CHAPTER 3 - AFFECTED ENVIRONMENT

This chapter describes the affected environment associated with the construction and operation of the proposed Project. The affected environment is the physical area that bounds the environmental, sociological, economic, or cultural features of interest that could be impacted by the Proposed Action or alternatives. When preparing this EIS, the best available information was used to describe existing environments and the proposed facilities and activities. The information serves as a baseline from which to identify and evaluate environmental changes resulting from construction and operation of the proposed Project. The baseline conditions, for the purposes of analysis, are the conditions that currently exist.

In the following sections, the term "Project area" refers to the area that encompasses the proposed right-of-way and associated project components, such as the access road and project wells as well as the area immediately adjacent to the proposed facilities. The study area, or ROI, varies depending on the resource being analyzed and the predicted locations of direct and indirect impacts from the Proposed Action or alternatives. The APE, as used in the Cultural and Historic Resources section, is synonymous with the Project area.

The following resources are considered in the evaluation of the Proposed Action and alternatives in the Final EIS:

- Section 3.1 - Air Quality
- Section 3.2 - Geological Hazards and Mineral Resources
- Section 3.3 - Soil Resources
- Section 3.4 - Water Resources
- Section 3.5 - Noise
- Section 3.6 – Biological Resources include Vegetation and Wildlife Resources
- Section 3.7 - Paleontological Resources
- Section 3.8 - Cultural and Historic Resources
- Section 3.9 - Socioeconomic Resources
- Section 3.10 - Environmental Justice
- Section 3.11 - Land Use, Recreation, Transportation, and Access
- Section 3.12 - Visual Resources
- Section 3.13 - Health and Safety/Hazardous Materials

3.1 AIR QUALITY AND CLIMATE

This section describes the existing meteorological and air quality conditions in and around the proposed Project and existing emission sources. Air quality data were obtained from existing literature, agency files, and meteorological data from local monitoring stations.

In Nevada, air quality management areas typically comprise a valley, a portion of a valley, or a terminal basin. The air quality ROI for the proposed Project incorporates portions of Nye County in Nevada and portions of the Death Valley National Park in Inyo County, California, within the Amargosa Desert Hydrographic Basin #230.

3.1.1 Regulatory Framework

The EPA implements and enforces the requirements of most federal environmental laws. The EPA Region 9 administers federal air programs in Nevada, including oversight of the State of Nevada, Department of Environmental Protection and Clark County, Department of Air Quality and Environmental Management which are responsible for implementing those programs within their jurisdiction. The Clean Air Act most recently amended in 1990, provides the EPA with the legal authority to regulate air pollution from stationary, area, and mobile sources.

Pursuant to the federal Clean Air Act of 1970, 42 USC § 7401 et seq. as amended in 1990, the EPA has established primary and secondary National Ambient Air Quality Standards (NAAQS) for criteria pollutants. The criteria pollutants under the NAAQS include ozone (O_3), NO_2, lead (Pb), CO, SO_2, and PM. The Nevada air quality standards are the same as the NAAQS, with the exception of a more restrictive CO standard in locations with a ground elevation above 5,000 feet. Table 3-1 lists the national and State of Nevada standards.

Two subsets of PM are inhalable PM_{10} and $PM_{2.5}$. The PM_{10} regulation was established by the Clean Air Act. Sources of PM_{10} within the Project vicinity include:

- stationary point sources, such as fuel combustion and industrial processes
- fugitive sources, such as roadway dust from paved and unpaved roads
- wind erosion from open land
- transportation sources, such as automobiles

Recently, the EPA implemented revised standards for PM. Specifically EPA revised prior standards for PM_{10} and added a new standard for $PM_{2.5}$. The requirement that agencies demonstrate attainment of the new standards has affected the current emission standards for combustion and fugitive dust sources.

O_3 is not emitted directly into the atmosphere from emission sources; it is produced through photochemical (light catalyzed) reactions in the atmosphere involving hydrocarbons and NO_x, known generically as O_3 precursors. Because O_3 formation results from large-scale atmospheric processes, O_3 formation and transport is a regional concern, and not directly associated with individual, localized sources of pollution. In 2008, the EPA promulgated a new O_3 standard, and as of January 2010, is considering changes to making the standard more stringent.

CO is an odorless, invisible gas usually formed as the result of incomplete combustion of organic substances. The primary sources of CO are motor vehicles and stationary combustion sources. Secondary sources include aircraft emissions and agricultural and/or forest burning. CO is more of a localized pollution issue, due to its ability to react in the atmosphere under normal

conditions. However, during those periods when the air is stagnant, such as with a ground-based inversion, local levels of CO can increase. Such inversions are caused when a layer of colder air at higher elevations traps relatively warmer air near the ground, preventing normal air circulation.

SO_2 is formed during the combustion of sulfur-bearing materials, such as the sulfur in metal ores or fossil fuels.

NO_X, consisting primarily of nitric oxide and NO_2, as well as VOCs emissions, readily react in the atmosphere as precursors to O_3 and, to a lesser extent, PM, and are major contributors of acid rain. The NAAQS is specific to NO_2, although total NO_X is usually quantified for emission sources.

Historically, the main sources of Pb emissions are vehicles fueled with leaded gasoline and Pb smelters.

3.1.2 General Conformity Rules

These regulations ensure that federal agencies will not engage, support, or provide financial assistance for licensing or permitting, or approve any activity which does not conform to an approved Clean Air Act implementation plan. Specifically within nonattainment and maintenance areas, potential federal actions (directly or through use authorizations) should not: (1) cause or contribute to new violations; (2) increase the frequency or severity of existing violations; or (3) delay timely attainment or interim emission reductions.

As federal lead agency, the BLM must complete a conformity analysis and possibly a formal determination for the proposed action before it can be approved. The General Conformity Rule excludes activities which are accounted for in the approved SIP, as well as certain specific actions which are assumed to conform. In addition, based on an assessment of reasonably foreseeable potential emissions of the specific air pollutant(s) for which the nonattainment and/or maintenance area was established, activities whose emissions would be below regulatory threshold levels are also assumed to conform. Potential emissions may incorporate BLM enforceable controls or mitigation measures.

Activities which cannot be presumed to conform will require the BLM to prepare a formal General Conformity Determination for public comment, including preparation of a draft Determination, presentation to the public for formal comments, incorporation of changes based on public review, and presentation of the final Determination. If the final Determination cannot demonstrate the activity will comply with applicable requirements of the Clean Air Act, the proposed activity will not be allowed to occur.

Table 3-1 National and State of Nevada Ambient Air Quality Standards

		Nevada Standards[A]		National Standards[B]		
Pollutant	**Averaging Time**	**Concentration[C]**	**Method[D]**	**Primary[C, E]**	**Secondary[C, F]**	**Method[G]**
O_3	1 hour	0.12 ppm (235 µg/m^3)	Ultraviolet absorption	1 hour equals 0.12 ppm (235 µg/m^3) 8 hours equal 0.08 ppm	Same as primary	Chemiluminescence
Ozone Lake Tahoe Basin, #90	1 hour	0.10 ppm (195 µg/m^3)				
CO less than 5,000′ above mean sea level (amsl)	8 hours	9 ppm (10,500 µg/m^3)	Nondispersive infrared photometry	9 ppm (10 mg/m^3)	None	Nondispersive infrared photometry
At or greater than 5,000′ amsl		6 ppm (7,000 µg/m^3)				
CO at any elevation	1 hour	35 ppm (40,500 µg/m^3)		35 ppm (40 mg/m^3)		
NO_2	Annual arithmetic mean	0.053 ppm (100 µg/m^3)	Gas phase chemiluminescence	0.053 ppm (100 µg/m^3)	Same as primary	Gas phase chemiluminescence
SO_2	Annual arithmetic mean	0.030 ppm (80 µg/m^3)	Ultraviolet fluorescence	0.030 ppm	None	Spectrophotometry (Pararosaniline method)
	24 hours	0.14 ppm (365 µg/m^3)		0.14 ppm		
	3 hours	0.5 ppm (1,300 µg/m^3)		None	0.5 ppm	

Table 3-1 National and State of Nevada Ambient Air Quality Standards

		Nevada Standards[A]		National Standards[B]		
Pollutant	**Averaging Time**	**Concentration[C]**	**Method[D]**	**Primary[C, E]**	**Secondary[C, F]**	**Method[G]**
Particulate 50 µg/m^3 matter as PM_{10}	Annual arithmetic mean	50 µg/m^3	High-volume PM10 sampling	50 µg/m^3	Same as primary	High-volume PM_{10} sampling
	24 hours	150 µg/m^3		150 µg/m^3		
Pb	Quarterly arithmetic mean	1.5 µg/m^3	High-volume sampling, acid extraction, and atomic absorption spectrometry	1.5 µg/m^3	Same as primary	High-volume sampling, acid extraction, and atomic absorption spectrometry
Hydrogen sulfide	1 hour	0.08 ppm (112 µg/m^3)G	Ultraviolet fluorescence	—	—	—

Notes:

[A] – The director shall use the Nevada standards in considering whether to issue a permit for a stationary source and shall ensure that the stationary source will not cause the Nevada standards to be exceeded in areas where the public has access.

[B] – These standards, other than for O_3, PM, and those based on annual averages, must not be exceeded more than once per year. The 1-hour O_3 standard is attained when the expected number of days per calendar year with a maximum hourly average concentration above the standard is equal to or less than one. The PM_{10} 24-hour standard is attained when there are one or fewer days per calendar year with a 24-hour average concentration above the standard, rounded to the nearest 10 µg/m3. The expected number of days per calendar year is generally based on an average of the number of times the standard has been exceeded per year for the last 3 years. The national standards are to be used in determinations of attainment or nonattainment.

[C] – Where applicable, concentration is expressed first in units in which it was adopted. All measurements of air quality that are expressed as mass per unit volume, such as micrograms per cubic meter, must be corrected to a reference temperature of 25 degrees Centigrade and a reference pressure of 760 millimeters of Hg (1,013.2 millibars); *ppm* in this table refers to parts per million by volume, or micromoles of regulated air pollutant per mole of gas; *µg/m^3* refers to micrograms per cubic meter.

[D] – Any reference method specified in accordance with 40 CFR Part 50 or any reference method or equivalent method designated in accordance with 40 CFR Part 53 may be substituted.

[E] – National primary standards are the levels of air quality necessary, with an adequate margin of safety, to protect the public health.

[F] – National secondary standards are the levels of air quality necessary to protect the public welfare from any known or anticipated adverse effects of a regulated air pollutant.

[G] – The ambient air quality standard for hydrogen sulfide does not include naturally occurring background concentrations.

Source: NDEP 2009

3.1.3 Climate and Meteorology

The region around the Project area has a semiarid climate, with total annual precipitation range of approximately 4 to 10 inches. Mean nighttime and daytime air temperatures typically range from 72°F to 93°F in the summer, and from 34°F to 51°F in the winter. On average, the daily range in temperature change is approximately 18°F. The closest weather-monitoring station to the Project site is located at the Amargosa Valley Library, approximately 0.5 mile from the eastern edge of the Project site. Table 3-2 summarizes daily maximum and minimum temperatures, as well as extreme high and low temperatures by month.

Table 3-2 Climate Temperature Data for Amargosa Valley, Nevada

Month	Air Temperature (°F)			Extremes (°F)		Average Number of Days			
						Maximum Temperature		Minimum Temperature	
	Average Max	Average Min	Average	High	Low	≥90°F	≥75°F	≤32°F	≤20°F
Jan	60.1	33.1	45.6	81	12	0.0	0.7	14.7	1.1
Feb	62.8	36.5	49.2	80	20	0.0	1.9	7.1	0.2
Mar	71.0	42.2	56.8	92	25	0.3	12.4	2.1	0.0
Apr	77.4	47.9	63.4	98	31	2.9	19.0	0.2	0.0
May	89.3	58.2	75.2	108	40	16.6	28.3	0.0	0.0
Jun	98.4	66.5	84.2	110	49	26.8	29.9	0.0	0.0
Jul	104.3	74.1	90.4	114	61	30.9	31.0	0.0	0.0
Aug	101.4	71.7	87.4	112	56	30.3	31.0	0.0	0.0
Sep	93.8	62.3	78.4	107	47	22.4	29.6	0.0	0.0
Oct	81.5	51.4	66.1	99	36	6.4	24.5	0.0	0.0
Nov	69.0	40.2	53.7	87	21	0.0	8.0	4.1	0.0
Dec	59.0	32.2	44.5	75	18	0.0	0.3	16.8	0.5

(Period of Record October 1999 to December 2008)
Source: Community Environmental Monitoring Program 2009

Precipitation in the region is influenced by two distinct storm patterns, one occurring in the winter and the other in the summer. Winter precipitation (dominantly snow in the mountains and rain in the valleys) tends to be low intensity and long duration and covers a great area. In contrast, most summer rains, resulting from local convective thunderstorms, are of high intensity and short duration. These storms can generate an abundance of lightning, strong winds, and

heavy and rapid precipitation. Table 3-3 summarizes precipitation data (rainfall) for the Amargosa area for the period from October 1999 through December 2008.

Local wind patterns have a strong daily cycle of daytime winds from the south and nighttime winds from the north. Figure 3-1 shows the wind patterns near the proposed Project, and illustrates the fluctuations in data from different heights and times of day.

Table 3-3 Precipitation Data for Amargosa Valley, Nevada

Month	Monthly Average	Extremes		Average Number of Days of Precipitation				
		Max 10-minute Precipitation	Max Daily Precipitation	≥ .01 Inch	≥ 0.1 Inch	≥ 0.25 Inch	≥ 0.5 Inch	≥ 1 Inch
Jan	0.48	0.08	0.70	3.1	1.4	0.7	0.2	0.0
Feb	0.97	0.14	1.74	4.9	2.3	1.4	0.3	0.2
Mar	0.29	0.06	0.57	1.8	0.9	0.4	0.2	0.0
Apr	0.19	0.06	0.75	2.1	0.3	0.1	0.1	0.0
May	0.04	0.11	0.32	0.3	0.1	0.1	0.0	0.0
Jun	0.02	0.03	0.05	0.6	0.0	0.1	0.0	0.0
Jul	0.27	0.26	0.85	1.2	0.6	0.3	0.2	0.0
Aug	0.20	0.37	0.64	1.2	0.3	0.3	0.2	0.0
Sep	0.52	0.12	2.37	1.3	0.8	0.4	0.3	0.1
Oct	0.20	0.09	0.40	2.1	0.5	0.3	0.0	0.0
Nov	0.32	0.07	0.89	1.4	0.7	0.4	0.1	0.0
Dec	0.24	0.05	0.63	2.3	0.5	0.3	0.1	0.0
Total	3.74	0.37	2.37	22.4	8.5	4.9	1.9	0.3

Source: Community Environmental Monitoring Program 2009

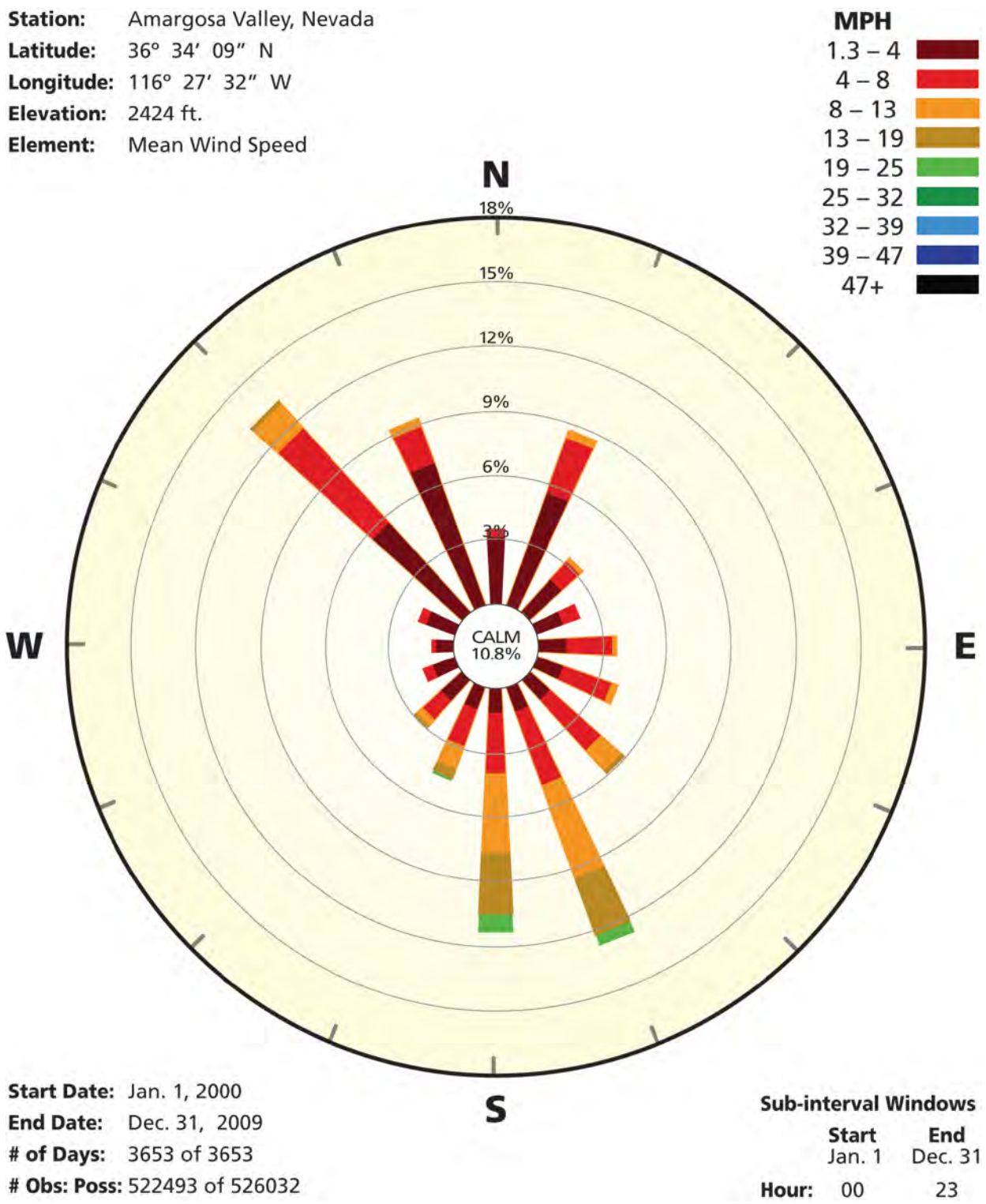


Figure 3-1 Wind Patterns in the Vicinity of the Proposed Project

Table 3-4 summarizes wind speed data for the period from October 1999 through December 2008.

Table 3-4 Wind Speed Data for Amargosa Valley, Nevada

Month	Average	Max Daily Average	Average Daily Peak Gust	Peak Gust	Average Number of Days Peak Gust		
					≥ 30	≥ 40	≥ 50
Jan	4.4	18.8	17.5	43	3.1	0.1	0.0
Feb	5.1	16.6	19.5	42	3.3	0.6	0.0
Mar	5.4	18.1	20.8	42	3.6	0.3	0.0
Apr	7.2	20.4	25.1	58	9.1	1.0	0.1
May	6.5	19.1	23.8	52	5.4	0.7	0.1
Jun	6.9	22.3	24.3	50	5.8	0.8	0.1
Jul	7.1	14.8	25.7	46	7.9	0.3	0.0
Aug	6.8	15.4	24.2	38	5.7	0.0	0.0
Sep	5.6	19.2	21.9	47	4.6	0.4	0.0
Oct	4.8	17.9	18.6	42	2.5	0.2	0.0
Nov	4.0	19.7	16.6	45	1.3	0.2	0.0
Dec	4.0	16.9	16.5	42	2.5	0.2	0.0

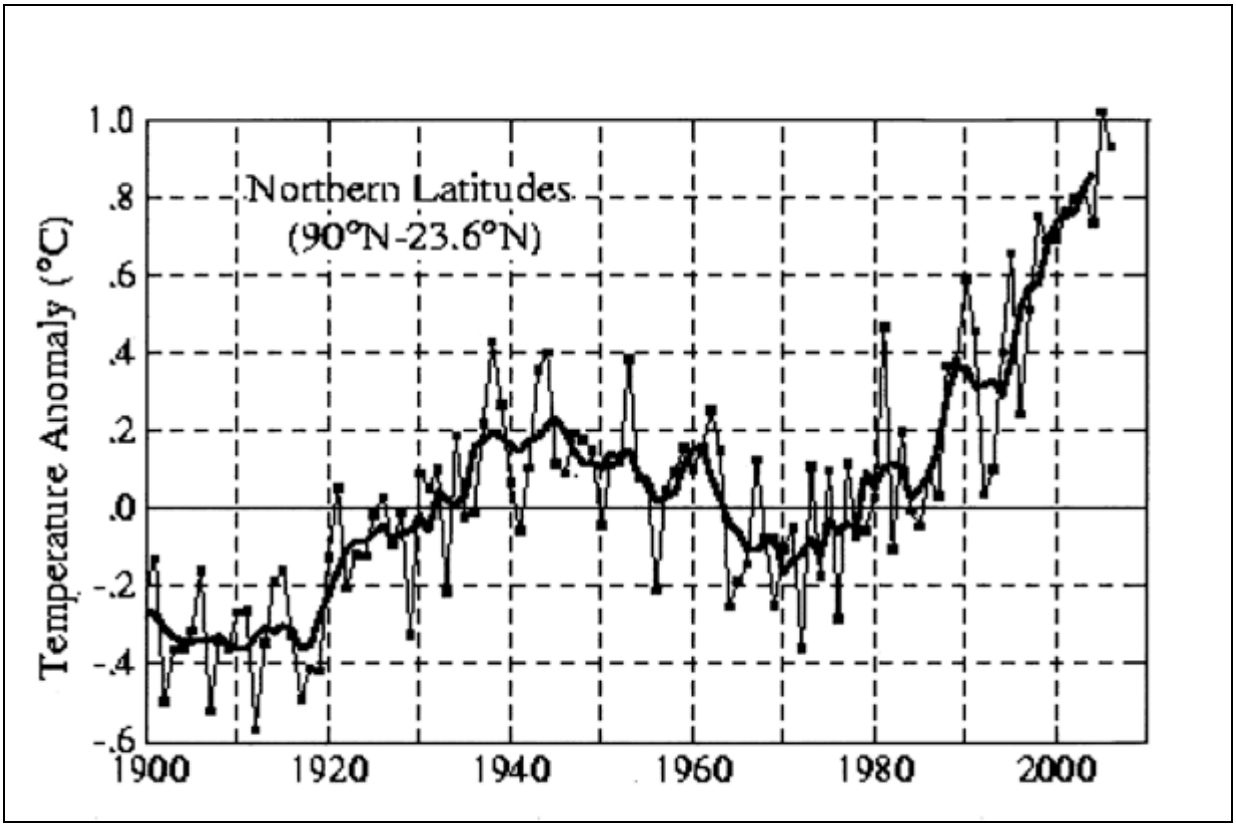
Source: Community Environmental Monitoring Program 2009

3.1.4 Climate Change

Ongoing scientific research into global climate change correlates increasing atmospheric concentrations of greenhouse gases (including carbon dioxide [CO_2], methane, nitrous oxide, water vapor, and several trace compounds) with observed trends of increasing temperatures and changes in the amount and seasonal variability of precipitation. The assessment of greenhouse gas emissions and climate change is in its formative phase, and the net impact to climate cannot yet be determined with an absolute certainty. Predicting regional changes in precipitation due to climate change remains challenging, particularly because of uncertainty in regional projections of how precipitation changes (Intergovernmental Panel on Climate Change [IPCC] 2007). Currently, the BLM does not have operational tools to predict climate change impacts from potential GHG emissions.

Global mean surface temperatures have increased nearly 1.0°C (1.8°F) from 1890 to 2006 (Goddard Institute for Space Studies, 2007). However, observations and predictive models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Figure 3-2 demonstrates that northern latitudes (above 24° N) have exhibited temperature

increases of nearly 1.2°C (2.1°F) since 1900, with nearly a 1.0°C (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 greenhouse gases are likely to accelerate the rate of climate change.



Source: Goddard Institute for Space Studies (2007)

Figure 3-2 Annual Mean Temperature Change for Northern Latitudes (24 - 90° N)

3.1.5 Existing Ambient Air Quality

The primary factors that determine air quality of a region are the locations of the air pollution emission sources, amounts and types of pollutants emitted, and local meteorological conditions over a period of time.

An area is considered to be in nonattainment for a pollutant if it has violated the NAAQS (generally, more than one exceedance of the NAAQS annually) for that pollutant. Areas in violation of one or more of these standards are called nonattainment areas. If an area has not been designated as nonattainment, and if there are no representative air quality data, the area is listed as unclassifiable. For regulatory purposes, the EPA considers unclassifiable areas to be in attainment. The Project area is located in an unclassifiable area.

Section 176(c)(1) of the Clean Air Act requires federal agencies to ensure that their actions conform to applicable implementation plans for the achievement and maintenance of the

NAAQS for criteria pollutants. To achieve conformity, a federal action must not contribute to new violations of standards for ambient air quality, increase the frequency or severity of existing violations, or delay timely attainment of standards in the area of concern (e.g., a state or a smaller air quality region). The EPA general conformity regulations (40 CFR 93, Subpart B) contain guidance for determination of whether a proposed federal action would cause emissions to be above certain levels in locations designated as nonattainment or maintenance areas. By definition, a *maintenance area* is a region that was previously in nonattainment, but the EPA or state has re-designated it as an attainment area, with a requirement to develop a maintenance plan.

The Prevention of Significant Deterioration (PSD) program of the Clean Air Act controls air quality in attainment areas; its goal is to prevent significant deterioration of existing air quality. This program is applicable only to point sources and does not apply to transportation sources. Under the PSD provisions, Congress established a land classification scheme for areas of the country with air quality better than the NAAQS. Under this scheme, Class I allows very little deterioration of air quality, Class II allows moderate deterioration, and Class III allows more deterioration; but within each classification, the pollution concentrations must not violate any NAAQS.

On August 7, 1977, Congress designated 158 areas in existence as Class I, including national parks larger than 6,000 acres and wilderness areas larger than 5,000 acres. Class II areas are essentially all areas that are not designated Class I by Congress. Class II areas could include rural and urban areas, lands managed by cities or state agencies, and land managed by the federal government that have not been designated as Class I. Death Valley National Park is a Class II designation area. The nearest boundary of Death Valley National Park is approximately 4 miles southwest of the Project area.

Due to the remoteness of the Project area, there are limited air quality data specific to Amargosa Valley. However, air quality data are available for the Yucca Mountain area north of the Project site, and for the Pahrump Regional Planning District approximately 30 miles southeast of the Project site. The dominant air pollutant in the regional area is PM. Although construction and excavation activities tend to aggravate dust production in the area; however, natural sources of particlate matter, especially dust accumulating in dry playas, tend to be the dominant source.

While the air quality in most of Nye County is unclassifiable, a portion of the Pahrump Valley is in nonattainment for PM_{10}. Nye County and Pahrump, in cooperation with NDEP, successfully negotiated with the EPA to enter into a Memorandum of Understanding to address the nonattainment classification in Pahrump Valley. The Memorandum requires the parties to prepare a Clean Air Action Plan for the nonattainment portion where rapid growth and development have affected air quality with increased fugitive dust levels for Pahrump Valley. As required by the Memorandum, Nye County has enacted an ordinance to regulate construction and other ground-disturbing activities, and has implemented a mandatory program of Best Practicable Methods for use on all ground disturbances of 0.5 acre or greater (NDEP 2009). This Memorandum of Understanding refers to Pahrump Valley only it does not include Amargosa Valley where the proposed Project site is located.

3.1.6 Existing Emission Sources

There are three primary emission sectors in Nevada: (1) electrical generation; (2) transportation; and (3) residential, commercial, and industrial fuel use. The smaller emission sectors are industrial processes, agriculture, waste management, fossil fuel industry, and forestry. The NDEP – BAPC has jurisdiction over air quality programs in all counties in the state, with the exception of Clark and Washoe counties. The BAPC has jurisdiction only over fossil-fuel-fired units that generate steam for electrical production in these counties.

NRS 445B.380 requires that a statewide greenhouse gas emissions inventory be prepared and issued by the NDEP, at least every four years beginning in 2008. The emissions inventory must include the origins, types and amounts of greenhouse gases released throughout the State, as well as all supporting analyses and documentation.

On October 30, 2009, the EPA promulgated Title 40 part 98 – Final Mandatory Reporting of Greenhouse Gases Rule (Federal Register: Volume 74, Number 209; Page 56259-56519). In general, the rule covers sources emitting any of the major greenhouse gases (CO_2, methane, nitrous oxide, hydroflourocarbons, perfluorocarbons, sulphur hexafluoride, and other fluorinated gases, including nitrogen trifluoride and hydrofluorinated ethers) in an amount equal to or greater than 25,000 metric tons of greenhouse gas emissions or its equivalent per year. This rule requires that facilities classified as general stationary fuel combustion sources, including electricity generating services (North American Industry Classification System [NAICS] Code 221) report emissions if annual rates equal or exceed 25,000 ton of greenhouse gas. However, the rule does not set specific reporting requirements for electric power generation from solar resources (NAICS code 221110).

The BAPC issues four types of operating permits – Class I, Class II, Class III, and Surface Area Disturbance (SAD). Class I sources are sources that have a potential to emit more than 100 tons of PM_{10}, SO_2, NO_X, CO, or VOCs; Class II sources are sources that have the potential to emit less than 100 tons of PM_{10}, SO_2, NO_X, CO, or VOCs. Class III sources are sources that cannot emit more than 5 tons/year of combined PM_{10}, SO_2, NO_X, and VOCs and may not be subject to federal standards (40 CFR 60, 61, 63), excluding 40 CFR 60 Subpart IIII and JJJJ (Phillip, personal communication, 2009).

SAD sources are Class II sources that only have a surface-area disturbance associated with the site/facility. Surface-area disturbance permits are required if the Project will disturb 5 or more acres of land (Phillip, personal communication, 2009).

There are no PSD sources or Class I sources in the ROI (Amargosa Desert Hydrographic Basin #230). There are several Class II and III sources in Basin 230. These are listed in Table 3-5.

Table 3-5 Class II and Class III Sources in the Amargosa Valley

Facility ID	Permit ID	Class	Company Name	Facility Name
A0519	AP32712457	II	Cind-R-Lite Cinder Cone Mine	Class II – Cinder Cone Mine
A0447	AP14592231	II	Mud Camp Mining Company, LLC	Class II – dba Industrial Mineral Ventures (IMV) Nevada
A0786	AP48122278	II	Alltel Communications, Inc.	Class II – Mt. Schader Cell Site
A0966	AP10412492	II	CR Reward Corporation	Class II – Reward Mine
A0448	AP14592455	II	R.T. Vanderbilt Co., Inc.	Class II – Vanderbilt Minerals
A0467	AP14990924.02	II	Ash Meadows, LLC	Class II – Ash Meadows Project
A0557	AP49530184.02	II	U.S. Ecology Nevada, Inc	Class II – Hazardous Waste Stabilization Unit
A0106	AP14421368	III	Have Welder Will Travel	Class III
A0483	AP16112479	III	Funeral Mountain Ranch	Class III
A1025	AP48122565	III	Alltel Communications, LLC	Class III – Amargosa Valley Cell Site
A0936	AP16292454	II	Death Valley Raceway	SAD – Death Valley Raceway
A0641	AP16292090	II	Tri-state Contracting	SAD – E Street Apartments, LLC
A0771	AP14592261	II	Mud Camp Mining Co., LLC – IMV Nevada	SAD – Ewing Bentonite Mining Area
A0191	AP10412304	II	Barrick Bullfrog, Inc.	SAD – Final Closure of Tailings Pond 3/4
A0229	AP14421142.01	II	Nye County Road Department	SAD – Free Use Gravel Pit
A0801	AP16292295	II	TSS Investments, LLC	SAD – Kozal Subdivision
A0449	AP16292435	II	Galtar, LLC	SAD – Lathrop Mill
A1005	AP14422540	II	Frehner Construction Company	SAD – Mercury Highway Project
A0772	AP14592262	II	Mud Camp Mining Co., LLC – dba IMV Nevada	SAD – Moretti Mining Area
A0773	AP10412263	II	Sterling Gold Mining Corporation	SAD – Sterling Mine
A0674	AP16292123	II	Clay Management Trust	SAD – T&T Parcels Project
A0770	AP14592260	II	Mud Camp Mining Co., LLC – dba IMV Nevada	SAD – West Dry Lake Mining Area
A0816	AP16292311	II	William Hernstadt	SAD – Zoe Village Estates

Source: Phillip, personal communication, 2009

3.2 GEOLOGICAL HAZARDS AND MINERAL RESOURCES

This section presents an overview of the regional and local geology, geological hazards, and mineral resources that occur within the Project area and ROI. The main purpose of this analysis is to identify geological hazards that could result in potential risks to Project construction or operation, and any locatable, leasable, and salable mineral deposits that may be impacted by the Project. Geological hazards include active faulting, seismicity, and ground subsidence. The Project area is located in the Amargosa Valley, Nye County, Nevada, within the Leeland, and South of Amargosa Valley, U.S. Geological Survey (USGS) 7.5-minute quadrangle topographic maps.

3.2.1 Regulatory Framework

3.2.1.1 Federal

NEPA and FLPMA serve as the primary federal legislation requiring assessment and mitigation of potential impacts to geological resources on federally administered land. The General Mining Law of 1872, Mineral Leasing Act of 1920, and Mineral Materials Act of 1947 specifically govern the discovery, disposition, and extraction of mineral resources throughout the western United States.

The General Mining Law of 1872 (30 USC §§ 22, 28, 28b) was the first formal, large-scale demarcation of mining claim law in the United States. In general, the law allows United States citizens to locate lode or placer mining claims on federal land that has been opened to mineral entry. Lode claims are located within rock formations or veins of ore, whereas placer deposits are deposits of minerals that have been washed by water into alluvial deposits. The Mineral Leasing Act of 1920 (30 USC §§ 181-187, 187a-b, 188-195, among others.) separated the governance of coal, petroleum, natural gas, and other hydrocarbons away from the jurisdiction of the General Mining Law, and provided regulation and guidance for their leasing on public lands. The Mineral Materials Act of 1947 (30 USC §§ 601-604) regulates the sale and disposal of mineral material resources from public land, including common varieties of sand, gravel, stone, pumice, pumicite, cinders, clay, other minerals, and petrified wood. Many of the mineral resources governed by this law are most often used for construction or industrial purposes.

The majority of the Project area is located on BLM-administered land. As such, an approved right-of-way is required for the Project and all of the previously listed federal laws regarding geological resources must be adhered to throughout the construction and operation of the proposed Project.

3.2.1.2 State

The establishment of claims on locatable mineral resources, such as lode and placer mines, is governed by the NRS §§ 517.003-517.460. Leasable mineral resources such as oil and gas deposits on state land in Nevada are governed by NRS §§ 522.010-522.190.

3.2.1.3 Local

No local regulations governing geological resources are known to apply to the construction and operation of the proposed Project.

3.2.2 Data Collection Methods

The geological inventory for the proposed Project presents an overview of the regional geology and the specific geological features that occur within the Project area and ROI. The Project area refers to the area that encompasses the proposed right-of-way and associated components. The ROI includes the Project area, as well as the Amargosa Valley Planning Area. Information for the inventory was obtained from the scientific literature (publications and maps) and discussions with agency specialists at the USGS, BLM, and Nevada Bureau of Mines and Geology (NBMG).

Locality information pertaining to geological formations, local seismicity, recent earthquakes, and known areas of Quaternary faulting was compiled into a geographic information system (GIS). The geological formations within the Project area were identified from a geological map of the Nevada Test Site region (Slate et al. 1999). Landslide and fault data were compiled from the USGS Atlas (USGS 2009). Earthquake data between 1973 and the present were acquired from the National Earthquake Information Center (USGS 2009). Seismicity data were obtained from the Geological Hazards Team at the USGS Earthquake Hazard Program (Peterson et al. 2008; USGS 2009).

The mineral resource inventory presents an overview of the locatable, leasable, and salable resources present in the Project area and ROI. Locatable resources are typically metallic mineral deposits such as copper and gold. Leasable resources include energy resources such as petroleum, natural gas, and coal. Salable resources include sand and gravel. Information for the inventory was obtained primarily from the Geocommunicator online database that is operated by the BLM and U.S. Forest Service (USFS [2009]). Additional information was obtained from publications and maps of the USGS, BLM, and NBMG. Mineral resource data were compiled into the GIS.

3.2.3 Regional Geological Setting

The Project area is located within the Amargosa Valley in southern Nevada, which is located in the southwestern part of the Basin and Range physiographic province (Fenneman 1931). The Basin and Range physiographic province is characterized by north-south trending mountain ranges that are separated by alluvium-filled, nearly flat to gently sloping valleys. The mountain ranges consist mostly of Paleozoic quartzite, limestone, dolomite, sandstone, siltstone, shale, and chert. Also present in the mountain ranges are Mesozoic limestone, siltstone, conglomerate, granodiorite, and monzonite. The valleys contain Cenozoic, tuffaceous, sedimentary rocks, as well as alluvial, fluvial, playa, lacustrine, and spring deposits (Stewart 1980). The Basin and Range Province formed through regional, crustal extension of the western part of the North American continental plate, with fault blocks sliding downward, forming basins that are separated by ranges (Eaton 1982).

The southeastern portion of Amargosa Valley is bounded by the Amargosa and Funeral Mountain ranges to the southwest; the Ash Meadows area, Specter Range, and Little Skull Mountain to the east; and Yucca Mountain and the Calico Hills to the north. The Amargosa River flows mostly north to south and is underground through the western side of Amargosa Valley. Fortymile Wash is a tributary of the Amargosa River that originates on the Nevada Test Site to the north of the Project area as Fortymile Canyon, before flowing toward the south and becoming Fortymile Wash (Stonestrom et al. 2003). Fortymile Canyon lies between Yucca Mountain and the Calico Hills. Fortymile Wash flows in a southwesterly direction through the Project area before joining the Amargosa River. Fortymile Canyon and Fortymile Wash drain highland areas that are mostly comprised of igneous rocks of Tertiary age. For instance, Yucca Mountain is largely composed of Tiva Canyon Tuff that erupted from the Claim Canyon caldera; whereas, the Calico Hills are composed of the Calico Hills Rhyolite (Slate et al. 1999). Elevation near the Project area is from 2,600 feet above sea level at the floor of Amargosa Valley to over 6,500 feet above sea level at Yucca Mountain.

