3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

In accordance with National Environmental Policy Act (NEPA) regulations codified at Title 40 Code of Federal Regulations (CFR) 1502.15, this chapter presents a summary of the existing conditions of the human and natural environments in the areas that potentially could be affected. This information serves as the baseline to assess the impacts that are anticipated to result from implementing the proposed Project or alternatives. The environment that would be affected by the Project or alternatives is characterized for the following resources, land uses, and social and economic conditions.

- Climate and Air Quality
- Geology, Soils, and Minerals
- Water Resources
- Biological Resources
- Cultural Resources
- Paleontological Resources
- Land Use
- Transportation and Access
- Social and Economic Conditions
- Environmental Justice
- Visual Resources
- Public Safety, Hazardous Materials, and Solid Waste
- Microwave, Radar, and Other Communications
- Noise

These topics were selected based on Federal regulatory requirements and policies, concerns of the lead and cooperating agencies, and/or issues expressed by agencies, and the public during scoping.

The existing conditions of the environment are described based on recent available data—primarily literature, published and unpublished reports, and agency databases. Field reconnaissance verified data gathered for visual resources, vegetation, and wildlife. Three long-term sound level measurements were conducted. Intensive field surveys were conducted to inventory cultural resources within the proposed areas of disturbance, including turbine corridors, interior roads, facility sites, and along linear features such as the proposed access route and potential transmission line routes. The Project Area addressed in the following sections is defined in Chapter 2 and includes the Wind Farm Site, an existing access road with a proposed extension past the Detrital Wash Materials Pit to the Wind Farm Site, and a distribution line and temporary water pipeline that would be within the primary access road right-of-way (ROW).

The areas where different project components are or would be located were examined at different resource-dependent scales for each resource. For example, air quality or socioeconomic conditions are analyzed over broad areas, while other analyses focus on more localized resource areas, such as a view or an archaeological site. In areas of broader focus, specific project components are not necessarily addressed, or are addressed as a group.

3.2 CLIMATE AND AIR QUALITY

3.2.1 Introduction

Climate data were obtained from the Western Regional Climate Center (WRCC). Data on air quality regulations and area attainment status applicable in the State of Arizona were obtained from Federal and State air quality permitting authorities, specifically the U.S. Environmental Protection Agency (USEPA) and the Arizona Department of Environmental Quality (ADEQ) websites. The Arizona Administrative Code was used as a source for air pollution control regulations enforced by the ADEQ. The Mohave County website was reviewed for local air quality requirements. National Park Service (NPS), USEPA, and ADEQ resources were reviewed to identify air quality monitors near the Project Area.

3.2.2 Regional Overview

Climate

The Project region is characterized by shallow to steeply sloping ridges within the White Hills formation. Surrounding areas include the Detrital Valley to the west, the Hualapai Valley to the east, Lake Mead National Recreation Area to the north, and the White Hills community to the south. Table 3-1 summarizes meteorological conditions within and near the Project region.

Table 3-1 Meteorological Conditions Within and Near the Project Region

Monitor	Winter Average	Spring Average	Summer Average	Fall Average	Annual Average
Mean Monthly Temperature Average degrees Fahrenheit (°F)[a]					
Boulder City, Nevada	48.4	65.5	86.6	68.5	67.2
Temple Bar	49.1	69.4	92.5	70.9	70.5
Yucca, Arizona	50.0	64.8	86.7	68.8	67.6
Searchlight, Nevada	46.1	61.1	81.9	65.1	63.5
Kingman, Arizona	44.9	58.7	79.4	63.2	61.6
Kingman No. 2, Arizona	44.4	58.4	80.1	63.1	61.5
Mean Monthly Precipitation Average (inches)[a]					
Boulder City, Nevada	1.81	1.18	1.30	1.26	5.55
Temple Bar	2.30	0.97	1.25	1.09	5.62
Yucca, Arizona	2.62	1.47	1.71	1.73	7.47
Searchlight, Nevada	2.63	1.39	2.13	1.56	7.70
Kingman, Arizona	3.56	1.96	2.47	2.36	10.35
Kingman No. 2, Arizona	3.28	2.20	2.77	2.22	10.47
Average Wind Speed (miles per hour)[b]					
Kingman AP, Arizona	8.2	10.9	11.2	8.5	9.7

SOURCE: Western Regional Climate Center 2009

NOTES: AP = Airport
AZ = Arizona
NV = Nevada
Fall Average = Average for the months of September, October, and November
Spring Average = Average for the months of March, April, and May
Summer Average = Average for the months of June, July, and August
Winter Average = Average for the months of December, January, and February

°F = degrees Fahrenheit

[a] For mean monthly temperature and mean monthly precipitation , the period used for Boulder City, Nevada, is 1931 to 2004; for Temple Bar, Arizona, 1988 to 2007; for Yucca, Arizona, 1950 to 2009; for Searchlight, Nevada, 1913 to 2009; for Kingman, Arizona 1901 to 2003; and for Kingman No. 2, Arizona 1967 to 1993.

[b] For average wind speed values, averages are based on data collected between 1996-2006.

Due to its moderately high elevation (on average approximately 4,250 feet above mean sea level [MSL]), Mohave County experiences milder summers and colder winter temperatures than the low desert regions of Arizona. Average annual temperatures near the Project Area are in the low 60s degrees Fahrenheit (°F). Summer temperatures generally range from the mid-70s to the mid-90s °F. In winter, early morning temperatures normally drop to the low 30s and reach the mid-50s °F by the afternoon (WRCC 2009).

Mohave County in northwestern Arizona has an arid desert climate, characterized by moderate variations in diurnal and annual temperature. The area receives precipitation during the summer months, when afternoon showers form as a result of moist air from the Gulf of Mexico moving over the area, and in the fall and winter, when cold fronts moving to the east and southeast from the Pacific Ocean create steady, usually light rain. The average amount of precipitation received annually in the project vicinity is 8 to 10 inches, including a small amount of snowfall. While snowfall is not unusual during the winter months, snow rarely accumulates to significant depths. Evaporation is correspondingly high, due to high temperatures, the dryness of the air, and the high percentage of sunshine. Mean lake evaporation varies from approximately 80 inches per year in the southwestern part of the state to 50 inches in the northeast (WRCC 2009).

Extreme weather is very uncommon in the region. Other than an occasional strong thunderstorm that produces heavy rain, high winds, and possibly damaging hail, more severe events, such as tornados, are very rare.

Wind patterns in the Project vicinity are primarily influenced by seasonal and diurnal patterns and by local topography, resulting in variability of both wind speed and direction. As a result, wind speeds are typically higher during the afternoon than in morning or evening hours. Thirteen temporary meteorological stations (12 met towers and one SODAR) have been constructed to collect data within the Project Area boundary. These stations are being used to collect data on the wind resources available. Two to three permanent meteorological stations are planned and additional temporary met towers may be installed within the proposed ROW for testing during construction.

Air Quality

Air quality is characterized by the concentration of specified pollutants in the atmosphere in parts per million (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 proposed Project, predicted emissions are compared to National Ambient Air Quality Standards (NAAQS), as identified in the Federal Clean Air Act (CAA) and regulated by the USEPA (see Table 3-2).

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 consisting of examining the available health data and assessing whether the existing air concentration standard is adequately health-protective. In addition, an independent committee of non-USEPA experts conducts peer review of the USEPA work and provides the USEPA Administrator with advice and recommendations regarding the scientific adequacy of the USEPA evaluation.

National Ambient Air Quality Standards

Since 1970, the Federal CAA and subsequent amendments have provided the authority and framework for USEPA regulation of air emission sources. The USEPA 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:

- 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)
- 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 ADEQ Air Quality Division enforces compliance with the NAAQS for criteria air pollutants emitted by sources within the agency's jurisdiction, which includes Mohave County. The NAAQS are listed in Table 3-2 (USEPA 2010c).

Table 3-2 National Ambient Air Quality Standards

Pollutant	Primary Standard		Secondary Standard	
	Level	**Averaging Time**	**Level**	**Averaging Time**
Sulfur dioxide (SO_2)	75 ppm	1-hour	0.5 ppm	3-hour[1]
	0.14 ppm	24-hour[1]		
	0.03 ppm	Annual		
Particulate matter equal to or less than 10 microns in diameter (PM_{10})	150 $\mu g/m^3$	24-hour[2]	Same As Primary	
Particulate matter equal to or less than 2.5 microns in diameter ($PM_{2.5}$)	35 $\mu g/m^3$	24-hour[3]	Same As Primary	
	15 $\mu g/m^3$	Annual[4]	Same As Primary	
Carbon monoxide (CO)	35 ppm	1-hour[1]	—	
	9 ppm	8-hour[1]	—	
Nitrogen dioxide (NO_2)	0.053 ppm	Annual	Same As Primary	
	0.100 ppm	1-hour[5]	Same As Primary	
Lead (Pb)	1.5 $\mu g/m^3$	Quarterly[6]	1.5 $\mu g/m^3$	
Ozone (O_3)	0.12 ppm	1-hour[7]	Same As Primary	
	0.08 ppm (1997 std)	8-hour[8]	Same As Primary	
	0.075 ppm (2008 std)	8-hour[9]	Same As Primary	

SOURCE: U.S. Environmental Protection Agency 2010

NOTES: $\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
To convert from ppm to $\mu g/m^3$, multiply the value in $\mu g/m^3$ by 0.02445 and divide by the molecular weight of the pollutant.

(1) Not to be exceeded more than once per year.

(2) Not to be exceeded more than once per year on average over 3 years.

(3) 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 $\mu g/m^3$.

(4) 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 $\mu g/m^3$ (effective December 17, 2006).

(5) 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).
(6) Final rule signed October 15, 2008.
(7) (a) USEPA 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 ≤ 1.
(8) (a) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 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 USEPA undertakes rulemaking to address the transition from the 1997 O_3 standard to the 2008 O_3 standard.
(c) USEPA is in the process of reconsidering these standards (set in March 2008).
(9) To attain this standard, the 3-year average of the fourth-highest daily maximum 8-hour average O_3 concentrations measured at each monitor within an area over each year must not exceed 0.075 ppm (effective May 27, 2008).

The USEPA 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 the national primary and secondary ambient air quality standard for the pollutant,
- **Nonattainment** – an area that does not meet (or contributes to ambient air quality in an area that does not meet) the 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 USEPA to designate an area as attainment. Areas in which air pollutant concentrations exceed the NAAQS are designated as nonattainment for specific pollutants and averaging times. Typically, nonattainment 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.

One area near Bullhead City in Mohave County, approximately 40 miles south of the Project Area, is categorized as "PM_{10} Attainment with a Maintenance Plan." This means that the area was previously classified as non-attainment, a State Implementation Plan was established to outline a plan for achieving compliance with the PM_{10} NAAQS, the plan was executed successfully, ADEQ demonstrated to USEPA that the area had achieved compliance, and USEPA redesignated the area as an attainment area. All other areas within Mohave County are currently classified as attainment or are unclassified. See Figure 3-1 (ADEQ 2008).

Prevention of Significant Deterioration

The Federal Prevention of Significant Deterioration (PSD) program is part of a larger pre-construction review and permitting process called New Source Review (NSR). The overall purpose of the PSD Permitting Program, which applies to major sources in areas currently meeting the NAAQS, 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) to 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 (USEPA 2008). 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 U.S. are designated Class II.

Grand Canyon National Park (GCNP) is a Class I area and is located approximately 18 miles northeast of the Project Area. Lake Mead National Recreational Area (NRA), located directly north of and adjacent to the proposed Wind Farm Site, is designated Class II. Air quality monitors located in GCNP and Lake Mead NRA (labeled as Meadview) are identified on Figure 3-2.

USEPA Greenhouse Gas Mandatory Reporting Rule

The USEPA issued a mandatory reporting rule for large sources and suppliers of greenhouse gases (GHGs) in 2009. Subpart D of the rule addresses requirements for electric generating facilities. The rule limits applicability to sources in this category that are subject to 40 CFR Part 75, "Continuous Emission Monitoring." The operating wind farm 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 (Btu) 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.

Arizona Air Quality Regulations

The State of Arizona has promulgated air pollution control regulations, which are codified in Title 18, Chapter 2 of the A.A.C. These regulations include general administrative procedures and more specific requirements pertaining to various types of operations. The proposed project would potentially be subject to the requirements contained in the following articles, which are located in Title 18, Chapter 2 of the A.A.C.:

- Article 1: General
- Article 2: Ambient Air Quality Standards; Area Designations; Classifications
- Article 3: Permits and Permit Revisions
- Article 4: Permit Requirements for New Major Sources and Major Modifications to Existing Major Sources
- Article 5: General Permits
- Article 6: Emissions from Existing and New Nonpoint Sources
- Article 7: Existing Stationary Source Performance Standards
- Article 8: Emissions from Mobile Sources (New and Existing)
- Article 9: New Source Performance Standards
- Article 17: Arizona State Hazardous Air Pollutants Program

The text that follows highlights selected requirements within these articles that are applicable to the proposed project.

Article 1: General

The applicable air quality control region is defined in A.A.C. R18-2-101(10.d) as the Mohave-Yuma Intrastate Air Quality Control Region, which encompasses the counties of La Paz, Mohave, and Yuma.

Fugitive emissions are defined under of A.A.C. R18-2-101(49) as "those emissions which could not reasonably pass through a stack, chimney, or vent, or other functionally equivalent opening."

The definitions of "insignificant activity" given in Subsections (c) and (h) in A.A.C. R18-2-101(57) are applicable to the proposed facility. A.A.C. R18-2-101(57) provides a list of categories accepted as insignificant when the activity in an emissions unit is not otherwise subject to any applicable requirement.

The definition of an operating source emitting a significant quantity of regulated air pollutants is defined in A.A.C. R18-2-101(106). If the proposed project had the potential to emit any of the listed pollutants in excess of the corresponding yearly rates, it would meet the definition of significant. Operating emissions from a wind farm are not anticipated to exceed these levels. Fugitive dust emissions generated during construction are not subject to the significance criteria.

Article 2: Ambient Air Quality Standards; Area Designations; Classifications

This section defines ambient air quality standards for criteria pollutants including PM_{10}, $PM_{2.5}$, SO_2, O_3, CO, NO_2, and Pb. The NAAQS were discussed in the above section on applicable Federal regulations. The State of Arizona is currently updating Article 2 so that the ambient air quality standards in the rule will reflect the most recent updates to the NAAQS.

Criteria for areas of the State of Arizona designated as Class I, Class II, or Class III are discussed in A.A.C. R18-2-217. The subject property is considered a Class II area in the State of Arizona, since all areas not determined to be Class I are Class II, unless they have been redesignated by the Governor or Governor's designee in accordance with A.A.C. R18-2-217 E & F.

Article 3: Permits and Revisions

The ADEQ issues three classes of air quality permits: Class I, Class II, and general permits. (General permits are discussed under Article 5.) Class I permits are issued for major sources of air pollutants. A major source is one that has the potential to emit 100 tons per year of any criteria pollutant, 10 tons per year of any single hazardous air pollutant (HAP), or 25 tons per year of any combination of HAPs. Class I permits also are issued to affected sources defined in A.A.C. R18-2-101(5) and solid waste incineration units. Class II permits are issued to sources that do not require Class I permits and meet the requirements in A.A.C. R18-2-302(B)(2). This includes "minor" sources that emit significant quantities of regulated air pollutants (see "Article 1: General," above), sources that operate internal combustion engines rated at 325 horsepower or greater, sources operating fuel-burning equipment rated at more than 1 million Btu per hour operated continuously for 8 hours, and sources subject to CAA Sections 111 or 112.

Article 4: Permit Requirements for New Major Sources and Major Modifications to Existing Major Sources

These are the NSR/PSD requirements mentioned in the previous section. In general, permit applications for major sources in NAAQS attainment areas must demonstrate that Best Available Control Technology (BACT) will be installed to control the pollutants emitted at major source levels, and to show, through a refined dispersion analysis, what the impacts of criteria pollutant emissions would be on ambient air quality, visibility and other Air Quality Related Values (AQRVs). Permit applications for major sources in NAAQS nonattainment areas must demonstrate Lowest Achievable Emission Rate (LAER), instead of BACT, and show that nonattainment pollutant emissions have been offset by emission reductions elsewhere within the nonattainment area (by amounts greater than 1:1, depending on the severity of the nonattainment area. The proposed project would be subject to these requirements if it includes fossil-fuel equipment that emit 100 tons of a criteria pollutant per year.

Article 5: General Permits

General permits are preapproved permits covering specific classes of sources, which include concrete batch plants (limited to daily production of 1,175 cubic yards (yd^3) when operating under commercial power), crushing and screening plants (limits apply for PM_{10}, CO, and nitrogen oxide [NOx] emissions), and generators (with total capacity less than 325 horsepower). Sources may apply for coverage under a general permit by completing and submitting the appropriate application, in accordance with the established guidelines. The contractor operating equipment subject to permitting requirements would

apply for coverage for concrete batch and crushing/screening plants, generators, and other equipment, as appropriate.

Article 6: Emissions from Existing and New Nonpoint Sources

Open burning is prohibited unless a permit is obtained from the appropriate authority. Permits in this area of Mohave County may be obtained from ADEQ. Permits are required for construction burning, agricultural burning, residential burning, prescribed burns conducted on private lands, fires set by a public officer performing an official duty, and open outdoor fires of dangerous materials or household hazardous waste or of a nature that requires an air curtain destructor. These types of fires and those that do not require a permit are defined in A.A.C. R18-2-602.

During project construction or operation, both paved and unpaved roadways and streets must be managed in a manner that prevents excessive amounts of particulate matter from becoming airborne. This may be accomplished through temporary paving, dust suppressants, watering, detouring, and reducing speed limits on unpaved and graveled roads, or by other effective means.

Dust generated from materials handling, conveyance, or transport (including during construction) must be managed to prevent particulate matter from becoming airborne. Appropriate precautions include wetting the material, covering the load, using spray bars, applying dust suppressants and preventing "trackout."

Storage piles that may produce dust (such as aggregate and sand) must be managed using chemical stabilization, wetting, or covering to prevent excessive particulate matter from becoming airborne.

Article 7: Existing Stationary Source Performance Standards

The general provisions of Article 7 include limitations on opacity of plumes from point and stationary sources. This limitation would apply to any diesel-fired emergency equipment installed at the proposed facility. A.A.C. R18-2-703 limits particulate matter emissions from fuel-burning equipment. In addition, recordkeeping requirements and fuel limitations applicable to fuel-burning equipment are discussed in A.A.C. R18-2-719.

Article 8: Emissions from Mobile Sources (New and Existing)

The provisions of Article 8 limit the opacity of exhaust emissions from, and dust caused by operation of, off-road machinery, heater/planer units, roadway and site cleaning machinery and asphalt or tar kettles. Most of the self-propelled construction equipment used on the project, such as dozers, loaders, graders and belly-dumpers would meet the definition of off-road machinery. The opacity limitation for off-road machinery is 40 percent for any period greater than 10 seconds. Visible emissions when starting cold equipment is exempt for the first 10 minutes. The opacity limit for asphalt or tar kettles is 40 percent for any period greater than 10 seconds.

Article 9: New Source Performance Standards

New Source Performance Standards (NSPS) have been established by USEPA to limit air pollutant emissions from certain categories of new and modified stationary sources. ADEQ has adopted these standards with a few changes. The NSPS regulations are contained in 40 CFR Part 60 and cover many different industrial source categories. If diesel-fired engines are installed to supply emergency or non-emergency power for the proposed Wind Farm Site or are used during construction, they would be regulated by the NSPS for diesel engines (compression ignition engines), 40 CFR Part 60, Subpart IIII. Emissions from the generator(s) would be required to comply with Table 1 within NSPS Subpart IIII. If the proposed project utilizes an emergency fire pump, it would be covered under 40 CFR Part 60, Subpart IIII. Table 4 within NSPS Subpart IIII is applicable to emergency fire pump engines. The non-

methane hydrocarbon and NOx emissions standard for equipment manufactured in 2009 or later also is likely to apply to the equipment selected for the proposed facility.

Article 17: Arizona State Hazardous Air Pollutants Program

Definitions of major, minor and de minimis sources of HAPs are included in A.A.C. R18-2-1701. Stationary sources with the potential-to-emit more than 10 tons of any single HAP or 25 or more tons of any combination of HAPs are major sources. Sources emitting between 1 and 10 tons of any single HAP or between 2.5 tons and 25 tons of total HAPs are minor sources. Table 1 in A.A.C. R18-2-1701 lists de minimis levels for specific HAPs in both pounds per hour and pounds per year. Based upon the information provided for the proposed Project, limited amounts of HAPs may be used during maintenance activities. HAPs are also emitted during the combustion of fossil fuels.

Mohave County Requirements

The Mohave County Development Services Department, Building Division, requires a permit for projects that include grading. A grading permit is required for the project since more than 5,000 cubic yards would be graded. Submittal information is listed under "Engineered Grading Requirements." No specific air quality ordinances have been enacted within Mohave County (Mohave County 2010).

3.2.3 Existing Conditions

Ambient air quality in northwest Arizona is generally good. However, few air quality monitoring stations are positioned near the Project Area, so available data are limited. An active visibility monitor is located within Lake Mead NRA and at GCNP. These monitors measure aerosol particles that create haze when sunlight encounters particles of pollution in the air. Light is either absorbed by the particles or scattered by them, resulting in a reduction of clarity and color for the observer. The NPS and other agencies monitor air quality in our national parks to protect and improve visibility. Table 3-3 presents a summary of monitoring data from 2004 through 2008 at Lake Mead NRA and GCNP. The data are presented in deciviews. Higher deciview values indicate worse visibility. In general, the average person is able to perceive a change of one deciview. It should be noted that visibility in cleaner environments is more sensitive to increases in particle concentrations than visibility in more polluted areas.

Table 3-3 Summary of Aerosol Monitoring Data from IMPROVE Network Monitors Located at Meadview and Grand Canyon National Park, Arizona

Year	Parameter	Meadview Annual Average (DV)	GCNP 2 Annual Average (DV)
2004	Aerosol	8.34	7.16
2005	Aerosol	8.48	7.56
2006	Aerosol	8.57	7.34
2007	Aerosol	8.67	7.87
2008	Aerosol	8.55	6.92

SOURCE: IMPROVE Network (2010)
NOTES: DV= deciviews

Mobile ozone monitors were used by the NPS to collect data on ozone levels from 2003 to 2006 (NPS 2010a). Summary data are presented in Table 3-4. Ozone is formed in a series of complex photochemical reactions involving NOx and volatile organic compounds (VOCs) in the presence of sunlight. Since ground-level ozone is the primary constituent in smog, it impacts visibility. Ozone presents a health hazard at ambient concentrations exceeding the ozone NAAQS.

Table 3-4 Days with 8-Hour Averages Exceeding Ozone Standard at Lake Mead National Recreation Area 2003-2006

Parameter	Applicable Standard	2003	2004	2005	2006
8-hour Ozone	0.8 ppm	1	2	3	1

SOURCE: National Park Service (2010) http://www.nature.nps.gov/air/monitoring/ads/ADSReport.cfm.
NOTES: This standard was established in 1997 and is the applicable standard for these monitoring years. The new standard of 0.075 ppm was effective May 27, 2008.

The nearest PM_{10} monitors in Mohave County are located in Bullhead City and Peach Springs, approximately 48 miles southerly and 36 miles easterly from the Project Area, respectively.

The area is known for moderate to strong, steady winds. High winds commonly create blowing dust and reduced visibility, except after significant rainfall. Wind data obtained from temporary met towers located within the Project boundary indicate winds blow primarily from the south and secondarily from the north-northeast (BP Wind Energy 2009).

3.2.4 Climate Change

Ongoing scientific research has identified the potential impacts of anthropogenic (manmade) GHG emissions and changes in biological carbon sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses attributable to alterations in land cover such as croplands, pastures and forests are believed to cause a net warming effect of the atmosphere, primarily by decreasing the amount of heat radiated by the Earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused carbon dioxide equivalent, or CO_2e, concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. CO_2e is calculated by multiplying the mass of each GHG emitted by its global warming potential. As an example, CO_2 is used as the baseline and has a global warming potential of 1, whereas methane (CH_4) has a global warming potential of 72. Therefore, every 1 ton of CH_4 emitted is 72 tons CO_2e. The Intergovernmental Panel on Climate Change (IPCC) concluded in 2007 that "warming of the climate system is unequivocal" and "most of the observed increase in globally average temperatures since the mid-20th century is very likely due to the observed increase in anthropogenic greenhouse gas concentrations" (IPCC 2007).

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. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change (IPCC 2007).

In 2001, the IPCC indicated that by the year 2100, global average surface temperatures would increase 2.5°F to 10.4°F above 1990 levels. 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. Although large-scale spatial shifts in precipitation distribution may occur, these changes are more uncertain and difficult to predict (IPCC 2007).

Although there are uncertainties associated with the science of climate change, this does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty, because they are based on well-known physical laws and documented trends.

Several activities contribute to the phenomena of climate change, including solar energy output, emissions of GHGs (especially CO_2 and methane) from fossil fuel development, large wildfires, decomposition of vegetation, and activities using combustion engines; changes to the natural carbon cycle; and changes to radiative forces and reflectivity (albedo). It is important to note that GHGs will have a sustained climatic impact over differing temporal scales. For example, recent emissions of CO_2 may influence the climate for 100 years (IPCC 2007).

3.3 GEOLOGY, SOILS, AND MINERALS

3.3.1 Introduction

The geologic setting and geologic hazards assessment for the Project was based on a review of data gathered from the Natural Resources Conservation Service (NRCS), the Arizona Geological Survey (AZGS), the Arizona Department of Water Resources (ADWR), the U.S. Geologic Survey (USGS), the Mineral Resource Data System (MRDS) and general professional knowledge of soils in Arizona (USGS 2009, 2010, 2011a). These data were presented in the report "Geology and Geologic Hazard Assessment Report, Mohave County Wind Farm Project" (URS 2010a). It should be noted that the information published by the NRCS and AZGS provides general geologic information related to surficial soil conditions, which is defined as the upper 200 centimeters or approximately 6.5 feet. Section 3.3 provides general geologic constraints and hazards within the boundaries of the Project Area that is suitable for the purposes of this environmental analysis, but is not intended for making design and construction decisions.

3.3.2 Geologic Setting

The Project Area is located in the White Hills situated between the Detrital Valley Basin and the Colorado River to the west and the Hualapai Valley Basin to the east. The Colorado River runs through Lake Mead to the north and the Cerbat Mountains are south of the Project Area. The White Hills predominantly consist of Tertiary-aged sedimentary volcanics and intrusive igneous rocks (granite) unconformably adjacent to Precambrian-aged metamorphic rock. The Tertiary sedimentary rocks predominantly consist of sandstone, mudstone conglomerates, and unconsolidated sediments (sands and gravels). These sedimentary units generally outcrop at the lower elevations within the White Hills. Tertiary-aged tuffs and ash deposits generally outcrop at lower elevations within the White Hills. The Tertiary-aged basalt flows, Precambrian-aged gneiss and schist rocks form the cliffs and peaks of the White Hills. The Tertiary sedimentary deposits are the most susceptible to disturbance and it may become difficult to prevent wind erosion and blowing dust once any disturbance takes place.

3.3.3 Soils Overview

The 32 soil map units identified in the Project Area by the NRCS soil survey data are shown on Map 3-1, Soil Units. The soil types mapped in the Project Area have slopes ranging from 0 to 75 percent and generally consist of gravelly sandy clay loams to gravelly loamy sands. Areas of rock outcrop located within the northern portion of the Project Area covering approximately 6,300 acres.

Soil properties for each soil type identified within the Project Area are shown in Table 3-5. Details regarding the soil survey data obtained from NRCS can be found in the Geology and Geologic Hazard Assessment Report (URS 2010a).

Table 3-5 Soil Properties of the Mohave County Wind Farm Project Area

Map Unit	Name	Acres	Percent of Site Coverage	Location within Wind Farm Site	Depth to Restrictive Layer - Lithic Bedrock	Shrink/ Swell Potential	Steel Corrosivity	Concrete Corrosivity
3	Appleseed-Huevi association, 4 to 30 percent slopes	21.69	0.05%	Northwest corner of Project Area	Assumed to be >11 in.	Low	High	Low
5	Arizo-Detrital-Nickel complex, 2 to 6 percent slopes	7,891.50	16.77%	Southern portion of Project Area	Assumed to be >75 in.	Low	High	Low
8	Arizo-Riverwash complex, 1 to 4 percent slopes	130.93	0.28%	Small portions in eastern Project Area	Assumed to be >75 in.	Low	High	Low
9	Arizo-Riverwash complex, dry, 0 to 1 percent slopes	1,466.71	3.12%	Small portions throughout western half of Project Area	Assumed to be >75 in.	Low	High	Low
15	Carrizo complex, 1 to 5 percent slopes	687.17	1.46%	Small portion in northwest corner of Project Area	Assumed to be >75 in.	Low	High	Low
16	Carrizo-Riverwash complex, 0 to 1 percent slopes	118.19	0.25%	Small portion in central Project Area	Assumed to be >75 in.	Low	High	Low
17	Carrizo-Riverwash complex, 3 to 8 percent slopes	214.17	0.46%	Northwestern portion of Project Area	Assumed to be >75 in.	Low	High	Low
25	Deluge-Gotchell-Sunstroke complex, 3 to 7 percent slopes	1,858.17	3.95%	Central and eastern portions of Project Area	Assumed to be >50 in	Low	High	Low
26	Detrital-Bluebird complex, 2 to 12 percent slopes	1,477.49	3.14%	Eastern and southeastern portions of Project Area	Assumed to be >75 in.	Low	High	Low
28	Detrital-Nickel complex, dry, 1 to 6 percent slopes	2,760.99	5.87%	Throughout central portion of Project Area	Assumed to be >75 in.	Low	High	Low
41	Goldroad-Rock outcrop complex, 35 to 65 percent slopes	76.15	0.16%	Small portion in west central part of Project Area	Assumed to be >7 in.	Low	High	Low
44	Gotchell-Sunstroke complex, 6 to 35 percent slopes	6,161.99	13.09%	Eastern and southern portions of Project Area	Assumed to be >27 in.	Low	NA	Low
52	Greyeagle-Skelon families complex, moist, 4 to 25 percent slopes	1,505.82	3.2%	Throughout eastern half of Project Area	Assumed to be >75 in.	Low	High	Low
54	Haplogypsids, eroded-Haplogypsids complex, 35 to 75 percent slopes	31.35	0.07%	Small portion in northwest corner of Project Area	Assumed to be >6 in.	NA	High	High
60	Huevi extremely cobbly sandy loam, 2 to 6 percent slopes	1,445.56	3.07%	Through western portions of Project Area	Assumed to be >75 in.	Low	High	Low
63	Huevi-Carrizo complex, 1 to 25 percent slopes	16.99	0.04%	Small portion in western Project Area	Assumed to be >75 in.	Low	High	Low
64	Huevi-Carrwash complex, 2 to 75 percent slopes	19.13	0.04%	Small portion in northwest corner of Project Area	Assumed to be >75 in.	Low	High	Low

Map Unit	Name	Acres	Percent of Site Coverage	Location within Wind Farm Site	Depth to Restrictive Layer - Lithic Bedrock	Shrink/ Swell Potential	Steel Corrosivity	Concrete Corrosivity
66	Hulda extremely gravelly sandy loam, 20 to 65 percent slopes	1,479.47	3.14%	Throughout central and southeast corner of Project Area	Assumed to be >7 in.	Low	High	Low
67	Hulda-Rock outcrop complex, 20 to 65 percent slopes	124.58	0.26%	Small portion of northeast corner and north central areas	Assumed to be >5 in.	Low	High	Low
94	Nickel family-Bluebird complex, 15 to 45 percent slopes	1,088.72	2.31%	Throughout eastern Project Area	Assumed to be >75 in.	Low	High	Low
95	Nickel-Skelon family-Detrital complex, 3 to 10 percent slopes	5,090.25	10.82%	Portions throughout southwest half of Project Area	Assumed to be >75 in.	Low	Moderate	Low
97	Nodman-Antares complex, 3 to 15 percent slopes	166.83	0.35%	Eastern Project Area	Assumed to be >38 in.	Low	High	Low
116	Razorback extremely gravelly sandy loam, 15 to35 percent slopes	2,586.39	5.5%	Throughout all of Project Area	Assumed to be >5 in.	Low	High	Low
118	Razorback-Rock outcrop complex, 20 to 70 percent slopes	2,853.60	6.06%	Central and northeast portion of Project Area	Assumed to be >5 in.	Low	High	Low
135	Skelon-Pinaleno families complex, 1 to 4 percent slopes	1,373.30	2.92%	Scattered throughout Project Area	Assumed to be >75 in.	Low	High	Low
136	Storybook very gravelly loam, 1 to 3 percent slopes	1,248.58	2.65%	Small portion is southwest corner of Project Area	Assumed to be >75 in.	Low	High	Low
138	Sunrock extremely gravelly sandy loam, 15 to 35 percent slopes	865.88	1.84%	Central and northern portions of Project Area	Assumed to be >5 in.	Low	High	Low
139	Sunrock-Rock outcrop complex, 30 to 65 percent slopes	3,118.95	6.63%	Central and northern portions of Project Area	Assumed to be >7 in.	Low	High	Low
150	Tumarion-Nickel family complex, 8 to 35 percent slopes	117.56	0.25%	Small portion in southwest corner of Project Area	Assumed to be >18 in.	Low	High	Low
151	Tumarion-Nickel family complex, moist, 5 to 40 percent slopes	65.54	0.14%	Small portion in southeast part of Project Area	Assumed to be >18 in.	Low	High	Low
152	Tyro extremely stony sandy loam, 3 to 35 percent slopes	864.73	1.84%	Small portion in Northwest part of Project Area	Assumed to be >16 in.	Low	High	Low
154	Tyro-Sunrock complex, 3 to 15 percent slopes	137.24	0.29%	Northern portion of Project Area	Assumed to be >75 in.	Low	High	Low

SOURCE: U.S. Department of Agriculture, Natural Resources Conservation Service 2009

Not included in Table 3-5 are the soil units and corresponding data associated with the ROW proposed for the primary access road, distribution line, and water pipeline proposed from US 93 to the Wind Farm Site. The current geological condition of these potential features is discussed in Section 3.3.13.

3.3.4 Geologic Hazards

Available data were reviewed to identify potential geologic hazards within the Project Area, including collapsible soils, shrink/swell potential, earth fissures, land subsidence, depth to bedrock, corrosive soils (steel and concrete), seismicity, sinkholes, and landslides. Details regarding these hazards can be found in the Geology and Geologic Hazard Assessment Report (URS 2010a).

The findings from the data review indicate that the Project Area may be subject to the geologic hazards described in the following sections. These descriptions are based on readily available data, which did not include specific laboratory testing results. Specific impacts associated with these hazards are addressed in Section 4.3 of this Environmental Impact Statement (EIS).

3.3.5 Collapsible Soils

The site is located in a depositional basin of the Basin and Range province, which generally consists of young alluvial deposits. These young alluvial deposits can have a potential for collapse when inundated or saturated. Therefore, it should be assumed that collapsible soils are present within the Project Area.

3.3.6 Shrink/Swell Potential

According to available NRCS data, the shrink/swell potential of the shallow soils is low throughout the Project Area.

3.3.7 Earth Fissures/Land Subsidence

No earth fissures or land subsidence are recorded within or near the Project Area.

3.3.8 Approximate Bedrock Location

The depth to bedrock constraints were evaluated based on the NRCS soils data for the Project Area. It was determined that there was not sufficient information available for the Project Area to give definitive depths to many of the restrictive layers. Based on NRCS data, it is speculated that the depth to bedrock ranges from 5 inches to greater than 75 inches with the majority of the bedrock being greater than 75 inches.

