoenix area as part of the local freeway system connecting Phoenix to the Town of Wickenburg crossing through several west valley cities including Wittmann, Surprise, Peoria, Glendale, and West Phoenix. Additionally, US 60 serves as a freight corridor between Phoenix and Las Vegas, Nevada, by way of a regional connection with US 93 in Wickenburg. SR 74 is an east-west Arizona state route that connects I-17 (east of the Study Area) to US 60 just north of Morristown, Arizona. This route is 31 miles long, and serves Lake Pleasant Regional Park in northern Maricopa County. SR 74 also serves as a northern bypass to sections of US 60 in the Phoenix metropolitan area that are often congested with daily commuter traffic. SR 303 is a local state route that creates the outer loop of the Phoenix metropolitan freeway system. SR 303 is located in the southeastern-most portion of the Study Area and bisects US 60 near Deer Valley Road.

The Study Area is located within the planning areas of Peoria and Surprise, Arizona, northwest of the intersection of SR 303 and US 60. The Proposed Action route and the other Action Alternatives would be accessible from the north via SR 74 and I 17 and US 60 and SR 303 from the south.

3.12.2.1 Surface Transportation

The Study Area consists of a variety of existing roadways, including regional highways, local arterials, and collector streets. Existing regional highways in the Study Area include SR 74,

US 60, and SR 303.The existing and projected AADT for identified regional highways within the Study Area is listed in **Table 3.12-1**.

Table 3.12-1 Regional Highways Annual Average Daily Traffic within the Study Area

ROAD-WAY	SEGMENT	EXISTING LANES [1]	EXISTING AVERAGE DAILY TRIPS[5] (# VEHICLES)	2031 PROJECTED AVERAGE DAILY TRIPS [6] (# VEHICLES)
SR74	East of US 60	2[2]	5,500	20,600
	West of Castle Hot Springs Rd.		5,700	25,800
	Between Castle Hot Springs Rd and New River Road		5,600	29,000
	Between New River Road and I 17		7,700	26,800
SR303	East of US 60	4[3]	11,200	75,600
	Between Lake Pleasant Parkway and I 17		6,000	73,000
US 60	Between Dove Valley Road and 163rd Avenue	4-6[4]	9,300	49,300
	Between 163rd Avenue and SR 303		22,500	70,600
	South of SR 303		23,800	60,300

[1]Through lanes only. Does not include auxiliary lanes, on-ramps or off-ramps.
[2]ROW preservation is planned to accommodate a 10-Lane facility.
[3]SR 303 will be expanded to a 6-lane facility.
[4]US 60 reduces from 6 to 4-lanes North of SR 303.
[5]Existing ADT – Counts range in years from 2005 to 2011.
[6]MAG 2031 traffic forecast.
Source: T. Strow, MAG, personal communication July 25, 2012.

The largest expected future increase in traffic throughout the Study Area is located along US 60 and is likely due to planned future development in the area. Plans for future development in the area are discussed in the Environmental Resource Report for Land Use, Recreation, and Special Designations (URS 2012a).

Local arterial and collector roads in the Study Area are a combination of dirt and paved with primary access coming from regional highways, including US 60, SR 74, and SR 303. The majority of local arterial and collector roads in the Study Area are either unimproved dirt or consist of only two lanes. Many of these roads are identified for future expansion based on the level of future residential and commercial development in the area. Future transportation

projects identified and funded through the MAG Regional Transportation Plan (RTP) Arterial Life Cycle Program include capacity and intersection improvements along Sun Valley Parkway, Lake Pleasant Parkway, and Happy Valley Road. Future improvements throughout the Study Area will consist of expanding the majority of arterial streets to four- and six-lane roadways (MAG 2010).

Future regional highway projects are also identified in the MAG RTP for US 60, SR 74, and SR 303. The BLM has established a Transportation Corridor in the Bradshaw-Harquahala RMP along SR 74 (**Figure 3.12-1**) for future highway projects. Funded projects located throughout the Study Area include:

US 60 – Planned projects along US 60 throughout the Study Area include widening efforts to expand the roadway in the vicinity of SR 303 from four general purpose lanes to six. These improvements are identified in Phase III of the MAG RTP (FY 2016 – 2020).

SR 74 – ROW preservation for a potential future freeway facility. Funding for ROW acquisition has been identified in Phase V of the MAG RTP (FY 2026 – 2031). A final feasibility report was conducted for SR 74 in May 2010 and recommended that the ROW should be preserved for a potential 10-lane freeway (URS 2010).

SR 303 – The SR 303 corridor will be continuously developed as a new freeway facility throughout the Study Area. SR 303 will eventually include three general purpose lanes and one High-Occupancy Vehicle (HOV) lane in each direction. New highway construction and capacity improvements in the Study Area are identified in Phases II and III of the MAG RTP (FY 2011 – 2020).

3.12.2.2 Air Transportation

There are currently six airports or airstrips located within or in the immediate vicinity of the Study Area including Pleasant Valley Airport, LAFB Auxiliary Field #1, Ranta Airstrip Airport, Thunder Ridge Airpark, Castle Well Airpark, and Roesner Ranch Airport.

Pleasant Valley Airport – The Pleasant Valley Airport is located near the intersection of SR 74 and Lake Pleasant Parkway. It is a general aviation airport with three parallel runways and one cross wind runway. Pleasant Valley Airport is open to the public and serves single engine, light twin, helicopter, and glider aircraft (AirNav 2011a).

LAFB Auxiliary Field #1 - The LAFB Auxiliary Field #1 is located at the intersection of Happy Valley Road and 211th Avenue. This airfield is used by the LAFB for flight training throughout the year. It is located 15 miles northwest of LAFB and supports approximately 13,000 practice operations per year (LAFB 2011).

Ranta Airstrip Airport – The Ranta Airstrip Airport is located along Gates Road, west of the SR 74/US 60 intersection. This airport is a private facility with one gravel runway (AirNav 2011b).

Thunder Ridge Airpark – Thunder Ridge Airpark is located at 237th Avenue and Joy Ranch Road in Morristown. It is a private facility with an asphalt runway located within a residential airpark. The airpark has nine residential homes and hosts annual fly-in activities that regularly average 20 to 25 planes (AirNav 2011c).

Castle Well Airpark – The Castle Well Airpark is located north of SR 74 and east of US 60. It is a private facility with one asphalt runway for use by residents of the community (AirNav 2011d).

Roesner Ranch Airport - The Roesner Ranch Airport is located west of the intersection of 237th Avenue and SR 74, along the 8th Street alignment in Morristown. It is a private facility with one gravel runway (AirNav 2011e).

3.12.2.3 Rail Transportation

The BNSF rail line that intersects the Study Area is part of the 209-mile BNSF Phoenix Subdivision. Approximately 22 miles of the Phoenix Subdivision is located within the Study Area, along the US 60 alignment, as shown on **Figure 3.12-1**. The railroad consists of a single-line track with periodic sidings that allow trains to pass each other, as necessary. The maximum operating speed on this section of the line is 49 miles per hour, and BNSF operates approximately eight to ten trains per day. However, future projections identify potential growth to nearly 17 trains per day by the end of 2012. The BNSF ROW throughout this section of the Phoenix Subdivision varies from 75 feet to 200 feet in width. There is one future BNSF facility planned to be located within the Study Area in Surprise. The future Surprise Logistics Center will be located near Dove Valley Road and US 60 and is expected to house a serving yard, a 200-acre auto center, and 350 acres of direct served uses, including manufacturing, warehousing, storage, and general industrial land uses (URS 2009).

3.13 VEGETATION RESOURCES, INCLUDING NOXIOUS AND INVASIVE WEEDS AND SPECIAL STATUS PLANTS

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Biological Resources Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012i). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

3.13.1 Laws, Ordinances, Regulations, and Standards

Endangered Species Act of 1973 (ESA; PL 85-624; 16 USC §§ 661, 664, 1008) - Federal agencies are required to consult with the USFWS to ensure that actions they authorize do not jeopardize the continued existence of any listed species, result in the destruction or modification of critical habitat, or cause a "take" (to harass, harm pursue, hunt, shoot, wound, kill, trap, capture, or collect) of any listed species.

Federal Noxious Weed Act of 1974 as amended by the Food, Agriculture, Conservation and Trade Act of 1990 (USC 2801 et. seq.) - The Weed Act of 1974 gave the US Secretary of Agriculture authority to declare plants "Noxious Weeds" and limit the spread of such plants without a permit. The 1990 Farm Bill requires that each federal land-management agency 1) designate a trained person in charge of a plant control program, 2) adequately fund the program, 3) implement cooperative agreements with the States, and 4) establish integrated management systems to control or contain the plants targeted under the agreements.

Federal Plant Pest Act (7 USC 150aa et seq.) - Prohibited the movement of plant pests from a foreign country into or through the United States unless authorized by USDA. Superseded by the Plant Protection Act of 2000 (P.L. 106-224, Title IV), which gave Animal and Plant Health Inspection Service broad authority to inspect, seize, quarantine, treat, destroy, or dispose of imported plant and animal materials potentially harmful to US agriculture, horticulture, forestry, and, to a certain degree, natural resources (7 USC 7701 et seq.).

Noxious Weed Control and Eradication Act (Public Law 108-412) - Requires that the Secretary of Agriculture establish a program to provide assistance to eligible weed management entities to control or eradicate noxious weeds on public and private lands.

Invasive Species EO 13112 (February 3, 1999) - Established the National Invasive Species Council (NISC) to ensure that federal programs and activities to prevent and control invasive species are coordinated, effective, and efficient.

American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the ESA (June 5, 1997; Secretarial Order 3206) - Establishes that federal agencies (DOI, NOAA) shall be responsible for 1) working directly with tribes to promote healthy ecosystems, 2) recognizing that Indian lands are not subject to the same controls as federal public lands, 3) assisting tribes in developing programs to promote healthy ecosystems, and 4) being sensitive to Indian culture, religion, and spirituality.

Arizona Native Plant Law - No protected native plant can be relocated or transplanted without permission and a permit from the ADA. The Arizona Native Plant Law requires a NOI before land clearing.

3.13.2 Vegetation Communities

The predominant native vegetation communities in the Study Area include Sonora-Mojave creosotebush-white bursage desert scrub and Sonoran paloverde-mixed cacti desert scrub (USGS 2004). In addition, a riparian forest/woodland vegetation community occurs along the Agua Fria River. Other native vegetation communities or cover types also occur in the Study Area in very low frequency and are described below.

Table 3.13-1 summarizes the vegetation communities within the ROWs associated with the Proposed Action route, the ACC-certificated route, and all other Action Alternative routes (refer to **Figure 3.13-1**). To compare the Proposed Action route with the alternative routes, acreage calculations for each vegetation community and land cover is provided in **Table 3.13-1**.

Table 3.13-1 Vegetation Communities and Land Cover (in acres)

	CREOSOTE SCRUB	CACTI SCRUB	SALT SCRUB	UNVEG	RIP	MESQUITE SCRUB	TOTAL
Proposed Action (200 ft. ROW)	327	597	1	0	1	0	926
ACC-Certificated Route	3,613	4,572	16	1	10	1	8,213
Alternative 1 (200 ft. ROW and additional corridor)	329	3,678	1	0	3	0	4,011
Alternative 2 (200 ft. ROW and additional corridor)	327	1,547	1	0	3	0	1,878
Alternative 3 (200 ft. ROW)	341	590	1	0	1	0	933
Sub-alternative (200 ft. ROW)	17	82	0	0	1	0	100
Primary Segment Common to All Action Alternatives (200 ft. ROW)	25	70	0	0	0	0	95

Creosote Scrub = Creosote-White Bursage Desert scrub; **Cacti Scrub** = Sonoran Paloverde Mixed Cacti Desert scrub; **Salt scrub** = Sonora Mojave Mixed Salt Desert scrub; **Unveg** = Barren Land and Open Water; **Rip** = North American Warm Desert Riparian; **Mesquite Scrub** = Apacherian-Chihuahuan Mesquite Upland Scrub
Source: Southwest ReGAP 2004

3.13.2.1 Creosotebush-White Bursage Desert scrub

Creosotebush-white bursage desert scrub (creosote scrub) forms the vegetation community in broad valleys, lower bajadas, plains, and low hills in the Chihuahuan, Mojave, and lower Sonoran deserts where soils are arid and fine-textured (NatureServe 2011). This form of desert scrub is characterized by a sparse to moderately dense layer of small-leaved, drought-tolerant shrubs and deciduous herbs (NatureServe 2011). Shrubs tend to be widely spaced with little grass or other herbaceous cover between. Creosote (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) are the typical dominants, but a variety of other shrubs, dwarf-shrubs, and cacti can be present or form sparse understories (NatureServe 2011).

3.13.2.2 Sonoran Paloverde-Mixed Cacti Desert scrub

Sonoran paloverde-mixed cacti desert scrub is the typical vegetation community in hilly to mountainous terrain, foothills, breaks, and major incised channels in the region. This vegetation community develops on coarse, gravelly to rocky soils and outcrops (NatureServe 2011). Creosotebush and white bursage are often the most common plants in this plant community; however, foothill paloverde (*Parkinsonia microphylla*), blue paloverde (*Parkinsonia florida*), saguaro (*Carnegiea gigantea*), and ocotillo (*Fouquieria splendens*) are the common characteristic species of this plant community that dominate in site-specific areas (NatureServe 2011). Other leguminous trees like desert ironwood (*Olneya tesota*) and velvet mesquite (*Prosopis velutina*), other cacti (e.g., *Opuntia* sp., *Cylindropuntia* sp., *Ferocactus* sp.), and agave (*Avage* sp.) also occur as sub-dominant species.

3.13.2.3 Sonora-Mojave Mixed Salt Desert Scrub

Sonora-Mojave mixed salt desert scrub occurs in arid and semiarid environments within the Southwest that have fine, loamy soils that are saline or strongly alkaline (NatureServe 2011). This vegetation community usually has a sparse ground cover that ranges from 2 to 40 percent and includes many plant species with either drought-deciduous or succulent leaves (NatureServe 2011). The dominant species include four-wing saltbush (*Atriplex canescens*), allscale (*A. polycarpa*), shadscale (*A. confertifolia*), desert holly (*A. hymenelytra*), and desert seepweed (*Suaeda suffrutescens*), which are all tolerant of high-salinity soils and low moisture (NatureServe 2011). This plant community is often a transitional community that develops after disturbances, particularly on abandoned agricultural fields.

3.13.2.4 Barren Land and Open Water

Barren land include areas of bedrock, desert pavement, scarps, talus, slides, volcanic material, glacial debris, sand dunes, strip mines, gravel pits and other accumulation of earthen material (NatureServe 2011). Generally, vegetation accounts for less than 15 percent of total cover. Open water is associated with Lake Pleasant and areas of open water, generally with less than 25 percent cover of vegetation or soil (NatureServe 2011).

3.13.2.5 North American Warm Desert Riparian

Two vegetation communities compose the broader category of North American warm desert riparian habitats. These include North American warm desert riparian mesquite bosque and North American warm desert riparian woodland and shrubland.

North American warm desert riparian mesquite bosque is scattered along washes and at established cattle tanks throughout the Study Area where the water table is 25 feet (8 meters) or less from the surface. These areas are flooded frequently during the winter rainy and summer monsoon seasons. This vegetation community is dominated by closed-canopied woodlands of mesquite that can grow to heights of 45 feet (14 meters) (NatureServe 2011). The understory consists of a variety of plants that include inland saltgrass (*distchilis spicata*), desert hackberry (*Celtis ehrenbergiana*), catclaw acacia (*Acacia greggii*), ground cherry (*Physalis sp.*), and other shrubs and herbs (NatureServe 2011).

The North American warm desert riparian woodland and shrubland community is scattered along the larger washes, at the CAP canal, and on the Agua Fria River and its larger

tributaries where there is perennial or semiperennial surface water. Dominant trees include box elder (*Acer negundo*), velvet ash (*Fraxinus velutina*), Fremont cottonwood (*Populus fremontii*), Godding's willow (*Salix gooddingii*), arroyo willow (*Salix lasiolepis*), netleaf hackberry (*Celtis laevigata var. reticulate*), and Arizona walnut (*Juglans major*) (NatureServe 2011).

Shrub dominants include sandbar willow (*Salix exigua*), false willow (*Baccaris* sp.), and desert willow (*Chilopsis linearis*) (NatureServe 2011). The vegetation is dependent upon annual or periodic flooding, sediment scour, and/or annual rise in the water table for growth and reproduction (NatureServe 2011). In the Study Area, this plant community occurs exclusively along the Agua Fria River south of Lake Pleasant to about SR 74, where riparian strands become smaller and more fragmented.

While these riparian communities are limited in extent, they have highly productive habitats that support a high diversity of plants, animals, and food resources. These areas are important ecological centers for wildlife and are particularly critical during periods of drought, which are frequent in the region.

3.13.2.6 Apacherian-Chihuahuan Mesquite Upland Scrub

Apacherian-Chihuahuan mesquite upland scrub occurs in the vicinity of mesquite bosques. Sonoran mid-elevation desert scrub is a transitional desert scrub community that typically occurs on the lower slopes of mountainous areas where the climate is too dry for chaparral to develop and where freezing temperatures during winter are too frequent and prolonged for many of the frost-sensitive species characteristic of Sonoran paloverde-mixed cacti desert scrub (NatureServe 2011). Although limited in total area, these vegetation communities can be high in biodiversity, similar to Sonoran paloverde-mixed cacti desert scrub and mesquite bosque habitats.

3.13.3 Special-Status Species

The assessment results from the Heritage Database Management System (HDMS) database for special status plant species indicated that suitable habitat or records for three special status plant species occur within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes. This dataset was not available for the entire Study Area extent. The details of the legal protection, habitat requirements, habitat suitability, and local distributions of these species are described in **Table 3.13-2**.

Seven other plant species that are protected under the Arizona Native Plant Law were observed during field reconnaissance of the Study Area (also shown in **Table 3.13-2**). In addition, Arizona Game and Fish Department (AGFD) HDMS indicates records of occurrence for the straw-top cholla (*Cylindropuntia echinocarpa)* within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes. Salvage restricted cactus species encountered during the reconnaissance survey included: tree cholla (*Cylindropuntia imbricata*), teddy bear cholla (*Cylindropuntia bigelovii*), California barrel cactus (*Ferocactus cylindraceus*), saguaro (*Carnegiea gigantea*), ocotillo (*Fouquieria splendens*), Engelmann's hedgehog cactus (*Echinocerus engelmannii*), and yellow-spine prickly pear (*Opuntia engelmannii* var. *flavispina*). The ADA list of highly safeguarded and

salvage restricted plant species is provided in Appendix E of the Biological Resources Report (URS 2012i).

Table 3.13-2 Special Status Plant Species

SPECIES	STATUS	HABITAT REQUIREMENTS	HABITAT SUITABILITY
Agave murpheyi Hohokam agave	ESA-SC BLM-S HSA	Found in well drained soil on benches or alluvial terraces of gentle bajada slopes above major drainages in desert scrub between 1,300 and 3,200 feet (400 – 975 m). Often found in association with pre-Columbian agricultural and settlement features.	Suitable habitat along river terraces in the northern part of Study Area. Species has been documented near Wickenburg and along the Agua Fria River in the vicinity of Lake Pleasant, approximately two miles (3.2 km) north of the Proposed Action route. Suitable habitat was not surveyed.
Allium bigelovii Bigelow's onion	SRA	Found in all Arizona counties except Apache County. Found on gentle slopes between 2,000 and 5,000 feet (610 to 1,525 meters), with dry rocky soil in open grassland, chaparral, and desert scrub communities.	Potential habitat within the Proposed Action route, near the Agua Fria River, south of SR 74. Suitable habitat was not surveyed.
Carnegiea gigantea Saguaro	SRA	Rocky slopes and well-drained flats below 3,600 feet (1,197 meters).	Suitable habitat within the Study Area. Found throughout Sonoran-palo verde mixed desert scrub in the Study Area during field reconnaissance. Most common in uplands within the Hieroglyphic Mountains.
Cylindropuntia bigelovii Teddybear cholla	SRA	Desert to rocky hillsides below 3,000 feet (915 meters)	Suitable habitat within the Study Area. Found throughout the Study Area during field reconnaissance. Expected along all route alternatives in both uplands and lowlands. Particularly prevalent along all routes east of US 60.
Cylindropuntia echinocarpa Straw-top cholla	SRA	Found along dry washes and mesas to 6,000 feet (1,830 meters). Creosotebush associations, desert scrub with Joshua trees, and piñon-juniper woodland.	Suitable habitat within the Study Area near washes associated with creosotebush habitats. Species has been documented near the White Tank and Hassayampa River Mountains. AGFD HDMS record of occurrence within three miles (five kilometers) of the Proposed Action route (refer to Appendix D of the Biological Resources Report; URS 2012i). Expected along the Proposed Action route from the Sun Valley Substation to US 60.