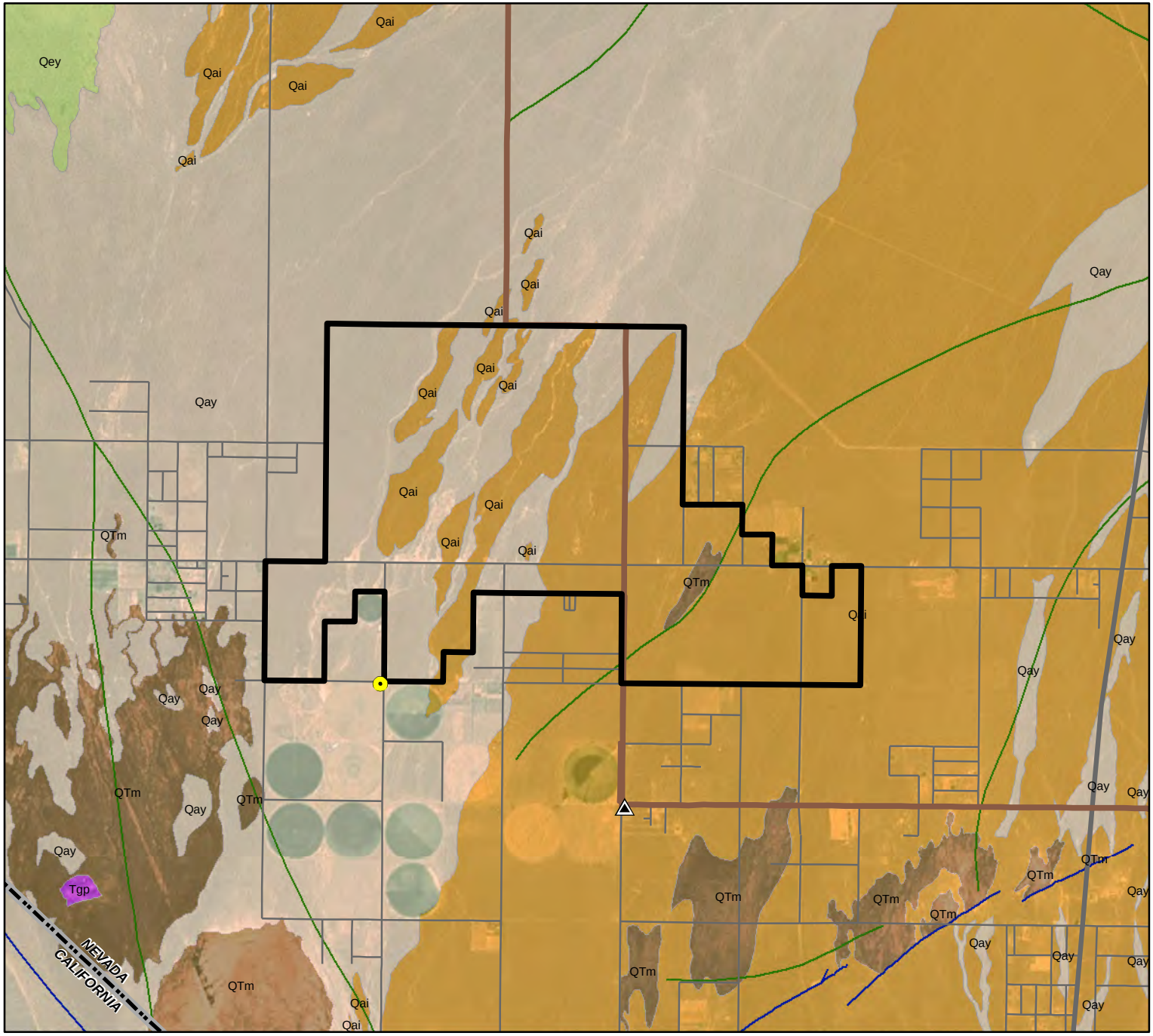
3.2.4 Geological Units in the Project Area

The Project area contains mostly alluvial-fan deposits, which are the most common geological units within the Amargosa Valley (Figure 3-3). Two Quaternary alluvial deposits and one Quaternary-Tertiary spring deposit are mapped within the Project area (Slate et al. 1999). These mapped geological units are named, respectively: (1) Young alluvial deposits (Qay); (2) intermediate alluvial deposits (Qai); and (3) Quaternary-Tertiary marl deposits (QTm). The alluvial units share a likely source in the mountains and hills to the north of US 95. The Quaternary-Tertiary marl deposits were emplaced by ancient springs and seeps that were present in the Amargosa Valley.

The hydrogeologic units described by Sweetkind et al. (2004) can be correlated with these geological units. Younger and Older Alluvial Aquifers described by Sweetland et al. (2004) are correlated with the Young alluvial deposits and intermediate alluvial deposits, respectively; and the Limestone Aquifer is correlated with the marl deposits. The hydrogeologic units described by Winograd and Thordarson (1975) are not correlated with these geological units. The Valley-fill aquifer that they described is present, on average, between 650 and 960 feet deep. The Lower Carbonate aquifer as described by Winograd and Thordarson (1975) is present, on average, between 1,370 and 1,800 feet deep. Devils Hole in the Ash Meadows area is a water-filled cave system in the Paleozoic carbonates of the Bonanza King Formation. This suggests that the surface water in the Ash Meadows area is linked to the Lower Carbonate Aquifer as described by Winograd and Thordarson (1975).

3.2.4.1 Young Alluvial Deposits

Quaternary to recent alluvium is mapped as a long, southwestern-oriented lobe overlying another broader and older alluvial fan composed of older Quaternary alluvial material (see Figure 3-3). Young alluvial deposits comprises poorly sorted silt, sand, gravel, and cobbles, with a typical total thickness of less than 2 meters (Slate et al. 1999).



Amargosa Farm Road Solar Energy Project (NVN-84359)

Geologic Resources
Figure 3-3

LEGEND

Project Area

Geology

- Intermediate Alluvial Deposit (Qai)
- Marl Deposit (QTm)
- Young Alluvial Deposit (Qay)
- Young Eolian Sand Deposit (Qey)
- Pre-Basin-Range Sedimentary Rock (Tgp)
- Geologic Structure
- Fault

General Reference Features

- Existing Transmission Line (<230kV)
- Existing Substation
- Proposed Project Well
- Highway
- Local Road
- State Boundary

Source: Geology - USGS, 1999;
Transmission Lines, Substations - Platts, 2009;
Wells - Nevada State Engineer, 2008;
Roads - TerraSpectra Geomatics 2009;
Imagery - ESRI, 2009

September 2010

0 0.75 1.5 Miles

These deposits are Holocene to Recent in age (10,000 years old to present) and exhibit little to no development of desert pavement. Surface clasts are unvarnished. Young alluvial deposits are present in the western half of the Project area.

3.2.4.2 Intermediate Alluvial Deposits

Intermediate alluvial deposits are mapped alongside the Young alluvial deposits as the principal component of a large alluvial fan that covers most of the eastern end of Amargosa Valley (Slate et al. 1999). Intermediate alluvial deposits consist of silt, sand, gravel, and cobbles. Surface clasts are old enough (Holocene to late Pleistocene in age) to have acquired some desert varnish.

3.2.4.3 Quaternary-Tertiary Marl Deposits

Marl deposits of Quaternary-Tertiary age are the only non-alluvial geological units mapped within the Project area (see Figure 3-3). These spring deposits consist of massive to well-bedded mudstone and marlstone that commonly contain fossil root casts of plants (Slate et al. 1999).

3.2.5 Unique Geological Resources

Unique geological resources that may have recreational interest to the general public include dunes, natural bridges, caves, waterfalls, and rock or mineral collecting areas. Based on a search of recreation-related websites (e.g., Nevada Division of State Parks), there are no known recreational or unique geological resources associated with the Project area.

The nearest geological resource of recreational interest is the Big Dune complex located in Amargosa Valley, approximately 4 miles northwest of the Project area. The Big Dune complex is protected as a BLM-designated ACEC. The dune is composed of Quaternary eolian dune sand derived from Precambrian source rocks, likely the Funeral Mountains southwest of the dune field (Castor et al. 2006; Slate et al. 1999). The Big Dune exhibits the characteristic multi-lobed morphology of a large, pyramidal star dune. Star dunes are frequently stable, only shifting within a localized area, often remaining fixed in place for centuries (Bates and Jackson 1987).

3.2.6 Geological Hazards

Geological hazards include earthquakes, faults, seismicity, and ground subsidence. Earthquake data have been compiled by the USGS National Earthquake Information Center since 1973 (USGS 2009). The USGS maintains archives of all earthquakes of detectable magnitude and have made this earthquake catalog available to the public. No earthquakes have been recorded within the Project area, although nine earthquakes have been recorded within 10 miles of the Project area, ranging from 2.9 to 4.1 magnitudes on the Richter scale (Figure 3-4). The most recent earthquake occurred in 2004, in the Funeral Mountains southwest of the Project area.

Faults have been mapped in the eastern portion of the Project area, as well as outside the Project area to the west (Figure 3-4). These faults were inferred from gravity anomalies in the Amargosa

Valley. Quaternary to Recent faults have also been mapped southeast of the Project area, and are the likely source of spring deposits and Quaternary marls, as the faults provide a path for groundwater to reach the surface (dePolo 2008; Slate et al. 1999).

Seismicity is a measure of the susceptibility of an area to damaging earthquakes and is measured in terms of acceleration due to gravity (Peterson et al. 2008). Seismicity data and maps are available from the Geological Hazards Team, a unit of the USGS Earthquake Hazard Program (USGS 2009). The region around the Project area is mapped as having 10 to 15 percent gravity (Figure 3-4). According to the USGS, 10 percent gravity is the lower threshold at which damage to structures is likely to occur, dependent upon measures taken in design and construction to mitigate structural damage as a result of ground shaking.

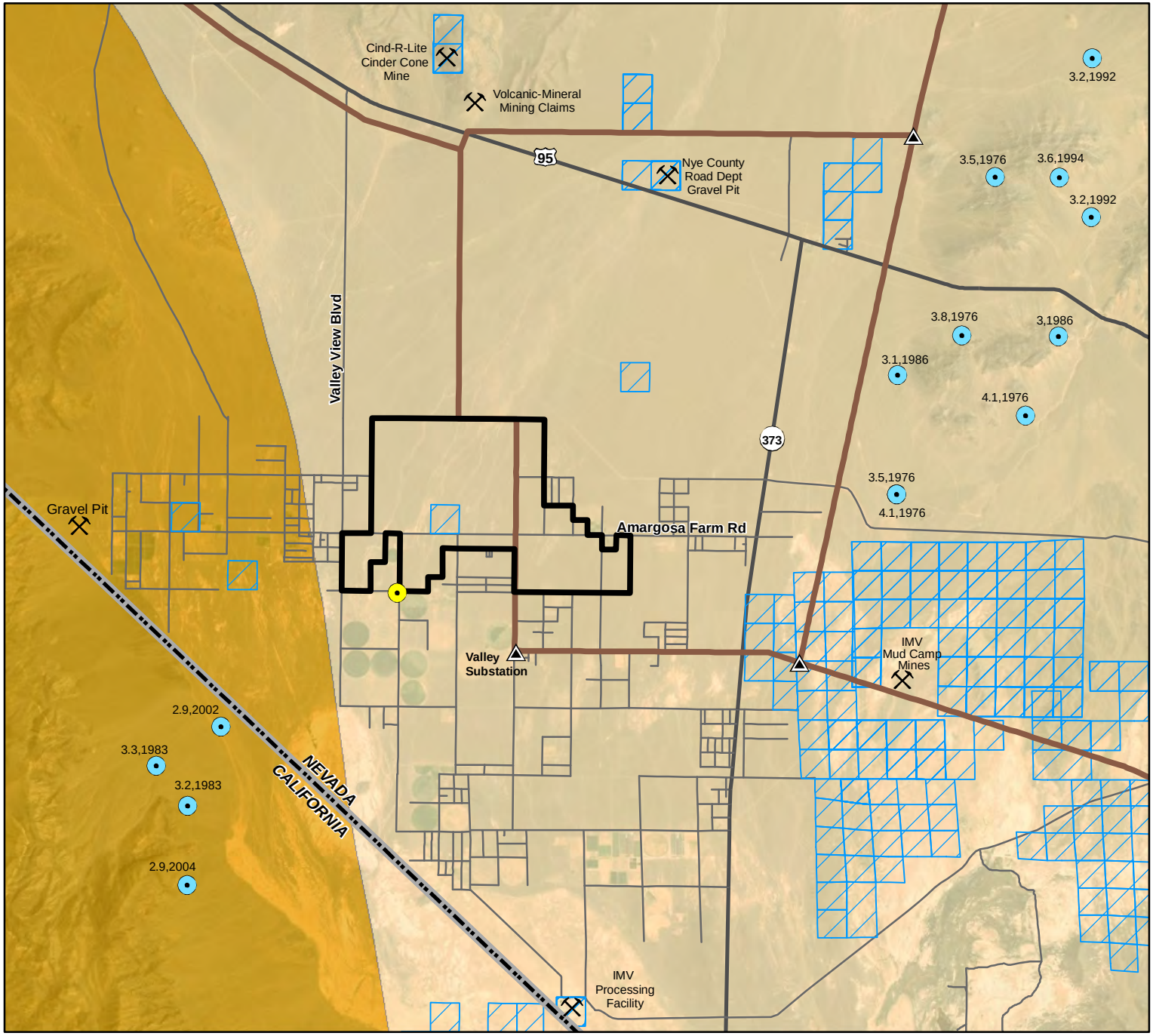
Ground subsidence is the relative downward motion of the local land surface that is often the result of subsurface mining, drawdown of groundwater for irrigation, or settling of soils resulting from local usage of high explosives for mining or construction. Within the Project area, groundwater drawdown is the most likely cause for ground subsidence. A minor amount of subsidence has been mapped using satellite interferometry within Amargosa Valley, which is attributed to groundwater usage (Katzenstein and Bell 2005).

3.2.7 Mineral Resources

An inventory of mineral resources was conducted in and around the Project area to determine if known mineral resources are present, or if there is a possibility of discovering mineral resources in the future. The inventory included locatable, leasable, and salable mineral resources and was conducted using information from the USGS, BLM, and NBMG.

Active mining claims and mineral-materials areas are mapped by the Geocommunicator online mapping system maintained by the BLM and USFS. There are four active mineral-resource-extraction areas in Amargosa Valley within 5 miles of the Project area (see Figure 3-4). The first area has active mining claims staked by Mud Camp Mining, LLC, which are present to the southeast of the Project area in sections 20, 21, and 29 of T16S R50E. The Mud Camp Mining claims provide specialty clays (sepiolite and saponite) to a processing facility operated by IMV Nevada, located in section 29 of T17S R49E to the south of the Project area. The second area, in section 10 of T15S R49E, is a sand and gravel site used by Nye County under a Free Use Permit. The third area contains an active sand and gravel operation at the western end of Amargosa Farm Road, approximately 5 miles from the Project area. The fourth area has a series of public and private claims for volcanic-mineral materials, such as pumice and cinder, which are located north of the Project area at the junction points of T14S R48E, T14S R49E, T15S R48E, and T15S R49E.

This final group of claims includes the Cinder Cone Mine operated by the Cind-R-Lite Block Company, located in section 36 of T14S R48E. None of these four active mineral-resource-extraction areas is located in the Project area. Potential mineral resources located within the Project area are described in the following section.



Amargosa Farm Road Solar Energy Project (NVN-84359)

Geologic Hazards and Mineral Resources Figure 3-4

LEGEND

Project Area

Geologic Hazards

Peak Horizontal Acceleration (%g)
(g = acceleration due to gravity)

- 10-15
- 15-20
- Earthquakes (magnitude, year)

Mining Claims

- Active Mining Claim / Processing Facility
- Closed Placer Claim

General Reference Features

- Existing Transmission Line (<230kV)
- Existing Substation
- Proposed Project Well
- Highway
- Local Road
- State Boundary

Source: Earthquakes, Seismicity - USGS, 2009;
Mining Claims - BLM, 2009; Imagery - ESRI, 2009;
Transmission Lines, Substations - Platts, 2009;
Roads - TerraSpectra Geomatics 2009;
Wells - Nevada State Engineer, 2008

September 2010

0 1 2 Miles

3.2.7.1 Locatable Mineral Resources

There are no active claims in the Project area (BLM and USFS 2009).

3.2.7.2 Leasable Mineral Resources

No leases for leasable mineral resources (oil, gas, and coal resources) are recorded within the Project area (Garside and Hess 2007; Hess et al. 2004; BLM and USFS 2009).

3.2.7.3 Salable Mineral Resources

No mineral-material contracts for salable mineral resources (sand, gravel, topsoil, and clay) are recorded within the Project area (BLM and USFS 2009).

3.3 SOILS

3.3.1 Data Collection Methods

The soil inventory presents an overview of soil types and characteristics, including areas of potential wind and/or water erosion in the Project area. Information for the inventory was obtained primarily from publications, unpublished reports, data of the Soil Conservation Service and the BLM, and from discussions with specialists. The soils inventory was compiled from data maintained online as part of the U.S. Department of Agriculture (USDA) Natural Resources Conservation Service (NRCS) Web Soil Survey, namely the USDA soil survey report that includes the Project area and ROI.

3.3.2 Soils in the Project Area

Four soil map units (three associations and one series) have been mapped within the Project area (Figure 3-5): (1) the Yermo, hot-Yermo-Arizo association; (2) Lewdlac-Yermo association; (3) Sanwell-Sanwell, warm-Yermo association; and (4) Shamock series (Borup 2004).

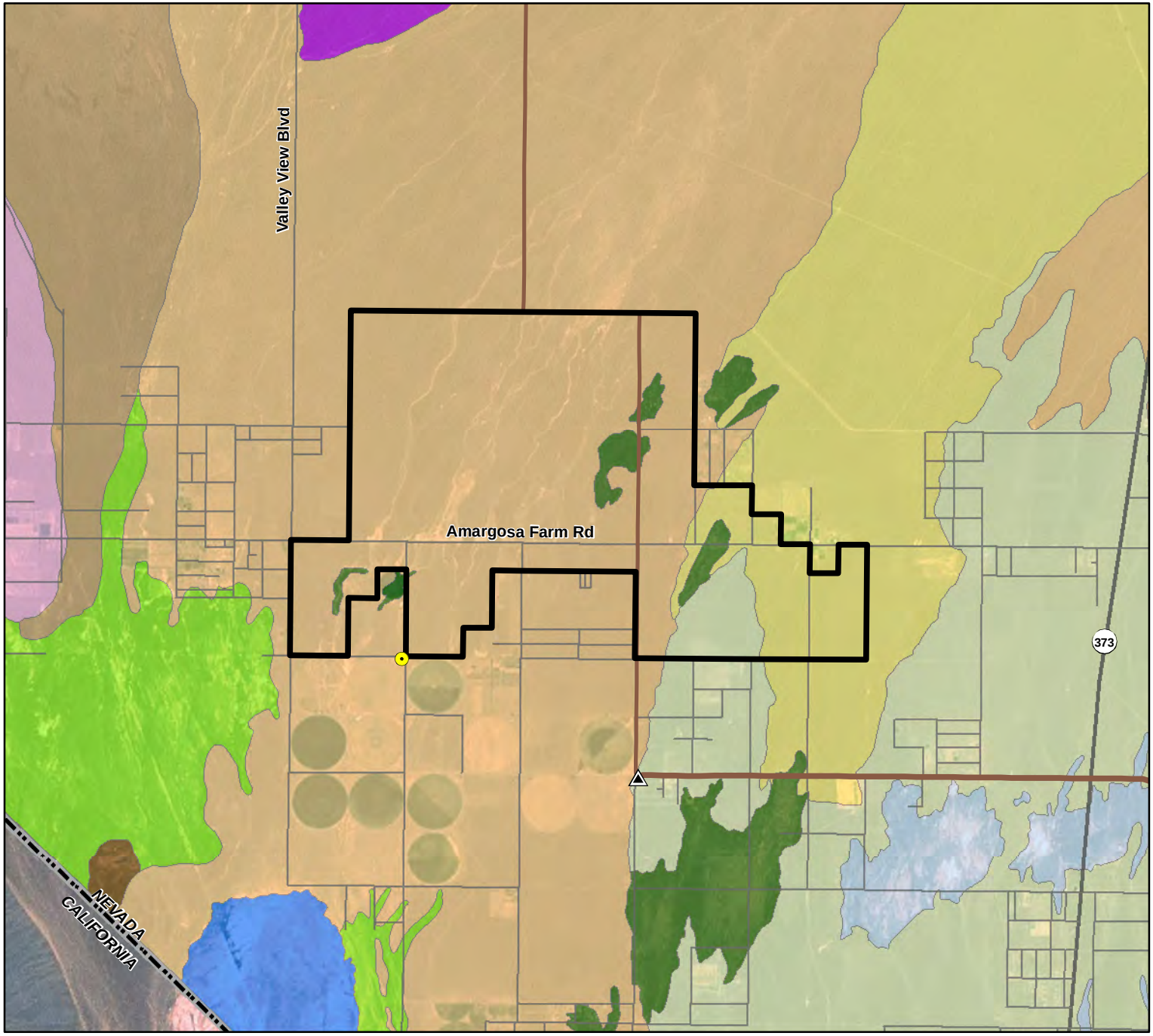
A soil association is a map unit used in soil surveys to represent areas that contain two or more distinct soil series in such a pattern that it is easy to illustrate them as a single map unit for mapping purposes. A soils series is an individual map unit, much like a geological formation that represents an area that has unique characteristics. The four soil map units mapped within the Project area are listed in Table 3-6.

3.3.2.1 Yermo, hot-Yermo-Arizo Association

The Yermo, hot-Yermo-Arizo association mostly comprises 40 percent hot-Yermo soil, 30 percent Yermo soil, and 15 percent Arizo soil on slopes of 2 to 4 percent. This soil association is the most common, covering more than two-thirds of the Project area.

Table 3-6 Soil Map Units and Properties within Project Area					
Map Unit		Yermo, hot-Yermo-Arizo association	Shamock series	Sanwell-Sanwell, warm-Yermo association	Lewdlac-Yermo association
Texture		Skeletal, mixed, thermic, Typic Torriorthents	Coarse-loamy, mixed, thermic, Typic Haplodurids	Skeletal, mixed, thermic Duric Torriorthents	Loamy, mixed, thermic, Cambidic Haplodurids
Permeability		Moderately rapid to very rapid	Moderate	Moderate to moderately rapid	Moderately rapid
pH		8.5	8.5	8.2	8.2
Water Capacity		Low	Low	Low	Very low
Hydrologic Group		B	C	B	D
Water Erosion	**Kw**	0.1	0.2	0.2	0.2
	Kf	0.2	0.3	0.4	0.3
	T	5	2	5	2
Wind Erosion	**WEG**	5	4	4	3
	WEI	56	86	86	86
Landscape Position (percentage slope)		2 to 4	2 to 4	0 to 4	2 to 4
Depth to Bedrock/ Restrictive Feature (inches)		>80	25 to 40 to duripan	>80	10 to 20 to duripan
Land Capability (Irrigated, Nonirrigated)		4	4	–	7
Topsoil Reclamation		Poor	Poor	Poor	Fair

Key:
Kw = susceptibility of the whole soil to sheet and rill water erosion
Kf = susceptibility of only the soil's fine portion (<2 millimeters in diameter) to these same forms of water erosion
(Generally, soils that are more susceptible to water erosion will exhibit greater Kw and Kf factors.)
WEG = wind erodibility group; soils assigned lower ratings are more susceptible to erosion
WEI = wind erodibility index



Amargosa Farm Road Solar Energy Project (NVN-84359)

Soils
Figure 3-5

LEGEND

Project Area

SSURGO Soils

- Rock outcrop-Upspring-Rubble land
- Corbilt gravelly fine sandy loam, warm
- Yermo, hot-Yermo-Arizo association
- Vace gravelly sandy loam
- Shamock gravelly fine sandy loam
- Arizo-Bluepoint-Dune land complex
- Arizo very gravelly sandy loam, moist
- Arizo-Corbilt-Commski association
- Sanwell-Sanwell, warm-Yermo association
- Nowoy-Skelon association
- Lewdlac-Yermo association

General Reference Features

- Existing Transmission Line (<230kV)
- Existing Substation
- Proposed Project Well
- Highway
- Local Road
- State Boundary

Source: Soils - NRCS, 2006; Imagery - ESRI, 2009; Transmission Lines, Substations - Platts, 2009; Wells - Nevada State Engineer, 2008; Roads - TerraSpectra Geomatics 2009

September 2010

0 0.8 1.6 Miles

The Yermo, hot-Yermo-Arizo association has a low water capacity, with moderately rapid to very rapid permeability, and is assigned to hydrologic group B, which corresponds to a moderate water-infiltration route in soils with fine to moderately coarse texture. The soil association has a measured pH of 8.5. Bedrock is not encountered at 80 inches of depth and is likely much deeper. This map unit has been rated as a poor candidate to provide suitable topsoil for reclamation efforts (Borup 2004).

The soils of the Yermo series are typically deep and well drained, occurring on alluvial fans with alluvium derived from mixed rocks. Typically, Yermo series soils are characterized as loamy-skeletal, mixed, superactive, calcareous, thermic, Typic Torriorthents (Borup 2004). The taxonomic classification, Typic Torriorthents, is given to those soil units that exemplify the torriorthents, a soil order that is defined by little to no development of any true soil horizons and that are formed in warm, arid environments (USDA – NRCS 1993). This soil order and its variations are some of the most common soils throughout the Southwest (Birkeland 1999). Within this soil association, the Yermo series is divided into two separate soil units, the Yermo and the hot-Yermo. This division reflects varying average temperatures recorded within the Yermo series, possibly due to greater gravel content or slope facing.

The soils of the Arizo series are typically deep and excessively drained, occurring on inset fans with slopes between 0 and 15 percent. Arizo series soils form in alluvium that is derived from mixed rocks (e.g., igneous, carbonate). Taxonomically, Arizo series soils are characterized as sandy-skeletal, mixed, thermic, Typic Torriorthents (Borup 2004).

3.3.2.2 Lewdlac-Yermo Association

The Lewdlac-Yermo association is intermittently present in the Project area, specifically in the southwestern, southeastern, and northeastern corners of the Project area. The Lewdlac-Yermo association consists of 70 percent Lewdlac series soils and 15 percent Yermo series soils on slopes of 2 to 4 percent. The Lewdlac-Yermo association exhibits very low water capacity with moderately rapid permeability and is assigned to hydrologic group D, which corresponds to a very slow water-infiltration rate. This is likely because of a duripan layer between 10 and 20 inches below the surface that impedes the transmission of water. This soil association has a measured pH of 8.2. Bedrock is not encountered at 80 inches and is likely much deeper. The Lewdlac-Yermo association has been given a fair rating regarding its suitability to provide topsoil for reclamation efforts (Borup 2004).

The soils of the Lewdlac series are typically shallow, over a strongly cemented duripan. These well-drained soils occur on alluvial flats with slopes ranging from 2 to 8 percent. Lewdlac series soils form in alluvium mostly derived from quartzite over reworked lacustrine sediments. Typically, Lewdlac series soils are characterized as loamy, mixed, superactive, thermic, shallow, Cambidic Haplodurids. The soil taxonomic classification, Cambidic Haplodurids, includes aridisols that contain a duripan within the upper 40 inches of the soil unit that is strongly cemented (Borup 2004).

Yermo series soils mapped within this soil association exhibit the same characteristics as those mapped as part of the Yermo, hot-Yermo-Arizo association.

3.3.2.3 Sanwell-Sanwell, warm-Yermo Association

The Sanwell-Sanwell, warm-Yermo association is restricted to the southeastern portion of the Project area. It consists of 65 percent Sanwell series soils and 20 percent Yermo series soils on slopes of 0 to 4 percent. This soil association exhibits low water capacity with moderately rapid permeability and is assigned to hydrologic group B, which corresponds to a moderate water-infiltration route in soils with fine to moderately coarse texture. The Sanwell-Sanwell, warm-Yermo association has a measured pH of 8.2. This soil association has been assigned a poor rating regarding its suitability for use as topsoil for reclamation efforts (Borup 2004).

The soils of the Sanwell series are typically very deep and well drained, occurring on alluvial flats with slopes ranging from 0 to 8 percent. Sanwell series soils form in coarse lacustrine sediments. This lacustrine source is likely associated with the marl deposits that are mapped just upslope from the location of this soil unit. Typically, Sanwell series soils are characterized as loamy-skeletal, mixed, superactive, calcareous, thermic, Duric Torriorthents. The taxonomic soil classification, Duric Torriorthents, applies to soil units formed in hot and arid environments that do not exhibit well-developed soil horizons, but may include a notably harder and competent soil horizon within 40 inches of the soil surface (Borup 2004).

Yermo series soils mapped within this soil association exhibit the same characteristics as Yermo soils mapped as part of the Yermo, hot-Yermo-Arizo association.

3.3.2.4 Shamock Series

The Shamock series is restricted to the easternmost portion of the Project area and has the second greatest areal extent within the Project area. It is present within the Project area on slopes of 2 to 4 percent. This soil series exhibits a low water capacity with moderate permeability. It is assigned to hydrologic group C, which corresponds to a slow rate of water infiltration in soils with moderately fine to moderately coarse texture. The Shamock series has a pH level of 8.5. A well-indurated duripan is present between 25 and 40 inches from the surface of the soil unit. This soil unit has been given a poor rating for suitability for topsoil reclamation, because of difficulty of recovery (Borup 2004).

The soils of the Shamock series are typically moderately deep over a duripan. The well-drained soils occur on alluvial flats with slopes ranging from 0 to 4 percent. Shamock series soils form in alluvium derived from mixed rocks. Typically, Shamock series soils are characterized as coarse-loamy, mixed, superactive, thermic, Typic Haplodurids. The taxonomic classification Typic Haplodurids refers to aridisols, soils formed in arid environments with well-developed soil horizons that contain a duripan within the upper 40 inches of the soil unit (Borup 2004).

3.3.3 Erosion Potential

Water erosion of soils are typically indicated in soil surveys by two factors, Kw and Kf, where Kw represents the general susceptibility of the whole soil to sheet and rill water erosion, and Kf represents the susceptibility of only the soil's fine portion (<2 millimeters diameter) to these same forms of water erosion (USDA – NRCS 1993). Generally, soils that are more susceptible to

water erosion will exhibit greater Kw and Kf factors. The Yermo, hot-Yermo-Arizo association, located in the western two-thirds of the Project area, is the least susceptible to water erosion (lower Kw and Kf factors), whereas the other soil associations that are located in the eastern one-third of the Project area are more susceptible to water erosion (higher Kw and Kf factors).

Wind erosion may have adverse impacts on soils, particularly those that lack vegetation cover (USDA – NRCS 1993). The NRCS assesses a soil series' susceptibility to wind erosion by assigning each soil series to a WEG. This includes a rating on the WEI that is measured in tons of soil lost per acre per year. These determinations are made based upon the composition and texture of a given soil. For example, soils with well-established desert pavement are far less susceptible to wind erosion than unvegetated soils that are composed of fine sand soils assigned lower ratings of the WEG scale are more susceptible to erosion than soils assigned higher ratings. WEG ratings of 3 or 4 (on a scale of 1-8) are assigned to the Lewdlac-Yermo association; Sanwell-Sanwell, warm-Yermo association; and Shamock series. The Yermo, hot-Yermo-Arizo association is less susceptible to wind erosion and is assigned to a WEG of 5 (Borup 2004). Therefore, soils in the western two-thirds of the Project area are less susceptible to wind erosion than soils in the eastern one-third of the Project area.

3.3.4 Prime and Unique Farmland

The USDA uses the designation *prime farmland* to describe soils that have the correct combination of physical and chemical characteristics that allow the soil to produce significant amounts of food, feed, fiber, or oilseed crops. These characteristics include soil quality, growing season, and moisture supply needed to produce economically sustained high yields of crops when properly managed with farming methods such as an adequate and dependable water supply (USDA – NRCS 1993). No soil within the Project area has been designated as prime farmland. However, irrigated farmlands are present south of the Project area. These agricultural areas are serviced by rotary irrigation systems that create the circular patterns easily visible in aerial photographs. Without the irrigation systems, it is unlikely that Amargosa Valley could support extensive agriculture.

3.4 WATER RESOURCES

This section presents an overview of the surface and groundwater resources in the ROI which could be affected by construction, operation, and maintenance of the proposed Project. The ROI for surface water is different from the groundwater ROI based on potential effects of the proposed Project on water resources. Surface water features in the ROI are described in Section 3.4.3, followed by a discussion of groundwater resources in Section 3.4.4. Because springs are a function of groundwater expression and influence, regional springs are discussed in the groundwater resources section.

3.4.1 Regulatory Framework

3.4.1.1 Federal

Federal laws and policies establish standards for clean water, controlling development in flood plains, and protecting the environment. The CWA 33 USC §§ 1251-1387, regulates both direct and indirect discharges, including stormwater discharges from construction and industrial activities.

Activities resulting in the dredging or filling of jurisdictional waters of the United States, which can include drainages and ephemeral washes, require authorization under a Section 404 permit issued by the USACE. In addition, an applicant for a federally permitted activity that may result in a discharge to jurisdictional waters must obtain from the State a Section 401 certification that the action will not violate state or federal water quality standards. In Nevada, the 401 Certificate is issued by the NDEP BWQP.

Quality of jurisdictional waters of the U.S. is protected through Sections 301 and 402 of the CWA, which regulates discharges of pollutants and stormwater discharges through the NPDES. In Nevada, authority to implement the NPDES permit program has been delegated to the NDEP BWPC.

The Safe Drinking Water Act (SDWA) is the main federal law that ensures the quality of Americans' drinking water. The SDWA was originally passed by Congress in 1974 to protect public health by regulating the nation's public drinking water supply. The law was amended in 1986 and 1996 and requires many actions to protect drinking water and its sources, including: rivers, lakes, reservoirs, springs, and groundwater wells. Under SDWA, the EPA sets standards for drinking water quality and oversees the states, localities, and water suppliers who implement those standards (EPA 2010). The SDWA does not regulate private wells that serve fewer than 25 individuals (EPA 2010). The SDWA also mandates that a Groundwater Wellhead Protection Program be developed by each state in order to protect groundwater resources that serve as sources for public drinking water.

The National Flood Insurance Program (NFIP) is administered by the Federal Emergency Management Agency (FEMA), a component of the U.S. Department of Homeland Security. The NFIP enables property owners in participating communities to purchase insurance protection against losses from flooding. This flood insurance is designed to provide an alternative to federal disaster assistance to meet the escalating costs of repairing damage to buildings and their contents caused by floods.

In support of the NFIP, FEMA identifies flood hazard areas throughout the United States by identifying and mapping Flood Hazard Boundary Maps, Flood Insurance Rate Maps, and Flood Boundary and Floodway Maps. Several areas of flood hazards are commonly identified on these maps. One of these areas is the Special Flood Hazard Area, which is defined as an area of land that would be inundated by a flood having a 1 percent chance of occurring in any given year (previously referred to as the base flood or 100-year flood). Development may take place within the Special Flood Hazard Area, provided that development complies with local floodplain management ordinances, which must meet the minimum Federal requirements.

Based on review of the Flood Insurance Rate Map for Nye County, Nevada, and Incorporated Areas (32023C8400E), there are no Special Flood Hazard Areas in or near the Project area.

3.4.1.2 State

The state serves in several relevant functions with regard to water regulation. First, Nevada law governing water rights is set forth in NRS Chapters 533 and 534. The NDWR, headed by the State Engineer, is responsible for the administration of these laws. Applications for new appropriations or to change water already appropriated under an existing right must be reviewed and approved by the State Engineer, prior to any water diversion. The State Engineer determines the limit and extent of water rights and establishes any appropriate conditions regarding these rights. In ruling on a water right application, the State Engineer must consider four criteria:

1) Is there unappropriated water available for the proposed use?
2) Will the proposed water use impair senior water rights?
3) Is the proposed water use in the public interest?
4) Is the proposed Project feasible, and if so is it filed for speculative purposes?

When a water rights permittee has “perfected” a water right; i.e., shown that the water has been put to beneficial use as defined by NRS 533.030 and NRS 533.035, the Nevada State Engineer's Office issues a Certificate of Appropriation. Once granted, water rights in Nevada have the standing of both real and personal property; this means that they are conveyed as an appurtenance to real property unless they are specifically excluded in the deed of conveyance. When water rights are purchased or sold as personal property or treated as a separate appurtenance in a real-estate transaction, the water rights are conveyed specifically by a deed of conveyance. It is possible to buy, sell, or lease water rights and change the water's point of diversion, manner of use, and/or place of use by filing an application with the State Engineer (NDWR 2009b).

The NDEP administers the Nevada Water Pollution Law (NRS 445A.300-730), which implements the state water quality standards and protection programs mandated by the CWA. The regulatory requirements governing these programs (Water Quality Standards Regulation) are published in 40 CFR § 131 and applicable sections of the NAC. States are responsible for reviewing, establishing, and revising water quality standards. Section 303(d) of the CWA requires states to provide a list of impaired waters only, identifying possible pollutants and prioritizing those waters for further pollution control. The Nevada Water Pollution Control Law applies the NPDES system to all water of the state, regardless of whether they are federal jurisdictional waters.

The State of Nevada Stormwater Program, administered by NDEP, requires operators of large and small construction sites to obtain an NPDES construction stormwater permit in order to discharge stormwater. The submittal of a NOI for inclusion under the State of Nevada’s General Stormwater Permit and a SWPPP is required for all soil disturbing activities (including grading, trenching, and demolition), where one or more acres will be disturbed, and have a discharge of stormwater to a receiving water (e.g., wetlands, creeks, unnamed creeks, rivers, marine waters, ditches, and estuaries), and/or storm drains that discharge to a receiving water (NDEP 2009).

The NDEP administers the Wellhead Protection Program, which is developed and implemented at the local level. The NDEP offers guidance and enforces regulatory setbacks to protected groundwater and wellhead areas and tracks specific areas delineated as wellhead and source water protection areas.

The state also administers the federal SDWA, through the NDEP Bureau of Safe Drinking Water.

3.4.1.3 Local

The Nye County Water Resources Plan (Buqo 2002) outlines the county plan for ensuring adequate supplies of water remain available in Nye County to maintain and enhance the quality of the environment; to improve the quality of life for residents and visitors to the County; and to expand and diversify the economy of the County. In 2007 the Nevada Legislature established the Nye County Water District pursuant to NRS Chapter 542. The Nye County Water District Board was created to oversee the qualitative and quantitative status of water resources available for use within Nye County.

3.4.2 Data Collection Methods

Since the early 1950s, extensive investigations have been conducted to characterize water resources that have been, or may be, affected by activities at the Nevada Test Site and the proposed Yucca Mountain repository. In addition, because of the presence of environmentally sensitive areas at Devils Hole, Ash Meadows, and Death Valley, extensive hydrological monitoring infrastructure has been installed and has resulted in the accumulation of over 40 years of water level monitoring and water chemistry analysis in the Death Valley Hydrographic Region.

The DOE, in cooperation with the USGS and other federal, state, and local agencies, has conducted studies to evaluate water-resources potential of the region, evaluate the impacts of groundwater pumping, estimate groundwater recharge from wash infiltration, and evaluate regional groundwater flow. Between 1951 and 1996, more than 1,700 publications and abstracts have been written about the geology, hydrogeology, and hydrology of the Nevada Test Site area (Seaber et al. 1997). Since 1996, additional studies have been conducted as new technology has emerged, and the body of knowledge has increased. Hydrologic investigations relevant to the Amargosa Desert include measurements of evapotranspiration within the Central sub-region; construction of a dataset for pumping in the Amargosa Desert (and other areas); and measurement of groundwater recharge underneath the Amargosa River and irrigated fields in the Amargosa Farms area.