3.3.9 Corrosion of Concrete and Steel

The NRCS soils survey data indicate that the shallow soils of the entire site have high steel corrosion potential and low concrete corrosion potential. High steel corrosion is not uncommon in arid Southwest soils. The corrosion potential of soils is generally managed through the appropriate selection of materials during design and is typically evaluated as part of a more detailed geotechnical investigation for the Project Area.

3.3.10 Seismic Analysis

An evaluation was performed to determine the probable future seismic events for the Project Area by reviewing the available 2008 USGS mapping data of Quaternary-aged faults (about 1.6 million years ago to present) and peak ground acceleration in Arizona. These mapping data depict recent (geologic time scale) faulting in proximity to the Project Area and provide an estimate of the peak ground acceleration for the site. Peak ground acceleration is defined as the maximum acceleration a particle will experience during an earthquake (USGS 2007).

The USGS mapping data indicate there are eight faults that are either completely or partially encompassed within a 50-mile radius of the Project Area. There are no known Quaternary faults presently mapped within the Project Area. The nearest faults are approximately 15 miles from the center of the Project Area to the west and northeast and date to the Mid Quaternary era (750,000 to 130,000 years ago). The nearest fault with recent activity is the Lavic Lake fault in California, which is approximately 140 miles to the southwest and dates to the Late Quaternary era (130,000 years ago to present). This fault was last active in 1999 during the Hector Mine Earthquake, which registered magnitude 7.1 on the Richter magnitude scale. The fact that there are no Quaternary faults presently mapped within the Project Area does not mean that faults are not present; there are older faults within the Project Area that have

been dormant dating back to more than 10 million years ago during the formation of the basin. These older dormant faults are shown on Map 3-2, Geology.

Based on the USGS mapping data, the peak ground acceleration with a 2 percent probability of exceedance in a 50-year period is estimated to be 0.14 g (where g is the gravitational constant of 32.2 feet per second per second (time squared) and 0.14g = 0.14*32.2 feet per second per second = 4.51 feet per second per second) for the Project Area. The peak ground acceleration with a 10 percent probability of exceedance in a 50-year period is estimated to be 0.06 g (0.06*32.2 feet per second per second = 1.93 feet per second per second) for the Project Area.

3.3.11 Landslides/Soil Erosion

There are several areas within the Project Area that contain highly or potentially highly erodible soil units as shown in Map 3-3, Soil Erosion, with 1:100,000 USGS Quads. The erodible lands that are on steep slopes (≥50 percent) are considered at high risk for landslides, rockslides, and debris slides. Areas of high susceptibility to erosion within the western half of the Project Area include Squaw Peak in the northwest, a rock outcrop in the northeast, and the base of Senator Mountain on the eastern edge of the Wind Farm Site. Structures at the toe and crest of these highly erodible and potentially highly erodible slopes may be at risk of landslides.

3.3.12 Mineral Resources/Mining

Minerals are not a true geologic hazard, but can affect the design and/or construction of the Project. Map 3-4, Mineral Data, portrays the minerals within and near the Project Area which include Federal mineral reserves, mineral districts, potential mining claims, and historic mining areas.

Near the Project Area, there are several other closed mine sites, prospect sites, and other mineral features. The area with the most significant mining activity is approximately 10 miles southeast of the center of the Project Area in the White Hills Mineral District (shown on Map 3-4). This area contains approximately 20 closed mines and one prospect site that have been mined primarily for gold and silver with some beryllium. Approximately 8 miles south of the Project Area is a prospect site for uranium, lead, and zinc. North of the proposed Wind Farm Site are mine prospect sites for uranium (carnotite and uranophane), gypsum, selenite, and calcite. The western edge of the Project Area shares a boundary with a sodium potassium deposit. East of the Project Area is an assortment of mines and prospects for gold, mica, quartz, and tungsten. The Project is within an area where all Federal minerals are available for mining, but it is an area of low favorability for mineral mining. According to the Bureau of Land Management (BLM) mineral database, the Project Area is not in a mining district and there are no active mining claims within the proposed Wind Farm Site.

3.3.13 Primary Access Road, Distribution Line, and Temporary Water Pipeline

The current geological, soil, and mineral conditions associated with the primary access road connecting US 93 to the Wind Farm Site (see Map 2-1), the water pipeline and distribution line within the ROW of this road, and the nearby materials source are similar to those of the Wind Farm Site, as described above. Collapsible soils, shrink/swell potential, corrodibility, and seismic analysis for these areas should be similar to those described in the above sections, but should be verified and determined in conjunction with a formal geotechnical investigation.

3.4 WATER RESOURCES

3.4.1 Introduction

This section includes a description of the existing conditions for water resources that include watersheds, water quality, streams (washes), floodplains, groundwater, and wells. Existing conditions for water resources have been characterized based on review of the USGS National Hydrography Dataset (NHD), Federal Emergency Management Agency (FEMA) floodplain data, the ADEQ Draft 2010 Status of Water Quality Integrated 305(b) Assessment and 303(d) Listing Report (ADEQ 2011), ADWR data, Mohave County's Water Quality Management Plan, and the BLM Resource Management Plan (RMP) for Kingman, Arizona.

3.4.2 Regional Overview

A watershed is a hydrologically defined geographic area that includes both groundwater and surface water flow (USEPA 2010a); therefore, watersheds are the basis of the regional analysis for water resources in this EIS. The three regional watersheds that are connected to the Project are the Lower Detrital Wash, Middle Detrital Wash, and Trail Rapids Wash-Lower Colorado River (see Map 3-5, Water Resources). These are watersheds are discussed in detail below.

3.4.3 Project Area Conditions

3.4.3.1 Watershed Boundaries and Water Quality

Watershed health is important to Federal and state agencies as a means for protecting water quality. The BLM Land Use Planning Handbook encourages a watershed-based approach for land management and requires BLM to identify watersheds that may need special protections for human health concerns, ecosystem health, or other public uses. Further, BLM must ensure that proper measures are taken for enhancing watershed functions and conditions (BLM 2005c).

The three Project action alternatives for the Wind Farm Site encompass between 34,720 and 47,059 acres divided among three different watersheds: Lower Detrital Wash, Middle Detrital Wash, and Trail Rapids Wash-Lower Colorado River. Under all Project action alternatives, the majority of the proposed Wind Farm Site would be located within the Lower Detrital Wash watershed. Table 3-6 shows the affected acreage within each surface watershed under the three Project action alternatives. For comparison, the Lower Detrital Wash watershed encompasses about 151,420 acres, the Middle Detrital Wash watershed encompasses about 190,454 acres, and the Trail Rapids Wash-Lower Colorado River watershed encompasses 115,596 acres (USDA, NRCS and University of Arizona 2007).

Table 3-6 Watersheds Potentially Affected by Project Action Alternatives

Watershed	Acres by Project Action Alternatives		
	Alternative A	Alternative B	Alternative C
Lower Detrital Wash	38,188	30,564	31,073
Middle Detrital Wash	881	0	0
Trail Rapids Wash – Lower Colorado River	7,991	4,156	4,229
TOTAL ACRES	47,060	34,720	35,302

NOTE: This table indicates overall acreage within the project/lease area and not specific surface disturbance estimates.

The Clean Water Act (Section 303[d]) requires states, Tribes, and territories to develop lists of impaired waters which do not meet established water quality standards. Based on Arizona's 2008 and Draft 2010 303(d) list of impaired waters, no impaired waterways have been identified in the Project Area. ADEQ Water Quality Standards for surface water are prescribed in Title 18, Chapter 11, Article 1 of the A.C.C. This Code also includes the Department's designated uses of surface water as a means for developing numerical water quality criteria to maintain and protect surface waters (A.A.C. R18-11-104[c]).

3.4.3.2 Annual Precipitation and Surface Water

Annual precipitation on the valley floors of Mohave County ranges from about 5 to 10 inches (Western Regional Climate Center 2005, cited in Anning et al. 2007). No perennial surface waters are present within the Project Area. However, as is typical of arid Southwest environments, numerous ephemeral desert washes traverse the Project Area. These ephemeral washes only flow during storm events and are often sources of flash floods. Flow in the ephemeral washes during storms occurs in a northerly direction, draining towards Lake Mead and ultimately into the Colorado River (USGS 2008).

The nearest springs to the Project Area occur approximately 6 miles southeast of the Wind Farm Site near the White Hills Community (Map 3-5, Water Resources). Springs could be a source for wetland conditions; however, wetlands have not been mapped within the Project Area in accordance with the USFWS National Wetlands Inventory (EcoPlan 2011). If wetlands are identified as the Project progresses, formal wetland delineations would occur along with delineations of jurisdictional waters of the United States. Jurisdictional waters of the United States are described below in Section 3.4.3.3, Streams (Washes).

3.4.3.3 Streams (Washes)

Based on USGS NHD data from 2010, Trail Rapids Wash is the only named stream within the Wind Farm Site. This wash traverses the northeastern portion of the site, flowing to the north and ultimately into Lake Mead (Map 3-5). Another named stream, Temple Wash, originates just north of the Project Area and flows into Trail Rapids Wash.

Map 3-5 shows that the Wind Farm Site encompasses approximately 25 unnamed ephemeral desert washes and approximately 10 tributaries. Most of the unnamed washes are in the Lower Detrital Wash watershed and flow to the west or northwest into a drainage channel called Detrital Wash. This wash, located a few miles west of the Wind Farm Site (Map 3-5), flows north to its confluence with Lake Mead at Bonelli Bay. The USGS recorded peak flow data on Detrital Wash from 1963 to 1980 near Chloride, Arizona (south of the Project Area). During that time, annual peak flow ranged from zero to 470 cubic feet per second (cfs) (USGS 2011b). In most cases, peak flow on the wash occurred between July and September during the monsoon season.

A preliminary jurisdictional delineation was completed in December 2011, which indicated the presence of about 93.8 acres of potential jurisdictional waters within the anticipated disturbance areas within the Project Area. These consist of ephemeral drainages; no perennial or intermittent streams, wetlands, or other types of jurisdictional waters occur (EcoPlan 2011). As of February 2012, these preliminary findings are still pending approval from the U.S. Army Corps of Engineers, which will review the jurisdictional delineation report in accordance with the Clean Water Act (33 U.S. Code [USC] Section 1251).For any jurisdictional waters of the United States, the Phoenix, Arizona Regulatory Office of the U.S. Army Corps of Engineers would process any necessary permits in accordance with the Clean Water Act Section 404 (dredge and fill). ADEQ would review the activities and provide conditions for protecting water quality to issue a Section 401 (water quality) permit for inclusion in the Section 404 permit.

3.4.3.4 Floodplains

As shown on Map 3-5, no designated 100-year or 500-year floodplains occur within or directly adjacent to the Project Area. The FEMA designates floodplain zones. When an area is designated as "Zone A," it indicates the area is "subject to inundation by the 1-percent-annual-chance flood event." The Zone A designation does not include floodways, which occur within floodplains and inhibit development encroachment activities (FEMA, Map Service Center 2011). The nearest designated 100-year floodplain is located around Detrital Wash just west of the Project Area in Township 28 North, Range 21 West (Map 3-5). FEMA-designated floodplain Zone D abuts the northwestern and the northeastern most boundaries of the Project Area. The Zone D designation is described as an Undetermined Flood Hazard by FEMA, which means no analysis of flood hazards has been conducted.

An existing rock and gravel quarry, located to the west of the proposed Wind Farm Site and adjacent to the main access road from US 93, is within the 100-year floodplain. Activities at the quarry were permitted previously by Mohave County and the U.S. Army Corps of Engineers.

3.4.3.5 Groundwater and Wells

As shown on Map 3-5, the Project Area is located within the Colorado River Basin hydrographic area which encompasses the Detrital Valley and the Hualapai Valley groundwater basins. The Project footprint lies entirely within the Detrital Valley groundwater basin. The Hualapai Valley groundwater basin is located about one mile east of the Project Area at its closest point.

Both the Detrital and Hualapai Valley groundwater basin are part of the Basin and Range Physiographic Province, which extends throughout the western United States to include southern and western Arizona. This Province was shaped during the Tertiary Period when structural deformation formed a series of alternating mountain ranges and basins on adjacent sides of high-angle normal faults. The valleys represent the basins, or downthrown fault blocks, and the adjacent mountain ranges represent the up-thrown fault blocks. As the mountain blocks were uplifted and eroded, sediment was carried by streams into the basins and deposited as alluvial fans. In the Detrital and Hualapai valleys, these basin-fill sediments range in thickness from thin veneers along the mountain fronts to more than 5,000 feet in parts of each basin (Freethey et al. 1986).

In both valleys, the basin-fill material has been divided into older, intermediate, and younger alluvium deposits (Gillespie and Bentley 1971). The older alluvium is stratigraphically the oldest and deepest deposit, and consists of moderately consolidated fragments of eroded rock from the surrounding mountains in a silty-clay or sandy matrix. The intermediate alluvium is younger and shallower and contains boulder- to pebble-sized fragments near the mountains, and gravel, sand, and silt in the middle of the valleys. Thickness of the intermediate alluvium is on the order of a few hundred feet (Gillespie and Bentley 1971). The younger alluvium overlies the intermediate layer and consists of Holocene and Pleistocene weakly-consolidated piedmont, stream, and playa deposits. This younger layer tends to be thinner than the intermediate and older alluvium.

Collectively, the older, intermediate, and younger alluvium form a water bearing unit commonly referred to as the Basin-Fill aquifer. In the Detrital Valley basin, the intermediate and younger alluvium are above the water table in most areas (Gillespie and Bentley 1971). As a result, extractable groundwater is generally contained within the older alluvium.

The Detrital Valley groundwater basin slopes downward to the north to its eventual terminus at Lake Mead. Groundwater flow within the Basin-Fill aquifer is also to the north, although the northern part of the aquifer lacks wells for defining groundwater levels and flow directions with much accuracy. Groundwater elevations in the Detrital Valley Basin-Fill aquifer vary from greater than 2,200 feet in the

southern part of the basin to less than 1,300 feet in the northern part near Lake Mead (Anning et al. 2007). These elevations correspond to groundwater depths that range from 20 feet below ground surface near Lake Mead to as much as 984 feet below ground surface in the southern part of the basin (Mohave County 2003; Anning et al. 2007). In 1990-1991 and 2003-2004, groundwater levels were relatively stable in wells with measurements collected, although water levels for different time periods show long-term declines in an area northeast of Dolan Springs as a result of pumping (Anning et al. 2007).

Groundwater wells with measured yields in the Detrital Valley basin are mostly located outside the Project Area near Dolan Springs and Temple Bar. Reported well yields from the Basin-Fill aquifer range from less than 100 gallons per minute (gpm) up to 500 gpm (ADWR 2009). In the Hualapai Valley basin, the least productive wells also typically have 100 gpm well yields or lower. However, more productive wells in this basin can exhibit much higher yields in excess of 2,000 gpm (ADWR 2009).

Groundwater quality in the Detrital Valley basin is known to be suitable for most purposes, although concentrations of radionuclides and arsenic that exceed drinking water standards have been measured at some wells (ADWR 2009).

Five wells are located within the Wind Farm Site, as shown on Map 3-5. There are also five existing water wells at the Materials Source, three of which have been proposed to serve construction water needs, including batch plant operations and dust suppression. The five wells at the Materials Source are likely completed in the Basin-Fill aquifer and have permitted pumping rates up to 60 gpm.

The wells at the Detrital Wash Pit are located in Township 28 North, Range 21 West along the proposed site access road from US 93. In 2007, Mason and others completed a study to estimate total recoverable groundwater by township in the Basin-Fill aquifer throughout the Detrital Valley basin. The estimates were prepared for several depth ranges using three different values of specific yield: 3, 6, and 8 percent. Within 1,200 feet of land surface, potential recoverable groundwater in Township 28 North, Range 21 West was estimated between 239,000 and 637,000 acre-feet (Mason et al. 2007). The smallest value of this range was derived using a specific yield of 3 percent, while the highest value was derived using a yield of 8 percent. It should be noted that some of the estimated groundwater in storage may not be economically recoverable due to the location of future production wells, local variations in the saturated thickness of the Basin-Fill aquifer, and heterogeneous aquifer properties that may inhibit the feasibility of pumping.

Table 3-7 shows water resources present on land managed by the BLM and Reclamation. The existing conditions for water resources not listed in Table 3-7 are the same across all land jurisdictions.

Table 3-7 Summary of Water Resource Considerations

Water Resource Consideration	Land Manager for Site	
	Bureau of Land Management	**Bureau of Reclamation**
Surface Watersheds (Alternative A only)	4,154 - 7,991 acres of Trail Rapids Wash-Lower Colorado River watershed (6.5 – 12.5 sq mi) 25,948 - 29,228 acres of Lower Detrital Wash watershed (40.5 – 45.7 sq mi) 881 acres of Middle Detrital Wash watershed (1.4 sq mi, Alternative A only)	3,844 - 8,966 acres of Lower Detrital Wash watershed (6 – 14 sq mi)
Steams (Washes)	Site crossed by Trail Rapids Wash	
Jurisdictional Waters	About 74 miles (93.8 acres) of potentially jurisdictional washes on site (across all land managers)	
Groundwater Basins	27,033 acres in Detrital Valley groundwater basin (42.2 sq mi)	8,922 acres in Detrital Valley groundwater basin (14 sq mi)
Wells	Five existing wells (within the Wind Farm Site)	No existing wells

NOTE: sq mi = square miles

3.5 BIOLOGICAL RESOURCES

The biological resources associated with the proposed Project are described in this section of the EIS. This includes local resident species and species that may temporarily use the Project Area during migration or during some seasons of the year.

The BLM manages habitat for biological resources on public lands it administers, which is part of its multiple-use mandate under the Federal Land Policy Management Act (FLPMA) of 1976 (43 U.S.C. 1701). Also NEPA requires Federal agencies to consider impacts to biological resources as part of the affected environment in project planning and land management (42 U.S.C. 4321). BLM management of biological resources includes vegetation, wildlife, natural communities, special status species, and landscape-scale connections. Landscapes are connected geographical regions that have similar environmental characteristics, such as the Sonoran Desert and can span BLM administrative boundaries. For the purposes of this analysis, Reclamation is incorporating BLM's management strategy for biological resources on Reclamation-administered land to provide consistency in data collection, analysis, construction, reclamation, and monitoring activities.

Federal and Arizona State legislation, policies, and regulations applicable to biological resources in the Project Area are described as follows:

The Endangered Species Act (ESA) of 1973, as amended (16 U.S.C. 1531 et seq.) provides a program for the conservation of threatened and endangered plants and animals and their habitats. The USFWS and the U.S. National Oceanic and Atmospheric Administration (NOAA) Fisheries Service administer the provisions of the ESA. The law requires Federal agencies, in consultation with the USFWS and/or the NOAA Fisheries Service, to ensure that actions they authorize, fund, or carry out are not likely to jeopardize the continued existence of any listed species or result in the destruction or adverse modification of designated critical habitat of such species. The ESA defines "take" as "to harass, harm, pursue, hunt, shoot, wound, kill, trap, capture, or collect, or to attempt to engage in any such conduct."

The Migratory Bird Treaty Act (MBTA) (16 U.S.C. 703 et seq.) combined with Executive Order (EO) 13186 (Responsibilities of Federal Agencies to Protect Migratory Birds) protects more than 800 migratory bird species by making it illegal to take, possess, import, export, transport, sell, purchase, barter, or offer for sale any migratory bird, or the parts, nests, or eggs of such a bird; except as authorized under a valid permit. The MBTA defines "take" as "to pursue, hunt, shoot, wound, kill, trap, capture, or collect, or attempt to pursue, hunt, shoot, wound, kill, trap, capture, or collect." EO 13186 directs agencies to take certain actions to further strengthen migratory bird conservation under the conventions under the MBTA, the Bald and Golden Eagle Protection Act (BGEPA), and other pertinent statutes. It requires the establishment of memoranda of understanding (MOUs) between the USFWS and other Federal agencies. Accordingly, BLM and USFWS implemented an MOU in 2010 to promote migratory bird conservation (BLM and USFWS 2010a).

The Bald and Golden Eagle Protection Act (BGEPA) (16 U.S.C. 668) as amended in 1972 prohibits any form of possession or take of bald or golden eagles, including any part, nest, or egg; unless allowed by permit. The BGEPA defines "take" as "to pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest or disturb." The USFWS has issued a *Draft Eagle Conservation Plan Guidance Module 1: Wind Energy Development* that provides recommendations for the development of *Eagle Conservation Plans* to support issuance of eagle programmatic take permits for wind facilities, and describes a process by which wind energy developers can collect and analyze information that could lead to a programmatic permit to authorize unintentional take of eagles at wind energy facilities (USFWS 2011a).

BLM Manual 6840 authorizes each BLM State Director to designate and protect sensitive species on land managed by the BLM. Equal weight is given to species Federally listed as endangered, threatened, or candidate; designated critical habitat; species and critical habitat proposed for Federal listing; state listed species; and other sensitive species designated as such by BLM State Directors (BLM 2008, 2010a). This last category is generally used for species that occur on BLM-administered land for which the agency could, through its management, significantly affect the conservation status of a species.

Arizona Revised Statutes (ARS) Title 17 (Game and Fish) establishes that wildlife found in Arizona, except fish and bullfrogs impounded in private ponds or tanks or wildlife and birds reared or held in captivity under permit or license from the state wildlife commission, are property of the State of Arizona and may be taken at such times, in such places, in such manner, and with such devices as provided by law or rule of the commission. ARS Title 17 and associated rules regulate the lawful taking and handling of wildlife and establishes the Arizona Game and Fish Department (AGFD) as the agency responsible for managing wildlife populations in the state. Additionally, a project-specific MOU between BLM and AGFD further describes the scope of collaboration and desired outcome for management of wildlife and habitats in the Project Area.

EO 13112 (Invasive Species) requires that Federal agencies prevent the introduction and spread of invasive species and to not authorize, fund, or carry out actions that are likely to cause or promote the introduction or spread of invasive species.

The Plant Protection Act (Public Law 106-224) (2000) replaced many previous invasive plant species acts including the Federal Noxious Weed Act, the Plant Quarantine Act, the Federal Plant Pest Act and other related statutes and primarily applies to USDA, but authorizes the Animal and Plant Health Inspection Service to take both emergency and extraordinary actions to address incursions of noxious weeds that can be regulated on Federal lands.

The Noxious Weed Control and Eradication Act (Public Law 108-412) (2004) is an amendment to the Plant Protection Act and provides for the provision of funds through grants and agreements to weed management entities for the control and eradication of noxious weeds.

Arizona Native Plant Law (ANPL) (ARS § 3-901 to 3-916) is administered by the Arizona Department of Agriculture (ADA),who manages native plant resources and impacts to protected native plant species. ANPL-listed plants include four protection categories: Highly Safeguarded, Salvage Restricted, Salvage Assessed, and Harvest Restricted. ANPL requires permitting, inventory, and the opportunity to salvage protected native plant species on state lands. Other landowners must file a notice of intent to clear land and destroy protected native plants.

3.5.1 Existing Conditions

3.5.1.1 Regional Overview

Ecoregion

The Project Area is located in the Mojave Desert ecoregion. Within this ecoregion, the Project Area is situated in a transitional zone between the warmer Sonoran Desert to the south and the higher and cooler Great Basin Desert to the north, in which shrub-dominated habitats begin to replace succulent-dominated ones (Lowe 1985). Arizona contains only the southeastern edge of the Mojave Desert, with the remainder lying in California, Nevada, and Utah. Located in the northwest corner of the state, Arizona's portion of the Mojave Desert covers about 3.2 million acres and is dominated by Mojave desert scrub, which has plants characteristic of both Great Basin desert scrub and the Sonoran desert scrub. Upper and lower Sonoran habitat types are found in warmer microclimates in the southern margin of the ecoregion, and it

is often difficult to determine boundaries between Sonoran desert scrub and Mojave desert scrub because these habitat types share so many plant species. Five other habitat types are found more widely in the ecoregion, and are typically associated with mountain ranges and higher elevation basins.

Physiography

Major land features near the Project Area include the Hualapai Valley and Grand Wash Cliffs to the east, Cerbat Mountains to the south, Detrital Valley and Black Mountains to the west, the Sacramento Valley and Mohave Mountains farther to the southwest, and Lake Mead to the north (USGS 1983).

The Colorado and Virgin rivers are the primary river systems in the region. The Colorado River has been modified over most of its length with the creation of lakes Mead, Mohave, and Havasu. Historically, the Colorado River—with its tributaries, wetlands, flood plains, and riparian forests—provided habitat for a diverse array of wildlife species and native fish in this desert ecosystem. While the Colorado River has been dammed and the original river habitat has been impacted, there is considerable habitat created along the river corridor. This is in addition to the Havasu National Wildlife Refuge and Bill Williams National Wildlife Refuge, and lower Colorado River system.

Elevation in the Project Area is between about 1,920 feet in the northwestern corner and 3,836 feet near the eastern border of the Project Area (Township 29 North, Range 19 West, Section 32) (USGS 1983). The terrain is highly variable throughout the Project Area. The northwest sector is hilly with low mountains; the eastern part is hilly; and the central section is generally flat.

Precipitation is scarce in the region and Project Area. Precipitation ranges from about 8 inches to 10 inches per year. Seasonally, slightly more precipitation falls in winter than during the summer monsoon. Biological resources are influenced greatly by the cyclical El Niño-La Niña climate events. El Niño years provide higher than average precipitation and more resources for plants and animals; whereas, La Niña years provide lower than average precipitation and resources for plants and animals.

The broad ecological setting of the Project Area is influenced by its geographic relationships to the ecoregion and physiographic province. This allows the Project Area to share plants and animals that are characteristic of parts of the Great Basin, Mojave Desert, and Sonoran Desert. The various microclimates created by local differences in soil, topography, and available water, characterize the habitats influence the local diversity and distribution and abundance of these plants and animals in the Project Area. The details of these biological resources are described further in the sections that follow.

3.5.1.2 Vegetation

Data Collection Methods

The narrative of vegetation resources is based on field surveys, mapped landcover from the Southwest Regional Gap Analysis Project (Southwest ReGAP) (USGS 2004), soil survey ecological site data, and other published information (Brown 1994). The plant associations that are described use the conventional naming of Southwest ReGAP, and the scientific names of plants follow the taxonomy of the U.S. Department of Agriculture (USDA) PLANTS database (USDA, NRCS 2010).

Statistical analyses were conducted to assess the baseline conditions among the alternative project configurations. The acreages of the vegetation and landcover types were compared using an analysis of variance for correlated data ($\rho = 0.05$). Although the acreages vary somewhat among the three action alternatives, this comparison indicated that there is no difference in the baseline composition of the vegetation and landcover types for the Project Area defined for each alternative.

The landcover and vegetation classes that represent the different biotic communities associated with the Project are described below. The distribution of these areas within the Project Area is shown in the vegetation map for the different alternatives (Map 3-6), and acreages of the vegetation and landcover types are shown in Table 3-8 according to the three action alternatives.

3.5.1.3 Land Cover and Plant Communities

Sonora-Mojave Creosotebush-White Bursage Desert Scrub. This vegetation type forms in broad valleys, lower bajadas, plains, and low hills in the Mojave and lower Sonoran deserts (Natureserve 2009). It is the most common type of vegetation in the Project Area. Acreages of this vegetation are presented in Table 3-8 according to the Project action alternatives.

Table 3-8 Acres of Vegetation or Landcover by Project Action Alternatives [1]

Vegetation or Landcover Class	Alternative A	Alternative B	Alternative C
Sonora-Mojave Creosotebush-White Bursage Desert Scrub	42,566	32,482	33,289
North American Warm Desert Volcanic Rockland	2,843	1,326	1,396
Mojave Mid-Elevation Mixed Desert Scrub	1,225	740	477
North American Warm Desert Bedrock Cliff and Outcrop	328	66	66
Inter-Mountain Basins Semi-Desert Shrub Steppe	96	68	36
Sonora-Mojave Mixed Salt Desert Scrub	1	1	1
Inter-Mountain Basins Big Sagebrush Shrubland	1	1	1
Total Acres	**47,060**	**34,684**	**35,266**

SOURCE: Southwest ReGAP

[1]Acreages are based on Southwest ReGAP data; actual ground conditions may vary (not ground-truthed).

This desert scrub association is characterized by a sparse to moderately dense layer (2-50 percent cover) of small-leaved, broad-leaved, and drought-adapted shrubs (Natureserve 2009). Creosotebush (*Larrea tridentata*) and white bursage (*Ambrosia dumosa*) are the dominant species, but many different shrubs, dwarf-shrubs, and cacti may form sparse understories (Brown 1994). Within the Project Area, this vegetation type exhibits a great deal of variation in its secondary species, which change with elevation, soil texture, and available precipitation. These can include banana yucca (*Yucca baccata*), rayless goldenhead (*Acamptopappus sphaerocephalus*), white burrobrush (*Hymenoclea salsola*), big galleta (*Pleuraphis rigida*), black grama (*Bouteloua eriopoda*), slim tridens (*Tridens muticus*), bush muhly (*Muhlenbergia porteri*), flat-top buckwheat (*Eriogonum fasciculatum*), Joshua tree (*Yucca brevifolia*), Nevada Mormon tea (*Ephedra nevadensis*), blackbrush (*Coleogyne ramosissima*), and white brittlebush (*Encelia farinosa*) (USDA, NRCS 2005). Catclaw acacia (*Acacia greggii*) usually occurs as a co-dominant species near dry washes (USDA, NRCS 2005). Sonora-Mojave creosotebush-white bursage desert scrub occurs extensively throughout the Project Area, except in mountainous and hilly terrain that occurs in the north-central and extreme eastern regions.

Mojave Mid-Elevation Mixed Desert Scrub. This vegetation type grows in a transition zone between sagebrush vegetation and piñon-juniper woodlands (Natureserve 2009) in the Mojave Desert, and the plant composition is quite variable. This is the second most common vegetation type in the region and all stands of this plant community are located in the White Hills, in the eastern part of the Wind Farm Site, irrespective of the action alternative boundaries.

Co-dominant and diagnostic species include gray horsebrush (*Grayia spinosa*), desert thorn (*Lycium* spp.), spiny menodora (*Menodora spinescens*), beargrass (*Nolina* spp.), buckhorn cholla (*Cylindropuntia acanthocarpa*), bladder sage (*Salazaria mexicana*), Parish's goldeneye (*Viguiera parishii*), Mohave yucca (*Yucca schidigera*), banana yucca, flat-top buckwheat, blackbrush, or Nevada Mormon tea (Natureserve 2009). Less common are stands with scattered Joshua trees or salt bush (*Atriplex* spp.). Juniper (*Juniperus* sp.) occurs sporadically in parts of this vegetation type in the White Hills.

North American Warm Desert Volcanic Rockland. This landcover type is restricted to barren and sparsely vegetated (<10 percent plant cover) volcanic substrates in the warm deserts of North America (Natureserve 2009). The vegetation varies according to local environmental conditions. Warm desert volcanic rockland occurs in the White Hills from Squaw Peak northward, in the north-central parts within the action alternatives boundaries.

North American Warm Desert Bedrock Cliff and Outcrop. This landcover type includes barren and sparsely vegetated landscapes (generally <10 percent plant cover) on steep cliff faces, narrow canyons, and smaller rock outcrops (Natureserve 2009). This also includes unstable scree and talus slopes that often form below cliff faces. Sites with this landcover in the Project Area include places scattered among various ridgelines and mountain formations. There typically is no defined vegetation type, but species include rock-dwelling plants and may include ocotillo (*Fouquieria splendens*), beargrass, and other desert species, especially succulents (Natureserve 2009). This landcover type occurs in the White Hills, in the northwestern and south-central parts within the action alternatives boundaries.

Inter-Mountain Basins Semi-Desert Shrub Steppe. This vegetation type occurs throughout the intermountain western United States, typically at lower elevations on alluvial fans and flats with moderate to deep soils (Natureserve 2009). It grows on in small isolated patches in the White Hills, in the eastern portion within the action alternatives boundaries—all on BLM-administered land.

This semi-arid shrub-steppe is typically dominated by grasses (>25 percent cover) and has an open to moderately dense overstory of shrubs. Common grasses include blue grama (*Bouteloua gracilis*), inland saltgrass (*Distichlis spicata*), Sandburg bluegrass (*Poa secunda*), tall dropseed (*Sporobolus airoides*), needle and thread grass *(Hesperostipa comata*), and James' galleta (*Pleuraphis jamesii*) (Natureserve 2009). Characteristic shrubs include four-wing saltbush (*Atriplex canescens)*, big sagebrush (*Artemisia tridentata*), Greene's rabbitbrush (*Chrysothamnus greenei*), yellow rabbitbrush (*Chrysothamnus viscidiflorus*), Mormon tea (*Ephedra* spp.), broom snakeweed (*Gutierrezia sarothrae*), and winterfat (*Krascheninnikovia lanata*).

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 2009). 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 2009). The dominant species include four-wing saltbush, 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 2009). This landcover type occurs as two isolated patches in the White Hills, in the eastern part of the alternative project boundaries.

Inter-Mountain Basins Montane Sagebrush Shrubland. This vegetation type includes sagebrush communities occurring in foothills and mountains across the western United States (Natureserve 2009). It occurs where the climate is cool, semi-arid to sub-humid, and the soils are deep and stony. It occurs in the White Hills in the eastern part within the action alternatives boundaries.

This vegetation type includes a variety of plants that vary according to local and regional environments. Big sagebrush is typically the most common species, but is often intermixed with other sagebrush species. Other common species include antelope bitterbrush (*Purshia tridentata*), snowberry, serviceberry (*Amelanchier* spp.), rubber rabbitbrush (*Ericameria nauseosa*), wax currant (*Ribes cereum*), and yellow rabbitbrush. Most stands have an abundant perennial herbaceous layer (25 percent to 50 percent cover), often dominated by various grass species. Fire may be important for maintaining the cover and composition of plant species.

3.5.1.4 Riparian Areas and Desert Washes

Numerous dry desert washes occur within the Project Area. All of the washes identified during jurisdictional delineation surveys were categorized as ephemeral drainages in the Project Area; no perennial or intermittent streams, wetlands, or other surface water occurred in the Project Area (EcoPlan 2011). The washes were typically devoid of vegetation within the channel (EcoPlan 2011). Channel substrates were primarily composed of sand and gravel, and no hydrophytic vegetation or hydric soils were observed along any of the washes identified within the Project Area (EcoPlan 2011).

Proper Functioning Condition

An assessment of proper functioning condition (PFC) is not applicable to the Project. PFC is a measure of wetland health. BLM defines wetlands as marshes, shallow swamps, lakeshores, bogs, muskegs, wet meadows, estuaries, and riparian areas. Only ephemeral drainages are present in the Project Area, and PFC assessment is not relevant.

3.5.1.5 Noxious and Invasive Weeds

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 Mojave Desert, invasions of these species can degrade food and habitat resources for native wildlife and 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 (Brooks et al. 2004).

For this project, noxious-weeds are those invasive plant species that are defined by law by the State of Arizona and Federal government. Noxious weeds are managed according to BLM policy and in support of the following laws (described in detail above): EO 13112 (Invasive Species), The Plant Protection Act (Public Law 106-224) (2000), The Noxious Weed Control and Eradication Act (Public Law 108-412) (2004). Under state law, noxious weeds include plants, plant parts, or seeds of non-native and invasive species that are grouped into three classes. Prohibited noxious weeds include species that are prohibited from entry into the state. Regulated noxious weeds include species, that if found within the state, may be controlled or quarantined to prevent further infestation or contamination. Restricted noxious weeds include species, that if found within the state, shall be quarantined to prevent further infestation or contamination.