SPECIES	STATUS	HABITAT REQUIREMENTS	HABITAT SUITABILITY
Cylindropuntia impbricata Tree cholla	SRA	Gravelly or sandy soils of hills, flats, valleys, plains, and washes, mostly in grassland	Suitable habitat within the Study area. Found in Study Area during field reconnaissance along the Proposed Action route from US 60 to the Agua Fria River, primarily outside of steep terrain. Found hybrids with teddybear cholla north of the Proposed Action route near SR 74 during reconnaissance survey of the Study Area.
Echinocerus engelmannii Engelmann's hedgehog cactus	SRA	Sandy and rocky flats, and hillsides below 5,000 feet (1,525 meters).	Suitable habitat within the Study Area. Found in Study Area during field reconnaissance near SR 74 in the Hieroglyphic Mountains. Expected along Proposed Action route and alternatives east of US 60.
Ferocactus cylindraceus California barrel cactus	SRA	Occurs along desert washes, gravely slopes and beneath desert canyon walls	Suitable habitat within the Study Area. Found in Study Area during field reconnaissance near SR 74 in Hieroglyphic Mountains and along wash margins in Sonoran palo-verde mixed desert scrub. Expected along all routes, particularly east of US 60.
Fouquieria splendens Ocotillo	SRA	Rocky, well-drained slopes below 5,000 feet (1,525 meters).	Suitable habitat within the Study Area. Found in Study Area during field reconnaissance in the Hieroglyphic Mountains, but may occur elsewhere along the Proposed Action route and the alternative routes east of US 60.
Opuntia engelmannii var. *flavispina* Yellow-spine prickly pear	SRA	Found in Sonoran Desert, sandy bajadas from 1,600 to 2,600 feet (490 meters to 790 meters).	Suitable habitat within the Study Area near washes. Species has been found near the Hassayampa River and White Tank Mountains. Found extensively in the Study Area during field reconnaissance. Expected throughout the Proposed Action route and alternative routes.

Notes:
Agencies: BLM = Bureau of Land Management; ESA = Endangered Species Act (1973 as amended)
Status Definitions: **ESA:** SC = species of concern (has shown recent population decline to warrant this agency—the only categorization to preempt decline and listing). **BLM:** S = sensitive (a species considered to have shown declines; BLM policy is to provide these species with the same level of protection as is provided for candidate species under *Bureau of Land Management Manual*, Section 6840.06C—that is, to "ensure that actions authorized, funded, or carried out do not contribute to the need for the species to become listed." **State:** HSA = highly safeguarded plant in Arizona (no collection allowed); SRA = salvage restricted in Arizona (collection only with permit).

3.13.4 Invasive and Noxious Plant Species

Invasive plants are those species that have been introduced into an environment where they did not evolve. As a result, they usually have no natural enemies to limit their reproduction and spread. Noxious weeds are legally designated by a federal, state, or county government as a plant that is injurious to public health, agriculture, recreation, wildlife or property. In the Sonoran Desert, invasions of these species can alter the wildland fire regime, which can lead to more frequent and intense fires that can destroy the non-fire adapted native plants and permanently alter the vegetation community and wildlife habitats in an area that burns.

A review of invasive and noxious plant species records in the Study Area indicated that one state noxious weed species and 10 invasive plant species occur regionally (USGS 2007). The results described here are based on existing records and field reconnaissance, but complete surveys of the Proposed Action route and other Action Alternative routes for invasive and noxious plants has not been completed.

Buffelgrass (*Pennisetum ciliare*) is a state regulated noxious weed that occurs primarily along major roadways within the Study Area. Saharan mustard (*Brassica tournefortii*) is an invasive species that is extremely fast growing and can smother native herbaceous plants and compete with shrubs for scarce resources. Saharan mustard and buffelgrass are major agents of changing historic fire regimes and unbalancing the ecology of native ecosystems in the region.

Other invasive species in the Study Area that are more or less prevalent but can have the same effects of changing fire regimes and changing the ecology of native ecosystems include rip-gut brome (*Bromus diandrus*), red brome (*Bromus rubens*), cheatgrass (*Bromus tectorum*), Bermuda grass (*Cynodon dactylon*), Russian thistle (*Salsola kali*), Mediterranean grass (*Schismus barbatus*), and wild oats (*Avena fatua*). Cheatgrass and red brome were observed during field reconnaissance and were widespread near roadways, on BLM land near SR 74, and near human settlements in the Study Area. Saltcedar (*Tamarix* sp.) occurs in washes, drainages, and roadside swales in many parts of the Study Area. It can nearly completely replace native vegetation by outcompeting native shrubs for available water and by increasing soil salinity. Salt cedar was observed during field reconnaissance and is a relatively common plant along the Agua Fria River. Red stem filaree (*Erodium cicutarium*) occurs widely in disturbed areas in the Study Area and may provide seed resources for some ant species and rodents.

3.14 VISUAL RESOURCES

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Visual Resources, Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012j). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

3.14.1 Laws, Ordinances, Rules, and Standards

The BLM Land Use Planning Handbook (BLM 2005) - The handbook states that VRM management classes shall be designated for all BLM land based on consideration of visual resource inventory data and management considerations for other land uses. Resource use and management activities shall be managed according to the VRM objectives established in the land use plan."

Visual Resource Management System - Visual resources on BLM-managed lands are managed per the VRM system as directed in the BLM 8400 – Manual Series: Visual Resource Management (BLM 1986). The VRM system provides the framework for managing visual values by classifying all BLM-managed lands into one of four VRM classes. Classification of lands occurs during the RMP development process by considering the relative visual value of lands within the context of other resource and land management needs.

Maricopa County Zoning Ordinance - The Maricopa County Zoning Ordinance (Maricopa County 2012) established the Wickenburg Highway and SR 74 scenic corridor overlay zoning districts. The Wickenburg Scenic Corridor encompasses lands within 2 miles of the edge of the ROW of US 60 from Bell Road to the Town of Wickenburg corporate limits. The ordinance sets standards for commercial use components such as building height, screening, signs, and architecture. The SR 74 Scenic Corridor encompasses lands within 500 feet of the ROW centerline from approximately 0.5-mile west of the Agua Fria River to 1.5 miles east of US 60. (However, according to the City of Peoria, the SR 74 Scenic Corridor within their jurisdiction does not apply.) The ordinance sets standards for residential and nonresidential uses. Standards are set for components such as setbacks, heights, and screening. The ordinance states that utility lines are required to be buried. Utility lines are not defined in the ordinance; however, this requirement is clarified in the SR 74 Scenic Corridor Guidelines (Maricopa County n.d. c), a part of the Maricopa County 2020 Eye to the Future Comprehensive Plan. The guidelines state, "New utility lines should be located underground, except 69kV or greater electric transmission lines." Because this Project proposes a combined 230kV and 500kV transmission line, the ordinance does not apply to this Project.

City of Peoria General Plan - The City of Peoria's General Plan covers approximately 234 square miles of public, private, and State Trust lands. The Land Use Element of the Peoria General Plan describes how the City anticipates addressing future population and employment growth while promoting a development pattern that promotes a pedestrian-friendly environment; and integrates natural and manmade features in a manner consistent with the vision for the City of Peoria. Policy 3.B.4 (Chapter 8, Public Services and Facility element) would be applicable to visual resources in the portions of the Study Area that traverse Peoria. It states, "Promote the use of existing utility and major transportation corridors for new overhead utility siting to minimize visual and environmental impacts" (City of Peoria 2010). The General Plan also contains a utility corridor paralleling SR 74 (City of Peoria 2010), roughly corresponding with the ACC-certificated route.

Town of Buckeye General Plan - The Buckeye Planning Area encompasses approximately 600 square miles of land and is a mosaic of public, private, and federal land ownership as well as parcels of State Trust lands managed by ASLD. Land use designations in the

planning area include residential, mixed use, commercial, industrial, agriculture, military, and open space. A majority of the land in the Planning Area is designated as low- to medium-density residential. One policy would be applicable to visual resources in the portions of the Study Area that traverse Peoria. It states, "Provide proper planning of utility corridors in order to mitigate environmental impacts on sensitive landscapes and natural resources."

3.14.2 Visual Resource Inventory

The BLM has a stewardship responsibility to identify and protect visual (scenic) values on public lands as directed in NEPA and FLPMA.

The BLM's process for this Project, and based on VRM, begins by preparing a visual resource inventory (VRI) for the public lands administered within an administrative boundary, either a BLM district or field office. The inventory consists of determining scenic quality ratings of various landscapes, the sensitivity levels of potential viewers, and the distance zones of the viewers to the landscapes, as follows:

Scenic Quality

Scenic quality rating units are scored A (high), B (moderate), or C (low). The ratings are based on the key factors of landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications (man-made features).

Viewer Sensitivity

Viewer sensitivity rating units are rated High, Medium, or Low. The ratings are based on factors such as type of users, amount of use, public interest, adjacent land uses, and special areas.

Distance Zones

Distance zones are identified as foreground-middle ground, background, and seldom seen. These are distances from travel routes or observation points. The foreground-middle ground zone is from 0 to 3-5 miles, the background zone is from 3-5 to approximately 15 miles, and the seldom seen zone is beyond the background zone and other areas not visible to travel routes or observation points.

Based on the interrelationships among these three inventoried values, an appropriate inventory class is assigned in accordance with the VRI class placement matrix. The VRI classes represent the existing visual value at the time of the inventory. The inventoried lands are placed into one of four VRI classes. The classes are defined as the following:

VRI Class I - Assigned to all special areas where the current management situation requires maintaining a natural environment essentially unaltered by man, such as Wilderness Areas, the wild section of the national wild and scenic rivers, and other congressionally and administratively designated areas where decisions have been made to preserve a natural landscape.

VRI Class II - Highest visual value assigned through the inventory process for this project and based on the combination of scenic quality, visual sensitivity levels, and distance zones.

VRI Class III - Moderate visual value based on the combination of scenic quality, visual sensitivity levels, and distance zones.

VRI Class IV - Low visual value based on the combination of scenic quality, visual sensitivity levels, and distance zones.

3.14.3 Visual Resource Management Objectives

The BLM designates VRM classes through an RMP effort establishing visual management objectives that proposed actions are required to meet under the RMP implementation. Through the planning effort, inventoried visual resource values are weighed, along with all the other resources, to designate a VRM class. The resulting VRM class designated in the RMP may differ from the VRI class for a given area due to resource allocation decisions made in the RMP. VRM classes provide the visual management performance standards for the design, development, and rehabilitation of projects on public land.

The four management classes have the following objectives:

VRM Class I - To preserve the existing character of the landscape while providing for natural ecological changes. The level of change to the characteristic landscape should be very low and must not attract attention.

VRM Class II - To retain the existing character of the landscape. Development may be seen but should not attract attention of the casual observer. Any changes must repeat the elements of form, line, color, and texture found in the predominant natural features of the landscape.

VRM Class III - To partially retain the existing character of the landscape. Development may attract attention but should not dominate the view of the casual observer. Changes should repeat the elements of form, line, color, and texture found in the predominant natural features of the landscape.

VRM Class IV - To provide for development that requires major modification of the existing character of the landscape. Development may dominate the view and be a major focus of viewer attention. Every attempt should be made to minimize the impacts of the development through careful location, minimal disturbance, and repeating the elements of form, line, color, and texture (BLM 1986).

When a project is proposed for development on BLM lands, the agency performs an assessment of the potential visual impacts of the proposed project within the landscape. This assessment is referred to as a contrast rating. Locations are chosen to represent views of the potential project from which the assessments are performed. These key observation points (KOPs) represent typical and/or sensitive views of a project, such as from communities and well-traveled routes, or special project or landscape features such as hilltop locations. Photographs of the project site taken from the KOPs are used to create photographic simulations of the proposed project. The visual elements of the existing landforms/water, vegetation, and structures are compared to the visual elements of the proposed project, and the levels of contrast are determined. The contrast levels are compared to the VRM class objectives. If the objectives are not met, then the contrast rating is used to focus mitigation efforts to reduce the degree of impact in order for the project to meet the VRM objective.

The potential impacts are also used to determine if there would be changes to the scenic quality ratings, sensitivity levels, and distance zones associated with the VRI.

3.14.4 Visual Resources Inventory and Management within the Study Area

A VRI was conducted in 2010 by the BLM for land in the HFO planning area. The inventory classes were created after the 2010 Bradshaw-Harquahala RMP was approved, so the management classes in the RMP are based on an older inventory. The scenic quality ratings, viewer sensitivity ratings, and distance zones from the 2010 inventory were used to describe the affected visual environment for this Project (refer to **Figures 3.14-1**, **3.14-2**, and **3.14-3**, respectively).

VRM objectives are established for the BLM-managed public lands in the Study Area within the Bradshaw Harquahala-Planning Area. The BLM-managed lands within the Study Area for visual resources consist of VRM classes II, III, and IV. The land from the Sun Valley Substation to approximately the 179th Avenue alignment is Class IV. The land from approximately the 179th Avenue alignment to the Morgan Substation in the BLM SR 74 transportation corridor and south is Class III, and north of the transportation corridor is Class II (**Figure 3.14-4**).

3.14.5 Description of Visual Resources, Sensitive Viewers, and Key Observation Points

The following sub-sections describe the visual characteristics, sensitive viewers, and KOPs specific to various portions of the Proposed Action and Action Alternative routes.

3.14.5.1 Selection of Key Observation Points

Teams of visual resource management specialists traveled the Study Area repeatedly, photographing and documenting the visual resources at numerous points. Views of the potential ROWs were considered from various angles and distances. The number and location of KOPs were determined by BLM based on an adequate representation of issues associated with the proposed and alternative routes and a range of viewers and viewing situations (**Figure 3.14-4**).

3.14.5.2 Format for Description of Visual Resources

The existing condition of visual resources is described in terms of form, line, color, and texture in the natural elements and human developments of the landscape; and the overall relative sense of naturalness and scenic qualities of the views. Photos from the KOPs (when available) are referenced to **Chapter 4**, where they are shown in conjunction with simulated views incorporating the transmission line.

3.14.5.3 Project Area Overview

The visual resources Study Area is within the North American Deserts Ecoregion (Level I division) (Commission for Environmental Cooperation n.d.) and the Sonoran Basin and Range subdivision (Level III division) (EPA 2010a, 2011a). The subregion is distinguished by paloverde-cactus vegetation including saguaro, cholla, and agave cacti.

The Study Area is within the Basin and Range Physiographic Province. The climate of the province is characterized by being the driest in the United States. With low average annual rainfall comes a wide variation in precipitation from year to year, and a tendency for the rainfall to be concentrated into brief and heavy showers, producing flash floods that cause erosion rather than perennial streams. The topography is characterized by mountain ranges that are roughly parallel. The basins between the ranges are relatively flat plains with gentle slopes next to the mountains (Fenneman 1931).

The Project region is in the Sonoran Desert subdivision of the physiographic province. The subdivision is characterized by being approximately 20 percent mountains and 80 percent plains. The mountains vary from hills and buttes up to mountains rising 4,000 feet above sea level. The desert plains mostly lie below 2,000 feet elevation (Fenneman 1931).

The economy of the region has historically been based on irrigated agriculture, livestock rising, and mining (Commission for Environmental Cooperation 1997). Today federal and ASLD land includes commercial, recreational, range, and vacant lands. Private land includes residential, commercial, and industrial areas. The primary types of residential land adjacent to the Study Area are low- to medium-density suburban and rural areas.

Commercial areas are sparse within the Study Area, although some recreational lands include a commercial component. The industrial land is mainly used for manufacturing, landfill, and mining operations (URS 2012j).

Viewers in the Study Area can be categorized as residential and educational, recreational, travel, commercial, and industrial viewers. The individual viewer sensitivity to landscape changes range from low to high. Low sensitivity is typical for industrial viewers at warehouses, gravel pits, and utilities. Moderate sensitivity is typical for commercial viewers at office parks and retail stores, recreational viewers on OHV and golf courses, and travel viewers on major and arterial roads. High sensitivity is typical for viewers at residences and schools, recreational viewers in parks, on trails, and in picnic areas, and travel viewers on parkways, community gateways, and scenic routes (URS 2008).

3.14.5.4 Portion Common to All Action Alternatives

This portion of the Project begins at the Sun Valley Substation and extends to just north of US 60.

Landscape Characteristics

The portion of the proposed route that is common to the Action Alternative routes would start at the planned Sun Valley Substation and is on flat terrain with scattered trees and shrubs. It crosses over the CAP Canal within a designated utility corridor on BLM land. Landforms and vegetation are highly modified for the CAP Canal and associated pumping station. The route then crosses flat to rolling terrain with scattered saguaros, trees and shrubs, washes, and dirt roads. It parallels the CAP Canal and crosses over four short segments of the CAP Canal on BLM-managed public land.

The route would then turn north-northwest and parallels an existing Western Area Power Administration 500kV transmission line and service road approximately 500 feet west of the route centerline. The terrain is relatively flat to gently rolling with scattered shrubs. The route

occasionally crosses shallow washes with scattered trees, and bladed and two-track dirt roads. After 2.2 miles, the route heads north and turns away from the 500kV transmission line. The route crosses scattered saguaros, the paved Patton Road, and an existing 69kV transmission line. At an approximate distance of 6.6 miles from the CAP Canal, the route turns east. It crosses Iona Wash, which has a well-defined sandy bed.

The route continues east across the western edge of the US 60 scenic corridor. The route crosses similar landforms and vegetation for 6.6 miles. It then turns north and continues for 3.5 miles. There are two houses approximately 0.1-mile away from the centerline of the route. The route crosses Trilby Wash, which has a well-defined sandy bed. The route also crosses bladed and two-track dirt roads, US 60, and the BNSF Railway track. The route does not parallel US 60 at any point.

BLM Visual Resources Inventory and Management

Most of the ROW between the location of the Sun Valley Substation and the point where the ROW diverges from the CAP would be located on BLM-managed public lands. The VRI indicates that the scenic quality for this area is C (low); sensitivity ranges from low to high; and the distance zones are foreground to middle ground.

The overall VRI Class is III with some IV in the southwest. This area is managed by the BLM as a utility corridor, and as such the VRM Class is IV.

Sensitive Viewers and Key Observation Points

Between the Sun Valley Substation location and just north of US 60, sensitive viewers would include residents and future residents of developments, and travelers on US 60.

KOP 1

KOP 1 is located approximately one mile northeast of the Sun Valley Substation location, within Pulte's Festival Ranch planned development, south of the ROW, looking northeast. Sensitive viewers from KOP 1 would be landowners of Pulte's Festival Ranch who would be looking at the proposed transmission line within the BLM utility corridor.

The landscape form viewed from this KOP (**Figure 4.14-1a**) is relatively flat and open. The view appears relatively natural; the area is sparsely vegetated with a limited variety of low grasses and shrubs, with a few small shrubby trees and occasional saguaro cactus. The skyline creates a strong horizontal line that is accentuated by a barb wire fence in the foreground and vegetation patterns in the foreground and middle ground. Fence posts in the foreground provide short, strong vertical lines. Saguaros in the middle ground and faint lattice structures in the background also provide short, subtle vertical lines. The predominant color in the landscape is shades of tan and brown in the exposed ground and short vegetation, punctuated by shades of green in the shrubs, trees, and cactus. The fence posts, wire, and lattice structures range from almost black to metallic gray. Vegetation appears patchy and dotted in the foreground, to stippled and lumpy in the middle ground. Visually the landscape appears relatively homogeneous with little variety in color, line, or texture.

KOP 2

KOP 2 is located northeast of the point where the ROW diverges from the CAP, within the Spurlock Ranch planned development, in the vicinity of Deer Valley Road and east of 275th Avenue, looking southwest. Sensitive viewers from KOP 2 would be landowners of the Spurlock Ranch development looking at the proposed transmission line within the BLM utility corridor.

The landscape form viewed from this KOP (**Figure 4.14-2a**) is relatively flat and open with mountains in the distance, and appears fairly natural with developments in the distance. The area is vegetated with uniform species of medium sized shrubs, with short grasses at the bases of the shrubs. The skyline creates a strong horizontal line that is accentuated by faint transmission lines in the distance. Shrub vegetation creates short, irregular vertical and diagonal lines in the foreground that become indistinct in the middle ground. Two different sets of lattice towers create faint vertical lines rising from the strong horizontal line at the skyline. The predominant color in the landscape is dark brown to reddish brown in the woody stems of the shrubbery. Patches of green surround the bases of the shrubs, separated by the light tan of the bare ground in between. Vegetation and bare ground in the foreground appears feathery, dotted, and stippled, and becomes smooth in the middle ground to distance. Visually the landscape appears relatively homogeneous with little variety in color, line, or texture.

KOP 3

KOP 3 is located along US 60, south of the ROW crossing, looking west-northwest, and captures the views that northbound travelers on US 60 would have of the transmission line crossing the highway. KOP 3 is also within the Wickenburg Scenic Corridor. Sensitive viewers from KOP 3 would be travelers on US 60 looking at the proposed transmission line crossing US 60 near the Burlington Northern-Santa Fe commercial area and Broadstone Ranch development.

The landscape form viewed from this KOP (**Figure 4.14-3a**) is relatively flat. Distant mountains are barely perceptible through vegetation at the skyline. The dominant lines in the landscape are the vertical lines created by the divided highway, the painted lines on the highway, and the railroad tracks and an existing APS 69 kV transmission line that parallel the highway. The area between the divided lanes of US 60 and between US 60 and the railroad tracks is densely vegetated with a variety of short grasses, low shrubs, and a few trees. A few saguaros are visible in the middle ground. Visually, the landscape is dominated by diagonal lines created by US 60, the railroad tracks and associated railroad bed, and faint transmission lines. These strong diagonal lines converge with the strong horizontal line at the skyline. Monopole structures create short, repetitive vertical lines to the left of the highway. The predominant color in the landscape is shades of gray of the highway punctuated by white stripes, and the reddish-tan color of the exposed railroad bed. Vegetation is mottled tans, browns, and shades of green. The man-made structures appear smooth and linear, while the vegetation is feathery to stippled and lumpy. The presence of the divided highway, railroad tracks, and transmission line give the landscape a fairly developed feel.

3.14.5.5 Portion Common to the Proposed Action, Alternatives 1, 2, and 3

This portion of the Project begins just north of US 60 and extends to the intersection of SR 74 and the 179th Avenue alignment.