The references that were selected for use in this analysis are listed in Chapter 6 – References, with full bibliographic citations. The information compiled from these sources is assumed to be factual and sufficiently accurate for use in this analysis.

Additional data sources reviewed for this EIS include USGS topographic and aerial maps, reports and studies prepared by the DOE for the proposed Yucca Mountain Geologic Repository,

as well as additional water resource reports by various organizations. Basin water rights abstracts and pumpage inventories were obtained from the USGS and NDWR and were used as the basis for the values of perennial yield, committed water resources, and estimated water use in the ROI.

3.4.3 Surface Water Resources

For water planning and management purposes, the USGS and the NDWR, Department of Conservation and Natural Resources, have divided the state into 256 discrete hydrologic basins and sub-areas, within 14 major hydrologic units called Hydrographic Regions (NDWR 2009b). Hydrographic basins and sub-areas generally consist of valleys that are separated by surface-water drainage divides (Rush 1968).

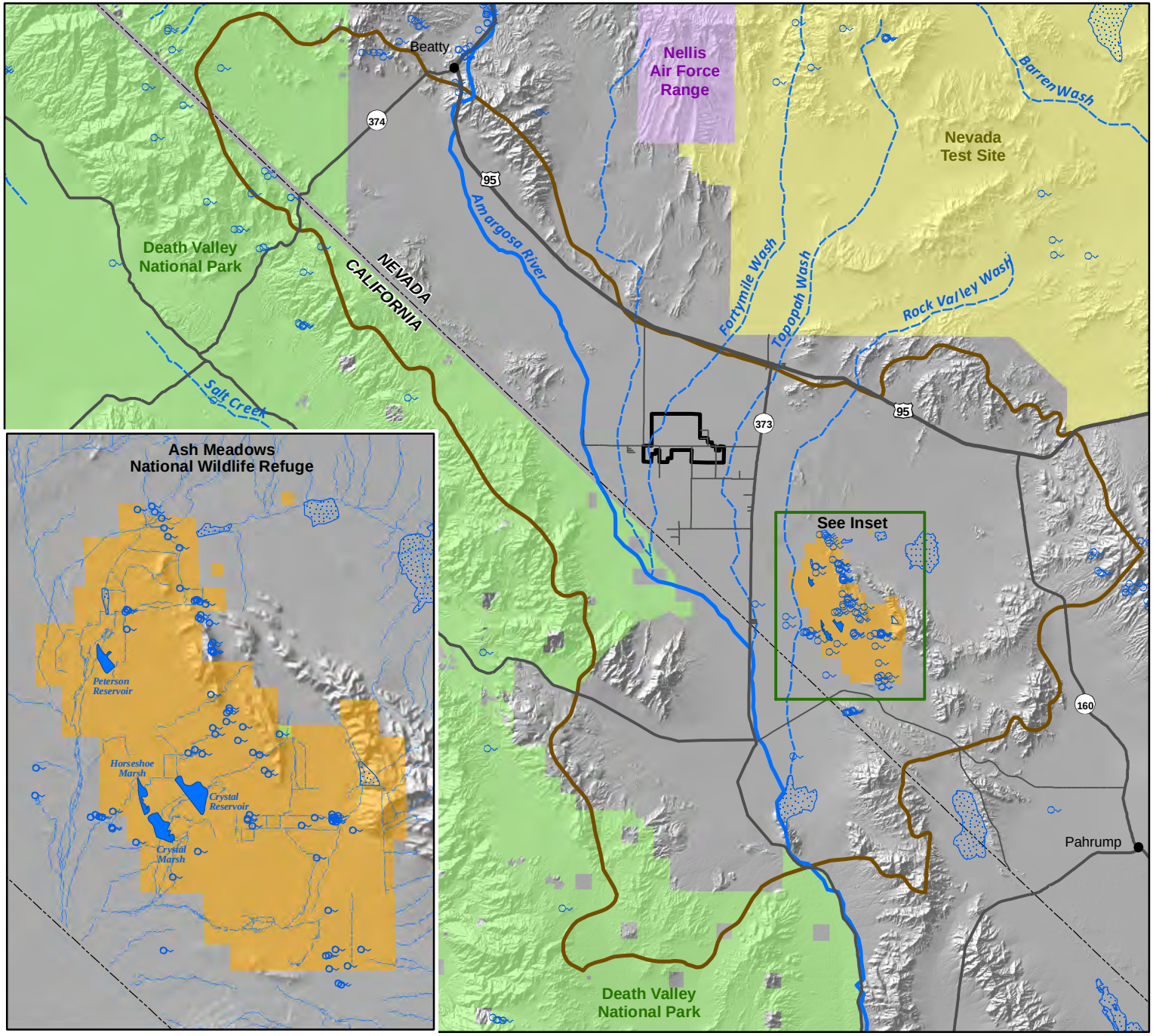
All Project components would be located within the Nevada portion of the Amargosa Desert Hydrographic Basin (#230), which is a part of the Death Valley Hydrographic Region (#14). The Amargosa Desert Hydrographic Basin covers 896 square miles (573,440 acres). Approximately 65 percent of the Amargosa Desert Hydrographic Basin is located in Nye County, with the remainder in Inyo County, California, primarily within Death Valley National Park.

3.4.3.1 Surface Water Features

The Project is situated within the Amargosa River drainage system (Figure 3-6). The Amargosa River begins in Oasis Valley, north of Beatty, and drains an area approximately 3,100 square miles by the time it reaches Tecopa, California. Its course extends approximately 60 miles farther, before terminating in the Badwater Basin in Death Valley National Park (DOE 2008). Basin relief is approximately 8,000 feet, ranging from approximately 7,700 feet above sea level at Pahute Mesa, Nevada, to approximately 300 feet below sea level at Badwater Basin in Death Valley, California (Tanko and Glancy 2001).

Major tributaries of the Amargosa River in Nevada include Thirsty Canyon and Beatty Wash in the northern reach, Fortymile Wash, Tonopah Wash, and Carson Slough along its central reach and China Ranch Wash and Salt Creek in the lower reach in California.

Despite the large drainage area, most of the Amargosa River and its tributaries are ephemeral, except in a few relatively short reaches of the River where discharging springs maintain small, perennial base flows. The Amargosa Desert portion of the river is dry more than 98 percent of the time (Stonestrom et al. 2007). Within the lower reach of the Amargosa River, small thermal springs near Shoshone and Tecopa, California contribute flow to the river. These springs also add to river flow in the reach between Tecopa and Dumont Sand Dunes. A 4-mile segment of the Amargosa River in this area was designated “wild and scenic” under the Omnibus Public Land Management Act of 2009. This Act, signed by President Barack Obama on March 30, 2009, provides protection of riverside land along both sides of a river in order to preserve the river's free-flowing nature.



Amargosa Farm Road Solar Energy Project (NVN-84359)

Water Resources
Figure 3-6

LEGEND

- Project Area

Water Resources

- Amargosa Desert Hydrographic Basin (230)
- Reservoir
- Playa
- River
- Wash
- Spring/Seep

General Reference Features

- Ash Meadows National Wildlife Refuge
- Death Valley National Park
- Nevada Test Site
- Nellis Air Force Range
- US Highway
- State Highway
- Local Road
- State Boundary

Source: Water Resources - USGS, 2005,2006;
Ash Meadows - USFWS, 2005;
Land Ownership - BLM, 2007;
Local Roads - Terra Spectra, 2009;
Highways - ESRI, 2005

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0 6 12 Miles

The Project site is traversed by Fortymile Wash, which is tributary to the Amargosa River and originates in the mountains of the Nevada Test Site directly to the north. Along its 93-mile length, the Fortymile Wash drains the western slopes of Shoshone Mountain, the eastern slopes of Yucca Mountain, and the western part of Jackass Flats all on the Nevada Test Site. Fortymile Wash has a sizeable canyon associated with its upper reaches between the mountains and remains a moderately confined channel to approximately one mile upstream of US 95 where the wash widens into several distributary channels. These numerous channels form a less defined drainage pattern that persists downstream to the confluence with the Amargosa River floodplain. The nearest surface water impoundments are Peterson Reservoir, Crystal Reservoir, Lower Crystal Marsh, and Horseshoe Reservoir in the Ash Meadows NWR, approximately 7 miles southeast of the Project area. The largest of these is Crystal Reservoir, a manmade impoundment at Ash Meadows, which captures the discharge from several springs in the area and has a capacity of 1,500 acre-feet (1.8 million cubic meters). Crystal Reservoir and other smaller pools in Ash Meadows drain to the Amargosa River through Carson Slough (DOE 2008).

3.4.3.2 Flood Occurrence

Streamflow characteristics of the Amargosa River have been studied for at least 45 years, with USGS stream gage data being recorded since 1964 near Beatty (USGS streamflow gauging station 10251220). Other stream gages and thermal detection gages have been installed along the Amargosa River; though they have not been continuously monitored.

Streamflow characteristics of Fortymile Wash have been similarly studied for the past 26 years; primarily within the Nevada Test Site, directly north of the Project area and US 95, and to a lesser extent in Amargosa Valley. USGS stream gage data is available at the Nevada Test Site southwestern boundary, upstream of US 95 (USGS streamflow gauging station 10251258).

As part of the DOE site characterization, investigations for Yucca Mountain (studies pertaining to surface-water runoff, including the potential for flooding in Fortymile Wash and Amargosa River) have been conducted (Beck and Glancy 1995; Tanko and Glancy 2001). Although flow in the Fortymile Wash is rare, the area is subject to flash flooding from intense summer thunderstorms or sustained winter precipitation. When these events occur, intense flooding can include mud and debris flows, in addition to water runoff in both the Fortymile Wash and Amargosa River (Blanton 1992).

At least three major flood events have occurred for which it is well documented that flows from Fortymile Wash and Amargosa River completely traversed the Amargosa Desert from the Nevada Test Site to Death Valley. These were in 1969, 1995, and 1998 (USGS 2008). The 1969 flood was the largest, producing a peak flow that exceeded the median annual peak flow by more than two orders of magnitude (Stonestrom et al. 2007). Beck and Glancy (1995) documented conditions during March 1995 and February 1998, when Fortymile Wash and the Amargosa River flowed simultaneously through their primary channels to Death Valley. During both floods, surface water from the Nevada Test Site flowed to the Amargosa River mainly via the Fortymile Wash, and road overflows were observed at similar locations (Tanko and Glancy

2001). In Fortymile Wash, a peak streamflow of approximately 3,000 cubic feet per second in 1995 severely scoured and eroded the channel, causing extensive road damage on the Nevada Test Site as well as to US 95 (Beck and Glancy 1995).

3.4.3.3 Surface Water Quality

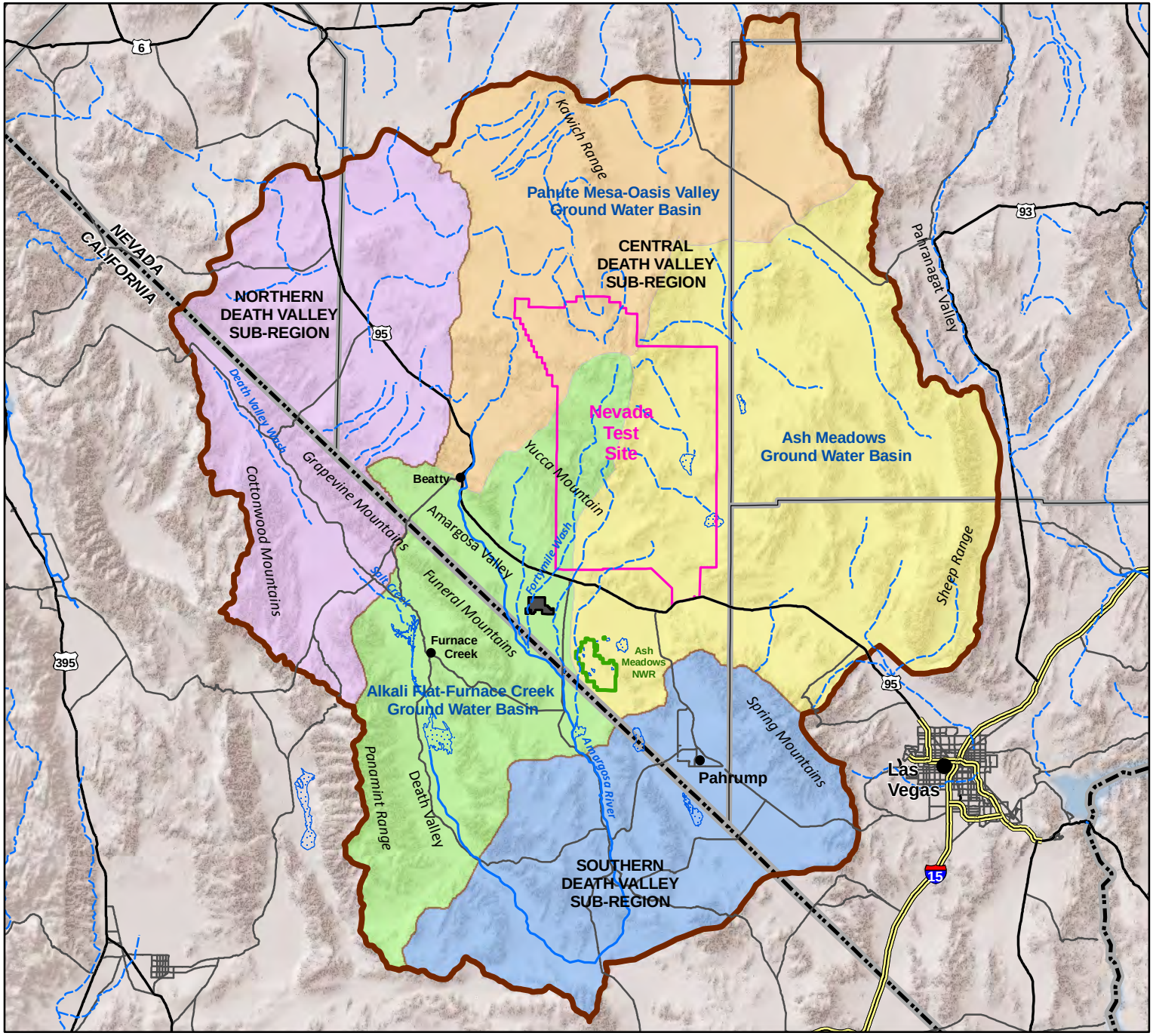
Section 305(b) of the CWA requires states to make water quality assessments and provide water quality reports to the EPA; CWA Section 303(d) requires states to identify waters, through their Section 305(b) water quality assessments, that do not or are not expected to meet applicable water quality standards with federal technology-based standards alone. Under CWA Section 303(d), States also are required to develop a priority ranking for these waters that takes into account the severity of the pollution and the designated uses of the waters. Once this listing and ranking of impaired waters is completed, States are required to develop Total Maximum Daily Loads for these waters in order to achieve compliance with the water quality standards. Nevada's 2006 Section 303(d) list of impaired waters shows no CWA Section 303(d) impaired waters in the Project area.

3.4.4 Groundwater Resources

The ROI for groundwater resources is the Death Valley Regional Flow System (DVRFS). The DVRFS (used as the basis for modeling groundwater flow for the Project) covers an area of 15,800 square miles and includes much of southern Nevada and the Death Valley region of eastern California (Harrill et al. 1998). As shown in Figure 3-7, this groundwater flow system is west of Las Vegas, Nevada, and includes parts of Clark, Esmeralda, Lincoln, and Nye counties, Nevada, and Inyo and San Bernardino counties, California. Death Valley, the largest valley within the flow system, forms the southwestern boundary of the flow system.

As shown in Figure 3-8, a total of 30 hydrographic areas are recognized within the DVRFS. Hydrographic areas are delineated primarily from topography and geologic structures, and generally correspond to major surface drainages. These areas serve as the basic units used by State and local agencies for water-resources planning, and in combination, form the regional flow systems delineated throughout the area (Harrill et al. 1998).

Groundwater flow within the DVRFS is divided into subregions that are further divided into sections, and the sections are grouped into groundwater basins. These divisions are based on locations of recharge areas; regional hydraulic gradients; distribution of aquifers, structures, and confining units that affect flow; and location of major discharge areas (Belcher 2004). The Project area is located within the Central Death Valley subregion. In this subregion, the dominant flow paths are associated with major regional or intermediate discharge areas and have been grouped into three groundwater basins: (1) Pahute Mesa-Oasis Valley basin, (2) Ash Meadows basin, and (3) Alkali Flat-Furnace Creek basin. The Project is situated within the Alkali Flat-Furnace Creek basin. Groundwater is derived from recharge on Pahute Mesa, Timber and Shoshone Mountains, and the Grapevine and Funeral Mountains. Additional recharge may occur as throughflow from Sarcobatus Flat, Oasis Valley, and Ash Meadows. Recharged groundwater then moves through volcanic rock aquifers in the north and carbonate rock aquifers in the south towards discharge areas in the southern and southwestern portions of the basin (Belcher 2004).



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Death Valley Regional Flow System Figure 3-7

LEGEND

- Project Area
- Death Valley Regional Flow System
- Northern Death Valley Sub-region
- Southern Death Valley Sub-region

Central Sub-region Ground Water Basin

- Alkali Flat-Furnace Creek
- Ash Meadows
- Pahute Mesa-Oasis Valley

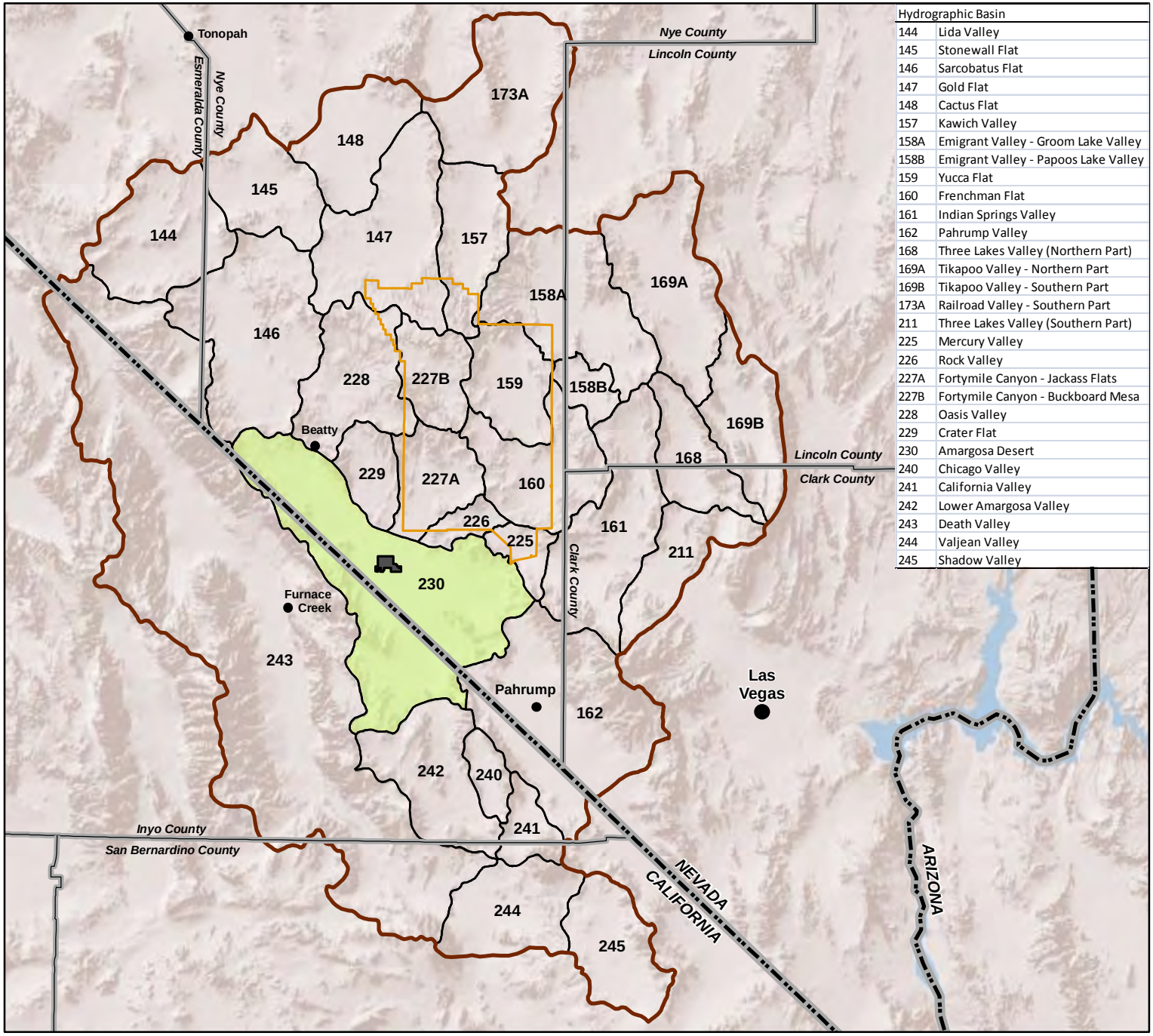
General Reference Features

- Interstate
- US Highway
- Major Road
- River
- Wash
- State Boundary
- County Boundary
- City / Town
- Playa

Source: DVRFS - USGS, 2004,
Ash Meadows - USFWS, 2005
Hydrology, Roads, Boundarys, Hillshade - ESRI, 2009

September 2010

0 10 20 Miles



Hydrographic Basin	
144	Lida Valley
145	Stonewall Flat
146	Sarcobatus Flat
147	Gold Flat
148	Cactus Flat
157	Kawich Valley
158A	Emigrant Valley - Groom Lake Valley
158B	Emigrant Valley - Papoos Lake Valley
159	Yucca Flat
160	Frenchman Flat
161	Indian Springs Valley
162	Pahrump Valley
168	Three Lakes Valley (Northern Part)
169A	Tikapoo Valley - Northern Part
169B	Tikapoo Valley - Southern Part
173A	Railroad Valley - Southern Part
211	Three Lakes Valley (Southern Part)
225	Mercury Valley
226	Rock Valley
227A	Fortymile Canyon - Jackass Flats
227B	Fortymile Canyon - Buckboard Mesa
228	Oasis Valley
229	Crater Flat
230	Amargosa Desert
240	Chicago Valley
241	California Valley
242	Lower Amargosa Valley
243	Death Valley
244	Valjean Valley
245	Shadow Valley

Amargosa Farm Road Solar Energy Project (NVN-84359)

Hydrographic Basins
Figure 3-8

LEGEND

- Project Area
- Death Valley Regional Flow System
- Amargosa Desert Hydrographic Basin (230)
- Nevada Test Site

General Reference Features

- State Boundary
- County Boundary
- City / Town

Source: DVRFS, Basins - USGS 2009
Nevada Test Site - USGS GAP 2005
Boundaries, Hillshade - ESRI, 2009

September 2010

0 10 20 Miles

Within the Alkali Flat-Furnace Creek basin, the Project is further divided into the Amargosa River Section. Recharge to this section is predominantly by throughflow in the basin-fill sediments from Oasis Valley, Crater Flat, Fortymile Canyon and Wash, and Specter Range sections (Belcher 2004).

Three types of aquifers are recognized in the region: the volcanic aquifer, alluvial aquifer, and carbonate aquifer. The most developed and utilized water-bearing source in the basin is the valley fill alluvial aquifer. The Valley-fill aquifer as described by Winograd and Thordarson (1975) is present, on average, between 650 and 960 feet deep. The Lower Carbonate aquifer as described by Winograd and Thordarson (1975) is present, on average, between 1,370 and 1,800 feet deep. As described in Chapter 3.3, Devils Hole in the Ash Meadows area is a water-filled cave system in the Paleozoic carbonates of the Bonanza King Formation. This suggests that the surface water in the Ash Meadows area is linked to the Lower Carbonate Aquifer as described by Winograd and Thordarson (1975).

Under the Amargosa Farms area, where the proposed Project would be located, the depth to groundwater ranges from approximately 135 feet below land surface in the northwest to approximately 90 feet below land surface near the Longstreet Inn at the California/Nevada state line (Buqo 2002).

Due to concerns regarding the use of groundwater for Project construction and operations, a numerical groundwater flow model of the DVRFS was used to evaluate the regional effects to water resources associated with current use and the potential regional effects to water resources associated with the proposed Project. The reader is referred to Section 4.4 (Water Resources) for a summary of the groundwater flow modeling and Appendix B for the complete groundwater flow modeling report.

3.4.4.1 Groundwater Recharge and Discharge

Most groundwater recharge in southern Nevada is derived from winter and spring precipitation, which represents approximately 40 to 60 percent of the total annual precipitation. Precipitation reaches the groundwater reservoirs through streams, originating in uplands and eventually discharging onto alluvial aprons or by infiltrating directly into consolidated rock and percolating vertically and laterally to the valley fill aquifer (BLM Las Vegas District RMP 1998). Recharge may also occur from infiltration during ephemeral flows of the Amargosa River and Fortymile Wash (Savard 1998; Beck and Glancy 1995; Stonestrom et al. 2007). Groundwater recharge was found to be narrowly focused beneath the Amargosa River channel, flanked by large tracts of recharge-free basin floor, in a study conducted in 1998-2001 (Stonestrom et al. 2007).

Stonestrom et al. (2007) noted differences in recharge beneath agricultural areas versus native vegetation. Recharge was found to be negligible beneath undisturbed native vegetation covering most of the Amargosa Desert floor, where water-potential profiles indicate upward flow and atmospherically deposited salts have been accumulating more or less continuously since the end of the Pleistocene Epoch. Accumulation of salts has formed pronounced bulges just below the root zone. In contrast, beneath both irrigated fields and the Amargosa River channel, extreme water potentials and low salt concentrations indicate active deep percolation and groundwater

recharge. Transit times of recharge beneath the channel are on the order of centuries. Transit times of irrigation-return flow are on the order of decades (Stonestrom et al. 2007)

Groundwater discharges from the Amargosa Valley Hydrographic Basin include: (1) evapotranspiration, (2) discharge from springs, (3) flows across a groundwater flow system boundary to an adjacent system, and (4) groundwater pumping from underground sources. These functions are described in the following section. Activities such as groundwater pumping for agricultural uses and human consumption remove water from storage in a groundwater system, thereby reducing hydraulic heads which are measured as groundwater levels in open wells. Groundwater pumping also can affect streams or springs in direct hydraulic connection with the groundwater system, because declining groundwater levels can lead to increased recharge from streams and decreased spring flow.

3.4.4.2 Evapotranspiration

Evapotranspiration is the combined process of evaporation and the transpiration of water through plant tissue into the atmosphere. Evapotranspiration is a critical component of the water cycle, and thus an important component of many hydrological and climate models. However, evapotranspiration is difficult to measure directly. It is calculated from climate data, factors representing vegetation characteristics, and water supply.

Historically, estimates of evapotranspiration in the DVRFS were computed as part of regional groundwater assessments (Malmberg and Eakin 1962; Eakin 1963; Pistrang and Kunkel 1964; Malmberg 1967; Rush 1968). These regional assessments estimated annual evapotranspiration losses as the product of the acreage of phreatophytes within a discharge area and an annual evapotranspiration rate representative of the vegetation and soil conditions of the discharge area (Laczniak et al. 1999).

Estimates of the total amount of evapotranspiration in the Amargosa Desert Hydrographic area vary. Walker and Eakin (1963) estimated 24,000 acre-feet of annual evapotranspiration in the Amargosa Desert. Of this total, approximately 10,500 acre-feet were determined to be from Ash Meadows (Winograd and Thordarson 1975); and the remainder from other smaller areas of groundwater discharge found throughout the Amargosa Desert.

Recent studies of evapotranspiration rates for vegetation and soil conditions in the regional area (Johnson 1987; Czarnecki 1997; Laczniak et al. 1999; Nichols 2000) indicate rates somewhat different than those presented in earlier studies. Based on the updated data, Laczniak et al. (1999) estimated 22,000 acre-feet of annual evapotranspiration in the Ash Meadows area.

3.4.4.3 Regional Springs

Several springs of regional importance lie outside of the immediate Project area. These include more than 30 seeps and springs in the Ash Meadows NWR, including Devils Hole, a 40-acre detached unit of Death Valley National Park. Devils Hole provides habitat for the only naturally occurring population of the endangered Devils Hole Pupfish (*Cyprinodon diabolis*).

Springs in the Ash Meadows NWR are created by groundwater discharge along the Ash Meadows fault system (Denny and Drewes 1965). The Ash Meadow fault system trends southeast to northwest through the eastern portion of the Ash Meadows NWR. Groundwater discharging at Ash Meadows originates from areas to the north and east and is transported into the area through the regional carbonate rock aquifer. Winograd and Friedman (1972) suggested that 65 percent of the spring-fed waters originate from the Spring Mountains and Sheep Range, 30 to 60 miles to the east; and 35 percent comes from underflow from the Pahranagat Valley, approximately 90 miles northeast of Ash Meadows.

Other springs in the Ash Meadows area discharge from the valley-fill aquifer, which is derived from and connected to the carbonate aquifer, but is overlain by valley-fill sediments. The total annual discharge of these springs is estimated at approximately 17,000 afy (Walker and Eakin 1963; Laczniak et al. 1999).

3.4.4.4 Groundwater Pumping and Use

Many reports have been published that estimate groundwater pumping and use in Nevada. Every 5 years since 1950, the USGS has compiled and published water use data in circulars entitled "Estimated use of water in the United States." The circulars include water use for several categories including public and domestic use, agricultural use, and industrial use. These reports also include population and irrigated acreage data. The Nevada State Engineers Office also has reported water use and pumping, in which water usage is estimated by county and hydrographic area.

The USGS data reflects different groundwater withdrawal amounts than the State Engineer's groundwater pumping inventory. The reason for this difference is that the USGS uses satellite imagery and consumptive use estimates to create their groundwater use inventory while the State Engineer's inventory bases its inventory upon metered amounts or estimates provided by a pumpage inventory field report for water rights owners with unmetered wells. Pumping estimates for unmetered wells are generally approximate and are based on rudimentary records, or consumptive use estimates made by the State Engineer Office, based on a standard consumptive use amount of 5 afy per acre. For example, 160 acres of irrigation at 5 afy per acre would require 800 afy. In 2003, 12 percent of reported irrigated acreage for Amargosa Desert was metered (Moreo et al. 2003). Table 3-7 lists pumpage history in the Amargosa Desert from 1983 through 2009. No data was available for 1984.

The primary use of groundwater in the Amargosa Desert Hydrographic Basin is for agricultural irrigation. Irrigation in the Amargosa Farms area began on a limited basis around 1917 and continued on a modest scale until roughly 1954. Intensive agriculture in Amargosa Desert began in 1954 as land was patented under the Desert Land Act (Moreo et al. 2003), and irrigated acreage exceeded 2,000 acres by 1965. Between 1954 and 1965, the number of wells grew by roughly 150 to support agricultural production (Laczniak et al. 1999; Stonestrom et al. 2003). As of 2009, more than 1,000 water supply wells have been drilled in the Amargosa Desert hydrographic basin (NDWR 2010a).

Table 3-7 Pumpage Inventories for the Amargosa Desert Hydrographic Basin 1983 through 2009

Year	Irrigation	Irrigation*	Industrial	Commercial[1]	Quasi-Municipal / Domestic[1]	Quasi-Municipal / Commercial[1]	Domestic[1]	Total
1983	5,893.0	3,212.0	850.0	20.0	450.0			10,425.0
1984	-	-	-	-	-	-	-	-
1985	5,807.0	2,665.0	950.0	20.0	230.0			9,672.0
1986	5,552.9	1,000.0	584.0	10.0	125.0			6,971.9
1987	4,500.0	1,200.0	298.0	10.0	125.0			6,133.0
1988	2,666.0	312.0	569.0	10.0	125.0			3,682.0
1989	1,266.0	300.0	525.0	10.0	125.0			2,226.0
1990	4,603.1	350.0	383.6	10.0	125.0			5,471.7
1991	4,716.5	225.0	335.0	10.0	100.0			5,386.5
1992	5,711.0	50.0	347.5	10.0	100.0			6,218.5
1993	8,558.8	150.0	495.0	10.0	100.0			9,313.8
1994	8,892.0	1,085.0	340.0	10.0	100.0			10,427.0
1995	10,839.0	1,515.0	349.0	10.0	100.0			12,813.0
1996	9,263.0	1,780.0	272.0			205.0	50.0	11,570.0
1997	9,349.0	1,105.0	251.0			576.0	366.0	11,647.0
1998	9,667.0	2,373.0	237.0			537.0	382.0	13,196.0
1999	9,069.0	1,766.0	253.0			593.0	364.0	12,045.0
2000	9,086.0	625.0	243.0			1,057.0	378.0	11,389.0
2001	8,782.0	625.0	237.0			1,067.0	396.0	11,107.0
2002	8,951.0	625.0	386.0			1,128.0	415.0	11,505.0
2003	9,846.0	625.0	333.0			1,324.0	437.0	12,565.0
2004	9,979.0	625.0	309.0			1,319.0	453.0	12,685.0
2005	10,139.0	625.0	247.0			1,332.0	466.0	12,809.0
2006	11,511.0	1,613.0	308.0			1,844.0	491.0	15,767.0
2007	11,909.0	2,150.0	306.0			1,793.0	55.0	16,663.0
2008	11,419.0	937.0	933.0			3,984.0	517.0	17,790.0
2009	10,493.0	984.0	510.0			3,905.0	487.0	16,380.0

* No Permits or Certificates

1 Prior to 1996, Quasi-Municipal/Domestic and Commercial inventories were calculated under different classifications. Beginning in 1996 commercial water use, which includes local dairies, were included with quasi-municipal. Domestic water use is inventoried separately and includes water rights for domestic use over 2.02 afy.

Source: NDWR 2010a

As shown in Table 3-7, total groundwater withdrawal from Amargosa Desert fluctuates annually, but has steadily increased over the past 5 years. The annual variation in total groundwater withdrawal is attributed primarily to crop and irrigation cycles, and the amount of precipitation in a given year. Alfalfa fields typically are allowed to fallow 2 years during a 7-year period. Other fields are irrigated once every 5 years to demonstrate beneficial use and maintain water rights (Moreo et al. 2003).

Non-irrigation groundwater use in the Amargosa Desert includes industrial, quasi-municipal/ commercial, and domestic. Industrial water use is primarily related to mineral exploration activities at the American Borate, IMV, and Barrick Bullfrog Mine. Groundwater use for mining has fluctuated over the years, based on the rise and fall of ore prices.

Quasi-municipal and commercial water use in the Amargosa Valley is primarily related to large-scale farming operations, such as dairies, and to a lesser degree, municipal water uses by local water providers and businesses. There are only three water supply systems in the Amargosa Valley that are publically owned. They include the Amargosa Elementary School, Amargosa Town Complex, and the Amargosa Water Company.

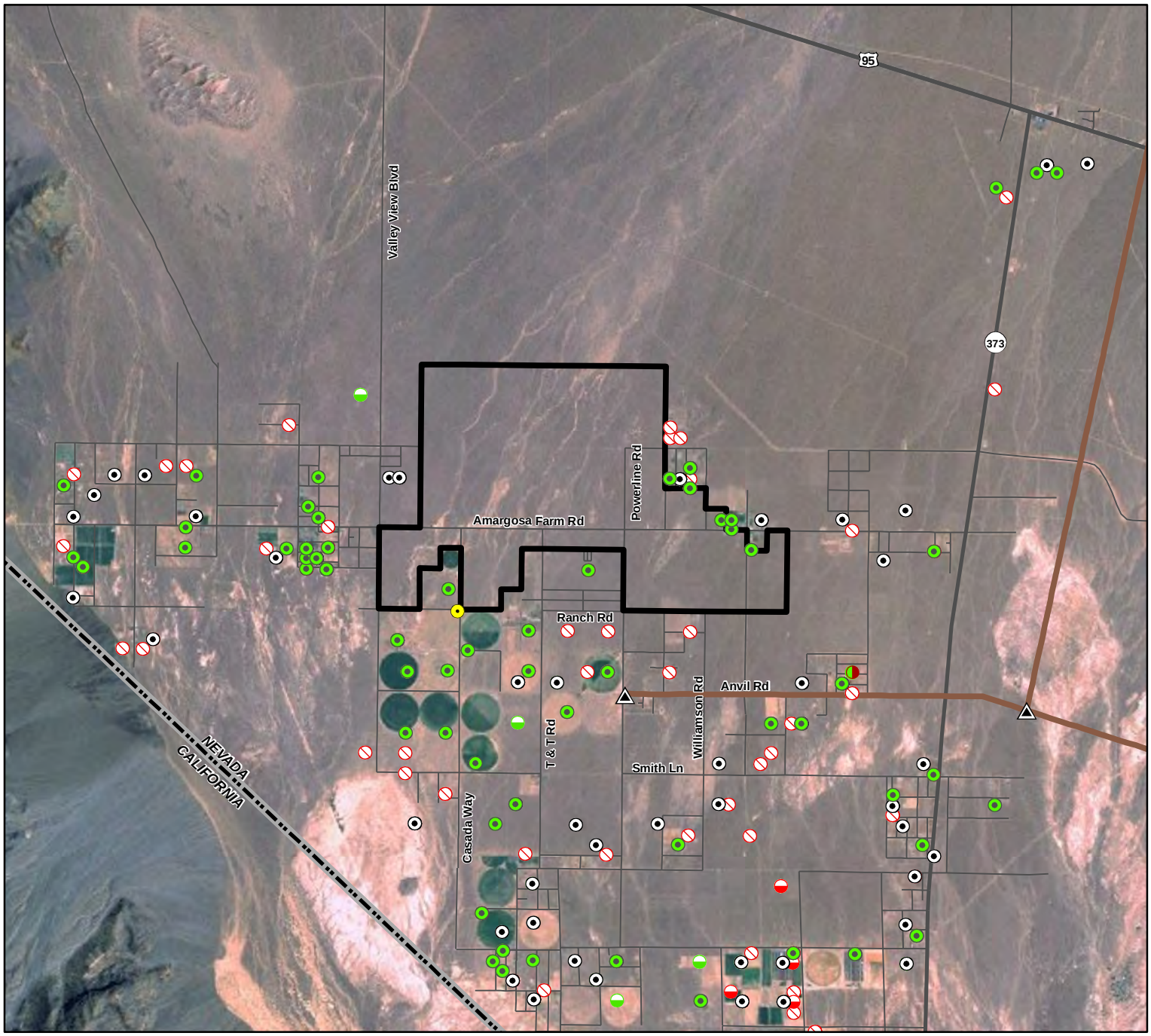
Most residents in the Amargosa Valley area rely on individual wells for their water supply. In 2000, there were 378 domestic wells listed in the NDWR database. By the end of 2008, a total of 517 domestic wells had been drilled in the Amargosa Desert Hydrographic Basin. It is unknown how many of these wells are currently being pumped. Under Nevada water law, a domestic well may use up to 1,800 gallons per day (2.02 acre-feet annually) for domestic purposes without the benefit of a water right permit (NRS § 534.180). In 2009, this equates to a potential of 1,046.36 afy being pumped from existing domestic wells.