BLM's preferred practice of invasive plant and noxious weed control is to prevent infestation or to treat small infestations prior to their spread throughout a larger area (BLM 2010e). BLM uses an integrated approach to manage infestations, with methods that include combinations of biological, mechanical, and chemical control. The goal is to use those control methods that have the least negative impact on the environment and that are most effective at controlling a particular infestation. Chemical pesticides are used if they are the most effective control and after considering other control methods (BLM 2007). Also

BLM develops partnerships to better control invasive plants and noxious weeds throughout a larger regional basis to aid in preventing infestations on BLM administered lands.

No specific noxious weed surveys have been conducted within the Project Area. Incidental observations during baseline biological surveys indicated infestations of non-native plant species that included Sahara mustard (*Brassica tournefortii*), red brome (*Bromus rubens*), and cheat grass (*Bromus tectorum*) within the Project Area. Records of invasive plants available from the Southwest Exotic Plant Information Clearinghouse (2007) indicate that these three species along with Mediterranean grass (*Schismus barbatus*), Russian thistle (*Salsola tragus*), and red-stem filaree (*Erodium cicutarium*) are common, with numerous records in the valleys surrounding the Project Area. Salt cedar (Tamarix sp.) Malta star thistle (*Centaurea melitensis),* and Bermuda grass (*Cynodon dactylon*) have been recorded along or near the southern shore of Lake Mead (NPS 2010c). Malta star thistle also occurs within the right-of-way along Highway 93 in the Project Area vicinity, and has the potential to be spread to and within the Project Area. None of these species are listed as noxious weeds by the State of Arizona or the Federal government. However, these non-native invasive plants have the effect of damaging natural communities by increasing the frequency of fire or degrading habitat or food resources for native animal species such as the desert tortoise (Brooks et al. 2004). Salt cedar can nearly completely replace native vegetation by outcompeting native shrubs for available water and by increasing soil salinity.

3.5.1.6 Fire

Desert vegetation associations in the Mojave Desert ecoregion have had a low historical fire frequency. Under natural conditions, the dry climate limits the woody biomass, which is not favorable for fueling natural fires, and the discontinuous structure of the vegetation is poorly suited to spreading any ignitions (BLM 2004). As a result, most perennial plants of the Mojave Desert have not adapted to fire and can be killed or damaged when burned (Brooks et al. 2004). The invasion of exotic annual grasses into deserts of the Southwest has changed the structure of the vegetation, allowing for more frequent fires that burn extremely hot and fast through an area. Once burned, native desert vegetation is often replaced or dominated by exotic annual grasses that are more competitive in burned areas.

Fuel Types

Fuels in the Mojave Desert consist of desert shrubs intermixed with grasses, annuals, and perennials. Fuels depend on heavy winter and early spring precipitation for growth of grasses and herbaceous annuals and perennials, which also may persist to the next year's growing season (BLM 2004). Above average moisture usually results in an abundance of annual fuels, but there is little yearly change in fuels from desert shrubs. Fuel types in the Project Area and surrounding region are represented by the National Fire Danger Rating Fuel Model A and Northern Forest Fire Laboratory Fuel Model 1 (BLM 2004).

Wildland Fire Management

Wildland fire is not desired in natural ecosystems in the Mojave Desert ecoregion. Fire suppression is the preferred method of management (BLM 2004). Prescribed fire would not be used normally, because native vegetation is primarily maladapted to fire; however, pile burning may be used in conjunction with mechanical treatment (including manual) where appropriate (BLM 2004). Mechanical thinning, control of invasive plants by various methods, or removal of vegetation could be used to reduce the potential of wildland fire in an area (BLM 2004). *Post-fire restoration and rehabilitation would be implemented according to the Colorado River District Fire Management Plan (BLM 2011d).*

Fire Regimes

Desert shrublands are the predominant type of vegetation in and near the Project Area. These shrublands are categorized as Fire Regime IV (35 to 100-plus-year frequency, stand replacement severity) and are currently in condition class 2 (BLM 2004). Condition Class 2 is defined as a fire regime moderately altered from historic range, and the risk of key ecosystem component loss is moderate. Condition Class 2 also has departed from historical fire frequency by more than one return interval, and there is a moderate change to fire size, frequency, intensity, and/or landscape pattern and to vegetation. These categories have been instituted in the region because of the invasion of fire-prone, introduced annual grasses and the resulting increase in fire occurrence (BLM 2004). Recent large wildland fires in parts of the Mojave Desert ecoregion have reduced the presence of native plant species (BLM 2004).

Fire History and Data

The historical fire frequency in and near the Project Area has had a return rate of 35 to 100 or more years. Between 1980 and 2003, 251 fires started on public lands north of Interstate 40 (I-40) that are administered by the BLM Kingman Field Office (BLM 2004). These fires burned an estimated 72,053 acres (BLM 2004). Most of the area burned was in the Mojave Desert shrublands. The largest fire burned 21,276 acres and the average fire size was 277 acres. There have been 39 large fires of 100 or more acres during this period (BLM 2004). No fire history data are available specifically for the Wind Farm Site irrespective of the action alternative boundaries.

3.5.2 Wildlife

3.5.2.1 Data Collection Methods

The wildlife section describes wildlife resources that may be found in the proposed Project Area and vicinity. The sources of information include published literature, AGFD Heritage Database Management System (HDMS) data (AGFD 2010b), and AGFD unpublished species abstracts. In addition, a two-year baseline field study was conducted in a previously proposed Project Area, between April 2007 and June 2009, and included surveys of nesting raptors; avian use, including passerines and migratory birds; and bat species that involved acoustical monitoring counts, mine exit surveys, and mist net surveys (Goode and Thompson 2009). Wildlife included some effort on the current footprint and some off-site to the east. As a result of significant changes to the proposed project boundary, a second round of baseline wildlife studies was conducted between September 2010 and July 2011 within the current footprints of the Project action alternatives. The detailed methods and results of the field studies are archived in the administrative record for the Project, and the results are summarized in the following sections.

3.5.2.2 Mammals

Boykin et al. (2007) used improved Southwest ReGAP distribution models to predict the distribution of vertebrates in the Mojave Desert. Based on these distribution models, the authors' data indicate that 46 to 58 mammalian species may occur in the Project Area or in the nearby surrounding vicinity (Boykin et al. 2007). This region is moderately diverse; desert environments in the Southwest can have upwards of 70 to 80 species of mammals in similar to slightly larger areas (Hoffmeister 1986, Hall 1947). Ten terrestrial species of mammals were observed supplemental to baseline biological surveys for birds and bats (Thompson et al. 2010) in the Project Area (Table 3-9). The mule deer (*Odocoileus hemionus*) was the most commonly observed mammal species. Specific data regarding the overall abundance, density, and distribution of these species were not available.

Table 3-9 Incidental Mammal Observations in the Project Area

Common Name	Scientific Name
White-tailed antelope ground squirrel	*Ammospermophilus leucurus*
Badger	*Taxidea taxus*
Black-tailed jackrabbit	*Lepus californicus*
Coyote	*Canis latrans*
Common gray fox	*Urocyon cinereoargenteus*
Kangaroo rat	*Dipodomys* spp.
Kit fox	*Vulpes macrotis*
Mule deer	*Odocoileus hemionus*
Pocket mouse	*Perognathus spp.*
Pronghorn	*Antilocapra americana*

SOURCE: Thompson et al. 2011

Bats

Bat species potentially occurring in the area characteristically include those that roost in rock and boulder crevices, mines, caves, and manmade structures. These species forage for insects, normally in sparse desert habitats, xeri-riparian areas along drainages and washes, or at higher altitudes above the desert floor. Tree roosting and forest-dwelling bat species are expected to be uncommon seasonal migrants or absent altogether from the proposed project area. As many as 17 to 19 species of bats could be expected to occur in the proposed project area (Bat Conservation International 2010). Thompson et al. (2011) estimated that 20 species could occur in the Project Area.

Data on the distribution and seasonal use patterns of bats in the Project Area were gathered by a variety of methods. To collect information on year-round habitat use by bat populations at the proposed Project Area, acoustic monitoring stations were established at fixed locations using Anabat II bat detectors. Sampling was conducted monthly from April 2007 to August 2008 within a previous configuration of the Project boundary. Following major changes to the Project boundary, acoustical monitoring surveys were repeated from September 8 through November 4, 2010 and February 23 through July 15, 2011 to sample bat activity at new sites in the current Project Area that were not part of the original Project Area. During the 2009 acoustic monitoring period two AR125© Binary Acoustic Technology (BAT; Tucson, Arizona) ultrasonic detectors were rotated among Anabat ground stations on a weekly basis to aid in identifying specific bat species in the Project Area (Thompson et al. 2011). Acoustic data recorded with BAT detectors are full spectrum, which differs from zero-crossing data by retaining more of the information in each echolocation pulse, including harmonics that can be useful for species identification (Thompson et al. 2011).

During the initial surveys from April 2007 to August 2008, mist net surveys were conducted at water sources to further estimate use patterns within the previous configuration of the Project boundary. Also, mine shaft surveys were conducted during that period to document use of the area by breeding and hibernating bats. Exit counts of mine shafts were conducted to determine if large roosts exist in abandoned mines near the previous configuration of the Project boundary (Solick et al. 2009). The closest of these is about 1.7 miles (2.7 km) southeast of the southeastern corner of the action alternatives boundaries. The remaining mines are about 3.3 to 8.4 miles east of the eastern action alternatives boundaries (Map 3-7).

The number of detectors out at any given time varied between two and ten. At the 14 stations, Anabat units recorded 18,313 bat passes during 2,632 detector-nights. Averaging bat passes per detector-night across all locations resulted in a mean of 7.73 bat passes per detector-night, with the average bat activity being 8.36 bat passes per detector-night at ground stations and 6.14 bat passes per detector-night at raised stations (Thompson et al. 2011). Unlike activity patterns at most other proposed wind developments where bat activity rates generally peak in the fall, bat activity levels in the Project Area peaked in the spring (late April and early May) of each year of study (Thompson et al. 2011).

Low frequency (less than 35 kilohertz [kHz]; e.g., hoary bat, Mexican free-tailed bat) echolocation passes accounted for the majority (92.6 percent) of all bat passes, while high-frequency (greater than 35 kHz; e.g., *Myotis* species) passes accounted for only 7.4 percent (Thompson et al. 2011). From acoustic data collected within the Project Area, only western mastiff bat, Allen's big-eared bat, hoary bat, and big free-tailed bat were positively identified, all four of which are categorized as sensitive by AGFD and/or BLM (Thompson et al. 2011). Mist-net captures and full-spectrum acoustic surveys conducted in 2007-2009 at locations 3 to 12 miles (5 to 19 kilometers [km]) east of the current project boundary identified seven other bat species (Table 3-10), all or many of which may use the currently proposed Project Area (Thompson et al. 2011).

A total of 11 species were recorded during the sampling periods (Table 3-10). Nine species were captured during mist net surveys, of which the canyon bat (*Parastrellus hesperus*), California myotis (*Myotis californicus*), and Townsend's big-eared bat (*Corynorhinus townsendii*) were most common among captured species (Solick et al. 2009). The other captured species are presented in Table 3-10 (Solick et al. 2009). The hoary bat (*Lasiurus cinereus*) was the only tree bat that was recorded in the Project Area. Of these, hoary bats, Mexican free-tailed bats, and big brown bats have been recorded as fatalities at other wind-energy facilities (Solick et al. 2009). The western mastiff bat, big free-tailed bat, and Allen's big-eared bat have also raised concern, because these species are fast, high-altitude fliers that could fly in the rotor sweep area of wind turbines. Species richness varied among the sampling stations.

Table 3-10 Characteristics of Bats Found or Likely to Occur in the Project Area

Call Frequency Groupings	ANABAT Type Groupings	Species	Sensitive Species	Long Distance Migrant	Fatality at Other Wind Facilities	Found in Project Surveys	Detection Method
High-Frequency (≥35 kHz)	50 kHz	California myotis *Myotis californicus*	--------	No	No	Yes	Mist Net
		Yuma myotis *Myotis yumanensis*	--------	No	No	Yes	Mist Net
	40 kHz	Western small-footed myotis *Myotis ciliolabrum*	--------	No	No	No	--------
		Long-legged myotis *Myotis volans*	--------	Yes	Yes	No	--------
		Little brown bat *Myotis lucifugus*	--------	No	Yes	No	--------
		Canyon bat *Parastrellus hesperus*	--------	No	Yes	Yes	Mist Net
		California leaf-nosed bat *Macrotus californicus*	BLM	No	No	No	--------
	Identified to species when possible	Western red bat *Lasiurus blossevillii*	Tier 1C SGCN	Yes	Yes	No	--------
Low-Frequency (<35 kHz)	30 kHz	Fringed myotis *Myotis thysanodes*	--------	No	No		--------
		Pallid bat *Antrozous pallidus*	Tier 1C SGCN	No	No	Yes	Mist Net
		Big brown bat *Eptesicus fuscus*	--------	No	Yes	Yes	Mist Net
		Silver-haired bat *Lasionycteris noctivagans*	Tier 1C SGCN	Yes	Yes	No	--------
		Mexican free-tailed bat *Tadarida brasiliensis*	Tier 1B SGCN	Yes	Yes	Yes	Mist Net
		Long-eared myotis *Myotis evotis*	Tier 1C SGCN	No	Yes	No	--------
		Townsend's big-eared bat *Corynorhinus townsendii*	Tier 1C SGCN, BLM	No	No	Yes	Mist Net
	Identified to species when possible	Hoary bat *Lasiurus cinereus*	Tier 1C SGCN	Yes	Yes	Yes	Mist Net Acoustic
		Allen's big-eared bat *Idionycteris phyllotis*	BLM	No	No	Yes	Mist Net Acoustic
		Big free-tailed bat *Nyctinomops macrotis*	Tier 1C SGCN	Yes	Yes	Yes	Acoustic
		Western mastiff bat *Eumops perotis*	Tier 1B SGCN, BLM	No	No	Yes	Acoustic
		Spotted bat *Euderma maculatum*	Tier 1B SGCN, BLM	No	No	No	--------

SOURCE: Solick et al. 2009, Thompson et al. 2011, AGFD 2010b, BLM 2010a.

Activity also varied spatially across the Project Area. The Project Area is not located close to any large, known bat colonies. Numerous mines are located in the mountains surrounding the Project Area, some of which were occupied by bats during earlier surveys (Solick et al. 2009), but no mines are known within the most current Project boundary (Thompson et al. 2011). The Project Area lacks large tracts of forest cover, unlike the high-mortality sites in the eastern US, but does contain topographic features that may be utilized by roosting bats, primarily cliffs that contain cracks/crevices for roosting (Thompson et al. 2011). The mountain ranges are generally small and not well connected within the Project Area and would not likely serve as a funnel for migrating bats; however, the highest bat activity rates recorded during surveys within the Project Area were along the western slope of the mountains north of Squaw Peak in the northwestern portion of the Project Area (Thompson et al. 2011). Bat activity at Station MC2g in that area accounted for a quarter (25.1 percent) of the calls recorded during acoustical monitoring surveys (Thompson et al. 2011). The reason for the elevated activity levels at Station MC2g is unknown. Moderate to low bat activity was recorded at the remaining stations, with the stations in the northern half of the Project Area usually having more activity than those in the southern half.

The ground units at three of four monitoring stations recorded more passes than the raised units. Bat activity at Station WTT in the southeastern sector of the Project Area was the exception, where activity at the raised station was slightly greater than at the ground station. The pattern suggests higher bat activity at heights near the bottom or below the proposed rotor swept area (Thompson et al. 2011).

The mean number of bat detections per night was compared to existing data from two other wind facilities in the greater region where both bat activity and mortality rates have been measured. Overall bat activity recorded by ground detectors within the Project Area was 8.36 ± 1.04 bat passes per detector-night. This rate is much higher than the rates observed at the Dillon wind facility in southern California (<1 bat pass/detector night for all seasons individually) (Chatfield et al. 2009 in Thompson et al. 2011), and similar to the one observed at the Dry Lake facility in Arizona (8.83 bat passes/detector night). Fatality rates for bats at those two sites were 2.17 and 4.29 fatalities/MW/year, respectively. Based solely on this rate, expected fatality rates from the proposed Project may be expected to be closer to 4.29 than to 2.17 (Thompson et al. 2011). However, while overall mean activity rates were similar between the Project Area and Dry Lake, the timing of the activity differed in potentially important ways, with peak bat activity occurring in the spring within the Project Area and during the fall at Dry Lake (Thompson et al. 2011). Habitats also differ significantly between the Project Area and the Dry Lake facility. This may translate to a lower potential fatality rate than the numbers would suggest.

Big Game

Four big game mammal species may occur within or near the Project Area: pronghorn (*Antilocapra americana*), mule deer (*Odocoileus hemionus*), desert bighorn sheep (*Ovis canadensis*), and mountain lions (*Puma concolor*). Mule deer and pronghorn were documented in the Project Area during baseline wildlife surveys.

Pronghorn – In Arizona, pronghorn are most common in the northern grasslands and shrub-steppes. They also inhabit high elevation meadows between forested areas; and scattered herds have repopulated the grasslands of southeastern Arizona. The endangered Sonoran pronghorn is restricted to the extreme desert lands of southwestern Arizona and northern Sonora, Mexico. The statewide population of pronghorn is estimated at 7,800 post-hunt adults (AGFD 2009a).

Pronghorn habitat consists of grass-shrub valleys and grasslands with low topographic relief. Based on several studies conducted over the years, the species prefers habitat with: (1) ground cover averaging 50 percent living vegetation and 50 percent nonliving vegetation; (2) a vegetation composition of 40 to 60 percent grass, 10 to 30 percent forbs, and 5 to 20 percent browse; (3) succulent plants, available in spring and wet summers; and (4) vegetation averaging 38 centimeters (15 inches) in height (AGFD

2002a). Habitat for the species occurs in the valleys in and around the Project Area. There was a single observation of two individuals of this species during baseline wildlife surveys for bats and birds (Thompson et al. 2011).

Mule Deer – Mule deer are the most abundant big game animal in Arizona, with the statewide population estimated at 120,000 post-hunt adults. Populations can be found in most areas of the state, from sparsely vegetated deserts upward into high, forested mountains. Mule deer move seasonally between various vegetation zones. Summer ranges include forest habitats and other upland vegetation types at higher elevations, and winter ranges usually incorporate the lower desert lowlands. Mule deer occupy almost all types of habitat within their range, yet they seem to prefer arid, open areas and rocky hillsides. Bitterbrush and sagebrush occur most commonly among habitats used by mule deer. Mature bucks tend to prefer rocky ridges for bedding ground, while does and fawns are more likely to bed down in the open (AGFD 2009a). Habitat for mule deer occurs throughout the Project Area. There were 17 observations of this species with a total of 34 individuals that were observed during baseline wildlife surveys for bats and birds (Thompson et al. 2011).

Bighorn Sheep – Bighorn sheep are diurnal animals and are usually found in small bands of 4 to 10 individuals, although herds of 50 or more are sometimes seen. Native grasses are important in the bighorn sheep's diet, although the animals also feed heavily on jojoba (*Simmondsia chinensis*) and other woody plants. Preferred forage plants vary with habitat quality, locality, and local availability. Mountain lions are the principal predator, although golden eagles (*Aquila chrysaetos*) and bobcats (*Lynx rufus*) have been detected taking lambs (AGFD 2009a). Desert bighorn sheep require access to freestanding water during the summer months; during periods of drought, bighorn sheep may need water throughout the year. Individuals sometimes obtain needed water by consuming pincushion (*Mammillaria* and *Escobaria* spp.), barrel (*Ferocactus* and *Echinocactus* spp.), or saguaro (*Carnegiea gigantea*) cacti. Arizona's bighorn sheep population, consisting of both Rocky Mountain and desert races, is currently estimated at about 6,000 animals (AGFD 2009a).

Desert bighorn sheep are located in mountain ranges throughout the Southwest. Typical desert bighorn sheep terrain is rough, rocky, and steep, and is broken up by canyons and washes, which affords them some advantage in avoiding predators. Places with bighorn sheep herds nearest to the Project Area include the cliffs above Lake Mead and the Black Mountains, between 10 miles northwest to 16 miles west of the Project Area. BLM has established a bighorn sheep Area of Critical Environmental Concern in the Black Mountains west of the Project Area. Bighorn sheep could move between these two areas along cliffs and mountainous uplands along the Colorado River. It is unlikely that bighorn sheep would occur in the Project Area. Any occurrences would be limited to rare migrants moving between the higher mountainous areas in the region.

Mountain Lion – In Arizona, mountain lions are absent only from the extremely arid southwest and those areas heavily impacted by human development. In general, the distribution of mountain lions in the state corresponds with the distribution of the animal's major prey species—mule and white-tailed deer. However, they will feed on carrion and prey on other ungulates, rodents, reptiles, and birds (AGFD 2009a).The statewide population is estimated at 2,500 mountain lions (AGFD 2009a).

Mountain lion habitat ranges from desert, chaparral, and badlands to subalpine mountains. Two of the most important components of lion habitat are a source of prey and cover for hunting. Lions are generally most abundant in areas where mule deer are plentiful. The entire project area is potential mountain lion habitat. No mountain lions were observed during baseline wildlife surveys for bats and birds (Thompson et al. 2011).

Wild Burros

There are three wild horse and burro Herd Management Areas (HMAs) within the Kingman BLM District (BLM 1995). The nearest HMA is the Black Hills Management Area, approximately 20 miles northwest and west of the Project Area. No burros have been seen in the Project Area (Thompson et al. 2011).

3.5.2.3 Birds

To assess the abundance and location of birds within the Project Area, an avian abundance survey was conducted. Initial surveys were conducted between April 2007 and November 2008 using a fixed point count methodology. After the Project boundary changed substantially, surveys were repeated in parts of the new Project Area that were not surveyed previously; this second set of surveys were conducted from September 3, 2010 through May 30, 2011 using the same methods.

Thirty-five species were detected during fixed point count surveys. An additional 26 species were detected as incidental observations. Based on information from the Arizona Breeding Bird Atlas (Corman and Wise-Gervais 2005), 20 of the 35 species observed have potential for nesting in the Project Area and may be considered residents during the breeding season (Thompson et al. 2011). Of all observations recorded during fixed-point surveys, 92.5 percent were of the 20 species considered to be likely residents in the project area, suggesting the area is utilized more by resident species potentially using the area for nesting than as a corridor for large numbers of migrants. Of the 15 species considered to be migrants in the project area, with little or no potential for nesting, only the sage thrasher (*Oreoscoptes montanus;* 27 observations) had more than three total observations during fixed-point surveys (Thompson et al. 2011).

Regardless of bird size, four species (12.1 percent of all species) composed 51.5 percent of all observations: black-throated sparrow (*Amphispiza bilineata*), common raven (*Corvus corax*), horned lark (*Eremophila alpestris*), and turkey vulture (*Cathartes aura*) (Thompson et al. 2011). All four species are potentially resident breeders within the Project Area. None of the four are considered sensitive by state or Federal agencies (AGFD, USFWS, or BLM). Each of the other 31 species individually comprised less than 5 percent of the observations (Thompson et al. 2011).

Bird diversity (i.e., the number of unique species observed) was higher in the spring (21 species) and fall (20) than in the winter (14). Large bird species richness (mean number of species per plot per survey) was higher in the spring (0.60 species/plot/survey) than in the winter (0.22) or fall (0.19) (Thompson et al. 2011). Small bird species richness was also higher in the spring (1.28 species/plot/survey) than in the fall (0.31) or winter (0.25) (Thompson et al. 2011). Common ravens composed 84.1 percent of overall large bird use in winter, 42.3 percent in fall, and 15.8 percent in spring (Thompson et al. 2011). Turkey vultures composed 28.5 percent of the overall large bird use in the fall and 22.0 percent in the spring. Passerine use was highest in the spring (2.31 birds/plot/20-min survey), compared to the winter (0.54), and fall (0.44). Black-throated sparrow had the highest use by any single passerine species during all three seasons (Thompson et al. 2011).

The height of flying birds was recorded as part of surveys to help assess impacts in the rotor sweep area. The zone of risk was defined as a flight height of 77 to 492 feet (23.5 to 150 meters), which is the blade height of many typical turbines currently used at wind-energy projects. Overall, 42.4 percent of large birds observed flying were recorded within rotor swept heights (RSH), 47.2 percent were flying below the RSH, and 10.4 percent were flying above the RSH for potential collision with turbine blades. At the point of initial observation, more than half (56.4 percent) of all raptors observed flying were within the RSH, 38.5 percent were below the RSH, and 5.1 percent were above the RSH. Diurnal raptors had the highest percentage of birds within the RSH, primarily due to 60.9 percent of initial buteo observations recorded at this height. Vultures had the second highest percentage of birds flying within the RSH (51.3 percent), followed by large corvids with 37.3 percent. Doves/pigeons were always observed flying below the RSH,

while all but one small bird species (northern rough-winged swallow; 2 observations) observed within the 100-m plots were observed below the RSH (100 percent) (Thompson et al. 2011).

Distribution

For all large bird species combined, use was highest at four survey stations located in the eastern portion of the Project Area, where use ranged 1.0 to 1.04 birds/20-min survey. In this area the topography was gently rolling and dispersed Joshua tree woodland habitats were prevalent. Bird use at other points ranged from 0.23 to 0.57 birds/20-min survey. The high use indices in the eastern portion of the Project Area were attributable to use by Gambel's quail, mourning doves, common ravens, and turkey vultures. Large corvid use was highest at a survey station in section 3, T28N, R20W (0.56 birds/20-min survey), and ranged from zero to 0.31 birds/20-min survey at other points. Passerine use was highest at point the station in section 20, T29N, R19W (2.16 birds/20-min survey), and ranged from 0.32 to 1.27 at other points (Thompson et al. 2011). Small bird use was well distributed and showed no obvious patterns, with the highest use recorded at point 2.3 in the northwest and point 1.9 in the eastern portion of the project (Thompson et al. 2011).

Migratory Birds

Sixty of the 61 native bird species that were detected in the Project Area during avian surveys or as incidental observations are listed as migratory birds and receive protection under the Migratory Bird Treaty Act. Gambel's quail is the only species among these that is not on this list (USFWS 2011b).

Raptors

For the purpose of the bird survey, the following groups were defined as raptors: vultures, hawks, eagles, and owls. Five diurnal raptor species were detected during fixed point count surveys. These included the turkey vulture, red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), American kestrel (*Falco sparverius)*, and merlin (*Falco columbarius*). Incidental observations in the Project Area included the five species detected during the fixed point count surveys and four other diurnal raptor species that included the sharp-shinned hawk (*Accipiter striatus*), northern harrier (*Circus cyaneus*), zone-tailed hawk (*Buteo albonotatus*), and prairie falcon (*Falco mexicanus*). Incidental observations also included three nocturnal raptors: the barn owl (*Tyto alba*), great-horned owl (*Bubo virginianus*), and burrowing owl (*Athene cunicularia*) (Thompson et al. 2011).

Overall, diurnal raptor use was generally well distributed across the Project Area, with slightly elevated use at stations along the eastern portion of the Project Area. Overall raptor use was highly influenced by red-tailed hawks, with red-tailed hawk use largely concentrated among three points in the southeastern extent of fixed-point survey locations (Thompson et al. 2011). There was nothing obviously unique about the habitat in this area, other than perhaps an elevated presence of Joshua trees compared to most other survey points. Topography in this area was gently rolling, with no large cliffs/ridges present. Perhaps the presence of three raptor nest sites within 2.5 miles of these observation points explains some of the elevated use. Falcon use was relatively low across all survey stations, and vulture use was higher and well distributed in the eastern half of the Project Area (Thompson et al. 2011).

Diurnal raptor use was highest at a single survey station in section 36, T29N, R20W (0.24 birds/20-min survey), while use at other points ranged from 0.03 to 0.17 raptors/20-min survey. This station was located in gently rolling terrain, with no obvious features that should attract raptors; however, the station was rather centrally located between three historical raptor nest sites, all of which were located less than 2.5 miles away from the point (Thompson et al. 2011).

Flight Paths

Flight paths for diurnal raptors and vultures were digitized and mapped. Overall, raptor use was relatively low and widely distributed (Thompson et al. 2011). No obvious flyways or concentration areas were observed for any species, except that golden eagles were only observed using the steeper terrain in the northwest portion of the Project Area. It should be noted however, that only four golden eagle flight paths were recorded, indicating relatively low use across the Project Area, including in the areas where this species was occasionally observed (Thompson et al. 2011). The available data do not indicate that any portions of the study area warrant being excluded from development due to relatively high bird use (Thompson et al. 2011).

Raptor Nests

During the spring of 2011, aerial raptor nest surveys were conducted within the Project Area and surrounding 10-mile (16-km) buffer area utilizing standard protocols for helicopter surveys (Pagel et al. 2010). A first round of survey was conducted on March 9 and 10, 2011, and a second round was completed on April 21, 2011. Additionally, ground-based surveys were conducted within portions of the Project Area (proposed development corridors at that time) in spring 2008 (Thompson 2011a).

Five non-eagle nest sites were documented in 2008, 2009, or 2011 within approximately 0.6 mile of the proposed turbine corridors. All five of these nests were believed to be red-tailed hawk nests; however, no birds were observed on two of these nests to confirm identification. Four of the nests were located in Joshua trees and one was located on a transmission line tower. The one nest on the transmission tower is potentially an historical golden eagle nest. Only three of the five nests were located within the overall bounds of the proposed turbine corridors, while the other two were located just east or west of the turbine corridors, which should help to reduce impacts to the resident pairs that utilize these nest sites. Due to the physical structure of Joshua trees, which can obscure nests, additional nests may have been overlooked.

Golden Eagles

Eagle use, consisting solely of use by golden eagles, was highest in the northwestern portion of the Project Area, with all eagle use occurring at three survey sites in this part of the Project Area (Thompson et al. 2011). Two of these points were located in relatively close proximity (0.5 and 0.75 mile, respectively) to a cliff face containing several potential golden eagle nests, although none of the nests were active or occupied in 2011. Due to a lack of previous survey data, it is unknown when the territory was last occupied (Thompson et al. 2011).

During aerial raptor nest surveys, 36 potential golden eagle nests were documented at 26 different locations within about 10 miles of the Project boundary. Thirty-three likely golden eagle nests were located at 24 locations during the initial round of survey in the Project Area and 10-mile buffer area (Thompson et al. 2011). During the second survey, all of the nests found during the initial survey were re-checked, and due to a change in the project boundary a small area of additional habitat was searched (via helicopter) along the far southern edge of the new 10-mile buffer. Two golden eagle nests were located in this area (Thompson et al. 2011). AGFD assessed the status of this territory in February 2011 as part of their statewide golden eagle survey. None of the 36 surveyed nests were occupied or active (i.e. no adults were incubating eggs or tending nests) during the 2011 surveys (Thompson et al. 2011).

Of all the potential golden eagle territories, only two were considered occupied in 2011, with occupancy determined by the presence of adult golden eagles in the vicinity of nest sites (although no eagles or eggs were observed on the nests) (Thompson et al. 2011). A pair of adult golden eagles was observed near a cluster of seven nests located approximately 9 miles south of the southernmost turbine corridor during the first round of survey (Thompson et al. 2011). Although none of the nests in this territory had been tended (i.e., no fresh nest materials observed) and the birds were not incubating, this territory was considered

occupied (Thompson et al. 2011). This was the only territory documented as being occupied within 10 miles of the original turbine corridors (Thompson et al. 2011). According to data provided by the BLM, the AGFD located several nests that were within or close to the 10-mile buffer associated with the revised project boundary of June 28, 2011 (Thompson et al. 2011). The AGFD data reported that a different pair of golden eagles was observed in the vicinity of these other nests during their February 2011 survey flight; and categorized the territory as occupied (Thompson et al. 2011).

Among the potential territories documented, two are located less than 1 mile from proposed turbine corridors; however, none of the nests in these two territories exhibited any evidence of occupancy in 2011. Both territories were considered unoccupied. One potential territory occurs in the northwest corner of the Project Area, a mountainous region near Squaw Peak (Thompson et al. 2011). The second potential territory occurs near the eastern boundary of the Project Area (Thompson et al. 2011).

The remaining nests varied from about 3 to 10.5 miles from the nearest turbine corridors. There was one historical golden eagle nest in the AGFD HDMS located along the major transmission line approximately 0.6 miles of the nearest turbine corridor (Thompson et al. 2011). This nest was likely occupied by red-tailed hawks in 2011.

The Project Area and surrounding region seem to be sparsely populated by golden eagles. However the single year of surveys does not provide information on breeding or population trends in the region (Thompson et al. 2011). In 2012, AGFD is conducting follow-up surveys to better understand the breeding locations and trends of golden eagles surrounding the Project Area. The results will provide the best known and available scientific information to be incorporated into the Eagle Conservation Plan (ECP) for the Project.

Game Birds

One upland game bird species was detected: the Gambel's quail (*Callipepla gambelii*). Gambel's quail composed 16.3 percent of the overall large bird use during the spring, and 14.2 percent during the fall. The mourning dove (*Zenaida macroura*) is also a hunted game bird that occurs in the Project Area, and it comprised 20.3 percent of the large bird observations in the spring and 1.8 during the winter. Both species were most common in the eastern part of the Project Area where gently rolling hills and dispersed Joshua tree woodland habitats were predominant (Thompson et al. 2011).

3.5.2.4 Reptiles

Eight reptile species were recorded incidentally in the Project Area, including the Sonoran desert tortoise (*Gopherus agassizii*) and seven species of lizards. Three Sonoran desert tortoise and numerous signs of use were observed incidentally within the Project Area (Thompson et al. 2011). These data may indicate that the species is more common in the northern two-thirds of the Project Area, where there is more hilly and mountainous terrain .One desert tortoise was seen on two consecutive days at the same location in September 2008. Signs of desert tortoise activity (e.g., scat and likely burrows) were documented incidental to bird surveys in the spring of 2009. The desert tortoise is a Federally threatened species in its range north and west of the Colorado River (i.e., the Mojave population). As of December 2010, the Sonoran population in the portion of the range south and east of the Colorado River, which includes the Project Area, was entered in the Federal register as a candidate for listing as threatened under the taxonomic name *G. agassizii* (U.S. Fish and Wildlife Service [USFWS] 2010c). The Sonoran population of the desert tortoise also is categorized as a species of special concern (Tier-1b SGCN) by the State of Arizona and is classified as sensitive species by the BLM.

3.5.2.5 Amphibians

The Project Area may support a limited number of amphibian species. The geographic ranges of seven amphibian species overlap with the Project Area (Brennen 2010). These species are American bullfrog (*Lithobates catesbeiana*), relict leopard frog (*Lithobates onca*), northern leopard frog (*Lithobates pipiens*), lowland leopard frog (*Lithobates yavapaiensis*), Great Plains toad (*Anaxyrus cognatus*), Arizona toad (*Anaxyrus microscaphus*), and red-spotted toad (*Anaxyrus punctatus*). The American bullfrog, relict leopard frog, northern leopard frog and Arizona toad require various types permanent or semi-permanent surface water in rivers, streams, or ponds that do not exist in the Project Area. The Great Plains toad and red-spotted toad have broader ecological requirements and can exist in drier environments than the aforementioned frogs and toads. These two toad species could use temporary pools for breeding in the Project Area. These two species were not observed during baseline wildlife surveys for bats and birds.

3.5.2.6 Wildlife Movement Corridors

The Arizona Wildlife Linkages Assessment identified the area between the Mount Wilson Wilderness and the Mount Tipton Wilderness as a significant wildlife movement corridor (Arizona Department of Transportation [ADOT] 2006). While this wildlife movement corridor is outside the Project Area, wildlife could move between the While Hills in and near the Project Area, and the Cerbat Mountains about 5 to 10 miles to the south, or other larger mountain ranges from 5 to 15 miles to the east and west of the Project Area (URS communication with Stroud 2010). Given that there is little development, broad areas of topographic relief, and most land is under Federal jurisdiction; the landscape is highly connected and conducive to broader movements of big game, medium-sized mammals, tortoises, or smaller terrestrial wildlife that would not be confined to a corridor.