Landscape Characteristics

From just north of US 60, the route continues north and parallels the Thunder Ridge Airpark, a residential community with an airstrip, approximately 0.2 mile from the route centerline. A bladed dirt road parallels and is within the route for a portion of this segment. The route then turns to the east for 1.7 miles until reaching the end of the Wickenburg Scenic Corridor. The route crosses bladed and two-track dirt roads.

The route continues east for 5.2 miles across rolling landforms with numerous washes with well-defined sandy beds. Trees and saguaros are more abundant along these washes than the previous portions crossed by the route. Vegetation includes scattered trees and shrubs between the washes. The route crosses the paved two-lane 211th Avenue, bladed and two-track dirt roads, and a large wash. Several segments of dirt road parallel the route just slightly inside or outside of the Proposed Action 200-foot wide ROW. The portion of the route that is common to the Proposed Action and Alternatives 1, 2, and 3 routes ends near the 179th Avenue alignment.

BLM Visual Resource Inventory and Management

No BLM-managed public lands are crossed in this portion of the Project; therefore no BLM VRI or VRM classes are assigned.

Sensitive Viewers and Key Observation Points

Sensitive viewers in this portion of the Project Area include residents in the vicinity of Thunder Ridge Air Park, travelers on 211th Avenue and SR 74; OHV recreationists; and travelers approaching SR 74 on the rock crushing/ranch road.

KOP 4

KOP 4 is located west of the ROW near Thunder Ridge Airpark, near the point where the ROW would turn east to follow the Joy Ranch Road alignment, looking east. KOP 4 is also within the Wickenburg Scenic Corridor. Sensitive viewers from KOP 4 would be residents and users of Thunder Ridge Airpark looking at the proposed transmission line passing behind (east of) the existing development.

The landscape form viewed from this KOP (**Figure 4.14-4a**) is relatively flat and open. The area appears modified and developed in conjunction with the residential area and airpark. Vegetation appears to be a variety of densely growing native shrubs, cactus, and trees, with some ornamental vegetation in landscaped areas. The horizontal line at the skyline in the middle ground is broken by structures, taller trees, and cactus. The visible roadway in the foreground creates a smooth curvilinear line, and the wall has broken horizontal lines creating a stair-step effect. The landscape lighting provides a series of short vertical and geometric lines. The structures in the middle ground create crisp horizontal and vertical lines. The buildings, wall, and landscaping gravel are all shades of cream, tan, reddish-tan, and brown, and the road is dark gray. The predominant vegetation color is shades of green, gray-

green, and tan. The roadway, buildings, and wall are smooth and surrounded by landscaping rock that appears stippled. Vegetation is feathery to spiky.

KOP 5

KOP 5 (**Figure 3.14-5**) is located along SR 74 approaching Morristown, looking southeast. Sensitive viewers from KOP 5 would be eastbound travelers on SR 74. KOP 5 is within both the SR 74 and the Wickenburg scenic corridors looking at the proposed transmission line in the distance across vacant land.

The landscape viewed from this KOP appears very natural and is relatively flat creating a strong horizontal line at the skyline. Pyramidal mountains are visible in the distance, which adds faint, irregular horizontal lines. The vegetation is sparse clumps of grasses, shrubs, low trees, and species of cactus with several saguaros, which adds short and sometimes indistinct vertical lines in the foreground to middle ground. Looking south-southwest, in the far distance near the skyline developments appear as reflections and transmission line towers are faintly visible vertical lines. At the periphery of the view, the visible roadway and associated shoulders creates a strong diagonal line that diminishes into the distance. The predominant colors in the landscape are shades of tan, brown, and dark brown in the bare ground, and shades of green, gray-green, and tan in the vegetation. Distant mountain ranges appear blue to purple. Bare ground in the foreground appears coarse and gravely, while vegetation is feathery to spiky. In the middle ground the vegetation has a soft and lumpy texture, while distant mountains appear smooth.

KOP 6

KOP 6 (**Figure 3.14-6**) is located approximately one mile southeast of KOP 5 along SR 74, looking south-southeast. Sensitive viewers from KOP 6 would be eastbound travelers on SR 74. KOP 6 is within the SR 74 Scenic Corridor looking at the proposed transmission line in the distance across vacant land.

The landscape viewed from this KOP appears very natural and is flat, forming a strong horizontal line at the skyline. Rugged mountain ranges can be seen, one somewhat faintly in the distance, creating short, jagged, irregular horizontal lines. The area is sparsely vegetated with low shrubs, a few trees and other species of cactus, and several saguaros, which create random, short, vertical lines that intersect the horizon. The edge of the highway and the painted white line create strong horizontal lines in the foreground. The predominant colors in the landscape are shades of tan and brown, dotted with shades of green vegetation. Mountains in the background are shades of blue. The highway in the foreground appears smooth, with a backdrop of feathery, lumpy, to blunt and spiky vegetation. Distant mountains appear smooth to slightly lumpy.

KOP 7

KOP 7 is located approximately one mile south of SR 74 on 211th Avenue, looking south. Sensitive viewers from KOP 7 would be travelers on 211th Avenue looking at the proposed transmission line crossing 211th to the south under the Proposed Action.

The form in the open landscape viewed from this KOP (**Figure 4.14-5a**) is relatively flat with jagged to pyramidal mountains in the distance. The view appears very natural, except

for the tall communications tower that focuses the viewers' attention. The area either side of 211th Avenue is densely vegetated with a variety of native shrubs, small trees, and cactus, and contains several saguaros. The landscape is varied with numerous lines. The vegetation creates an irregular horizontal line in the middle ground, in front of a backdrop of distant mountains that create another irregular horizontal line at the skyline. 211th Avenue and its bladed shoulders create strong diagonal lines, and the communications tower creates a prominent vertical line in the center of the view. Saguaros create intermittent short vertical lines that appear to repeat the vertical line of the communications tower. The predominant color is the gray of the road surface of 211th Avenue, and reddish-tan of the bare road shoulders. The vegetation is shades of green, gray-green, yellow-green, tans, and browns. The distant mountains appear gray-blue. The roadway is smooth and the bare road shoulders are stippled to smooth. Vegetation is feathery to spiky. The distant mountains appear lumpy and grooved.

KOP 8

KOP 8 (**Figure 3.14-7**) is located at the intersection of the rock crushing/ranch road and SR 74, looking south. Sensitive viewers from KOP 8 would be travelers on the rock crushing/ranch road coming to a stop at the intersection, or travelers on SR 74 looking south across vacant land at the proposed transmission line perpendicular to their view, approaching SR 74.

The landscape viewed from this KOP is flat with foreground views of the road cut and vegetation, and views of a mountain range in the distance, which together create an indistinct and broken horizontal line at the skyline. Aside from evidence of the highway the landscape appears very natural. The edge of the highway and the edge of the bare ground from the road cut both create strong, parallel, horizontal lines in the foreground. Vegetation consists of a combination of shrubs and low trees with several saguaros, creating short vertical lines against the sky. The predominant colors in the landscape are the gray of the highway and associated road cut, shades of green, gray-green, and a few tans in the vegetation. Distant mountains appear shades of blue. The road surface appears smooth, and the road cut gravely. Vegetation appears feathery to blunt.

KOP 11

KOP 11 is located within the Castle Hot Springs SRMA and Hieroglyphic Mountains RMZ, along OHV Trail LP-9A, approximately five miles north of SR 74 and The Boulders Staging Area, looking south-southwest. Sensitive viewers from KOP 11 would be primarily OHV recreationists (although hikers or horseback riders could also access this area) looking across the southern portion of the SRMA at distant views of the proposed transmission line south of SR 74.

The view from this KOP (**Figure 4.14-18a**) is of an open landscape that is mostly lower in elevation than the KOP, with a few rolling hills in the middle ground and a mountain range in the distance. The landscape appears very natural. Distant flat lands form a strong horizontal line between the backdrop of the mountains and the rolling hills in the middle ground. The rolling hills create a soft, undulating horizontal line with subtle diagonal lines connecting. The only noticeable developments are several OHV trails that are visible as curvilinear lines

of light tan. The trails are not obvious and do not attract attention. The area is fairly uniformly vegetated in patches of low shrubs, grasses, and numerous saguaros in shades of green and dark brown. Patches of exposed earth are shades of light to dark gray-tan. Vegetation appears clumped and feathery in the foreground, stippled in the middle ground, to smooth in the distance.

3.14.5.6 Portion Common to the Proposed Action, Alternative 1, and Alternative 2

This portion of the Project begins at the intersection of SR 74 and the 179th Avenue alignment and extends to the point where the Proposed Action and Alternative 1 route would cross to the north side of SR 74.

Landscape Characteristics

From 179th Avenue, the Proposed Action, Alternative 1, and Alternative 2 routes turn north for 0.2 mile and then parallel SR 74 for 2.1 miles. In this area, the landforms are rolling with washes with well-defined sandy beds with many trees in the washes. Vegetation includes scattered saguaros, trees, and shrubs between the washes. The route crosses bladed and two-track dirt roads. The route then turns north after passing two outlying hills of the Hieroglyphic Mountains. The route continues north for 0.2 mile to the edge of the SR 74 scenic corridor. At this point Alternative 2 route turns to the east, continuing into the Hieroglyphic Mountains. The Proposed Action/Alternative 1 route continues 0.1 mile further to SR 74.

BLM Visual Resource Inventory and Management

No BLM-managed public lands are crossed in this portion of the Project; therefore, no BLM VRI or VRM classes are assigned.

Sensitive Viewers and Key Observation Points

Sensitive viewers in this portion of the Project Area include travelers on SR 74 and OHV recreationists.

KOP 10

KOP 10 is located at The Boulders OHV Staging Area, which is located near the southern edge of the Castle Hot Springs SRMA and the Hieroglyphic Mountains RMZ (see **Section 3.9**, **Recreation and Special Designations** for detailed information), approximately one mile north of SR 74, looking south-southeast. Sensitive viewers from KOP 10 would be recreationists looking at the proposed transmission line south of SR 74 on vacant land.

The form in the open landscape viewed from this KOP (**Figure 4.14-14a**) is relatively flat in the foreground to middle ground, with low, jagged to pyramidal mountains in the middle ground, and other mountain ranges visible in the distance. The view is somewhat complex and picturesque with the gravel parking area and fence visible in the foreground, accessed by a curvilinear gravel road that winds through patchy dense native vegetation and numerous saguaros. The horizontal line at the skyline is subtle and indistinct, broken up by faint views of distant mountain ranges, and undulating mountains in the middle ground. Numerous saguaros create short, bold to indistinct vertical lines that generally do not break the skyline.

Development in the distance is visible as white dots where structures reflect the sunlight. The gravel road and parking area are stippled reddish-tan to gray and white. Vegetation consists of patchy low shrubs, cactus, and numerous trees and saguaros. Vegetation is shades of green, gray-green, tans, and dark brown, feathery in the foreground to middle ground, and stippled to dotted in the distance.

3.14.5.7 Proposed Action and Alternative 1

This portion of the Project begins at the point where the Proposed Action and Alternative 1 route would cross to the north side of SR 74 and ends at the Morgan Substation.

Landscape Characteristics

The Proposed Action/Alternative 1 route continues north from SR 74 for 0.3 mile into a BLM-designated transportation corridor (BLM 2010a). The route crosses one heavy-use BLM inventoried-trail. The Proposed Action/Alternative 1 route turns east and northeast paralleling SR 74 for 5.1 miles. The route centerline is approximately 2,000 feet north of SR 74. The route crosses rolling to very rolling landforms for 1.3 miles with vegetation that includes scattered saguaros, trees, and shrubs between the washes. The saguaros are more obvious on the steeper hillsides. The route crosses a low, a moderate, and a heavy use trail (as inventoried by BLM). The route then crosses very hilly terrain for 1.2 miles and 2.1 miles of slightly lower and less rugged hills that contain one light use BLM trail. The route continues east for 0.5 mile over flat to rolling terrain to a ridge, and crosses the paved Christian Church Camp Road (also referred to as Church Road; moderate use BLM trail) and an informal recreation use area with a network of dirt roads (heavy use BLM trail). The trees and shrubs become scattered and the density of saguaros appear to be the same as the previously described portions of the route north of SR 74. The route turns south for 0.4 mile to SR 74 and crosses over a light-use BLM trail.

The Proposed Action/Alternative 1 route continues south of SR 74 for 0.2 mile and merges into a route common to Alternative 2. The route centerline crosses a moderate use BLM trail. The route turns east for 1.2 miles paralleling SR 74. The route centerline is approximately 800 to 900 feet south of SR 74. The route crosses low rolling hills with vegetation that includes scattered saguaros, trees, and shrubs between washes. The route crosses a heavy-use BLM trail that parallels a sandy bottom wash and another heavy-use trail south of the end of Castle Hot Springs Road.

The route continues to parallel the south side of SR 74 for two miles. The vegetation is similar to the vegetation on BLM land north of SR 74, but the terrain is less hilly and more rolling for about 1.5 miles. The route crosses a sandy bottom wash and several two-track roads. The route then descends into the Agua Fria valley. The terrain steepens then flattens and the trees are dense along the braided river channels. The route crosses the Maricopa Trail, the main trail of the Maricopa County Regional Trail System. The route then crosses two-track roads, rises out of the Agua Fria valley bottom and turns south for 0.9 mile. The route leaves the scenic corridor and crosses the Beardsley Canal, two-track roads, and a single track OHV course. The route turns east for 0.6 mile and crosses the Beardsley and Waddell canals and two-track dirt roads, ending at the Morgan Substation.

BLM Visual Resource Inventory and Management

The VRI indicates that the scenic quality for the BLM-managed public lands north of SR 74 is B (moderate); sensitivity is high; and the distance zones are foreground to middle ground. The overall VRI Class is II. The VRM Class is Class III in the existing BLM transportation corridor, immediately north of SR 74, and for the "key" shaped parcel of BLM-managed public lands south of SR 74. North of the transportation corridor the VRM Class is Class II.

Sensitive Viewers and Key Observation Points

Sensitive viewers in this portion of the Project Area include travelers on SR 74, viewers from the Quintero Development and Lake Pleasant Regional park; and OHV recreationists.

KOP 12

KOP 12 is located at a golf course overlook within the existing Quintero Development, approximately one mile north of SR 74, looking southeast. Sensitive viewers from KOP 12 would be golfers and residents of Quintero looking across the southern portion of the SRMA at the proposed transmission line north of SR 74.

The landscape viewed from this KOP (**Figure 4.14-15a**) is partially at a lower elevation than the KOP and is relatively open with flat to somewhat hilly landforms in the foreground to middle ground, with angular gentle mountains in the middle ground and distance. The rolling hills and mountains form an undulating horizontal line at the skyline that flattens as it moves away from the hills. Mountains in the distance serve as a backdrop to a portion of the flattened horizontal line. The hills and low mountains in the middle ground create soft diagonal lines. The view is complex with a mixture of natural areas and man-made developments. The majority of the area is vegetated with a dense mixture of shrubs, cactus, and low trees, with numerous saguaros that is colored shades of green, brown, and tan. The boundary between the golf course turf and the native vegetation is a crisp horizontal line that repeats the other horizontal lines in the scene. The golf course turf is variegated shades of bright green that contrasts strongly with the muted shades of green in the native vegetation. The saguaros create numerous subtle short vertical lines that do not break the skyline. In the foreground to middle ground the vegetation is feathery and fades to stippled and dotted in the middle ground, and to smooth in the distance.

KOP 13

KOP 13 is located approximately one mile north of SR 74 within the Castle Hot Springs SRMA along OHV trail LP-1, and approximately two miles east of the southernmost point of the Quintero development, looking south-southwest. Sensitive viewers from KOP 13 would be single-track OHV recreationists looking across the southern portion of the SRMA at the proposed transmission line north of SR 74.

The landscape viewed from this KOP (**Figure 4.14-16a**) is at a lower elevation and is somewhat open, but surrounded by low rolling hills and rugged buttes that make it feel slightly enclosed. Looking southwest, the landscape flattens and provides distant views of low mountain ranges. The skyline forms a strong horizontal line that undulates slightly with the distant mountains. The surrounding rolling hills create soft curvilinear lines that focus the view through the gentle valley, out into the flatter terrain in the distance. The area is

vegetated with a patchy dense combination of low trees, numerous saguaros, and a few other species of cactus. Single-track OHV trails are visible in the landscape as light tan to gray curvilinear lines, but are not obvious and do not attract attention. Otherwise, no man-made structures are noticeable; the view appears very natural and picturesque. The numerous saguaros are evenly distributed in the foreground and middle ground, and create short, dark vertical lines that do not break the skyline. Vegetation is shades of green, gray-green, and yellow-green, and dark brown. Exposed ground in between vegetation patches is light tan to gray. The vegetation is feathery to clumped in the foreground and middle ground, and fades to stippled in the middle ground, and almost smooth in the distance. Distant mountain ranges are jagged blue-gray.

KOP 16

KOP 16 is located at the Lake Pleasant Regional Park campground, looking southwest. Sensitive viewers from KOP 16 would be campers in the campground and other recreationists looking across vacant land at the proposed transmission line south of and parallel to SR 74.

The landscape viewed from this KOP (**Figure 4.14-20a**) is at a somewhat lower elevation; is open and flat to slightly undulating with a few surrounding low hills, and mountains in the distance. The hills and backdrop of mountains create a broken, undulating horizontal line at the skyline that is repeated with appearances of horizontal lines created by vegetation patterns in the flatter areas. Scattered hills create short, subtle, curvilinear and diagonal lines. One short segment of dirt road is visible as a reddish-tan curvilinear line; otherwise, no man-made features are visible, and the landscape appears very natural. The area is sparsely vegetated predominantly with low shrubs and cactus, and a few trees and saguaros. The saguaros punctuate the otherwise fairly horizontal landscape with a few short and irregularly spaced vertical lines. The vegetation is mostly shades of tan, brown and gray, with scattered clumps of green trees, and a few gray-green saguaros. The exposed ground is shades of tan with red and gray tones. Vegetation is feathery in the foreground, becoming dotted and stippled in the middle ground, to smooth in the distance. Visually the landscape appears somewhat homogeneous; the hills add some visual interest to an area with little other variety in color, line, or texture.

KOP 19

KOP 19 is located at the intersection of the Quintero access road and SR 74, looking south. Sensitive viewers from KOP 19 would be Quintero residents and recreationists leaving the golf course looking at the proposed transmission line south of and parallel to SR 74.

The landscape viewed from this KOP (**Figure 4.14-19a**) is flat to gently rolling, with middle ground views of low hills primarily to the east of the direct south view from the KOP. Striping on SR 74 in the foreground creates strong horizontal lines. Vegetation in the foreground creates an indistinct horizontal line. The backdrop of mountain ranges in the distance creates a subtle irregular horizontal line at the skyline. The horizontal lines are broken by short vertical lines created by the numerous saguaros. A few fence posts visible in the foreground repeat the short-vertical lines of the saguaros. Vegetation in the foreground appears patchy and dense, comprised of small trees, low shrubs, saguaros, and other cactus

species. The vegetation is mostly shades of green, gray-brown, and brown. The exposed ground is shades of tan with tinges of red in places. Distant mountain ranges are jagged blue-gray. Vegetation is feathery in the foreground with scattered saguaros that appear thick and blunt.

Linear KOP

The portion of SR 74 traversing the low rolling hills, mountains and rugged buttes of the Hieroglyphic Mountains has recognized scenic values. Because of this, the entire stretch of SR 74 roughly between the Agua Fria River and just past the westernmost crossing of SR 74 by the ROW is one linear KOP, which is approximately 10 miles long. Travelers either direction on SR 74 enter the linear KOP from areas that are relatively flat, dominated by horizontal lines, with little variety in color or form. After passing the linear KOP entry points, views of development diminish, and the landscape appears more natural and unmodified, as well as scenic. Moving through the linear KOP, SR 74 has gentle curves that wind through the low hills and buttes. The views become more enclosed and in some cases focus the viewers' attention on more prominent formations. Saguaros that are sparse outside the linear KOP at higher elevations occur in dense stands on the hillsides and saddles between hills. Within the linear KOP, topography, road cuts, and taller vegetation sometimes limit middle ground views from the highway. As travelers on SR 74 approach the end points of the linear KOP, the landscape is noticeably flattening out; vegetation becomes less diverse and more uniform, lines are predominantly horizontal, and the views less scenic.

Within the linear KOP, specific observation points have been established to evaluate the impacts to the views of eastbound and westbound traffic, to the BLM VRI, and contrast on lands other than those managed by the BLM. KOP 17 is the westbound linear KOP, and KOP 18 is the eastbound linear KOP. Specific observation points are denoted alphabetically (i.e., "a", "b", etc.).

KOP 17a

KOP 17a (no photograph taken at this KOP) is located just east of the Agua Fria River along SR 74, looking west. Sensitive viewers from KOP 17a would be westbound travelers on SR 74 looking at the proposed transmission line coming in from the south perpendicular to SR 74, and then paralleling the south side of SR 74 going into the distance.

KOP 17a is the entry point for the westbound linear KOP along SR 74. From KOP 17a, the landscape transitions from relatively flat topography in the foreground to low hills and buttes in the middle ground and background that give the area scenic and natural appearing qualities. The strong horizontal line at the skyline is irregular with domed and pyramidal hills. The highway with its associated shoulders and painted lines creates a strong diagonal line that becomes weaker and curvilinear in the distance. Wood poles supporting the existing power line paralleling the highway create strong vertical lines in the foreground to middle ground. Vegetation is sparse, consisting primarily of low grasses and shrubs, with an occasional saguaro visible. The predominant colors in the landscape are the gray of the highway; tan, brown, and reddish brown in the bare ground; and tans and browns with some shades of green in the vegetation. Textures are feathery to gravely in the foreground, stippled in the middle ground, to smooth in the distance.