Wells within 3 miles of the Project area are shown on Figure 3-9. During the biological surveys conducted in the Spring 2009, several water wells were found scattered throughout the site. Most of these wells have either been plugged or have welded covers on the casing; at least one well was uncapped. It is assumed these wells are associated with past agricultural fields and desert land entrees that have been filed with BLM. Prior to the enactment of FLPMA, trespass agricultural fields were established throughout the Amargosa Valley. Over the years, these fallow agricultural fields have reverted back to desert scrub communities.

3.4.4.5 Water Rights

Water rights in the Amargosa Desert Hydrographic Basin are associated with commercial and industrial use, domestic wells, mining, agriculture (farming, livestock, and dairies), and federal use. Water rights are issued for pumping from an underground source, either from the valley-fill deposit or from fractured or faulted carbonate and volcanic rock; and diversion of surface or spring flows. The withdrawal of groundwater from much of the area is limited by federal mandates instituted to protect rare and endangered species dependent for their survival on regional springflow in Ash Meadows, Devils Hole, and Death Valley.

The perennial yield of the Amargosa Desert Hydrographic Basin was estimated by Walker and Eakin (1963) to be 24,000 afy. Perennial yield of a groundwater reservoir may be defined as the maximum amount of groundwater that can be withdrawn each year over the long term without depleting the groundwater reservoir. Withdrawals of groundwater in excess of the perennial yield contributes to adverse conditions such as water quality degradation, storage depletion, diminishing yield of wells, increased cost due to increased pumping lifts, land subsidence, and possible reversal of groundwater gradients.



Amargosa Farm Road Solar Energy Project (NVN-84359)

Wells Within 3-Miles of Project Figure 3-9

LEGEND

Project Area

Wells

- Abrogated
- Certificated
- Permitted
- Ready for Action
- Ready for Action (Protested)
- Relinquished a Portion

General Reference Features

- Existing Transmission Line (<230kV)
- Existing Substation
- Proposed Project Well
- Highway
- Local Road
- State Boundary

Source: Transmission Lines, Substations - Platts, 2009;
Wells - Nevada State Enginee, 2008;
Local Roads - TerraSpectra Geomatics 2009;
Highways, Imagery - ESRI, 2009

September 2010

0 1 2 Miles

Although numerous studies have been conducted to revise the current perennial yield estimate, the Office of the State Engineer maintains that none of the new studies offer new and convincing arguments that the perennial estimates should be revised (Nevada State Engineer 2007).

According to the State Engineer, the estimated perennial yield of 24,000 acre feet includes 17,000 acre-feet discharged by springs in Ash Meadows and 7,000 acre-feet from underground water in the Amargosa Desert Hydrographic Basin. At the time of publication, there are over 25,000 acre-feet of permitted underground water rights. The 17,000 acre-feet discharged by springs in Ash Meadows, not included in the underground rights total, are used to satisfy the certificated rights of the USFWS for wildlife conservation purposes.

Table 3-8 lists the current (2010) annual duty for the various types of water use in the Amargosa Desert Hydrographic Basin. The annual duty is the total volume of water per year that may be diverted under a vested, permitted, or certificated water right authorized by the State Engineer. As shown in Table 3-8, committed groundwater resources of the Amargosa Desert Hydrographic Basin currently exceed the groundwater basin's estimated perennial yield.

Table 3-8 Summary of Groundwater Use in the Amargosa Desert Hydrographic Basin

Manner of Use	Active Annual Duty* (Acre-Feet)	Pending Annual Duty* (Acre-Feet)
Commercial	1,447.59	452.30
Domestic	3.22	0.00
Irrigation - Domestic	1,942.16	0.00
Irrigation	18,886.43	160.10
Industrial	0.00	400.00
Mining and Milling	1,923.49	0.00
Municipal	431.79	0.00
Quasi-Municipal	588.61	5.00
Wildlife	9.42	0.0
Total	**25,232.73**	**1,017.40**

* May include supplemental duties as well as duties associated with applications to change
Source: NDWR 2010b

Water rights in the Amargosa Desert Hydrographic Basin have been scrutinized for many years due to the proximity of environmentally sensitive areas at Devils Hole, Ash Meadows, and Death Valley. In the late 1960s and early 1970s, ranching and farming operations in the Ash Meadows area resulted in a decline in water levels in Devils Hole, which threatened the survival of the Devils Hole Pupfish. As a result, the NPS filed a lawsuit against the land owner, Cappaert Ranch, to restrict groundwater pumping.

In 1973 the U.S. District Court granted a preliminary injunction preventing pumping that would lower the pool level more than 2.98 feet below the datum. The injunction was made permanent by the District Court's decision, and upon appeal, the Supreme Court affirmed the lower court decision. In 1978 the District Court issued a revised permanent injunction to limit pumping to maintain a daily mean water level of 2.69 feet below the datum, based on scientific studies (Bedinger and Harrill 2006).

By 1988 the pool level had recovered to roughly 0.98 feet below the pre-pumping level when it began to decline. Concerns were raised that in the intermediate to long-term future the pool level would fall below the court-mandated minimum level. Since 1989, to protect the springs and seeps in the Ash Meadows NWR area, the USFWS has acquired 57 permitted or certificated water rights, totaling over 16,908 afy in the Amargosa Desert Hydrographic Basin, making the USFWS the largest water rights holder in the basin. These water rights, formerly used primarily for irrigation, were changed to modify the place and manner of use for wildlife purposes.

To further protect federally reserved water rights at Devils Hole, the Nevada State Engineer issued Order 1197 on November 4, 2008. Information provided during the administrative hearing for Order 1197 showed the water level in Devils Hole to be only 0.6 to 0.7 feet above the threshold level mandated by the U.S. District Court. The State Engineer ruled that the conditions warranted the curtailment of future appropriations of underground water and additional regulations of change applications within portions of the Amargosa Desert Hydrographic Basin. The State Engineer ordered, with exceptions, that "any applications to appropriate additional underground water and any application to change the point of diversion of an existing groundwater right to a point of diversion closer to Devils Hole, described as being within a 25-mile radius from Devils Hole within the Amargosa Desert Basin, will be denied."

Certain applications are excepted from this restriction:

- Any application within the described area that seeks to change an existing point of diversion closer to Devils Hole but remains: (1) within its existing place of use and (2) is no more than 1/2 mile from its original point of diversion.

- Those applications filed which seek to appropriate 2.0 afy or less may be considered and shall be processed subject to NRS 533 and 534.

- Projects that require changes of multiple existing rights; the State Engineer may compare the net impact of the proposed changes to Devils Hole to the impacts of the base rights to Devils Hole. If the net impact of the proposed changes is the same or less than the base rights impacts, as determined by the State Engineer, such change applications may be considered and shall be processed subject to NRS 533 and 534. In no such case shall new points of diversion be allowed within 10 miles of Devils Hole.

- Those applications for environmental permits filed pursuant to NRS 533.437 to 533.4377, inclusive.

- Those applications filed pursuant to NRS 533.371.

The proposed Project is located within the 25-mile radius of Devils Hole. However, since the Proponent would use existing water rights for the Project, and would not move the point of diversion closer to Devils Hole, the Project would comply with Order 1197.

3.4.4.6 Groundwater Quality

With the exception of radionuclide contamination at the Nevada Test Site, the water quality of the surface and groundwater resources in the ROI is generally good. Elevated concentrations of fluoride, sulfate, arsenic, and TDS are present in some areas, and traces of naturally occurring uranium are also present (DOE 2008). Preliminary water quality tests of the well to be used for the proposed Project indicate the well water meets EPA drinking water standards.

3.4.4.7 Jurisdictional Waters, Drainage, and Riparian Areas

The USACE regulates “discharge of dredged or fill material” into “waters of the U.S., which includes tidal waters, interstate waters, and all other waters that are part of a tributary system to interstate waters or to navigable “waters of the U.S.” (33 CFR 328.3(a)). Once waters have been determined to be jurisdictional “waters of the U.S.” the USACE generally takes jurisdiction within the plane of ordinary high water determined by erosion, the deposition of vegetation or debris, and changes in vegetation. The law requires authorization from the Secretary of the Army, acting through the USACE, for the construction of any structure in or over any navigable water of the United States, or any other water of the United States.

Before the USACE will issue a Section 404 permit, applicants must receive a Section 401 Water Quality Certification from the NDEP BWQP. By federal law every applicant for a federal permit or license for an activity which may result in a discharge into a water body must request State certification that the proposed activity will not violate state and federal water quality standards. The state may respond to the application in three ways:

- **Waiver** – Under federal law the state may waive its certification authority if it takes no action on an application within a "reasonable time" not to exceed one year. For Section 404 permit projects, the USACE has defined "reasonable time" to be 60 calendar days, starting with receipt of a complete application by the state, but may extend this period up to one year on a case-by-case basis. Waivers carry no conditions, and are, in some ways, equivalent to certification without conditions.

- **Certification** – Certification is based on a finding that the proposed Section 404 discharge will comply with all pertinent water quality standards. In order to allow certification, special conditions may be required by the the state in order to remove or mitigate potential impacts to water quality standards. Such conditions must ultimately be included in the federal Section 404 permit.

- **Denial** – The state has the option to deny certification if it is unable to find that the project will comply with water quality standards or other applicable requirements. If a project is denied certification, a Section 404 permit for it cannot be issued by the federal government. In some instances denial is necessary due to failure by the applicant to meet

a procedural requirement or the ability to meet water quality standards. Once the deficiency is addressed, the application for water quality certification may be reconsidered.

Representatives from the USACE, EPA, BLM, USFWS, and the Project Proponent and consultants met on May 13, 2010 to discuss the geographic extent of jurisdictional waters on the Project site and the direct and indirect impacts that could occur as a result of Project construction. The criteria that may be considered when determining impacts include habitat for plants and animals, recharge to the groundwater system, and sediment transport.

Preliminary discussions with the USACE indicate that jurisdictional washes are present in the Project area. However, the extent to which construction and operation of the proposed Project will affect those washes has not been determined, but some level of mitigation will be required by the USACE. A complete assessment of the potential effects to jurisdictional waters that would be caused directly or indirectly by the proposed Project will be completed when the USACE issues a Jurisdictional Determination for the proposed Project.

3.5 NOISE

This section discusses noise regulations and standards and the existing ambient noise conditions within and adjacent to the Project site.

3.5.1 Regulatory Framework

There are no federal, state, or local laws or regulations directly regulating off-site (community) noise. The Project area is subject to the management guidance included in the Las Vegas RMP/EIS, which does not contain noise regulations or standards. Also, Nye County currently does not have noise regulations or standards.

For such circumstances, the EPA (1974) has developed and published criteria for environmental noise levels with a directive to protect public health and welfare with an adequate margin of safety. That is, EPA developed this criterion (*Information on Levels of Environmental Noise Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety*) for use as an acceptable guideline when no other local, county, or state standard has been established. However, the EPA criterion is not meant to substitute agency regulations or standards where states and localities should use the developed criteria accordingly to their individual needs and situations.

The EPA established its criteria using the day-night average sound exposure (Ldn) metric. This metric is a 24-hour average noise level calculated by obtaining the daytime noise level from the hours of 0700 to 2200 and applies a 10 decibel (dB) penalty for the more restrictive quietest nighttime noise levels between the hours of midnight to 7:00 a.m, and 10:00 p.m. to midnight.

According to the EPA guidelines, an Ldn of 45 A-weighted decibel (dBA) indoors and 55 dBA outdoors for residential areas is identified as the maximum allowable noise level that has no effects on public health and welfare occur due to interference with speech or other activity.

These levels also would protect the vast majority of the population under most conditions against annoyance, in the absence of intrusive noises with particularly aversive content. Table 3-9 was published by the EPA and summarizes the maximum allowable noise level for specified areas.

Table 3-9 Summary of Noise Levels Identified as Requisite to Protect Public Health and Welfare with an Adequate Margin of Safety

Effect	Level	Area
Hearing Loss	$L_{eq}(24)$ =< 70 dB	All areas
Outdoor activity interference and annoyance	Ldn =< 55 dB	Outdoors in residential areas and farms and other outdoor areas where people spend widely varying amounts of time and other places in which quiet is a basis for use
	$L_{eq}(24)$ =< 55 dB	Outdoor areas where people spend limited amounts of time, such as school yards, playgrounds, etc.
Indoor activity interference and annoyance	Ldn =< 45 dB	Indoor residential areas
	$L_{eq}(24)$ =< 45 dB	Other indoor areas with human activities such as schools, etc.
L_{eq} – Equivalent Sound Level; Ldn – Day/night sound level		

The proposed Project also is governed by federal OSHA hearing conservation noise exposure regulations. These regulations are designed to protect workers against the effects of noise exposure, and list permissible noise level exposure as a function of the amount of time to which a worker is exposed. The Federal OSHA Occupational Noise Exposure standard states:

1910.95(b)(1)

When employees are subjected to sound exceeding those listed in Table 3-10, feasible administrative or engineering controls shall be utilized. If such controls fail to reduce sound levels within the levels of Table 3-10, PPE shall be provided and used to reduce sound levels within the levels of the table.

1910.95(b)(2)

If the variations in noise level involve maxima at intervals of 1 second or less, it is to be considered continuous.

Table 3-10 Permissable Noise Exposures[1]	
Duration per day, hours	**Sound level dBA slow response**
8	90
6	92
4	95
3	97
2	100
1 ½	102
1	105
½	110
¼ or less	115

[1] When the daily noise exposure is composed of two or more periods of noise exposure of different levels, their combined effect should be considered, rather than the individual effect of each. If the sum of the following fractions: C(1)/T(1) + C(2)/T(2) C(n)/T(n) exceeds unity, then the mixed exposure should be considered to exceed the limit value. C(n) indicates the total time of exposure at a specified noise level, and T(n) indicates the total time of exposure permitted at that level. Exposure to impulsive or impact noise should not exceed 140 dB peak sound pressure level.

3.5.2 Data Collection Methods

Noise is generally defined as unwanted or objectionable sound. The effects of noise on people can include general annoyance; interference with speech communication; sleep disturbance; and, in the extreme, hearing impairment. An assessment of the potential for a project to result in adverse noise effects requires an evaluation of several factors. These factors include an inspection of the site's general setting (such as isolated, rural, suburban, or urban); nature of the existing ambient noise sources or activities occurring in those settings; proximity of the receptor to the existing ambient noise source or activity; time of day; and various sound-attenuating factors such as vegetation, ground absorption, topographic features, buildings, and atmospheric conditions.

Noise standards and sound measurement equipment have been designed to account for the sensitivity of human hearing to different frequencies. This is accomplished by applying "A-weighted" correction factors. This correction factor is widely applied in the industry and is known to de-emphasize the very low and very high frequencies of sound in a manner similar to the response of the human ear. The primary assumption is that the dBA is a good correlation to a human's subjective reaction to noise.

Noise is measured in units of dB on a logarithmic scale. Because human hearing is not equally sensitive to all frequencies of sound, certain frequencies are given more "weight." The dBA scale corresponds to the sensitivity range for human hearing. Noise levels capable of being heard by humans are measured in dBA. A noise level change of 3-dBA is barely perceptible to average human hearing. A 5-dBA change in noise level, however, is clearly noticeable. A 10-dBA

change in noise level is perceived as a doubling or halving of noise loudness, while a 20-dBA change is considered a dramatic change in loudness. Table 3-11 provides typical instantaneous noise levels of common activities in dBA.

Table 3-11 Typical Noise Levels

Common Outdoor Activities	Noise Level (dBA)	Common Indoor Activities
	110	Rock Band
Jet Fly-over at 1,000 feet	100	
Gas Lawn Mower at 3 feet	90	
Diesel Truck at 50 feet, at 50 miles per hour (mph)	80	Food Blender at 3 feet Garbage Disposal at 3 feet
Noisy Urban Area, Daytime Gas Lawn Mower at 100 feet	70	Vacuum Cleaner at 10 feet
Commercial Area Heavy Traffic at 300 feet	60	Normal Speech at 3 feet
Quiet Urban Daytime	50	Large Business Office, Dishwasher in Next Room
Quiet Urban Nighttime	40	Theater, Large Conference Room (Background)
Quiet Suburban Nighttime	30	Library
Quiet Rural Nighttime	20	Bedroom at Night, Concert Hall (Background)
	10	Broadcast/Recording Studio
Lowest Threshold of Human Hearing	0	Lowest Threshold of Human Hearing

3.5.3 Existing Conditions

The Project area is located within a rural, sparsely populated area. The existing ambient noise environment in the vicinity of the Project site is mainly made up of natural sounds, vehicle noise associated with the small roadway segments, and community activity in the vicinity of the Project site, as well as noise associated with the Amargosa Valley Elementary School and over flight aircraft traffic. There are no other identified noise sources located within the vicinity of the Project site.

To confirm and document the current community ambient noise conditions at the site, two environmental noise monitors were placed on the Project site to capture the rise and fall of ambient noise conditions in the area. One noise meter was located along the eastern edge of the property and the second noise meter was placed in the center of the proposed eastern powerblock area. The noise monitors were programmed to record simultaneously in the appropriate data acquisition format for depicting the significant daily background noise levels prevalent within the area of the proposed Project site. The two 24-hour noise monitors were programmed to record continuously throughout a typical business day on Thursday, December 3, 2009; the results are shown in Table 3-12.

Table 3-12 Measured Ambient Noise Levels Over a 24-Hour Period

Position	Date	Location	24 Hour L_{EQ} (dBA)	Ldn (dBA)
1	12-3-2009	Eastern Property Line	34.5	39.7
2	12-3-2009	Eastern Power Block Area	33.0	41.4

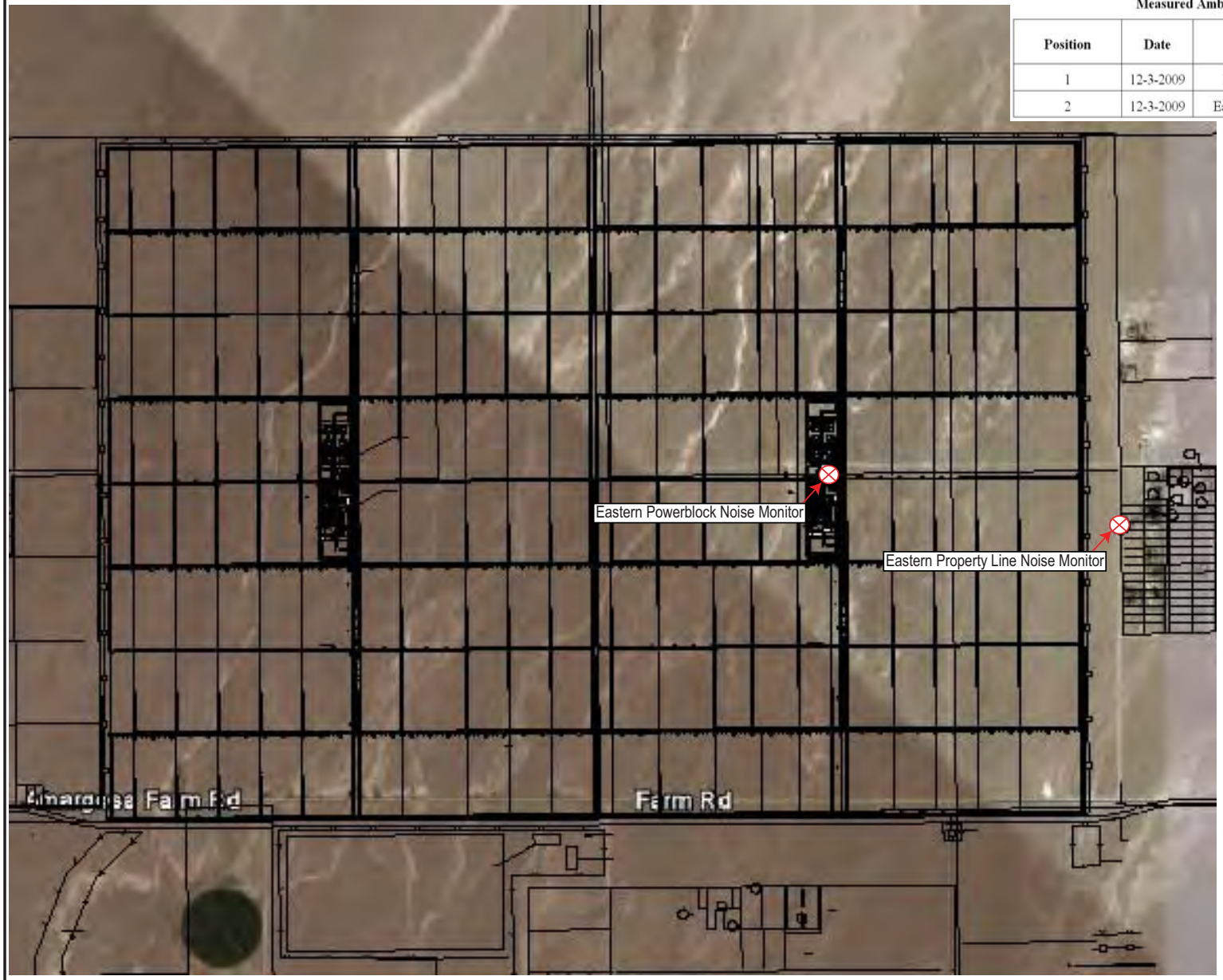
The two continuous 24-hour sound level measurements (Ldn, A-Weighted) range from a worst-case noise impact of 41.4 dBA Ldn at the center of the proposed eastern powerblock area, down to the quietest noise level of 39.7 dBA Ldn at the eastern property line. During the on-site noise measurements, start and end times were recorded as well as any significant and background noise sources in the area. The 24-hour sound level measurements ran from midnight to midnight, integrating and logging data every 30 minutes. For a graphical representation showing the two 24-hour ambient noise monitoring locations and resultant measurement values see Figure 3-10.

Other field data gathered at the site includes measuring or estimating distances, angles-of-view, slopes, and site elevations. This information is subsequently verified using available maps and records. The sound level meters were field-calibrated prior to and following the noise measurements to ensure accuracy. All sound level measurements conducted and presented in this report are in accordance with and were made using a sound level meter that conforms to the American National Standards Institute (ANSI SI.4-1983 - R2001) specifications for sound level meters. All instruments are maintained with the National Bureau of Standards traceable calibrations.

Results of any investigations or field measurements and any findings presented in this report apply solely to conditions existing at the time when the investigative work was performed. It must be recognized that any such investigative or measuring activities are inherently limited and do not represent a conclusive or complete characterization. Conditions in other parts of the Project site may vary from those at the locations where data were collected. The ability to interpret investigation results is related to the availability of the data and the extent of the investigation activities.

Measured Ambient Noise Levels over a 24 Hour Period

Position	Date	Location	24 Hour L_{EQ} (dBA)	Ldn (dBA)
1	12-3-2009	Eastern Property Line	34.5	39.7
2	12-3-2009	Eastern Powerblock Area	33.0	41.4



Amargosa Farm Road Solar Energy Project
Amargosa Valley, Nevada

Global Image Showing Ambient Noise Measurement Locations and Data Results

ARCADIS

FIGURE
3-10

3.6 BIOLOGICAL RESOURCES

3.6.1 Regulatory Framework

Numerous federal and state environmental regulations and legislative acts are applicable to biological resources. Following are those which are applicable to the Proposed Action within the Project area.

3.6.1.1 Endangered Species Act of 1973

The ESA of 1973 (16 USC 1531 et seq.), as amended, provides for the conservation of federally listed plant and animal species and their habitats. The ESA directs federal agencies to conserve listed species, and imposes an affirmative duty on these agencies to ensure that their actions are not likely to jeopardize the existence of a listed species or adversely modify their habitat. Each species listed is required to have designated critical habitat. Critical habitat is the specific geographic areas that are most essential for the conservation and protection of a listed species.

3.6.1.2 Bald and Golden Eagle Protection Act

The Bald and Golden Eagle Protection Act (16 USC 668) applies primarily to taking, hunting, and trading activities that involve Bald Eagles (*Halaeetus leucocephalus*) or Golden Eagles (*Aquila chrysaetos*). The act prohibits the "taking" of any individuals of these two species, as well as any part, nest, or egg. The term "take" as used in the Act includes "pursue, shoot, shoot at, poison, wound, kill, capture, trap, collect, molest, or disturb."

On July 13, 2010, the BLM issued Instructional Memorandum No. 2010-156 regarding the Bald and Golden Eagle Protection Act – Golden Eagle NEPA and Avian Protection Plan Guidance for Renewable Energy Projects. The purpose of the Instructional Memo is to provide direction for complying with the Bald and Golden Eagle Protection Act—including its implementing regulations—and to identify steps that may be necessary within the habitat of golden eagles to ensure environmentally responsible authorization and development of renewable energy resources.

For this Project, there is no anticipated take of Bald or Golden Eagles as no suitable nesting/roosting habitat is present within the Project area nor is any present within likely foraging distance.

3.6.1.3 Migratory Bird Treaty Act of 1986

The MBTA (16 USC 703) makes it unlawful to pursue, hunt, take, capture, kill, or possess any migratory bird or part, nest, or egg of such bird listed in wildlife protection treaties among the United States, Great Britain (on behalf of Canada), Mexico, Japan, and the former Soviet Republic. In addition, this act also contains a clause that prohibits baiting or poisoning of these bird species. The current list of species covered by the MBTA can be found in Title 50, CFR

Section 10.13. Because many migratory bird species occur within the Project area, the MBTA applies to those bird species that may be affected during the construction and operation of the proposed Project.

3.6.1.4 Nevada State Protection of Christmas Trees, Cacti, and Yucca

The State of Nevada has a statute for the protection of Christmas Trees, Cacti, and Yucca (NRS 527.060-527.120). Under this statute it is illegal for any individual or company to cut, destroy, mutilate, remove, or possess any Christmas tree, cactus, yucca, or portions of these plants. Additionally, it is illegal to sell any of these plants from any lands owned by or under the jurisdiction of the United States. This statute applies to any cacti or yucca on BLM-managed lands that may be affected during construction of the proposed Project.

3.6.1.5 Nevada State Protection and Propagation of Native Fauna

The State of Nevada has a statute for the protection and propagation of native fauna (NRS 503.584-503.589). The purpose of this statute is to provide for the conservation, protection, restoration, and propagation of selected species and the perpetuation of the habitats of such species. The Board of Wildlife Commissioners, under consultation with authorities, will determine which species' existence is endangered or habitat is threatened with destruction, thereby warranting protection under this statute. This statute applies to species listed by the State of Nevada that may be affected during the implementation of the proposed Project.

3.6.2 Environmental Setting

The Project area lies in the Amargosa Valley in Nye County, Nevada, between the Yucca Mountains to the north and the Funeral Mountains to the southwest. The proposed Project is located in the Northern Mojave Desert Ecoregion which encompasses the southern tip of Nevada and extends into Arizona, California, and Utah. This ecoregion is a transitional region between the higher and cooler Great Basin Desert to the north and the warmer Sonoran Desert to the south (Webb et al. 2009), featuring basin and range topography, with broad valleys separated by rugged mountain ranges. This ecoregion is dominated by Mojave Desert scrub, which is intermediate between the Great Basin Desert scrub and the Sonoran Desert scrub habitats. Elevation in the region ranges from approximately 450 to more than 8,000 feet, averaging 2,770 feet. Precipitation in this ecoregion ranges from approximately 5 to 11 inches per year, with slightly more winter than summer precipitation.

The Amargosa Valley averages 4.2 inches of rain annually, with annual extremes of anywhere from less than half an inch (0.45 inch in 2002) to more than 10 inches (10.4 inches in 1983) (Western Regional Climate Center, Amargosa Farms Garey, Nevada [Station 260150]). The Project area is characterized as creosote desert scrub, dominated by creosote bush (*Larrea tridentata*). It is a typical dry region of Mojave Desert, with relatively sparse shrub canopy and very little annual herbaceous growth except during wet years. The topography of the Project area is uniform with a few small, shallow washes that cross the site from north to south. The largest of these washes is Fortymile Wash that connects to the Amargosa River.

3.6.3 Data Collection Methods

A biological inventory of the Project area was conducted utilizing scientific literature, satellite imagery, agency contacts, and biological resource field surveys. Data were collected by Tierra Data, Inc. in the Project area in the spring and summer of 2009. Agency personnel were asked to provide information on potential or known occurrences of sensitive species of wildlife and plants and on habitats of special concern within the Project area and ROI. The following agencies were contacted for information: BLM, USFWS, and NDOW.

Data were collected and digitized into GIS format for:

- vegetation communities
- species listed as federally threatened, endangered, or as candidates under review for listing
- species classified as rare, sensitive, or otherwise protected by the State of Nevada
- areas of special biological value or interest, including riparian and wetland habitats

The report entitled "*Biological Resources Surveys for Amargosa Farm Road Solar Project*" (Tierra Data 2009) contains detailed information on the vegetation and wildlife resources inventoried. The results of the biological resources inventory are summarized below.

3.6.4 Vegetation

3.6.4.1 Vegetation Communities within the Region of Influence and Project Area

The ROI for botanical resources, including threatened, endangered, proposed, and candidate plant species, consists of areas that may be affected by permanent and temporary features of the Proposed Action and areas that may be impacted groundwater withdrawal. The extent of the ROI for botanical resources is based on the effects on surface and groundwater hydrology discussed in the analysis provided in Water Resources-Section 3.4 of this document. Based on these criteria, the ROI for direct impacts on botanical resources includes those areas in the immediate vicinity of the Proposed Action construction, operation, and maintenance activities. The ROI for indirect effects is the Amargosa Desert Hydrographic Basin #230.

The majority of the Project area is characterized as desert flats with Mojave creosote scrub (Holland code 34100; Hartman 2002) as the sole dominant community type. This community type is dominated by creosote bush, either as the sole dominant or co-dominant, with one or more other shrub species. Burrobush is the most typical co-dominant, followed by saltbush (*Atriplex* spp.) in more alkaline soils. The shrubs range from 1.5 to 9 feet tall, are widely spaced, and generally the ground between shrubs is essentially barren or contains very sparse forbs and grasses (Hartman et al. 2002). Growth occurs during spring (rarely in summer or fall) if rainfall is sufficient. Cold winters and droughts in other seasons can limit plant growth. Many herbaceous ephemeral species may flower in late March and April if winter rains are sufficient. Summer thundershowers can also trigger growth in these ephemeral species.

The soils where creosote scrub occurs are characterized as well-drained soils with very low available water holding capacity (Hartman 2002). They occur on slopes, alluvial fans, and valleys. Winter nighttime temperatures are often below freezing in these areas.

Creosote scrub is extensive and characteristic of the Mojave Desert, extending from the Death Valley region southward and across the Mojave Desert to the San Bernardino Mountains, and eastward to northwestern Arizona and southern Nevada (Hartman 2002).

A number of shallow ephemeral washes cross the western half of the Project area flowing from north to south; however, none have desert riparian trees typical of deset washes in more mesic regions, such as desert willow (*Chilopsis linearis*) or catclaw acacia (*Acacia greggii*). The washes in the Project are mainly unvegetated, or have a sparse shrub assemblage composed primarily of the surrounding desert flats. A few individuals of cheesebush (*Hymenoclea salsola*), a shrub species typical of desert washes elsewhere, do occur, but are sparse and widely scattered. In some places, the washes have well-developed banks, especially Fortymile Wash. Along the banks it is more common to see desert saltbush (*Atriplex polycarpa*) than in the uplands away from the banks.

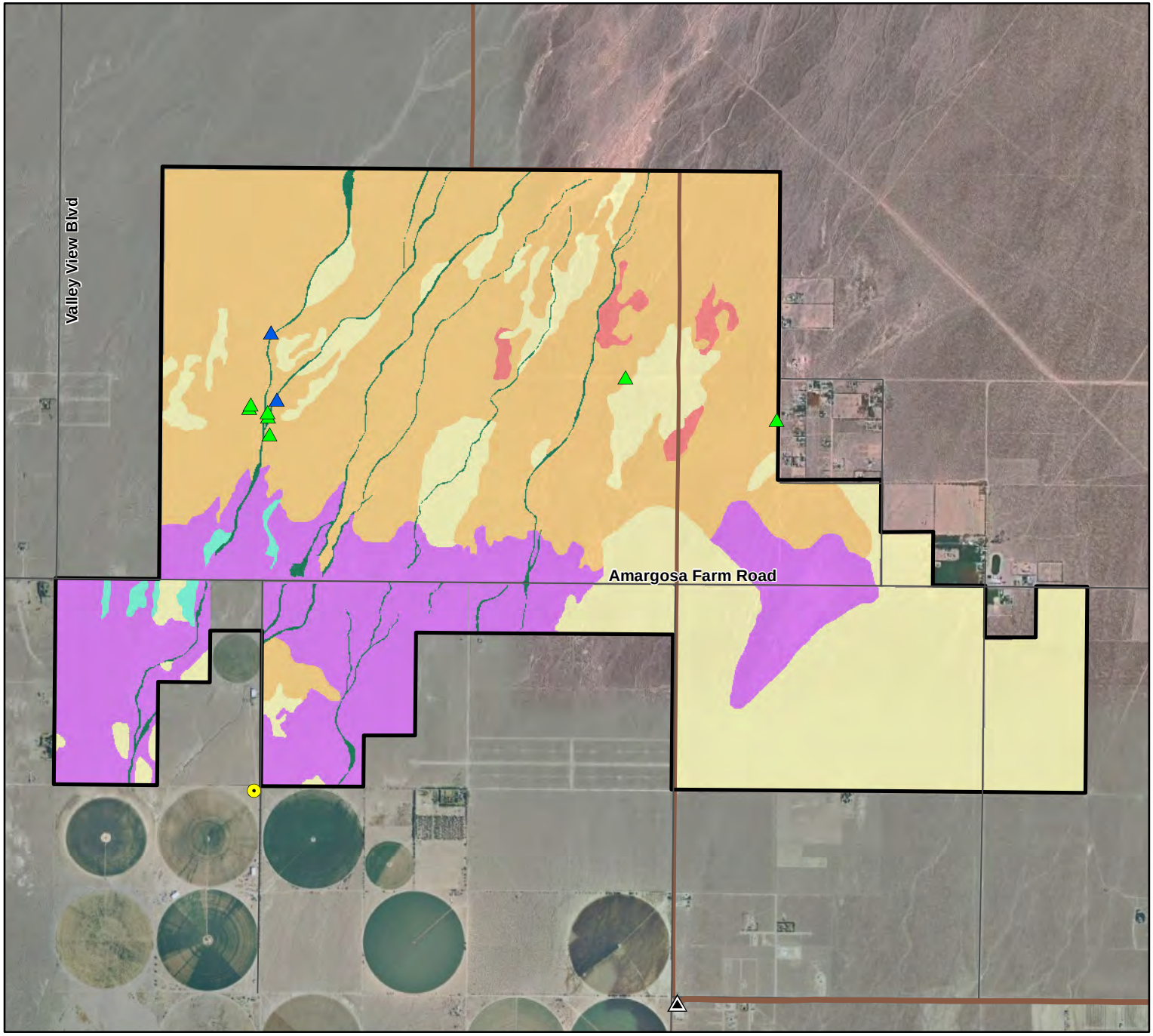
3.6.4.2 General Vegetation Conditions within Project Area

The vegetation within the Project area is generally very sparse and dominated by creosote bush and burrobush (*Ambrosia dumosa*), with very little herbaceous growth; most of which is confined to the shrub canopies or just a short distance beyond (Figure 3-11). Between shrubs the surface is mostly barren, desert pavement with a widely scattered growth of a few forb and grass species, primarily cryptantha (*Cryptantha* spp.), goldfields (*Lasthenia californica*), and devils spineflower (*Chorizanthe rigida*).

The relative proportions of these annuals tended to shift from mostly Cryptantha and Schismus in areas of creosote bush-burrobush, to more Chorizanthe in areas dominated solely by creosote bush. Other forb species common on-site were various annual buckwheat species (e.g., flat-topped buckwheat [*Eriogonum deflexum*], Thomas' buckwheat [*Eriogonum thomasii*]), several species of the primrose (Onagraceae) family (e.g., devils lantern [*Oenothera deltoides*], Booth's evening primrose [*Camissonia boothii*]), and annual mustard species (none could be identified in 2009 since the only evidence observed was the remnants of previous years' growth, which lacked the identifiable structures necessary to identify the species). Other annual species documented in the species list compiled for this Project were scarce, occurring mostly as widely scattered individual plants.

Cacti found within the Project area are represented by just two species; golden cholla (*Cylindropuntia echinocarpa*) and beavertail pricklypear (*Opuntia basilaris* var. *basilaris*). Only seven cholla and two beavertail were found. All cacti, with the exception of two, were located in a small area in the northwestern quadrant of the Project site (Figure 3-11).

The washes located within the Project area are little more than shallow swales, with no riparian vegetation.



Amargosa Farm Road Solar Energy Project (NVN-84359)

Vegetation
Figure 3-11

LEGEND

Project Area

Vegetation Association

- Creosote Bush
- Creosote Bush - Allysum
- Creosote Bush - Bursage
- Creosote Bush - Bursage - Saltbush
- Creosote Bush - Saltbush
- Sparse, wash

Cactus Species Detected

- Golden Cholla *(Cylindropuntia echinocarpa)*
- Beavertail Prickly Pear *(Opuntia basilaris)*

General Reference Features

- Proposed Project Well
- Existing Substation
- Local Road
- Existing Transmission Line (<230kV)

Source: Vegetation, Species - TierraData, 2009;
Wells - Nevada State Engineer, 2008;
Local Roads - TerraSpectra, 2009;
Imagery - ESRI, 2009

September 2010

0 0.4 0.8 Miles

3.6.4.3 Non-native and Invasive Plants

Plant surveys conducted in spring 2009 found 8 species that are not native and may be invasive to the area (Table 3-13) (Tierra Data 2009).

Table 3-13 Non-native and Invasive Plants within the Project Area

Scientific Name	Common Name
Bromus madritensis ssp. *rubens*	red brome
Datura stramonium	jimson weed
Erodium cicutarium	redstem stork's bill
Salsola sp.	Russian thistle
Salsola tragus	spiny Russian thistle
Schismus barbatus	Mediterranean grass
Sisymbrium irio	London rocket
Tamarix aphylla	athel tamarisk

Red brome

Red brome (*Bromus madritensis* ssp. *rubens*) is the most widely scattered non-native grass species in the area, and is one of the most invasive because, once established, it becomes competitive with other grasses. The tolerance of this subspecies to high salt and high pH conditions partially explains its success in desert soils, but control may be possible by reducing seed production and increasing competition from native herbaceous plants.

Jimson weed

Jimson weed (*Datura stramonium*) is commonly found on dry rangelands and waste places, and was found scarcely scattered in the Project area. The seeds of this plant can lie dormant underground and germinate when the soil is disturbed.

Redstem stork's bill

Redstem stork's bill (*Erodium cicutarium)*, also known as filaree, is a widespread annual species common in disturbed habitats. It has the capacity to form dense, transient populations when conditions are suitable.

Russian thistle

Russian thistle (*Salsola* sp.) is especially troublesome because it is very difficult to control once it becomes established. It is a common invader on disturbed sites and is extremely drought

tolerant, the taproot extends several feet into the soil to reach subsurface moisture. The numerous seeds are spread when mature plants are blown along by the wind. A few patches of spiny Russian thistle (S. *tragus*) were present, some of which consisted of numerous individuals and seedlings. The populations ranged from a few plants to greater than 20 plants. All individuals were located near roads, generally no more than 60 feet from the road edges. Control of Russian thistle is difficult. Biological agents were introduced in the 1970s, with little success.