AGFD and the Arizona Wildlife Linkages Workgroup (AWLW) are currently working on a county-by-county analysis of wildlife movement corridors based on the original Wildlife Linkages Assessment that was completed in 2006 (URS communication with AGFD 2010a). Currently, wildlife corridor analysis for Mohave County has not been completed.

3.5.3 Special Status Species

3.5.3.1 Data Collection Methods

This section is a summary of special status species that may be found in the Project Area and vicinity. The sources of information include published literature, USFWS Arizona Ecological Services Field Office data (USFWS 2010a), AGFD HDMS data (AGFD 2010a), AGFD Project Evaluation Project Online Environmental Review (AGFD 2010b), and AGFD unpublished species abstracts. Potential for occurrence was determined based on wildlife inventories, range distribution maps, resources specialist input, literature, and professional judgment based on habitat type.

Special status species are legally protected under Arizona state law, BLM policies, and ESA. For the purpose of this EIS, special status species are defined as:

- Species proposed for listing as threatened or endangered under ESA (50 CFR 17.11 for listed animals, and various notices in the Federal Register for proposed species)
- Species that are candidates for possible future listing as threatened or endangered in ESA
- Species or habitats included in BLM Manual 6840, Special Status Species Management, BLM Sensitive Species 2010, and BLM Instruction Memorandum IM 2008-050, dated December 18, 2007, Migratory Bird Treaty Act –Interim Management Guidance

- Special status plant species listed as Highly Safeguarded or Salvage Restricted under the Arizona Native Plant Law
- Bald and Golden Eagle Protection Act Compliance, and BLM IM 2010-156 on APPs and eagles requiring development of an Eagle Conservation Plan
- Migratory Bird Treaty Act compliance
- Species listed by the State of Arizona as Wildlife Species of Concern

3.5.3.2 Special Status Plants

Information regarding the known distribution and habitats of these special-status plant species was obtained from several sources including AGFD HDMS website, Arizona Flora (Kearney and Peebles 1951), A Field Guide to the Plants of Arizona (Epple 1995), The Jepson Manual (Hickman 1993), correspondence with agency personnel, and internet searches.

A total of 46 special status plant species occur within Mohave County. Many species have multiple designations. For example, Siler Pincushion Cactus (*Pediocactus sileri*) is listed as threatened under the ESA, sensitive species by the BLM, and highly safeguarded under the Arizona Native Plant Law. Of the 46 special status plant species that occur within Mohave County, four special-status plant species were identified as potentially occurring in the Project Area based on AGFD HDMS records (Table 3-12). The four species include Las Vegas bearpoppy (*Arctomecon californica*), clustered barrel cactus (*Echinocactus polycephalus* var. *polycephalus*), silverleaf sunray (*Enceliopsis argophylla*), and Navajo Bridge cactus (*Opuntia nicholii*).

Surveys for special status plant species of the Project Area were conducted between April 2008 and May 2008. No USFWS endangered, threatened, candidate, or species of concern; or BLM sensitive species were encountered during surveys (Flaig 2009).

The Arizona salvage-restricted clustered barrel cactus was detected during surveys. A total of 182 individuals were encountered in the northern portion of the Project Area, immediately east of Squaw Peak (Flaig 2009).

Federally Listed Plants

USFWS lists 23 Federally listed plant species as occurring within Mohave County: 2 endangered, 2 threatened, 2 candidate species, and 17 species of concern. No Federally listed plants have the potential to occur in the Project Area.

BLM Sensitive Plants

BLM lists 15 sensitive plant species as occurring within Mohave County. Of the 15 species, the silverleaf sunray is the only BLM sensitive plant species that could potentially occur in the project vicinity (AGFD 2010a) (Table 3-12). The silverleaf sunray has been documented about 1 mile west of the Project Area (AGFD 2010a) where it is known to occur on gypsum soils in Township 29N; Range 21W. It more than likely occurs within the project boundary.

Protected Arizona Native Plants

The Arizona Native Plant Law lists 30 species as occurring within Mohave County: 5 highly safeguarded and 25 salvage restricted species. Of these species, AGFD HDMS review indicated that four salvage restricted species have been documented in or near the Project Area. These include the Las Vegas bearpoppy, clustered barrel cactus (*Echinocactus polycephalus*), straw-top cholla (*Cylindropuntia echinocarpa*), and Navajo Bridge cactus (Table 3-12). The cottontop cactus was detected during surveys

of the Project Area. The Navajo Bridge cactus has been documented within 5 miles of the Project Area (AGFD 2010a). Straw-top cholla occurs in or near rugged terrain at several sites within about 10 miles of the Project Area. The Las Vegas bear poppy has been documented within 0.6 and 1.18 miles northwest of the Project Area and habitat for this species likely occurs in the northwestern part of the Project Area. All four species could occur in the Project Area.

Plant surveys for the Project identified a number of other protected native plants within turbine corridors in the Project Area. These are shown in Table 3-11. Other cactus and succulents not listed in Table 3-11 but occurring in the Project Area would be protected as either highly safeguarded, salvage restricted, or harvest restricted species.

Table 3-11 Salvage Restricted Plant Found within or near the Project Area

Common Name	Scientific Name
clustered barrel cactus	*Echinocactus polycephalus var. polycephalus**
Engelmann's hedgehog cactus	*Echinocereus engelmannii var. nicholii*
Johnson's fishhook cactus	*Echinomastus johnsonii*
desert barrel cactus	*Ferocactus cylandraceus var. lecontei*
common fishhook cactus	*Mammillaria tetrancistra*
buckhorn cholla	*Opuntia acanthocarpa*
beavertail cactus	*Opuntia basliaris var. basilaris*
teddy-bear cholla	*Opuntia bigelovii*
Mojave pricklypear	*Opuntia erinacea var. erinacea*
pencil cactus	*Opuntia ramosissima*
Joshua tree	*Yucca brevifolia*
Mohave yucca	*Yucca schidigera*

SOURCE: Flaig 2009

3.5.3.3 Special Status Wildlife

Federally Listed Wildlife

As identified by USFWS, 22 species listed as endangered, threatened, or candidate under the ESA occur in Mohave County. Of this total, two species with Federal status have the potential to occur in the project area. The relationship of these two species to the project are described in Table 3-12.

The California condor (G*ymnogyps californianus*) is listed as endangered, and the reintroduced population in Arizona is categorized as an experimental, non-essential population that is managed as a threatened species outside the reintroduction area under rule 10(j) of the ESA. Section 7 consultations are relaxed for non-essential populations; consultation is only required for Federal actions affecting non-essential populations occurring on National Park Service or USFWS refuge lands. The reintroduced population has been expanding its foraging range to the north and northeast of its release site near Grand Canyon and has not utilized areas south of the Grand Canyon since about 2000 (USFWS 2010b). This may represent a natural pattern related to the scarcity of carrion from livestock and from large game species like deer and elk. The USFWS determined that no species Federally listed as threatened or endangered, or designated critical habitat, would be affected by the Project.

The USFWS registered the Sonoran population of the desert tortoise (*Gopherus agassizii*) as a candidate species for threatened status in December 2010, with listing precluded by other priorities (USFWS 2010c). Three Sonoran desert tortoise and numerous signs of use were observed incidentally within the Project Area (Thompson et al. 2011). These data may indicate that the species is more common in the

northern two-thirds of the Project Area, where there is more hilly and mountainous terrain. Further surveys to document the size of the population in the area are ongoing.

BLM Sensitive Wildlife

BLM lists 26 sensitive wildlife species as occurring within Mohave County. Of the 26 species, nine species occur or potentially occur in the Project Area: Allen's big eared bat (*Idionycteris phyllotis*), Townsend's big-eared bat (*Corynorhinus townsendii*), western mastiff bat (*Eumops perotis*), spotted bat (*Euderma maculatum*), golden eagle, American peregrine falcon (*Falco peregrinus anatum*), ferruginous hawk (*Buteo regalis*), western burrowing owl (*Athene cunicularia*), and Sonoran desert tortoise (refer to Table 3-12). Allen's big-eared bat, Townsend's big-eared bat, western mastiff bat, golden eagle, and western burrowing owl were documented as part of the baseline wildlife surveys for the project (Thompson et al. 2011).

Arizona Wildlife of Concern

AGFD lists 29 wildlife species of concern as occurring within Mohave County. Of these species, three species have the potential to occur in the Project Area: American peregrine falcon, ferruginous hawk, and Sonoran desert tortoise (refer to Table 3-12). The Sonoran desert tortoise has been documented within the Project Area, and the ferruginous hawk has been documented within about 10 miles of the Project Area.

The banded Gila monster (*Heloderma suspectum cinctum*) receives general protection under Arizona statutes. Records of the species occur within 5 miles of the Project Area, and suitable habitat occurs in the Project Area, primarily in mountainous terrain near Squaw Peak.

Eagles

The bald eagle and golden eagle are protected under the Bald and Golden Eagle Protection Act and the Migratory Bird Treaty Act. Both species have been documented within 5 miles of the proposed Project Area. The local population of overwintering bald eagles would likely remain near Lake Mead. However, the golden eagle utilizes habitats within the Project Area alternatives. Of the two species, the golden eagle utilizes habitats within the proposed action alternatives boundaries. Golden eagles were documented using the Project Area, and nests were located in and surrounding the Project Area during baseline wildlife surveys (Thompson et al. 2011). Section 3.5.2.3 describes the survey results for golden eagles in greater detail. The local population of overwintering bald eagles would likely remain near Lake Mead.

During aerial raptor nest surveys, 36 potential golden eagle nests were documented at 26 different locations within about 10 miles of the project boundary. None of the 36 surveyed nests were occupied or active (i.e. no adults were incubating eggs or tending nests) during the 2011 surveys (Thompson 2011). Of all the potential golden eagle territories incorporating these nest locations, only two were considered occupied in 2011, with occupancy determined by the presence of adult golden eagles in the vicinity of nest sites (although no eagles or eggs were observed on nests) (Thompson 2011). AGFD is conducting ongoing golden eagle surveys in 2012 to better understand the location and trends of breeding golden eagles surrounding the Project Area.

Table 3-12 Special Status Species Potentially Occurring in the Project Area

Species Common Name Scientific Name	Status	Habitat Requirements	Occurrence Potential
Birds			
American Peregrine falcon *Falco peregrinus anatum*	S WSC MBTA	Breeds in Arizona wherever sufficient prey is available near cliffs. Areas of spectacular cliffs such as the Mogollon Rim, Grand Canyon, and Colorado Plateau contain most of Arizona's breeding peregrines. Optimum peregrine habitat is generally considered to be steep, sheer cliffs overlooking woodlands, riparian areas or other habitats supporting avian prey species in abundance (AGFD 2002d).	**Likely.** Peregrine falcons are known to nest along the Colorado River below Hoover Dam and along the shoreline of Lakes Mead and Mohave. These known nesting sites are within 15 miles of the Project Area, and peregrine falcons could utilize the Project Area as a possible foraging site.
California condor *Gymnogyps californianus*	E (managed under 10(j) rule) MBTA	Condors are cavity-nesting species that require caves, ledges, or large trees in order to nest. High perches are necessary for roosting, as well as to create the strong updrafts required for lift into flight. Open grasslands or savannahs are important to condors while searching for food. In Arizona, condors are found at elevations between 2,000-6,500 feet (610-1,981 meters). In northern Arizona, condors are located primarily near the Vermilion cliffs and Grand Canyon (AGFD 2004).	**Unlikely.** Limited suitable habitat in the Project Area. No known populations within or near the Project Area.
Ferruginous hawk *Buteo regalis*	S (Breeding population only) MBTA WSC	Ferruginous hawks breed in northern Arizona on the Colorado Plateau; otherwise, this species occurs in Arizona from September to April. This species can be seen in virtually any part of Arizona with open environs, particularly in agricultural fields and native grasslands. In general, the Ferruginous hawk breeds in open areas with little topographic relief. Hunting areas are typically open grasslands, preferably those dotted with suitable low hills or short trees which serve as perches (AGFD 2003a). Elevation: 3,500-6,000 feet (1,067-1,830 meters).	**Possible.** Likely suitable habitat in the Project Area for overwintering ferruginous hawks. Records within 10 miles of the Project Area

Species **Common Name** **Scientific Name**	**Status**	**Habitat Requirements**	**Occurrence Potential**
Golden Eagle *Aquila chrysaetos*	S MBTA BGEPA	Typically found in open country, including shrublands, grasslands, canyons, and desert plains, as well as open coniferous forests in mountainous regions (AGFD 2002b).	**Present.** Suitable habitat present within the Project Area. Species detected in northwest part of Project Area. Numerous nests documented in parts of the Project Area and within a 10 mile buffer area around the Project.
Bald Eagle *Haliaeetus leucocephalus*	MBTA BGEPA	In Arizona, overwintering bald eagles usually roost in riparian areas with mature trees, particularly large mature cottonwoods that are adjacent to large bodies of water (major rivers, lakes, or reservoirs) with abundant prey (large fish and waterfowl). Roost areas sometimes include mature pine forests or canyon rims.	**Unlikely.** Suitable habitat is not present within the Project Area. However, individuals overwinter in the vicinity of Lake Mead. A record of the species is within 5 miles of the northwestern corner of the Project Area.
Western burrowing owl *Athene cunicularia*	MBTA S	Occurs locally in open areas, generally year-round, with only a few winter records on the Colorado Plateau in the northeastern part of the state. Prefers variable habitat in open, well-drained grasslands, steppes, deserts, prairies, and agricultural lands, often associated with burrowing mammals. Sometimes in open areas such as vacant lots near human habitation, golf courses or airports (AGFD 2001a). Elevation: 650-6,140 feet (198-1,873 meters).	**Present.** Numerous documented occurrences in Project Area during agency surveys.
Mammals			
Allen's big-eared bat *Idionycteris phyllotis*	S	In Arizona, bats are found in ponderosa pine, piñon-juniper, Mexican woodland and riparian areas of sycamores, cottonwoods and willows. They have also been found in white fir and in Mojave desert scrub. These bats typically occur along streams or over ponds where the bats may be seeking insects, water or both. They roost in caves and abandoned mineshafts (AGFD 2001c).	**Present.** Species detected during surveys.

Species **Common Name** **Scientific Name**	**Status**	**Habitat Requirements**	**Occurrence Potential**
Pale Townsend's Big-eared Bat *Corynothinus townsendii pallescens*	S	In Arizona, summer day roosts are found in caves and mines from desert scrub up to woodlands and coniferous forests. Night roosts may often be in abandoned buildings. In winter, they hibernate in cold caves, lava tubes and mines mostly in uplands and mountains from the vicinity of the Grand Canyon to the southeastern part of the state (AGFD 2003b).	**Present.** Species detected during surveys.
Western mastiff bat *Eumops perotis*	S	This species is considered a year-round resident in Arizona. Bats occur from lower and upper Sonoran desert scrub near cliffs, preferring rugged rocky canyons with abundant crevices (AGFD 2002c).	**Present.** Species detected during surveys.
Spotted Bat *Euderma maculatum*	S	Spotted bats are found in a wide variety habitats. In Arizona, most are captured in dry, rough desert scrub with a few captured or heard in ponderosa pine forest. Likely a solitary roosting species that roosts in crevices and cracks in cliff faces (AGFD 2003).	**Likely.** Suitable habitat occurs in Project Area.
Plants			
Clustered barrel cactus *Echinocactus polycephalus* var. *polycephalus*	SR	This species is found in the driest parts of the Sonoran and Mojave deserts in Mohave and Yuma counties. Plants occur on rocky flats and washes, bajadas, rock ledges, and rocky, gravely slopes in the driest parts of the Sonoran and Mojave deserts (AGFD 2006).	**Present.** Species detected during surveys and is widespread in the region.
Las Vegas Bearpoppy *Arctomecon californica*	SR	Las Vegas bearpoppy occurs on barren, gravelly desert flats, shale, hummocks and slopes in the creosote bush zone, that are heavily gypsiferous or otherwise chemically unusual (borate-bearing, lithium-bearing). In Arizona, this species is found in Mojave desert scrub within the Grand Canyon, on narrow gravelly Formation and Devonian limestone shelves high on the slopes of side canyons (AGFD 2005a).	**Likely.** Suitable habitat in part of Project Area. Known populations in the Detrital Valley. Closest record is between 0.56 and 1.18 miles west of northwest corner of Project Area.

Species **Common Name** **Scientific Name**	**Status**	**Habitat Requirements**	**Occurrence Potential**
Straw-top cholla *Cylindropuntia echinocarpa*	SR	Gravelly to rocky flats, bajadas, and canyons, often along the margins of washes with suitable substrate.	**Likely.** This species is common and widespread in the region and should be found throughout the Project Area.
Navajo Bridge cactus *Opuntia nicholii*	SR	This species occurs on barren areas with saltbush and *Ephedra* with limestone or red, sandy soils.	**Likely.** Suitable habitat may be present within the Project Area.
Silverleaf sunray *Enceliopsis argophylla*	S	Silverleaf sunray is found in warm desert shrub communities on dry slopes and sandy washes. It occurs on clay and gypsum cliffs, gravelly slopes, and sandy washes (AGFD 2005b).	**Likely.** Known to occur within 1 mile of the Project Area and is likely to occur within the Project Area.
Reptiles			
Banded Gila monster *Heloderma suspectum cinctum*	State Protected	In Arizona, banded Gila monsters primarily occur in the Sonoran Desert and extreme western edge of the Mojave Desert. It is less frequent in desert-grassland and rare in oak woodland. The species is most common in undulating rocky foothills, bajadas and canyons; and found less frequently or absent on open sandy plains (AGFD 2002e).	**Likely.** Suitable habitat may be present within the Project Area. The species has been recorded in or within 5 miles of the Project Area.
Sonoran desert tortoise *Gopherus agassizii* (Sonoran population)	C S WSC	The Sonoran population of the desert tortoise occurs primarily on rocky slopes and bajadas of Mojave and Sonoran desert scrub. Caliche caves in incised, cut banks of washes (arroyos) are also used for shelter sites, especially in the Lower Colorado River Valley subdivision. Shelter sites are rarely found in shallow soils (AGFD 2001b).	**Present.** Species detected during surveys.

NOTES: Agency or Law: BLM = Bureau of Land Management; ESA = Endangered Species Act; MBTA = Migratory Bird Treaty Act; BGEPA = Bald and Golden Eagle Protection Act. Status Definitions: **ESA:** SC = species of concern. **BLM**: S = sensitive. **State of Arizona:** WSC = wildlife of special concern in Arizona, SR = salvage restricted plant under the Arizona Native Plant Laws. Occurrence Potential Definitions: Present = individuals documented in the Project Area. Likely = habitat is large enough in the Project Area and has the qualities required by the species; Unlikely = suitable habitat is absent or too small in the Project Area to be useable by the species.

3.6 CULTURAL RESOURCES

3.6.1 Introduction

The cultural environment includes those aspects of the physical environment that relate to human culture and society, along with the institutions that form and maintain communities and link them to their surroundings (King and Rafuse 1994). This section describes cultural resources, including archaeological sites, historical sites and structures, and traditional cultural resources, that could be affected by the project.

3.6.1.1 Regulatory Requirements

Cultural resources are addressed in this EIS pursuant to Section 101(b)(4) of NEPA, which directs Federal agencies to preserve important historical and cultural aspects of our nation's heritage. Cultural resource issues also were addressed in accordance with other applicable Federal laws and regulations, particularly Section 106 of the National Historic Preservation Act (NHPA), 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) and seek to avoid, minimize, or mitigate potential adverse effects of the undertaking on identified historic properties in consultation with the State Historic Preservation Officer and other interested parties. To be eligible for the National Register, properties must be 50 years old (unless they have special values) and have national, state, or local significance in American history, architecture, archaeology, engineering, or culture. 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 (36 CFR Part 60)

The regulatory procedures that Federal agencies follow to comply with Section 106 of the NHPA often are coordinated with the NEPA process but are a requirement independent of NEPA. Under NHPA, consideration of adverse effects is limited to historic properties (including traditional cultural properties) that are listed in or determined eligible for the National Register. A broader range of resources can be considered under NEPA. When coordinated, both processes share similar steps of inventory and evaluation of the significance of potentially affected resources as well as assessment of impacts and consideration of measures to resolve any adverse impacts.

3.6.1.2 Region of Influence (Area of Potential Effects)

The cultural resource assessment for this Project was designed to address potential impacts within the region of influence, which is the geographic area within which a proposed project may affect resources. The concept is analogous to the area of potential effects of an undertaking as defined by regulations implementing Section 106 of the NHPA for considering effects on National Register-listed or eligible properties (36 CFR Part 800). The area of potential effects and region of influence can vary for each type of potential impact on the cultural environment.

The programmatic EIS that BLM prepared for wind energy development in the West concluded that earthmoving activities, such as digging, grading, and clearing of vegetation have the highest potential for disturbing or destroying significant cultural resources (BLM 2005). The programmatic EIS also recognized that associated vehicle and pedestrian traffic has potential to disturb or crush artifacts and archaeological and historical features. Accordingly, the area of potential effects for direct impacts was

defined as the area that could be disturbed by construction, operation, and eventual decommissioning of the project. Although this could include the entire area within the proposed project boundaries, preliminary engineering indicates that actual ground disturbance could accumulate to a maximum of 2.3 square miles, or about 3 percent of the total 73.4 square miles of ROW.

The BLM programmatic EIS for wind energy development also recognized the potential for indirect impacts due to (1) visual changes in the settings of cultural resources, (2) soil erosion stemming from construction disturbances, and (3) unauthorized collection and vandalism stemming from improved vehicle access to a currently remote area and more people being present.

Archaeological sites important for their potential to yield important information generally would not be affected by visual changes, but settings might be an important element of the historical values of other types of resources, such as historic trails and roads, historic buildings and structures, and traditional cultural resources. BLM visual resource management (VRM) analyses evaluate effects on the visual character of resource settings within foreground and middleground distances, which are defined as extending 3 to 5 miles, and in some cases in background or seldom seen settings that might extend as much as 15 miles or more. In conformance with this method of visual impact analysis, the area of potential effects for visual impacts was defined as extending up to 5 miles beyond the Project Area, but potential impacts on known cultural resources that could be sensitive to visual impacts were considered out to 20 miles in conjunction with visual resources studies conducted for the Project. Visual resources are discussed in detail in Section 3.12.

Construction activities that modify the slope of the natural terrain or compact soils have potential to increase erosion, which might affect the integrity of cultural resources. Because construction activities would comply with regulations regarding the control of storm water discharges, there is only minor potential for increased soil erosion to damage cultural resources. Such secondary impacts are likely to be confined to the immediate vicinity of construction zones. The area of potential effects for increased erosion was defined as extending no more than 100 feet beyond the construction zones.

Studies have demonstrated that, in rural settings, the integrity of archaeological and historical sites near roads is much more likely to have been diminished by unauthorized artifact collection and vandalism than sites in more remote settings (Ahlstrom et al. 1992; Nickens et al. 1981; Simms 1986; Spangler 2006; Spangler et al. 2006). The impacts of unauthorized collection and vandalism vary with distances from roads, but 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, depending on the visibility of a site or public knowledge of its location.

3.6.1.3 Inventory Methods

To address the identified issues, eight reports were completed to inventory, evaluate, and assess impacts on archaeological, historical, and traditional cultural resources (Kirvan and Rogge 2011a, 2011b; Rogge 2010, 2011a, 2011b, Rogge and Albush 2010; Rogge et al. 2010, 2011). The initial phase of study involved preparation of a cultural resource overview (Class I inventory), which compiled and mapped, in a geographic information system (GIS) database, information about prior cultural resource studies and archaeological and historical sites recorded within the Project Area and a 1-mile buffer. Information about prior studies and recorded cultural resources also was compiled, reviewed, and summarized in tables for areas 1 to 5 miles around the Project Area. The surrounding area out to 20 miles beyond the Project Area was reviewed to identify known cultural resources with values that might be affected by visual changes of the landscape.

Primary sources of information included the BLM Kingman Field Office files, the AZSITE Cultural Resources Inventory, and consultations with tribes and agencies. AZSITE is a GIS database that includes records of the AZSITE Consortium members (Arizona State Museum, Arizona State University, Museum of Northern Arizona, and State Historic Preservation Office), and participating agencies such as BLM. National Register listings also were reviewed. General Land Office plats and other historical maps were reviewed as well for indications of potential unrecorded historical resources. Additional information was collected at the Mohave Museum of History and Arts in Kingman, and selected reports of prior studies were reviewed. Ethnographic reports were reviewed for information about traditional land uses and traditionally named places in and near the Project Area (e.g., Dobyns 1956, 1957, 1976; Euler 1958; Kroeber 1935; Manners 1974; McGuire 1983; Stone 1987).

Intensive pedestrian (Class III) field survey was conducted to inventory cultural resources within the area of potential effects for direct construction impacts as well as surrounding buffers where potential impacts due to increased erosion and unauthorized artifact collection and vandalism might occur. Based on preliminary engineering, corridors about 650 feet wide were surveyed for the turbine corridors, and corridors about 400 feet wide were surveyed for the access roads/electrical collector lines. Additional areas were surveyed for a main access road; meteorological towers; construction staging and laydown areas; an operation and maintenance building; alternative locations for substations, a switchyard, and an interconnection transmission line; and for geotechnical investigations. To date, the Class III survey covers about 16 square miles (10,248 acres), which is almost seven times more area than the estimated extent of construction disturbance. The surveyed buffer zones are likely to accommodate shifts of facility locations as final designs are prepared, but additional supplemental survey could be required as more detailed construction plans are developed.

3.6.2 Regional Overview

The following brief summary of the regional cultural history provides a context for evaluating the cultural resources that could be affected. This summary is based on a Class I cultural resource inventory prepared by BLM for west-central Arizona (Stone 1987) and an overview prepared for the Project (Rogge 2011a, 2011b; Rogge et al. 2010), which is incorporated into this EIS by reference and provides additional details and citations of relevant prior studies.

Almost a century of archaeological and historical research had documented that the region has been occupied for at least about 14,000 years. The cultural history of the area can be divided into numerous periods that reflect changing adaptations and lifeways, including Paleoindian, Archaic, Ceramic, Ethnohistoric, and historic Euro-American periods.

The earliest traces of human occupation in northwestern Arizona date to the Paleoindian period (about 12,000 to 8,000 B.C.) when the cooler and wetter climate of the late Pleistocene era of the last Ice Age transitioned to the subsequent Holocene period with climatic conditions similar to those of today. Paleoindians hunted various species of game including large, now extinct, herbivores such as mammoths, horses, camels, and ancient bison. Paleoindian sites are rare, and evidence of this early period in the region is limited mostly to isolated finds of large spear points made of finely flaked stone.

The Paleoindian period was followed by the Archaic period, a long post-Pleistocene epoch that followed the retreat of continental glaciers and the extinction of the large Pleistocene game species. This period may have lasted as late as A.D. 700 in northwestern Arizona. Like the earlier Paleoindians, Archaic groups continued to pursue a hunting and gathering way of life, typically traveling in small bands through their territories to hunt various game species and collect and process indigenous plant foods with the changing seasons. The Archaic period commonly is divided into early, middle, and late periods based primarily on various styles of stemmed and notched dart points made of flaked stone. Few sites dating to

the early and middle Archaic periods have been found in northwestern Arizona, but sites dating to the late Archaic period are more common and probably reflect population growth.

The Ceramic period is marked by the making and use of pottery, the growing of domesticated crops, and more permanent or semi-permanent habitations. During the Ceramic period (circa A.D. 700 to 1850), the Cerbat culture occupied the region where the proposed Project is located. The tradition is characterized by the use of Cerbat Brown pottery; flat and shallow basin milling stones; one-hand grinding stones; small, triangular arrow points; use of rockshelters and brush wikieups; and cremation burial. The Cerbat people raised crops at selected, well watered locations, but continued to rely heavily on hunting game and gathering indigenous plant foods for much of their subsistence. In contrast to many other cultural groups in the Southwest who became fully sedentary farmers at this time, the Cerbat continued to move seasonally throughout their territory to exploit various natural resources similar to the hunting and gathering cultures of the Archaic period.

The Project Area is within the traditional territory of the ethnohistorically documented Hualapai, who spoke a Yuman language and represent a continuation of the prehistoric Cerbat culture. The Yavapai, who lived to the south, also spoke a Yuman language, but relations between the two groups were often hostile. The Mojave, a lowland Yuman group, lived to the west along the Colorado River, as did the Chemehuevi, a band of Southern Paiute who ranged into the desert west of the river. Most of the related Southern Paiute bands lived north of the Colorado River. Traditionally, the Hualapai were organized into camps, commonly of about 25 to 40 people of patrilineally related families. The camps were organized into approximately 7 to 13 larger bands, each with home territories, and the bands were organized into three subtribes. Although the Havasupai are recognized as a distinct tribal government today, in earlier times they seem to have been essentially another band of the Hualapai. The Project Area is within what was the territory of the Red Rock Band at the northwestern edge of Hualapai territory. Band and tribal territories were fluid and members of other Hualapai bands and other tribes in the region may have traveled through or hunted and gathered natural resources in the area, and traded with, intermarried, and resided temporarily with the Red Rock Band.

The Hualapai bands lived in winter camps near springs located in canyons eroded into the flanks of mountain ranges, such as the Cerbat Mountains south of the Project Area, or in canyons cut into the Colorado Plateau to the east. The Hualapai raised crops at some springs. The camps moved or sent out work groups with the changing seasons. In spring, they gathered agave in upland areas. In the summer they harvested grass seed and seeds of other plants on the valley floors. During the late summer, yucca and prickly pear were gathered in canyons, and in the fall acorns and pinyon nuts were collected in the mountains before returning to the winter camps at lower elevations. That settlement and subsistence strategy apparently was pursued for centuries, if not millennia.

European explorers traveled north out of Mexico into what is now Arizona in the early sixteenth century. Although Spain, and then independent Mexico, claimed hegemony over the area for more than three centuries, they made no attempt to settle near the Hualapai. The Spanish priest Francisco Garcés probably was the first European to encounter the Hualapai, when he passed through their territory as he traveled from the Colorado River east to the Hopi villages in 1776. Native guides undoubtedly led Garcés to the Hopi villages over long established trade routes. The presence of the newcomers near the Hualapai increased after 1829 when Antonio Armijo, a merchant from Santa Fe, led a caravan of about 60 men and 100 mules from Mexican settlements in northern New Mexico to missions in California along a route that later became known as the Old Spanish Trail. A segment of Armijo's original route down the Virgin River valley to the Colorado River is beneath Lake Mead, about 16 miles north of the Project Area.

The situation changed rapidly in 1848 when Mexico ceded land north of the Gila River to the United States with the Treaty of Guadalupe-Hidalgo that concluded the War with Mexico. The U.S. Army soon built a series of forts and camps, including Fort Mojave (1859-1890), Camp Hualapai (1869-1873), and Camp Beale's Springs (1871-1874) in and near Hualapai territory, and conquered native groups and forced them onto reservations. The U.S. Army began issuing rations to the Hualapai at Camp Beale's Springs (near Kingman) in 1871. When the administrative control of the Hualapai was transferred from the War Department to the Office of Indian Affairs in 1874, many of the Hualapai were confined to the Colorado River Indian Tribes Reservation for a year. When the Hualapai returned from their traditional territory they found that Euro-Americans had taken control of their water sources.

A reservation was established for the Hualapai in 1883, but the Office of Indian Affairs initially leased much of it to Euro-American ranchers. After many Hualapai died during the influenza epidemic of 1918, many of the survivors moved onto the reservation near Peach Springs. A tribal government was organized in 1934. Today, the tribe manages a reservation of approximately 1,550 square miles and has approximately 2,300 enrolled members.

In addition to conquering aboriginal groups, the U.S. Federal government devoted substantial efforts to developing transportation routes. Edward F. Beale and a team of military surveyors and laborers blazed a 1,000-mile-long wagon road from Fort Smith, Arkansas, to California between 1857 and 1859. The Atlantic & Pacific Railroad (known as the Atchison, Topeka & Santa Fe Railway after 1902) was built in that corridor between 1881 and 1883, and led to the founding of Kingman in 1882. Segments of Beale's Wagon Road and the Atlantic & Pacific Railroad followed the aboriginal trade route that Garcés' followed to the Hopi villages about a century earlier. Kingman became the Mohave County seat in 1887, after earlier county seats at the Colorado River towns of Mohave City and Hardyville and the mining communities of Cerbat and Mineral Park declined. In the 1860s, Mormons began to operate ferries on the Colorado River to accommodate expansion of settlement south from Utah. Mormon missionary Jacob Hamblin first ferried across the river near the confluence with Grand Wash in 1863 and Harrison Pearce developed a ferry at that location in 1876. Stone's Ferry was established before 1870 at the confluence with Detrital Wash and was moved about 3 miles upstream to the Virgin River confluence, and became known as Bonelli's Ferry or Rioville after Daniel Bonelli acquired the ferry in 1875. Those ferries led to the development of wagon roads south of the Colorado River along the Detrital and Hualapai valleys west and east of the Project Area.

After the 1848 gold rush to California waned, many prospectors moved into Arizona (part of the New Mexico Territory until 1863) in the 1850s and 1860s. Gold and silver were discovered in the Cerbat Mountains in the 1860s and in the 1870s gold was discovered farther north in Gold Basin where a mining district was organized in November 1881 east of the Project Area, but lack of water and fuel thwarted extensive mining.

A Hualapai shaman, Indian Jeff, discovered silver in the White Hills District, and in 1892 he revealed the location of the discovery for a fee, triggering a mining rush. By 1894, the town of White Hills had a population of 1,200, but the ore was mostly exhausted within four years and the community faded away. The townsite and mine shafts were flooded by a flash flood in 1899, and by 1902 all businesses were closed. An attempt to reopen the mines in 1922 failed, and renewed exploration in the 1970s concluded there was insufficient ore to justify development. Meager remnants of the White Hills townsite are about 2 miles south of the Project Area.

Damming of the Colorado River, beginning with the completion of the Hoover Dam in 1935, stabilized agricultural development and stimulated growth of an economy based on recreation and retirement communities such as Bullhead City, Arizona, and Laughlin, Nevada. The NPS assumed administration of the Boulder Dam Recreation Area in 1936 and amended their cooperative agreement with Reclamation to

include the future Lake Mohave to the south in 1947. It was officially designated Lake Mead National Recreation Area and became a unit of the National Park System in 1964.

3.6.3 Archaeological and Historical Resources

The cultural resources overview identified information about 42 prior cultural resource studies conducted since the 1950s within or overlapping the proposed Project Area and facilities, and a surrounding 1-mile-wide buffer. Information was identified about 62 additional studies within 1 to 5 miles. The only cultural resource previously recorded in the Project Area is the Liberty-Mead 345-kV transmission line, which was put into operation in 1967. Although the line is not yet 50 years old, the segment of the line within the Lake Mead NRA has been evaluated as eligible for the National Register because it is an early example of considering aesthetic factors in the design of high-voltage transmission lines, but the segment within and near the Project Area lacks historical significance.

One historical resource, U.S. Highway 93 (US 93), was previously recorded within 1 mile of the Project Area and evaluated as eligible for the National Register for its potential to yield important information about the historic state highway system (Criterion D). The overview identified 21 other archaeological and historical sites recorded within 1 to 5 miles of the Project Area. Those sites include the historic mining town of White Hills and three camps where Hualapai laborers and their families lived around the margins of the town. Nine other sites date to the historic period and most are related to mining. Six sites date to the prehistoric period and most are artifact scatters. One site is Senator Mountain, which was identified as an area of traditional Hualapai cultural interest. The recorders of 5 of those 21 sites recommended that they be considered eligible for the National Register and that 7 be considered ineligible. The National Register eligibility of the other 9 sites has not been evaluated.