KOP 17b

KOP 17b is located along SR 74 just east of the proposed easternmost crossing of SR 74 by the transmission line, looking west-southwest from the north side of the highway. Sensitive viewers from KOP 17b would be westbound travelers on SR 74 looking at the proposed transmission line at the easternmost crossing.

The landscape viewed from this KOP (**Figure 4.14-7a**) is somewhat enclosed by surrounding hills and buttes, and road cuts through the hills. The prominent butte just to the south of SR 74 creates a picturesque feature landscape, focusing the viewer's attention on the butte. The gentle hills and butte create an undulating horizontal line at the skyline. Strata in the butte and surrounding hills create subtle horizontal and diagonal lines that are accentuated by vegetation patterns and shadows. SR 74 and its associated road shoulders create strong diagonal lines. The area is sparsely vegetated with a variety of grasses, low shrubs, small trees, and numerous saguaros, which create short vertical lines that are skylined along the saddle between the prominent butte and the adjacent hill. The predominant colors in the view from this KOP are shades of brown with dots of various shades of green. Exposed ground ranges from dark brown to light tan, gray, and almost white. Vegetation in the foreground is feathery to spiky, and becomes dotted to stippled in the middle ground.

KOP 17c

KOP 17c is located in the same general area as 17b, but views the Proposed Action route from the south side of SR 74, looking northwest. Sensitive viewers from KOP 17c would be westbound travelers on SR 74 looking at the proposed transmission line north of SR 74 within the SRMA.

The landscape viewed from this KOP (**Figure 4.14-9a**) is somewhat enclosed by surrounding hills and buttes, and road cuts through the hills. The landscape is characterized by a series of low hills in the middle ground of the view that create an undulating and somewhat broken horizontal line at the skyline. The hills create subtle curvilinear and diagonal lines in the middle ground. The area is sparsely vegetated with a variety of grasses, low shrubs, small trees, and numerous saguaros, which create short vertical lines. The predominant colors in the view from this KOP are a mixture of browns and various shades of green. Exposed ground ranges from dark brown to light tan, gray, and almost white. Vegetation in the foreground is feathery to spiky, and becomes dotted to stippled in the middle ground. The combination of the rolling hills, variety of vegetation, and presence of saguaros in a relatively natural appearing setting makes the view visually appealing.

KOP 18a

KOP 18a (no photograph taken at this KOP) is located along eastbound SR 74, approximately one mile west of the westernmost crossing of SR 74, looking east. Sensitive viewers from KOP 18a would be eastbound travelers on SR 74 looking at the transmission line's proposed westernmost crossing of SR 74. Eastbound travelers on SR 74 come up over a small rise and the Project Area comes into view ahead. The landscape transitions, from this point eastward, from relatively flat, open terrain vegetated mostly with low shrubs and small trees, to an area with low rolling hills that are vegetated with a variety of shrubs, cactus, and trees. As the elevation increases traveling eastward, the density of stands of saguaro cactus

increases, which contributes to the level of visual interest and scenic quality of the area. This point was selected as the eastbound entry point for the linear KOP because the Project would come into clear view at this point and eastbound travelers would clearly see the changes in topography, vegetation, and overall scenic quality.

KOP 18b

KOP 18b is located along eastbound SR 74, just west of the westernmost crossing of SR 74, looking east. Sensitive viewers from KOP 18b would be eastbound travelers on SR 74 looking at the proposed transmission line's proposed westernmost crossing of SR 74 from the south side to the north side, then paralleling SR 74 going into the distance.

The landscape viewed from this KOP (**Figure 4.14-10a**) is relatively flat and open in the foreground, and transitions to low rolling hills in the middle ground. The landscape is characterized by a series of low hills in the middle ground of the view that create an undulating and somewhat broken horizontal line at the skyline. The hills create subtle curvilinear and diagonal lines in the middle ground. Vegetation is patchy, with some patches densely vegetated with small trees, shrubs, and a variety of cactus; interspersed with patches that are sparsely vegetated or bare ground. Most of the vegetation appears soft and lumpy. Numerous saguaros create short vertical lines. The predominant colors in the landscape are the gray of the highway and road shoulders surrounded by shades of green dotted with yellow in the foreground. The colors transition to gray-green, tans, and browns in the middle ground. Textures range from fine and feathery in the foreground, to dotted and stippled in the middle ground.

KOP 18c

KOP 18c is located along eastbound SR 74, near the midpoint of the segment of the transmission line that lies north of SR 74, looking northeast. Sensitive viewers from KOP 18c would be eastbound travelers on SR 74.

The landscape viewed from this KOP (**Figure 4.14-12a**) is somewhat enclosed in the foreground by the surrounding low hills and the road cut on the north side of SR 74. The enclosed nature of the landscape surrounding the road cut focuses the viewer's attention on the hills in the middle ground and coarse mountains in the distance, which create an uneven weak horizontal line at the skyline. From this KOP the area in the foreground appears sparsely vegetated with a few trees and shrubs, and several saguaros that create short, vertical lines that break the skyline in some cases. Delineators along the highway repeat the short vertical lines created by the saguaros. The highway and associated guard rail are curvilinear. Aside from the gray color of the highway, the predominant color in the landscape is the reddish tans and grays of the bare ground. The distant hills and mountains appear tan, brown, and gray-green to blue. Bare ground in the foreground appears coarse and gravely, and the vegetation is feathery to spiky. In the distance the hills and mountains appear patchy.

KOP 20

KOP 20 is at the intersection of Castle Hot Springs Road and SR 74, looking south. Sensitive viewers from KOP 20 would be southbound travelers on Castle Hot Springs Road who are traveling at relatively low rates of speed (35 mph or less), preparing to come to a stop at the

intersection. Sensitive viewers would be looking at the proposed transmission line south of the intersection paralleling SR 74.

The landscape viewed from this KOP (**Figure 4.14-17a**) is comprised of low, gentle rolling hills that create a somewhat enclosed feeling. There is a saddle between two low hills south of SR 74 that southbound viewers look through and glimpse distant views of the skyline, which creates a short horizontal line in the center of the view. The hills are sparsely vegetated with clumps of grasses, a few shrubs and small trees, and numerous saguaros, which create short vertical lines against the sky. The guard rail at the intersection creates a strong horizontal line in the center of the view. Castle Hot Springs Road is crossed by a small electric line that turns north to parallel Castle Hot Springs Road. Poles that can be seen peripherally repeat the vertical lines of the saguaros. The existing power line, traffic signs, delineators, and guard rails accentuate the human developments over the natural environment at the intersection. The predominant colors in the landscape are a combination of tans, browns and greens. Vegetation appears feathery to spiky; bare ground appears coarse and rocky.

3.14.5.8 Alternative 2

This portion of the Project begins at the point where the Proposed Action and Alternative 1 route would cross to the north side of SR 74, continues along the south side of SR 74, and ends at the point where the Proposed Action and Alternative 1 route returns to the south side of SR 74.

Landscape Characteristics

The Alternative 2 route parallels SR 74. The route centerline is approximately 500 feet south of the road. From the point where the Proposed Action route turns north to cross SR 74 at approximately 163rd Avenue, the Alternative 2 route continues east for 0.9 mile and crosses rolling landforms with sandy washes. Vegetation includes saguaros, trees, and shrubs with more trees along the washes. The route crosses two two-track dirt roads and one trail. It then crosses the Hieroglyphic Mountains and continues east for 2.3 miles. The landforms in this area are hills interspersed with lower rolling terrain and small washes. The Alternative 2 route generally stays to the north or on the north slope of higher mountains. The vegetation includes saguaros, trees, and shrubs with more trees along the washes. The route criss-crosses eight bladed and two-track dirt roads. The route then crosses lower rolling terrain with washes with well-defined sandy bottoms for 1.1 miles. The route crosses one two-track road. Near the eastern end of the segment the route crosses the north slope of a hill.

The Alternative 2 route continues east onto BLM land for 0.8 mile and then merges with the Proposed Action/Alternative 1 route. The terrain is low and rolling except for a prominent butte that the route crosses on its north slope. The butte is the most prominent landform along SR 74 in the Study Area. The route crosses one wash with a well-defined sandy wash bottom.

BLM Visual Resource Inventory and Management

The VRI for BLM-managed public lands south of SR 74 indicates that the scenic quality for this area is B (moderate); sensitivity is high; and the distance zones are foreground to middle ground. The overall VRI Class is II. The VRM Class is Class III.

Sensitive Viewers and Key Observation Points

Sensitive viewers in this portion of the Project Area include travelers on SR 74 and recreationists in portions of the SRMA where the south side of SR 74 is visible.

KOP 13

See the description for KOP 13 under **Section 3.14.5.7**. Under Alternative 2 sensitive viewers would be looking at the proposed transmission line paralleling the south side of SR 74 (**Figure 4.14-16a**).

KOP 17d

KOP 17d is located along SR 74, along the portion of the Alternative 2 route that would be located south of SR 74 (while the Proposed Action would be north of SR 74), looking southwest. Sensitive viewers from KOP 17d would be westbound travelers on SR 74 looking at the proposed transmission line paralleling the south side of SR 74.

The landscape viewed from this KOP (**Figure 4.14-23a**) is comprised of low hills that give it a somewhat enclosed feeling. The hills create an undulating horizontal line in the middle ground at the skyline. Viewers catch glimpses of the skyline in the distance with angular mountains though the saddles between the hills. Vegetation is patchy, with some patches densely vegetated with small trees, shrubs, and a variety of cactus; interspersed with patches that are sparsely vegetated or bare ground. Most of the vegetation appears soft and lumpy. Numerous saguaros create short vertical lines. The highway with the associated guard rail and painted lines create strong diagonal lines. The upright posts supporting the guard rail create regular, repetitive vertical lines. The predominant colors in the landscape are the gray of the highway and road shoulders surrounded by tans and browns of bare ground, and shades of green dotted with yellow in the vegetation in the foreground. Vegetation appears feathery to spiky, interspersed with the gravely bare ground. The highway and guard rail appear smooth. Aside from the highway, the landscape appears very natural and scenic.

KOP 18d

KOP 18d is located along SR 74, along the portion of the Alternative 2 route that would be located south of SR 74 (while the Proposed Action would be north of SR 74), looking southeast. Sensitive viewers from KOP 18d would be eastbound travelers on SR 74.

The landscape viewed from this KOP (**Figure 4.14-24a**) is comprised of low hills that give it a somewhat enclosed feeling. The hills create an undulating horizontal line in the middle ground at the skyline. Viewers catch glimpses of the skyline in the distance at the road cut, revealing mountain ridges that create somewhat muted horizontal lines at the skyline. The top of a prominent butte is visible south of SR 74. Vegetation is patchy, with some patches densely vegetated with small trees, shrubs, and a variety of cactus; interspersed with patches that are sparsely vegetated or bare ground. Most of the vegetation appears soft and lumpy. Numerous saguaros create short vertical lines. The highway with the associated guard rail and painted lines create strong curvilinear lines. The predominant colors in the landscape are the gray of the highway and road shoulders surrounded by tans and browns of bare ground, and shades of green in the foreground to middle ground. Vegetation appears feathery to

spiky, interspersed with the gravely bare ground. The highway and guard rail appear smooth. Aside from the highway, the landscape appears very natural and scenic.

KOP 20

See the description for KOP 20 under **Section 3.14.5.7**.

3.14.5.9 Alternative 3

This portion of the Project begins at the intersection of SR 74 and the 179th Avenue alignment, extends south to the Carefree Highway alignment, continues east along the Carefree Highway Alignment, turns northeast to parallel the Westwing/Raceway common corridor, and ends at the Morgan Substation.

Landscape Characteristics

The Alternative 3 route diverges from the route common to the Proposed Action and Alternatives 1 and 2 routes at 179th Avenue. Alternative 3 travels south along the 179th Avenue alignment for 2.0 miles. The terrain is gently rolling and crosses mainly small washes. Vegetation includes saguaros, shrubs, and trees. The trees are mainly along the small washes. The route crosses two two-track dirt roads and parallels a dirt road for about one mile. The route then turns east along the Carefree Highway alignment and continues for 2.1 miles crossing many north-south washes of various sizes, including Padelford Wash, a large braided wash. The route crosses five bladed and two-track roads and parallels a two-track road for approximately one mile.

The Alternative 3 route continues east along the Carefree Highway alignment and crosses the outlying hills of the Hieroglyphic Mountains. The route then continues through the Hieroglyphic Mountains which are relatively tall (2,200 feet) and rugged at this point for 2.4 miles. Between the mountains are washes with sandy bottoms. The vegetation includes saguaros, shrubs, and trees. The trees are mainly along the small washes, and there are more trees on the north-facing slopes. The route crosses or borders the future developments of Saddleback Heights and Vistancia. It crosses three existing two-track dirt roads. The route continues east where the lower rolling terrain widens between the hills and mountains for 2.9 miles. The route crosses a few washes with sandy bottoms and trees along the washes. The trees are evenly distributed on the north and south sides of the hills. The route crosses portions and borders portions of the future developments of Saddleback Heights, Vistancia, and Lake Pleasant Heights. It crosses many two-track roads and single track roads and/or trails. The Clementine Mine is about 0.5 mile to the south, the Twin Buttes (local high points) are about 0.7 mile to the south, and the CAP Canal is about 1.4 miles to the south. For the next 2.2 miles, the route continues east and crosses on the south slopes of an unnamed long tall ridge, over a steep-sided wash, and then drops down into the Agua Fria valley. The vegetation in the braided river bottom is composed of shrubs, relatively dense trees, and few if any saguaros. There are bladed, two-track, and single track dirt roads and OHV courses in the floodplain.

The Alternative 3 route turns northeast for 1.5 miles. The route travels out of the valley bottom and crosses the Maricopa Trail with gently rolling terrain. The vegetation consists of shrubs some saguaros, and widely scattered trees. The route parallels existing Western Area

Power Administration 500kV, 230kV, and 69kV transmission lines. Canyon Speedway and various vehicle courses are to the east and Cowtown Paintball recreation facility is to the west across the river. The route passes over a surfaced road to the paintball facility and a bladed and many two-track roads. The route passes next to the Raceway Substation and over the Beardsley and Waddell canals. It ends at the Morgan Substation.

BLM Visual Resource Inventory and Management

No BLM-managed public lands are crossed in this portion of the Project; therefore no BLM VRI or VRM classes are assigned.

Sensitive Viewers and Key Observation Points

Sensitive viewers in this portion of the Project Area include travelers on SR 74, residents in the northern portions of the Vistancia development south of the CAP, and landowners of the private property between the CAP and SR 74.

KOP 9

KOP 9 is located along SR 74 where the ROW along the Joy Ranch Road alignment approaches and begins to parallel the south side of SR 74, then turns south along 179th Avenue, looking east. Sensitive viewers from KOP 9 would be east-bound travelers on SR 74.

The landscape form viewed from this KOP (**Figure 4.14-26a**) is slightly undulating in the foreground with rolling hills visible in the distance. The vegetation in the area of the KOP is patchy to dense, with a variety of native shrubs, cactus and a few low trees. While the landscape is open, the road cut with vegetation blocking the middle ground views begins to feel slightly enclosed. Aside from SR 74, no other man-made developments are visible, making the view feel very natural. The vegetation in the foreground and rolling hills in the background create an undulating, broken horizontal line at the skyline. The roadway with painted lines and the associated road shoulder creates crisp diagonal lines. Several saguaros are visible, creating short vertical lines that contrast with the horizontal line of the skyline. The predominant colors in the landscape are the gray of the road surface, shades of greens, tans, and browns in the vegetation, and thin slivers of dark gray-blue of the hills in the background. The road surface appears smooth with cracks in the foreground to smooth in the distance. Vegetation is clumped, and feathery to stippled.

KOP 12

See the description for KOP 12 under **Section 3.14.5.7**.

KOP 14

KOP 14 is located approximately one mile south of SR 74, immediately west of the BLM-managed public lands south of SR 74, on private property that is planned to be included in the Vistancia development, looking south. Sensitive viewers from KOP 14 would be landowners looking at the proposed transmission line crossing vacant lands.

The landscape viewed from this KOP (**Figure 4.14-27a**) is open and relatively flat in the foreground, with views of a few pyramidal hills in the middle ground, forming an irregular strong horizontal line. Glimpses of distant views of the horizon can be caught in the saddles

between the hills, forming short, faint horizontal lines. Distant rugged mountains create another faint, irregular horizontal line. Vegetation is patchy, with some patches densely vegetated with small trees, shrubs, and a variety of cactus; interspersed with patches that are sparsely vegetated or bare ground. Most of the vegetation appears soft and lumpy. Numerous saguaros create short vertical lines. The predominant colors in the landscape are shades of green, reddish brown, and tan. Vegetation in the foreground is feathery to spiky, and becomes dotted to stippled in the middle ground. No developments are visible in the landscape, and it appears very natural and scenic.

KOP 15

KOP 15 is located in the central portion of the Vistancia development, just south of the CAP, looking north. Sensitive viewers from KOP 15 would be land owners and residents looking at the proposed transmission line crossing vacant land within the Vistancia development.

The landscape viewed from this KOP (**Figure 4.14-28a**) is composed of low, gently rolling hills. A glimpse of distant hills is visible in a saddle between the hills. The hills create a strong irregular and somewhat curvilinear horizontal line at the skyline. Development in the foreground has eliminated most vegetation. A few shrubs, trees, and saguaros are visible at the periphery of the view. Vegetation in the middle ground appears patchy and sparse, comprised of low shrubs and trees. The landscape has been highly modified and, as viewed at the time of the photograph, was under development. The predominant colors in the landscape are the gray paved road; browns, tans, grays, and reddish browns and tans of the bare ground under development. Vegetation in the middle ground is gray-green against the reddish-brown bare ground. The foreground appears smooth to gravely in the area under development, and rocky, stippled, and dotted in the middle ground.

KOPs 19 and 20

See the descriptions for KOPs 19 and 20 under **Section 3.14.5.7**.

3.14.5.10 State Land Route Variation Sub-alternative

Sub-alternative

This portion of the Project begins just north of the intersection of the Proposed Action route and US 60, continues east for three miles along the Cloud Road alignment, turns north for one mile along 211th Avenue, and ends where the route rejoins the Proposed Action route just south of SR 74.

Landscape Characteristics

The Sub-Alternative route diverges from the route common to the Action Alternatives at Cloud Road. The route travels east paralleling the north side of Cloud Road or its alignment for 1.8 miles until reaching the eastern boundary of the Wickenburg Scenic Corridor. The terrain is gently rolling with many small and larger sandy bottom washes. Vegetation includes saguaros, shrubs, and trees. The trees are mainly located along washes. The route crosses nine two-track dirt roads; four of the roads are within 0.5 mile of 211th Avenue. The centerline of the route is within approximately 600 feet of 13 homes, which are located just west of 211th Avenue. The route crosses the boundary of the scenic corridor and continues

0.2 mile. The route then turns north along the west side of 211th Avenue and continues for 1 mile crossing a sandy bottomed wash several times. The route crosses three two-track roads and ends at the route common to all Action Alternatives. Just to the east of 211th Avenue is a communications tower with daytime white obstruction lighting and two residences.

BLM Visual Resource Inventory and Management

No BLM-managed public lands are crossed in this portion of the Project; therefore no BLM VRI or VRM classes are assigned.

Sensitive Viewers and Key Observation Points

Sensitive viewers of the Sub-alternative route would be travelers on 211th Avenue and residents with views of the Sub-alternative route.

KOPs 4 and 7

See the description for KOPs 4 and 7 under **Section 3.14.5.5**. Under the Sub-alternative route, sensitive viewers from KOP 4 would not see the proposed transmission line behind residences in Thunder Ridge Airpark. From KOP 7, sensitive viewers would see the proposed transmission line paralleling 211th on the east under the Sub-alternative route.

KOP 21

KOP 21 is located near the intersection of Caravaccio Lane & 213th Drive, looking northwest. Sensitive viewers from KOP 21 would be residents looking at the proposed transmission line running behind existing residences.

The landscape viewed from this KOP (**Figure 4.14-29a**) is relatively flat with homes, garages, dirt roads, and fences in the foreground, and a few rugged mountains in the distance. The horizontal line at the skyline is broken by buildings, trees, and distant mountains making it indistinct. Fencing in the foreground creates broken but distinct horizontal and vertical lines that repeat the lines in the structures. The residences appear boxy, and the rooflines of the residences in the foreground are made up of short diagonal lines. The foreground is mostly cleared of vegetation except for scattered cactus, low trees, and patches of grass. Vegetation in the middle ground appears to be dense patches of trees and shrubs with an occasional saguaro. The predominant colors in the landscape are light tans and browns in the bare ground and structures. Vegetation is shades of green and gray-green. Distant mountains appear gray-brown. Bare ground in the foreground appears smooth to stippled, dotted with grass or gravel. Vegetation in the middle ground appears feathery, while the distant mountains appear smooth to slightly lumpy.

KOP 22

KOP 22 is located east of 211th Avenue on Carlisle Road, looking west. Sensitive viewers from KOP 22 would be residents looking at the proposed transmission line paralleling 211th.