Mediterranean grass

Mediterranean grass (*Schismus barbatus*) is common in agricultural and urban areas, occurring along roadsides, in cultivated fields, and other disturbed areas, although it can occur in undisturbed habitats as well, especially along river bottoms, plains, and hillsides in desertscrub. Activities that disturb the soil and reduce groundcover contribute to its spread. Mediterranean grass is commonly found in the spaces between shrubs, often producing a carpet of green that turns purplish at maturity and fades to a light straw color soon after death.

London rocket

London rocket (*Sisymbrium irio*) is abundant and widespread throughout North America, and appears to thrive along roadsides, waste places, and irrigated lands. It is one of the first weeds to appear in the winter, and because it is a prolific seeder, can be a troublesome invader.

Athel tamarisk

Various Tamarix species are listed as noxious weeds in Nevada; however, athel tamarisk (*Tamarix aphylla*), which was found in the Project area, is not regarded as weedy, nor is it considered an aggressive invader. All individuals were found near roads where they were planted in several locations around residential structures in adjacent neighborhoods; however, some of the individuals growing along roadsides were located within the Project boundary.

3.6.4.4 Federally Threatened, Endangered, Proposed, and Candidate Plant Species

No federally threatened, endangered, proposed, or candidate plant species were located during surveys of the Project area. However, the USFWS identified several threatened and endangered plant species with the potential of occurring within the ROI. Table 3-14 lists these species and identifies corresponding protection status for the BLM and the State of Nevada.

Table 3-14 Endangered and Threatened Plant Species that May Occur within the Region of Influence					
Scientific Name	**Common Name**	**Habitat**	**Endangered Species Act**	**State of Nevada**	**BLM**
Nitrophila mohavensis	Amargosa Niterwort	Carson Slough – highly alkaline, moist, salt-encrusted soils	Endangered	Endangered	Sensitive
Astragalus phoenix	Ash Meadows Milkvetch	Ash Meadows – hard, white, alkaline clay soils	Threatened	Endangered	Sensitive
Centaurium namophilum	Spring-loving Centaury	Ash Meadows – seasonally flooded wetlands, moist alkali meadows, and edges of some scrub-shrub communities	Threatened	Endangered	Sensitive
Enceliopsis naudicaulis var. corrugata	Ash Meadows Sunray	Ash Meadows – dry washes and weathered saline soils	Threatened	Endangered	Sensitive
Grindelia fraxinopratensis	Ash Meadows Gumplant	Ash Meadows – ash-screwbean mesquite woodlands and desert shadscale scrub vegetation	Threatened	Endangered	Sensitive
Ivesia eremica	Ash Meadows Ivesia	Ash Meadows – highly alkaline, clay lowlands or depressions where soil moisture remains high	Threatened	Endangered	Sensitive
Mentzelia leucophylla	Ash Meadows Blazing Star	Ash Meadows – upland alkaline soils found in arroyos and on knolls	Threatened	Endangered	Sensitive

All federally endangered and threatened plant species assessed in this document are endemic to the Ash Meadows NWR area. Ash Meadows NWR is home to 25 species of plants and animals found nowhere else in the world and are highly dependent upon available water (USFWS 1990). The Project area is located approximately 7 miles northwest of the edge of the Ash Meadows NWR, which is located within the ROI.

Amargosa Niterwort

Regulatory Status

The Amargosa niterwort (*Nitrophila mohavensis*) was first proposed endangered under the ESA on October 13, 1983 with six other rare plants and one insect species in Ash Meadows, Nevada and California (48 FR 46590-46598). It was finally listed as Endangered with designated critical habitat on May 20, 1985 (50 FR 20777-20794). The plant was included in a recovery plan at Ash Meadows with 11 other federally listed species in 1990 (USFWS 1990). In addition to federal

protection, it is fully protected in Nevada, is a BLM Special Status Species in Nevada, and is considered endangered by the Nevada Native Plant Society (NNHP 2001). Designated critical habitat is located in Inyo County, California, approximately two miles northeast of the Amargosa River along Ash Meadows Road, approximately 0.75 miles south of the California-Nevada state line (USFWS 1990).

Species Description

The Amargosa niterwort was first collected by J.C. and A.R. Roos in 1955 (50 FR 20777-20794) and described by Munz and J.C. Roos in 1955 (48 FR 46590-46598; 50 FR 20777-20794). This small, 4-inch tall perennial herbaceous plant is a member of the goosefoot family, that comprises a group of herbs or shrubs that are often succulent or scurfy, and often weedy and frequently of saline or subsaline places (Munz 1974). The characteristic which identifies *Nitrophila* from other genera is the presence of sepals, that are strongly imbricate, scarcely united, and strongly chartaceous. The leaves are opposite and united at the base (Munz 1974). The Amargosa niterwort is one of two species included in the *Nitrophila* genus, and is identified by its 5-8 centimeter stems that are erect from extensive heavy underground root-stocks, round-ovate leaves, small, inconspicuous pink flowers and shiny black seeds (Munz 1974). *N. mohavensis* appears to be restricted to heavy alkaline mud in habitats at approximately 2,050 feet in elevation.

Status and Distribution

The Amargosa niterwort occurs in colonies of individuals linked by their large, rhizomatous roots in highly alkaline, moist, salt-encrusted clay soils within the southern portion of Carson Slough in Nevada and California. Carson Slough is a large and extensive marsh into which the waters from Fairbanks Spring drain, but has been obliterated due to the present large-scale exploitation of water resources for agricultural purposes. Only a few remnants of the marshland and its vegetation are known to exist today. The Carson Slough was not botanically surveyed prior to its destruction and there is no basis upon which to judge how many rare or possibly endemic species may have been lost (Conservation Management Institute [CMI] 1996).

When the species was listed in 1985, it was known from one location, the type locality, in the southern end of Carson Slough, approximately three miles northeast of Death Valley Junction, California (Beatley 1977; USFWS 2007a). Since the listing in 1985, five additional populations have been documented, totaling six populations; two in California and four in Nevada. In Nevada, populations were found at Crystal Reservoir, Central Carson Slough 1 on the NWR boundary line, Central Carson Slough 2 outside of the NWR, and the NWR West Entrance, north and south side of Spring Meadows Road. During surveys conducted by USFWS and USGS in 2005 and 2006, the species was found at five of the six known locations. During surveys conducted at the NWR West Entrance in 2006 resulted in no plants found. Currently, this population is likely extirpated from the location (USFWS 2007a). The most important *Nitrophila mohavensis* population is located in the Lower Carson Slough in California, but the Crystal Reservoir population in Nevada represents the second most important population for the species. According to the USFWS (2007a), the size and extent of the Crystal Reservoir population is not well characterized, but it appears to be the second most important population with respect to the

number of ramets observed. Ramets are the above-ground stems, that are the most visible to the naked eye, but they may not represent true numbers of plants because they reproduce underground as rhizomes, along which multiple ramets emerge.

The population at Crystal Reservoir occupies larger acreage than at Lower Carson Slough, but the population is smaller and less dense. In a 2005 survey conducted by Caicco (2005), the niterwort occupied approximately 25-30 acres. The remaining populations of niterwort in Nevada and California represent approximately two percent of the known distribution of ramets (USFWS 2007a). Based on available data, according to USFWS, the Lower Carson Slough population may be declining due to the species' inability to recover from impacts resulting from development activities (e.g., peat mining, water diversions, and groundwater pumping associated with large-scale farming in the NWR and Upper Carson Slough during the 1950s and 1960s). It also appears the extent of the Lower Carson Slough and Tecopa populations are also decreasing. According to the USFWS (2007a), little or no data are available to suggest trends for the populations at Tecopa and the NWR West Entrance.

Life History

There is little known about the life history of Amargosa niterwort, but it is known to be a long-lived perennial, reproducing underground. Its presence appears to be limited to areas that are highly alkaline in moist salt-encrusted clay soils. Observations indicate it is an extremely hardy plant that is tolerant of high soil salinity and alkalinity, and because of this, few other plant species occupy the habitat where it grows (USFWS 1990). Large rhizomatous roots connect many seemingly individual plants within a colony. Flowering occurs in late spring (NNHP 2001).

The niterwort is confined to specific habitat that is restricted to extremely local areas within or near the Carson Slough, where saline and alkaline sinks occur near the terminuses of seepage from springs that lie many miles to the north and east in Ash Meadows (50 FR 20777-20794).

Ash Meadows is a fragile ecosystem dependent on water, which enters a vast underground aquifer system. The water is known as fossil water because it takes thousands of years to move through the ground. The fault system blocks the flow of water, forcing it to the surface into 30 seeps and springs (Desert Gazette 2009). The hydrological and soil conditions at these sites make them uniquely suitable for Amargosa niterwort. Little is known regarding the subsurface flows in the Central and Lower Carson Slough that currently support the majority of the niterwort. A groundwater study conducted by Rowley in 2003, determined that groundwater entering Lower Carson Slough comes from three or four flow paths within the Death Valley Flow system that includes Ash Meadows subbasin and/or Alkali Flat Furnace Creek Ranch subbasin (Rowley 2003).

Threats to the Species

A significant portion of plant habitat in Ash Meadows was eliminated in the 1960s when Carson Slough was drained to facilitate peat mining, then large scale farming shortly thereafter. Even though Amargosa niterwort habitat was not plowed, free-flowing water to its habitat was halted by upstream plowing and reduction of spring flows resulting from groundwater pumping (48 FR

46590-46598). According to Reveal (1978), Amargosa niterwort is sensitive to disturbance and does not reestablish itself at sites where salt crust overlying the soil has been disturbed. The Nevada population lies in a remote area where the disturbance has been limited to trampling by wild horses and soil compaction by OHVs (USFWS 1990).

Throughout the species' range, three major threats have been identified by USFWS (2007a): (1) Ecosystem-based alteration, particularly habitat loss by changes in groundwater availability, (2) direct and indirect impacts resulting from surface mining, and (3) direct and indirect impacts resulting from raised construction of Ash Meadows Road. Currently, three of the four Nevada population sites face the threat of interruption of water supply to habitat. The fourth site at Crystal Reservoir, appears to be secure from the threat. Impacts to the niterwort due to groundwater pumping may not be immediately evident. Slow population declines can take years and trends may be masked by other factors such as annual variations in precipitation (USFWS 2007a). The Project area is located approximately 7 miles northwest of the Ash Meadows NWR within the adjacent Alkali Flat/Furnace Creek hydrologic subbasin; however, none of the Nevada population sites are within this subbasin (USFWS 2007a). Given the proximity and predicted flow paths, the Central and Lower Carson Slough populations of Amargosa niterwort likely receive water from both the Ash Meadows and Alkali Flat hydrologic subbasins (USGS 2002). The hydrology that supports the Crystal Reservoir population is poorly understood because at the time the Reservoir was constructed in 1970s, it was unknown whether the niterwort already existed there (USFWS 2007a).

The second major threat to all Ash Meadows species, including Amargosa niterwort, is habitat loss or degradation from surface mining. Mining directly and indirectly threatened the Lower Carson Slough population in California, and the four niterwort populations on the Ash Meadows NWR, which are on BLM and USFWS lands with public minerals. The third threat is from habitat degradation from construction of Ash Meadows Road. In late 1999 and early 2000, the California Department of Transportation improved Ash Meadows Road where it crossed the Lower Carson Slough and Amargosa niterwort habitat. California Department of Transportation raised the roadbed, which altered sedimentation patterns in the Carson Slough during thunderstorms or rare high flow events (USFWS 2007a). Other threats to the niterwort include trampling by wild horses and OHV activity, invasive species and fire, and damage to Crystal Spring Dam.

Species in the Project Area

The Project area is located approximately 12 miles northwest of the nearest known locations of the species in near Crystal Reservoir at Ash Meadows NWR. The plant has never been found within the Project area, although the plant populations at Ash Meadows share some groundwater-related commonalities with the Project area. The Ash Meadows Basin (includes most of Ash Meadows NWR) and Alkali Flat-Furnace Creek Basin (includes the Project area and a small portion of Ash Meadows NWR) are connected by the Central Death Valley subregion of the DVRFS.

Ash Meadows Blazing Star

Regulatory Status

The Ash Meadows blazing star (*Mentzelia leucophylla*) was listed as threatened with designated critical habitat on May 20, 1985 (50 FR 20777-20794). The plant was included in a recovery plan at Ash Meadows with 11 other federally listed species in 1990 (USFWS 1990). In addition to federal protection, it is fully protected in Nevada, is a BLM Special Status Species in Nevada, and is considered threatened by the Nevada Native Plant Society (NNHP 2001). Critical habitat consists of 1,240 acres in Ash Meadows at four locations; two along and just east of Carson Slough and two east of Carson Slough in close proximity to Devils Hole (50 FR 20777-20794).

Species Description

The Ash Meadows blazing star (*Mentzelia leucophylla*) was first collected in 1898 by Carl Purpus, and described by Brandegree in 1899 (USFWS 1990). Initially, the plant collected by Purpus was included with *M. oreophila* as a single species by Darlington in 1934 and Abrams in 1951. The reverse synonomy was published by Jepson in 1936 and Munz and Keck in 1959. Taxonomy of the species was in question until the issue was resolved in a status report completed by Reveal in 1977.

This small biennial or short-lived perennial is a member of the stick-leaf (blazing star) family that is comprised of a group of herbs that are pubescent with barbed or sometimes stinging hairs. The characteristics which most readily identifies *Mentzelia* from other genera is the presence of three placentae, seeds that are 1-4 millimeters, white to golden yellow flowers, and never with stinging hairs (Munz 1974). *M. leucophylla* has leaves that are densely covered with white hairs (NNHP 2001). Flowers are few, small, opening only briefly from May to September. In addition, the stems are covered with an epidermis that peels in long segments. Leaves are mainly basal, linear-oblong, 6-8 centimeters long, 1 centimeter wide, rigid, densely tomentose with strongly revolute margins. The seeds are flat and narrowly margined (Knight and Clemmer 1987).

Status and Distribution

The Ash Meadows blazing star occurs exclusively in Nye County, and is endemic to Ash Meadows. The local distribution of small populations suggests the species is extremely vulnerable to any land disturbance (USFWS 1990). It has been suggested that past development for agriculture is believed to have eliminated some populations within their range (Reveal 1978). Few individuals occur at any one site, with fewer than 200 individuals estimated on the refuge; however, because the species blends in well with the landscape, plants may be missed during surveys. Currently, four populations occur in Nevada, all of which are within designated critical habitat. They include (1) Purgatory Spring, (2) Old Rooker Ranch-Cold Spring, (3) North County Road, and (4) Marsh to Bradford springs (Knight and Clemmer 1987).

Life History

Mentzelia leucophylla is a small biennial or short-lived plant that occurs only in Ash Meadows, in clay soils of spring areas, especially along canyon washes where *Atriplex* is common, at

elevations ranging from 2,200-2,300 feet amsl (Beatley 1976). Mozingo and Williams (1980) suggests, in addition to clay soils, it also occurs in sandy or saline clay soils in plant communities dominated by, *Atriplex confertifolia*, *Haplopappus acradenius*, *Cryptantha confertiflora*, *Enceliopsis nudicaulis* var. *corrugata*, and *Astragalus phoenix*, at elevations 2,200-6,500 feet amsl. The USFWS suggests that the species is associated with upland alkaline soils found in arroyos and on knolls only within the more xeric portions of Ash Meadows (50 FR 20777-20794). However, this uncommon plant is often found with Ash Meadows milkvetch and Ash Meadows sunray. According to the USFWS (1990), the Ash Meadows blazing star is probably the rarest of all plant species endemic to Ash Meadows. Although little is known about its life history or habitat requirements, it is known to occupy alkaline soils in dry washes and on barren bluffs distributed along the eastern edge of Ash Meadows. Bright yellow flowers bloom from late May into September and are open only for brief periods in late afternoon (NNHP 2001).

Threats to the Species

According to USFWS (50 FR 20777-20794):

> "Existing populations have been greatly reduced from those known to have occurred 15 years ago by habitat disturbance during road construction, cropland development, and peat mining in Carson Slough. Threats to its existence include alteration of storm drainage patterns through arroyos by road construction, habitat destruction in locations where road construction activities are proposed, and the trampling by wild and free-roaming horses."

The blazing star is narrowly confined to a spring-fed desert wetland area with extreme saline soils. Eight sites are known in Nevada, which are threatened by development. Agricultural development and the associated large-scale exploitation of the region's water resources have destroyed large portions of the local native flora (NatureServe 2009).

The local distribution of small populations suggests the species is vulnerable to any level of disturbance. In addition to trampling by wild and free-roaming horses and agricultural development, USFWS (1990) also suggests trampling by other livestock and disturbance caused by OHV travel as major threats to these small, fragile populations.

Species in the Project Area

The Project area is located approximately 9 miles northwest of the nearest known locations of the species in Nevada at Ash Meadows and Carson Slough. The plant has never been found within the Project area, although the plant populations at Ash Meadows share some groundwater-related commonalities with the Project area. The Ash Meadows Basin (includes most of Ash Meadows NWR) and Alkali Flat-Furnace Creek Basin (includes the Project area and a small portion of Ash Meadows NWR) are connected by the Central Death Valley subregion of the DVRFS.

Ash Meadows Gumplant

Regulatory Status

The Ash Meadows gumplant (*Grindelia fraxino-pratensis*) was listed as threatened with designated 1,968 acres of designated critical habitat for the species under the ESA on May 20, 1985 (50 FR 20777-20794). The plant was included in a recovery plan at Ash Meadows with 11 other federally listed species in 1990 (USFWS 1990). In addition to federal protection, it is fully protected in Nevada, is a BLM Special Status Species in Nevada, and is considered endangered by the Nevada Native Plant Society (NNHP 2001). Designated critical habitat is located in Inyo County, California and Nye County, Nevada, at 11 locations east of Carson Slough, and one site on the west side of the Slough (USFWS 1990).

Species Description

The Ash Meadows gumplant was first collected in 1965 by Beatley, and described by Reveal and Beatley in 1971 (50 FR 20777-20794). This tall (70-100 centimeters) biennial (or short-lived perennial) herbaceous plant is a member of the sunflower family, the largest family of vascular plants, with possible 950 genera and 20,000 species, chiefly herbaceous, and world-wide in distribution (Munz 1974). There are one to three stems arising from a woody root-stock. The stems are glabrous, leafy, and openly branched in their upper halves. The leaves are leathery, dark green, and dotted with resinous glands. Basal leaves are oblanceolate and 4 to 7 centimeters long while the stem leaves are oblanceolate to oblong and 1.5 to 5.0 centimeters long. The leaf edge is entirely to somewhat toothed at the apex (Mozingo and Williams 1980).

Status and Distribution

The Ash Meadows gumplant is endemic to the Ash Meadows area in Nye County, Nevada and Inyo County, California, and is concentrated in three main populations and several smaller ones, covering approximately 2,260 acres (BLM and USFWS 2000a), mostly within the boundaries of the Ash Meadows NWR, but one population occurs outside the wildlife refuge, but within the Ash Meadows ACEC managed by the BLM. This large population extends approximately one mile into Inyo County, California. Most of the populations were surveyed in 1998, and plants were confirmed at all sites identified in 1985; however a few small populations on private lands were not surveyed and six new sites were discovered during the 1998 surveys (Glenne 1998; Alexander 1998). Based on survey history, it appears the gumplant has increased its distribution since the species was listed in 1985, probably due to the conversion of some agricultural lands back to a natural state, and the species ability to recover in disturbed habitats (USFWS 2007b; Mozingo and Williams 1980).

According to USFWS (2007b), there is little quantitative or demographic data to describe trends for the Ash Meadows gumplant. In 2000, the entire population, based on visual estimates of 81,000 plants, was likely a serious underestimate of the total number of plants actually present. A 2002 survey conducted in California found approximately 241,514 (+ or – 69,660) plants on 88 acres.

Life History

The Ash Meadows gumplant is a biennial or short-lived perennial that occurs generally in moist saltgrass flats and near stringer washes and pools with high water table, at elevations ranging from 2,070 to 2,320 feet amsl (Center for Biological Diversity 2009). It has been associated with ash-screwbean mesquite woodlands and desert shadscale scrub vegetation. It occasionally occurs on open alkali clay soils in drier shadscale habitats (BLM 2009a). According to the NNHP (2001), the gumplant occurs in open, flat, whitish, strongly alkaline, moist and hard to sometimes dry and powdery clay soils in or bordering meadows and shallow drainages near springs and seeps. It sometimes occurs in disturbed and somewhat weedy areas in creosote bush-bursage and shadscale zones in ash-mesquite woodlands, shadscale scrub, or saltgrass meadows with *Prosopis* spp., *Fraxinus* spp., *Atriplex confertifolia*, *Centaurium namophilum*, *Distichlis spicata*, *Sporobolus airoides*, *Baccharis emoryi*, *Iva acerosa*, *Tamarix ramosissima*, and *Cirsium mohavense*. Best population development is on moist intact soils (Knight and Clemmer 1987). The meadow ecosystem occupied by Ash Meadows gumplant is also commonly associated with spring-loving centaury (*Centaurium namophilum*), yerba mansa (*Anemopsis californica*), western niterwort (*Nitrophila occidentalis*), and California loosestrife (*Lythrum californicum*). Additional species associated with the gumplant in shadscale scrub include desert isocoma (*Isocoma acradenius*), alkali rabbitbrush (*Chrysothamnus albidus*), and sealight (*Saueda* spp.) (Cochrane 1981).

New leaves of the gumplant start growing in June or July, and budding occurs from July through August. Beginning in June, the plant produces daisy-like bright yellow flowers, with fruit produced in early October. The seeds are very light and can be blown by the wind for a long distance. Seeds that fall near the parent plant may also be transported by water during winter rains or summer flash floods. Mammals, birds, and ants may also aid in seed dispersal. The germination date of seeds is unknown (Center for Biological Diversity 2009).

Threats to the Species

Throughout the species' range, three major threats have been identified by USFWS (2007b): (1) Loss of habitat from groundwater pumping; (2) invasive non-native species; and (3) surface mining. During the 1985 final rule to list the Ash Meadows gumplant, interruption of water supply was identified as a major threat to the species. This threat continues today as groundwater pumping occurs on a regional scale, particularly from the Alkali Flat/Furnace Creek Ranch hydrologic basin in Amargosa Valley, at approximately two times the rate predicted to be sustainable (USGS 2005). The NPS has indicated that the number of water rights issued by the State of Nevada for Amargosa Valley has grossly exceeded sustainable levels and the resource is over-allocated (Baldino 2006).

The second largest threat to the Ash Meadows gumplant, and all native flora, is the infestation and establishment of non-native species. According to Pimental et al. (2005), approximately 42 percent of all threatened and endangered species in the U.S. are at risk because of non-native species. Because agricultural land is common throughout the area, noxious weeds commonly associated with agriculture include Russian knapweed (*Acroptilon repens*), five hook bassia (*Bassia hyssopifolia*), Malta star thistle (*Centaurea melitensis*), yellow star thistle (*Centaurea solstitialis*), and hoary cress (*Cardaria draba*) (USFWS 2006a). The weeds directly compete

with native species for water, nutrients, and sunlight, and alter ecosystem processes such as nutrient cycling and fire regime. The adaptations of noxious weeds present on the Ash Meadows NWR allow them to out-complete native flora and colonize undisturbed habitat (USFWS 2007b). The wet meadows are particularly vulnerable to invasion by noxious weeds because it provides favorable conditions to invade sites that are occupied by the gumplant. The agricultural fields adjacent to large populations of Ash Meadows gumplant are infested with Russian knapweed, bassia, and Malta star thistle (USFWS 2007b).

Fire facilitated by non-native species is a threat that was not identified in the 1985 listing document. Where weeds are present, anecdotal observations suggest fire appears to provide an opportunity for non-native plants to expand on the wildlife refuge where most of the gumplant exists. Because weeds alter fire regimes by increasing the ease with which fires spread through riparian corridors and along spring channels, they destroy native plants and their habitats. The hardier non-natives typically prevent regrowth and colonization of native plants after fires, causing reduction in native plant cover and diversity (USFWS 2007b).

Surface mining has remained a threat to the Ash Meadows gumplant since it was listed in 1985. Direct impacts to the plant as result of mining include loss of habitat. Indirect impacts are caused by diverting or draining water away from its habitat during mining operations (USFWS 2007b). However, there are plans to withdraw BLM and USFWS lands with public minerals, so the threat caused by surface mining is looking more optimistic for the species. Other threats to the gumplant include trampling by cattle and wild horses, OHV activity, and potential stochastic and natural catastrophic events (USFWS 2007b).

Species in the Project Area

The Project area is located approximately 11 miles northwest of nearest known locations of the species within or adjacent to the Ash Meadows NWR. The plant has never been found within the Project area, although the plant populations at Ash Meadows share some groundwater-related commonalities with the Project area. The Ash Meadows Basin (includes most of Ash Meadows NWR) and Alkali Flat-Furnace Creek Basin (includes the Project area and a small portion of Ash Meadows NWR) are connected by the Central Death Valley subregion of the DVRFS.

Ash Meadows Ivesia

Regulatory Status

The Ash Meadows ivesia (*Ivesia eremica*[=*I. kingii var. eremica*]) was listed as threatened with designated critical habitat under the ESA on May 20, 1985 (50 FR 20777-20794). The plant was included in a recovery plan at Ash Meadows with 11 other federally listed species in 1990 (USFWS 1990). In addition to federal protection, it is fully protected in Nevada, is a BLM Special Status Species in Nevada, and is considered threatened by the Nevada Native Plant Society (NNHP 2001). Designated critical habitat is located at five general locations east of Carson Slough (large and extensive marsh) in Nye County, Nevada (50 FR 20777-20794).

Species Description

The Ash Meadows ivesia (*Ivesia eremica[=I. kingii var. eremica]*) was first discovered by Coville and Funston on March 2, 1891 near Watkins Ranch, south of Devils Hole in north Ash Meadows, Nye County, Nevada (Beatley 1976; Knight and Clemmer 1987). It was originally described as *Potentilla eremica* in 1892, because remains of spent flowers were collected in mid-winter and was thought to be *P. santolinoides*, but was later changed to *Ivesia eremica.* Coville and Funston found *Ivesia* only in one location east of Watkins/Collins Ranch in an alkaline limestone marsh with *Spartina gracilis*, *Anemopsis californica*, and *Schoenus nigricans* (Beatley 1977). As of 1987, the taxonomy of the species and genus has been controversial. The *Horckelia-Ivesia-Potentialla* complex went through revision, and *Ivesia eremica* became the accepted name of the plant, although some botanists question whether this taxon is distinctive enough to be maintained as a discrete variety of the species *I. kingii*. The species as a whole is extremely variable and somewhat rare (NNHP 2001).

This tall, prostrate perennial herb is a member of the rose family. It grows from an erect thick woody root that bears a basal tuft of grayish pubescent leaves. The leaves are pinnately compound with 60 pairs of overlapping leaflets covered with fine hairs (Knight and Clemmer 1987). Flowering stems are about 9 centimeters long and bear white flowers from August to October (NNHP 2001). Plants occur as solitary clumps not exceeding 4.8 centimeters high and 25 centimeters in diameter (USFWS 1990).

Status and Distribution

As of 1987, seven populations were located in Ash Meadows. They included: (1) Old Rooker Ranch; (2) Shaft-Chalk springs; (3) Mary Scott-Indian-School-Crystal Pool springs; (4) Crystal Pool/Amargosa Reservoir; (5) Collins Ranch; (6) Bluffs west of County Road; and (7) Tubbs-Love ranches (Knight and Clemmer 1987). According to USFWS (1985), existing populations were smaller and less numerous than those known historically because of habitat eliminations during agricultural development From 1987 through 2001, eight occurrences were mapped totaling 3,862 plants covering approximately 9.1+ acres (NNHP 2001), but are now more widely distributed.

Life History

There is little known about the life history of Ash Meadows ivesia, but it is known as a matted perennial herb that flowers from August to October. All other stages including germination, leafing, budding, fruiting and fruit dispersal and dissemination agents are unknown (CMI 1996).

Ash Meadows ivesia is associated with highly alkaline, clay lowlands or depressions where soil moisture remains high from perched groundwater maintained by springs and seeps (50 FR 20777-20794). It occurs only in the mesic, meadow areas of just north and east of Ash Meadows at elevations ranging from 2,200- 2,300 feet amsl (CMI 1996). The flat, mesic, meadow areas with white, alkaline clay soils are remnants of Pleistocene age lakes. The ivesia is associated with *Distichlis spicata* var. *stricta*, *Centaurium namophilum*, *Haplopappus acradenius*, *Spartina gracilis*, *Juncus balticus*, and *Cordylanthus tecopensis* (Knight and Clemmer 1987). According to NNHP (2001), Ash Meadows ivesia occurs in open, moist to saturated, whitish, heavy, to

chalky soils on flats, drainages, and bluffs near springs and seeps, in saltgrass meadow, shadscale, and ash-mesquite vegetation with *Atriplex confertifolia*, *Prosopis* spp, *Cirsium mohavense*, *Fraxinus velutina*, *Anemopsis californica*, and *Iva acerosa*.

Threats to the Species

Threats to the Ash Meadows ivesia include trampling by cattle, wild horses, and sheep, and spring diversions and groundwater pumping resulting in the drying of soils and elimination of its habitat (USFWS 1990). The existing populations are smaller and less numerous than those known historically because of habitat eliminations during agricultural development, including cropland development, spring alteration, and stream channelization and diversion, and during road construction occurring with municipal development (50 FR 20777-20794).

Groundwater depletion, drying ivesia habitat, poses the greatest threat to the existence of the species. Its dependence on perched groundwater issuing from seeps and springs or their outflows makes it extremely vulnerable to decreases in spring discharge that result in less water seeping to areas distantly removed from water sources (50 FR 20777-20794). In addition, road construction could eliminate populations by passing through habitat or interrupting drainage patterns and drying areas that were previously moist. Approximately 45 percent of the known populations occur on the Ash Meadows NWR.

Species in the Project Area

The Project area is located approximately 9 miles northwest of the nearest known locations of the species in Nevada at Ash Meadows and Carson Slough. The plant has never been found within the Project area, although the plant populations at Ash Meadows share some groundwater-related commonalities with the Project area. The Ash Meadows Basin (includes most of Ash Meadows NWR) and Alkali Flat-Furnace Creek Basin (includes the Project area and a small portion of Ash Meadows NWR) are connected by the Central Death Valley subregion of the DVRFS.

Ash Meadows Milkvetch

Regulatory Status

The Ash Meadows milkvetch (*Astragalus phoenix*) was proposed threatened under the ESA on October 13, 1983 with six other rare plants and one insect species in Ash Meadows, Nevada and California (48 FR 46590-46598), and finally listed as threatened with designated critical habitat on May 20, 1985 (50 FR 20777-20794). The plant was included in a recovery plan at Ash Meadows with 11 other federally listed species in 1990 (USFWS 1990). In addition to federal protection, it is fully protected in Nevada, is a BLM Special Status Species in Nevada, and is considered threatened by the Nevada Native Plant Society (NNHP 2001). Designated Critical habitat includes nine small areas east of Carson Slough at Ash meadows in Nye County, Nevada. This designation includes 1,200 acres of dry, hard, white, barren saline, clay flats, knolls, and slopes, which is the only suitable habitat for the plant (USFWS 2009a).

Species Description

The Ash Meadows milkvetch was first collected in Ash Meadows by Carl Anton Purpus in 1898. His original specimen was left unnamed until botanist Art Cronquist (1972) collected and named a second better specimen in 1966. It was finally described by Rupert Barneby in 1970 (Barneby 1970). This low, mat-forming perennial herb is a member of the legume or pea family, which is comprised of 450-500 genera and many thousands of species, many of great economic importance for food, forage, dyes, and wood (Munz 1974).

The plant forms mounds that are up to 40-50 centimeters across. The older stems characteristically have a flaking bark. The leaves, which are densely covered with coarse, white hairs, are 1.5 to 3.5 centimeters long and bear 2 to 3 ovate to obovate leaflets which are 3 to 7 millimeters long. The stipules are 2 to 3 millimeters long, pubescent on the outer surface and glabrous on the inner surface. The pinkish to purple flowers are borne on short, erect stems in a mat and commonly number only one or two per inflorescence. No other species occurs within the known range of *Astragalus phoenix* with which it could easily be confused. The flowers are very similar to those of *A. newberryi* Gray, but the latter is vegetatively very different in that it does not form the dense mound of foliage typical of *A. phoenix* (Mozingo and Williams 1980).

Status and Distribution

The Ash Meadows milkvetch is endemic to the Ash Meadows area in Nye County. Its range includes the Ash Meadows NWR, a small portion of the BLM Ash Meadows ACEC adjacent to the northeastern refuge boundary, and private lands within the refuge boundary. The plant was originally known from six sites in spring areas of north and east Ash Meadows (Beatley 1976). Two years later, Reveal (1978) estimated the population to contain 1,000 individuals. Cochrane (1981) identified 19 localities at which the milkvetch had been reported. Knight and Clemmer (1987) reported the species at six sites, which represented subpopulations of one historically larger, biological unit growing as adaphic endemics. In 1998, survey efforts concentrated on the six sites identified by Knight and Clemmer in 1987, and the total population was estimated to be about 1,800 plants on 847 acres (BLM and USFWS 2000b.).

Refuge-wide surveys of listed and rare plants, including, Ash Meadows milkvetch, were begun in 2008. As a result of these surveys, the total population on the wildlife refuge is estimated at 11,643 individuals on about 800 acres (Bio-West 2008a). According to Bio-West (2008a), a large area on public land occupied by the milkvetch was newly discovered adjacent to a previously known population on private land in 2008. The occupied area at most other previously reported sites was also extended.

Life History

The life history and habitat requirements of Ash Meadows milkvetch are largely unknown (USFWS 1990), but appear to be consistent with a stress-tolerant life history as described by Grime (1977). It is known to be a long-lived perennial composed of spreading branches that eventually form large, pulvinate mounds. Both foliage and fruit are matted with dense, grayishhairs. The plants accumulate air-borne particles, becoming partially buried by maturity (Knight and Clemmer 1987).

Stress-tolerant plants are typically long-lived with low annual production, except during favorable conditions (Grime 1977). According to Reveal (1978), winter and early spring rains are required to produce large numbers of flowers, but some flowering occurs each year regardless of climatic conditions. Flowering occurs in early spring from March to late May with fruit forming in April and lasting to June-July. It appears that population growth is constrained by low seed output per plant when precipitation is low. The opposite is generally true when there is above average precipitation. However, in a study conducted by Pavlik et al. (2006), seedlings were not observed at four of the six known sites during a year with above average precipitation. It was suggested that either the seed bank was depleted or the species was dependent on the most extreme and infrequent precipitation events. Wind and water appear to be the primary vectors for dispersal of seeds, and these seeds typically remain within the leaves and branches of the parent plant (USFWS 2009b).

Stress-tolerant species, like Ash Meadows milkvetch are generally slow to recover from disturbance, and given the little known life history of the plant and its naturally low rate of reproduction, it is unlikely that severely disturbed habitat has recovered. However, the slow population increases are probably the result of new protections implemented at Ash Meadows since it was established as a wildlife refuge (USFWS 2009c).

The Ash Meadows milkvetch grows between 2,200 and 2,300 feet elevation amsl, and appears to be restricted to flats and knolls of hard, white, alkaline clay soils in the Ash Meadows area (Knight and Clemmer 1987). The specific hydrological requirements for the species are largely unknown, but surface and subsurface groundwater that reaches the surface through capillary action may be an important habitat determinant for at least some of the populations of the species. The primary constituent elements of designated critical habitat consist of the biological and physical attributes essential to the species' conservation within those areas (USFWS 2009c). Those elements include hard, white, barren, saline, clay flats, knolls, and slopes (USFWS 2009c). Plant species associated with the Ash Meadows milkvetch include, saltgrass, shadscale, Ash Meadows blazing star, Alkali golden bush (*Isocoma acradenius*), and Ash Meadows sunray (*Enceliopsis nudicaulis* var. *corrugata*) (Knight and Clemmer 1987).

Threats to the Species

The threats to Ash Meadows milkvetch are consistent with those of other Ash Meadows plants and ecosystem including: (1) Present and threatened destruction, modification, or curtailment of habitat or range (e.g., groundwater withdrawal, surface mining, proposed road construction); (2) inadequacy of existing regulatory mechanisms; (3) other natural or manmade factors affecting continued existence (e.g., trampling by wild horses) ; (4) non-native species; (5) rabbit herbivory of flowers and fruits; (6) OHVs; (7) stochastic events affecting species with restricted ranges or small population sizes; and (8) climate change (USFWS 2009c).

At the time of listing, groundwater development was a major threat to the milkvetch and the entire Ash Meadows ecosystem. The milkvetch depends, in part, on near-surface water for its survival. Water levels in Devils Hole stabilized after groundwater pumping on the refuge stopped in 1975; however, the water level in Devils Hole declined 7 centimeters between 1988 and 2004, and increased again after a wet year. As groundwater pumping at Ash Meadows decreased, it

increased in the Amargosa Valley, and is currently occurring in some areas of the basin at about twice the rate predicted to be sustainable (USGS 2005).

Habitat loss or degradation from surface mining occurs in the Ash Meadows area. New mineral claims and subsequent mining could cause direct loss of Ash Meadows milkvetch habitat, as well as indirect impacts by diverting or draining water away from occupied habitat. Surface mining of a valid existing mining claim on private land within the wildlife refuge, therefore, poses a significant threat to one of the six known populations of Ash Meadows milkvetch. Alteration of the local groundwater table from mining could negatively affect this population and adversely modify its critical habitat on adjacent public land (USFWS 2009c).

New proposed road construction is not a threat to the milkvetch; however, some populations along the Ash Meadows Road may have been affected by the disruption of surface flows due to prior road construction. The species is found on the floor of washes and water has been identified as one of the vectors by which its seed may be distributed (Reveal 1978).

Non-native species impact approximately 42 percent of all federally listed and rare plants in the United States. (Pimental et al. 2005). They compete directly with native species for water, nutrients, and sunlight, and indirectly by altering ecosystem processes such as nutrient cycling and fire regimes (Brooks et al. 2004). The flats and knolls of hard, dry, alkaline clay that support the Ash Meadows milkvetch is a harsh environment, so weeds have not been identified as a major threat to the species. However, salt cedar (*Tamarix ramosissima*), Russian knapweed, five hook bassia (*Bassia hyssopifolia*), Malta star thistle, yellow star thistle, and hoary cress are noxious weeds that could potentially threaten Ash Meadows milkvetch (USFWS 2006b).

Species in the Project Area

The Project area is located approximately 9 miles northwest of the nearest known locations of the species in Nevada at Ash Meadows and Carson Slough. The plant has never been found within the Project area, although the plant populations at Ash Meadows share some groundwater-related commonalities with the Project area. The Ash Meadows Basin (includes most of Ash Meadows NWR) and Alkali Flat-Furnace Creek Basin (includes the Project area and a small portion of Ash Meadows NWR) are connected by the Central Death Valley subregion of the DVRFS.