Intensive field surveys conducted for the Project discovered 33 archaeological and historical sites and 218 isolated artifacts and features (Kirvan et al. 2011; Kirvan and Rogge 2011a, 2011b). Although most of the areas that could be disturbed by the proposed wind farm have been intensively surveyed, the locations of some Project components could be moved during preparation of final designs and require supplemental cultural resource survey. Background research and the field survey indicate that cultural resources are sparse in the area but some additional cultural resources might be discovered by supplemental survey.

About one-fourth of the isolated artifacts and features reflect the prehistoric occupation of the area and are mostly pieces of flaked stone. The other three-fourths date to the historic or modern era and are primarily cans, fragments of broken bottles, and mining claim and cadastral survey markers. BLM has evaluated all the isolated artifacts and features, which do not meet the Arizona State Museum standards for formal designation as archaeological sites, as not meeting the criteria for inclusion in the National Register.

Thirteen of the 33 archaeological and historical sites are along the corridor of a possible main access road and a once proposed interconnection with the Moenkopi-El Dorado transmission line that is no longer being considered; those sites would not be affected by the proposed Project. Nine of the remaining 20 sites are prehistoric toolstone collecting and knapping locations. Those sites vary in size and quantity of artifacts but they are similar and lack any features, except for a few concentrations of flaked stone that probably represent knapping stations and one possible anvil stone. All nine of those sites have been evaluated as eligible for the National Register under Criterion D for their potential to yield important information. The other 11 sites date to the historic period, and include 3 corrals or livestock watering locations related to ranching, 1 trash dump along US 93, and 7 roads. Only one of the historic roads, Stone's Ferry Road, was evaluated as eligible for the National Register (Table 3-13).

Table 3-13 Recorded Archaeological and Historical Sites

Site Number, Name	Affiliation, Age	Site Type	Features, Artifact Counts	Site Size
Sites Eligible for the National Register of Historic Places[1]				
1 AZ F:3:25(ASM)	aboriginal	toolstone collecting and knapping	Features: 1 anvil stone (embedded boulder), Artifacts = 25	less than 0.1 acre
2 AZ F:3:26(ASM)	aboriginal	toolstone collecting and knapping	Features: none Artifacts: 37	0.1 acre
3 AZ F:3:31(ASM)	aboriginal, Archaic	toolstone collecting and knapping	Features: 1 knapping station Artifacts: 3,000 (estimated)	20.0 acres
4 AZ F:3:32(ASM)	aboriginal	toolstone collecting and knapping	Features: none Artifacts: 3,000 (estimated)	2.1 acres
5 AZ F:3:33(ASM)	aboriginal	toolstone collecting and knapping	Features: 9 knapping stations Artifacts: 113	1.1 acres
6 AZ F:3:34(ASM)	aboriginal	toolstone collecting and knapping	Features: none Artifacts: 7,000 (estimated)	1.5 acres
7 AZ F:3:35(ASM)	aboriginal	toolstone collecting and knapping	Features: none Artifacts: 2,000 (estimated)	0.7 acre
8 AZ F:3:36(ASM)	aboriginal	toolstone collecting and knapping	Features: 5 knapping stations Artifacts: 199	0.8 acre
9 AZ F:3:37(ASM)	aboriginal	toolstone collecting and knapping	Features: none Artifacts 8,000 (estimated)	2.3 acres
10 AZ F:3:43(ASM) Stone's Ferry Road	*Euro-American, late 19th century*	historical road with campsites and artifacts	Features: 3 possible campsites Artifacts: scattered along the road	11.5 miles long, 0.1 mile in survey area
Sites Not Eligible for the National Register of Historic Places				
1 AZ F:2:116(ASM)	Euro-American, circa 1930s to 1950s	trash dump	Features: trash dump, trash scatter, two-track road Artifacts: 49 in scatter, thousands in dump	0.5 acre
12 AZ F:3:24(ASM) White Hills–Temple Bar Road	Euro-American, late 19th century	road and telephone line	Features: 41, including road, pole remnants and anchors (rock stacks), grading stakes, and artifact clusters Artifacts: 2,046 (mostly cans and broken glass) inventoried in survey area	23.9 miles long, 7.1 miles in survey area
13 AZ F:3:28(ASM)	Euro-American, mid-20th century	corral	Features: water tank, water troughs, fire ring, two-track road, fence Artifacts: approximately 31	2.9 acres
4 AZ F:3:29(ASM)	Euro-American, mid-20th century	corral	Features: fence, water pipe, water trough Artifacts: several wire fragments and metal fittings from burned water trough	1.7 acres
5 AZ F:3:30(ASM)	Euro-American, mid-20th century	livestock watering station	Features: water tank, water trough, wood pile, 10 push piles Artifacts: 6	0.5 acre
6 AZ F:3:38(ASM)	Euro-American, mid-20th century	road	Features: graded road Artifacts: none	7.0 miles long, 0.1 mile surveyed
7 AZ F:3:39(ASM)	Euro-American, circa 1950s	road	Features: graded road Artifacts: none	7.5 miles long, 0.2 mile (2 segments) in surveyed
8 AZ F:3:40(ASM) Temple Bar Back Road	Euro-American, mid-20th century	road	Features: graded road, abandoned road segment, graded area, cluster of hardware items, artifact scatter Artifacts: 800 (estimated)	8.5 miles long, 2.2 miles surveyed
9 AZ F:3:41(ASM)	Euro-American, mid-20th century	road	Features: graded road Artifacts: none	10.2 miles long, 0.5 mile (5 segments) surveyed
10 AZ F:3:42(ASM)	Euro-American, mid-20th century	road	Features: graded road Artifacts: none	1.8 miles long, 0.2 mile surveyed

Site Number, Name	Affiliation, Age	Site Type	Features, Artifact Counts	Site Size
Sites Not Subject to Impacts and Not Evaluated for National Register Eligibility				
1 AZ F:3:27(ASM)	Euro-American, 1920s to 1930s	historical trash scatter	Features: none Artifacts: 10 and 1 prehistoric potsherd	0.4 acre
2 AZ F:7:12(ASM)	Euro-American, late 19th to early 20th century	historical trash scatter	Features: abandoned road, trash dump Artifacts 3,000 (estimated)	1.3 acres
3 AZ F:7:15(ASM)	Euro-American, late 19th to early 20th century	historical trash scatter	Features: road, 2 rock piles Artifacts: 2000 (estimated), 1 prehistoric potsherd	6.3 acres
4 AZ F:7:16(ASM)	Euro-American, late 19th to early 20th century	historical trash scatter	Features: none Artifacts: 38	0.03 acre
5 AZ F:7:17(ASM)	Euro-American, late 19th to early 20th century	historical trash scatter	Features: none Artifacts 500 (estimated)	1.4 acres
6 AZ F:7:18(ASM)	Euro-American, late 19th to early 20th century	historical trash scatter	Features: rock ring, modern survey marker Artifacts: 200 (estimated)	0.5 acre
7 AZ F:7:19(ASM)	Euro-American, late 19th century	historical road	Feature: road Artifacts: none	4.4 miles long, 0.1 mile surveyed
8 AZ F:7:20(ASM)	Euro-American, mid-20th century	historical road	Features: road Artifacts: none	2.8 miles long, 0.1 mile surveyed
9 AZ F:7:21(ASM)	Euro-American, undated	rock features	Features: 2 rock rings, 1 rock stack Artifacts: none	less than 0.01 acre
10 AZ F:7:22(ASM)	Euro-American, late 19th century to modern	historical trash scatter	Features: remnants of small wood structure, 5 rock stacks, 3 mining claim markers, 2 pits with berms, berm, depression Artifacts: 21	2.3 acres
11 AZ F:7:24(ASM)	Euro-American, late 19th to early 20th century	historical trash scatter	Features: none Artifacts 16,000 (estimated)	19.7 acres
12 AZ F:7:25(ASM)	Euro-American, late 19th to early 20th century	historical trash scatter	Features: none Artifacts: 2,000 (estimated)	5.8 acres
13 AZ F:7:26(ASM) El Dorado Ferry/ White Hills Road	Euro-American, late 19th century	historical road	Feature: road Artifacts: none	4.2 miles long, 0.1 mile surveyed

NOTE: [1] These sites have been evaluated as eligible for the National Register under Criterion D for their potential to yield important information. Ongoing consultations with the State Historic Preservation Office and tribes could determine that these sites are eligible under additional criteria.

3.6.4 Traditional Cultural Resources and Other Cultural Resources Sensitive to Visual Impacts

Cultural resources that might be affected by visual impacts include protected or interpreted sites in national parks and monuments, historic sites, landmarks, and trails; properties listed in the National Register of Historic Places; Areas of Critical Environmental Concern (ACECs) designated by BLM to protect important cultural resource values; traditional cultural resources, and other cultural resources for which there is agency or public sentiment for protection in place. Traditional cultural resources include traditional tribal territories, settlements, and use areas; sacred sites; or other areas of cultural or religious importance.

BLM is consulting with 13 tribes regarding potential impacts on archaeological sites and traditional cultural resources (see Section 5.2.2.3 for a list of tribes). Representatives of five of those tribes (Hualapai Tribe, Fort Mojave Tribe, Colorado River Indian Tribes, Yavapai-Prescott Indian Tribe, and Las Vegas Paiute) have participated in meetings and field tours, and the Hopi Tribe has provided comments by letters. Those six tribes have expressed support for BLM's effort to inventory and consider potential

effects on cultural resources, and recommended that BLM protect the environment of the Project Area and its animal and plant resources just as their ancestors did when the land was their traditional territory. The Hopi Tribe expressed special concerns about potential impacts on raptors.

The Project Area is in the White Hills, which were within territory that the Red Rock Band of the Hualapai occupied during ethnohistoric times. The Hualapai Reservation is about 23 miles east of the Project Area. The Hualapai referred to the White Hills as Moon Mountain (Wi Hla) and their traditions maintain that Eagle Man and Eagle Woman lived in the hills. Springs were important places of Hualapai habitation and gardening, but there are few springs in the White Hills and none have been identified in or near the Project Area; no evidence of Hualapai habitation sites has been found.

The records review identified one National Register-listed traditional cultural property within 20 miles of the Project Area. The place, which is known as Gold Strike Canyon-Sugarloaf Mountain, is about 16 miles northwest of the Project Area near Hoover Dam. Consultations conducted in conjunction with construction of the highway bypass around Hoover Dam determined that this location has traditional cultural significance for the Southern Paiute, Mojave, Hualapai, Yavapai, Hopi, Zuni, and Navajo. In conjunction with the assessment of potential visual impacts of the proposed Project on landscape character and scenic quality, the Hualapai Tribe Department of Cultural Resources identified seven natural geographic features as potential key observation points based on traditional cultural interests (Table 3-14). Prior ethnographic studies identified some of those places as traditionally named use areas, but the Hualapai Tribe has not provided specific information about the traditional cultural significance of those natural geographic features. During the course of consultations, Hualapai representatives also expressed a general concern about potential impacts on mountain slopes, hills, and caves because they were often used as burial grounds, but no specific burial areas have been identified.

Table 3-14 Traditional Cultural Resources

	Geographic Name	Traditional Name	Tribe	National Register Status	Distance from Project Area
1	none (source of salty earth)	Mata Thija	Hualapai	unevaluated	possibly in right-of-way
2	Squaw Peak		Hualapai	unevaluated	in right-of-way
3	Senator Mountain		Hualapai	unevaluated	1.5 miles
4	Pilot Knob		Hualapai	unevaluated	3 miles
5	Wilson Ridge	Wi Gawad	Hualapai	unevaluated	5 miles
6	Mount Wilson		Hualapai	unevaluated	9 miles
7	Red Lake	Mat Kwata	Hualapai	unevaluated	17 miles
8	Gold Strike Canyon–Sugarloaf Mountain		Southern Paiute, Mojave, Hualapai, Yavapai, Hopi, Zuni, and Navajo	listed in 2004	16 miles

One of the natural features identified by the Hualapai Tribe, Squaw Peak, is within the Project Area Traditional Hualapai consider mountain peaks to be places of powerful spirits and the home of the spirits of the dead, and shamans are said to have conducted ceremonies on mountain peaks. Another traditional Hualapai cultural resource is Mata Thija, a small cave where the Hualapai Red Rock Band gathered salty earth. Documentation of the cave's location is ambiguous (Dobyns 1957). Although the Hualapai Tribe identified a possible location for Mata Thija within the southern part of the proposed Project ROW, no cave was found in the area.

Four other traditional Hualapai cultural resources are hills or peaks outside the Project ROW but within the Project viewshed. The closest of these, Senator Mountain, is about 1.5 miles east of the Project Area. The three others—Pilot Knob, a place on Wilson Ridge known in Hualapai as Wi Gawad, and Mount Wilson—are about 3 to 9 miles west of the Project Area.

The other traditional Hualapai cultural resource, Red Lake, is an ephemeral playa in Hualapai Valley, about 17 miles southeast of the Project Area. Red Lake was a source of water when rainfall runoff was sufficient to reach the valley floor. The Red Rock Band shared the harvests of seedy plants that grew up around the playa with other Hualapai bands, and probably hunted game when the playa held enough water to attract wildlife.

The Hualapai used the Cerbat Mountains, several miles southeast of the Project Area, for centuries as a place for winter habitations and hunting and gathering. The mountains were a battleground of the Hualapai and the U.S. Army during conflicts resulting from increased mining in the area in the 1860s, and the Hualapai held a Ghost Dance in the Cerbat Mountains around 1890. During the reservation era, many Hualapai learned ranching skills when they were employed at Anglo-owned ranches in the vicinity of the Cerbat Mountains.

Other cultural resources that might be affected by visual impacts outside the Project Area were identified in conjunction with the assessment of potential visual impacts on landscape character and scenic quality out to a distance of 20 miles. Those cultural resources were identified by reviewing the Kingman RMP (BLM 1995) and maps of northwestern Arizona and southern Nevada, and consulting with agency cultural resource specialists. In addition to the eight identified traditional cultural resources, eight other cultural resources sensitive to potential visual impacts were identified (Table 3-15).

Table 3-15 Cultural Resources Sensitive to Potential Visual Impacts (within 20 Miles)

	Resource	Description	Distance from Project Area
1	historic White Hills townsite and cemetery	site of silver mining community, circa 1892 to 1902, few remnants left, cemetery on public land	2 miles
2	Black Mountains Ecosystem Management ACEC	desert bighorn sheep habitat and wild burro management area, numerous archaeological sites, including rockshelters (including Bighorn Cave), campsites, pictographs, and mining cabins	5 miles
3	Temple Bar Mission 66 Facilities	example of mid-twentieth-century National Park Service program to upgrade facilities	7 miles
4	Petroglyph Wash	concentration of petroglyphs in canyon of Colorado River tributary within the Lake Mead National Recreation Area	10 miles
5	Joshua Tree-Grand Wash Cliffs ACEC	densest stand of Joshua trees in Arizona and 10 miles of scenic 2,000-foot-high cliffs, numerous archaeological sites (many with roasting pits)	12 miles
6	Willow Beach Gauging Station	built in 1934-1935 and operated to 1939 to measure river flows below Hoover Dam, listed in National Register in 1986	12 miles
7	Old Spanish National Historic Trail	trail used for trade between Mexican settlements in northern New Mexico and southern California, circa 1829 to 1840s	16 miles
8	Hoover Dam National Historic Landmark	massive concrete arch-gravity dam built between 1931 and 1936; designated a National Historic Landmark in 1985	17 miles

NOTE: ACEC = Area of Critical Environmental Concern

Remnants of the abandoned White Hills townsite are about 2 miles south of the Project Area. Most of the townsite and adjacent mines are on private land but an associated cemetery is on public land adjacent to the townsite.

The Old Spanish National Historic Trail originated as the route that the merchant Antonio Armijo followed in 1829 to lead a caravan of about 60 men and 100 mules from Mexican settlements in northern New Mexico to missions in California. The closest segment of Armijo's original route down the Virgin River valley to the Colorado River is about 16 miles north of the Project Area in the Lake Mead NRA but it is inundated by Lake Mead.

There are NPS "Mission 66" facilities at Temple Bar in the Lake Mead NRA about 7 miles north of the Project Area. Mission 66 was a mid-twentieth-century NPS program to expand staff and upgrade deteriorating park facilities to meet the needs of increased visitation of the national parks. The 10-year Mission 66 program was completed in 1966—the fiftieth anniversary of the founding of the NPS—and Mission 66 facilities are considered a milestone in the agency's history. Petroglyph Wash, located in the Lake Mead NRA area more than 10 miles northwest of the Project Area, has a significant concentration of petroglyphs pecked on canyon walls.

The BLM designated the Joshua Tree–Grand Wash Cliffs ACEC primarily to protect the densest stand of mature Joshua trees in Arizona and the scenic qualities of about 10 miles of the 2,000-foot-high Grand Wash Cliffs. Numerous prehistoric archaeological sites have been found in the area and protection of those resources for scientific and educational purposes was a secondary reason for designating the ACEC. At its closest, the Joshua Tree–Grand Wash Cliffs ACEC is about 12 miles east of the Project Area.

BLM designated the Black Mountains Ecosystem Management ACEC primarily because it is outstanding desert bighorn sheep habitat and also includes the Black Mountain Wild Burro Herd Management Area. The ACEC also provides protection for a variety of cultural resources, including Bighorn Cave (which is listed in the National Register), other prehistoric rockshelters, campsites, and pictographs, and remains of some of the oldest Euro-American mining cabins in Mohave County. The cultural resources in the ACECs are primarily significant for their potential to yield information, which would not be affected by visual impacts. At its closest, the northern edge of the Black Mountains Ecosystems Management ACEC is about 5 miles southwest of the Project Area.

Hoover Dam, which was built between 1931 and 1935, was designated a National Historic Landmark in 1985. The dam is about 17 miles northwest of the Project Area. The National Register-listed Willow Beach gauging station, built in 1934 and operated until 1939 in conjunction with the construction of Hoover Dam, is about 16 miles west of the Project Area.

3.6.5 Indian Trust Assets

Indian trust assets are legal interests in property held in trust by the United States for Indian tribes or individuals. The Secretary of the Interior, acting as the trustee, holds many assets in trust. Examples of trust assets are lands (including tribal trust, fee title, and allotted lands); minerals; hunting and fishing rights, and water rights. While most Indian trust assets are on reservations, they may also be found off-reservations. The United States has a trust responsibility to protect and maintain rights reserved by or granted to Indian tribes or Indian individuals by treaties, statutes, and executive orders. These are sometimes further interpreted through court decisions and regulations. Consultation with the Bureau of Indian Affairs confirmed that there are no Indian trust assets in the Project Area.

3.7 PALEONTOLOGICAL RESOURCES

3.7.1 Introduction

The paleontological setting and assessment for the proposed Project were based on a review of data gathered from the Arizona Geological Survey, USGS, the Arizona Museum of Natural History, and paleontological and geologic literature. Dr. Pat Hester, regional paleontologist with the BLM Albuquerque District Office, was consulted. No site visit was made. The study area considered for the paleontological analysis is the same as the Project Area as defined in Chapter 2.0 of this EIS.

3.7.2 Regional Overview

The study area lies between the Basin and Range province and the Colorado Plateau. The Colorado Plateau endured the Cenozoic without disruption, but the Basin and Range Province underwent extreme attenuation. The area between the two has been termed the northern Colorado River extensional corridor (Faulds et al. 1990). It is characterized by detachment faulting, and the South Virgin-White Hills detachment fault snakes along its length. Magmatization in the area began 20 to 18 million years ago; east-west extension occurred from 16 to 8 million years ago (Faulds et al. 2008). Cenozoic volcanic and sedimentary rocks filled the White Hills Basin before it was disrupted by the South Virgin-White Hills detachment fault. As much as 10.7 miles (17 kilometers) of Proterozoic metamorphic rock now separate the north and south basin segments. The basin segments now constitute areas of east-dipping volcanic and sedimentary rocks. The igneous and sedimentary rocks of the northern and southern segments of the White Hills Basin together with the intervening metamorphic rocks make up the White Hills. Middle Miocene to Quaternary basin fill sediments overlie these in some areas.

3.7.3 Existing Conditions

The proposed Wind Farm Site lies within the northern White Hills, between Detrital Valley to the west and Hualapai Valley to the east. It lies within townships T28N, R19W, T28N, R20W, T29N, R19W, and T29N, R20W. These are found on the Senator Mountain, Senator Mountain SW, Senator Mountain NE, and Senator Mountain NW USGS, 7.5 minute topographic maps.

3.7.3.1 Geologic Setting

Wilson and Moore (1959) mapped the area as part of their mapping of Mohave County geology. Faulds et al. (2008) mapped it in their study of the boundary area between the Colorado Plateau and the Basin and Range province. The White Hills predominantly consist of Tertiary aged sedimentary and igneous rocks, along with Proterozoic metamorphic rocks. One granitic intrusion is also present to the southwest of the Project. The Tertiary sedimentary rocks predominantly consist of sandstone, mudstone conglomerates, and unconsolidated sediments (sands and gravels). These sedimentary units generally outcrop at the lower elevations within the White Hills. None of the published maps assign formational names to these geologic units. Holocene to latest Pleistocene formations found in the Project Area are known to be fossiliferous elsewhere; however, no fossils have been recorded in the Project Area and no paleontological field survey has been completed in the Project Area. If fossils are found during ground disturbing activities, mitigation measures would be implemented.

3.7.3.2 Paleontological Resources

A search was made for pertinent information on paleontological resources in available geological and paleontological literature. A paleontological records search from the Arizona Museum of Natural History was conducted to extend 1 mile beyond the Wind Farm Site.

3.7.3.3 Literature Search Results

A search of geologic and paleontological literature yielded no records of paleontological resources within the Project Area. Works consulted include Lindsay and Tessman (1974), Lucas and Morgan (2005a and b), McCord (1994), Mead (2005), Meade et al. (2005), and Morgan and White (2005). The current geological conditions associated with the access road are similar to those of the Wind Farm Site within the Project Area.

3.7.3.4 Paleontological Records Search Results

The results of the paleontological records search were provided by Dr. Robert McCord (2010). He found evidence of 15 vertebrate paleontological localities within Mohave County. Dr. McCord reported that the Arizona Museum of Natural History, the Museum of Northern Arizona, the Northern Arizona University Quaternary Studies Program collections, and the collections at the University of Arizona have no evidence of paleontological sites within 10 miles of the Project Area.

3.8 LAND USE

3.8.1 Introduction

This section discusses existing regional and Project Area land use (including special management areas), recreation, livestock grazing, and access route ROWs.

Regional and Project Area data were collected from published literature reviews, online research, and coordination with the BLM and Reclamation. There were no field surveys conducted. The study area considered for the land use, recreation, and livestock grazing analysis is the same as the Project Area as defined in Chapter 2.0 of this EIS.

3.8.2 Regional Overview

Within northwestern Arizona in Mohave County, land is managed by BLM, Reclamation, NPS, State Trust, and private land owners (Map 3-8, Land Use). Mohave County encompasses 13,286 square miles with approximately 2,485 square miles under private ownership (Mohave County 2011). The U.S. Forest Service and BLM administer 55.2 percent of the land, Indian reservations cover 6.7 percent, and the State of Arizona administers 6.6 percent of land within the county. Much of the public land managed by the BLM Kingman Field Office is characterized by large areas of intermingled ownership. Mohave County includes diverse communities and development ranging from urban to rural (Arizona Department of Commerce 2008).

The nearest communities to the Project Area include White Hills, Arizona (located approximately 5 miles south), Dolan Springs, Arizona (located approximately 15 miles south which are both within unincorporated Mohave County). Other more distant communities include the City of Kingman, Arizona (located approximately 37 miles southeast), Boulder City, Nevada (located approximately 37 miles west) and Henderson, Nevada (located approximately 40 miles northwest).

3.8.2.1 Land Use Plans Applicable to the Project and Surrounding Area

The Project Area is located within the BLM Kingman Resource Area and is managed by the BLM Kingman Field Office under the jurisdiction of the Kingman Resource Area Resource Management Plan approved by the Record of Decision dated March 7, 1995 (the Kingman RMP) (BLM 1995). The Kingman Field Office oversees more than 2.4 million acres of public land in Mohave and Yavapai Counties in northwestern Arizona located south and east of the Colorado River, south of Lake Mead and south of the Hualapai Indian Reservation. The Kingman RMP contains decisions for managing public lands and resources administered by the BLM in the Kingman Resource Area. The Resource Management Plan guides the management of public lands, associated resources and diverse multiple uses on the resource area over a 20 year time period. The RMP does not have any specific management plans or special land use designations in the Project Area. Management plans for livestock grazing and recreation in the Project Area are described in Section 3.8.4.2 and 3.8.4.3.

The Project Area is located within Reclamation's Lower Colorado Region and is managed by Reclamation under the guidance of Policies, and Directives and Standards. The Lower Colorado Region covers an area of nearly 202,000 square miles, and encompasses parts of five states that contribute water to or draw water from the Colorado River. Reclamation manages the Colorado River and its reservoirs to meet water and power delivery obligations, protect endangered species and native habitat, support outdoor recreation opportunities, and provide flood control. Reclamation has management plans in place where resource issues and allocation decisions warrant. The Project Area is not subject to such a plan.

The Lake Mead National Recreation Area (NRA) General Management Plan (GMP) was approved in 1986 and provides a general framework to guide future NPS management decisions for the NRA. The GMP analyzes the fundamental resources that are critical to achieving the NRA purpose and maintaining its significance, describing specific desirable resource conditions and visitor use goals. The Lake Mead NRA GMP focuses on accommodating increasing visitor use while protecting the area's most outstanding cultural and natural resources. The GMP was amended in 2005 to provide additional and more specific guidance for the long-term management of Lakes Mead and Mohave. The GMP does not provide any specific management guidance or requirements for the Project Area or NPS-managed lands immediately adjacent to the Project Area. The NPS Lake Mead GMP states that "the National Park Service will work with the Bureau of Land Management to ensure protection of natural and scenic values on these adjacent Federal lands" (NPS 1986).

The Arizona State Land Department has not established a specific land use management plan for State Trust land in the vicinity of the Project, but they do have goals, policies, and programs in place to manage and provide support for resource conservation programs for the well-being of the public and the State's natural environment including recreation and livestock grazing.

Private lands in the vicinity of the Project Area are under the jurisdiction of Mohave County and are subject to the policies set forth in the Mohave County General Plan. The Mohave County General Plan was originally adopted in 1965 and was reassessed and revised in 1995, 2005, and 2010. The Mohave County General Plan consists of existing and anticipated conditions affecting the county, establishes goals, policies and implementation measures that guide the counties future actions, and describes actions to take to achieve the counties desired future. The county's general plan is intended to provide a clear understanding of the development patterns the community has found to be most appropriate. As such, it sets forth the policies that will guide the county's review of individual development proposals.

The Land Use Element of the Mohave County General Plan supports the efficient use of public and private resources by promoting urban growth in areas where infrastructure is already in place or in close proximity. The pattern of development described by the general plan reduces the potential for locating incompatible land uses adjacent to one another. The goals, policies and implementation measures of the plan provide guidance for ensuring land use compatibility.

The following goals and policies from the Energy Section of the Mohave County General Plan could be applicable to proposed alternative energy facilities:

> **Goal 6**: To encourage the efficient use of alternative energy sources by residential and nonresidential users.
>
> - **Policy 6.1** The County should support the voluntary use of alternative energy through its subdivision, zoning and building regulations.
>
> - **Policy 6.2** The County should support the use of alternative energy.

- **Policy 6.3** The County should work with local utilities to explore opportunities to encourage the use of alternative energy.

- **Policy 6.4** The County should support and encourage the development of beneficial alternative energy production facilities in conducive locations, that are consistent with any existing adjacent development, and the community in which the facilities will be located.

3.8.3 Regional Land Use

3.8.3.1 Residential and Commercial Uses

There are several proposed land development projects in the region. These projects include planned communities for the Ranch at White Hills and Mardian Ranch, and the Villages of White Hills (see Map 3-8). The Ranch at White Hills and Mardian Ranch is a proposed master planned area encompassing 25,360 acres of privately owned lands in and around the White Hills area of Mohave County, Arizona. The Ranch at White Hills and Mardian Ranch is composed of four distinct planning group properties: The Ranch at White Hills (6-10 dwelling units/acre [du/ac]), The Ranch at Temple Bar (3-5 du/ac), The Mardian Ranch and Ranch at Red Lake (3-5 du/ac), and the Table Mountain Renewable Energy properties. The Ranch at White Hills development also identifies 80 acres of proposed commercial development at White Hills Road and US 93, and further site-specific commercial development property along Pierce Ferry Road (Arizona Acreage, LLC 2004). The Village at White Hills is a planned 2,727-acre community with commercial, recreation, and open space uses. The community, as proposed, would include more than 20,000 dwelling units spread across four distinct villages with their own village center which include residential densities of 5 du/ac, 12 du/ac, and 25 du/ac. This project also proposes to include commercial development at the entrance to the community along US 93, as well as 150 acres of dedicated parks and open space.

In addition to the land development projects in the region, there are a small number of homes on larger lots located in Dolan Springs. Private property located south of the Wind Farm Site consists of lots that are at least 5 acres in size or larger. Section 3.10 provides the population densities and demographic information for this area.

3.8.3.2 Utility Uses

Utility corridors in the region include three existing transmission lines, two 500-kV lines and a 345-kV line. The 500-kV Moenkopi-El Dorado line is located south of the Project Area. Two parallel Western transmission lines (500-kV and 345-kV) with an east-west orientation are located north of White Hills, Arizona, and pass through the southern portion of the Project Area (see Map 3-8). In addition, there are three proposed transmission lines in the immediate vicinity of the Project Area. An approximately 900-mile overhead, high-voltage direct current transmission line from northeast New Mexico to southern California is being proposed by Clean Line Energy Partners. One corridor under consideration is located south of the Project Area and north of Kingman. A 500-kV transmission line is planned to parallel the existing Moenkopi-El Dorado line, south of the Project Area, to be owned and operated by the Navajo Tribal Utility Authority. The West-wide Energy Corridor Programmatic EIS has proposed a 500-kV transmission line to parallel the existing Western 500-kV and 345-kV transmission lines north of White Hills in the southern portion of the Project Area.

There are numerous communications facilities on public lands in the region, most consisting of specific use facilities to serve linear ROWs, such as pipeline and powerline control operations or cellular telephone relays. Eleven mountaintop communication sites have been designated in the region. The three sites located closest to the Project Area include Senator Mountain to the southeast, Patterson Slope to the east, and Willow Beach to the west. All three of these nearby sites are electric communication sites (BLM 1995).

3.8.3.3 Mining Uses

There are several closed mine sites, prospect sites, and other mineral features in the region. The area with the most mining activity is southeast of the center of the Project Area in the White Hills Mineral District (see Map 3-4). This area contains approximately 20 closed mines and one prospect site that have been mined primarily for gold and silver. The Project is within an area of low favorability for mineral mining. The Project Area is not in a mining district and there are no active mining claims within the proposed Project Area.

3.8.3.4 Aviation Uses

Triangle Airpark is located 0.5 mile northeast of White Hills Road and US 93. The airport has two runways (one asphalt and one dirt) and is privately owned by Boulder City Aero Club Inc. The airport is available for private use only. The Federal Aviation Administration visual flight rule restricts the use of the airpark to day use only.

3.8.3.5 Special Management Designations

Special management designations provide additional protection for areas with unique natural, historic, scenic, or recreational resources. BLM special designations can include National Monuments, National Conservation Areas, ACECs, Wilderness Study Areas, Back Country Byways, National Historic or Scenic Trails, Wilderness, and Wild and Scenic Rivers. Wilderness Study Areas and ACECs are BLM administrative designations, while the other special designation areas are created by presidential proclamation or an act of Congress.

The Route 66 National Back Country Byway begins 5 miles south of Kingman, approximately 40 miles south of the Project Area. The Joshua Tree Forest/Grand Wash Cliffs ACEC, designated to protect unique vegetation and scenic values, is located east of the Project Area. The Black Mountains ACEC, designated to protect big horn sheep, wild burro habitat, and cultural resources, is located to the southwest, and Lake Mead NRA is located to the north. The Cerbat Foothills Recreation Area Trail System, located approximately 10 miles northwest of Kingman, is a cooperative effort between the BLM, AGFD, and the City of Kingman. The area is managed for recreational purposes, which includes hiking, mountain biking, and horseback riding. There are no Special Recreation Management Areas (SRMAs) located in the region.

An inventory evaluating the presence or absence of wilderness character on BLM-administered lands was completed in 1980 which determined that wilderness character was absent in the Project Area. The wilderness characteristics inventory maintenance completed in July 2010 also found that wilderness characteristics are not present on BLM-administered lands in the Project Area (Fuselier 2010). Based on the analysis, BLM determined that the 1980 inventory findings indicating that BLM-administered lands within the Project Area do not possess wilderness character remains valid. A survey was not completed for lands administered by Reclamation because Reclamation does not manage for wilderness characteristics. As such, wilderness character will not be further analyzed in this EIS.

3.8.3.6 Wilderness and Proposed Wilderness Areas

The 23,900-acre Mount Wilson Wilderness Area is located approximately 20 miles northwest of the Project Area on lands administered by BLM. The area, encompassing 8 miles of Wilson Ridge, contains a diverse landscape of mountains, desert, mesas, cliffs, and badlands. Several springs found in the area support a variety of wildlife, including a population of desert bighorn sheep. Approximately 4 miles north and 1 mile east of the Project Area, Lake Mead NRA contains areas that NPS proposed as wilderness in 1979 (see Map 3-8, Land Use). Temple Bar Back Road and Temple Bar Road provide vehicle access into these areas. Recreation opportunities in the wilderness area and proposed wilderness area include wildlife viewing, hunting, hiking, primitive camping, backpacking, and horseback riding.

3.8.3.7 Recreation

Located in the Mojave Desert, the region offers a wide variety of recreational experiences and opportunities due to the topography, terrain, vegetation, scenic values, historic resources, wildlife, wilderness, and riparian resources. The area is in a transition between the Basin and Range and the Colorado Plateau physiographic provinces (BLM 1995) and contains the Black, Cerbat, Haulapai, McCracken, and Aquarius mountains. Scenic features are diverse in topography and include the Grand Wash Cliffs, Cerbat Pinnacles, Squaw Peak, Pilot Knob, Senator Mountain, Mount Nutt, and the Hualapai Mountains. A wide variety of recreational pursuits including camping, backpacking, horseback riding, hiking, rockhounding, off-highway vehicle (OHV) use, hunting, recreational target shooting, fishing, and wildlife viewing take place within the region. While there are no designated horse or hiking trails within the Project Area, there are two-track trails that are considered primitive roads. Regional helicopter tours, which generally originate in Las Vegas, include sight-seeing flights to the Grand Canyon and Lake Mead RNA; some of these flights pass over the Project Area. Recreation opportunities exist in remote areas and designated areas (i.e., campgrounds, wilderness areas, recreation areas). Mohave County contains numerous Federal, State, and local parks and recreation areas within the region.

Special Recreation Permits (SRPs) are BLM-granted land use authorizations that allow specified recreational uses of public lands. There are five types of recreation uses in which BLM would require an SRP; commercial use, competitive use, vending, special area use, and organized group activity and event use. In the Kingman Field Office, from 2007 to 2011, an average of 6 commercial and competitive SRPs were issued each year (Table 3-16) (BLM 2012). Commercial permits were issued for hunting outfitter and guide services and a competitive use permit was issued in 2009 for a motorized event.