The landscape viewed from this KOP (**Figure 4.14-30a**) is flat with middle ground views of a few rolling hills and mountains on the periphery of the view. The presence of the structure, roads, and fences give the view a feeling of rural semi-development. A communications tower near the center of the view creates a prominent, tall vertical line. The skyline creates a horizontal line that is fuzzy and indistinct due to intervening vegetation. Carlisle Road and

the fences that line it create strong diagonal lines in the foreground, with upright fence posts creating a visual sequence of short vertical lines. One structure is peripherally visible. Vegetation in the area consists of sparse low shrubs with an occasional small tree and saguaro. The predominant colors in the landscape are light tan, dark brown, and shades of green. Vegetation appears soft and feathery, except for the saguaro, which look blunt and rounded. The structures and distant mountains appear smooth.

Primary Segment Common to All Action Alternatives

This portion of the Project begins just north of the intersection of the Proposed Action route and US 60, continues north to the Joy Ranch Road alignment, then turns east for approximately three miles and ends at the intersection with 211th Avenue.

Landscape Characteristics

The portion of the Proposed Action/common route that could be replaced by the Sub-alternative starts in the Wickenburg Scenic Corridor. After crossing US 60 and the Burlington Northern Santa Fe Railroad track, the route crosses Cloud Road and continues north paralleling the Thunder Ridge Airpark, a residential community, approximately 0.2 mile from the route centerline. A bladed dirt road parallels and is within the route for a portion of this segment. The route then turns to the east for 1.7 miles until reaching the eastern end of the Wickenburg Scenic Corridor. The terrain is gently rolling with many small and larger sandy bottom washes. Vegetation includes saguaros, shrubs, and trees. The trees are mainly in the washes but are also scattered between the washes. The route crosses one bladed and five two-track dirt roads. The route continues east for 0.3 mile crossing two two-track roads and paralleling a two-track segment that is within the 200-foot wide ROW. At 211th Avenue, this segment would join the route common to all Action Alternatives.

BLM Visual Resource Inventory and Management

No BLM-managed public lands are crossed in this portion of the Project; therefore no BLM VRI or VRM classes are assigned.

Sensitive Viewers and Key Observation Points

Sensitive viewers of the primary segment route common to all Action Alternatives would be travelers on 211th Avenue and residents in the vicinity of Thunder Ridge Airpark.

KOPs 5, 6, and 7

See the descriptions for KOPs 5, 6, and 7 under **Section 3.14.5.5**.

3.15 WATER RESOURCES

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Water Resources Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012k). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

The Study Area for this section was based on a watershed level which includes the lands within and adjacent to the Proposed Action route, the ACC-certificated route, and the other

Action Alternative routes. The Project locally traverses from east to west the Lower Agua Fria River, Trilby Wash, and the Lower Hassayampa River watersheds.

This report discusses applicable plans, policies, and regulations for water resources and identifies the existing surface water and groundwater resources that may be potentially affected by the Project.

3.15.1 Surface Water Resources

3.15.1.1 Laws, Ordinances, Regulations, and Standards

Clean Water Act - In 1972, Congress passed the Federal Water Pollution Control Act, which was reauthorized in 1977, 1981, 1987, and 2000 as the CWA (33 USC Section 1251 et seq.). The goals of the law are to eliminate pollution in the nation's waters by imposing uniform standards on all municipal and industrial wastewater sources based on the best available technology and wherever attainable, water quality which provides for the protection and propagation of fish, shellfish, and wildlife and provides for recreation in and on the water. The CWA requires states to set standards to protect, maintain, and restore water quality through the regulation of point source and certain non-point source discharges to surface water. Those discharges are regulated by the National Pollutant Discharge Elimination System (NPDES) permit process (Section 402 of the CWA; 33 USC §1342).

Section 401 of the Clean Water Act of 1972

Section 401 of the CWA (33 USC §1341) requires that any activity, including river or stream crossings during road, pipeline, or transmission line construction, which may result in discharge into a state waterbody, must be certified by the ADEQ. This certification ensures that the proposed activity does not violate state and/or federal water quality standards. ADEQ uses its Section 401 certification authority to ensure that Section 404 permits protect state water quality standards.

Section 404 of the Clean Water Act of 1972

In 1972, the U.S. Congress gave the U.S. Army Corps of Engineers (USACE) authority to regulate the discharge of dredged or fill material into waters of the U.S. under Section 404 of the CWA (33 USC §1344). The Rivers and Harbors Act of 1899 defined navigable waters of the U.S. as those waters that are subject to the ebb and flow of the tides and/or are presently used, or have been used in the past, or may be susceptible to use to transport interstate or foreign commerce. The CWA built on this definition and defined waters of the U.S. to include tributaries to navigable waters, interstate wetlands, wetlands which could affect interstate or foreign commerce, and wetlands adjacent to other Waters of the U.S.

The USACE may issue either individual, site-specific permits (standard permit, letter of permission) or general permits (regional or nationwide) for discharges of dredged or fill material into waters of the U.S. Transmission line construction is covered under Nationwide Permit No. 12 Utility Line Activities.

APS had an initial meeting with the local USACE office in August 2012 to introduce the Project and discuss methods for completing a Jurisdictional Delineation. Based upon the initial meeting and a review of the Project, the USACE stated that the Project could likely be

permitted under a Nationwide Permit No. 12, thus complying with Section 404 of the CWA. In order to determine if the Project would meet the requirements of a Nationwide Permit No. 12, complete delineation efforts would begin upon completion of the DEIS.

Section 303(d) of the Clean Water Act of 1972

The objective of the CWA is to restore and maintain the chemical, physical, and biological integrity of the Nation's waters (33 USC §1251(a)). Under Section 303(d) of the CWA, states, territories, and authorized tribes are required to develop lists of impaired waters. The term "303(d) list" is short for the list of impaired and threatened waters (e.g., stream/river segments, lakes) that all states are required to submit for EPA approval during even-numbered years. A state's 303(d) impaired waters list is composed of all waters where the state has identified that required pollution controls are not sufficient to attain or maintain applicable water quality standards. The law requires that states establish a prioritized schedule for waters on the lists, and develop Total Maximum Daily Loads (TMDLs) for the identified waters based on the severity of the pollution and the sensitivity of the uses to be made of the waters, among other factors (40 CFR §130.7(b)(4)).

Arizona's Integrated 305(b) Assessment and 303(d) Listing Report (ADEQ 2009) describes the status of surface water in Arizona in relation to state water quality standards. The report also contains a list of Arizona's impaired surface waters, including a list of surface waters requiring the development of a TMDL (the 303(d) List). The report fulfills requirements of the federal CWA Sections 305(b) assessment, 303(d) impaired water identification, and 314 status of lake water quality.

Executive Order 11988 – Floodplain Management - Executive Order 11988 requires federal agencies to avoid, to the extent possible, long- and short-term adverse impacts associated with the occupancy and modification of floodplains and to avoid direct and indirect support of floodplain development wherever there is a practicable alternative. In accomplishing this objective, each agency shall provide leadership and shall take action to reduce the risk of flood loss, to minimize the impact of floods on human safety, health, and welfare, and to restore and preserve the natural and beneficial values served by floodplains.

The National Flood Insurance Program administered by the Federal Emergency Management Agency (FEMA) identifies flood hazard areas throughout the U.S. by producing Flood Hazard Boundary Maps, Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps. Several areas of flood hazards are commonly identified on these maps. One of these areas is the Special Flood Hazard Area, or high-risk area, defined as any land that would be inundated by a flood having a 1 percent chance of occurring in any given year (also referred to as a base flood or 100-year flood). These maps will be used to determine where the Project crosses flood hazard areas, so that potential safety hazards can be recognized and floodplains preserved or restored.

Executive Order 11990 – Protection of Wetlands - Executive Order 11990, issued on May 24, 1977, requires federal agencies to take action to minimize the destruction, loss or degradation of wetlands and to preserve and enhance the natural and beneficial values of wetlands. To meet these objectives, the Order requires federal agencies, in planning their actions, to consider alternatives to wetland sites and limit potential damage if an activity

affecting a wetland cannot be avoided. The Order applies to the acquisition, management, and disposition of federal lands and facilities construction and improvement projects which are undertaken, financed or assisted by federal agencies and federal activities and programs affecting land use, including but not limited to water and related land resources planning, regulation, and licensing activities. This Order does not apply to the issuance of permits, licenses, or allocations by federal agencies to private parties for activities involving wetlands on non-federal property.

Stormwater National Pollutant Discharge Elimination System - Sections 301 and 402 of the CWA prohibit the discharge of pollutants from point sources to Waters of the U.S., unless authorized under a NPDES permit. NPDES regulates stormwater discharge from a large group of industrial activities, including construction. NPDES permits can be issued by EPA or by agencies in delegated states. As of December 5, 2002, ADEQ administers the NPDES Program in the State of Arizona under the AZPDES. Where discharges have a potential to enter waters of the U.S. or a storm drain system, an AZPDES permit is required from ADEQ. The Project would require an AZPDES Construction General Permit for construction operations.

Maricopa County, Arizona - Maricopa County Floodplain Regulations require a Floodplain Use Permit for any construction in regulated and pending floodplains. The Flood Control District of Maricopa County (FCDMC) issues Floodplain Use Permits through a cooperative agreement with FEMA. The FEMA requirement includes federal lands and therefore, development on BLM land is not exempt from this process. The Project would require a Floodplain Use Permit from FCDMC.

Maricopa County Department of Planning and Development does not have jurisdiction over federal lands, consequently, the Project would not require a Maricopa County Grading and Drainage Permit or a Drainage Facilities Permit for development on BLM lands. However, the Maricopa County Department of Planning & Development does have jurisdiction over the portion of the ACC-certificated route that crosses state land, thus a Grading and Drainage and/or Drainage Facilities Permits would be required for applicable portions.

3.15.1.2 Climate

The climate of the Study Area is arid and characterized by hot summers, mild winters, and large diurnal temperature variations. Mean monthly maximum temperatures measured at Wittmann, Arizona, a city located near the Project along US 60 about 35 miles northwest of Phoenix (**Figure 3.15-1**), for the period from 1923 to 2005 is 63.8°F in January and 105.4°F in July. Mean monthly minimum temperatures at Wittmann, Arizona for the same period is 36.2°F in January and 76.5°F in July (Western Regional Climate Center 2011b).

Mean annual precipitation is 9.09 inches at Wittmann, Arizona and 7.52 inches at Phoenix Sky Harbor International Airport for the period from 1948 to 2005 (Western Regional Climate Center 2011b). Precipitation varies greatly from year to year, and wet years may have as much as four times the precipitation of dry years (Cordy et al. 1998). The climate is characterized by two rainy periods. Convective storms occur during July and August and are sometimes intense. Frontal storms of lesser intensity occur from December through mid-

March (Sellers and Hill 1974). Evaporation rates are high, and free-water surface evaporation exceeds 5 feet per year (Farnsworth et al. 1982).

3.15.1.3 Surface Water Conditions

Regionally, the Study Area is located in the Lower Gila-Agua Fria surface water basin that is drained by the Gila River and its tributaries, the Salt and Agua Fria Rivers (**Figure 3.15-1**). The Lower Gila-Agua Fria basin is subdivided into the Agua Fria and Hassayampa regional watersheds. Within these regional watersheds, the Proposed Action route and other Action Alternative routes traverse from east to west the Lower Agua Fria River, Trilby Wash, and the Lower Hassayampa River watersheds. These watersheds are bordered by desert mountain ranges that include the Vulture and Hieroglyphic Mountains on the north; the Phoenix Mountains and Camelback Mountain on the east; and the Belmont and White Tank Mountains to the south. Gently sloping alluvial plains generally extend, at a grade of approximately one percent, from the base of the mountains southeast to the Agua Fria River and southwest to the Hassayampa River. Along the Proposed Action route and other Action Alternative routes, the altitude of the land surface ranges from about 2,000 feet amsl in the Hieroglyphic Mountains to approximately 1,400 feet amsl along the Agua Fria and Hassayampa Rivers to the east and west, respectively.

Most of the Study Area is characterized by desert scrub vegetation and desert washes. The desert washes are braided in plain view and generally flow to the southeast to the Agua Fria River or southwest to the Hassayampa River. These washes are ephemeral and therefore only flow during, or immediately after, a significant seasonal rainfall. They naturally distribute water and sediment across the region. The washes are unstable and can migrate laterally during significant runoff. They also carry destructive bedloads (boulders and gravels) during intense flash flooding rain events.

Most of these washes are small erosion features that are less than 10 feet wide and 3 feet deep. With the exception of the Agua Fria and Hassayampa Rivers, there are no perennial or intermittent watercourses in the Study Area. Flows in the Agua Fria River are almost entirely regulated. In years of normal precipitation, all flow is captured and stored behind a dam in the Lake Pleasant reservoir (e.g., Lake Pleasant) that is upstream from the Study Area. Downstream from the dam and reservoir, only occasional flow in local tributaries reaches downstream rivers except at times of high flows during extremely wet years.

Water from the reservoirs is distributed through a system of canals. Originally, the canals were designed to provide only surface water for irrigated agriculture, but as the area developed, groundwater augmented the supply. Since the early 1960s, treated effluent from metropolitan Phoenix has been delivered through some canals. As the region has undergone a transition from agricultural to urban land use, the canals have become integrated into urban water-supply systems. The Beardsley Canal, operated by the Maricopa Water District, transports water from Agua Fria River to the west-central part of the Study Area.

The water supply from rivers within the basin is augmented by the CAP which brings water from the Colorado River to central and southern Arizona. The cities of Phoenix and Glendale treat CAP water and distribute it through their municipal systems. CAP water also can be delivered to the area through Salt River Project canals and the Beardsley Canal. CAP water is

stored in Lake Pleasant with water from the Agua Fria River. Generally, water is banked in Lake Pleasant during low demand periods such as the winter and released during high demand periods such as the summer.

Lower Agua Fria River Watershed

The Lower Agua Fria River, also known as the Agua Fria River below Lake Pleasant, watershed lies south of Lake Pleasant and covers 439 square miles (**Figure 3.15-1**). The Agua Fria River is the most prominent surface water feature in the watershed. It flows into the watershed from the New Waddell Dam that forms Lake Pleasant to the north and flows south out of the watershed to its confluence with the Gila River. The primary purpose of Lake Pleasant is to store Colorado River water for CAP use.

The eastern end of the Project begins in the floodplain along the Agua Fria River and traverses the Hieroglyphic Mountains through the western portion of the Lower Agua Fria watershed until it enters the Trilby Wash watershed to the west. Topographic elevations along the Proposed Action route and other Action Alternative routes within the watershed range from approximately 1,400 feet amsl along the Agua Fria River, to 2,000 feet amsl in the Hieroglyphic Mountains, and to 1,900 feet amsl where the route enters the Trilby Wash watershed. The routes traverse numerous southeast-trending ephemeral washes.

With the exception of the Agua Fria River, all washes in the watershed are ephemeral and only flow during and immediately following large precipitation events. There are numerous washes in the watershed. Most of the washes are small, 10 feet wide or less, but larger washes more than 10 feet wide also exist. The washes in this watershed tend to be shallow with depths ranging from three feet or less. A few of the larger washes have depths of 3 feet or more. The washes collect runoff from the surrounding areas and convey it southeast to the Agua Fria River. Most of the runoff is lost to evaporation before it reaches the river, except during large precipitation events when seepage to the subsurface may occur through the permeable alluvial sediments.

A review of the current FEMA Flood Insurance Rate Maps indicates that the Project crosses FEMA-regulated or pending floodplains in the Lower Agua Fria River watershed (**Figure 3.15-1**).

Trilby Wash Watershed

The Trilby Wash, also known as the Trilby Wash-Trilby Wash Basin, watershed lies west of the Lower Agua Fria River watershed and covers 242 square miles (**Figure 3.15-1**). The Picacho, Trilby, and Iona Washes are the most prominent surface water features in the watershed and traverse the Proposed Action route. These washes and their tributaries convey runoff to the southeast where it discharges to the Trilby Wash Basin, a flood control structure managed by the Maricopa County Flood Control District. The McMicken Dam, a 10-mile long, 34-foot high earthen dam, is constructed at the eastern end of the Trilby Wash Basin. Discharge from the Trilby Wash Basin to the Agua Fria River occurs through the McMicken Dam Outlet Channel and McMicken Dam Outlet Wash.

The Project enters the Trilby Wash watershed from the Lower Agua Fria River watershed to the east, traverses the relatively flat alluvial basin comprising the watershed until it enters the

Lower Hassayampa River watershed to the west. Numerous southeast-trending ephemeral washes cross the Project within the watershed. Topographic elevations along the Project within the Trilby Wash watershed range from approximately 1,900 feet amsl along the eastern boundary of the watershed to 1,760 feet amsl where the route enters the Lower Hassayampa River watershed.

All washes in the watershed are ephemeral and only flow during and immediately following large precipitation events. There are numerous washes in the watershed. Most of the washes are small, 10 feet wide or less, but larger washes more than 10 feet wide exist. The washes in this watershed tend to be shallow with depths ranging from three feet or less. A few of the larger washes have depths of three feet or more. The washes collect sheet flow from the surrounding areas and convey it southeast to the Trilby Wash Basin and the Agua Fria River. Most of the runoff is lost to evaporation before it reaches the Trilby Wash Basin, except during large precipitation events when seepage to the subsurface may occur through the permeable alluvial sediments. Seepage losses to the subsurface likely occur beneath the Trilby Wash Basin when standing water is present.

A review of the current FEMA Flood Insurance Rate Maps indicates that the Project crosses FEMA-regulated or pending floodplains in the Trilby Wash watershed (**Figure 3.15-1**).

Lower Hassayampa River Watershed

The Lower Hassayampa River watershed lies west of the Trilby Wash watershed and covers 333 square miles (**Figure 3.15-1**). The Hassayampa River and Wagner Wash are the most prominent surface water features in the watershed along the Proposed Action route. The river flows south through the watershed to its confluence with the Gila River upstream of the Gillespie Dam. Wagner Wash flows south along the east side of the Project, and then turns southwest at the CAP to its confluence with the Hassayampa River.

The Project enters the Lower Hassayampa River watershed from the Trilby Wash watershed to the east and traverses north to south along the eastern side of the Hassayampa River to its terminus near a re-lift pumping station along the Hayden-Rhodes Aqueduct of the CAP. The Project would cross several ephemeral washes that are tributaries to the Hassayampa River. Topographic elevations along the route within the Lower Hassayampa River watershed range from approximately 1,760 feet amsl along the eastern boundary of the watershed to 1,520 feet amsl at its terminus along the CAP.

With the exception of the Hassayampa River, all washes in the watershed are ephemeral and only flow during and immediately following large precipitation events. There are numerous washes in the watershed. Most of the washes are small, 10 feet wide or less, but larger washes more than 10 feet wide also exist. The washes in this watershed tend to be shallow with depths ranging from three feet or less. A few of the larger washes have depths of three feet or more. The washes collect sheet flow from the surrounding areas and convey it southwest to the Hassayampa River or southeast to Wagner Wash. Most of the runoff is lost to evaporation before it reaches the river, except during large precipitation events when seepage to the subsurface may occur through the permeable alluvial sediments.

A review of the current FEMA Flood Insurance Rate Maps indicates that the Project would cross FEMA-regulated or pending floodplains in the Lower Hassayampa River watershed (**Figure 3.15-1**).

Wetlands

Under section 404 of the CWA, wetlands are defined as "areas that are inundated or saturated by surface or groundwater at a frequency sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions." Three parameters are used to delineate wetlands: hydrophytic vegetation (more than 50 percent of dominant plants are adapted to anaerobic soil conditions), hydric soils (soils classified as hydric or that exhibit characteristics of a reducing environment), and wetland hydrology (inundation or soil saturation during at least five percent of the growing season).

For the purposes of this DEIS, the amount of wetlands present in the Study Area has been identified using data from the National Wetland Inventory database. A review of National Wetland Inventory data indicates that wetlands are not present with the Study Area.

Waters of the U.S.

Waters of the U.S. refers to areas under USACE jurisdiction pursuant to section 404 of the CWA; they are generally defined by the ordinary high water mark. USACE jurisdiction can extend beyond the ordinary high water mark, to the limit of adjacent aquatic features, when adjacent aquatic features are present.

For the purposes of this DEIS, Waters of the U.S. were identified through a review of aerial photography. **Table 3.15-1** summarizes potential Waters of the U.S. within the 200-foot wide power line corridor. It also summarizes potential Waters of the U.S. that could be crossed by the new access roads. These roads would be constructed, used temporarily, and then reclaimed after the transmission lines are installed. Of the washes identified in the table, some may not be crossed, some may not be directly impacted by fill, and/or some may not be jurisdictional. Potential Waters of the U.S. consist of non-wetland ephemeral washes. The largest ephemeral wash crossing in the Project is the Agua Fria River, located approximately 1 mile northwest of the Morgan Substation. The Hassayampa River is located in the vicinity of the Sun Valley Substation, but is not crossed by the Project. One CAP canal crossing occurs within the Study Area approximately 0.5 mile north of the Sun Valley Substation.

The Gila River from Powers Butte to the Gillespie Dam is the closest Traditional Navigable Water (TNW) to the Study Area. At the closest point, the Study Area near the Sun Valley Substation is approximately 25 miles north of the Gila River TNW. Potential Waters of the U.S. within the Study Area have connectivity to the Gila River TNW through surface flows. Whether or not any or all of these potential Waters of the U.S. are jurisdictional would be determined later in the NEPA process, well before construction begins. However, regardless of whether or not they are jurisdictional, these washes are still conveyances that may have importance to the impact assessment.