Ash Meadows Sunray

Regulatory Status

The Ash Meadows sunray (*Enceliopsis nudicaulis* var. *corrugata*) was first proposed as threatened under the ESA on October 13, 1983 with six other rare plants and one insect species in Ash Meadows, Nevada and California (48 FR 46590-46598), and was listed as threatened with designated critical habitat on May 20, 1985 (50 FR 20777-20794). The plant was included in a recovery plan at Ash Meadows with 11 other federally listed species in 1990 (USFWS 1990). In addition to federal protection, it is fully protected in Nevada, is a BLM Special Status Species in Nevada, and is considered threatened by the Nevada Native Plant Society (NNHP 2001).

Approximately 1,760 acres of designated critical habitat are located in the Ash Meadows area in Nye County, Nevada, approximately 7 miles southeast of the Project (USFWS 1990). It includes nine locations, comprised of three main subpopulations, along and east of Carson Slough and in the vicinity of Devils Hole. Some of this area overlaps with critical habitats for the Ash Meadows milkvetch and Ash Meadows blazing star (USFWS 1990).

Species Description

Ash Meadows sunray was described in 1972 from specimens collected by Cronquist in 1966 in north Ash Meadows (Cronquist 1972; Beatley 1976). This medium-sized perennial shrub is a member of the sunflower family, the largest family of vascular plants, with a possible 950 genera and 20,000 species, chiefly herbaceous, and world-wide in distribution (Munz 1974). It forms clumps 10–40 centimeters high from a stout, woody root-stock. The leaves, which are densely tomentose with fine grayish-white hairs, are relatively small, with a blade about 1 to 3.6 centimeters long. They are ovate to subcircular in shape. The leafless flower stalks bear individual heads with disks 0.8 to 1.4 inches across. The ray flowers number 11 to 23 and possess yellow corollas 2 to 2.5 centimeters long. The disk flowers are strongly compressed. The silky-pubescent achenes bear 2 short awl-shaped awns connected by a whorl of short, fused scales, but sometimes the pappus are absent on the achenes. This variety appears as a geographically peripheral phase of the species *E. nudicaulis*, and is distinctive in habitat and morphological features (CMI 1996). The varietal name, *corrugata*, refers to its strongly ruffled-corrugate leaves (Mozingo and Williams 1980).

Status and Distribution

This variety of sunray is found in local populations in or near limestone mountain ranges or limestone outcrops. Historically, the plant occupied the southern end of Monitor Range, northern Belted Range, and the foothills of Quinn Canyon Range at elevations ranging from 3,300 to 6,400 feet amsl. (Beatley 1976). The elevational range was also reported from 2,300 to 2,410 feet in Mozingo and Williams (1980). The Ash Meadows sunray is endemic to Ash Meadows where it occupies dry washes and weathered saline soils. According to USFWS (50 FR 20777-20794):

> "It is one of the more common species of plants endemic to Ash Meadows but its populations have been reduced during the past 15 years by habitat elimination for agricultural production, the initial phases of PEC's development, and road construction."

PEC (Preferred Equities Corporation) is a real estate developer that purchased land in Ash Meadows during the 1980s.

In the late 1980s, the sunray was found throughout the Ash Meadows NWR, and was the most widespread of the rare species, but populations were destroyed during road construction, land leveling for crops, and alterations for municipal development between 1970 and 1985 (USFWS 1990, 2009b).

At Rogers-Purgatory-Longstreet Springs along Carson Slough, the habitat is variably disturbed from clay mining and OHV use. There are two distinct populations in this area. In central Ash

Meadows, the populations are very large but are somewhat fragmented occurring from the terrace overlooking Old Rooker Ranch to Collins Ranch and southwest to Amargosa Reservoir. This area is riddled with roads, OHV tracks, agricultural fields, and other human-caused disturbances (Knight and Clemmer 1987). Within the southeast portion of Ash Meadows, sunray populations and habitat run from west of the county dirt road to Jack rabbit Spring and south nearly to Big Spring. The area is disturbed by county and private roads, private ranches, and natural and altered drainage patterns from the springs (Knight and Clemmer 1987).

Life History

There is little known about the life history and habitat requirements of the Ash Meadows sunray, particularly the reproductive phenology except that flowering occurs between April and May. It flowers coincidentally with the Ash Meadows milkvetch. A single plant usually produces a number of flowering stalks, each supporting an individual yellow flower (USFWS 1990).

It typically occurs in whitish, poorly drained, alkaline soils along dry washes or on pale, hard limestone outcrops. The region within which this plant grows is relatively dry; rainfall in Ash Meadows averages three to five inches per year, falling mainly in the autumn and winter with some sporadic summer rains (CMI 1996). *Enceliopsis* is generally a common component of the perennial flora. Much of the lower elevation alkali clay soils have underlying water table making the habitat inappropriate for *Enceliopsis* distribution. This is particularly true along the western and southern borders of the wildlife refuge (Knight and Clemmer 1987). It occupies habitats of the Ash Meadows milkvetch and Ash Meadows blazing star in addition to areas that are more densely vegetated with *Ambrosia dumosa*. According to Mozingo and Williams (1980), individuals are restricted to dry, upland areas outside the influence of water from seeps and springs. However, recent soil surveys have revealed that approximately 14 percent of the populations occur on landtypes that are saturated to the surface or to within 50 cm in the winter months (Novosak 2010, personal communication). In CMI (1996) and Knight and Clemmer (1987), Ash Meadows sunray is associated with *Atriplex confertifolia*, *Haplopappas acradenius*, *Arctomecon merriami*, and *Cryptantha confertifolia*.

Threats to the Species

Recent losses of habitat due to agricultural and municipal/residential development activities, land clearing for road construction, groundwater removal and surface spring diversion and local mining activities, all have threatened the species habitat and ultimately their survival. Ash Meadows remained largely intact until 1967 when PEC purchased large tracts (approximately 20 square miles) in the northern and eastern regions. In their attempt to farm the land, they plowed large areas of land and installed pumps at the springs. These alterations virtually obliterated the natural features of the area including Carson Slough and its surrounding vegetation. Corporate farming failed in the area and it was abandoned in 1975 (CMI 1996).

Currently, the plant is threatened primarily by large-scale destruction of the native flora over large portions of the Ash Meadows area caused by continued agricultural development, road construction, and OHV activity (CMI 1996). Habitat destruction and mineral development has broken the hard, xeric alkali clay slopes of the upland topography into sporadic patterns (Knight

and Clemmer 1987). The sunray's distribution appears to be limited to a particular edaphic condition in washes weathered saline soils. Any further loss of its habitat would probably be detrimental to the species survival (CMI 1996).

Species in the Project Area

The Project area is located approximately 9 miles northwest of the nearest known locations of the species in Nevada at Ash Meadows and Carson Slough. The plant has never been found within the Project area, although the plant populations at Ash Meadows share some groundwater-related commonalities with the Project area. The Ash Meadows Basin (includes most of Ash Meadows NWR) and Alkali Flat-Furnace Creek Basin (includes the Project area and a small portion of Ash Meadows NWR) are connected by the Central Death Valley subregion of the DVRFS.

Spring-Loving Centaury

Regulatory Status

The variety of spring-loving centaury (*Centaurium namophilum* var. *namophilum*) was proposed endangered under the ESA on October 13, 1983 with six other rare plants and one insect species in Ash Meadows, Nevada and California (48 FR 46590-46598). However, USFWS later did not accept the validity varietal designations for *C. namophilum*, so the entire species was listed as threatened with designated critical habitat on May 20, 1985 (50 FR 20777-20794). The plant was included in a recovery plan at Ash Meadows with 11 other federally listed species in 1990 (USFWS 1990). In addition to federal protection, it is fully protected in Nevada, is a BLM Special Status Species in Nevada, and is considered threatened by the Nevada Native Plant Society (NNHP 2001). Approximately 1,840 acres of designated Critical habitat are scattered in or adjacent to Ash Meadows in Nye County, Nevada, approximately 7 miles southeast of the Project (USFWS 1990).

Species Description

The taxonomy of the spring-loving centaury has been a contentious issue since the 1970s. The spring-loving centaury was first collected in 1891 by Coville and Funston, while on the Death Valley expedition (Knight and Clemmer 1987), but was not described until 1973 by Reveal, Broome, and Beatley (Reveal et al. 1973; 50 FR 20777-20794). According to Broome (1981), the plants collected from the Furnace Creek area in Death Valley closely resembled specimens of C. *namophilum* var. *namophilum* found in Shoshone and Tecopa in Inyo County, but due to certain morphological characteristics, the specimens were likely to be a second variety; *C. n.* var. *nevadense*. During Broome's survey in 1981, she also found *C. n. namophilum* near Beatty, Nevada, although Morefield (1991) did not relocate it, but found several populations of *C. exaltatum* and *C. calycosum* instead. Intermountain flora and Jepson Manual treatments combined *C. n. nevadense* with *C. exaltatum*, and *C. n. namophilum* became a valid taxon without varietal distinctions. It is now officially identified as *Centaurium namophilum*, and is currently restricted to Ash Meadows (USFWS 2009d; Knight and Clemmer 1987; 50 FR 20777-20794; USFWS 1990).

This annual herb is a member of the pea family, comprised of over 65 genera and 600 species, is widely distributed, but most abundant in temperate regions. A colorless bitter juice is a distinguishing characteristic of the family (Munz 1974). The spring-loving centaury is an erect, annual herb, up to 45 centimeters tall with flowering stems borne from the base and flowering lateral branches. Stems and herbage are glaucous and the leaves are opposite, not forming basal rosettes. Stems are yellowish to tannish with internodes up to 4 centimeters long. Inflorescences extend more than half the length of the plant, and are paniculate-cymose (Knight and Clemmer 1987). Flowers are deep rose-pink above and below. The throat is yellowish with five dark purple spots below the juncture of adjacent petals (Reveal et al. 1973).

Status and Distribution

Historically, the plant probably occupied all the springs and seeps in the northern and eastern sections of Ash Meadows until development in the 1960s through 1980 reduced its distribution to small isolated patches. Cochrane (1981) identified 17 localities at which the plant had been previously observed, and Knight and Clemmer (1987) reviewed data and identified seven general areas from which the species had been reported. In 1998, surveys targeted those seven locations, and as a result, the population was estimated to be approximately 175,000 plants on 522 acres (BLM and USFWS 2000c).

The centaury is endemic to the Ash Meadows area of Nye County, Nevada. Its range includes the Ash Meadows NWR and adjacent public and private land. On public land managed by the BLM, the plant is found entirely within the Ash Meadows ACEC. Beginning in 2008, rangewide surveys were conducted for all rare plants throughout the Ash Meadows NWR. As a result of the survey effort for spring-loving centaury, the total population is estimated to be 4,468,571 individuals on about 800 acres (Bio-West 2008b). The likely reasons for the increase from 1998 to 2008 is most likely due to better, more comprehensive survey effort, natural fluctuations in the population size of an annual species, and differences in estimation protocols (USFWS 2009d).

According to Bio-West (2008b), the plants confirmed in the 2008 surveys were found at most of the previously recorded sites. In addition, distribution range of the plants in 1998 was extended in most locations to connect populations that were once believed to be separate. They found the plant to be widespread throughout the wildlife refuge in habitats that included seasonally flooded wetlands to seasonally moist alkali meadows, and the edges of some alkali scrub-shrub communities. In addition, they concluded that any habitat with surface or subsurface water was potential habitat for the species. The species has apparently extended beyond the wildlife refuge as well, but it is important to note, while the numbers have increased at most locations, other smaller populations reported in 1998 have apparently disappeared.

Based on the 2008 survey effort conducted by Bio-West (2008b), the current distribution includes six major subpopulations with additional minor subpopulations. They include: (1) Purgatory-Rogers-Longstreet-Five springs-North Carson Slough- T17S, R50E, Sections 10, 14-16, 20-23; (2) Scruggs-Mary-Scott-Indian School-Crystal-marsh springs- T17S, R50E, Sections 7-10,and 15-18; (3) Unmapped seep west of South Springs Meadow road- T18S, R50E, Sections 14 and 23; (4) Point of Rocks Springs- T18S, R51E, Sections 7 and 12; (5) Jackrabbit-Big springs- T18S, R51E, Sections 18-19 and west from Big Spring extending into T18S, R50E,

Sections 14, 22-24; and (6) last Chance-Bole-Brahma springs- T18S, R51E, Sections 20, 29, and 30 (USFWS 2009d).

The land and management of spring-loving centaury within the wildlife refuge is 50 percent USFWS land, 45 percent BLM land, and 5 percent private land. No data are available for populations outside the wildlife refuge within the BLM Ash Meadows ACEC (USFWS 2009d).

Life History

The life history and habitat requirements of spring-loving centaury are largely unknown, but general observations indicate it is an annual species that flowers during the late summer and autumn (USFWS 1990). According to Reveal et al. (1973), each flower develops into a narrow, linear seed capsule containing about 50 seeds, of which one plant can produce thousands. Like other plants, it likely has certain controls that delay germination, allowing it to persist in the soil seed bank for long periods (USFWS 2009d). The seeds are small (0.07–0.09 centimeter) and are easily dispersed by wind, water, and animals. Similar to other plants, most seed probably remains near the parent plant.

According to USFWS (2009b), it is unknown whether the centaury is self compatible or requires pollination, but based on the present distribution and population numbers, pollination probably does not limit reproduction. Even though little is known or understood about the centaury's life history, it is probably consistent with other species that have adapted to disturbed habitats (ruderal), like agriculture and other human-caused activities that impact habitats. Grime (1977) described ruderal plants with similar life histories as being adapted to disturbance, where the relative proportion of energy devoted to seed production is high, and capable of recovering from disturbance more quickly than other species.

The spring-loving centaury grows at elevations between 2,070 to 2,320 feet amsl in alkaline clay soils where water availability is a limiting factor (Pavlik and Manning 1986). It prefers moist to wet clay soils along the banks of streams or in seepage areas, habitat similar to that of Ash Meadows gumplant (USFWS 2009b). Where found, it occurs in abundance and is associated with *Cordylanthus tecopensis*, *Distichlis spicta*, var. *stricta*, *Baccharis emoryi*, *Fraximus velutina*, and *Prosopis* (Knight and Clemmer 1987), and *Pyrrocoma* spp., *Juncus balticus*, *Anemopsis californica*, *Nitrophila occidentalis*, *Atriplex* spp, *Tamarix* spp., *Typha* spp., and *Iva* spp. (NNHP 2001). According to Reveal et al. (1973) in USFWS (2009b), the plant typically grows in wet saltgrass meadows near springs and streams and occasionally in low uplands at seeps.

Threats to the Species

The threats to spring-loving centaury are consistent with those of other Ash Meadows plants and ecosystem. They include: (1) Present destruction, modification, or curtailment of habitat or range (e.g. groundwater withdrawal, surface mining, non-native species; (2) overutilization for commercial, recreational, scientific, or educational purposes (e.g. disease or predation); (3) inadequacy of existing regulatory mechanisms; (4) other natural or manmade factors affecting continued existence (e.g., vulnerability to environmental uncertainty, and climate change) (USFWS 2009d).

The spring-loving centaury depends on the outflow of springs and near-surface water for its survival, so local groundwater pumping negatively affects populations of the species (USFWS 2009d). At the time of listing, groundwater development was a major threat to the entire Ash Meadows ecosystem. Water levels in Devils Hole stabilized after groundwater pumping on the Ash Meadows NWR stopped in 1975; however, the water level at Devils Hole declined 7 centimeters between 1988 and 2004, and increased again after a wet year. As groundwater pumping at Ash Meadows decreased, it increased in the Amargosa Valley, and is currently occurring in some areas of the basin at about twice the rate predicted to be sustainable (USGS 2005).

Habitat loss or degradation from surface mining occurs in the Ash Meadows area. New mineral claims and subsequent mining could cause direct loss of spring-loving centaury, as well as indirect impacts by diverting or draining water away from occupied habitat. Surface mining of a valid existing mining claim on private land within the wildlife refuge, therefore, poses a significant threat to about 50 percent of the known occurrences of the centaury within the wildlife refuge that are open to public minerals. The existing claims do not occur near any of the large populations of the plant, so mining doesn't pose a significant threat to those populations (USFWS 2009d).

Non-native species impact approximately 42 percent of all federally listed and rare plants in the United States. (Pimental et al. 2005). They compete directly with native species for water, nutrients, and sunlight, and indirectly by altering ecosystem processes such as nutrient cycling and fire regimes (Brooks et al. 2004). Over 100 non-native species, approximately 16 percent of the total flora, occur on Ash Meadows NWR. Of the total, six species could potentially threaten the centaury including salt cedar, Russian knapweed, five hook bassia, Malta star thistle, yellow star thistle, and hoary cress (USFWS 2006c). The wet meadows and old agricultural fields that support the species are also favorable conditions for non-native, noxious weeds. There are about 4,460 acres of old agricultural fields on Ash Meadows NWR, and some of these fields are nearly monocultures of non-native noxious weeds; however, approximately 315 acres or roughly 10 percent of spring-loving centaury habitat is threatened by non-native noxious weeds (USFWS 2009d).

Since the final listing rule was published for spring-loving centaury, laws and regulations were interpreted as simply providing recognition of the species' status, but no legal protection was afforded to the individual plants or their habitats. Weak interpretation and enforcement of these laws and regulations in Nevada, where the plant occurs, has further threatened the species' survival. Since the final listing rule was published, regulations have been strengthened and new regulatory mechanisms have been developed to protect and conserve the spring-loving centaury (USFWS 2009d).

Other natural or manmade factors affecting the species' continued existence include vulnerability to environmental uncertainty and climate change. Environmental uncertainty includes extreme flash flooding, which could affect the species, but because its distribution creates population redundancy, flash flooding does not appear to be a serious threat to the centaury. The same holds true for climate change. Based on current climatic modeling, the southwestern United States is likely to experience increased frequency of regional drought in response to elevated levels of atmospheric CO_2. The aquifer that supports the centaury is recharged from precipitation in the

same area. If precipitation decreases significantly in the area, it could affect the plant, but to what level climate change will have on the local aquifer that supports the ecosystem and the plant is unknown. Monitoring groundwater change would be important to identifying climate change as a potential threat (USFWS 2009d).

Species in the Project Area

The Project area is located approximately 8 miles northwest of the nearest known locations of the species in Nevada at Ash Meadows and Carson Slough. The plant has never been found within the Project area, although the plant populations at Ash Meadows share some groundwater-related commonalities with the Project area. The Ash Meadows Basin (includes most of Ash Meadows NWR) and Alkali Flat-Furnace Creek Basin (includes the Project area and a small portion of Ash Meadows NWR) are connected by the Central Death Valley subregion of the DVRFS.

3.6.4.5 Sensitive Plant Species

No special status plant species were located within the Project area during field surveys. However, two cactus species were located. Two individual beavertail prickly pear and seven golden cholla were found in the Project area (see Figure 3-11). Neither species is considered rare; however, both are protected by the State of Nevada's statute for the protection of Christmas trees, cacti, and yucca (NRS 527.060-.120).

Tecopa bird's-beak (*Cordylanthus tecopensis*) has been identified by the BLM as a species of concern in Nevada. This annual herb occupies moist alkaline meadows and flats, saltbush scrub within Mohave desert scrub. It is found in salt encrusted clay soils at 2,000 to 2,700 feet elevation along bottomlands of the Amargosa River drainage, east of Death Valley in California and Nevada and in Fish Lake Valley, Nevada. Locally, several populations occur in Ash Meadows, each following major drainage patterns of the springs. (NDOW 2003; Knight and Clemmer 1987; Mozingo and Williams 1980). Main threats to this species include water diversion, development, intensive recreation/OHV, non-native species, vandalism, vegetation encroachment (undesirable species), groundwater pumping, wild burros and livestock, rights-of-way, and mining (NDOW 2003; Mozingo and Williams 1980).

3.6.5 Wildlife Resources

The ROI for wildlife resources, including threatened, endangered, proposed, and candidate wildlife species, consists of areas that may be affected by permanent and temporary features of the Proposed Action and areas where groundwater withdrawal may impact surface and groundwater hydrology. The extent of the ROI for wildlife resources is based on the effects of the proposed Project on water resources as described in Section 3.4. Based on these criteria, the ROI for direct impacts on wildlife resources includes those areas in the immediate vicinity of the Proposed Action construction, operation, and maintenance activities. The ROI for indirect effects is the Amargosa Desert Hydrographic Basin.

3.6.5.1 Wildlife Observed within the Project Area

Fifty-eight vertebrate species were detected or seen over the course of the field surveys in the Project area during the spring and summer of 2009. Of these, 13 species were reptiles, 27 species were birds, and 18 species were mammals (Tierra Data 2009).

Thirteen species of reptiles were found or detected in the Project area during 2009 surveys (Table 3-15). The only protected reptile species detected was the Desert Tortoise which is listed as threatened under the ESA and discussed further in section 3.6.5.2.

Table 3-15 Reptiles Observed in the Project Area

Common Name	Scientific Name	Common Name	Scientific Name
Desert Tortoise	*Gopherus agassizii*	Desert Iguana	*Dipsosaurus dorsalis*
Long-nosed Leopard Lizard	*Gambelia wislizenii*	Zebra-tailed Lizard	*Callifsaurus draconoides*
Side-blotched Lizard	*Uta stansburiana*	Desert Horned Lizard	*Phyrnosoma platyrhinos*
Great Basin Whiptail	*Aspidocelis tigris*	Spotted Leaf-nosed Snake	*Phyllorhynchus decutatus*
Red Racer	*Masticophis flagellum*	Glossy Snake	*Arizona elegans eburnata*
Long-nosed Snake	*Rhinocheilus lecontei*	Nevada Shovel-nosed Snake	*Chionactis occipitalis talpina*
Mojave sidewinder	*Crotalus cerastes*		
Source: Tierra Data 2009			

Twenty-seven bird species were seen or detected within the Project area during 2009 surveys, although no nests were found (Table 3-16). Surveys revealed that avian nesting potential is low to moderate owing to the sparse nature of the vegetation. No active nests for any species were located during 2009 surveys. Of the 27 total identified species five are classified as sensitive: Swainson's Hawk, Prairie Falcon, Phainopepla, LeConte's Thrasher, and Burrowing Owl. These species are discussed further in section 3.6.5.3.

Table 3-16 Bird Species Observed in the Projet Area			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Great Egret	*Ardea alba*	White-faced Ibis	*Plegadis chihi*
Turkey Vulture	*Cathartes aura*	Cooper's Hawk	*Accipiter cooperii*
Swainson's Hawk	*Buteo swainsoni*	Red-tailed Hawk	*Buteo jamaicensis*
American Kestrel	*Falco sparverius*	Prairie Falcon	*Falco mexicanus*
Eurasian Collared Dove	*Streptopelia decaocto*	Mourning Dove	*Zenaida macroura*
Greater Roadrunner	*Geococcyx californianus*	Burrowing Owl	*Athene cunicularia*
Lesser Nighthawk	*Chordeiles acutipennis*	Ash-throated Flycatcher	*Myiarchus cinerascens*
Western Kingbird	*Tyrannus verticalis*	Common Raven	*Corvus corax*
Horned Lark	*Eremophila alpestris*	LeConte's Thrasher	*Toxostoma lecontei*
Phainopepla	*Phainopepla nitens*	Wilson's Warbler	*Wilsonia pusilla*
Chipping Sparrow	*Spizella passerina*	Black-throated Sparrow	*Amphispiza bilineata*
Lincoln's Sparrow	*Melospiza lincolnii*	Black-headed Grosbeak	*Pheucticus melanocephalus*
Great-tailed Grackle	*Quiscalus mexicanus*	House Finch	*Carpodacus mexicanus*
House Sparrow	*Passer domesticus*		
Source: Tierra Data 2009			

Twelve terrestrial mammal species were detected or observed in the Project area during the 2009 surveys (Table 3-17). No special status mammals were detected.

Large mammals are not thought to be common to this area, however, burro tracks were encountered frequently throughout the Project area and two burros were observed traversing the Project area during the spring surveys. Wild burros are managed by the BLM. The closest actively managed herd management area (HMA) is the Johnnie HMA. This HMA boundary lies approximately 15 miles east of the Project area. The current estimated population for the Johnnie HMA is 77 wild horse and 158 wild burros. In addition to burro presence, during the spring 2009 survey, a Bighorn Sheep skull was found in Fortymile Wash. No other big game species were detected within the Project area.

In addition to the 12 terrestrial mammals species, 6 species of bats were detected during acoustic surveys in 2009 (Table 3-17). All of these species are considered sensitive species and are discussed further in section 3.6.5.3. No bat roosting habitat was identified in the Project area.

Table 3-17 Mammal Species Observed in the Project Area			
Common Name	**Scientific Name**	**Common Name**	**Scientific Name**
Deer Mouse	*Peromyscus maniculatus*	Little Pocket Mouse	*Perognathus longimembris*
Long-tailed Pocket Mouse	*Perognathus formosus*	Merriam's Kangaroo Rat	*Dipodomys merriami*
White-tailed Antelope Squirrel	*Ammospermophilus leucurus*	Desert Cottontail	*Sylvilagus audubonii*
Black-tailed Jackrabbit	*Lepus californicus*	California Myotis	*Myotis californicus*
Yuma Myotis	*Myotis yumanensis*	Western Paratrelle	*Parastrellus Hesperus*
Townsend's Big-eared Bat	*Corynorhinus townsendii townsendii*	Pallid Bat	*Antrozonous pallidus*
Brazilian Free-tailed Bat	*Tadarida brasiliensis*	Domestic Dog	*Canis familiaris*
Coyote	*Canis latrans*	Kit Fox	*Vulpes velox*
Burro	*Equus asinus*	Bighorn Sheep	*Ovis canadensis*
Source: Tierra Data 2009			

3.6.5.2 Federally Threatened, Endangered, Proposed, and Candidate Wildlife Species

The USFWS identified several threatened and endangered wildlife species with the potential of occurring in the proposed Project area or in the ROI. No proposed or candidate species were identified. Table 3-18 lists these species and identifies corresponding protection status under the ESA, BLM, and NDOW.

Table 3-18 Endangered and Threatened Wildlife Species that May Occur within the Region of Influence					
Scientific Name	**Common Name**	**Habitat**	**Endangered Species Act**	**State of Nevada**	**BLM**
Gopherus agassizii	Desert Tortoise (Mojave population)	Mojave desertscrub	Threatened	Protected	Sensitive
Cyprinodon diabolis	Devils Hole Pupfish	Devils Hole	Endangered	Protected	Sensitive
Cyprinodon nevadensis mionectes	Ash Meadows Amargosa Pupfish	Ash Meadows – large, warm waters	Endangered	Protected	Sensitive
Cyprinodon nevadensis pectoralis	Warm Springs Pupfish	Ash Meadows – Warm Springs Complex	Endangered	Protected	Sensitive

Table 3-18 Endangered and Threatened Wildlife Species that May Occur within the Region of Influence					
Scientific Name	**Common Name**	**Habitat**	**Endangered Species Act**	**State of Nevada**	**BLM**
Rhinichthys osculus nevadensis	Ash Meadows Speckled Dace	Ash Meadows – large, warm waters	Endangered	Protected	Sensitive
Ambrysus amargosus	Ash Meadows Naucorid	Ash Meadows – Point of Rocks Spring	Threatened	–	Sensitive
Source: USFWS 2009					

Desert Tortoise (Mojave population)

Regulatory Status

The Desert Tortoise (*Gopherus agassizii*) consists of two geographically dissimilar populations: the Mojave and Sonoran. The Mojave population is defined as those tortoises north and west of the Colorado River and west of Beaver Dam Slope, Utah, and is distributed throughout southern Nevada, southeastern California, the Beaver Dam Mountains and Virgin River area of southwestern Utah, and northwestern Arizona. The Sonoran population is found in most of Arizona, western New Mexico, and south through Sonora to northern Sinaloa, Mexico. The Sonoran population of Desert Tortoises also occurs on Isla Tiburon, in the Sea of Cortez (Germano et al. 1994).

Major declines and die-offs of Desert Tortoises were observed in the Mojave Desert in the 1980s, leading to the emergency listing of the Mojave population of Desert Tortoise as endangered on August 4, 1989 (54 FR 32326-32331). On October 13, 1989, the USFWS published a proposed rule to list the Mojave population as endangered (54 FR 42270-42278), but because the emergency rule expired on April 2, 1990, it was necessary to publish the final rule on that day, to prevent a lapse in protection for the tortoise. On April 2, 1990, the USFWS published a determination of threatened status for the Mojave population of Desert Tortoise with no critical habitat determination at that time (55 FR 12178-12191).

The Mojave population has been divided into six distinct population segments or recovery units, based on presumed evolutionary history (those population segments are sometimes deemed evolutionarily significant units. Each recovery unit has been delineated based on variations in genetic, morphological, ecological, physiological, and behavioral traits (USFWS 2008), and the USFWS adopted recovery plan in 1994 (USFWS 1994). The USFWS is currently developing a revised recovery plan which is in draft form (USFWS 2008). Also, in 1994, the USFWS designated a total of 6.4 million acres of critical habitat (59 FR 5820-5866). Within those six management units, the USFWS identified Desert Wildlife Management Areas or areas, where populations of tortoises facing similar threats would be managed with the same strategies (59 FR 5820-5866).

The California and Nevada State Natural Heritage Programs have listed Desert Tortoises as imperiled, and in Utah they are considered critically imperiled (NatureServe 2009). The Desert Tortoise is protected by the State of Nevada (NNHP 2009). The Mojave population is on the watch list of species in Clark County, Nevada, and it is considered sensitive by the BLM and USFS (NNHP 2009).

Species Description

The Desert Tortoise was first described by Cooper in 1863 as *Xerobates agassizii*, named after the iconoclastic Harvard professor Louis Agassiz. Over the years, scientists assigned it to different genera including, *Scaptochelys* (Bramble 1971), *Xerobates* (Lamb et al. 1989), and *Gopherus* (Crumley 1994), the genus under which it is now recognized.

The Desert Tortoise has a domed shell (carapace) and a relatively flat, unhinged plastron (abdominal portion of the shell). The exterior of the carapace is comprised of horny plates made up of keratin called scutes. Adults will reach a carapace length of 8 to 15 inches and shell height of 4 to 6 inches. Adults typically weigh 8 to 15 pounds. When hatchlings emerge from their eggs, they are approximately 2 inches long (Ernst et al. 1994).

The Desert Tortoise is greenish-gray to dark brown with tan scute centers. Their forelimbs have heavy, conical scales and are flattened for digging and burrowing. Hindlimbs are more elephantine. When limbs pull in, they block the openings of the shell (Ernst et al. 1994).

Status and Distribution

Population densities of the Desert Tortoise are decreasing in many areas, particularly in the western Mojave Desert (Corn 1994). According to a USGS report by Berry and Medica (1995), density estimates in 1990 ranged from approximately 13 to 168 adult tortoises per square mile depending on location. A study in southeastern Nevada found a density of approximately 17 tortoises per square kilometer (44 per square mile), and most populations discussed in that report showed a downward trend (Berry and Medica 1995).

Although population density studies have been conducted for many years in several areas throughout the Desert Tortoise's range, inconsistencies in sampling techniques, study scale, and study goals make long-term population trend determinations impracticable. Those data may however provide a general overview of the species' range-wide status and demonstrate considerable declines at the local level (USFWS 2008). Beginning in 2001 (1999 in the Upper Virgin River Recovery Unit) annual range-wide monitoring was initiated (USFWS 2006d). Results from the first 5 years of this program estimated a population density low of 2 to 8 tortoises per square mile for the NE Mojave Recovery Unit and a high of 44 to 78 tortoises per square mile for the Upper Virgin River Recovery Unit (USFWS 2006d). The Project area is located within the NE Mojave Recovery Unit. Because this monitoring program is designed to measure long-term population trends, the first 5 years of the program are essentially to establish baseline densities and variability between years and between recovery units (USFWS 2006d).

Life History

Tortoises of the Mojave population are found primarily in Mojave desert scrub. They are generally associated with communities dominated by creosote bush and other sclerophyll shrubs and small cacti (Germano et al. 1994). Some parts of their range may contain abundant Joshua trees (*Yucca brevifolia*). In the Mojave Desert, the terrain is generally gently rolling alluvial fans with sandy or gravelly soils (Ernst et al. 1994).

Adequate burrowing substrate and thermal cover plant species are a crucial habitat component for Desert Tortoises. In the Mojave population, Desert Tortoises will construct their own burrows to avoid extreme hot or cold temperatures. They often excavate burrows under vegetation, up to 33 feet deep. Elevations at which tortoises occur in the Mojave population range from below sea level in Death Valley, California, up to about 5,000 feet at Yucca Mountain, Nevada (Arizona Game and Fish Department 2001).

The annual reproductive cycle of the Mojave Desert Tortoise begins in February or March when they emerge from hibernation. Mating generally takes place in the spring and may last into fall (Ernst et al. 1994). Between 1 and 14 eggs are laid in an excavated nest near a shrub or burrow entrance between May and July (Ernst et al. 1994). Incubation generally lasts for 90 to 120 days. Egg hatch rates vary, but hatchling and juvenile mortalities are assumed to be very high, and it has been estimated that only one hatchling for every 15 to 20 nests will survive to reach sexual maturity (Lawler, no date). Average age of reproductive viability of females is primarily a function of animal size, but is usually between the ages of 12 and 25 years (USFWS 1994). Females produce from one to three clutches of eggs per year (Turner 1986).

Desert Tortoises are herbivores, consuming a wide variety of plant materials including dicot annuals, grasses, herbaceous perennials, trees, shrubs, sub-shrubs/woody vines, and succulents (Arizona Game and Fish Department 2001). A study of their food habits in the Mojave Desert found that they used 43 plant species, including 37 annuals and 6 perennials. The diet showed a very strong preference for native plants (95.3 percent), and some of their preferred food plants were uncommon to rare (Jennings 1997). A study of juvenile tortoises found differences in diet between wet and dry summers. During a very dry summer, tortoises were observed foraging on only three species, but they used 15 species during a wet summer (Spangenberg 1995). Tortoises may forage selectively, sampling several possibilities before consumption (Oftedal 2002; Van Devender et al. 2002). Selective food preferences for individual tortoises within a population make plant diversity an important constituent of tortoise habitat (Tracy 2001). Desert Tortoises also ingest rocks, bones, and soil, possibly to maintain intestinal bacteria, to provide additional minerals, or as gastroliths to aid digestion (Esque and Peters 1994; Stitt and Davis 2003).

Threats to the Species

Desert Tortoises are facing numerous threats to their survival. Livestock grazing, recreational OHV use, military training activities, urban development, disease, and increases in predation are some of the factors that affect tortoise survival by reducing or fragmenting available habitat, causing population declines (Lovich 1999). Additional threats include illegal collection of tortoises as pets, vandalism (shooting, crushing or mutilation), road-kill mortality, and use as human food (USFWS 1994; Stitt and Davis 2003).

The presence of livestock may affect tortoise habitat in several ways. Tortoises, their eggs, and hatchlings can be killed directly by trampling and collapsing burrows. Livestock also trample vegetation (e.g., creosote bush) that is utilized by tortoises to shade burrows, pallets, and for thermoregulation. Impacts from grazing include damage to soils crusts and cryptogamic soils leading to increased erosion, decreased water infiltration due to soil compaction, and an increase in exotic annual vegetation, which compromises plant diversity and density, and increases fire fuel (USFWS 1994). Removal of native vegetation by livestock grazing allows the infiltration and proliferation of exotic plants on disturbed soils. Some of these invading exotic species include filaree (*Erodium cicutarium*), tumbleweed (*Salsola iberica*), split grass (*Schismus barbatus*), Arab grass (*S. arabicus*), cheat grass (*Bromus tectorum*), and red brome (*Bromus rubens*) (USFWS 1994), and are of decreased nutritional quality relative to native species (Oftedal 2002).

Invasion by exotic plants can have a negative impact on tortoises due to the changes that are effected in the native plant community. Red brome, for example, a European import, competes with native perennial grasses, shrubs, and annuals. Recurrent fires due to the presence of exotic ephemerals, such as red brome, can reduce the abundance and diversity of native forbs on which the tortoises depend (NPS 2009). Increased fires also aggravate habitat fragmentation, which is a major contributor to tortoise population declines (USFWS 1994).

Effects to tortoises and tortoise habitat by OHV use include mortality by crushing on the surface or in burrows, collapsing of burrows, destruction of soil crusts and compaction of soils, soil erosion, proliferation of weeds, increase in wild fires, and damage or destruction of plants used for food, water, and thermoregulation (USFWS 1994). A study of food preferences found that the preferred plant species were often found in washes and on hills. These areas also are heavily used by recreational OHVs (Jennings 1997). Since tortoises are very particular in their food plant selection, reduction of available food sources due to damage from recreational OHVs can force tortoises to change their diets. This may result in additional energy expenditures searching for acceptable food sources. When tortoises are forced to switch foods, they accrue a long-term digestive deficit due to the lag time in adjustment of their gut microflora to the new food source. Their effective feeding season is thus shortened (Tracy 2001).

Urban development has affected tortoises and tortoise habitat through habitat fragmentation and destruction. The construction of roads leads to habitat destruction, habitat fragmentation, road kills, and increased human access into formerly remote areas. The proliferation of landfills and illegal dumping subsidizes increased population densities of predators, including Common Ravens (*Corvus corax*), Coyotes (*Canis latrans*), and feral domestic dogs (*Canis familiaris*). These effects are greatest nearer to human settlements (USFWS 1994). Gila Monsters (*Heloderma suspectum*), snakes, skunks, and foxes are also tortoise egg predators (Ernst et al. 1994).

While predators are not normally a concern for tortoise populations in an undisturbed ecosystem, the perturbation of an ecosystem can cause predators to become a management issue. Increasing populations of generalist native predators have resulted in an increased rate of mortality of hatchling and juvenile tortoises. The USFWS's Breeding Bird Survey Program showed a 15-fold increase in raven populations in the Mojave Desert for the 20-year period from 1968 to 1988 (BLM et al. 1989). This surge in the raven population was attributed to increases in perching and

nesting structures. The food supplies listed were road-kills, landfills, trash, garbage dumps, and agricultural developments. The perching structures listed were fence posts, power poles and towers, signs, buildings, bridges, and freeway access ramps. Elevated perches were historically scarce in the Mojave Desert, and such man-made substitutes provide perching sites for predatory birds. Farrell (1989) documented ravens utilizing power line towers for perches while consuming juvenile tortoises (USFWS 1994). Human predation in the form of highway mortality and the illegal removal of adult tortoises for pets are also factors in the decreasing numbers of Desert Tortoises (Lovich 1999; 59 FR 5820-5866). Tortoises will urinate in response to harassments and this jeopardizes their survival through the summer due to water loss (Averill-Murray et al. 2002).

The manipulation of populations and/or individual tortoises during earlier conservation efforts was mostly unsuccessful. This may have been due to a lack of information regarding tortoise ecology, or poor planning. The translocation of in-situ tortoises and reintroduction of captive tortoises to the wild by the public are ongoing management problems. The historic lack of success of reintroductions can be attributed to several factors. Relocated tortoises often attempt to return to their home ranges (Blythe et al. 2004) and they face increased vulnerability to predators and potential antagonistic responses from resident tortoises. Perhaps the largest problem facing potential relocation efforts is the potential for the spread of diseases, especially upper respiratory tract disease, and genetic pollution.