Table 3-16 Special Recreation Permits Issued in the BLM Kingman Field Office

	2007	2008	2009	2010	2011
Commercial Permits	3	5	6	7	8
Competitive Use Permits	0	0	1	0	0
Total	3	5	7	7	8

SOURCE: Bureau of Land Management 2012

Reclamation issues Reclamation Recreation Purpose Licenses to individuals, groups of individuals, profit or nonprofit organizations, or commercial operators that grant permission to use lands under the jurisdiction of Reclamation for recreation purposes beyond those normally provided to the general public. The last Reclamation Recreation Purpose License issued by Reclamation in the region was in 2009 for the Colorado River Heritage Greenway Park and Trails.

Managed by the NPS, Lake Mead NRA is identified as a designated recreation area which provides primitive and non-primitive recreation opportunities (see Map 3-8). The Lake Mead NRA includes two reservoirs and covers approximately 1.5 million acres of land. It is characterized by a contrast of desert

and water, mountains and canyons, and primitive backcountry and public marinas. Recreation opportunities are diverse within the recreation area and include hiking, boating, horseback riding, fishing, hunting, kayaking, swimming, camping, scuba diving, wildlife viewing, biking, and picnicking. The Lake Mead NRA estimates that more than 7.3 million persons visit the recreation area annually (Holland 2012).

Numerous roads provide access to Lake Mead NRA, including Temple Bar Road, which branches off from U.S. 93. According to the Mohave County Public Works Traffic Count, 123 vehicles were recorded using the Temple Bar Road per day. The count period was between October 26, 2010 and November 2, 2010 (Mohave County Public Works 2010). This count was not taken during summer, which is the high use season of Lake Mead NRA, and may not present a fully accurate representation of yearly use of Temple Bar Road. Traffic data on certain roads within Lake Mead NRA are also maintained by NPS. Based on the traffic counts, NPS estimates that about 81,000 visitors entered Lake Mead NRA via Temple Bar Road in 2009 and about 68,000 visitors used this road in 2010 (Holland 2012). Therefore, of the approximately 7.3 million visitors, approximately 1 percent of the visitors use Temple Bar Road for access.

Although there are no formally established trails in the vicinity of the Project Area near the Lake Mead NRA, there are a number of approved backcountry roads that provide access to the park. In addition, there are designated campsites identified in the park's Backcountry Management Plan at the intersection of Temple Bar Road and Salt Spring Road; Salt Spring and Gregg's Hideout. Based on traffic count data, NPS estimated that in 2010 approximately 2,500 people per year travel on Temple Bar Backcountry Road. This is based on the number of vehicles counted on AR 134 (backroad to Gregg's Hideout) which is a road similar to Temple Bar Back Road. (See Section 3.9 for traffic count data.) Visitor activity in the area is primarily day use.

Mohave County Parks Department manages four community parks in the region and three special use parks, all outside of the Project Area. The community parks, including Mt. Tipton, Veteran's, Neal Butler, and Chloride, range in size from 1 acre to 18 acres and provide recreation opportunities including picnicking, walking, and athletic activities. The closest park, Mt. Tipton Community Park, is located approximately 15 miles south of the Project Area in Dolan Springs on Pierce Ferry Road just east of US 93. Approximately 6 acres in size, the park offers a lighted ramada with picnic tables, a pit barbecue, horseshoe pits, baseball diamond, basketball court, and a playground area for children.

The Mohave County special use parks include Hualapai Mountain Park and Davis Camp. These parks provide additional recreational opportunities within the region of the Project Area. The approximately 2,300-acre Hualapai Mountain Park is located more than 45 miles from the Project Area. Recreation opportunities include hiking, camping, backpacking, picnicking, OHV use, mountain biking, and horseback riding. Davis Camp is also located more than 45 miles from the Project Area and provides opportunities for picnicking, camping, boating, fishing, target shooting, and athletic activities (Mohave County 2010).

The City of Kingman, located approximately 37 miles south of the Project Area, manages 13 parks ranging in size from 2 acres to 51 acres. Recreation activities at City of Kingman parks include picnicking, walking, and athletic activities.

Other recreation areas in the project vicinity include the Hoover Dam to the north and Colorado River Heritage Greenway Park and Trails to the south. These recreation areas and facilities provide diverse recreation opportunities such as boating, camping, OHV use, fishing, hunting, wind-surfing, sailing, picnicking, wildlife viewing, hiking, swimming, and sightseeing.

3.8.3.8 Livestock Grazing

Historic livestock grazing practices in northwest Arizona, including within the region, 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, 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 and Guidelines for Rangeland Health* (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.

Grazing allotments on public lands in the region 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 in Mohave County are designated as perennial or ephemeral. Forage availability in the allotments is both ephemeral and perennial and most ranching operations on public land in the region are yearlong cow-calf enterprises.

Rangeland improvement projects have been constructed throughout the region to improve livestock grazing. Rangeland improvements such as springs, wells, storage tanks, and rain catchments have been developed in the region to provide water for livestock and wildlife. Rangeland improvement features in Big Ranch Unit A include unfenced reservoirs, troughs, windmills, and livestock fencing. Big Ranch Unit B range features include a trough, storage tank, and two developed springs (see Map 3-8). There are no rangeland improvement projects located on Reclamation-administered lands in Big Ranch Unit B.

3.8.4 Project Area Overview

This section describes the existing land use, recreation, and livestock grazing conditions within the limits of the Project Area.

3.8.4.1 Project Area Land Use

The proposed Project Area is primarily composed of undeveloped open space/vacant lands. Land uses within the Project Area include ROWs, a utility corridor, recreational uses, and livestock grazing operations. No existing residential commercial, industrial or public facilities are located within the Project Area. Table 3-17 lists the land jurisdiction status within the boundary of the Wind Farm Site by action alternative. There are no private lands within the boundary of the Wind Farm Site or the associated features that comprise the Project Area.

Table 3-17 Land Jurisdiction Status within the Proposed Wind Farm Site

Jurisdiction	Alternative A		Alternative B		Alternative C	
	Acres	Percent	Acres	Percent	Acres	Percent
BLM	38,099	81	30,872	89	30,178	85
Reclamation	8,960	19	3,848	11	5,124	15
Total	47,059	100	34,720	100	35,302	100

ROWs for utilities and roads are located throughout the Project Area. Approximately 6 miles of the Mead to Phoenix designated utility corridor is located within the Wind Farm Site. Within this designated utility corridor, approximately 6 miles of the ROW for a 345-kV Liberty-Mead power line operated by Western crosses the southern portion of the Project Area east to west (see Map 3-8). Refer to Section 3.9 for information on transportation ROWs throughout the Project Area. The land use designation in the Mohave County General Plan for land that includes the Project Area is Rural Development Area. This includes both BLM-administered and Reclamation-administered lands. The General Plan states that Mohave County should "coordinate its planning efforts with those of state and Federal agencies in order to set and carry out compatible planning and development policies" (Mohave County 2010) and a plan amendment would provide for better consistency with established land use plans. There are no private lands within the boundary of the Project Area, but there are lots south of the site that are at least 5 acres in size.

3.8.4.2 Recreation

Lands within the Project Area are managed by BLM as the Kingman Extensive Recreation Management Area (ERMA). The Kingman ERMA provides opportunities for dispersed recreation including motorized and non-motorized activities for people from nearby communities, including the City of Kingman, Arizona. BLM manages the ERMA where recreation is non-specialized, dispersed, and does not require intensive management or developed facilities. The ERMA is managed to provide for public safety and protection of resources. The Project Area includes a variation in topography and terrain and ecologically diverse landscapes. The BLM Recreation Opportunity Spectrum (ROS) defines six classes of recreation opportunities ranging from primitive natural, low-use areas to urban highly developed, intensive use areas.

The BLM uses ROS classifications to set recreation management objectives for recreation management areas. Objectives are established to provide opportunities for desired recreation activities and to guide management of the setting needed to support those activities and the desired recreation experience. While the Kingman RMP did not establish ROS classifications for management of the ERMA where the Project is located, the current setting could be associated with a semi-primitive motorized objective. This objective allows for some opportunity for isolation from man-made sights, sounds, and management controls in a predominantly unmodified environment. It provides the opportunity to have a high degree of interaction with the natural environment, to have moderate challenge and risk and to use outdoor skills. The concentration of visitors is low, but the evidence of other area users is present.

Recreation opportunities in the Project Area include photography, backpacking, wildlife viewing, horseback riding, hunting, primitive camping, hiking, target shooting, and OHV use. All motorized vehicle use is restricted to existing roads, trails, and washes. One commercial Special Recreation Permit was issued in the Project Area in 2009 for a competitive event (BLM 2011), but there are no organized recreation events or Special Recreation Permits issued currently for activities or events in the Wind Farm Site.

AGFD manages hunting and trapping throughout the state including areas in and around the proposed Project Area. The Project Area is located in Arizona Game Management Units 15B and 15B-E. Wildlife species hunted within Game Management Units 15B and 15B-E include pronghorn antelope, elk, desert bighorn sheep, mountain lion, mule deer and javelina, and upland game bird species including dove and quail. As of 2008 data, the average number of hunting permits processed for the three most targeted species over the past five years includes: mule deer (390 permits), bighorn sheep (13 permits), and an antelope (7 permits). According to AGFD data, the most common game species that inhabits parts of the project area is mule deer (AGFD 2008).

3.8.4.3 Livestock Operations/Grazing Allotments/Grazing Permits

The Project Area is located on portions of two grazing allotments: Big Ranch Unit A and Big Ranch Unit B (Table 3-18). A majority of the Project Area is located within the Big Ranch Unit A allotment. The BLM categorizes grazing allotments by three types of management priority; "I" for improve, "M" for maintain, and "C" for custodial. Allotments within the Project Area are categorized as "I" for improve, and "C" for custodial. The two grazing allotments encompassing the Project Area are classified as ephemeral and authorized for yearlong cow-calf enterprises. In Arizona, BLM grazing allotments classified as ephemeral are rangelands that do not consistently produce enough forage to sustain a year round livestock operation but may briefly produce unusual volumes of forage to accommodate livestock grazing. Livestock grazing is permitted on Reclamation-administered land and, prior to issuing a grazing lease; the lessee determines carrying capacities and establishes a grazing plan to maintain productive rangelands (Reclamation 2002). There are no rangeland improvement features in Big Ranch Unit A or Big Ranch Unit B within the proposed Wind Farm Site (Map 3-8).

Table 3-18 Grazing Allotments in Proposed Wind Farm Site

Allotment Name	Management Priority	Allotment ID	Acres in Allotment	Permitted AUMs in Allotment	Acres within Project Area	Percentage of Allotment Located within Wind Farm Site
Big Ranch Unit A	I	00007	173,343	5,397	29,445	17.0
Big Ranch Unit B	C	00081	442,630	0	17,619	0.4

SOURCE: LR 2000

3.9 TRANSPORTATION AND ACCESS

3.9.1 Introduction

This section includes a discussion of the existing transportation and access conditions in the project area, including routes, OHV, and air transportation. Transportation and access data were obtained and collected through literature reviews, Internet research, and coordination with the BLM and Reclamation. No field surveys were conducted.

3.9.2 Regional Overview

The major transportation corridor in the vicinity of the Project Area is US 93, which begins northwest of Wickenburg, provides access through Kingman, and continues northwest to Las Vegas. US 93 also provides access to Phoenix and is a major regional corridor and a key element of the Arizona's principal highway freight network delivering commercial, public, and private drivers and their cargo from Phoenix to Las Vegas. US 93 also connects to Interstate 40 in Kingman, which is the main travel route between Las Vegas and the Grand Canyon. A portion of US 93 near the Project Area, between Pierce Ferry Road and Hoover Dam, has been identified as a Scenic Route in the Mohave County General Plan, which includes the portion of US 93 that passes west of the Project Area. Other regional highways include I-40/Historic Route 66, and State Route 68. I-40/Historic Route 66 (Route 66) is an east-west interstate

that travels through Kingman, Arizona and extends westward south of the Project Area. Route 66 parallels and overlaps much of the I-40 alignment throughout Arizona and passes through the cities of Williams, Flagstaff, Winslow, and Holbrook. State Route 68 connects US 93, northwest of Kingman, Arizona, to Bullhead City, Arizona, which is located to the west at the Arizona/Nevada border. Temple Bar Road connects with US 93 west of the Project Area and is one of the nine paved access points to the Lake Mead NRA.

The Project Area is located east of US 93 and north of White Hills Road. The proposed Wind Farm Site would be accessible from US 93 via an existing 1.5 mile road to a gravel pit located west of the Project Area.

According to the Arizona Department of Transportation (ADOT), the 2009 Annual Average Daily Traffic (AADT) in the project vicinity along US 93 was approximately 9,000 vehicles. The State Highway Log identifies an increase in AADT throughout the section of US 93 that is located within the project vicinity by approximately 1,300 vehicles per day since 2008 (ADOT 2009). The increase in daily traffic may be attributed to the ongoing highway improvements along US 93 in conjunction with the Hoover Dam Bypass Project. AADT has not yet been released for 2010. According to the Mohave County Public Works Traffic Count, 123 vehicles were recorded using the Temple Bar Road per day. The count period was between October 26, 2010 and November 2, 2010 (Mohave County Public Works 2010). This count was not taken during summer, which is the high use season of Lake Mead NRA, and may not present a fully accurate representation of yearly use of Temple Bar Road. Traffic data on certain roads within Lake Mead NRA are also maintained by NPS. Based on the traffic counts, NPS estimates that about 81,000 visitors entered Lake Mead NRA via Temple Bar Road in 2009 and about 68,000 visitors used this road in 2010 (Holland 2012).

The NPS also maintains traffic data for selected back roads within Lake Mead NRA. One of the access roads within the Wind Farm Site becomes Temple Bar Back Road (NPS Approved Road [AR] 134) as the road passes into Lake Mead NRA. While traffic count data were not collected for the Temple Bar Back Road, NPS staff suggested that the data would be comparable to AR136, Gregg's Hideout Road. Based on traffic count data for Gregg's Hideout Road, NPS estimates that in 2010 approximately 2,500 people traveled on this road and that visitor use on Temple Bar Back Road would be comparable (Holland 2012).

The nearest airport to the Project Area is the Kingman Airport and Industrial Park located 5 miles north of I-40, along U.S. Highway 66. The Kingman Airport Authority, Inc., a not-for-profit corporation, leases the airport from the City of Kingman. The airport has four runways and accommodates both single and multiple engine airplanes. The airport is open to the public. Triangle Airpark is located 0.5 mile northeast of White Hills Road and US 93. The airport has two runways (one asphalt and one dirt) and is privately owned by Boulder City Aero Club Inc. It is a private use airpark; landing requires prior written permission and the airpark use is limited to Federal Aviation Administration visual flight rules. Based on input from the Triangle Airpark manager to Mohave County representatives, it is estimated that there are about 50 flights in or out of the airpark on an average week.

3.9.3 Existing Conditions

3.9.3.1 Surface Transportation

Routes in the Project vicinity are a combination of unimproved dirt (primitive roads), improved (bladed) unpaved, and paved roads (Map 3-9, Transportation). The primary access to the project from the north/south is US 93. White Hills Road is a paved secondary county road that extends east and then north from US 93. Squaw Peak Road (also referred to as Squaw Mountain Road) is a bladed dirt road that connects with White Hills Road south of the Project Area and is the only road that provides direct access to the Project Area. Squaw Peak Road is not maintained by Mohave County (Mohave County 2011).

The primary users of the unimproved routes in the area are hunters, OHV users, other recreationists, rangeland allottees, utility workers, and land managers. Approximately 42 miles of undesignated access roads are located within the Project Area and are open to motorized vehicle use year round.

Several routes within the Project Area provide access for recreation activities including hiking, OHV use, hunting, camping, and other recreational activities, although the level of recreational use is undocumented. White Hills Road is the primary access route used for recreation and hunting in the Project Area. According to the Mohave County Public Works Traffic Count, 344 vehicles were recorded using the White Hills Road per day. The count period was between October 26, 2010 and November 2, 2010 (Mohave County Public Works 2010). All motor vehicle travel in the Project Area is designated as limited to existing roads, washes, and primitive roads.

3.9.3.2 Air Transportation

There are no air transportation facilities located within the Project Area.

3.10 SOCIAL AND ECONOMIC CONDITIONS

3.10.1 Introduction

This section describes the existing socioeconomic conditions in the area that may be affected by the proposed Project. The key socioeconomic resources addressed in this section include population, housing, income, employment, agriculture, and commuting. This section presents information on existing (or baseline) conditions in the study area as it relates to these key parameters.

The data used for the socioeconomic analysis in this Draft EIS are the most recent published data from reliable sources. All efforts are made to ensure that these data are updated to their latest release year. Primary data sources include the U.S. Bureau of the Census, U.S. Bureau of Economic Analysis (BEA), U.S. Bureau of Labor Statistics (BLS), Arizona Department of Economic Security, and the Arizona Department of Commerce.

3.10.1.1 Levels of Analysis

This section includes four geographic levels of analysis, from the immediate towns and communities near the Project Area. The four types of geographic levels are as follows:

1. Places: Concentrations of population are referred to as either Incorporated Places or Census Designated Places (CDPs) by the Census Bureau. The boundaries for the latter are informal estimates generated by the Census Bureau, and are generally larger than the towns in the sparsely populated West. Data are presented for the places of Bullhead City, Dolan Springs, and Kingman, Arizona. Data are also presented for Boulder City, Nevada which is located close to the state and county boundary separating Clark County, Nevada and Mohave County, Arizona.
2. Mohave County, Arizona: The proposed Project is located in Mohave County and contains the socioeconomic areas most likely to be directly impacted by the proposed Project.
3. Arizona: Each state has a unique profile and serves as an introduction to the broader region.
4. United States: Comparisons to baseline U.S. patterns are enabled by inclusion of data pertaining to this level of geography.

The analysis focuses on the places closest to the Project Area and the County of Mohave where the Project is situated. Data on the state and national socioeconomic conditions are presented for comparison purposes.

3.10.2 Regional Overview

Mohave County is a large rural county in northern Arizona. There are several cities in Mohave County, but none with a population exceeding 50,000 people. Despite this, the county borders Clark County, Nevada, which contains the very large population center of Las Vegas, Nevada. While Mohave County serves as the region of analysis for socioeconomic resources, it is important to note that Mohave County is connected economically to Clark County. Approximately 20 percent of Mohave County residents work in Clark County, which is joined to Mohave County by US 93. Based on its physical proximity to the Project Area, data on Boulder City, Nevada, which is located just across the state boundary in Clark County, Nevada, are also included in this analysis.

3.10.3 Existing Conditions

Within the vicinity of the Project, there are a small number of homes and limited grazing of livestock. The affected environment of the proposed Project, however, extends beyond the Project vicinity to throughout Mohave County. The socioeconomic region of analysis for the proposed Project thus includes Mohave

County, Arizona, with special emphasis on the towns of Dolan Springs, Bullhead City, Kingman, and Boulder City (Nevada). Dolan Springs is the CDP located closest to the Project Area, while the other cities are the closest towns to the Project Area with populations of 10,000 or more. White Hills is the community that is closest to the Project, but is not described in this section due to lack of data.

3.10.3.1 Demographics

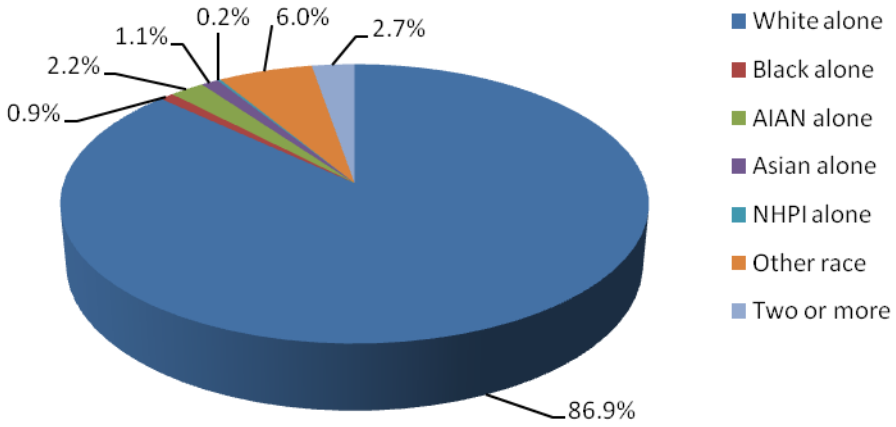
This section describes and discusses the current and projected future population and demographics of Mohave County, Arizona, as well as the towns of Bullhead City and Kingman, Arizona. The population of the communities of Dolan Springs, Arizona and Boulder City, Nevada are also located near the proposed Project boundary, so data are provided for those communities as available. The most recent data for Dolan Springs and Boulder City communities are from the 2010 Census and the Arizona Department of Commerce. Unless otherwise noted, the data provided are from the U.S. Bureau of the Census.

Mohave County

The 2010 population of Mohave County, as provided by the 2010 Census, is estimated to be 200,186. This compares to a 2000 population estimated at 155,032, which represents a 2.6 percent average annual growth rate in the county from 2000 to 2010. This is slightly higher than the 2.2 percent average annual growth rate for the State of Arizona during this time period, and significantly higher than the national average growth rate of 0.9 percent.

Of the Census total, 173,880 people, or 87 percent of the Mohave County population, identify themselves as white alone. Approximately 12,000 people identify themselves as some other race, or nearly 6 percent of the total population. Approximately 2 percent of the population, or 4,500 people, identify themselves as American Indian-Alaskan Native (AIAN) alone. Nearly 5,500 (3 percent) claim two or more races. The remaining 2 percent are comprised of black alone, Asian alone, and Native Hawaiian or Other Pacific Islander (NHOPI) alone (Figure 3-3).

Figure 3-3 Population Distribution by Race in Mohave County, Arizona in 2010



SOURCE: U.S. Bureau of the Census 2010 (Census 2010e)

Dolan Springs CDP, Arizona

The population of the Dolan Springs CDP in 2010 was 2,033 people. This is an annual growth rate of 0.9 percent from the 2000 population of 1,867. This is a lower growth rate than the overall growth rate exhibited within Mohave County (2.6 percent) and the growth rate in Arizona (2.2 percent) and equal to the U.S. population growth rate over this period (0.9 percent).

Bullhead City, Arizona

The population of Bullhead City in 2010 was estimated at 39,366, up from a population of 33,769 in 2000. This is an annualized growth rate of 1.5 percent from 2000, lower than the overall growth of Mohave County and Arizona, but higher than the overall U.S. growth over the same period.

Kingman, Arizona

The population of Kingman in 2010 was estimated at 28,068, up from a population of 20,069 in 2000. This is an annualized growth rate of 3.4 percent from 2000, higher than the overall growth of Mohave County, Arizona, and the U.S. over the same period.

Boulder City, Nevada

The population of Boulder City in 2010 was estimated at 15,023, up from a population of 14,966 in 2000. This is an annualized growth rate of less than one percent from 2000, which is driven by a controlled growth ordinance making the increase lower than the overall growth of Mohave County, Arizona, and the U.S. over the same period. Population in each geographic level of analysis is displayed in Table 3-19.

Table 3-19 Resident Population and Annualized Population Change for the Project Vicinity and Comparison Areas

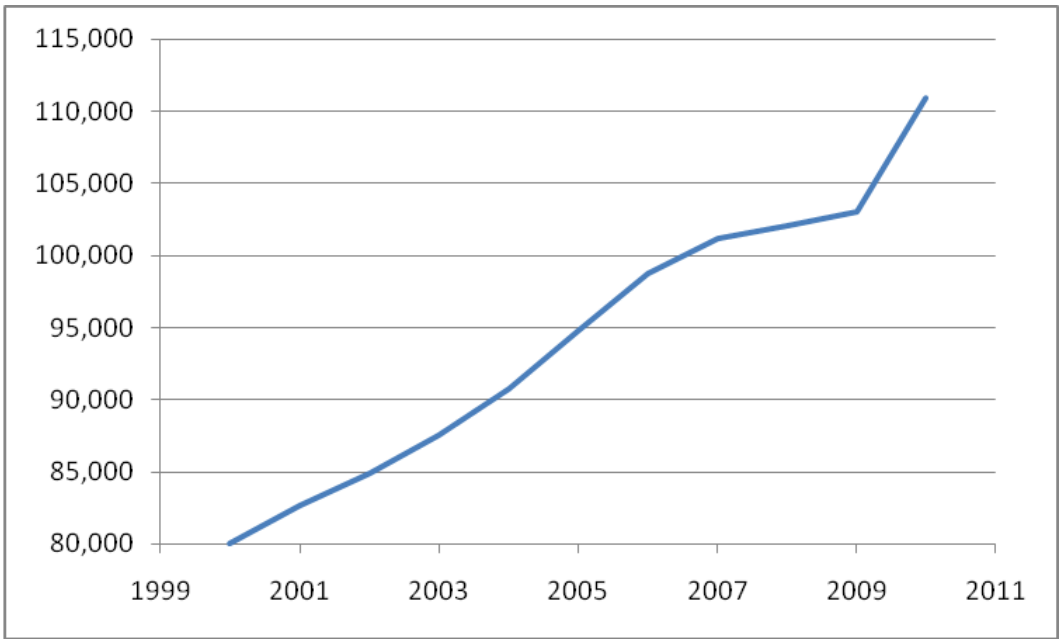
	Resident Population				Annualized Population Change		
	1990 Census	2000 Census	2010 Census	2020 Estimate	1990-2000	2000-2010	2010-2020
Dolan Springs	1,090	1,867	2,033	2,560	5.5%	0.9%	2.3%
Boulder City, Nevada	12,760	14,966	15,023	16,197	1.6%	0.0%	0.8%
Bullhead City, Arizona	21,951	33,769	39,366	46,836	4.4%	1.5%	1.8%
Kingman, Arizona	12,722	20,069	28,068	37,418	4.7%	3.4%	2.9%
Mohave County, Arizona	93,497	155,032	200,186	254,630	5.2%	2.6%	2.4%
Arizona	3,665,228	5,130,632	6,392,017	8,017,238	3.4%	2.2%	2.3%
United States	248,709,873	281,421,906	308,745,500	339,750,123	1.2%	0.9%	1.0%

SOURCES: U.S. Bureau of the Census 1990, 2000, 2010; Nevada State Demographer's Office 2009; Arizona Department of Commerce 2009; Arizona Department of Economic Security, Research Administration, Population Statistics Unit 2006.

3.10.3.2 Housing Characteristics

Total housing units in Mohave County are estimated at 110,911 for 2010 (Census 2008). As would be expected due to population growth, housing has grown significantly since 2000, when housing units were estimated at 80,062. Growth in the number of housing units since 2000 is presented in Figure 3-4.

Figure 3-4 Mohave County Housing Units 2000-2010



SOURCE: U.S. Census Bureau 2010 (Census 2010a)

Based on the 2010 Census, Mohave County has a home occupancy rate of 74.4 percent and a vacancy rate of 25.6 percent (28,372 vacant units). Of the occupied housing units, the homeownership rate was 69.9 percent. Median value of owner-occupied homes in Mohave County over the 2005-2009 period was $179,300 (Census 2010b).

Dolan Springs CDP

According to the 2010 Census, in the Dolan Springs CDP there are 1,556 housing units, of which there are 1,007 occupied (64.7 percent). Nearly all are owner-occupied (856 units), with only 151 units occupied by renters. The median house value of owner-occupied units in over the 2005-2009 period was $83,600.

Bullhead City, Arizona

Over the 2005 – 2009 period, median values of owner-occupied housing in Bullhead City are estimated at $150,200, with a total of 23,464 housing units. Over 70 percent of those housing units are occupied (16,761). Owner-occupied housing accounts for over 60 percent of the occupied housing (10,198 units). There are 6,703 vacant housing units in Bullhead City as of 2010 (28.6 percent) (Census 2010b).

Kingman, Arizona

Median values of owner-occupied homes over the 2005 – 2009 period in Kingman are estimated at $171,400. There are 12,724 total housing units, with 11,217 units (88.2 percent) occupied. Of those occupied 7,352 are owner-occupied (65.5 percent), with a total vacancy rate of 11.8 percent (1,507 units) (Census 2010b).

Boulder City, Nevada

According to the 2010 Census, there are 7,412 housing units in Boulder City, of which 6,492 are occupied (87.6 percent). Of those occupied, 4,545 are owner-occupied (70.0 percent), with only 1,947 units

occupied by renters (30.0 percent). The homeowner vacancy rate is 3.0 percent, while the rental vacancy rate is 12.4 percent. The median house value of owner-occupied units over the 2005 – 2009 period was $325,200.

3.10.3.3 Income Levels

The industries that are the largest contributors to income in Mohave County include government and government enterprises, health care and social assistance, retail trade, and construction (BEA 2009).

All income figures are presented in 2009 dollars, as adjusted by the Consumer Price Index. Total personal income in 2009 for Mohave County was $5.1 billion, with a per capita income of approximately $26,185. The county median household income for 2005 to 2009 was $40,159, compared to $50,932 for Arizona as a whole. Approximately 10.7 percent of families and 15.5 percent of individuals in Mohave County during the 2005 - 2009 period were below poverty level, which is a little higher than for Arizona as a whole (10.5 and 14.7 percent, respectively) (Census 2010b).

Table 3-20 summarizes income characteristics at each geographic level of analysis. Although income data for each geographic area are collected in different years, all values are adjusted to 2009 dollars. As indicated in the table, the project area of Mohave County has lower per capita and household income than other areas in Arizona and the United States. Dolan Springs, a community near to the Project Area, has significantly lower income levels than the state and the nation.

Table 3-20 Per Capita and Median Income in Project Vicinity 2005-2009 (2009 Dollars)

Place	Per Capita Income	Median Household Income
Dolan Springs, Arizona	$14,360	$31,090
Boulder City, Nevada	$37,400	$60,950
Bullhead City, Arizona	$20,810	$38,500
Kingman, Arizona	$20,030	$43,300
Mohave County, Arizona	$21,320	$40,160
Arizona	$25,200	$50,300
United States	$27,040	$51,430

SOURCE: U.S. Bureau of the Census, American Community Survey 2005-2009, June 3, 2011. (Census 2010b)

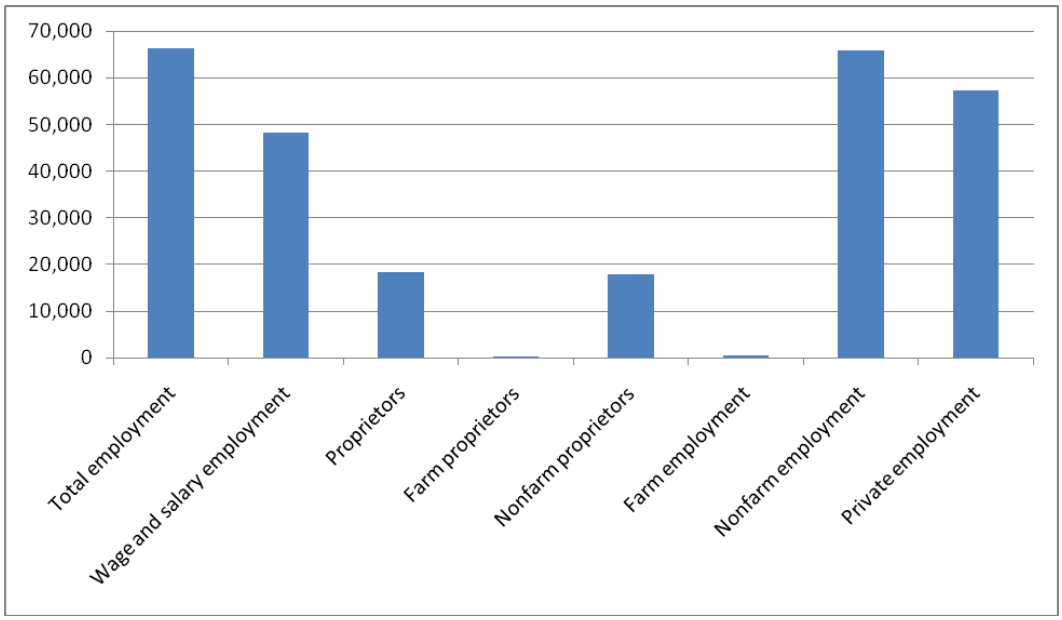
3.10.3.4 Employment

Mohave County

The total 2010 labor force in Mohave County is 91,814, with an unemployment rate of 10.1 percent. The major employers include retail trade, health care and social assistance, and construction (Arizona Department of Commerce 2011). The labor force measures the number of people residing in Mohave County who participate in paid employment. The labor force exceeds employment in Mohave County since many people who live in Mohave County work in Clark County, Nevada (and employment is measured by place of work rather than place of residence).

Mohave County had a total employment in 2009 of over 66,000 jobs. Most of this employment was private, nonfarm employment, with proprietor employment representing a significant proportion of employment (27.5 percent, Figure 3-5).

Figure 3-5 Total Employment by Type in Mohave County, Arizona in 2009



SOURCE: Bureau of Economic Analysis 2009

The largest employment sectors in Mohave County in 2009 were retail trade, state and local government, accommodations and food services, and real estate and rental and leasing (see Table 3-21). Overall employment growth in the County since 2001 is 19 percent, or 2.2 percent average annual growth. This employment growth, which reflects the high population growth in the area, is greater than the total employment growth in the rest of the state (14 percent from 2001 to 2009). The sectors adding the largest number of jobs in Mohave County since 2001 are real estate and rental and leasing, retail trade, health care and social assistance, and administrative and food wastes. Each of these sectors added more than 1,000 jobs between 2001 and 2009. Despite the growth in employment, unemployment in Mohave County has increased from 4.0 percent in 2000 to 10.1 percent in April 2011. This is a higher unemployment rate than the state and nation, with rates of 9.3 percent and 9.0 percent, respectively (BLS 2011).

In addition to highlighting industry size and growth, Table 3-21 also illustrates the industry sectors in Mohave County that are more concentrated than in Arizona as a whole. The last column in the table shows the location quotient, or relative concentration of employment in each industry in Mohave County compared to the state economy. Sectors with a location quotient greater than 1.0, account for a greater proportion of employment in Mohave County than in the State of Arizona, while sectors with a location quotient less than 1.0 account for a smaller proportion of Mohave County employment than is typical in the state.

Table 3-21 Employment Growth and Location Quotient by Industry

Industry	Mohave County Employment		Percent Growth 2001-2009		Location Quotient
	2001	2009	Mohave	Arizona	Mohave vs. Arizona
Farm	417	551	32%	22%	0.98
Forestry, fishing, related activities, other	(D)	(D)	N/A	-17%	N/A
Mining	(D)	531	N/A	51%	1.32
Utilities	298	312	5%	16%	1.16
Construction	6,712	5,039	-25%	-15%	1.35
Manufacturing	3,342	3,195	-4%	-23%	0.95
Wholesale trade	1,119	1,134	1%	8%	0.49
Retail trade	9,335	10,439	12%	12%	1.40
Transportation and warehousing	1,444	1,782	23%	11%	0.96
Information	959	1,060	11%	-21%	1.05
Finance and insurance	1,528	1,948	27%	28%	0.49
Real estate and rental and leasing	2,410	5,270	119%	58%	1.33
Professional, scientific, and technical services	1,832	2,340	28%	26%	0.55
Management of companies and enterprises	186	(D)	N/A	29%	N/A
Administrative and waste services	2,595	3,599	39%	6%	0.70
Educational services	320	709	122%	92%	0.56
Health care and social assistance	5,555	8,135	46%	44%	1.20
Arts, entertainment, and recreation	881	1,138	29%	28%	0.81
Accommodation and food services	5,157	6,030	17%	12%	1.22
Other services, except public administration	3,843	4,280	11%	11%	1.28
Federal, civilian	502	527	5%	21%	0.45
Military	361	417	16%	4%	0.59
State and local government	6,911	7,746	12%	14%	1.04
Total employment	**55,965**	**66,435**	19%	14%	1.00

SOURCE: Bureau of Economic Analysis 2009

(D) Not shown in order to avoid the disclosure of confidential information; estimates are included in higher level totals.