Table 3.15-1 Waters of the U.S. within the Study Area

ALTERNATIVE	NUMBER OF POTENTIAL WATERS OF THE U.S. CROSSINGS
Proposed Action and Alternative 1	552
Alternative 2	566
Alternative 3	544
Sub-alternative	73
Corresponding Segment Common to all Action Alternatives	70
New Roads for Proposed Action and Alternative 1	55
New Roads for Alternative 2	49
New Roads for Alternative 3	50
New Roads for Sub-alternative	0
New Roads for Corresponding Segment	0

Source: URS 2012l. Desktop Jurisdictional Evaluation, including addenda and updates.

As stated in **Section 3.15.1.1**, APS had an initial Project kick-off meeting with the USACE in August 2012 and it was agreed at that meeting that a Preliminary Jurisdiction Delineation would be conducted for the Project between the Draft EIS and Final EIS process. APS would coordinate with the USACE on data collection methods prior to conducting the field work and following the data gathering, a full Jurisdictional Delineation package would be submitted to USACE. Upon approval by the USACE, this data and information would then be incorporated into the Final EIS and a determination of what permit would be required would be provided and described.

3.15.1.4 Surface Water Flow and Runoff

Surface water runoff in the Study Area ranges from 0.1 to 0.5 inches per year or 5.3 to 26.7 acre-feet per square mile. These values are based on the USGS annual runoff contours developed for Maricopa County for 1951 through 1980 (Gebert et al. 1987). Several streamflow gages are operated cooperatively between the FCDMC and the USGS by the FCDMC's Automated Local Evaluation in Real Time (ALERT) System for the purposes of flood event monitoring. Stream flow measurements made by the FCDMC at selected stations in the Study Area indicates that surface water flows range from zero to as high as 787 cubic feet per second (cfs; FCDMC 2010). Most of the extreme flows occurred during February 2003. The extreme flow at Upper Trilby Wash, an ephemeral wash that crosses the Project route, was 129 cfs in February 2003. The peak flow in water year 2010 at Upper Trilby Wash was 28 cfs.

Floodplains

FEMA identifies and maps the floodplains of the U.S. through the National Flood Insurance Program. These maps are available to communities to help them reduce future flood damage. FEMA has designated a 100-year floodplain, areas of minimal flooding, and areas of undetermined flooding along the Project route (**Figure 3.15-1**). FEMA considers areas of minimal flood hazard as being outside of the 500-year flood level (FEMA 2011a and 2011b). Areas with undetermined flooding could have flood hazards, but no flood hazard analysis has been conducted.

3.15.1.5 Surface Water Quality

No surface water quality information is available as surface water only occurs in most of the washes during and immediately after rain events. However, the nature of the site soils, rain events, and local flooding that occurs suggests that the resulting surface waters would be high in turbidity because of suspended particulates and would contain naturally occurring constituents that are leached from the soils, including minerals and salts. As this is largely an undeveloped area, anthropogenic constituents would be expected to be low or non-existent.

Every two years, the ADEQ is required by the federal CWA to conduct a comprehensive analysis of water quality data associated with Arizona's surface waters to determine whether state water quality standards are being met and designated uses are being supported. The most recent report is the 2006/2008 Assessment Report (ADEQ 2009). The integrated surface water assessment and impaired waters listing report serves to fulfill the national reporting requirement of the CWA. It is submitted to the EPA and used to report on national water quality issues and concerns. Review of the 2006/2008 Assessment Report and an interactive map showing impaired waters (ADEQ 2011) indicates that there are no impaired waters along the Proposed Action route or other Action Alternative routes. Lake Pleasant is the nearest impaired water body to the Project.

3.15.1.6 Surface Water Use

Water to support irrigated agriculture and a growing urban population in the region has been obtained by building reservoirs on the Salt, Verde, and Agua Fria Rivers and by pumping groundwater from the alluvial sediments in the basin. The water used does not depend on local precipitation, but comes from snowmelt in the mountains of eastern and central Arizona and from groundwater recharged to the aquifer in prehistoric times. Since 1985, additional water has been imported from the Colorado River and either used directly or stored in the basin-fill aquifer. The hydrologic system is managed carefully, and the use of surface water and groundwater is strictly regulated. With the exception of the Agua Fria and Hassayampa Rivers, perennial or intermittent surface water is not present and, therefore, is not used within the Study Area. Surface water points of diversion and places of use (POU) are shown on **Figure 3.15-1**. The majority of the points of diversion and POUs supply water to livestock, wildlife, and irrigation. **Table 3.15-2** summarizes the surface water uses and water rights information for points of diversion and POUs within a one-mile radius of the Proposed Action and Action Alternative routes. All of these listed water rights have a status designated as active.

3.15.2 Groundwater Resources

3.15.2.1 Laws, Ordinances, Regulations, and Standards

Groundwater resources in Arizona are regulated under the Arizona Groundwater Code (ARS Title 45, Chapter 2) administered by the Arizona Department of Water Resources (ADWR). Under the Groundwater Code, groundwater development is restricted and intensively managed within five Aquifer Management Areas (AMAs), one of which is Phoenix AMA, in which the Project is situated. However, if groundwater is used for the Project, it will be leased or purchased from a well that is already constructed and permitted, thus there would be no need for a groundwater right or a groundwater withdrawal permit to pump groundwater. Nor would compliance with ADWR well spacing and well impact analysis be required.

Grandfathered Groundwater Rights

A well owner must have either a grandfathered right or a groundwater withdrawal permit to legally pump groundwater within an AMA at a rate in excess of 35 gallons per minute (gpm). Grandfathered rights are authorized under ARS Title 45, Chapter 2, Article 5, and are classified as Irrigation, Type 1 Non-Irrigation, and Type 2 Non-Irrigation grandfathered rights. Irrigation and Type 1 non-irrigation rights must be used on the land where the groundwater is pumped. A Type 2 non-irrigation grandfathered right can be used anywhere within an AMA and can be purchased or leased. Given that there is no irrigated land along the Proposed Action or other Action Alternative routes, a Type 2 grandfathered right is the only type of grandfathered water right potentially available for Project use.

Groundwater Withdrawal Permits

Prior to drilling a new well, or deepening or modifying an existing well, a person must file a Notice of Intent to Drill with the ADWR for all wells outside an AMA and non-exempt wells within an AMA and an Application for Drilling Permit for non-exempt wells within an AMA. Groundwater withdrawal permits are authorized under A.R.S. Title 45, Chapter 2, Article 7. As noted, there are no well drilling activities proposed for this Project.

Table 3.15-2 Surface Water Points of Diversions and POUs within a 1-Mile Radius of the Proposed Action and Action Alternative Routes

OWNER	PERMIT NO.	PT OF DIV OR POU	SURFACE WATER USE	SOURCE	WATERSHED	SUB-BASIN	FILE DATE	PRIORITY DATE
Chrysler Corp	33-91559	Pt of Div	Industrial, Livestock, Wildlife	Unnamed Wash	Agua Fria River	West Salt River Valley	11/19/1986	11/19/1986
Chrysler Corp	33-91559	POU	Industrial, Livestock, Wildlife	Unnamed Wash	Agua Fria River	West Salt River Valley	11/19/1986	11/19/1986
USBR	33-96335	Pt of Div	Wildlife	Morgan City Wash	Agua Fria River	Lake Pleasant	12/27/1993	12/27/1993
USBR	33-96335	POU	Wildlife	Morgan City Wash	Agua Fria River	Lake Pleasant	12/27/1993	12/27/1993
BLM	36-20866	Pt of Div	Not Given	Not Identified	Agua Fria River	Lake Pleasant	6/26/1979	4/17/1926
ASLD	36-2739	Pt of Div	Stockwater and Wildlife	East Draw	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2739	POU	Stockwater and Wildlife	East Draw	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2740	Pt of Div	Stockwater and Wildlife	Agua Fria River	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2740	Pt of Div	Stockwater and Wildlife	Agua Fria River	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2740	POU	Stockwater and Wildlife	Agua Fria River	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2740	POU	Stockwater and Wildlife	Agua Fria River	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2767	Pt of Div	Stockwater and Wildlife	Agua Fria River	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883

OWNER	PERMIT NO.	PT OF DIV OR POU	SURFACE WATER USE	SOURCE	WATERSHED	SUB-BASIN	FILE DATE	PRIORITY DATE
ASLD	36-2767	POU	Stockwater and Wildlife	Agua Fria River	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2768	Pt of Div	Stockwater and Wildlife	Power line Wash	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2768	POU	Stockwater and Wildlife	Power line Wash	Agua Fria River	Lake Pleasant	1/16/1987	12/31/1883
ASLD	36-2817	Pt of Div	Stockwater and Wildlife	Green Wash	Lower Gila River	Hassayampa	1/15/1987	12/31/1883
ASLD	36-2817	POU	Stockwater and Wildlife	Green Wash	Lower Gila River	Hassayampa	1/15/1987	12/31/1883
ASLD	36-2829	Pt of Div	Stockwater and Wildlife	Section 2 Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2829	POU	Stockwater and Wildlife	Section 2 Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2831	Pt of Div	Stockwater and Wildlife	ME Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2831	POU	Stockwater and Wildlife	ME Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2832	Pt of Div	Stockwater and Wildlife	Trilby Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2832	Pt of Div	Stockwater and Wildlife	Trilby Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2832	Pt of Div	Stockwater and Wildlife	Trilby Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2832	Pt of Div	Stockwater and Wildlife	Trilby Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2833	Pt of Div	Stockwater and Wildlife	Wild Dog Tank	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883

OWNER	PERMIT NO.	PT OF DIV OR POU	SURFACE WATER USE	SOURCE	WATERSHED	SUB-BASIN	FILE DATE	PRIORITY DATE
ASLD	36-2833	POU	Stockwater and Wildlife	Wild Dog Tank	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2847	Pt of Div	Stockwater and Wildlife	Bailey Draw	Agua Fria River	Lake Pleasant	1/15/1987	12/31/1883
ASLD	36-2847	POU	Stockwater and Wildlife	Bailey Draw	Agua Fria River	Lake Pleasant	1/15/1987	12/31/1883
ASLD	36-2848	Pt of Div	Stockwater and Wildlife	ME Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2848	Pt of Div	Stockwater and Wildlife	ME Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2848	POU	Stockwater and Wildlife	ME Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2848	POU	Stockwater and Wildlife	ME Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2855	Pt of Div	Stockwater and Wildlife	Lost Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2855	POU	Stockwater and Wildlife	Lost Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2856	Pt of Div	Stockwater and Wildlife	Tim's Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2856	POU	Stockwater and Wildlife	Tim's Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2857	Pt of Div	Stockwater and Wildlife	Bucky's Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2857	POU	Stockwater and Wildlife	Bucky's Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2859	Pt of Div	Stockwater and Wildlife	Koa Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883

OWNER	PERMIT NO.	PT OF DIV OR POU	SURFACE WATER USE	SOURCE	WATERSHED	SUB-BASIN	FILE DATE	PRIORITY DATE
ASLD	36-2859	POU	Stockwater and Wildlife	Koa Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	38-2860	Pt of Div	Stockwater and Wildlife	East Circle City Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2860	POU	Stockwater and Wildlife	East Circle City Wash	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2861	Pt of Div	Stockwater and Wildlife	Trap Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
ASLD	36-2861	POU	Stockwater and Wildlife	Trap Draw	Agua Fria River	West Salt River Valley	1/15/1987	12/31/1883
MCMWCD1	36-66399	Pt of Div	Multiple Uses	Agua Fria River	Agua Fria River	Lake Pleasant	6/7/1978	10/31/1888
BLM	38-17322	Pt of Div	Stockpond	Unnamed Wash	Agua Fria River	West Salt River Valley	6/20/1979	2/16/1977
BLM	38-17322	POU	Stockpond	Unnamed Wash	Agua Fria River	West Salt River Valley	6/20/1979	2/16/1977
BLM	38-17372	Pt of Div	Stockpond	Unnamed Wash	Agua Fria River	Hassayampa	6/20/1979	12/31/1970
BLM	39-17372	POU	Stockpond	Unnamed Wash	Agua Fria River	Hassayampa	6/20/1979	12/31/1970
BLM	38-17904	Pt of Div	Stockpond	Unnamed Wash	Agua Fria River	Hassayampa	6/21/1979	6/5/1939
BLM	38-17904	POU	Stockpond	Unnamed Wash	Agua Fria River	Hassayampa	6/21/1979	6/5/1939
BLM	38-19352	Pt of Div	Stockpond	Unnamed Wash	Agua Fria River	West Salt River Valley	6/25/1979	12/31/1970
BLM	38-19352	POU	Stockpond	Unnamed Wash	Agua Fria River	West Salt River Valley	6/25/1979	12/31/1970

OWNER	PERMIT NO.	PT OF DIV OR POU	SURFACE WATER USE	SOURCE	WATERSHED	SUB-BASIN	FILE DATE	PRIORITY DATE
BLM	38-19353	Pt of Div	Stockpond	Unnamed Wash	Agua Fria River	Lake Pleasant	6/25/1979	12/31/1970
BLM	38-19353	POU	Stockpond	Unnamed Wash	Agua Fria River	Lake Pleasant	6/25/1979	12/31/1970
Beardsley Land	3R-141	Pt of Div	Irrigation	Agua Fria River	Agua Fria River	Lake Pleasant	1/12/1924	1/12/1924
Beardsley Land	3R-141	Pt of Div	Irrigation	Agua Fria River	Agua Fria River	Lake Pleasant	1/12/1924	1/12/1924
Jackson	3R-190	Pt of Div	Stockwater	Agua Fria River	Agua Fria River	Lake Pleasant	1/12/1924	1/12/1924
Jackson	3R-190	Pt of Div	Stockwater	Agua Fria River	Agua Fria River	Lake Pleasant	1/12/1924	1/12/1924
Beardsley Land	4A-568	Pt of Div	Irrigation	Agua Fria River	Agua Fria River	Lake Pleasant	6/9/1925	6/9/1925
Beardsley Land	4A-568	Pt of Div	Irrigation	Agua Fria River	Agua Fria River	Lake Pleasant	6/9/1925	6/9/1925
MCMWCD1	4A-575	Pt of Div	Irrigation	Agua Fria River	Agua Fria River	Lake Pleasant	1/12/1924	1/12/1924
MCMWCD1	4A575	Pt of Div	Irrigation	Agua Fria River	Agua Fria River	Lake Pleasant	1/12/1924	1/12/1924

Notes:
MCMWCD1 Maricopa County Municipal Water Conservation District #1
Pt of Div Point of Diversion
POU Place of Use

3.15.2.2 Groundwater Conditions

Hydrogeologic Setting

The Project is located in the Basin and Range Lowlands Province, a physiographic region characterized by generally isolated, north- to northwest-trending, fault-bounded mountain ranges and broad, flat, intervening alluvial valleys and basins that are filled with sediments eroded from the adjacent mountains and form regional aquifers (Montgomery and Harshbarger 1989). The surrounding mountain ranges are composed of a complex suite of igneous, metamorphic, and sedimentary rocks.

The Project is located in the Salt River Valley regional groundwater basin which is designated as the Phoenix AMA. The Salt River Valley groundwater basin is one of a series of structural basins along a northwest-southeast trend characterized by exposed lower-plate crystalline rocks (Spencer and Reynolds 1989) and deep basins containing 8,000 to 12,000 feet of basin-fill sediments (Anderson et al. 1992).

The Project would traverse three local groundwater basins within the aforementioned regional basin. They are designated by the ADWR, from east to west, as the Lake Pleasant, West Salt River Valley, and Hassayampa (**Figure 3.15-2**). Most of the Project is located within the West Salt River Valley groundwater basin.

The West Salt River Valley groundwater basin is divided into northeastern and southwestern parts by a major linear subsurface structure that generally trends parallel to US 60 (Brown and Pool 1989). The thickness of basin fill in the northeastern part of the West Salt River Valley basin is generally less than 2,000 feet. The thickness of basin fill in the southwestern part of the West Salt River Valley basin may exceed 10,000 feet.

The basin fill is composed of alluvial sediments eroded from the surrounding mountains that were deposited in the structural basin since the mid-Tertiary disturbance particularly during and after the Basin and Range faulting (Brown and Pool 1989). The basin fill consists of beds of clay, silt, sand, and gravel typical of a continental environment. Beds usually are lenticular and cannot be traced laterally for long distances either in outcrops or in the subsurface. Sediments tend to be coarse grained near the mountain fronts and fine grained toward the center of the basin. The basin-fill sediments also tend to be coarse grained at the base of the unit where it overlies the crystalline bedrock. Evaporites including anhydrite, gypsum, and especially halite were found in the lower part of the basin fill (Brown and Pool 1989).

The basin fill has been subdivided into three hydrogeologic units called the Upper Alluvial Unit, the Middle Alluvial Unit, and the Lower Alluvial Unit (Corkhill et al. 1993; Dubas and Davis 2006; Freihoefer et al. 2009; Dubas 2010). The units are described below from the top of bedrock up to the land surface.

The Lower Alluvial Unit overlies or is in fault contact with the underlying Hydrologic Bedrock Unit (Corkhill et al. 1993) and ranges from several hundred to several thousand feet in thickness. The Lower Alluvial Unit consists mainly of conglomerate and gravel near the basin margins, grading into mudstone, gypsiferous and anhydritic mudstone and anhydrite in the central areas of the basin. Alternating layers of decomposed volcanics and alluvial fill material comprise the Lower Alluvial Unit in places.

The Middle Alluvial Unit overlies the Lower Alluvial Unit and comprises the uppermost 400 to 500 feet of basin fill. The Middle Alluvial Unit consists mainly of clay, silt, mudstone, and gypsiferous mudstone with some interbedded sand and gravel. Near the margins of the alluvial basins the Middle Alluvial Unit consists mainly of sand and gravel and is difficult or impossible to distinguish from the other units.

The Upper Alluvial Unit overlies the Middle Alluvial Unit and consists of stream alluvium deposited along the present-day Agua Fria, Salt, and the Gila Rivers. The Upper Alluvial Unit was deposited after the filling of the basins with sediment and consists of floodplain and channel-fill deposits. The stream alluvium ranges from clay and silt in the floodplain deposits to sand and gravel in the channel-fill deposits. The thickness of stream alluvium ranges from near zero where the Salt River flows over bedrock to as much as 400 feet near the confluence of the Salt and Gila Rivers (Brown and Pool 1989).

Groundwater Occurrence

Basin fill sediments and stream alluvium comprise the basin fill aquifer and form the most productive and important aquifer beneath the Proposed Action route and other Action Alternative routes. These sediments have a wide range of hydraulic conductivity, store very large volumes of groundwater, and yield small to large amounts of groundwater to wells. Although the basin fill aquifer may be more than 11,000 feet thick, most groundwater is pumped from the top 1,000 feet (Anderson et al. 1992). Groundwater occurs under unconfined and semiconfined conditions in this aquifer.

Groundwater Recharge and Discharge

Natural groundwater discharge occurs primarily to the Gila River along the southern edge of the Salt River Valley groundwater basin and through transpiration by the phreatophytes growing on the flood plains. Groundwater also leaves the West Salt River Valley basin by underflow to the southwest through the basin fill aquifer between the Buckeye Hills and the White Tank Mountains. The predominant groundwater discharge along the Project route occurs to the Agua Fria River and Hassayampa Rivers. Groundwater pumping is the primary source of groundwater discharge in the region, but is relatively insignificant along the Project route.

Groundwater recharge along the Proposed Action route and other Action Alternative routes occurs as mountain front recharge along the edge of the basin at the base of the Hieroglyphic Mountains, as stream channel recharge along the Agua Fria and Hassayampa Rivers, and possibly the Trilby Wash Basin. Groundwater also enters the basin by underflow through the basin fill aquifer from the Upper Hassayampa basin to the northwest. Little, if any, recharge results from precipitation falling directly on the valley floor (Anderson et al. 1992) because more than 95 percent of the precipitation that falls over the basin is lost to evaporation and transpiration before reaching stream channels (Arizona Interstate Stream Commission 1967). Evaporation within the basin ranges from 60 to 72 inches per year (Arizona Water Commission 1975).

Groundwater Depths, Elevations, and Flow Directions

The Groundwater Site Inventory (GWSI) database maintained by the ADWR contains records for thousands of wells in Arizona that have been physically located and inventoried in the field. A review of groundwater level data in the GWSI database (ADWR 2011) indicates that the depth to groundwater in permitted wells along the Proposed Action route and other Action Alternative routes ranges from less than 150 feet below ground surface in the Hieroglyphic Mountains to approximately 660 feet below ground surface in the West Salt River Valley basin (**Figure 3.15-2**).

The regional groundwater surface generally slopes to the southeast and southwest, indicating that groundwater flows in these directions. The direction of ground-water flow in the region has changed in response to large-scale ground-water pumping. Major cones of depression have developed where groundwater levels have declined more than 300 feet between LAFB and the White Tank Mountains. Groundwater flow near these areas has been redirected toward these cones of depression (Anderson 1986). Groundwater elevations are shown on **Figure 3.15-2**.

Groundwater Level Trends

In response to the continuing decline of groundwater levels, the Groundwater Management Code was passed by the Arizona Legislature in 1980 to eliminate severe ground-water overdraft and to provide a means for allocating Arizona's limited ground-water resources. As a result of the Groundwater Management Code, the ADWR and the Phoenix AMA were established. A principal goal of the Phoenix AMA is to reduce ground-water pumping by 2025 to a quantity that is equal to or less than the quantity being recharged.

ADWR maintains a statewide network of water level index wells for monitoring groundwater conditions. Static water levels are measured annually in the index wells and are stored in the GWSI database (ADWR 2011). A review of the GWSI database indicates that there are eight index wells located in the Study Area (**Figure 3.15-2**). Groundwater levels at most of the index wells show slightly increasing or decreasing trends. The increase or decrease in water level over time at these wells is 15 feet or less.