Recently, upper respiratory tract disease has been found to be a significant contributor to tortoise mortality, and this disease is widespread in the Mojave population. Upper respiratory tract disease is caused by a bacterium (*Mycoplasma agassizii*), and it may be aggravated by simultaneous infections from other bacteria. Upper respiratory tract disease has been reported in a variety of tortoise species from around the world. It is likely that it has been spread through the wild populations by the release of infected, captive tortoises (Jacobson 1993). One of the main reasons for the emergency listing of Mojave Desert Tortoises in 1999 was the observed die-offs of populations due to upper respiratory tract disease.

Groundwater withdrawal may cause the development of large fissures (Koehn Dry Lake, Saltdale, California) which act as pit-fall traps that can capture tortoises. Tortoises can also be trapped in utility trenches. Railroad tracks fragment tortoise habitat and their movements may be constrained by train rails (Edwards et al. 2004; 59 FR 5820-5866).

Species in the Project Area

A small Desert Tortoise population is known to exist approximately 25 miles to the northwest of the Project area near Beatty, NV. Desert Tortoise surveys conducted in 2006 (Knight and Leavitt 2006) and in 2007 (Converse Consultants 2008) for proposed mining operations, indicate population densities of 0-10 tortoise per square mile. The DOE, Nevada Test Site is located northeast of the Project, and has been extensively surveyed for Desert Tortoise over many years (Rautenstrauch and O'Farrell 1994). These surveys have indicated low to very low densities of Desert Tortoise.

To the south and east of the Project site, in the Pahrump Valley and an area known as Johnny, surveys were conducted over years that also indicated low densities of Desert Tortoise (Tierra Data 2009).

Desert Tortoise surveys were conducted within the footprint of the proposed Project from late March through May, 2009. Four Class 4 burrows were observed on the 7,670 acres surveyed during a time when tortoises would have been most active (Figure 3-12). Class 4 burrows are burrows with deteriorated condition that may have been used by Desert Tortoise. No dead or live tortoises were observed nor were any shells, scutes or bone segments of dead tortoise detected in washes or ponding areas during high water events. Generally, even if no other tortoise sign is detected during survey activities, tortoise remains can be found in washes (Tierra Data 2009).

Devils Hole Pupfish

Regulatory Status

The Devils Hole Pupfish (*Cyprinodon diabolis*) was listed by the USFWS as an endangered species on March 11, 1967 (32 FR 4001). The species was listed as critically endangered by the State of Nevada on January 1, 1969 (USFWS 1980). The species is currently listed as a protected species by the State of Nevada (NNHP 2009).

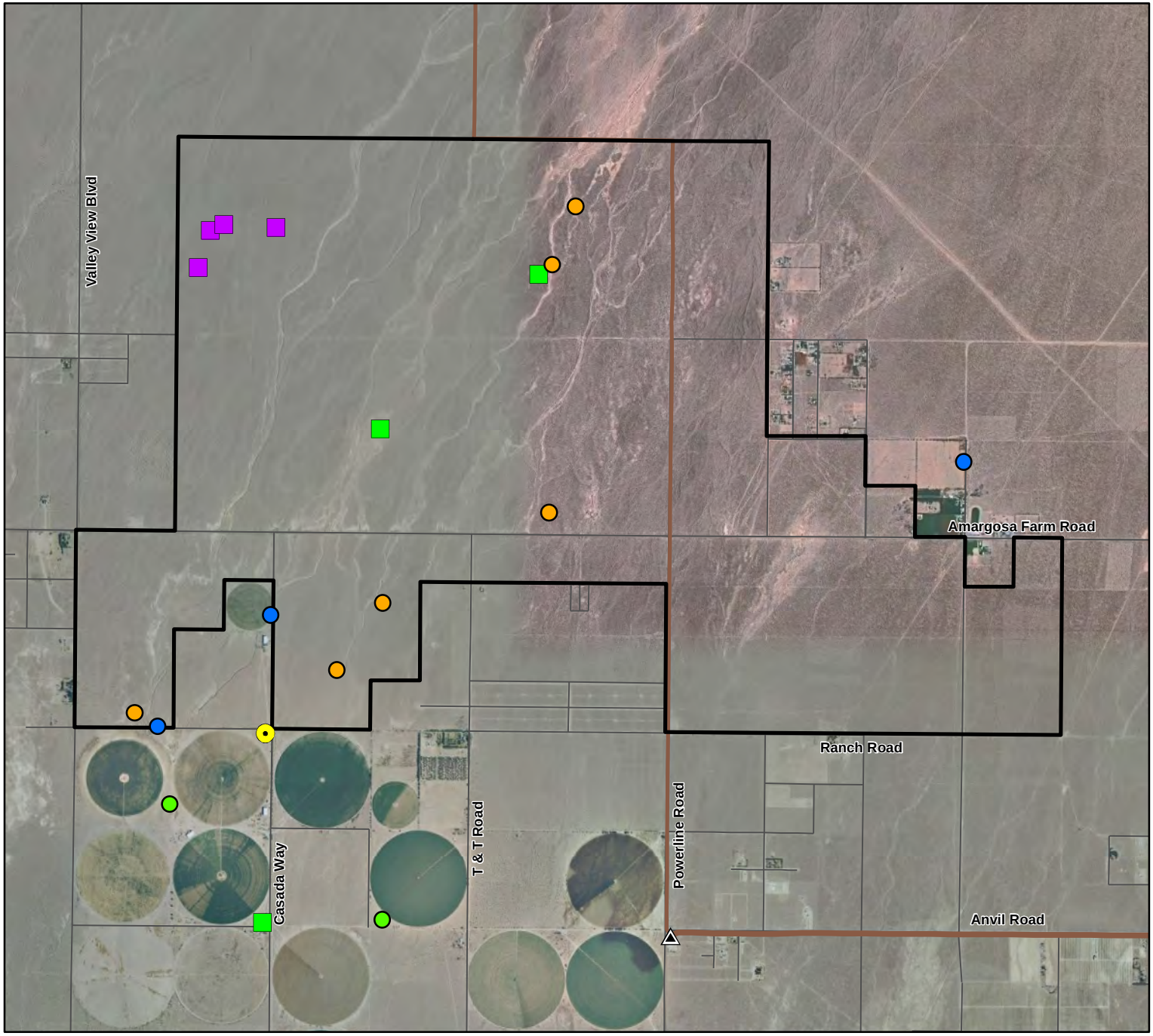
Maintaining the water level of Devils Hole is critical to the survival of the species. In 1976, the U.S. Supreme Court upheld the rights of the NPS to maintain the water levels at Devils Hole at no more than 2.7 feet below the copper marker (a copper washer in the wall of Devils Hole) over the water right holders in the vicinity of Devils Hole (Cappaert vs. U.S., 426 U.S. 128 [1976]; USFWS 1980; USFWS 1990).

Species Description

The Devils Hole Pupfish is among the smallest of the pupfish species reaching a maximum length of 0.98 inches. The body shape is similar to that of other pupfish as it possesses a large head and eyes and a long anal fin. However, this species lacks pelvic fins and vertical bars that are typical in other *Cyprinodon* species. The male Devils Hole Pupfish is typically a pale blue color with breeding males becoming a solid dark blue with a black terminal band on the caudal fin, violet gill covers, and a brownish to silver colored back. The females lack ocellus on their dorsal fin and are colored yellowish-brown along the back (Baugh and Deacon 1983; USFWS 1990, 2009b, 2009e).

Status and Distribution

This species is endemic to a single limestone cave called Devils Hole, which is located at the east-central boundary of the Ash Meadows NWR. The species has been isolated from other pupfish for an estimated 10,000 – 20,000 years (Soltz and Naiman 1978), and has always been small in numbers fluctuating from a maximum of 553 fish in the summer to a minimum of 127 fish in the winter (USFWS 1990). The population reached a low of 38 individuals in 2006 for reasons that are not clear (Hillyard and Van Breukelen 2009), but it appears the decline is not correlated with declining water levels. However, studies are on-going to determine what may be impacting the species (Wilson et al. 2009).



Amargosa Farm Road
Solar Energy Project
(NVN-84359)

Sensitive Wildlife Species
Figure 3-12

LEGEND

Project Area

Species Detected

- Desert Tortoise burrow (unoccupied)
- Burrowing Owl
- Burrowing Owl burrow (unoccupied)
- Prairie Falcon
- LeConte's Thrasher

General Reference Features

- Proposed Project Well
- Substation
- Existing Transmission Line (<230kV)
- Local Road

Source: Species Data - TierraData, 2009; Wells - Nevada State Engineer, 2008; Transmission Line, Substation - Platts, 2009; Local Roads - TerraSpectra Geomatics, 2009; Imagery - ESRI, 2009

September 2010

0 0.5 1 Miles

Small refugium populations have been established in the Amargosa Pupfish Station in Ash Meadows NWR and in facilities constructed by the Bureau of Reclamation located near the base of Hoover Dam along the Colorado River (USFWS 1990). Despite these efforts, none of the refugia were able to sustain a viable population of Devils Hole pupfish and no longer remain active (Mapula et al. 2009).

Life History

The species inhabits the limestone cave known as Devils Hole. Essential habitat for this species encompasses 21,760 acres of the area where groundwater removal most influences the water level in Devils Hole. This extends northwest of Devils Hole to within approximately 8 miles of the Project area. This species is highly dependent upon a limestone shelf where feeding and spawning are focused. This shelf can become unusable to the pupfish should the water level drop too low (Soltz and Naiman 1978). The Devils Hole Pupfish is an opportunistic feeder. During the fall and summer months, the pupfish primarily feeds on diatoms, but also feeds on algae (*Spirogyra*) and invertebrates such as amphipods, ostracods, and protozoa. Less frequent food items include beetles (*Stenelmis* sp.), a turbellarians (*Dugesia* sp.), and snails (*Tryonia* sp.) (Baugh and Deacon 1983; USFWS 1990).

Spawning occurs year-round due to the relatively constant water temperature of 32°C maintained in Devils Hole (Baugh and Deacon 1983). Spawning peaks in the spring during the maximum photoperiod (USFWS 1990), and eggs are fertilized when deposited onto a limestone substrate ledge where they incubate (Baugh and Deacon 1983; USFWS 1990).

Threats to the Species

The primary threat to the Devils Hole Pupfish is decreased water levels in Devils Hole due to pumping of surface and groundwaters for agriculture and other activities in the Amargosa Valley (USFWS 1980). By the late 1960s, ranching in the area altered most springs with heavy machinery, cleared extensive areas of riparian and marsh vegetation, decreased spring discharge by pumping surface and groundwaters, diverting water into earthen and concrete-lined ditches, and impounding waters. The population of the Devils Hole Pupfish declined to fewer than 150 individuals following these activities (USFWS 1980).

Much of the spawning and foraging activities of the pupfish occurs within 6.5 by 13 foot ledge. If water levels drop below that ledge, the Devils Hole Pupfish could suffer extreme population declines.

Species in the Project Area

The Devils Hole Pupfish does not occur within the Project area. The entire population is known only from Devils Hole which is located approximately 12.5 miles southeast from the edge of the Project area. Devils Hole and the Project area are located within the Nevada portion of the Amargosa Desert Hydrographic Basin (#230), which is a part of the Death Valley Hydrographic Region (#14).

Ash Meadows Amargosa Pupfish

Regulatory Status

The Ash Meadows Amargosa Pupfish (*Cyprinodon nevadensis mionectes*) was emergency listed as endangered on May 10, 1982 (47 FR 19995-19999). This listing was in effect until January 5, 1983 at which time a second emergency listing and a proposal of endangered status with critical habitat were published concurrently (48 FR 608-625). A determination of endangered status and critical habitat was published on September 2, 1983 (48 FR 40178-40186). Critical habitat was designated at Fairbanks, Rogers, and Longstreet Springs and three unnamed springs in the northwest corner of Section 23, T17S, R50E; Bradford, Jackrabbit, Big, and Point of Rocks Springs; Crystal Pool; and their outflows areas. All critical habitat for this subspecies is located within the Ash Meadows NWR (48 FR 40178-40186). The species is listed as a protected species by the State of Nevada (NNHP 2009).

Species Description

The Ash Meadows Amargosa Pupfish is a short, deep, slab-sided fish with a long head and strongly arched nape. This subspecies has low fin-ray and scale counts relative to other *Cyprinodon* species. The breeding males are iridescent silver-blue with a yellowish-olive color along the back anterior to the dorsal fin (Soltz and Naiman 1978).

Status and Distribution

The Ash Meadows Amargosa Pupfish tends to occupy relatively large habitats that are 14.5 to 79 feet in diameter and are relatively warm with constant temperatures of 24 to 30°C (Soltz and Naiman 1978). The subspecies is known to have been extirpated from Bole, Deep, and Forest Springs (48 FR 40178-40186). In 1990, this subspecies was known to occupy 10 spring areas and was established in clay ponds within Ash Meadows NWR. Population estimates from June 1982 reported 568 individuals from Jackrabbit Spring and 1,189 individuals from Big Spring. Estimates from July 1983 reported 1,189 individuals from Jackrabbit Spring and 1,822 from Big Spring (USFWS 1990).

Surveys were conducted between fall 2007 and summer 2008. These surveys resulted in a minimum population of 5,635 individuals captured in the winter of 2008. The highest number of individuals was detected in the summer of 2008 resulting in 8,346 individuals within the Ash Meadows NWR. The largest populations were consistently located in the Crystal and Fairbanks Springs systems in addition to the outflow from Peterson Reservoir. Additional large populations were located in the Kings, Jackrabbit, Big, and Longstreet Springs (USGS 2008).

Life History

Like other pupfish, the Ash Meadows Amargosa Pupfish is omnivorous, a subspecies thought to be similar to that of the Amargosa Pupfish (*C. n. amargosae*) which also feeds primarily on a mixture of algae and detritus throughout the year. Small invertebrates are consumed opportunistically (Naiman 1979).

Spawning typically occurs from February to September, but can occur year-round when conditions are suitable. Spawning peaks in the spring with females depositing one or two eggs at a time in a substrate of silt, sand, detritus, and/or algae (Soltz and Naiman 1978).

Threats to the Species

The subspecies is endemic to a very small area that is dependent upon the integrity of the Ash Meadows ecosystem including undisturbed flows from the Ash Meadows basin aquifer. Alteration of surface and groundwater flows could greatly impact the pupfish's population survival or growth (48 FR 40178-40186).

Introduction of non-native predatory organisms such as Largemouth Bass (*Micropterus salmoides*), Red Swamp Crayfish (*Procumbarus clarkii*), and Bullfrog (*Rana catesbeiana*) are an additional threat because these exotics are known predators of the Ash Meadows Amargosa Pupfish. Other introduced species such as the Sailfin Mollie (*Poecilia latipinna*), Convict Cichlid (*Archocentrus nigrofasciatus*), and Mosquitofish (*Gambusia affinis*) are known to outcompete and replace the pupfish (48 FR 40178-40186; USGS 2008). Intensive efforts to remove Sailfin Mollies and Convict Cichlids were undertaken in 2008, and based on the most recent surveys, have failed to capture either of these species indicating removal efforts may have been successful (USGS 2008; McKelvey and Taylor 2009).

Species in the Project Area

The Ash Meadows Amargosa Pupfish does not occur within the Project area. Its known range is located within the Amargosa Desert Hydrographic Basin (#230). The Project area is also located within the Nevada portion of this Basin, which is a part of the Death Valley Hydrographic Region (#14). Fairbanks Spring is the closest known population of Ash Meadows Amargosa pupfish to the Project area. It is located approximately 8 miles southeast from the edge of the Project area.

Warm Springs Pupfish

Regulatory Status

The Warm Springs Pupfish (*Cyprinodon nevadensis pectoralis*) was listed as endangered without critical habitat on October 13, 1970 (35 FR 16047-16048). The species is listed as a protected species by the State of Nevada (NNHP 2009). Essential habitat includes all known populations and is located entirely within the Ash Meadows NWR (USFWS 2009b). Essential habitat includes the area in which groundwater pumping is most likely to have an adverse affect to the discharge of Warm Springs (USFWS 1990).

Species Description

The Warm Springs Pupfish is the smallest of the subspecies of pupfish, with a shorter, deeper body and more numerous pectoral fin rays and displays the strongest tendency towards reduction

and loss of pelvic fins. Breeding males appear similar to the Ash Meadows Amargosa Pupfish with readily seen yellow on the nape (Soltz and Naiman 1978).

Status and Distribution

Warm Springs Pupfish habitat is relatively small, the water is less than 6.5 feet in diameter and 4 feet deep and is relatively warm with constant temperatures of 30 to 33°C (Soltz and Naiman 1978). This pupfish is isolated from other subspecies; found only in the Warm Springs Complex of Ash Meadows NWR. These springs have been isolated from other water bodies for several hundred years. This pupfish historically occupied seven springs within the complex, but one such spring (Mexican Spring) dried up in 1973 and is no longer inhabited (Soltz and Naiman 1978). Currently, the Warm Springs Pupfish occupies North Scruggs, South Scruggs, Marsh, North Indian, South Indian and School Springs (Sada and Mozejko 1984).

Surveys were conducted between fall 2007 and summer 2008. These surveys revealed a minimum population of 322 individuals captured in the spring of 2008. The highest number of individuals was detected in the fall of 2007 revealing 765 individuals within the Ash Meadows NWR. The School Springs underwent restoration during the survey period and was not surveyed completely, which may account for the low numbers found during the two seasons, as this spring complex showed the largest numbers prior to initiation of restoration work. Also, during restoration, exotic species such as Red Swamp Crayfish and Mosquitofish (*Gambusia affinis*) were eradicated, after which pupfish numbers increased at Warm Springs (USGS 2008).

Life History

Like other pupfish, the Warm Springs Pupfish is omnivorous, and is thought to be similar to that of the Amargosa Pupfish (*C. n. amargosae*) which feeds primarily on a mixture of algae and detritus throughout the year. Small invertebrates are consumed opportunistically (Naiman 1979).

Spawning typically occurs from February to September, but can occur year-round when conditions are suitable. Spawning peaks in the spring with females depositing one or two eggs at a time in a substrate of silt, sand, detritus, and/or algae (Soltz and Naiman 1978).

Threats to the Species

This pupfish is endemic to a very small area that is dependent upon the integrity of the Ash Meadows ecosystem including undisturbed flows from the Ash Meadows basin aquifer into the Warm Spring Complex. Alteration of surface and groundwater flows could greatly impact the Warm Springs Pupfish population survival or growth (USFWS 1990).

Introduction of nonnative predatory organisms to pupfish habitat such as Mosquitofish, Red Swamp Crayfish, and Bullfrog are an additional threat. These species, in particular, are known to prey upon and/or out-compete the Warm Springs pupfish (USFWS 1990). Intensive efforts to remove Mosquitofish and Red Swamp Crayfish from the School Springs system were undertaken in January 2008. Surveys following eradication of these species indicate an increase in Warm Springs Pupfish populations in addition to confirming complete eradication of Red Swamp

Crayfish and Mosquitofish (USGS 2008). A major goal of Ash Meadows NWR is the continued eradication of Red Swamp Crayfish and Mosquitofish from the Warm Springs Complex in 2009-2010 including from the North and South Indian Springs. If these goals are achieved, only one spring system within the Warm Springs Complex (the South Scruggs Spring system) will contain these non-native invasive species (Weissenfluh et al. 2009).

Species in the Project Area

The Warm Springs Pupfish does not occur within the Project area. Its known range is located within the Amargosa Desert Hydrographic Basin (#230). The Project area is also located within the Nevada portion of this Basin, which is a part of the Death Valley Hydrographic Region (#14). The entire population is only known from the Warm Springs Complex located approximately 11 miles southeast from the edge of the Project area.

Ash Meadows Speckled Dace

Regulatory Status

The Ash Meadows Speckled Dace (*Rhinichthys osculus nevadensis*) was emergency listed as endangered on May 10, 1982 (47 FR 19995-19999). This emergency listing was in effect until January 5, 1983 at which time a second emergency listing and proposal of endangered status with critical habitat were published concurrently (48 FR 608-625). A determination of endangered status with designated critical habitat was published on September 2, 1983 (48 FR 40178-40186), which included Bradford Springs, Jackrabbit Spring, Big Spring, and their outflows, all of which are located within the Ash Meadows NWR (48 FR 40178-40186). The species is currently listed as a protected species by the State of Nevada (NNHP 2009).

Species Description

The Ash Meadows Speckled Dace is a small fish with a maximum length of 3.9 inches and varies widely in their coloration. Typically the dorsum is olive-gray that blends ventrally to a golden color (USFWS 1990). The subspecies has black speckles and splotches covering the body with one or two distinct lateral stripes (Soltz and Naiman 1978; USFWS 1990). The degree of speckling and completeness of the lateral stripes varies between the isolated populations. It has a slightly overhung snout and small fins (Soltz and Naiman 1978).

Status and Distribution

The Ash Meadows Speckled Dace is thought to have historically occupied the same springs and outflows as Ash Meadows Amargosa Pupfish, which tends to occupy relatively large habitats that are 14.5 to 79 feet in diameter and are relatively warm with constant temperatures of 24 to 30°C (Soltz and Naiman 1978; USFWS 1990). In 1990, this fish was known to occupy four springs within Ash Meadows NWR, including Bradford, Big, Tubbs, and Jackrabbit Springs. Population surveys were conducted in June 1982 and July 1983 that resulted in an estimated total population of 500 individuals within Ash Meadows NWR (USFWS 1990).

Surveys were conducted between fall 2007 and summer 2008. These surveys revealed a minimum population of 1,009 individuals captured in the summer of 2008. The highest number of individuals was detected in the winter of 2008 revealing 1,552 individuals within the Ash Meadows NWR. Ash Meadows Speckled Dace were located in five spring complexes including, Bradford 1 Spring, Bradford 2 Spring, Forest Spring, Jackrabbit Spring, and Point of Rocks Spring. Point of Rocks and Forest Springs each resulted in fewer than 10 individuals during each survey period. The two systems with the highest population sizes were Bradford 1 Spring and Jackrabbit Spring. Surveys in Big and Tubbs Springs, which historically maintained populations of Ash Meadows Speckled Dace, failed to locate any individuals (USGS 2008).

Life History

Like other speckled dace, the Ash Meadows Speckled Dace is omnivorous, feeding on bottom surfaces for insect larvae, crustaceans, diatoms, snails, and algae as would be expected from its downward-shaped mouth (Soltz and Naiman 1978). Occasionally mid-water or surface food or insects will be consumed (USFWS 1990).

Spawning primarily occurs during the spring but a second spawning can occur in the summer. Spawning occurs over stream riffles where eggs are fertilized as they drift into the substrate (Soltz and Naiman 1978; USFWS 1990).

Threats to the Species

The subspecies is endemic to a very small area that is dependent upon the integrity of the Ash Meadows ecosystem including undisturbed flows from the Ash Meadows basin aquifer. Alteration of surface and groundwater flows could greatly impact the Ash Meadows Speckled Dace population survival or growth (USFWS 1990).

Introduction of nonnative invasive organisms to the habitat such as Largemouth Bass, Mosquitofish, Red Swamp Crayfish, and Bullfrogs is an additional threat. These species, in particular, are known to prey upon and/or outcompete the Ash Meadows Speckled Dace (USFWS 1990; USGS 2008). Intensive efforts to remove Largemouth Bass, Mosquitofish and Red Swamp Crayfish from the southern springs have been ongoing since the 1990s and more intensive during 2007 and 2008 (USGS 2008). Current restoration efforts at Fairbanks and Soda Springs are expected to provide reintroduction opportunities for expanding the current range of the Ash Meadows Speckled Dace into the northern springs of the Ash Meadows NWR from where the speckled dace was historically known (Andress et al. 2009; Bio-West 2009).

Species in the Project Area

The Ash Meadows Speckled Dace does not occur within the Project area. Its known range is located within the Amargosa Desert Hydrographic Basin (#230). The Project area is also located within the Nevada portion of this Basin, which is a part of the Death Valley Hydrographic Region (#14). Bradford Springs is the closest known population of Ash Meadows Amargosa Pupfish to the Project area. It is located approximately 13 miles southeast from the edge of the Project area.

Ash Meadows Naucorid

Regulatory Status

The Ash Meadows naucorid (*Ambrysus amargosus*) was listed as threatened with designated critical habitat on May 20, 1985 (50 FR 20777-20794). Critical habitat includes Point of Rocks Springs and their immediate outflows (50 FR 20787).

Species Description

The Ash Meadows naucorid is a member of the family *Naucoridae* which are commonly called creeping water bugs. The species has an average adult length of 0.24 inches (Parker et al. 2000). The species is a dull brown color with scattered dark yellow markings on the head, thorax, and legs. It is a flightless insect with hind legs modified for swimming and raptorial forelegs for capturing prey (Dominguez 2006).

Status and Distribution

Originally, the Ash Meadows naucorid was only known from an area at Point of Rocks Springs where flowing water passes over rock and pebble substrates (USFWS 1990). Water diverted from Point of Rocks Springs to aid recovery efforts for the Devils Hole Pupfish resulted in a reduction of suitable habitat for the Ash Meadows naucorid. In 1997, Ash Meadows naucorids were introduced into the Kings Pool outflow and later into the channel 16-33 feet below Kings Pool. Additional individuals were added in 1998 to supplement the fledgling population. By 2002, the population of naucorids in Kings Pool was extinct. In February 2009, water which had previously been diverted to the Devils Hole Pupfish refuge was returned to its original flow in the main stream channel at Point of Rocks. This nearly doubled the discharge and expanded the suitable habitat for naucorids. Reintroductions are being proposed to reestablish naucorids throughout their historic range (Parker et al. 2009).

Life History

Naucorids feed by piercing the exoskeleton of invertebrates and sucking out the body fluids. Feeding trials showed that *Hyalella* (amphipods), *Elmidae* larvae, and baetid mayfly nymphs were selected for while elmid beetle adults, snails and flatworms were not consumed (Parker et al. 2000).

Population levels peak in the spring and summer in response to reproduction activities. Fecundity is low with females only producing approximately seven eggs at a time. Selection of oviposition substrate is not clear, however, researchers have noted that eggs have been found on gravel, pebble and cobble substrates as well as from submersed vegetation, but no eggs have been reported from coarse sand or boulder substrates. Ash Meadows naucorids have five nymphal instars. Individuals may overwinter as adults or late instar nymphs (Parker et al. 2000).

Threats to the Species

The Ash Meadows naucorid is endemic to a very small area that is dependent upon the integrity of the Ash Meadows ecosystem including undisturbed flows from the Ash Meadows basin aquifer. Its current range is greatly reduced from its known historic range due to channelization of the springs' outflow for agricultural diversion in addition to other flow-restricting alterations made at Point of Rocks Springs. Alteration of surface and groundwater flows could impact the Ash Meadows naucorid population survival or growth by decreasing spring discharge (50 FR 20782).

Species in the Project Area

The Ash Meadows naucorid does not occur within the Project area. Its known range is located within the Amargosa Desert Hydrographic Basin (#230). The Project area is also located within the Nevada portion of this Basin, which is a part of the Death Valley Hydrographic Region (#14). The entire population is only known from Point of Rocks Spring located approximately 15 miles southeast from the edge of the Project area.

3.6.5.3 Other Sensitive Species

Several wildlife species of concern were acknowledged by BLM and NDOW as warranting special consideration in this EIS. They are briefly discussed below.

Reptiles

There are two reptile species of concern. The Desert Iguana is on the NNHP Plant and Animal Watch List, which means it is vulnerable to decline by habitat loss. The Project area consists of potentially suitable habitat for the Desert Iguana such as creosote bush on sandy soils. The second reptile that has been identified as a conservation priority species is the Nevada Shovel-nosed Snake. The Project area consists of suitable habitat for this species such as dry desert washes and sparse vegetation.

Amphibians

Two sensitive species of amphibians naturally occur in Nye County. The Amargosa Toad (*Bufo nelsoni*) is largely restricted to the Amargosa River around the towns of Springdale and Beatty, Nevada (Stebbins 1985). Although it may be found in a few other subsidiary creeks, none of them flow through the Project area. The southern end of the Amargosa Toad's range is in the Oasis Valley near Beatty, approximately 25 miles north of the Project area. Additionally, due to the lack of any permanent water within the Project area this species is not expected nor was it found within the Project area (Tierra Data 2009).

The Columbia Spotted Frog (*Rana luteiventris*) is also known from Nye County. However, the southern end of the range of the Columbia Spotted Frog extends to Cloverdale Creek located over 100 miles north of the Project area (Toiyabe Spotted Frog Technical Team 2004).

Birds

Bald and Golden Eagles are protected under the Bald and Golden Eagle Protection Act. No suitable nesting or roosting habitat was located within the Project area. Eagles have been known to occur at the Ash Meadows NWR; however, these occurrences are occasional and irregular (Las Vegas Audubon Society 1997). When Bald Eagles are sighted in the NWR, they are only known to use the NWR as a stop-over during seasonal migrations (USFWS 2010). There are no other known areas of occurrence or suitable nesting/roosting habitat located within 10 miles of the Project area.

Swainson's Hawk is considered a sensitive species by the BLM Nevada office and is a protected species under Nevada state law. Five Swainson's Hawks were observed at the southwestern corner of the Project area, perched in and adjacent to the alfalfa field located immediately south of the Project area. These hawks were apparently feeding on large insects, such as grasshoppers, available in the field. This species is strongly migratory, and was not seen again on the Project area during the spring surveys.

Prairie Falcon is considered a sensitive species by the BLM Nevada office and is a protected species under Nevada state law. Prairie Falcons were observed three times during the 2009 surveys, always perched on telephone poles adjacent to agricultural fields (see Figure 3-12). It is likely that these agricultural fields regularly attract local Prairie Falcons, due to the increased number of prey available there. Desert habitats support relatively lower numbers of prey and would be utilized by raptors for hunting much less frequently than agricultural fields.

LeConte’s Thrasher is considered a sensitive species by the BLM Nevada office and is a protected species under Nevada state law. LeConte’s Thrashers were observed on three occasions during the surveys (see Figure 3-12). These observations included adults in addition to recently fledged young. LeConte’s Thrasher naturally occurs at low densities, and since the entire site is potential habitat, it is possible that a small number of pairs are present throughout the site.

Phainopepla (*Phainopepla nitens*) is considered a sensitive species by the BLM Nevada office and is a protected species under Nevada state law. No suitable nesting habitat was observed within the Project area. During the spring 2009 survey, a single Phainopepla was observed perched on a tamarisk tree in a residential area along the eastern edge of the Project area.

Burrowing Owl is considered a sensitive species by the BLM Nevada office and is a protected species under Nevada state law. Two burrows previously occupied by owls were located during the 2009 surveys within the Project area (see Figure 3-12). Both of these burrow complexes had not been occupied in some time, as there were spider webs and debris in the entrances, very old whitewash, and bleached rodent bones and old pellets. No fresh pellets or feathers or prey remains were found, which suggests occupancy by wintering owls. It would be expected that the majority of owls using this area would be wintering owls, and a minority would remain to breed. Given the low productivity of the desert at this site, in terms of the very sparse vegetation and low insect and rodent populations, the only areas that are suitable for supporting breeding owls are those adjacent to the irrigated alfalfa fields.

A local resident identified an occupied Burrowing Owl burrow 1 mile south of the Project area along Casada Road in a residential lot adjacent to an alfalfa field (see Figure 3-12). One owl was observed during the visit, though the resident said that a pair of owls had fledged several young earlier in the year. In general, a low density of wintering owls could potentially occur throughout the Project area where there are suitable burrows. Breeding Burrowing Owls are most likely to be located adjacent to the alfalfa fields, where the prey base is significantly more abundant than the surrounding desert.

Focused surveys failed to observe or detect Bendire's Thrasher (*Toxostoma bendirei*) or Loggerhead Shrike (*Lanius ludovicianus*) in the Project area.

Bats

Six bat species were detected within the Project area. All six species are special status species. These are listed in Table 3-17. The majority of these bat species are found throughout Nevada, the exception being Yuma Myotis which is known from the southern and western half of Nevada. Except for the Brazilian Free-tailed Bat, these species are year-round residents that hibernate in the winter, rousing periodically to actively forage or drink. The Brazilian Free-tailed Bat is a summer resident that migrates to South America during the winter. These species utilize many different types of roosts, including mines, caves, buildings, rocks, hollow trees, bridges, vegetation, and exfoliating bark, although no roosting habitat was found in the Project area. All six species are invertevores, consuming moths, arthropods, flies, beetles, and aquatic insects (Bradley et al. 2006). Based on the positive results of the anabat survey, there is suitable foraging habitat for the bats in the Project and surrounding area.

3.7 HISTORIC AND CULTURAL RESOURCES

This section of the EIS addresses cultural resources, including the results of a cultural resource study that was completed in support of the proposed Project (Thompson et al. 2009).

3.7.1 Regulatory Framework

Section 106 of the NHPA, 16 USC § 470 requires federal agencies to take into account the effects of their undertakings on historic properties. For the purposes of Section 106, historic properties are defined as including prehistoric and historic sites, buildings, structures, districts, landscapes, and objects included in or eligible for inclusion in the NRHP, as well as artifacts, records, and remains related to such properties (National Register Bulletin 36). Historic properties can also include those cultural resources that are associated with the cultural practices or beliefs of a living community (National Register Bulletin 38).

3.7.2 Affected Environment

A cultural resource study consisting of a detailed records review and intensive pedestrian survey was conducted in support of the Proposed Action (Thompson et al. 2009). The study was

conducted to identify those cultural resources located within the Project's APE, and make recommendations on their eligibility for listing on the NRHP. These efforts were undertaken to support the preparation of the EIS and meet the BLM's Section 106 responsibilities, as well as to comply with other federal laws and EOs, such as EO Number 13007 (Indian Sacred Sites).

The APE originally encompassed 7,798.24 acres and included the proposed Project's power block, laydown area, office, maintenance building, switchyard, and detention basin. However, the Project size was formally reduced to 5,880 acres by the Proponent after the archaeological inventory was completed. Thirteen new prehistoric and/or historic cultural resource sites were documented within the current Project area. Of the 13 sites, only 1 prehistoric site has been determined eligible for listing on the NRHP under Criterion D. This criterion pertains to this site's potential to yield information important to local and regional prehistory. This site has the potential to be adversely affected by construction of this Project. A Memorandum of Agreement between the BLM and Nevada SHPO will be completed prior to the ROD. The Memorandum of Agreement ensures mitigation would occur prior to any Project implementation involving ground disturbance.

Through coordination with four of the Tribes that have ancestral ties to the Project area, there are no known sacred sites or cultural areas of concern within the Project area. Mitigation of NRHP-eligible site 26Ny13440 through use of the Memorandum of Agreement and the Historic Property Treatment Plant is considered appropriate by the Tribes to ensure that all of the National Register values of this site are retrieved prior to any possible project implementation.

3.8 PALEONTOLOGICAL RESOURCES

Paleontological resources are any fossilized remains, traces, or imprints of organisms that are preserved in the Earth's crust and are of paleontological interest and provide information about the history of life on Earth. Fossil remains may include bones, teeth, shells, leaves, and wood. They are found in geological deposits within which they were originally buried. Paleontological resources include not only the actual fossils, but also the collecting localities and the geological deposits that contain the fossils.

This section presents an overview of the paleontological resources, the location of any known paleontological localities, and the possibility of discovery of fossil resources within the Project area. This section also discusses the regulatory framework for paleontological resources, describes the methods used in the study, and presents a summary of the inventory results. The purpose of this inventory is to identify localities of known significant paleontological resources and to infer where potential significant paleontological resources may be present and potentially affected by construction-related activities.

3.8.1 Regulatory Framework

Federal, state, and local governments have enacted legislation providing for varying degrees of protection for fossil resources. The Society of Vertebrate Paleontology (SVP) regards paleontological resources as "nonrenewable scientific and educational resources that, along with their accompanying contextual data, constitute part of our natural heritage," (SVP 1995).

This paleontological resource inventory was conducted in accordance with the regulations that are applicable to the paleontological resources within the Project area.

3.8.1.1 Federal

The Federal Antiquities Act of 1906 and the PRPA, 16 USC § 470aaa serve as the primary, federal legislation that requires addressing potential impacts to paleontological resources on federally administered lands. The Federal Antiquities Act of 1906 (16 USC §§ 431-433) provides for protection of both historic and prehistoric items on federal land. NEPA (42 USC §§ 4321-4347) directs federal agencies, including the BLM, to fully assess and manage impacts (adverse or not) to the environment. FLPMA (PL 94-579; 43 USC §§ 1701-1782) provides for management and mitigation of adverse impacts on federal land by "protecting the quality of scientific, scenic, historical, ecological, environmental, air and atmospheric, water resource, and archaeological values." Paleontological resources are viewed as having scientific value and requiring protection under the auspices of FLPMA. The PRPA was enacted as part of the 2009 Omnibus Public Land Management Act and codified specific protection for vertebrate fossil resources and scientifically significant plant and invertebrate fossil resources on federal land. The PRPA created criteria for the issuance of paleontological collection permits and directed the secretary of the interior to ensure that paleontological resources from federal land are properly placed into the collections of approved repository institutions.

3.8.1.2 State

NRS § 381.197 govern the protection of historic and prehistoric sites on state and federal land in Nevada. Per this statute:

> "A person shall not investigate, explore, or excavate an historic or prehistoric site on federal or states lands or remove any object there from unless he is the holder of a valid and current permit issued pursuant to the provisions of NRS §381.195."

NRS §§ 381.195 through 381.219 state that:

> "An applicant is required to secure, from the Museum Director of the Nevada State Museum, or an agent designated by the Museum Director, a permit for the investigation, exploration, or excavation of any state or federal lands within the boundaries of the State of Nevada."

These statutes also define the requirements for the permitting and disposition of any collected paleontological material found on Nevada land.

3.8.1.3 Local

No local protection of paleontological resources is known to pertain to the Project area.

3.8.2 Data Collection Methods

The Project area refers to the area that encompasses the proposed right-of-way and associated components. The ROI for paleontological resources includes a 1-mile buffer around the Project area. Information for the inventory was obtained from a review of the scientific literature and from record searches at paleontological institutions. A review was conducted of relevant published and unpublished geological and paleontological reports, and museum paleontological locality records. Paleontological locality record searches were requested from the Nevada State Museum in Carson City, Nevada, and the San Bernardino County Museum in Redlands, California. Following standard procedure, any known paleontological localities within 1 mile of the Project area were noted. A search for paleontological localities within the ROI was also conducted using records from the University of California, Santa Barbara, Paleobiology Database. The literature and record searches found no paleontological localities within the ROI.

A paleontological resources survey was conducted on February 2 and 3, 2010 in order to determine the nature of the Quaternary-Tertiary marl deposits mapped by Slate et al. (1999) and whether the mapped marl deposits contain paleontological resources.