Dolan Springs CDP

According to the Arizona Department of Commerce, the 2011 civilian labor force in Dolan Springs is 839 people. The labor force increased at an average annual rate of 3.5 percent from 2000 when the labor force was 573 people (Arizona Department of Commerce 2011). This is slightly lower than the annual population growth of 5.5 percent. Unemployment in 2011 was 24.3 percent, up from 11.0 percent in 2000.

Bullhead City, Arizona

Total 2011 labor force in Bullhead City is 21,588 people, an average annual increase of 2.6 percent from 2000. The unemployment rate increased from 4.3 percent in 2000 to a rate of 9.6 percent in 2011.

Kingman, Arizona

The total 2008 labor force of Kingman is 12,349, an average annual growth of 2.6 percent since 2000. The unemployment rate increased from 4.1 percent to a rate of 9.9 percent over the same period.

Boulder City, Nevada

According to the 2005 – 2009 American Community Survey, the labor force in Boulder City is 6,520. Of those, there were 335 unemployed, resulting in an unemployment rate of 5.1 percent.

3.10.3.5 Agriculture

There is some agricultural activity in Mohave County, but it is neither a large employer nor a large income producing sector. In 2009, farm employment was estimated at 551 jobs, with a total of 303 farm proprietors (BEA 2009). There are 334 farms in Mohave County that cover 858,392 acres, primarily in forage crops (hay, haylage, silage, greenchop). High value crops include nursery and greenhouse crops. The total market value of agriculture products sold in 2007 was $19.2 million (2009 dollars), primarily from crops but also from cattle and calves and other livestock commodities (USDA 2007).

3.10.3.6 Commuting

Nearly 94 percent of those who work in Mohave County also reside there, with few non-residents commuting to work in the County (those that do commute to Mohave County are primarily from Clark County, Nevada). In contrast, approximately one-quarter of Mohave County workers commute to jobs located outside the County. Most people commuting outside of Mohave County work in Clark County, Nevada. The project area is accessed via US 93, which is the primary travel route between Clark County, Nevada and Mohave County, Arizona. There are also Mohave County residents commuting to San Bernardino County, California; Washington County, Utah; and other counties in Arizona (Arizona Workforce Informant 2010).

3.11 ENVIRONMENTAL JUSTICE

3.11.1 Introduction

The USEPA Office of Environmental Justice provides the following definition of environmental justice:

> *"The fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies. Fair treatment means that no group of people, including racial, ethnic, or socioeconomic group should bear a disproportionate share of the negative environmental consequences resulting from industrial, municipal, and commercial operations or the execution of Federal, state, local, and tribal programs and policies."*

The concept of environmental justice is rooted in the Civil Rights Act of 1964, which prohibited discrimination in Federally assisted programs, and in Executive Order 12898, "*Federal Actions to Address Environmental Justice in Minority Populations and Low Income Populations*," issued February 11, 1994. Executive order 12898 was intended to ensure that Federal actions and policies do not result in disproportionately high and adverse effects on minority or low-income populations. It requires each Federal agency to incorporate environmental justice into its mission by identifying and addressing, as appropriate, disproportionately high and adverse human health or environmental effects, including social or economic effects, of its programs, policies, and activities implemented both directly and indirectly (for which it provides permitting or funding), on minority populations and low-income populations of the United States (President's Council on Environmental Quality [CEQ] 1997). Additional guidance from the President's CEQ clarifies that environmental justice concerns may arise from effects on the natural and physical environment that produce human health or ecological outcomes, or from adverse social or economic changes.

Environmental justice issues are mandated and regulated at the Federal level, and compliance with NEPA requires analysis of environmental justice effects. As such, environmental justice is considered part of the NEPA process.

This section provides the background data for the analysis of environmental justice. The key socioeconomic parameters addressed here are race/ethnicity and measures of social and economic well-being, including per capita income, median household income, and poverty rates. The data used for this analysis of environmental justice impacts are from the most recent available or published data from reliable sources. All efforts are made to ensure that these data are updated to their latest release year for the specific level of analysis. Primary data sources include the U.S. Bureau of the Census, U.S. Bureau of Economic Analysis, and U.S. Bureau of Labor Statistics.

It is important to note that the geographic boundaries and divisions of Census Tracts and Block Groups are modified in Census 2010 (Figure 3-6(b)) compared to Census 2000 (Figure 3-6(a)). Also, economic data, such as poverty status, per capita income, and median household income, are now only collected through the American Community Survey and are no longer a part of the census data collection. The latest available American Community Survey data are 2005-2009 5-Year Estimates, which are provided for the Census 2000 geographic unit boundaries. Therefore, analysis of lower income populations is carried out using slightly different geographic boundaries (see Table 3-20), while data for identifying populations of minorities are analyzed based on 2010 Census boundaries (see Table 3-21).

3.11.1.1 Levels of Analysis

The project area is primarily defined as the physical footprint of the proposed Project. The geographic scope of the information presented primarily includes Mohave County and Census Tracts in the vicinity of the Project Area, with data on the State of Arizona and the United States provided for comparison purposes. Where available, data are presented at the level of the Census Block Group (within one Census Tract) in the county in which the Project Area is located, and also for the two larger cities of Kingman and Bullhead City and the Dolan Springs CDP. In addition to areas in Mohave County, Boulder City in the State of Nevada is also included in this analysis due to its vicinity to the Project Area. The locations of these geographic units in relation to the Project Area are presented in Figures 3-6(a) and 3-6(b). These data are used to identify geographic concentrations of minority and low-income populations that may potentially suffer disproportionately high and adverse human health or environmental effects from the project.

The five geographic levels of analysis are described below:

1. Census Tracts, Block Groups, and Blocks: Decennial census data are gathered at the level of Blocks, extremely small units of geography originating with city blocks. Block Groups are aggregates of Census Blocks, but their boundaries are drawn in part to respect political subdivisions including the boundaries of counties, cities, and American Indian Reservations. Block Groups, in turn, form Census Tracts, which are even larger units of geography that divide a county into population areas of approximately 3,000 persons. Eight and fourteen Census Tracts in the vicinity of the Project Area are included in the analysis (eight for the analysis of economic data based on 2005-2009 American Community Survey, and fourteen for the analysis of demographic data based on Census 2010). Block Group-level data are presented for the Block Group where the proposed project would be physically located. Block-level analysis is not presented.

2. Places: Concentrations of population are referred to as either Incorporated Places or CDPs by the U.S. Census Bureau. The boundaries for the latter are informal estimates generated by the U.S. Census Bureau, and are generally larger than the townsite in the sparsely populated West. Data are presented for Bullhead City and Kingman in Arizona and Boulder City in Nevada, as well as for the Arizona CDP of Dolan Springs.
3. Mohave County, Arizona: The County is a larger area with the proposed Project Area located within it, and is the area most likely to be directly impacted by the proposed project.
4. Arizona: Each state has a unique profile and serves as an introduction to the broader region.
5. United States: Comparisons to baseline U.S. patterns are enabled by inclusion of data pertaining to this level of geography.

3.11.2 Regional Overview

Mohave County is a large rural county in northern Arizona, without a significantly large urban population center. However, it borders Clark County, Nevada, in which is located the very large population center of Las Vegas, Nevada. While Mohave County and some Census Tracts and cities and CDPs within it serve as the study area for the environmental justice analysis, it is important to note that Mohave County is connected economically to Clark County. Approximately 20 percent of Mohave County residents work in Clark County. Based on this connection, data on Boulder City, Nevada which is located just across the state boundary in Clark County, Nevada are also included in this analysis.

3.11.3 Existing Conditions

This Section provides data on low-income and minority populations in the region of analysis as described in Section 3.10.

3.11.3.1 Low-Income Populations

According to the CEQ Guidance, communities should be identified as "low-income" based on the "annual statistical poverty thresholds from the Bureau of the Census' Current Population Reports, Series P-60 on Income and Poverty" (CEQ 1997). In other words, a community can be considered low-income if the median household income for a census tract is below the poverty line or if there are other indications of the presence of a low-income community within the Census Tract. For the purpose of this analysis, the per capita income, median household income, and poverty rates in the Census Tracts, select Census Block Group, and some major cities and a CDP in the vicinity of the Project Area are compared to those in Mohave County in order to identify low-income communities that may potentially suffer disproportionately high and adverse effects of the project.

As derivatives of total personal income, per capita and median household income and poverty rates represent widely used economic indicators of social well-being. Table 3-22 presents these socioeconomic data for the Census Tracts, select Block Group, major cities and a CDP in the vicinity of the Project Area, Mohave County, and Arizona. All income data presented in this section are inflated to 2009 U.S. dollars. Based on 2005-2009 data, per capita personal income in Mohave County is $21,321, which is approximately 85 percent of the statewide level of $25,203 and 79 percent of the national average of $27,041. The per capita income in Mohave County is about $4,000 less than that in Arizona and $6,000 less than the United States. The average annual growth rate of this income from 1997 to 2007 in the county was 3.9 percent compared to 4.2 percent for the state and 4.3 percent for the nation.

There is some disparity between local, county, and statewide conditions in the context of median household incomes. Based on 2005-2009 American Community Survey data, median household incomes in Mohave County and Arizona were $40,157 and $50,296, respectively (see Table 3-22). Data at the Block Group level are not yet available from the 2005-2009 American Community Survey. However, based on the 2000 Census data, median household income levels were even lower than the county in the two Block Groups in Census Tract 9504, where the proposed project would be located; with Block Group 1 at $34,974 and Block Group 2 at $22,489. Overall, seven of the eight Census Tracts analyzed in the vicinity of the Project Area (Census Tract 9514 is the exception) had a median household income lower than the county. However, of the cities and CDP analyzed, Kingman in Arizona and Boulder City in Nevada had median household incomes higher than Mohave County.

Finally, poverty rates represent the percentage of an area's total population living at or below the poverty threshold established by the U.S. Census Bureau. Based on 2005-2009 American Community Survey data, the poverty rate was 15.5 percent in Mohave County and 14.7 percent in the State of Arizona (Census 2005-2009a). However, based on 2000 Census data (given that data at the Block Group level are not yet available from the 2005-2009 American Community Survey) at 26.3 percent, Block Group 2 in Census Tract 9504, where the proposed project would be located, had a higher poverty rate than the county and state (70.4 percent higher than the county) (see Table 3-22). In fact, of all the areas examined in this analysis, this Block Group has the highest poverty rate. The entire Project Area is located in Census Tract 9504, Block Group 2; for the area of analysis, this is the largest Block Group in terms of area. The poverty rate in Census Tract 9504, where the Project would be located, is 18.2 percent higher than the poverty rate in Mohave County.

Table 3-22 Income and Poverty Rates based on 2005-2009 American Community Survey 5-Year Estimates[1] (incomes in 2009 dollars)

Area[2]	Per Capita Income	Median Household Income	Poverty Rate	% Difference in Poverty Rate Compared to Mohave County
Census Tract 9504	$21,157	$38,041	18.3%	18.2%
Block Group 2[3] (Project)	$16,798	$22,489	26.3%	70.4%
Census Tract 9505	$35,382	$33,750	8.0%	-48.2%
Census Tract 9506	$15,961	$32,186	16.3%	5.5%
Census Tract 9507.01	$17,835	$34,116	21.0%	35.9%
Census Tract 9507.02	$15,667	$29,571	20.9%	35.3%
Census Tract 9509	$21,021	$36,598	21.7%	40.3%
Census Tract 9511	$16,886	$39,009	20.1%	30.1%
Census Tract 9514	$26,745	$41,049	13.6%	-11.8%
Bullhead City	$20,809	$38,505	17.9%	15.7%
Kingman City	$21,030	$43,299	15.4%	-0.5%
Dolan Springs CDP	$14,358	$31,089	24.2%	56.5%
Boulder City, Nevada	$37,366	$60,948	7.8%	-49.8%
Mohave County	$21,321	$40,157	15.5%	0.0%
State of Arizona	$25,203	$50,296	14.7%	-4.7%
United States	$27,041	$51,425	13.5%	-12.8%

SOURCES:

U.S. Census Bureau 2005-2009 American Community Survey. *B17001. Poverty Status in the Past 12 Months by Sex by Age*.

U.S. Census Bureau 2005-2009 American Community Survey. *B19013. Median Household Income in the Past 12 Months (In 2009 Inflation-Adjusted Dollars).*

U.S. Census Bureau 2005-2009 American Community Survey. *B19301. Per Capita Income in the Past 12 Months (in 2009 Inflation-Adjusted Dollars).*

NOTES:

[1] Data are based on a sample and are subject to sampling variability. The degree of uncertainty for an estimate arising from sampling variability is represented through the use of a margin of error. In addition to sampling variability, the American Community Survey estimates are subject to nonsampling error.

[2] The geographic divisions of Census Tracts and Block Groups for the 2005-2006 American Community Survey data are based on the 2000 Census (Figure 3-6(a)). Therefore, the units in this table differ from those presented in Table 3-21 (Figure 3-6(b)) for race data, which are based on Census 2010 geographic unit boundaries and divisions.

[3] Block Group-level data are not available from the 2005-2006 American Community Survey. Therefore, while it is acknowledged that older data do not provide the best comparison, economic data from Census 2000 for the two Block Groups in Census Tract 9504 are presented to give some idea of how they compare to Mohave County.

3.11.3.2 Minority Populations

In accordance with CEQ Guidance, minority populations should be identified if the minority population in the project area "exceeds 50 percent" or if the percentage of minority population in the project area is meaningfully greater than the "minority population percentage in the general population or other appropriate unit of geographic analysis" (CEQ 1997). For this analysis, the population percentages of the various racial and ethnic groups in Census Tracts, a select Census Block Group, and major cities and a CDP in the vicinity of the Project Area are compared to those in Mohave County in order to understand any disproportionately high and adverse effects of the project on minorities.

Table 3-23 presents the racial and ethnic makeup of the Census Tracts and a select Census Block Group in the vicinity of the Project Area, the Cities of Bullhead City, Kingman, and Boulder City, Dolan Springs CDP; Mohave County, Arizona; and the United States based on 2010 Census data. The entire Project Area would be located in Census Tract 9504.02, Block Group 3. Mohave County is less diverse racially than both the state and nation, with only about 13 percent of residents identifying themselves as a racial minority in the 2010 Census. Statewide, 27 percent of residents belong to a racial minority compared with about 28 percent nationwide (Census 2010c, d). Ethnically, the county is less diverse than the state or nation as well, as only around 15 percent of county residents identified themselves as Hispanic or Latino in 2010, compared to about 30 percent of residents in the state and a little over 16 percent in the nation. Thus, there are relatively smaller proportions of racial minorities or Hispanic/Latino populations in the county compared with the state or nation.

The predominant racial group in Mohave County is White (Caucasian), comprising roughly 86.9 percent of the countywide population in 2010. The largest minority group in the county is Hispanics/Latinos, making up 14.8 percent of total 2010 population, followed by Some Other Races making up 6.0 percent of the total Mohave County population and Two or More Races comprising 2.7 percent of the county population based on 2010 data. Other racial groups, combined, represent only about 4.4 percent of the local population, led by AIAN (2.2 percent) and Asians (1.1 percent).

Analyzing these data at a smaller geographic scale, the racial and ethnic makeup of the Census Tracts in the vicinity of the Project Area is less diverse than countywide conditions in general, except for Bullhead City and areas around Kingman. In Census Tract 9504.02, Block Group 3, the Block Group in which the project would be physically located, Whites make up approximately 92.8 percent of total population (based on 2010 data). While the Block Group has lower percentages of all racial and ethnic groups compared to Mohave County, Census Tract 9504.02 has a larger proportion of AIAN (3.5 percent) relative to the County. Based on the data presented in Table 3-23, the Census Tracts in the vicinity of Kingman (9536.02 and 9536), as well as the two cities of Bullhead City and Kingman, have generally higher percentages of minority groups compared to the county.

Table 3-23 Population by Ethnic and Racial Groups (based on 2010 Census Population)

Area	2010 Population	Race							Ethnicity
		White	Black	AIAN	Asian	NHOPI	Other	Two or More Races	Hispanic or Latino[a]
Census Tract 9504.01	2,051	90.7	0.8	1.1	0.5	0.1	4.5	2.3	11.3
Census Tract 9504.02	3,950	91.4	0.6	3.5	0.8	0.2	1.7	1.9	5.8
Block Group 3 (Project)	1,408	92.8	0.8	1.4	0.6	0.1	1.9	2.3	6.0
Census Tract 9505	1,446	90.0	1.5	0.8	0.9	0.3	2.8	3.7	11.8
Census Tract 9506	9,029	90.9	0.4	1.5	1.0	0.3	3.2	2.7	10.6
Census Tract 9507.03	3,880	90.1	0.5	1.6	0.7	0.2	3.7	3.2	11.9
Census Tract 9507.04	5,995	91.7	0.9	1.5	0.9	0.2	2.2	2.7	10.1
Census Tract 9507.05	4,132	88.2	0.9	1.1	0.6	0.1	6.6	2.4	14.9
Census Tract 9507.06	3,825	87.6	0.7	1.6	0.5	0.2	5.3	4.1	12.4
Census Tract 9514.01	3,748	88.7	1.4	0.7	1.8	0.2	4.3	2.9	11.7
Census Tract 9514.02	4,036	87.0	1.4	1.1	2.1	0.2	5.7	2.5	16.1
Census Tract 9536.01	8,853	89.2	0.7	1.3	1.9	0.2	3.8	2.9	12.0
Census Tract 9536.02	2,647	85.0	1.4	2.8	0.9	0.2	6.3	3.5	16.1
Census Tract 9538	6,345	86.3	1.0	1.7	1.2	0.7	5.5	3.6	13.7
Census Tract 9549	3,796	91.3	1.2	1.3	1.4	0.1	2.6	2.1	8.6
Bullhead City	39,540	81.9	1.3	1.1	1.4	0.1	11.2	3.0	23.7
Kingman City	28,068	88.0	1.0	1.7	1.7	0.3	4.2	3.1	12.5
Dolan Springs CDP	2,033	90.7	0.8	1.1	0.5	0.1	4.5	2.3	11.4
Boulder City, Nevada	15,023	92.3	0.9	0.8	1.1	0.3	1.6	3.0	7.1
Mohave County	200,186	86.9	0.9	2.2	1.1	0.2	6.0	2.7	14.8
State of Arizona	6,392,017	73.0	4.1	4.6	2.8	0.2	11.9	3.4	29.6
United States	308,745,538	72.4	12.6	0.9	4.8	0.2	6.2	2.9	16.3

SOURCES:
U.S. Census Bureau 2010 Census. *2010 Census National Summary File of Redistricting Data, Tables P1, P2, P3, P4, H1.*
U.S. Census Bureau 2010 Census. *2010 Census Redistricting Data (Public Law 94-171) Summary File, Tables P1, P2, P3, P4, H1.*
NOTES:
[a] These may belong to any race.
ACRONYMS: AIAN – American Indian and Alaska Native; NHOPI – Native Hawaiian or Other Pacific Islander.
The geographic divisions of Census Tracts and Block Groups for demographic data are based on the 2010 Census (Figure 3-6(b)). Therefore, the units in this table differ from those presented in Table 3-20 (Figure 3-6(a)) for economic data from the 2005-2006 American Community Survey, which are based on Census 2000 geographic unit boundaries and divisions.

In Arizona, Whites account for only 73 percent of total population based on 2010 Census, while Hispanics/Latinos make up about 29.6 percent. The populations of Some Other Races, AIANs, Blacks or African Americans, Two or More Races, Asians, and NHOPI account for 11.9 percent, 4.6 percent, 4.1 percent, 3.4 percent, 2.8 percent, and 0.2 percent of the State's population, respectively, in 2010.

3.12 VISUAL RESOURCES

3.12.1 Introduction

The analysis area for the assessment of existing conditions for visual resources included all lands located within a 20-mile radius of the proposed Project (Map 4-1). A 20 mile radius was used in order to be consistent with the analysis area for other resources considered in this EIS. This geographic area includes the communities of Dolan Springs and White Hills, and public lands administered by the BLM Colorado River District (Kingman Field Office), Reclamation, and the NPS. Bureau of Land Management-administered lands include the Mount Wilson and Mount Tipton Wilderness Areas. Lands administered by the NPS include the Lake Mead NRA, bisected by the Colorado River, and the proposed Greggs Hideout Wilderness.

3.12.2 Methods

Existing conditions within the Project Area were defined, in part, by the visual resource inventory (VRI) class and component VRI data established during the VRI of lands administered by the Kingman Field Office prior to 1990. Planning-level data on visual sensitivity and distance zone were refined to indicate project-level conditions based on input from interagency coordination, tribal consultation, and scoping. A project-level assessment of the intensity and distribution of night lighting and motion within the analysis area was also conducted to better understand these elements of existing scenic quality.

Key Observation Points (KOPs) representing common views, sensitive receptors, special features, and/or landscape features were established from within the project viewshed. The landscape character of each KOP was described for views toward the Project Area. Landscape character was described in terms of the basic visual character elements of form, line, color, and texture, and included a discussion of analysis factors such as scale (size relationship, proportion), dominance (attraction, visibility), distance from the project, predominant angle of observation, dominant use (i.e., recreation or travel), and average travel speed of a viewer from which the project would be viewed. Project-level information on scenic resources was used to inform design options to avoid or reduce potential impacts to visual resource that may result from operation of the proposed project. Collectively, VRI and project-level data served as the baseline for the visual resource impact analysis presented in Chapter 4.

3.12.3 Regulatory and Management Framework

Regulation and management of visual resources within the analysis area is directed at the Federal and local level. The Arizona State Land Department does not apply visual resource management provisions to State Trust lands. Management of visual resources at the local level is directed by the Mohave County General Plan, which identifies US 93, between Pierce Ferry Road and the Colorado River, as a Scenic Route (Mohave County 2010a). This section of US 93 is situated west of the Project Area. Management goals associated with the Scenic Route apply to lands located within 1 mile of the highway, and include certain restrictions, such as prohibiting billboards.

Management of visual resources of the public lands is established by the following Federal law:

> ***National Environmental Policy Act (NEPA)(42 U.S.C. 4371)*** -- NEPA Section 101(b)(2) states that it is the "continuous responsibility" of the Federal government to "use all practicable means" to "assure for all Americans safe, healthful, productive, and esthetically and culturally pleasing surroundings." Section 1502.6 states that EISs should be prepared using an "interdisciplinary approach which will ensure the integrated use of natural and social science and environmental design arts" (Section 102(2)(A).

The analysis area includes public lands administered by three Federal agencies: BLM, Reclamation, and NPS (Lake Mead NRA). Reclamation-administered lands are managed per *Reclamation Manual Directives and Standards* (Reclamation 2002). Reclamation does not have management objectives for visual resources or area specific management plans for the Project Area. The Lake Mead NRA is administered per Public Law 88-639, which states that Lake Mead NRA shall be administered for public recreation "... in a manner that will preserve the scenic, historic, scientific, and other important features of the area ..." The NRAs General Management Plan also states that "Preserving the high visual qualities of the area is integral to preserving the high quality of the recreation experience" (NPS 1986).

The BLM visual resource management policy identifies a basic stewardship responsibility to identify and protect visual values on all BLM-administered lands. This policy is described in the *Federal Land Policy and Management Act*, the *Land Use Planning Handbook* (BLM 2005c) and Visual Resource Management (VRM) System (BLM 1986), described below:

- ***Federal Land Policy and Management Act*** – Section 102 (a)(8) of the FLPMA of 1976 states that "the public lands be managed in a manner that will protect the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archeological values…"
- ***Land Use Planning Handbook* –** The BLM *Land Use Planning Handbook* (BLM 2005c) states that VRM management classes shall be designated for all BLM-administered 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-administered lands are managed per the VRM System (BLM 1986). The VRM System is composed of three parts: The Visual Resource Inventory (VRI), planning for visual resource management through assignment of VRM Classes, and Plan implementation/project analyses using the Visual Resource Contrast Rating System.

The VRI involves identifying the visual resources of an area and assigning them to inventory classes using the BLM visual resource inventory process. The process involves rating the visual appeal of a tract of land (Scenic Quality), measuring public concern for scenic quality (Sensitivity Level), and determining whether the tract of land is visible from travel routes or observation points (Distance Zones). The BLM administered lands are placed into one of four visual resource inventory classes based on the interrelationships among the three inventoried values. The values are mapped independently, then overlaid and assigned the appropriate class in accordance with the VRI Class placement matrix. The VRI Classes represent the existing visual value at the time of the inventory:

- *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 or Wilderness Study Areas.
- *VRI Class II* **–** Highest visual value assigned through the inventory process 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.

The results of the VRI become an important component of the BLM RMP for an area. The RMP establishes how the public lands will be used and allocated for different purposes, and is developed through public participation and collaboration. During the land use planning process, visual values are considered in relation to other resource values and impacts are analyzed under each alternative to best ascertain the most appropriate VRM Class designation, factoring in protection of visual values, other resource management priorities and desired outcomes. These VRM Classes establish the following management objectives:

- *VRM Class I Objective* – To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention.
- *VRM Class II Objective* **–** To retain the existing character of the landscape. The level of change to the characteristic landscape should be low.
- *VRM Class III Objective* – To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate.
- *VRM Class IV Objective* – To provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high.

The Visual Resource Contrast Rating System is a project-level planning and design tool used for environmental impact analysis under NEPA. This tool helps to identify contrast in the landscape to determine whether the potential visual impacts from proposed surface-disturbing activities will meet the management objectives established for an area, or whether design adjustments will be required. The visual contrast rating process compares the project features with the major features in the existing landscape using the basic design elements of form, line, color, and texture, and evaluates the detectability of the proposed project by the casual observer. The analysis can then be used as a guide for assessing visual impacts. Once every attempt is made to reduce visual contrast, BLM managers can reach the most appropriate decision based on VRM Class conformance:

1. Accept the project proposal based on conformance with VRM Class Objectives.
2. Deny the project based on non-conformance with VRM Class Objectives.
3. Attach additional mitigation stipulations to bring the proposal into conformance with established objectives.
4. Or choose to revise the VRM Class designation through a land use plan amendment in order to proceed with an otherwise non-conforming project.

The Contrast Rating System can also reveal effective mitigation solutions for reducing visual contrasts for projects that are in conformance with VRM Class Objectives, as required under VRM policy.

The proposed Project is located within lands managed per VRM Class IV Objectives in the Kingman RMP (Map 19, Page 81) (BLM 1995). This VRM standard is based on a VRI completed before 1990. The BLM VRI and VRM designations do not apply to private, state, or other public lands within the Kingman Field Office administrative boundary. However, inventory values and classes, and the Contrast Rating System, are generally accepted as methods to objectively evaluate visual landscapes and the potential impacts of proposed projects.

3.12.4 Existing Conditions

3.12.4.1 Landscape Character

The Project Area is located within the transition zone of the Sonoran and Mohave Deserts, both of which are situated in the Basin and Range Physiographic Province. The Basin and Range Physiographic Province is characterized by long, isolated, roughly parallel north-south oriented mountain ranges separated by broad, flat, desert basins (Fenneman 1931). The landforms within the region are a result of geologic uplift and erosion. The most prominent features in the region include the numerous mountain ranges, including the Black, Senator, Iron, and Table Mountains, Squaw Peak, Mount Perkins, and Mount Tipton, and the prominent water bodies of Lake Mead and the Colorado River. The Black Mountains are located west of the Project Area, along the east side of the Colorado River. The mountains and valleys of the area are dissected by erosional features that form vast plains and steep drainages, such as Gold Basin on the eastern side of the Project Area. Exposed rock faces and outcrops are common in this landscape, particularly along mountain escarpments and canyon walls. The landscape is panoramic, and expansive vistas of distant mountains are common. From the inferior position of lower elevation viewpoints, mountainous features appear massive, steep, and pyramidal. These features create dominate horizontal and shallow diagonal lines that characterize the horizon, and are often silhouetted against the open sky.

The Project Area is part of the "Creosote Bush-Dominated Basins" ecoregion that occurs in the Mohave Desert at elevations ranging from 1,800 to 4,500 feet. Creosote bush forms the dominant vegetation matrix in the Project Area, particularly at lower elevations. The Project Area also includes sparse white bursage, cacti, yucca, ephedra, salt brush, and Indian rice grass. These short and regularly spaced shrubs are medium to coarsely-textured and display muted hues of olive green and browns across the alluvial plains and rugged terrain of the Project Area. Trees and shrubs (i.e., Mohave Yucca, Joshua Trees) are mixed with sagebrush at higher elevations, increasing the color and texture contrasts compared to the monotone flats at lower elevations. The low lying shrubs can appear monotonous in color and texture when evenly spaced, especially with the muted olive color tones found in the surrounding vegetation.

The Project Area is located between the cities of Kingman, Arizona and Las Vegas, Nevada. The Town of Dolan Springs is located approximately 14 miles southeast of the Project boundary. The White Hills community is located from 1/2 to 1-3/4 miles south of the Project, depending upon the alternative. Nearby transportation corridors include US 93 and Temple Bar Road, both located west of the Project Area, and Pierce Ferry Road, located to the east. Frequent OHV use of the Project Area has resulted in small two-track roads throughout the Project Area, and visible scars on the landscape. Development in vicinity of the Project Area includes vertical radio broadcasting antennae, meteorological towers, and electric transmission lines, service roads for the transmission lines, and a mineral material pit and access road.

3.12.4.2 Visual Resource Inventory Class

Information on VRI values, including scenic quality, visual sensitivity, and distance zones is provided below.

Scenic Quality

Scenic quality is defined as the visual appeal of a tract of land (BLM 1986). Scenic quality of BLM-administered lands is determined through the VRI process. This process entails dividing the landscape into Scenic Quality Rating Units (SQRUs) based on conspicuous changes in physiography or land use, and ranking scenic quality within each SQRU based on the assessment of seven key factors, including: landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modification. Each key factor is scored, and the value of each is added to derive an overall score for the unit. Based on these results, each SQRU is assigned a scenic quality rating of A, B, or C, with A representing the highest scenic quality, and C representing the lowest scenic quality.

The Project Area is located in SQRU 14 and SQRU 41, established during the pre-1990 VRI for the Kingman Field Office. The Project Area occupies approximately 2 percent of SQRU 14 (20,299 acres), and 20 percent of SQRU 41 (26,766 acres). Because SQRU 14 includes lands designated as Wilderness (i.e. VRM Class I), the total acres of SQRU 14 managed as VRM Class IV is overestimated. The actual portion of SQRU managed as VRM Class IV was not calculated as part of this analysis. The VRI for scenic quality of lands within both SQRUs was ranked as Class C (Map 3-10).

Viewer Sensitivity

Visual sensitivity is defined as a measure of public concern for scenic quality (BLM 1986). The Sensitivity Level Analysis (SLA) is completed in two steps: (1) Delineation of Sensitivity Level Rating Units (SLRUs), and (2) Rating visual sensitivity within each SLRU. Sensitivity Level Rating Units represent a geographic area where public sensitivity to change of the visual resources is shared amongst constituents. The unit boundaries may be defined by a single factor driving the sensitivity consideration, or factors driving sensitivity may extend across numerous SLRUs. Units are thus derived, in part, by the consideration of factors analyzed in the SLA. For example, constituents of a residential area are assumed to share a high sensitivity to change in visual resources of views from their homes. In such an example, an SLRU defining the general viewshed of this community would be established based on knowledge and assumptions of shared sensitivity of this area. Visual sensitivity within each SLRU is estimated as high, medium or low based on criteria described below:

- *Type of Users* – Visual sensitivity is expected to vary by type of user. For example, recreational sightseers may be highly sensitive to any changes in visual quality, whereas workers who pass through the area on a regular basis may not be as sensitive to change.
- *Amount of Use* – Visual sensitivity is expected to vary by amount of use. For example, areas seen and used by large numbers of people are potentially more sensitive. Protection of visual values usually becomes more important as the number of viewers increase.
- *Public Interest* – The visual quality of an area may be of concern to local, state, or national groups. Indicators of this concern are usually expressed in public meetings, letters, newspaper or magazine articles, newsletters, land-use plans, or public controversy created in response to proposed activities that is perceived to result in change to the landscape character.
- *Adjacent Land Uses* – The interrelationship with land uses in adjacent lands can affect the visual sensitivity of an area. For example, an area within the viewshed of a residential area may be very sensitive, whereas an area surrounded by commercially developed lands may not be visually sensitive.
- *Special Areas* – Management objectives for special areas such as Natural Areas, Wilderness Areas or Wilderness Study Areas frequently require special consideration for the protection of the visual values. This designation does not necessarily indicate high scenic quality, but rather the potential for management objectives to be aimed at preservation of the natural landscape setting.
- *Other Factors* – Additional information, such as research or studies that includes indicators of visual sensitivity, should be included in the sensitivity level analysis when available.

Visual sensitivity within the Project Area was defined as moderate in the western half (SLRU 14), and low for the eastern half (SLRU 41) during the pre-1990 VRI for the Kingman Field Office (Map 3-10). The boundaries of the SLRU coincide exactly with those defining the SQRUs in the Project Area.

Information on visual sensitivity was refined based on input received through interagency coordination, tribal consultation, and scoping meetings. Based on this information, the following site-specific assumptions of visual sensitivity were applied:

- Visual sensitivity of recreators within the Lake Mead NRA was assumed to be high. Approximately 29 percent of the NRA within a 20-mile radius of the Wind Farm Site is located in the Alternative A viewshed (Map 4-1).
- Visual sensitivity of residents within community of White Hills was assumed to be high based on prolonged views of the Project Area from residences.
- Visual sensitivity within SQRU 41 was assumed to be high for Hualapai tribal members based on the presence of their Traditional Cultural resources.

Visual sensitivity along Temple Bar Road (outside the NRA) and along US 93 is not expected to deviate from that described by the VRI as moderate. Travelers are moving approximately 50 miles/hour on Temple Bar Road with the purpose of reaching the recreation destination of Lake Mead.

Distance Zones

Distance zones represent the distance from which the landscape is most commonly viewed, and are established by buffering common travel routes and viewer locations at distances of 3 miles, 5 miles, and 15 miles. Because of the relationship between distance and viewer perception, distance zones can also be used to estimate visual thresholds, as a viewer's ability to detect attributes of form, line, color, and texture is expected to decrease with distance. Distance zones are defined as follows (BLM 1986):

- *Foreground-Middleground.* This is the area that can be seen from a particular location to a distance to 5 miles. The outer boundary of this distance zone is described as the point where the texture and form of individual plants are no longer apparent in the landscape. In some areas, atmospheric conditions can reduce visibility and shorten the distance normally covered by each zone.
- *Background.* The background includes locations that can be seen between a distance of 5 and 15 miles. The background zone does not include areas in the background which are so far distant that the only thing discernible is the form or outline. In order to be included within this distance zone, vegetation should be visible at least as patterns of light and dark.
- *Seldom-Seen Zone.* These are areas that are generally not visible within the foreground-middleground and background, or portions which are visible but beyond the background distance of 15 miles.

Based on the VRI completed during the pre-1990 VRI for the Kingman Field Office, distance zones of the Project Area are described as background for the western half and seldom seen for the eastern half (Map 3-10).

The results of combining the SQRU value of C, with the SLA values of high and moderate, with the Distance Zones of background and seldom seen culminated in the Project Area being classified as VRI Class IV in the pre-1990 inventory (Map 3-10).