Groundwater Quality

Two major trends in water use and land use have affected ground-water quality in the Salt River Valley. The first occurred from the 1870s until the 1920s when irrigated agriculture replaced native vegetation. The second is the rapid population increase in metropolitan Phoenix and the accompanying conversion of agricultural and desert land to urban land (Cordy et al. 1998). Groundwater quality along the Proposed Action route and other Action Alternative routes is not well defined due to a lack of reliable water quality data. Groundwater quality does not appear to have been influenced by agricultural irrigation or agricultural recharge as large-scale farms do not appear to exist along the corridor. Most of the groundwater wells along the route appear to be exempt wells associated with residential use. Groundwater quality data available from the few wells in the Study Area indicate that arsenic and fluoride concentrations in groundwater have equaled or exceeded drinking water standards. These constituents are likely naturally occurring as they commonly exceed applicable standards in other parts of the region.

3.15.2.3 Groundwater Use

Review of the ADWR (2011) Wells 55 database, indicates that most of the permitted wells within and adjacent to the Proposed Action route and other Action Alternative routes are classified as exempt. An exempt well has a maximum permitted pumping capacity of 35 gpm. Most exempt wells are used for residences and are more than adequate for household use. Other uses of exempt wells include non-irrigation purposes, non-commercial irrigation of less than two acres of land, and watering stock. In AMAs, new exempt wells used for non-residential purposes can withdraw a maximum of 10 acre-feet per year. **Figure 3.15-2** shows the municipal water service areas in the Study Area. The municipal water suppliers in the Study Area include Circle City, Chaparral Water Company, City of Peoria, Beardsley Water Company, West End Water Company, and Town of Buckeye. Municipal water is generally supplied from groundwater well fields. **Figure 3.15-2** also shows the non-exempt groundwater wells in the Study Area. Non-exempt wells have a permitted pumping capacity that exceeds 35 gpm. Non-exempt wells include municipal, residential development, industrial, and irrigation water supply wells.

3.16 WILDLIFE RESOURCES, INCLUDING SPECIAL-STATUS WILDLIFE AND MIGRATORY BIRDS

The information provided in the following subsections is taken from a report titled *Environmental Resource Report for Biological Resources Sun Valley to Morgan 500/230kV Transmission Line Project* (URS 2012i). The contents of that report are used essentially verbatim below, and without specific reference. Further, references made in that report are repeated herein without independent review.

3.16.1 Laws, Ordinances, Regulations, and Standards

Bald and Golden Eagle Protection Act (BGA) of 1940 (16 USC §§ 668-668d, 54 Stat. 250, as amended; and PL 95-616 (92 Stat. 3114) - Prohibits anyone, without a permit issued by the Secretary of Interior, from "taking" bald or golden eagles, including their parts, nests, or eggs. The Act defines "take" as to "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb."

Endangered Species Act of 1973 - (ESA; PL 85-624; 16 USC §§ 661, 664, 1008): Federal agencies are required to consult with the USFWS to ensure that actions they authorize do not jeopardize the continued existence of any listed species, result in the destruction or modification of critical habitat, or cause a "take" (to harass, harm pursue, hunt, shoot, wound, kill, trap, capture, or collect) of any listed species.

Migratory Bird Treaty Act of 1918 - (16 USC §§ 703-712, as amended): Established a federal prohibition to "pursue, hunt, take, capture, kill, attempt to take, capture, or kill, possess, offer for sale, sell, offer to purchase, purchase, deliver for shipment, cause to be shipped, deliver for transportation, transport, cause to be transported, carry, or cause to be carried by any means whatever, receive for shipment, transportation or carriage, or export, at any time, or in any manner, any migratory bird, …. or any part, nest, or egg of any such bird."

Responsibilities of Federal Agencies to Protect Migratory Birds - (EO 13186): States that each federal agency taking actions that have, or are likely to have, a measurable negative effect on migratory bird populations is directed to develop and implement, within two years, a Memorandum of Understanding (MOU) with the USFWS that shall promote the conservation of migratory bird populations.

American Indian Tribal Rights, Federal-Tribal Trust Responsibilities, and the ESA - (June 5, 1997; Secretarial Order 3206): Establishes that federal agencies (DOI, NOAA) shall be responsible for 1) working directly with tribes to promote healthy ecosystems, 2) recognizing that Indian lands are not subject to the same controls as federal public lands, 3) assisting tribes in developing programs to promote healthy ecosystems, and 4) being sensitive to Indian culture, religion, and spirituality.

BLM Manual 6840 Special Status Species Management – (Dec. 12, 2008; BLM 2008c) Provides policy and guidance for the conservation of BLM special status species and the ecosystems upon which they depend on BLM-managed lands. BLM special status species are: (1) species listed or proposed for listing under the ESA, and (2) species requiring special management consideration to promote their conservation and reduce the likelihood and need for future listing under the ESA, which are designated as Bureau sensitive by the State Director(s). All Federal candidate species, proposed species, and delisted species in the 5 years following delisting will be conserved as Bureau sensitive species. The objectives of the BLM special status species policy are 1) to conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA protections are no longer needed for these species; and 2) to initiate proactive conservation measures that reduce or eliminate threats to Bureau sensitive species to minimize the likelihood of and need for listing of these species under the ESA.

3.16.2 Field Reconnaissance

Data collection and assessment utilized a rapid ecological assessment methodology first developed by The Nature Conservancy and applied to a range of other applications (Ruediger and Lloyd 2003). Inventory of the biological resources involved documenting the distribution of habitat types, special status species, specialty resources, and wildlife species in the Study Area. Data also were obtained from published secondary sources, electronic online queries through the AGFD (AGFD 2006, 2010) and USFWS (USFWS 2008, 2011), and field verification using field reconnaissance.

Field reconnaissance was conducted during November 2007 and May 2008 for the Certificate of Environmental Compatibility application studies associated with this Project and again during October 2011 to verify and ground-truth the biological resources in the Study Area. Field reconnaissance during October 2011 concentrated on BLM lands north of SR 74, the Hieroglyphic Mountains, Agua Fria River, and larger washes in the vicinity of the Proposed Action route, Alternative 2, and western portion of Alternative 3. Plant and wildlife species observed were noted throughout the course of the field reconnaissance.

Prior to field reconnaissance, initial data relating to the distribution of special status species and species of concern occurring or likely to occur in the Study Area were collected from agency lists. Lists of federal, state, and agency listed species and designated critical habitat

potentially occurring in the Study Area were obtained from the USFWS (USFWS 2008, 2011) and AGFD (AGFD 2006, 2010).

3.16.3 General Wildlife

The diversity of animal species in the Study Area is high and reflects the diverse plant resources, topography, varied substrates, and the network of xeric desert washes surrounding the Study Area. Approximately 248 vertebrate species could occur along the Proposed Action route and other Action Alternative routes or nearby surrounding area. These species are tabulated taxonomically according to general habitat type in Appendix A of the Biological Resources Report (URS 2012i).

Lists of general wildlife species likely to occur within the Study Area were gathered from the best available published sources that focus on ecology and distributional biology of those groups of organisms. These included reptiles, amphibians, birds, and mammals. During field reconnaissance, the habitats for these species were evaluated and ground-truthed, and any wildlife or signs thereof were recorded. Species, likely to occur in the Study Area, organized by appropriate habitat, are presented in the sections that follow.

Wildlife of Creosote-White Bursage Deserts crub Communities

Amphibians

Amphibians typically occurring in this community include the Arizona toad (*Bufo microscaphus)* and Couch's spadefoot toad (*Scaphiopus couchii*). The number of species is limited because of the lack of surface water associated with this habitat.

Reptiles

A number of reptiles typically inhabit this vegetation community. Typical species include the long-nosed leopard lizard (*Gambelia wislizenii*), desert iguana (*Dipososaurus dorsalis*), desert spiny lizard (*Sceloporus magister*), tiger whiptail lizard (*Aspidoscelis tigris*), desert horned lizard (*Phrynosoma platyrhinos*), glossy snake (*Arizona elegans*), nightsnake (*Hypsiglena torquata*), common king snake (*Lampropeltis getula*), Sonoran whipsnake (*Masticophis bilineatus*), gopher snake (*Pituophis catenifer*), sidewinder (*Crotalus cerastes*), and Mojave rattlesnake (*Crotalus scutulatus*). This habitat can provide historic movement areas for the desert tortoise (*Gopherus agassizi*), but the Sonoran paloverde-mixed cacti desert scrub vegetation community is its preferred habitat in Arizona (Brennan 2008).

Birds

Widespread generalist birds like the turkey vulture (*Cathartes aura*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), common ground dove (*Columbina passerina*), burrowing owl (*Athene cunicularia*), northern mockingbird (*Mimus polyglottos*), and western meadowlark (*Sturnella neglecta*) could be found in this habitat type as well as arid habitat specialists that would include the white-winged dove (*Zenaida asiatica*), greater roadrunner (*Geococcyx californianus*), western kingbird (*Tyrannus verticalis*), Say's phoebe (*Sayornis saya*), and black-throated sparrow (*Amphispiza bilineata*) (Corman and Wise-Gervais 2005).

Mammals

Typical mammals in this habitat include the desert cottontail (*Sylvilagus audubonii*), black-tailed jackrabbit (*Lepus californicus*), Botta's pocket gopher (*Thomomys bottae*), little pocket mouse (*Perognathus longimembris*), Sonoran desert pocket mouse (*Chaetodipus penicillatus*), desert kangaroo rat (*Dipodomys deserti*), desert woodrat (*Neotoma lepida*), cactus mouse (*Peromyscus eremicus*), collared peccary (*Tayassu tajacu*), coyote (*Canis latrans*), bobcat (*Lynx rufus*), kit fox (*Vulpes macrotis*), and badger (*Taxidea taxus*). Between 17 and 21 species of bats could forage in this habitat, but roost sites other than human dwellings are not available in creosotebush-white bursage vegetation (summary derived from Hoffmeister 1986).

Wildlife of Sonoran Paloverde-Mixed Cacti Desert scrub

Wildlife species that include widespread generalists, rock-dwelling specialists, and cavity nesters are typical inhabitants of this habitat type.

Reptiles

Typical reptiles may include the western banded gecko (*Coleonyx variegates*), Gila monster (*Heloderma suspectum*), Great Basin collared lizard (*Crotaphytus bicinctores*), long-nosed leopard lizard (*Gambelia wislizenii*), chuckwalla (*Sauromalus ater*), desert spiny lizard (*Sceloporus magister*), tiger whiptail (*Aspidoscelis tigris*), nightsnake (*Hypsiglena torquata*), common king snake (*Lampropeltis getula*), gopher snake (*Pituophis melanoleucus*), Sonoran coral snake (*Micruroides euryxanthus*), western diamondback (*Crotalus atrox*), black-tailed rattlesnake (*Crotalus molossus*), and desert tortoise (Brennan 2008).

Birds

Birds typically found in this habitat type include the turkey vulture (*Cathartes aura*), golden eagle (*Aquila chrysaetos*), red-tailed hawk (*Buteo jamaicensis*), American kestrel (*Falco sparverius*), common ground dove (*Columbina passerina*), barn owl (*Tyto alba*), great horned owl (*Bubo virginianus*), western meadowlark (*Sturnella neglecta*), Harris' hawk (*Parabuteo unicinctus*), Gambel's quail (*Callipepla gambelii*), white-winged dove (*Zenaida asiatica*), greater roadrunner (*Geococcyx californianus*), elf owl (*Micrathene whitneyi*), lesser nighthawk (*Chordeiles acutipennis*), Gila woodpecker (*Melanerpes uropygialis*), western kingbird (*Tyrannus verticalis*), ash-throated flycatcher (*Myiarchus cinerascens*), Say's phoebe (*Sayornis saya*), cactus wren (*Campylorhynchus brunneicapillus*), curve-billed thrasher (*Charadrius vociferus*), Bendaire's thrasher (*Toxostoma curvirostre*), phainopepla (*Phainopepla nitens*), pyrruloxia (*Cardinalis sinuatus*), black-throated sparrow (*Amphispiza bilineata*), and Scott's Oriole (*Icterus parisorum*) (Corman and Wise-Gervais 2005).

Mammals

Mammalian species typical of this habitat type include the desert cottontail (*Sylvilagus audubonii*), round-tailed ground squirrel (*Spermophilus tereticaudus*), Harris' antelope ground squirrel (*Ammospermophilus harrisii*), rock pocket mouse (*Chaetodipus intermedius*), Merriam's kangaroo rat (*Dipodomys merriami*), white throated woodrat (*Neotoma albigula*), desert woodrat (*Neotoma lepida*), cactus mouse *(Peromyscus eremicus)*, collared peccary (*Tayassu tajacu*), mule deer (*Odocoileus hemionus*), coyote (*Canis latrans*), bobcat (*Lynx*

rufus), cougar (*Puma concolor*), ringtail (*Bassariscus astutus*), and western spotted skunk (*Spilogale gracilis*). Between 17 and 21 species of bats could forage in this vegetation community or locate roost sites in mountainous terrain coincident with the Sonoran paloverde mixed-cacti desert scrub (derived from accounts in Hoffmeister 1986).

Wildlife of North American Warm Desert Riparian Woodland

Although riparian communities are limited in the Study Area, they are typically highly productive and support a high diversity of mammals, birds, insects, and reptiles that make use of the abundant shade, water, and food resources. These areas are important ecological centers for wildlife and are particularly critical during periods of drought, which are frequent in the region. Due to the available water resources, moderate temperature, and abundant food resources, both plant and animal species diversity tends to be highest in riparian habitats in the desert environments of Arizona.

Amphibians

Riparian habitats in the Study Area could support concentrated wildlife activity. Areas with semi-permanent surface water on the Agua Fria River would be the most likely area to find potential amphibian species like the Arizona toad (*Bufo microscaphus)* and lowland leopard frog (*Rana yavapaiensis*).

Reptiles

Reptiles unique to riparian communities and potential inhabitants along the Agua Fria River where there is perennial surface water include the painted turtle (*Chrysemys picta*), Sonoran mud turtle (*Kinosternon sonoriense*), and spiny softshell (*Apalone spinifera*). Typical snakes would include the common king snake (*Lampropeltis getula*) and black-necked garter snake (*Thamnophis cyrtopsis*).

Birds

A wildlife biologist from URS observed the bird fauna along the riparian zone of the Agua Fria River, from an outlying access road, in May 2008. Several species were identified by sight or song during this visit. These species included the ash-throated flycatcher (*Myiarchus cinerascens*), Bell's vireo (*Vireo bellii*), mourning dove (*Zenaida macroura*), song sparrow (*Melospiza melodia*), yellow warbler (*Dendroica petechia*), and yellow-breasted chat (*Icteria virens*). Other birds found in riparian areas in this part of Arizona, and potentially found along the Agua Fria River, include the willow flycatcher (*Empidonax traillii*), verdin (*Auriparus flaviceps*), bushtit (*Psaltriparus minimus*), Lucy's warbler (*Vermivora luciae*), and thicket-loving sparrows (Family: Emberizidae).

Mammals

No riparian-specific mammals occur in this part of Arizona, but the number of bat species in the Study Area predictably would be highest along the Agua Fria River within riparian habitat. Twelve to 17 species of bat could frequent the riparian habitat along the Agua Fria River. Larger game mammals that require available drinking water likely depend greatly on this riparian community. Some of these species include the coyote (*Canis latrans*), bobcat

(*Lynx rufus*), striped-skunk (*Mephitis mephitis*), and possibly the mule deer (*Odocoileus hemionus*).

3.16.4 Threatened, Endangered, and Special-status Species

Data were gathered from the USFWS, BLM, and AGFD to develop a list of special status wildlife species that could occur within the Study Area. Aerial photographs, Southwest ReGAP land cover data, soils, and topography data also were reviewed to determine the locations of biologically sensitive areas.

With the aid of Geographic Information System (GIS) data, digitized versions of the Study Area were overlain on maps depicting land cover, vegetation communities, topography, landforms, and, where available, optimal habitats for special status species. From the species data and the associated environmental data, the Study Area was assessed to determine where suitable habitat is present for each species. The potential for occurrence of special status species in the Study Area was evaluated based on (1) pertinent scientific literature, (2) qualitative comparisons between the known habitat requirements of each species and biotic and abiotic conditions found in the Study Area, and (3) field reconnaissance.

Results indicated that suitable habitat exists for 19 special status wildlife species within the Study Area. Examination of the local ecology and habitats within the Study Area indicated that adequate habitat, food, and shelter exist in order to support individuals or local populations of these species. The details of the legal protection, habitat requirements, habitat suitability, and distributions of these species are described in **Table 3.16-1**.

From this list, only the southwestern willow flycatcher (*Empidonax traillii extimus*) and Sonoran desert tortoise have federal listing status under the ESA. The southwestern willow flycatcher is listed as an endangered species. The Sonoran desert tortoise is listed as a candidate species. The bald eagle (*Haliaeetus leucocephalus*) and golden eagle are protected under the BGA. The remaining species include BLM sensitive species, USFWS species of concern, and state species of concern.

Table 3.16-1 Special Status Wildlife Species

SPECIES	STATUS	HABITAT REQUIREMENTS	HABITAT SUITABILITY
AMPHIBIANS			
Lowland leopard frog *Rana yavapaiensis*	ESA-SC WSCA	A habitat generalist that inhabits aquatic systems from desert grasslands to piñon-juniper woodlands. Breeds in a variety of natural and man-made aquatic systems in both still water and running water habitats.	Suitable habitat in Study Area. Species has been documented on both the Agua Fria and Hassayampa rivers in Study Area. There is a AGFD HDMS record of occurrence within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes (refer to Appendix D of the Biological Resources Report; URS 2012i).
REPTILES			
Sonoran desert tortoise *Gopherus agassizii* (*morfakai*)	ESA-C WSCA	Found in bajadas and rocky slopes of Sonoran desert scrub at elevations up to 5,330 feet (1,625 meters).	Suitable habitat in Study Area. Species has been documented in parts of the Study Area. Records are concentrated in or near the southern extension of the Hieroglyphic Mountains, and along the Hassayampa River, and in bajadas surrounding these areas. There is a AGFD HDMS record of occurrence within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes (refer to Appendix D of the Biological Resources Report; URS 2012i). Species could be encountered along the Proposed Action route paralleling the Hassayampa River and the southern end of the Hieroglyphic Mountains and surrounding bajadas that include the Proposed Action route and Action Alternative routes.
Arizona chuckwalla *Sauromalus ater* (Arizona population)	ESA-SC	Predominantly found near cliffs, boulders or rocky slopes with rocks for basking and rock crevices for shelter. Can be found in rocky deserts, lava flows, hillsides, and outcrops. Creosotebush occurs throughout most of range.	Suitable habitat in Study Area where rocky hills or mountains with crevices or boulders exist. Most likely to occur in the Hieroglyphic Mountains along the Proposed Action route and Action Alternative routes.
Reticulate Gila monster *Heloderma suspectum suspectum*	State Protected	Most common in undulating rocky foothills, bajadas, and canyons. Less frequent or absent on open sandy plains.	Suitable habitat in Study Area where rocky hills or mountains with crevices or boulders exist. Most likely to occur in the Hieroglyphic Mountains along the Proposed Action route and Action Alternative routes.

SPECIES	STATUS	HABITAT REQUIREMENTS	HABITAT SUITABILITY
BIRDS			
Snowy egret *Egretta thula*	WSCA	Found in marshes, lakes, ponds, lagoons, mangroves and shallow coastal habitats.	Limited suitable habitat in Study Area. Species has been documented near Study Area around the Hassayampa River Preserve and could potentially occur along the Agua Fria River. The species could occur occasionally where the Proposed Action route intersects the Agua Fria River.
Golden eagle *Aquila chrysaetos*	BLM-S BGA	Usually found in open country especially in hilly or mountainous regions. They nest on rock ledges, cliffs, or in large trees. In Arizona they are found in mountainous areas and are virtually vacant after breeding in some desert areas.	Limited suitable habitat in the Hieroglyphic Mountains. Undeveloped areas within the Study Area may serve as foraging habitat or perch sites. The species could be expected occasionally anywhere along the Proposed Action route or Action Alternative routes.
Bald eagle *Haliaeetus leucocephalus*	ESA-SC BLM-S WSCA BGA	Large trees or cliffs near water with abundant prey. Elevational range varies statewide.	Suitable habitat in the Study Area. Resident breeding species at Lake Pleasant. There is a AGFD HDMS record of occurrence within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes (refer to Appendix D of the Biological Resources Report; URS 2012i).
Ferruginous hawk *Buteo regalis*	ESA-SC BLM-S WSCA	Found in open country in scrublands and grasslands. Winters in similar habitats and agricultural areas throughout the state.	Suitable habitat for overwintering occurs throughout most of the Study Area outside of mountainous areas. The species could be expected as a rare winter species or migrant along the Proposed Action route or Action Alternative routes from the Sun Valley Substation to the southern extension of the Hieroglyphic Mountains.
American peregrine falcon *Falco peregrinus anatum*	ESA-SC BLM-S WSCA	Found wherever sufficient prey is near cliffs and open expanses. Optimum peregrine habitat for roosting includes steep, sheer cliffs overlooking woodlands, riparian areas, or other habitats supporting abundant avian prey species.	Limited suitable habitat in Hieroglyphic Mountains. Roosting habitat for the species has been documented on Hassayampa River in nearby Yavapai County. The species could be expected occasionally anywhere along the Proposed Action route or Action Alternative routes outside the breeding season.