3.13 PUBLIC SAFETY, HAZARDOUS MATERIALS, AND SOLID WASTE

3.13.1 Introduction

This section discusses the affected environment of the Project Area related to public safety; the presence of hazardous materials and wastes; and the presence of solid waste. For purposes of this review, the study area includes the Project Area as defined in Chapter 2.

3.13.1.1 Data Sources and Collection Methods

A Preliminary Initial Site Assessment (PISA) was conducted in August 2010 (URS 2010b). A Phase I limited site reconnaissance was conducted of the BLM-administered public lands on October 8, 2009, and on July 1, 2010, a second site reconnaissance was conducted on Reclamation-administered Federal lands as well as for transmission line interconnection site alternatives that have since been eliminated from detailed analysis. Revised project footprints for Alternatives A, B, and C were established in June 2011 that included additional lands located in Sections 1, 12-13, and 23-27 of Township 28 North, Range 21 West; Sections 5-8, 12, 17-20, and 28-33 of Township 28 North, Range 20 West; and Sections 3-6, 10, 14, 22, 26-27, and 34 of Township 27 North, Range 20 West. No physical site reconnaissance was conducted on these additional areas.

Because the study area encompasses mountains, ridges, and washes, a four-wheel drive vehicle was used to traverse existing roads, trails, and drivable washes during the site reconnaissance visits. In some instances, a walking reconnaissance was conducted of areas not accessible by vehicle. Due to the vast size of the Project Area, not every portion of the Project Area was physically inspected. However, taking into consideration the current and historical use of most of the site (undeveloped), no major environmental concerns in the areas that were not physically inspected are anticipated.

3.13.1.2 Agency Coordination

In addition to physical observations of the study area, a preliminary regulatory database review of readily available public sources was conducted to identify the potential for hazardous materials concerns within the study area. For the analysis, the most current available information was gathered from Federal (USEPA) and state (Arizona) environmental databases and included: (a) known or potential hazardous waste sites or landfills; (b) sites currently under investigation for environmental violations; (c) sites that manufacture, generate, use, store, and/or dispose of hazardous substances or hazardous wastes; and (d) sites with recorded violations of regulations concerning underground storage tanks (USTs) and hazardous substances or petroleum products. The purpose of this task was to identify database listings present within the Project Area or on adjoining land that may have the potential to impact the environmental condition of the defined Project Area. Regulatory information on most of the Project Area was included in the August 2010 PISA. However, for those areas not physically accessed during the site reconnaissance visits (see Section 3.13.1.1 above), an agency records search was conducted on June 1, 2011.

Information on abandoned mine sites within the study area was gathered from publicly available websites and USGS MRDS website (USGS 2010).

3.13.1.3 Regulatory Guidance

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). For the purpose of this study, however, 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 USEPA uses the term hazardous substance for chemicals that,

if released into the environment above a certain amount, must be reported and, 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 both RCRA and CERCLA as it has been granted primacy by the USEPA for both programs.

3.13.2 Regional Overview

The study area consists of natural desert and mountain land crossed by unimproved access roads and ephemeral washes. The vegetation consists of grassland and low-lying bushes throughout. There are numerous dirt roads, jeep trails, and washes bisecting the study area. Two high voltage transmission lines (Mead-Phoenix 500-kV and Liberty-Mead 345-kV) trend northwest to southeast through the southern portion of the Project Area. The proposed Project could interconnect with either one of these lines.

3.13.3 Existing Conditions

3.13.3.1 Public Safety Issues

Due to the remote location, rugged terrain, and extreme temperatures of the Project Area, safety issues could exist for visitors to the area, include construction and maintenance workers. In addition, the presence of venomous snakes and desert animals could pose a threat to visitors.

Abandoned mine sites can present safety issues to individuals visiting the Project Area. While only one abandoned mine site has been identified by the USGS in the Project Area, there is the possibility that others could exist. Some visitors find abandoned mines and prospects attractive to explore and may be exposed to, and unaware of, the following hazards at these sites:

- open and unstable shafts, adits, drifts, pits, tailings piles, wells, or other excavations
- dilapidated and unstable buildings or other structures
- collapsed buildings or other structures
- mining implements or construction debris
- hazardous or toxic materials

No abandoned mines sites were observed during the field reconnaissance. However, unsafe conditions could yield a public safety risk should some unseen conditions exist.

3.13.3.2 Hazardous Materials

While a number of mining claims are filed within 20 miles of the Project Area, there are no mining claims filed within the Project Area according to a review of the BLM LR2000 database. No active mining operations are known to exist in the area. One abandoned mine site exists in the northeast portion of the Project Area. This inactive site, known as the Muscovite Mica mine, is shown on the Senator Mountain NE Arizona, 7.5-minute Topographic Quadrangle Map as an Open Pit Mine (USGS 1989). Cut hillsides observed during the site reconnaissance indicated the existence of this formerly mined area. No structures, remnants of structures, or equipment were observed at the site, and no evidence of hazardous materials was observed.

Other closed mine sites, prospect sites, and other mineral features are located near the Project Area. The area with the most significant mining activity is approximately 10 miles southwest of the center of the Project Area in the White Hills Mineral District. This area has approximately 20 closed mines and one prospect site that are mainly mined for gold and silver with some beryllium. About 8 miles south of the Project Area is one prospect site of uranium, lead, and zinc. The Project Area is located within an area

where all Federal minerals are available for mining, but it is an area of low favorability for mineral mining. According to the BLM mineral database, the Project Area is not in a mining district and there are no active mining claims.

Potential hazards from dumping of hazardous material in old mine shafts exist; however, no official incidents have been recorded. Mine tailings located at closed mine sites are potentially hazardous because chemicals in the tailing piles can potentially leach into soils and/or groundwater or become airborne hazardous wastes.

During the site reconnaissance, no chemicals, chemical containers, or stained soil were observed within the study area. In addition, no evidence of dumped petroleum waste was observed in the Project Area during the site visits. No indications of potentially hazardous materials, such as electrical transformers, were observed associated with the transmission lines within the study area.

Information available on-line through ADEQ was reviewed for evidence of the potential for hazardous materials concerns within the study area. The on-line service identified and mapped sites within the categories identified in Table 3-24:

Table 3-24 Number of Sites in Project Area by Environmental Database Category

Environmental Database	Description of Database	Number of Sites*
WQARF	A Water Quality Assurance Revolving Fund (WQARF) area, which is also referred to as a state Superfund area, is a region designated by Arizona Department of Environmental Quality (ADEQ) for further investigation regarding environmental concerns. This designation typically is based on known areas of groundwater contamination, or past or present land uses that have been known to use and discharge chemicals that can contaminate groundwater.	0
RCRA TSDs	U.S. Environmental Protection Agency (USEPA) Resource Conservation and Recovery Information System (RCRIS) identifies and tracks hazardous waste from the point of generation to the point of disposal. The RCRIS Treatment, Storage, Disposal (TSD) Facilities List is a compilation by USEPA of reporting facilities that generate, transport, store, treat, or dispose of hazardous waste as defined by the Resource Conservation and Recovery Act (RCRA) but are not undergoing any "corrective action."	0
RCRA Generators	RCRA-regulated hazardous waste generator notifiers list; both Large and Small Quantity Generators are included in this list.	0
SWLF	State inventory of solid waste disposal and landfill sites.	0
LUST	List of information pertaining to all reported leaking underground storage tanks (LUSTs).	0
UST	State underground storage tank sites listing. The State of Arizona requires that owners of most underground storage tanks (USTs) register their USTs with ADEQ.	0
DEUR	A Declaration of Use Restriction (DEUR), previously known as Voluntary Environmental Mitigation Use Restriction (VEMUR), is a restrictive use covenant which accompanies the title to the land. It is required by ADEQ when a property owner elects to (1) remediate contamination found on the property to a non-residential use level, or when (2) an institutional or engineering control remains as a means to meet remediation goals.	0

* Number of sites identified by ADEQ within the boundaries of the study area.

3.13.3.3 Solid Waste

Solid waste dumping, commonly referred to as wildcat dumping, refers to the disposal of hazardous and non-hazardous waste. Episodes of dumping range from abandonment of household trash and appliances to vehicles, equipment and personal items. Typical examples of wildcat dumping observed during the site reconnaissance visits to the Project Area included several discarded vehicles, a large truck, and a boat. In addition, a water tank and remnants of a corral area were observed at another location within the study area. While unsightly, no environmental issues associated with this discarded equipment were identified.

3.14 MICROWAVE, RADAR, AND OTHER COMMUNICATIONS

3.14.1 Introduction

This section addresses the affected environment of the Project in relation to civilian and military air traffic control radar and microwave communications. Publicly available data from the Federal Aviation Administration (FAA), Department of Defense (DOD), Federal Communications Commission (FCC), and preliminary studies conducted by the Project proponent have been reviewed and summarized in this chapter.

The FAA is authorized under Title 14 CFR Part 77 to review and approve the installation or construction of structures in the United States that exceed 200 feet in height or that would otherwise have the potential to affect the safety of civilian or military air navigation. Most modern wind turbines reach heights greater than 200 feet and as such would require FAA approval prior to installation.

Once the final wind turbine locations are determined, the Project proponent must submit the Notice of Proposed Construction or Alteration Form 7460-1 and supporting documents to the FAA through the web-based Obstruction Evaluation/Airport Airspace Analysis portal (FAA 2010a). The FAA would then conduct aeronautical studies with cooperation from the relevant DOD branches to formally evaluate the likely impacts from the Project's wind turbines on radar and flight. If no likely impacts are identified, the FAA issues the Determination of No Hazard to Air Navigation for each individual wind turbine, and construction may proceed subject to the review and approval of other regulatory agencies.

A national Memorandum of Understanding between the BLM and DOD completed in July 2008, "Wind Energy Protocol between the Department of Defense and the Bureau of Land Management Concerning Consultation on Development of Wind Energy Projects and Turbine Siting on Public Lands Administered by the Bureau of Land Management to Ensure Compatibility with Military Activities," specifies coordination protocols including timeline and process for projects such as the Mohave Wind Farm.

3.14.2 Regional Overview

The Project Area is located 215 miles northwest of Phoenix, Arizona, and 240 miles north of the Arizona-Mexico border. The nearest identified long-range radar system is located approximately 45 miles to the northwest at Las Vegas, Nevada. The nearest weather radar site is located near Boulder City, Nevada, approximately 35 miles to the west of the Project Area. The nearest microwave communication system path is located 4 miles southwest of the Project Area near the intersection of US 93 and White Hills Road. All known radar and microwave communication facilities within 50 miles of the Project Area have been considered in this section.

3.14.3 Existing Conditions

3.14.3.1 Federal Communication Commission Licensed Facilities

The installation and operation of wind turbines has the potential to interfere with the operation of microwave communication systems. Microwave communication uses a series of dish-or antenna-type stations to transmit telephone, video, digital, and other information. A typical example of a microwave communication system is a cellular telephone tower.

Electric and magnetic interference (EMI) is one of the most common problems in microwave communication. EMI can result from contact between microwave signals and metallic structures, such as house siding, large trucks, power lines, other microwave communication stations, and wind turbines.

A microwave study for the Project was conducted by Comsearch on August 25, 2011 (Comsearch 2011) (see Appendix E) to determine the potential for the Project to interfere with privately operated microwave beams under all of the action alternatives. A preliminary licensed microwave system search conducted by Comsearch identified three microwave telecommunication system paths near the Project Area (Comsearch 2006). The three microwave paths transect an area close to the intersection of US 93 and White Hills Road to the south of the Project Area. One microwave communication system is owned by CNG Communications, Inc., and two are owned by Citizens Utilities Rural Company, Inc. None of the identified microwave paths intersect the current Project Area.

Additionally, the Project proponent has requested the National Telecommunications and Information Administration (NTIA), which overseas Federal communication resources, to provide a review of the Project. The October 28, 2011 response from the NTIA indicates that after a 45-day period of review, no Federal agencies identified any concerns regarding blockage of their radio frequency transmissions. Any wind turbine that would potentially interfere with these microwave communication resources would require relocation or elimination from the Project.

On November 5, 2010, BP Wind North America submitted to the FAA notices of proposed construction for 130 proposed wind turbines. The physical turbine measurements provided for the submittal were for one of the larger potential wind turbine models being considered for the project. On January 31, 2011, the FAA responded with 130 Determinations of No Hazard, essentially approving all the turbines submitted. The cases are 2010-WTW-15553-OE through 2010-WTW-15682-OE, and may be viewed on the FAA Obstruction Evaluation website. When a wind developer proposes turbine installations, the FAA is required to circulate the request by all relevant civil, and defense aviation offices that could reasonably be impacted by the project.

3.14.3.2 Long Range Military Radar/Military Areas of Operation

The installation and operation of wind turbines has the potential to interfere with long-range radar systems used for civilian and military air traffic control. The FAA in cooperation with the DOD has developed the web-based DOD Preliminary Screening Tool (Tool) that enables developers to obtain a preliminary review of potential impacts to long-range and weather radars, military training routes and special airspace prior to official filing (FAA 2010b). The Tool is only a preliminary assessment to assist developers during the planning process and does not replace the detailed aeronautical studies required by the FAA upon filing of a project Notice of Proposed Construction or Alteration Form 7460-1.

For long range radar, the Tool classifies a project site as Red, Yellow, or Green. A Red classification signifies that it is highly likely that the project would impact air defense and homeland security radars and that an aeronautical study would be required. A project with a Yellow classification would likely impact air defense and homeland security radars and an aeronautical study would be required. The Green classification signifies that there is no anticipated impact to air defense or homeland security radars, but

an aeronautical study would still be required. The Tool assesses the likelihood of impacts to weather radar in a similar fashion with a Red, Yellow, or Green project classification.

The Tool also assesses military operations that are not radar related including impacts to special airspace and training routes. The Tool returns a result of either impacts being likely or not likely to Military Airspace, and provides personnel contacts and telephone numbers for each specific military branch.

The Wind Farm Site has been analyzed using the DOD Preliminary Screening Tool (Appendix F) for long-range radar, weather surveillance radar-1988 Doppler radars (NEXRAD), and military operations. Depending on the turbine model used, the turbine hubs would be between 262 feet (80 meters) and 345 feet (105 meters) above the ground, and the turbine blades would extend between 126 feet (38.5 meters) and 194 feet (59 meters) above the hub. At the top of their arc, the blades would be between 390 feet (118.5 meters) and 539 feet (164 meters) above the ground. The wind turbines proposed for this Project would need to comply with Federal Aviation Regulations Part 77 (FAA 2010b). The results indicate that a portion of the Project Area is classified as Yellow for long-range radar, and Green for weather radar. The nearest long-range radar facility is at Las Vegas, Nevada, and the nearest weather radar is near Boulder City, Nevada. The Tool did not identify the Project Area as being within an area of concern for military operations.

Project Team members periodically coordinated with the DOD via phone and e-mail primarily from October 2009 through July 2011 regarding potential impacts of the proposed wind turbines on military operations, particularly radar. A consultation letter was sent to the U.S. Navy Southwest Region in San Diego in October 2009 and the notice of intent to Luke Air Force Base in December 2009. The DOD (Nellis Air Force Base) took part in an FAA presentation on turbine lighting held at the BLM Kingman Field Office and at the Project Area on September 27, 2011.

3.14.3.3 Other Communication Signals

No other communication signals have been identified that would be affected by the installation of wind turbines at the Project Area.

3.15 NOISE

3.15.1 Introduction

3.15.1.1 Noise Fundamentals

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 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.

Sound is a physical phenomenon consisting of minute vibrations that travel through a medium, such as air, and may or may not be 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 cycles per second or are measured using a logarithmic scale. Sound intensity (a vector quantity) is defined as the sound power per unit area but when its direction is understood the magnitude is the value of interest. A sound level of 0 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 above approximately 110 dB begin to be felt inside the human ear as discomfort and eventually pain at 120 dB and higher levels. The minimum change in the sound level of individual events that an average human ear can detect is about 1 to 2 dB. A 3 to 5 dB change is readily perceived. A change in sound level of about 10 dB is usually perceived by the average person with healthy hearing function as a doubling (or if decreased by 10 dB, halving) of the sound's loudness, even though the actual intensity change is an order of magnitude.

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. First, if a sound's intensity is doubled, the sound level increases by 3 dB, regardless of the initial sound level. For example: 60 dB + 60 dB = 63 dB, and 80 dB + 80 dB = 83 dB.

Sound level is usually expressed by reference to a known standard. This section refers to sound pressure level (SPL), which can be measured by instruments and expressed as a pressure metric: force over a unit area, such as Pascals. In expressing SPL on a logarithmic scale, the sound pressure is compared to a reference value of 20 microPascals. 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.

Hertz is a measure of how many times each second the crest of a sound pressure wave passes a fixed point. For example, when a drummer beats a drum, the skin of the drum vibrates a number of times per second. When the drum skin vibrates 100 times per second, it generates a sound pressure wave that is oscillating at 100 Hz, and this pressure oscillation is perceived by the ear/brain as a tonal pitch of 100 Hz. Sound frequencies between 20 and 20,000 Hz are within the range of sensitivity of the best human ear.

Sound from a tuning fork contains a single frequency (a pure tone); however, most sounds one hears in the environment do not consist of a single frequency but rather 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 represents human hearing, which is less sensitive at low frequencies and extremely high frequencies than at the mid-range frequencies. This is called "A-weighting," and the decibel level measured is called the A-weighted sound level (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.

Although dBA 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 called the equivalent sound level (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 the time-varying character of environmental noise, statistical noise descriptors such as L_{10}, L_{50}, and L_{90} are commonly used. They are the noise levels equaled or exceeded 10 percent, 50 percent, and 90 percent of the measured time interval, respectively. Sound levels associated with the L_{10} typically describe transient or short-term events. Half of the sound levels during the measurement interval are less than the L_{50} value and half are greater, while levels associated with L_{90} often describe background noise conditions and/or continuous, apparently steady-state sound sources.

Finally, another sound measure known as the Day-Night Average Sound Level (L_{dn} or DNL) is defined as the A-weighted equivalent sound level for a 24-hour day. As part of its derivation from hourly or representative daytime and nighttime SPL, the calculation of L_{dn} applies an additive 10 dB penalty to sound levels during the nighttime period (10 PM to 7 AM), which helps compensate for apparent increased sensitivity to noise during the quieter nighttime hours.

The L_{dn} value is typically used to define acceptable land use compatibility with respect to noise. Because of the time-of-day penalties associated with the L_{dn} descriptor, the L_{eq} for a continuously operating sound source during a 24-hour period will be numerically less. Sound levels of typical noise sources and environments are provided in Table 3-25 to provide a frame of reference.

Table 3-25 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 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: Hendriks 1998

3.15.1.2 Laws, Ordinances, Regulations and Standards Summary

The following subsections describe laws, ordinances, regulations and standards (LORS) that are applicable to defining potential noise effects from the proposed Project.

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 and vibration issues as listed below:

- National Environmental Policy Act (42 USC 4321, et seq.) (PL-91-190) (40 CFR § 1506.5)
- Noise Control Act of 1972 (42 USC 4910)
- U.S. Department of Housing and Urban Development Noise Guidelines 24 CFR § 51 subpart B
- National Park Service (NPS) 2006 Management Policies, Section 4.9

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

Occupational exposure to noise is regulated by Title 29, CFR, Part 1910.95, which describes that protection against the effects of noise exposure shall be provided when the sound levels exceed an average of 90 dBA for an 8-hour period. When employees are subjected to sound exceeding this limit, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within 90 dBA, personal protective equipment (PPE) shall be provided and used to reduce sound levels within the limits. The employer shall administer a continuing, effective hearing conservation program whenever employee noise exposures equal or exceed an 8-hour time-weighted average sound level of 85 dBA (measured via slow response). For purposes of the hearing conservation program, employee noise exposures shall be computed in accordance with 29 CFR 1910.95 Appendix A (noise exposure computation) without regard to any attenuation provided by the use of PPE.

In Section 4.9 of its *Management Policies* document (NPS 2006), the NPS describes the expectations of its park superintendents to identify unnatural sounds and their levels that might cause impacts. These policies do not enumerate either absolute or relative thresholds applying to noise generated from human activities adjacent to park lands.

State

For power plant projects, the Arizona Corporation Commission (ACC) is typically delegated authority to act as the lead agency for purposes of environmental noise compliance. As stated in the ACC 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."*

Chapter 4 of this draft EIS details anticipated Project construction and operation noise emission levels that could—if applicable—satisfy this ACC anticipated noise emission description requirement.

Local (Mohave County)

The Project Area and its environs include unincorporated areas within and governed by Mohave County. Project noise at any noise-sensitive receivers must comply with the County General Plan and the Zoning Ordinance (Mohave County 2008).

General Plan

The County's General Plan, Section V.A.5, describes noise regulations within Mohave County. Figure 3-7 presents the County's noise standards regarding maximum noise levels for various land use. Implementation Measures N2 describes:

> "*Require developments which generate off-site noise levels in excess of 65 dBA to mitigate noise to levels that do not exceed the County's standards."*

Zoning Ordinance

The County's Zoning Ordinance, Section 27.S, describes Industrial Performance Standards pertaining to noise that include the following language.

Subsection C.2 states:

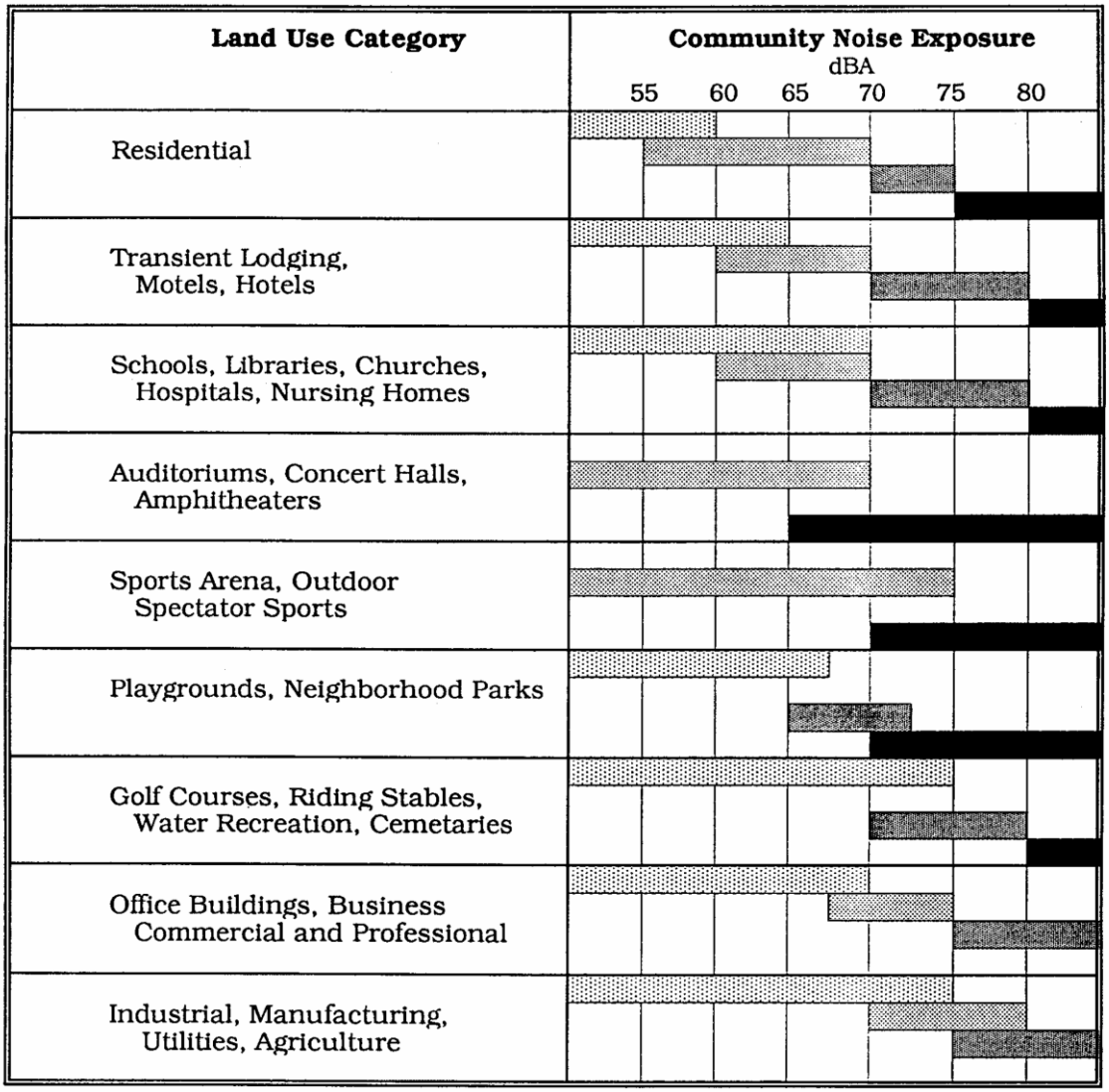
> "*Noise: at the boundary between the manufacturing district and residential districts, the maximum sound level radiated by any use or facility, other than transportation facilities, temporary construction work or safety relief systems shall not exceed the limits set forth in the following table:"*

"Table 1 Noise Limits

Octave Band (Cycles per Second)	**37 75**	**75 150**	**150 300**	**300 600**	**600 1200**	**1200 2400**	**2400 4800**	**4800 9600**	**A Scale**
Daylight decibel band limit (dB re 0.0002 microbar)	90	80	74	69	65	62	60	58	70
Nighttime decibel band limit (dB re 0.0002 microbar)	83	73	67	62	58	55	53	51	63

SOURCE: Mohave County 2008, Section 27.S, Subsection C.2."

Figure 3-7 Mohave County Noise Standards – Maximum Noise Levels for Various Land Uses



SOURCE: Mohave County 2005, Exhibit V.6.
Source: Adapted from California Office of Planning and Research. November, 1990.

Lake Mead National Recreation Area

There is no quantified noise threshold in Lake Mead NRA policies with respect to the assessment of potential noise impacts on recreational visitors and uses from noise sources external to park lands. In consideration of visitors that may elect to sleep outdoors in areas of Lake Mead NRA that are adjacent to the Project, NPS has recommended that a fixed guidance-based limit of 35 dBA nighttime (i.e., the nine hours between 10 p.m. and 7 a.m.) L_{eq} for Project-generated noise (exclusive of non-Project sound) be used in this EIS as an impact indicator for noise exposure with respect to Lake Mead NRA lands in the study area.

In support of its recommendation, NPS references Oregon Administrative Rules ("OAR") 340-035-0035 Noise Control Regulations for Industry and Commerce. OAR 340-035-0035 sets forth maximum permissible environmental noise levels for new commercial and industrial development in relationship to "noise-sensitive property," defined as "real property normally used for sleeping, or normally used as schools, churches, hospitals or public libraries."

A relative criterion, such as the allowable increase over ambient established in OAR 340-035, could—under the right conditions—effectively produce a similar limit on Project-generated noise that would be compatible with the NPS recommended nighttime limit of 35 dBA. With respect to wind facility development on previously undeveloped lands, and up to predefined limits identified in "Table 8" of the administrative rule, OAR 340-035-0035 (b) (B) (iii) (V) establishes maximum permissible noise levels as actual ambient levels + 10 dBA. By way of example using OAR 340-035-0035 as an impact indicator, if measured background sound levels are 25 dBA, then 35 dBA would be the maximum ambient sound level that includes added noise from the Project. Since these values are 10 dBA apart, and based on the acoustical principle of logarithmic addition as mentioned in Section 3.15.1, one can reasonably assert that the larger of the two is essentially the noise from the Project.

When background sound level (i.e., ambient without the Project) is relatively low, such as this 25 dBA example, the resulting limit on Project noise using this kind of relative criterion (ambient + 10 dBA) will tend to be consistent with industry expectations and guidance that describe favorable conditions for sleep. But when the background level is relatively high, as will be discussed in Section 3.15.3, this kind of relative criterion (ambient + 10 dBA) risks enabling Project noise to far exceed the NPS suggested level considered compatible for those park visitors sleeping outdoors without the noise reduction benefit of a structure, such as a bedroom wall.

For this reason, and to be discussed in greater detail in Section 4.15.1, this EIS analysis uses the absolute 35 dBA nighttime Leq as a limit on Project-generated noise.

3.15.1.3 Methods

In order to characterize the pre-Project existing ambient sound environment at representative noise sensitive receivers near the proposed Project Area, long-term sound level measurements were conducted during a field survey from Monday, October 26, 2009 to Tuesday, October 27, 2009. Later, and performed independently by NPS, a 2011 multi-month survey was performed on Lake Mead NRA land at a single location near the Project northern boundary.

In the absence of such field surveys, the existing sound level environment in the vicinity of the proposed Project could be coarsely estimated with both roadway proximity and population density methods as published by the Federal Transit Administration (FTA) in its *Transit Noise and Vibration Impact Assessment* (FTA 2006b).

3.15.1.4 Field Surveys

A technical report titled "Noise and Vibration Study, Mohave County Wind Farm Project" (URS 2010d) describes the selected long-term ambient sound measurement locations and summarizes the collected data. The report, which is available upon request to the BLM Kingman Field Office, presents a discussion of considerations with respect to the influence of ground wind speed on ambient sound measurement. The report lists reasons to support the usage and suitability of long-term measurement data (identified as LT3) to generally represent the ambient sound environment for land north of the Project—particularly Lake Mead NRA—and introduces "LAKE018," a measurement location selected and used by NPS for one of its recent long-term ambient sound level field surveys of the recreational area.

3.15.2 Regional Overview

The Project would be located within Mohave County, Arizona, approximately 40 miles northwest of Kingman, Arizona, approximately 9 miles south of the Colorado River, and approximately 20 miles southeast of Hoover Dam. The community of White Hills is located south of the proposed Project Area, with scattered residences identified as the noise sensitive receivers within its community. In addition, a few potential residential grids (i.e., layouts of unpaved roads and mostly undeveloped property parcels, some of which have had no further development activity for several years) have been identified to the east of the proposed Project Area.

3.15.3 Existing Conditions

3.15.3.1 Ambient Sound in the Proposed Project Vicinity

Table 3-26 reproduces a summary table from the Final Noise and Vibration Study Report of what are considered valid and representative ambient sound measurement.

Table 3-26 Noise Measurement Data Summary (dBA)

Site ID	Monitoring Date(s)	Start Time	End Time	L_{eq}	L_{max}	L_{min}	L_{10}	L_{50}	L_{90}	DNL	Temp. (°F)	RH (%)	Wind Speed Range (mph) & Direction
LT1	10-26 to 10-27-09	10:05	22:05	44	67	36	43	39	37	45	68	24	3-5 N→S
		22:05	1:05	36	49	36	37	37	36				
LT2	10-26 to 10-27-09	11:10	22:10	46	66	38	45	42	39	48	70	20	3-8 N→S
		22:10	1:10	40	59	38	41	39	38				
LT3	10-26 to 10-27-09	13:00	22:00	43	75	19	36	29	24	44	69	22	3-7 N→S
		22:00	23:00	35	49	22	38	34	29				

NOTES: LT = Long Term, DNL = Day-Night Average Noise Level, RH = Relative Humidity
Indicated Temperature, RH, and Wind Speed values were measured at the Start Time.

The noise survey performed by NPS in 2011 on Lake Mead NRA land just north of the Project Area at position LAKE018 was considerably longer in duration than the survey summarized in Table 3-26 and enabled the measurement of both ambient sound level and wind speed data—both at 1.5 meters (about 5 feet) above grade. Correlating this NPS collected data with available concurrent meteorological data suggests that daytime L_{eq} at LAKE018 (and, if considered representative, the portion of Lake Mead NRA land within 2 miles of the northern Project boundary) could be as low as 34 dBA when there would be calm conditions at wind turbine hub height (i.e., approximately 80 meters), and 24 dBA L_{eq} at night under similar conditions. But when the wind speeds at WTG hub height are substantial (e.g., 10 meters per second), the measured ambient sound levels were 46 dBA L_{eq} and 38 dBA L_{eq} for daytime and nighttime,

respectively. Considering all wind speeds, and factoring in the statistics during which they were measured to occur over the course of the multi-month-long survey performed by NPS, the daytime and nighttime L_{eq} values are 44 dBA and 35 dBA, which are very close to the measured L_{eq} values for LT3, the representative position closest to (but not on) Lake Mead NRA lands.

Using FTA ambient environmental noise prediction methods (FTA 2006a), predictions of existing ambient noise might range from 35 to 50 L_{dn} depending on distance to the nearby highway (US 93). The calculated L_{dn} values from measured A-weighted levels as appearing in Table 3-26, and L_{dn} similarly calculated from L_{eq} data from the NPS survey, would appear to be in agreement with this guidance.

Depending on the listener location in the vicinity of the Project, contributors to the measured and/or observed existing ambient sound level are likely to include the following:

- Distant passenger vehicle, bus and truck traffic on US 93.
- Typical residential land use activities, including but not limited to: yard work equipment, home improvement construction projects and usage of associated tools, amplified music, child play, dog barks, heating/ventilation/air conditioning equipment, etc.
- Commercial, civilian and military aircraft overflights, including both fixed-wing and rotary-wing vehicles.
- Wind-generated turbulence, resulting from wind interaction with vegetative ground cover and exposed rocky surfaces.
- Occasional off-road vehicle traffic, as permitted on either privately owned or BLM-administered lands, associated with recreational activities that use unimproved roads, which traverse the proposed Project Area. Such recreational activities could include, as permitted, discharge of firearms as part of target practice or hunting.
- Commercial and industrial (e.g., active mineral extraction and/or processing) activities that involve impulsive, intermittent or continuous electromechanical equipment operation. Pumps, refrigeration systems, and heating, ventilation and air-conditioning systems are usual noise generators.
- Residential and commercial road vehicle traffic on local roads, such as White Hills Road and the established streets of the White Hills community.
- Truck traffic that conveys extracted mineral materials from the extraction site to other locations, making usage of available routes such as Senator Road and White Hills Road. Such traffic, which seemed to occur with regular frequency and involving multiple trucks, was witnessed on these local roadways during the field survey. The mineral extraction site is active and located roughly southeast of the Project Area.

3.15.3.2 Surrounding Land Uses and Potential Noise-Sensitive Receivers

The potential noise-sensitive receivers discovered in and around the Project Area, such as those associated with the White Hills community and typified by the measurement location LT1 (see Map 3-11), include what appear to be occupied dwellings ranging from mobile homes to multi-story detached single homes built upon foundations. There is no known noise-sensitive area within 3 miles west of the proposed Project.

While noise regulations exist for recreational vehicles and equipment usage within the Lake Mead NRA that neighbors the Project to the north, there are no regulations or policies that describe absolute or relative numerical noise criteria with respect to noise entering the national recreation area from adjacent lands. Qualitatively, however, the potential noise sensitivity (i.e., expressed as preservation of the "natural soundscape") of appropriate park lands from such external noise sources is alluded to in Section 4.9 of the NPS Management Policies (NPS 2006) as follows:

> "Using appropriate management planning, superintendents will identify what levels and types of unnatural sound constitute acceptable impacts on park natural soundscapes. The frequencies, magnitudes, and durations of acceptable levels of unnatural sound will vary throughout a park, being generally greater in developed areas. In and adjacent to parks, the Service will monitor human activities that generate noise that adversely affects park soundscapes, including noise caused by mechanical or electronic devices. The Service will take action to prevent or minimize all noise that through frequency, magnitude, or duration adversely affects the natural soundscape or other park resources or values, or that exceeds levels that have been identified through monitoring as being acceptable to or appropriate for visitor uses at the sites being monitored."

3.15.3.3 Area Wildlife

The detailed description of the existing wildlife in the vicinity of the proposed Project Area is in Section 3.5.