SPECIES	STATUS	HABITAT REQUIREMENTS	HABITAT SUITABILITY
Western burrowing owl *Athene cunicularia hypugaea*	ESA-SC BLM-S	Habitat is variable in open, well-drained grasslands, steppes, deserts, prairies, and agricultural land. Often associated with burrowing mammals. Sometimes nest in open areas near human habitation such as vacant lots, golf courses, or airports. Often found in agricultural land in Maricopa County.	Suitable habitat throughout most of Study Area outside of rocky or mountainous areas. Species has been documented immediately east and south of the Study Area in the Phoenix metropolitan area. There is a AGFD HDMS record of occurrence within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes (refer to Appendix D of the Biological Resources Report; URS 2012i). Species most likely to occur along the Proposed Action route from Sun Valley Substation to about US 60, but could occur along washes east of this to the southern tail of the Hieroglyphic Mountains.
Southwestern willow flycatcher *Empidonax traillii extimus*	ESA-LE WSC	Obligate of riparian habitats with dense canopy cover, a large volume of foliage, and surface water during midsummer. Avoids riparian areas found in steep, closed canyons.	Suitable habitat occurs in riparian forest on Agua Fria River between Lake Pleasant and SR 74. Species documented in this area in 2004 and 2005 and seems to be occupied intermittently (BLM 2010c, Ellis et al. 2008). USFWS is proposing critical habitat at the Hassayampa River Preserve. There is a AGFD HDMS record of occurrence within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes (refer to Appendix D of the Biological Resources Report; URS 2012i).
LeConte's thrasher *Toxostoma lecontei*	BLM-S	Occurs in sparse creosote bursage desert scrub with widely spaced vegetation and little vertical structure.	Potential habitat occurs along the Proposed Action route in the vicinity of the Hassayampa River from the Sun Valley Substation to about US 60. Breeding bird survey records indicate the Study Area may be slightly outside the range of this species (Corman and Wise-Gervais 2005).
Belted kingfisher *Megaceryle alcyon*	WSCA	Occurs along perennial sources of water that are relatively clear.	Limited suitable habitat occurs along the Agua Fria River. While no perennial water occurs in the Agua Fria River within the Study Area, there are ephemeral flows, which could provide limited foraging habitat along the Proposed Action route or other Action Alternative routes that cross the Agua Fria River.

SPECIES	STATUS	HABITAT REQUIREMENTS	HABITAT SUITABILITY
MAMMALS			
California leaf-nosed bat *Macrotus californicus*	ESA-SC BLM-S WSCA	Found in arid Sonoran desert scrub habitats with roost sites including caves and mines. Forages through matrix of shrubs, often gleaning prey from shrubs or ground.	Suitable habitat for foraging, but limited for roosting. Species has been documented at several localities throughout Study Area. There is a AGFD HDMS record of occurrence within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes (refer to Appendix D of the Biological Resources Report; URS 2012i). Species expected to forage anywhere along the Proposed Action route or other Action Alternative routes.
Cave myotis *Myotis velifer*	ESA-SC BLM-S	Arid lower elevations usually around high cliffs and rugged rock outcrops from desert scrub to mid-elevation woodlands. Roosts in caves, mines during, and human built structures during the day.	Suitable habitat for foraging, but limited for roosting. Species has been documented in the northern part of the Study Area. There is a AGFD HDMS record of occurrence within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes (refer to Appendix D of the Biological Resources Report; URS 2012i). Species is expected to forage anywhere along the Proposed Action route or other Action Alternative routes. Potential roost sites may occur in the southern tail of the Hieroglyphic Mountains near the Proposed Action route and Action Alternative routes.
Western red bat *Lasiurus blossevillii*	WSCA	Occurs in riparian and other wooded areas. Roosts by day in trees. May travel away from these habitats while foraging.	Limited suitable habitat in Study Area. A likely resident in urbanized areas south and east of Study Area and riparian corridors along Agua Fria River. There is a AGFD HDMS record of occurrence near Lake Pleasant within about four miles (6.4 kilometers) of the Proposed Action route or other Action Alternative routes (refer to Appendix D of the Biological Resources Report; URS 2012i). Species could forage and roost where the Agua Fria intersects the Proposed Action route or Alternative 2.

SPECIES	STATUS	HABITAT REQUIREMENTS	HABITAT SUITABILITY
Western yellow bat *Lasiurus xanthinus*	WSCA	Habitat requirements are not well-known. Most often found roosting in palm trees, but will also utilize broad-leaved deciduous trees and tall yuccas (i.e., Joshua trees) as roost sites. Is likely a habitat generalist otherwise. Found in both native and human-influenced habitats.	Suitable habitat in Study Area. Species is a likely resident in urbanized areas on the southeastern border of Study Area and in riparian corridors with developed woodland along Agua Fria River, but it likely is a transient elsewhere in Study Area. Species could forage or roost where the Agua Fria intersects the Proposed Action route or other Action Alternative routes.
Greater western mastiff bat *Eumops perotis californicus*	ESA-SC BLM-S	Roosts in crevices in cliffs, large boulders, and occasionally in buildings. Forages in canyons and open desert scrub at hundreds to thousands of feet above the ground.	Suitable habitat for foraging, but limited for roosting. Potential roost habitat in Hieroglyphic Mountains. Species documented from greater Phoenix-metropolitan area. Species is expected to forage anywhere along the Proposed Action route or other Action Alternative routes. Limited roost habitat occurs in the southern tail of the Hieroglyphic Mountains near the Proposed Action route and Alternative 2.
Big free-tailed bat *Nyctinomops macrotis*	ESA-SC	Roosts in crevices in cliffs and canyons and occasionally in buildings. Occurs in Sonoran desert scrub, piñon-juniper woodlands, and conifer forests dominated by ponderosa pine or Douglas fir.	Potential habitat for foraging occurs throughout the Study Area. Limited roost habitat occurs in the Hieroglyphic Mountains. Species is expected to forage anywhere along the Proposed Action route or other Action Alternative routes. Limited roost habitat occurs in the southern tail of the Hieroglyphic Mountains near the Proposed Action route and Alternative 2.

Notes:
BLM = Bureau of Land Management; ESA = Endangered Species Act
Status Definitions: ESA: C = candidate; SC = species of concern. BLM: S = sensitive. BGA = Bald and Golden Eagle Protection Act. State of Arizona: WSCA = wildlife of special concern in Arizona. Habitat Suitability Definitions: Suitable habitat = habitat is large enough and has the qualities required by the species; Limited suitable habitat = habitat has the qualities required by the species, but may be too small to support the species.

3.16.4.1 Southwestern Willow Flycatcher

Southwestern willow flycatcher habitat is found in riparian forest/woodland vegetation along the Agua Fria River downstream of Waddell Dam. At the Agua Fria River, the Proposed Action route crosses south of riparian forests/woodlands adjacent to permanent or semi-permanent water in the Agua Fria River. Next to the Proposed Action route, the riparian forest/woodland is continuous in the 2,000 feet (610 meters) north of SR 74, but it is intermittent in the 1,500 feet (460 meters) south of SR 74. The terrain includes an incised arroyo or canyon that confines the riparian vegetation. Uplands along this segment have Sonoran paloverde-mixed cacti vegetation. The Alternative 3 route crosses the Agua Fria River about two miles (three kilometers) south of SR 74 at a point where surface water is absent or infrequent, and the surrounding vegetation and habitats differ little between the uplands and the river channel. Non-breeding residential adult southwestern willow flycatchers were detected in 2004 and 2006 in the expanse of riparian forest/woodland downstream of the Waddell Dam (refer to **Table 3.16-2**).

Along the Hassayampa River, suitable habitat for the southwestern willow flycatcher is found near Wickenburg, Arizona at the Hassayampa River Preserve operated by the Nature Conservancy. The Proposed Action route is located closest to the Hassayampa River at the Sun Valley Substation, located approximately 20 miles (32 kilometers) south of the Hassayampa River Preserve. At the closest point, the Proposed Action route is located within 10 miles (16 kilometers) of the Hassayampa River Preserve (refer to **Figure 3.16-1**). Nesting southwestern willow flycatchers have been detected from the Hassayampa River Preserve (refer to **Table 3.16-2**).

Southwestern willow flycatcher migration habitat is believed to occur primarily along riparian corridors. The Agua Fria and Hassayampa Rivers are likely migration corridors to breeding habitat north of the Study Area (Ellis et al. 2008).

AGFD conducted surveys at the Agua Fria River near Waddell Dam and Hassayampa River at the Hassayampa River Preserve. The survey results are summarized in **Table 3.16-2**.

The USFWS is proposing to revise critical habitat for the southwestern willow flycatcher. Within the Study Area, the proposed revision identifies the Hassayampa River at the Hassayampa River Preserve, approximately 5-10 miles northwest of the ROW where it crosses US 60, as critical habitat (refer to **Figure 3.16-1**). The 2005 critical habitat designation remains in effect during the current rulemaking process, which is anticipated to be completed in 2012. Under the 2005 critical habitat designation, critical habitat is not found within the Study Area.

Table 3.16-2 AGFD Southwestern Willow Flycatcher Survey Results

SITE NAME	YEAR	NO. SURVEYS	COUNTS					
			RESIDENT ADULTS	TERR	PAIRS	NESTS	UNK	MIGRANTS
Agua Fria River: Waddell Dam and Morgan City	1999	1	0	0	0	0	0	0
	2000	2	0	0	0	0	0	0
	2001	6	0	0	0	0	0	0
	2002	6	0	0	0	0	0	1
	2003	6	0	0	0	0	0	0
	2004	5	1	1	0	0	0	2
	2005	6	0	0	0	0	0	0
	2006	3	1	1	0	0	0	0
Hassayampa River Preserve	1993	2	0	0	0	0	0	0
	1994	2	0	0	0	0	0	0
	1996	4	0	0	0	0	0	0
	1997	3	2	1	1	1	0	0
	1998	3	4	3	1	1	0	0
	1999	3	2	2	0	0	0	1
	2000	1	0	0	0	0	3	0
	2001	5	0	0	0	0	0	0
	2002	2	4	3	1	0	0	0
	2003	3	2	2	0	0	0	0

TERR = Territories; UNK = Unknown status
Source: Ellis et al. 2008

3.16.4.2 Sonoran Desert Tortoise

The BLM has characterized desert tortoise habitat according to population density and suitability. This includes three classes. Category I habitat is essential for maintenance of large, viable populations; conflicts are resolvable; population density is medium to high or contiguous with medium or high density areas; and the population is increasing, stabilizing, or decreasing. Category II habitat may be essential to maintenance of viable populations; most conflicts are resolvable; population density is medium to high or low density and contiguous with medium or high density areas; and the population is stable or decreasing. Category III habitat is not essential to maintenance of viable populations; most conflicts are not resolvable; population density is low to medium and not contiguous with medium or high density areas; the population is stable or decreasing. Category II habitat occurs in the Hieroglyphic Mountains and is crossed by the Proposed Action route and Alternative 1 (refer to **Figure 3.16-1**). Category III habitat occurs largely south of SR 74 from the Morgan Substation to approximately 179th Avenue and is crossed by portions of Alternative 2 and 3 (refer to **Figure 3.16-1**).

Table 3.16-3 summarizes desert tortoise habitat categories within the Proposed Action route, ACC-certificated route, and the other Action Alternative routes. To compare the Proposed Action route with other Action Alternatives routes, acreage calculations for each desert tortoise habitat category is provided in **Table 3.16-3**.

Table 3.16-3 Acres of Desert Tortoise Habitat by Category within the Study Area

	I	II	III
Proposed Action route (200 ft. ROW)	0	135	192
ACC-Certificated route	0	932	1,453
Alternative 1 (200 ft. ROW and additional corridor)	0	1,811	1,602
Alternative 2 route (200 ft. ROW and additional corridor)	0	0	1,279
Alternative 3 route (200 ft. ROW)	0	0	244
Sub-alternative (200 ft. ROW)	0	0	0
Primary Segment Common to All Action Alternatives (200 ft. ROW)	0	0	0

Source: AIDTT 1996.

3.16.4.3 Bald Eagle

Suitable habitat for the bald eagle is found in the Study Area. A resident breeding population can be found on the upper end of Lake Pleasant at the confluence of the Agua Fria River.

The bald eagle nest enclosure zone is located five miles (eight kilometers) north of the Proposed Action route (refer to **Figure 3.16-1**). The AGFD Bald Eagle Management Program has conducted occupancy and reproductive assessments of the Lake Pleasant breeding population through nest monitoring and aerial survey since 1984 (AGFD 2011b, SWBEMC 2011). Results indicate that habitat use is concentrated along the Agua Fria arm of Lake Pleasant (SWBEMC 2011). In addition, studies of the movements and migratory patterns of Arizona bald eagles (Hunt et al. 1992, SWBEMC 2011) suggest that overwintering bald eagles and Arizona born juveniles pass through the Study Area in the vicinity of the Agua Fria River/Lake Pleasant and Hassayampa River. The most likely location where the bald eagle could occur, relative to the Proposed Action route or Action Alternative routes, would be along the riparian strand of vegetation on the north side of SR 74.

3.16.4.4 Golden Eagle

Suitable habitat for the golden eagle is found in the Study Area. GIS models of golden eagle nesting substrate based on digital elevation models and contour data indicates potential nesting substrate is located in the Castle Hot Springs/Hells Canyon Wilderness and Vulture Mountains (refer to **Figure 3.16-1**). Occurrence, use, and movement of golden eagles in the Study Area are not well understood. Review of the AGFD HDMS database indicates no

record of golden eagles within three miles (five kilometers) of the Proposed Action route or other Action Alternative routes. AGFD is conducting golden eagle nest surveys in select locations in Arizona; however, surveys have not occurred in the Study Area. Undeveloped areas within the Study Area may provide foraging habitat or perch sites.

3.16.4.5 Other Special Status Species

Other special status species that are conservation priority species include the USFWS birds of conservation concern and species of greatest conservation need that are listed in the *Arizona State Wildlife Action Plan* (SWAP) (USFWS 2008, AGFD 2006). Fourteen of the 28 species on the birds of conservation concern list that occur in the Sonoran Desert have potential to occur in the vicinity of the Study Area. Four of those—the bald eagle, peregrine falcon, burrowing owl, and LeConte's thrasher—were described in **Table 3.16-1**.

The prairie falcon (*Falco mexicanus*) nests on cliffs and forages in open shrublands and grasslands. Nesting habitat is limited to the Hieroglyphic Mountains or is absent altogether in the Study Area, and potential foraging habitat encompasses the entire Study Area. The nearest confirmed breeding record of the species is in the White Tank Mountains (Corman and Wise-Gervais 2005).

The elf owl (*Micrathene whitneyi*) most often inhabits densely wooded dry desert washes, but also utilizes riparian gallery forests, and upland desert scrub with columnar cacti. Suitable habitat for the species occurs throughout the Study Area, with the most suitable habitat occurring along the Proposed Action route or Action Alternative routes east of US 60. The species is a probable breeder in the Study Area (Corman and Wise-Gervais 2005).

Costa's hummingbird (*Calypte costae*) is a seasonal breeding resident that is present in the Study Area from October to late May or early June (Corman and Wise-Gervais 2005). The species primarily utilizes upland Sonoran desert scrub and North American Warm Desert Wash habitats. The most suitable habitat for the species occurs along the Proposed Action route or Action Alternative routes east of US 60.

The Gila woodpecker (*Melanerpes uropygialis*) and gilded flicker (*Colaptes chrysoides*) are relatively common and are year-round residents in the Study Area (Corman and Wise-Gervais 2005). These species occur in upland Sonoran desert scrub with saguaros and in North American Warm Desert Wash habitats. These species were observed at several localities along or near the Proposed Action route in the southern tail of the Hieroglyphic Mountains during field reconnaissance of the Study Area. The most suitable habitat for these two species occurs along the Proposed Action route or Action Alternative routes east of US 60.

Bell's vireo (*Vireo belli*) is a probable breeding resident in the Study Area. It most frequently occurs in North American Warm Desert Wash habitat and occasionally Sonoran desert upland vegetation (Corman and Wise-Gervais 2005). This species was observed during field reconnaissance north of SR 74 in riparian woodland along the Agua Fria River. Bell's vireo could occur at the intersection of the Agua Fria River and the Proposed Action route.

The crissal thrasher (*Toxostoma crissale*) is a non-migratory resident species of the Chihuahuan, Sonoran, and Mojave deserts. The species utilizes a variety of vegetation

communities, but consistently inhabits tall, dense brush and shrub thickets in dry desert washes, irrespective of the plant composition (Corman and Wise-Gervais 2005). Individuals have been encountered in mountain chaparral and oak-piñon-juniper woodlands in parts of Arizona (Corman and Wise-Gervais 2005). Crissal thrashers are a resident breeding species in the Study Area (Corman and Wise-Gervais 2005). The most suitable habitat for the crissal thrasher occurs at desert washes along the Proposed Action route or Action Alternative routes east of US 60.

Lucy's warbler (*Oreothlypis luciae*) is a breeding resident in the Study Area. It occurs in North American Warm Desert Wash habitat and occasionally upland Sonoran desert scrub (Corman and Wise-Gervais 2005). The most suitable habitat for the species occurs along the Proposed Action route or Action Alternative routes east of US 60.

The yellow warbler (*Dendroica petechia*) is a possible breeding resident in the Study Area. It occurs in riparian woodlands and forests (Corman and Wise-Gervais 2005). This species was observed during field reconnaissance north of SR 74 in riparian woodland along the Agua Fria River. The yellow warbler could occur at the intersection of the Agua Fria River and the Proposed Action route.

Lawrence's goldfinch (*Spinus lawrencei*) is a potential irregular winter resident that could inhabit the Study Area during regional irruptions (Davis 1999). The species would inhabit open areas along river floodplains, agricultural areas, and other lowland habitats with abundant seeds (Davis 1999). Potential habitat occurs in much of the Study Area, particularly along the Agua Fria River. Other potential habitat areas could occur along washes that intersect the Proposed Action route between US 60 and the upland transition of the southern extent of the Hieroglyphic Mountains.

Fourteen species of greatest conservation need in the SWAP potentially occur in the vicinity of the Study Area. All but two of these have been described already.

The sage thrasher (*Oreoscoptes montanus*) is a likely winter resident in the Study Area. It uses semi-open habitats with scattered shrubs, desert scrub, and sagebrush (Reynolds et al. 1999). Possible overwintering habitat occurs throughout the Study Area along the Proposed Action route and Action Alternative routes.

The red-naped sapsucker (*Sphyrapicus nuchalis*) is a possible winter resident in the Study Area. It uses riparian woodlands, oak savanna, oak-juniper, pine-oak, and pure-oak woodland in mountains to approximately 5,600 feet in its winter range in Arizona (Walters et al. 2002). Suitable overwintering habitat occurs along the Agua Fria River between Lake Pleasant and SR 74. The red-naped sapsucker could occur at the intersection of the Agua Fria River and the Proposed Action route.

3.16.5 Wildlife Linkages

Wildlife linkages are continuous corridors of land that encompass swaths of native vegetation and undisturbed landscapes that maintain the ability of wildlife to move between large blocks of native habitats (Beier et al. 2006). Linkages can include larger wildlife corridors and smaller wildlife movement areas that include expanses of vegetation with a similar structure or plant composition (Beier et al. 2006). These include continuous mountainous areas,

washes, rivers, and valleys. Beier et al. (2006) identified and defined the parameters of a wildlife corridor northeast of the Study Area that connects between the Wickenburg Mountains and Vulture Mountains. The shortest distance between the Proposed Action route and this wildlife corridor is about 7.4 miles (11.9 kilometers). The terrestrial linkage could accommodate the mule deer, badger (*Taxidea taxus*), black-tailed jackrabbit, javelina (*Tayassu tajacu*), desert tortoise, and Gila monster (Beier et al. 2006).

The major natural wildlife linkages in the Study Area are the Agua Fria River and Hassayampa River that facilitate movement of wildlife north and south through the Study Area. The land around the Hassayampa River remains largely undeveloped, and the connectivity remains largely intact along this wildlife corridor from the Vulture and Wickenburg Mountains in the north to the Maricopa Mountains, White Tank Mountains, Buckeye Hills, and Gila River in the south. The Agua Fria River remains largely in its natural state from Lake Pleasant to about Jomax Road, but it is surrounded by urban development south of Jomax Road to its confluence with the Gila River. However, the channel retains much of its native character and should remain functional as a corridor for many wildlife species. Lake Pleasant is a major obstruction to movement from the Study Area to places north along the Agua Fria River.

Smaller washes between the Hassayampa River and Agua Fria River are important linkages between local habitat patches. These provide strands of vegetation that wildlife can use for forage and cover (Levick et al. 2008). During times when these washes carry ephemeral flow, these can help amphibians and aquatic reptiles to move between areas with permanent water (Levick et al. 2008). In addition to serving as movement areas, milder microclimates along wash corridors allow these areas to serve as primary habitat and foraging sites for some species and secondary habitat during droughts and heat waves for other species (Levick et al. 2008). North American Warm Desert washes also are important cores of biodiversity in the desert (Levick et al. 2008).

The CAP canal was identified as a wildlife linkage in the *Arizona Wildlife Linkages Assessment* (ADOT 2006). This manmade structure can serve as a movement corridor for some wildlife species along its east-west route. Bats and birds are the primary beneficiaries of the CAP canal as a wildlife linkage. Some terrestrial wildlife species with generalized habitat requirements also utilize this as a movement area. Yet the CAP Canal also prevents or inhibits movement of terrestrial wildlife from moving along historic north-south movement areas.