3.8.2.1 Paleontological Potential

Information about the geological units and known fossil localities in the region was used to identify the paleontological potential of geological units within the Project area. Paleontological potential levels were assigned to each geological unit using the Potential Fossil Yield Classification (PFYC) system that was adopted by the BLM in 2007 for assessing paleontological potential on federal land (BLM Staff 2008). The PFYC system is a five-tiered system that the BLM uses to classify geological units based on the relative abundance of vertebrate fossils or scientifically significant invertebrate and plant fossils and their potential to be adversely impacted, with a higher class number indicating a higher potential. This classification system is applied to the geological formation, member, or other distinguishable map unit, preferably at the most detailed mappable level. This approach was followed in recognition of the direct relationship that exists between paleontological resources and the geological units within which fossils are entombed. By knowing the geology of a particular area and the fossil productivity of particular geological units that occur in the area, it is possible to predict where fossils will likely be found. Each class is defined below:

Class 1. Very Low Potential – geological units not likely to contain recognizable fossil remains. These units include igneous, metamorphic, and Precambrian rocks.

Class 2. Low Potential – sedimentary geological units not likely to contain vertebrate fossils or scientifically significant non-vertebrate fossils; these units include Aeolian, diagenetically altered, and Holocene sediments.

Class 3. Moderate or Unknown Potential – fossiliferous sedimentary geological units where fossil content varies in significance, abundance, and predictable occurrence; sedimentary units of unknown fossil potential. Class 3 is divided into two parts:

Class 3a. Moderate Potential – units are known to contain vertebrate fossils or scientifically significant non-vertebrate fossils, but these occurrences are widely scattered; common invertebrate or plant fossils may be found in the area.

Class 3b. Unknown Potential – units exhibit geological features and preservational conditions that suggest significant fossils could be present, but little information about the paleontological resources of the unit or area is known. This may indicate the unit or area is poorly studied and field surveys may uncover significant fossils.

Class 4. High Potential – geological units that contain a high occurrence of significant fossils. Vertebrate fossils or scientifically significant invertebrate or plant fossils are known to occur and have been documented, but may vary in occurrence and predictability.

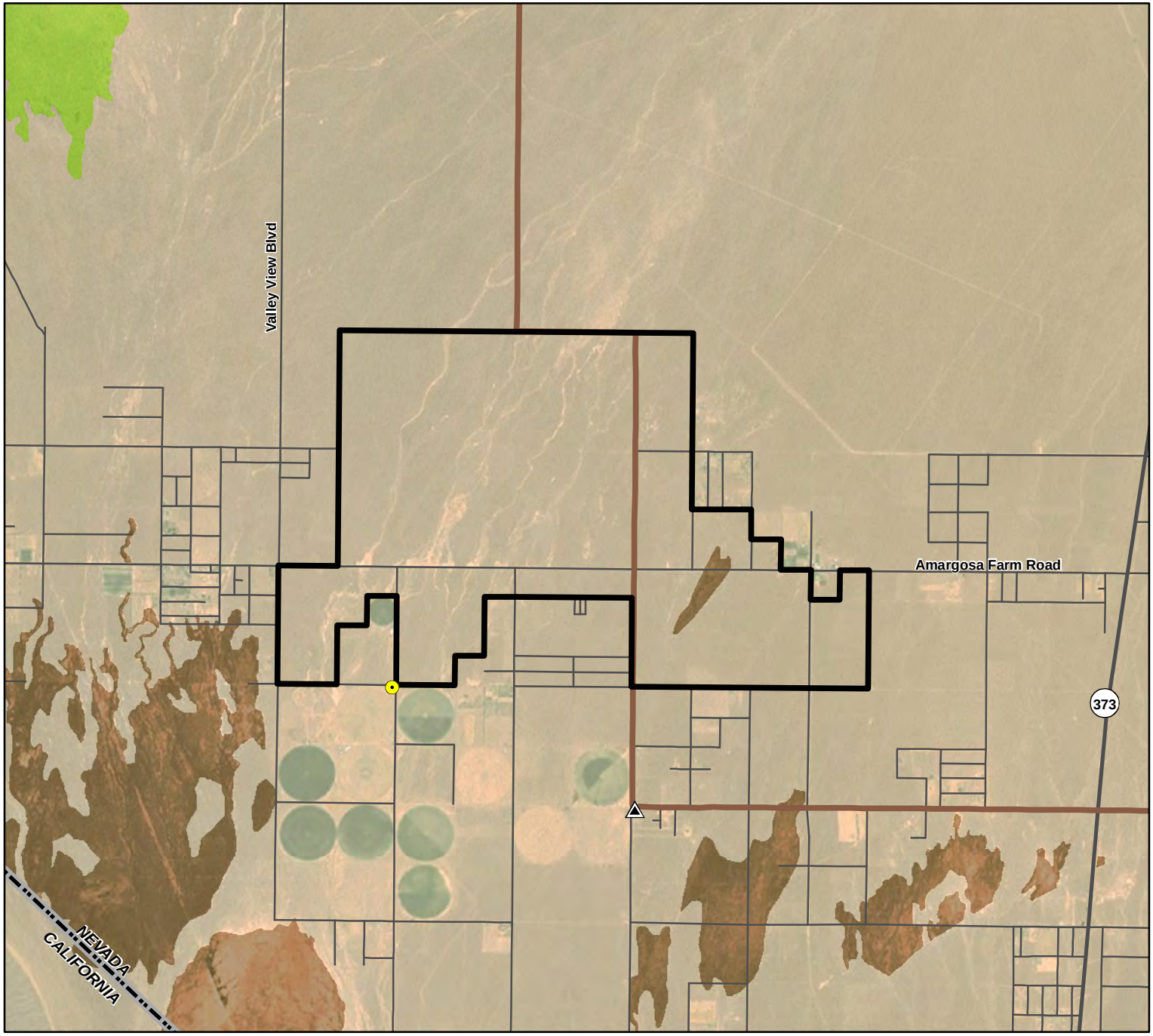
Class 5. Very High Potential – highly fossiliferous geological units that consistently and predictably produce vertebrate fossils or scientifically significant invertebrate or plant fossils.

3.8.2.2 Potential for Paleontological Resources in the Project Area

Three geological units have been mapped within the Project area: Young alluvial deposits (Qay), intermediate alluvial deposits (Qai), and Quaternary-Tertiary marl deposits (QTm) (Slate et al. 1999); as discussed previously in the section on geological hazards and mineral resources (see Figure 3-3). Results of the paleontological resources survey, however, determined that there are only two geological units present in the Project area.

Field evidence indicates that the marl deposits exposed in the Project area are not marl or ancient spring deposits as mapped by Slate et al. (1999), but are caliche deposits (another type of limestone deposit) that are part of a paleosol (an ancient soil). Field observations further indicate that these caliche deposits are part of the intermediate alluvial deposits (Qai). Therefore, the only geological units present in the Project area are the young alluvial deposits and the intermediate alluvial deposits. Each of these units has been assigned a PFYC value by the BLM based upon their physical nature, depositional history, probable fossil content, and age (Figure 3-13).

Young alluvial deposits of Holocene age are the youngest geological unit within the Project area. These alluvial deposits have a low potential for paleontological resources and have been assigned a PFYC of 2 as a result of their young age, which decreases the chances of preserving paleontological resources. Intermediate alluvial deposits range in age from the Pleistocene to the early Holocene. Field observations show that caliche deposits are common in the intermediate alluvial deposits. Exposures of caliche deposits in washes and in prospect pits commonly contain fossil root casts and root traces. The root casts and root traces are not considered to be scientifically significant by the BLM. No other fossils were found in the Project area during the paleontological resources survey. The intermediate alluvial deposits have a low potential for paleontological resources and have been assigned a PFYC of 2, because of the alluvial nature of these deposits and the low potential for scientifically significant fossils in the caliche deposits. The slightly older age of these deposits relative to the young alluvial deposits may result in a higher chance of discovering fossil material, but still warrants a PFYC of 2 based on the deposit's overall alluvial nature (Figure 3-13).



Amargosa Farm Road
Solar Energy Project
(NVN-84359)

Paleontological Resources
Figure 3-13

LEGEND

Project Area

Potential Fossil Yield Classification

1 - Very Low Potential
2 - Low Potential
3 - Moderate or Unknown Potential

General Reference Features

Existing Transmission Line (<230kV)
Existing Substation
Proposed Project Well
Highway
Local Road
State Boundary

Source: Geology - USGS, 1999; PFYC - EPG, 2009;
Transmission Lines, Substations - Platts, 2009;
Wells - Nevada State Engineer, 2008;
Roads - TerraSpectra Geomatics 2009;
Imagery - ESRI, 2009

September 2010

0 0.8 1.6 Miles

3.9 SOCIOECONOMICS

This section characterizes the existing social and economic conditions within the ROI. The ROI for the socioeconomic analysis is Nye and Clark counties in Nevada, with an emphasis on the communities closest to the Project area, such as Amargosa and Beatty, as well as larger communities within 2 hours of the site, such as Pahrump and Las Vegas.

3.9.1 Data Collection Methods

The socioeconomic inventory describes the following current socioeconomic conditions:

- County and community descriptions
- Demographic and economic characteristics
- Housing, including housing occupancy and average value of homes
- Fiscal revenue and expenditures
- Public infrastructure and services
- Affected groups and their attitudes about the proposed Project

Demographic and economic data are provided for communities located closest to the Project area, as well as communities with a population of over 20,000 within a 2-hour commute of the Project site.

The nearest community with a population over 20,000 is Pahrump, followed by the Las Vegas metropolitan area. Corresponding data for the State of Nevada is included to set the Proposed Action in a regional context. Data were obtained from the U.S. Census Bureau, U.S. Bureau of Labor Statistics, U.S. Bureau of Economic Analysis, Environmental Systems Research Institute (ESRI), and the Nevada State Demographer's Office.

3.9.2 Social Characteristics

3.9.2.1 Population

As shown in Table 3-19, 71.8 percent of Nevada's population is located in Clark County (71.9 percent). In 2000, the population of Clark County was 1,375,765. In 2010, the estimated population is 1,976,256, a 44 percent increase from 2000. Of this total, 96 percent live within the Las Vegas metropolitan area.

In comparison, Nye County's population in 2000 was 32,485. In 2010, the estimated population of Nye County was projected at 47,120, an increase of 45 percent. At 18,159 square miles, Nye County is the third largest county in the continental United States. Located over 100 miles north of the Project area, Tonopah, the county seat, had an estimated population in 2008 of 2,628 (Nevada State Demographers Office 2009). The majority of the county's population is concentrated in the unincorporated city of Pahrump with 34,335 people, approximately 73 percent of the county's population base (ESRI 2010).

Other unincorporated towns near the Project area include: Amargosa Valley with 2,706 people and Beatty with 1,390 people (ESRI 2010). The remaining population is located in isolated private residential areas throughout the county.

Nye County's sparse population can be attributed, in part, to the lack of available private land for development. In fact, 97 percent of the county's land area is administered by the federal government. Of the 11.6 million acres of land in Nye County, approximately 11.3 million acres are administered by the following federal agencies:

- BLM (6.5 million acres; 8,400 acres are jointly managed with the USFWS)
- USFWS (13,700 acres)
- USFS (1.9 million acres)
- U.S. DOD (1.8 million acres)
- DOE (863,000 acres)
- NPS (107,000 acres)
- Bureau of Indian Affairs (8,000 acres)

An additional 19,000 acres are under state jurisdiction, and a total of 249,000 acres in Nye County are privately owned (USFWS 2009f).

Table 3-19 through Table 3-22 summarize the population characteristics for the ROI. In summary the ROI has shown strong growth rates at the community, county, and state levels. Over the last several years Clark County, Nye County, and Nevada have been recognized as the fastest growing populations in the nation. Pahrump is also been one of the fastest growing communities in the nation. Although Amargosa Valley, Beatty, and Pahrump have historically been tied to industries that in recent years have shown some declines in activities (federal government, mining, agriculture), these communities are still projected to grow at modest rates.

- Although population bases in the individual ROI communities have historically been small, these communities have shown modest growth rates (Table 3-19).
- Number of households follows similar growth trends as total population (Table 3-20).
- Highest level of educational attainment for those 25+ years old was fairly consistent across all communities in the ROI and approximately 30 to 40 percent of this population has attained post high school education (Table 3-21).
- The common trend across all communities in the ROI is that a larger percentage of the overall populations are older than 19 years of age (Table 3-22).

Table 3-19 Population and Growth Rates for Communities and Counties in the ROI				
	2000 Census	**2010 ESRI Projection**	**2015 ESRI Projection**	**2010-2015 Annual Growth Rates**
Towns				
Amargosa Valley	1,591	2,706	3,108	+2.81%
Beatty	863	1,390	1,571	+2.48%
Pahrump	24,631	34,335	37,591	+1.83%
Counties				
Nye County	32,485	47,120	52,074	+2.02%
Clark County	1,375,765	1,976,256	2,176,936	+1.95%
Nevada	1,998,257	2,748,294	2,999,160	+1.76%
Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2010 and 2015.				

Table 3-20 Households and Growth Rates for Communities and Counties in the ROI				
	2000 Census	**2010 ESRI Projection**	**2015 ESRI Projection**	**2010-2015 Annual Growth Rates**
Towns				
Amargosa Valley	629	1,057	1,219	+2.89%
Beatty	399	643	730	+2.57%
Pahrump	10,153	14,256	15,708	+1.96%
Counties				
Nye County	13,309	19,463	21,652	+2.15%
Clark County	512,253	729,385	801,382	+1.9%
Nevada	751,165	1,025,511	1,116,629	+1.72%
Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2010 and 2015.				

Table 3-21 2009 Population 25+ by Educational Attainment for Communities and Counties in the ROI						
	Amargosa Valley	**Beatty**	**Pahrump**	**Nye County**	**Clark County**	**Nevada**
Total Population 25+ Years	1,641	965	26,242	34,208	1,306,928	1,823,265
Less than 9th Grade	8.4%	2.4%	4.1%	4.1%	7.0%	6.5%
9th–12th No Diploma	16.3%	13.6%	14.0%	13.5%	11.0%	10.5%
High School Graduate	35.3%	53.9%	44.2%	44.5%	32.2%	31.7%
Some College No Degree	19.3%	17.8%	20.5%	20.6%	24.5%	24.9%
Associates Degree	8.2%	4.4%	6.3%	6.2%	6.4%	6.7%
Bachelors Degree	8.2%	4.9%	7.4%	7.5%	12.4%	13.0%
Graduate/Professional Degree	4.3%	3.1%	3.4%	3.5%	6.5%	6.7%
Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2009.						

Table 3-22 Percent Population by Age for Communities and Counties in the ROI				
	2000 Census	**2009 ESRI Projections**	**2014 ESRI Projections**	**2009–2014 Avg. Annual Growth Rates**
Amargosa Valley				
Total Population	1,553	2,529	3,183	+5.1%
Less than 19 years	31.0%	29.0%	27.9%	-0.76%
18+ years	71.7%	73.7%	74.4%	+0.19%
85+ years	0.9%	0.9%	0.9%	0.0%
Beatty				
Total Population	898	1,382	1,706	+4.69%
Less than 19 years	27.9%	25.5%	24.1%	-1.10%
18+ years	74.3%	77.1%	78.1%	+0.26%
85+ years	0.8%	1.6%	1.8%	+2.5%
Pahrump				
Total Population	24,630	35,261	42,216	+3.94%
Less than 19 years	23.9%	21.2%	19.7%	-1.42%
18+ years	77.8%	80.7%	82.0%	-0.17%

Table 3-22 Percent Population by Age for Communities and Counties in the ROI				
	2000 Census	**2009 ESRI Projections**	**2014 ESRI Projections**	**2009–2014 Avg. Annual Growth Rates**
85+ years	0.9%	1.9%	2.3%	+4.21%
Nye County				
Total Population	32,485	47,4129	57,281	+4.15%
Less than 19 years	25.7%	23.0%	21.6%	-1.22%
18+ years	76.3%	79.1%	80.3%	+.30%
85+ years	0.9%	1.7%	2.1%	+4.71%
Clark County				
Total Population	1,375,765	1,974,024	2,295,868	+3.26%
Less than 19 years	28.1%	27.4%	26.8%	-0.44%
18+ years	74.4%	75.2%	75.5%	+0.08%
85+ years	0.8%	1.2%	1.4%	+3.33%
Nevada				
Total Population	1,998,257	2,746,331	3,147,495	+2.92%
Less than 19 years	28.2%	27.2%	26.7%	-0.37%
18+ years	74.4%	75.4%	75.7%	+0.08%
85+ years	0.9%	1.3%	1.4%	1.54%
Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2009 and 2014.				

Although Pahrump's population has grown at an average rate of 7.2 percent per year since the mid-1990s, the rest of the county has remained relatively stable, with some towns experiencing a slight decline in population (EDEN 2007). Nye County's historic dependency on the mining sector and activities at the Nevada Test Site has resulted in unstable population growth rates between 1970 and 2002, indicating the need for economic diversification in the county (EDEN 2007).

3.9.2.2 Housing

Table 3-23 and Table 3-24 summarize the housing characteristics of major population centers in the ROI. Housing data was obtained from the U.S. Census Bureau and ESRI. In 2009, the communities of Amargosa Valley and Beatty had relatively high projected rates of vacant houses, 22.7 percent and 26.0 percent, respectively. Overall, the communities and counties in the ROI are projected to expand housing between 3 to 5 percent per year (Table 3-23). The median and average home values in the communities and counties of the ROI are projected to be relatively flat at around 1 to 3 percent increases over the next few years (Table 3-24).

Table 3-23 Housing Units for Communities and Counties in the ROI				
	2000 Census	**2009 ESRI Projections**	**2014 ESRI Projections**	**2009-2014 Avg. Annual Growth Rates**
Amargosa Valley				
Occupied	614	995	1,252	+5.17%
Vacant	178	866	313	+3.53%
Total	792	1,261	1,565	+4.82%
Beatty				
Occupied	384	584	711	+4.35%
Vacant	153	277	339	+4.48%
Total	567	861	1,050	+4.39%
Pahrump				
Occupied	10,53	14,705	17,674	+4.04%
Vacant	1,502	2,141	2,475	+3.12%
Total	11,665	16,846	20,149	+3.92%
Nye County				
Occupied	13,309	19,694	23,305	+3.67%
Vacant	2,625	3,797	4,4049	+3.22%
Total	15,934	23,491	28,305	+4.10%
Clark County				
Occupied	512,253	736,521	855,744	+3.24%
Vacant	47,546	94,166	108,699	+3.09%
Total	559,799	830,687	964,443	+3.22%
Nevada				
Occupied	751,165	1,033,339	1,183,165	+2.90%
Vacant	76,292,	136,330	153,930	+2.58%
Total	827,457	1,169,669	1,337,095	+2.86%
Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2009 and 2014.				

Table 3-24 Median Home Values for Communities and Counties in the ROI				
	2000 Census	**2009 ESRI Projections**	**2014 ESRI Projections**	**2009-2014 Avg. Annual Growth Rates**
Amargosa Valley				
Median	$75,833	$106,745	$118,401	+2.18%
Average	$102,212	$143,657	$151,953	+1.15%
Beatty				
Median	$75,000	$105,048	$117,230	+2.32%
Average	$94,788	$120,854	$127,566	+1.11%
Pahrump				
Median	$106,588	$147,182	$168,217	+2.86%
Average	$121,590	$168,094	$185,821	+2.11%
Nye County				
Median	$96,272	$134,415	$151,874	+2.60%
Average	$111,527	$152,968	$168,616	+2.05%
Clark County				
Median	$132,186	$152,591	$156,949	+0.57%
Average	$153,519	$179,723	$184,730	+0.56%
Nevada				
Median	$132,514	$157,802	$164,516	+0.85%
Average	$157,238	$193,653	$202,226	+0.89%
Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2009 and 2014.				

Short-term housing is available in the ROI in the form of hotels and motels. In 2009, there were three, one, and five hotels and motels in the communities of Pahrump, Amargosa, and Beatty, respectively. Based on information from the website TravelNevada.com, there are approximately 613 guest rooms among the 9 hotels and motels in these areas. Additional temporary housing is available in communities within 2 hours of the proposed Project site, with many more rooms available in the Las Vegas metropolitan area. Additional housing opportunities are available in the form of recreational vehicle facilities, mobile home sites, and campgrounds.

3.9.2.3 Affected Groups and Attitudes

This section discusses some potential impacts of the proposed Project on particular stakeholder groups. Note that any one person may fit into multiple stakeholder groups. “Stakeholder groups” are people with a shared social position or set of concerns (not necessarily people who interact with one another) who perceive themselves as likely being impacted by the proposed Project. The grouping used emerged from comments made during the scoping process, additional

comments on the Draft EIS, and general social impact assessment practice in relation to public lands. Scoping comments and comments on the Draft EIS provide clues about opinions of each potentially affected stakeholder group. However, they are anecdotal and should be read as such; as there are no available survey data on the groups attitudes toward this Project, or on the attitude of the larger community of which those groups are part.

Immediate Neighbors / Immediate Neighbors with Responsibility for the Health and Safety of Community Residents

Immediate neighbors are residents who dwell in the immediate vicinity of the proposed Project. Survey data show that the owners of the public lands – the United States general population of adults – believe that affected communities should have the most say in public land use (Brunson and Steel 1994). This group includes youth who may be eligible for apprenticeships, jobless adults in search of work, people who are employed, people who run local businesses or practice agriculture, homemakers, and retirees.

Scoping comments indicate that immediate neighbors have varying views towards the proposed Project. The comments also suggest substantial diversity in values and in goals for the community. In general the comments suggest a dominant opinion in favor of renewable energy in general and of solar in particular. There were concerns, though, that their community might disproportionately bear such burdens as: inconvenience, loss of amenities, impacts to visual resources, and a strain on public safety, social, medical, and fire services without receiving compensation through reductions in electricity costs, advantages in jobs, or contributions to community services, facilities, and infrastructure. In terms of jobs, a key concern is whether local people and then regional residents will receive preference in hiring. Finally, there is a generalized local value in favor of not wasting water, which was expressed more strongly with regard to the “wet cooled” alternative.

Volunteer firefighters, the Sheriff’s Office, Search and Rescue, and local medical services are included in this group. The key concern expressed by people in this group is that the quality and efficiency of local public services might be undermined by the additional demands likely to be generated during the construction period for the Project. Another concern is that the required construction force cannot be fulfilled locally, such that there is likely to be a substantial influx of construction workers who may be more rowdy after work and place extra demands on the Sheriff’s office personnel in contrast to Amargosa Valley’s existing, largely senior population.

Outdoor Recreationists

Many Nevada residents are outdoor recreation enthusiasts. OHV use is common, with about 56 percent of Nevada adults riding OHVs at least once a year (Rollins et al. 2007). About 23 percent of Nevada adults go horseback riding at least once a year (Rollins et al. 2007). Local OHV users and horseback riders are accustomed to having easy access to roads and trails on public lands in the Amargosa Valley and vicinity. Local residents who provided scoping comments and comments on the Draft EIS also specifically mentioned camping, photography, hiking, wildlife viewing, and rock hounding as outdoor recreation activities they undertake in the Amargosa Valley. Key concerns of this group have to do with terrain that will be withdrawn

from outdoor recreation use and that access will be reduced between town and public lands that remain in public use.

Environmentalist Groups and Stewards

This group is especially concerned about water use and its impact on wildlife, plants, and the physical structure of the land, with cumulative impacts being of particular concern. Carbon sequestration issues, the possibility of habitat loss, and loss of open space are also concerns. As with other groups discussed in this section the views articulated by the spokespersons for these groups represent the views of their members, not necessarily of a representative sampling of environmental organizations or of a wider public.

Federal, State, and Local Governmental Agencies

Because approximately 97 percent of Nye County is administered by the federal government, most land use activities within the County are subject to federal agency oversight. Federal agency responsibilities for the management and protection of resources within their jurisdiction are myriad within the proposed Project area and the proposed Project's ROI. For example, the development of renewable energy resources, including on lands administered by BLM, is mandated by the EPAct of 2005 and other Federal laws, policies, and programs. FLPMA requires the BLM to ensure the multiple use and sustained yield of the lands it administers, including energy development, conservation, recreation, and other uses.

The protection of water rights for sensitive species within Nye County is one of largest challenges facing development in the area. Within the ROI, the USFWS is tasked with enforcing the provisions of the ESA, including protected species within the Ash Meadows NWR and desert tortoise, throughout their critical habitat area(s), and water use and conservation are key to these efforts. The NPS, in cooperation with the USFWS, is required by the ESA and its own Organic Act to protect and maintain habitat for the endangered Devils Hole pupfish. To ensure protection of critical water levels within Devils Hole and spring flows at Ash Meadows NWR, the USFWS has acquired 57 permitted or certificated water rights totaling 16,908 afy in the Amargosa Desert Hydrographic Area.

Not all restrictions are federal. For instance, the Nevada State Engineer has the authority to approve and control the amount of groundwater pumped within the Amargosa Basin. Due to concerns about decreased water levels at Devils Hole, water use within a 15-mile radius of Devils Hole is subject to Nevada State Engineer Order 1197 (see Section 3.3), which restricts where and how much groundwater may be extracted.

These mandates, restrictions, and policies sometimes conflict, or are perceived to conflict, with local government and private development goals and objectives. For example, Nye County recently (July 28, 2010) updated its Comprehensive Plan to include the following language to address potential changes in the management of public lands:

> *Nye County needs to address public lands within the County and changes in public land management policies. Goals, objectives, and polices are needed to protect the health, welfare, and economic well-being of the County and those residents whose livelihoods and way of life are dependent on public land policies. Nye County citizens must be protected from federal rules and regulations which conflict with local customs, laws, and decisions of the court and which adversely impact the economy and tax base of Nye County.*

A decision to grant a right-of-way for the proposed Project not only would be consistent with Nye County's desire to avoid "adversely impact[ing] the economy and tax base" of the County, but would affirmatively benefit the County's "economic well-being." Indeed, such a decision would serve to at least partly offset any adverse impacts to economic development caused by applicable federal and state legal restrictions and responsibilities. For example, to the extent the proposed Project would result in the retirement of existing water rights under federal and/or state law, the Project also would provide substantial benefits. Moreover, given the obligations of federal and state agencies in the County, particularly with regard to water use and sensitive species, the agencies would be required to evaluate any development requiring more than minimal water use in light of the same restrictions, such that any such development likely would face similar restrictions. Of course, federal agency decisions may not fully comply or synchronize with local goals and objectives. Providing for public review and comment periods and cooperating agency status to appropriate governmental entities enables BLM and other agencies to consider any such differences and, where possible and appropriate, seek to minimize them.

3.9.3 Economic Characteristics

The economy of Nye County has historically been supported by mining, agriculture, railroad operations, and federal defense research and development activities. Mining and agriculture have been the dominant economic activities in Nye County and continue as a source of income; however, the relative importance of agriculture and mining has decreased in recent decades. Both sectors are still important in the local economy but constitute a smaller share of employment and personal income sources. The historic economy has also been characterized by the “bust and boom” cycles of a mining economy, as shown by periods of high population growth, no population growth, and population declines.

Table 3-25 summarizes the labor force characteristics of the State of Nevada and Clark and Nye counties. The table includes state labor force data to provide a regional context for the county labor force data. Unemployment rates steadily declined between 1990 and 2008 for the State of Nevada and Clark and Nye counties, but recently rates have increased due to the economic slowdowns.

Table 3-25 Labor Force Characteristics of the State of Nevada, Clark County, and Nye County – 1990 Through 2008

	Nevada		Clark County		Nye County	
Year	**1990**	**2008**	**1990**	**2008**	**1990**	**2008**
Labor Force	655,896	1,373,462	407,763	987,998	8,945	17,764
Employment	622,516	1,282,012	387,881	922,878	8,616	16,036
Unemployment	33,380	91,450	19,882	65,120	329	1,728
Unemployment Rate	5.1%	6.7%	4.9%	6.6%	3.7%	9.7%

Source: NV Dept of Employment, Training and Rehabilitation – Research and Analysis Bureau 2009

While agriculture and mining activity have decreased in Nye County, these industries are still important basic industries in that they bring money into the county economy through sales to non-local businesses and individuals. The county's agricultural industry produced cash receipts of $23.8 million in 2007 (most recent available data) (USDA National Agricultural Statistics Service 2009). The predominant industry employer for all ROI communities and counties is the service sector. The small rural communities of Amargosa Valley and Beatty also have a strong presence of Agriculture and Mining (Table 3-26). Nearly one-half of all jobs in each ROI community or county are classified as white collar or professional occupations (Table 3-27).

Table 3-26 2009 Employed Population 16+ Years of Age by Industry for Communities and Counties in the ROI

	Amargosa Valley	Beatty	Pahrump	Nye County	Clark County	Nevada
Total Employment	905	569	10,846	15,417	823,682	1,153,371
Agriculture/Mining	12.8%	7.4%	2.3%	7.2%	0.2%	1.0%
Construction	7.8%	7.6%	15.6%	13.5%	10.1%	9.7%
Manufacturing	1.4%	3.5%	3.0%	3.3%	2.9%	3.8%
Wholesale Trade	0.4%	1.1%	1.1%	1.2%	2.1%	2.4%
Retail Trade	7.8%	7.6%	10.1%	9.1%	9.9%	10.1%
Transportation/Utilities	7.7%	4.7%	4.8%	4.4%	4.0%	4.1%
Information	0.7%	0.4%	2.6%	2.1%	1.9%	1.8%
Finance/Insurance/Real Estate	2.8%	2.1%	7.6%	6.2%	7.4%	7.1%
Services	52.4%	58.7%	44.8%	44.7%	57.7%	55.4%
Public Administration	6.1%	7.0%	8.1%	8.3%	3.8%	4.6%

Source: ESRI 2010

Table 3-27 2009 Employed Population 16+ Years of Age by Occupation for Communities and Counties in the ROI

	Amargosa Valley	Beatty	Pahrump	Nye County	Clark County	Nevada
Total Employment	905	569	10,846	15,417	823,682	1,153,371
White Collar	**46.4%**	**45.2%**	**49.5%**	**47.2%**	**52.8%**	**53.9%**
Management/ Business/ Financial	8.3%	4.4%	8.5%	8.0%	11.9%	12.2%
Professional	20.0%	19.5%	15.4%	16.4%	15.1%	16.1%
Sales	8.2%	8.8%	13.3%	11.1%	13.0%	12.7%
Administrative Support	9.9%	12.5%	12.2%	11.7%	12.8%	12.9%
Services	**25.0%**	**35.3%**	**22.9%**	**22.8%**	**28.0%**	**26.0%**
Blue Collar	**28.6%**	**19.5%**	**27.6%**	**30.1%**	**19.2%**	**20.1%**
Farming/Forestry/ Fishing	0.9%	0.2%	0.6%	0.5%	0.1%	0.2%
Construction/ Extraction	14.8%	8.3%	12.7%	13.0%	8.0%	7.9%
Installation/ Maintenance/ Repair	4.8%	5.6%	5.3%	6.3%	3.3%	3.6%
Production	3.2%	1.2%	3.0%	3.4%	2.6%	3.1%
Transportation/ Material Moving	5.0%	4.2%	6.1%	6.9%	5.2%	5.3%

Source: ESRI 2010

Local government workers are employed by Nye County. State government workers in Nye County are employed at the Nevada Division of Parks and the NDOT, among others. Federal agencies operating in or near Nye County include the DOE, U.S. DOD, USFWS, and the BLM.

Many sub-sectors of the service economy in Nye County are proportionately small when compared with the service sub-sectors in the State of Nevada and Clark County; particularly accommodation and food services, real estate, professional and technical, and health care services. In contrast, employment numbers in the retail trade sectors and the arts, entertainment, and recreation services sub-sector indicate that tourism and recreation play a key role in the Nye County economy.

According to an economic development strategy analysis prepared by the University of Nevada, Reno, rural counties often lose population in age groups 20 to 34 years because the young people with the best education, health, and the most marketable skills and abilities leave the rural areas

to realize their potential in areas with greater economic opportunities (UNR 2005). In addition to the out-migration of young persons, increased rates of retiree in-migration in recent years has raised concerns that the growing elderly population would require greater levels of public services in a narrowing economy characterized by a shrinking revenue base.

Employers in the Amargosa Valley are dispersed throughout the valley from US 95 south to the Nevada/California state line. Table 3-28 lists the major employers in the area and the number of employees. It is unknown how many of these employees reside in the Amargosa Valley and how many commute from Pahrump or Las Vegas. Most of the other employers in the area employ fewer than 10 people.

Table 3-28 Major Employers in Amargosa Valley

Company	Number of Employees
Ponderosa Dairy	120
Horizon Academy	50
IMV	30
US Ecology	30
Amargosa Valley School	29
Longstreet Inn and Casino	17
Cind-R-Lite	17

Source: Amargosa Valley School 2009; Bagley 2009; Bowlin 2009; EDEN 2009; NBMG 2008; Powell 2009

3.9.3.1 Income

In 2007, total personal income for Nye County was $1.35 billion and for Clark County was $71.6 billion. The total personal income for Nevada was $101.8 billion (U.S. Department of Commerce 2009). In 2000 the median household income for communities and counties in the ROI ranged from a low of $34,913 in Pahrump to a high of $44,650 in Clark County. However by 2010, Amargosa Valley had the lowest projected median household income of $41,852 and Clark continued with the highest at $57,807 (Table 3-29). Between 2010 and 2015 it is projected that median household income will grow between 2.85% and 3.28% in the ROI (ESRI 2010). In 2000, average household income is very similar between counties and communities in the ROI with the exception of Clark County at $57,569 (Table 3-30). Between 2010 and 2015, average household income is projected to grow at an average annual rate between 2.4 percent and 3.1 percent in most ROI counties and communities. However, Amargosa Valley is projected to increase average household income annually +6.19 percent between 2010 and 2015 (Table 3-31). This projection is more than likely taking into account the real potential for the areas alternative energy development that provides above average wages. As expected, per capita incomes are projected to increase at similar growth rates as average household incomes in counties and communities in the ROI (Table 3-29).

One potential source of income in the ROI is personal current transfer receipts. Personal current transfer receipts include government payments to individuals for retirement and disability insurance benefits, medical payments (mainly Medicare and Medicaid), income maintenance benefits, and veteran's benefits. In Nye County, personal current transfer receipts accounted for 22.7 percent of total personal income compared to 10.6 percent in Clark County and 10.7 percent in the State of Nevada or Clark County, which is an indicator of a larger proportion of retirement age population in Nye County (U.S. Department of Commerce 2009).

Table 3-29 Median Household Income for Communities and Counties in the ROI (2010 Dollars)

	2000 Census	2010 ESRI Projection	2015 ESRI Projection	2010-2015 Annual Growth Rates
Towns				
Amargosa Valley	$35,672	$41,852	$48,053	+2.96%
Beatty	$41,204	$50,582	$58,869	+3.28%
Pahrump	$34,913	$44,699	$51,633	+3.10%
Counties				
Nye County	$36,034	$45,624	$52,279	+2.92%
Clark County	$44,650	$57,807	$66,515	+2.85%
Nevada	$44,614	$57,546	$65,787	+2.86%

Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2010 and 2015.

Table 3-30 Average Household Income for Communities and Counties in the ROI (2010 Dollars)

	2000 Census	2010 ESRI Projection	2015 ESRI Projection	2010-2015 Annual Growth Rates
Towns				
Amargosa Valley	$47,099	$56,134	$73,515	+6.19%
Beatty	$42,910	$55,834	$62,543	+2.40%
Pahrump	$42,432	$53,623	$60,679	+2.63%
Counties				
Nye County	$43,196	$54,155	$62,062	+2.92%
Clark County	$57,569	$71,748	$82,836	+3.09%
Nevada	$57,469	$71,330	$82,236	+3.06%

Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2010 and 2015.

Table 3-31 Per Capita Income for Communities and Counties in the ROI (2010 Dollars)				
	2000 Census	**2010 ESRI Projection**	**2015 ESRI Projection**	**2010-2015 Annual Growth Rates**
Towns				
Amargosa Valley	$19,219	$21,936	$28,843	+6.30%
Beatty	$16,844	$25,828	$29,062	+2.50%
Pahrump	$17,747	$22,317	$25,410	2.77%
Counties				
Nye County	$17,962	$22,513	$25,953	3.06%
Clark County	$21,785	$26,761	$30,784	3.01%
Nevada	$21,898	$26,969	$30,985	2.98%
Source: U.S. Bureau of the Census, 2000 Census of Population and Housing. ESRI forecasts for 2010 and 2015.				

3.9.4 Public Services and Utilities

3.9.4.1 Law Enforcement and Emergency Services

Law enforcement in the Amargosa Valley is provided by the Nye County Sheriff's Department and the Nevada Highway Patrol. The Sheriff's Department has one substation in Amargosa Valley and three full time deputies. The area is also supported by a substation in Beatty which has one Lieutenant and three deputies. The Nevada Highway Patrol has three officers that patrol the highways in the area with a substation located in Pahrump (Amargosa Valley Area Plan Committee 2009).

Emergency services within Amargosa Valley are provided mainly by the Amargosa Valley Volunteer Fire Department managed by the Town of Amargosa Valley. There are two fire halls located in the area. The Nye County Emergency Services Department provides assistance to the local volunteers, including training. The BLM is responsible for fire protection for wildland fires on public land. Mercy Air Flight for Life helicopters provides emergency airlift services between Amargosa Valley and hospitals in Las Vegas. The Amargosa Valley Medical Clinic provides routine family medical care and is staffed by a visiting physician and physician's assistant (Amargosa Valley Area Plan Committee 2009).

3.9.4.2 Electricity and Natural Gas

The Project area is served by VEA. VEA is a nonprofit cooperative electric utility based in Pahrump, Nevada. VEA's service territory cover more than 6,800 square miles, mainly along the California-Nevada border. At present VEA provides electricity to approximately 16,000 customers (VEA 2009).

There are no natural gas services in the Amargosa Valley. However, there are several propane suppliers in Pahrump including: AmeriGas Propane, Proflame Gas of Pahrump, Shoshone Propane, and Suburban Propane.

3.9.4.3 Public Water Supply and Wastewater

There are very few public water supply systems in the Amargosa Valley Planning Area. The majority of water users rely on individual wells. There are only three public water supply systems near the Project area. These include wells supplying the Amargosa Elementary School, Amargosa Town Complex, and the Amargosa Water Company. As of 2008, over 500 domestic wells were listed in the NDWR database as being drilled in the Amargosa Valley Hydrographic Basin.

There are no wastewater treatment plants in the Amargosa Valley Planning Area. Domestic wastewater is disposed through septic tanks and leach fields.

3.9.4.4 Solid Waste

The NDEP, Bureau of Waste Management oversees the permitting of solid waste landfills and other waste management facilities within the state of Nevada. The nearest Class I landfill is the Pahrump Valley Landfill located north of Pahrump, east of Highway 160.

3.9.4.5 Schools

The proposed Project is located within the Nye County School District of Nye County. There are four schools that serve the Amargosa Valley; three public and one private. Horizon Academy is a special learning center for which students from other schools must apply independently. A summary of school information and enrollment for the schools is provided in Table 3-32.

Table 3-32 Summary of Schools in the Nye County School District

District	Schools	Grades Provided	Number of Students for 2008-2009 School Year	Location of School
Nye	Beatty School	K-8	103	Beatty
	Amargosa School	K-8	194	Amargosa Valley
	Beatty High School	9-12	139	Beatty
Private	Horizon Academy	7-12	129	Amargosa Valley

Source: Nye County School District 2009; Nevada Department of Education 2009

3.9.5 Fiscal Resources

Clark County: There are 90 funds that Clark County uses for its operations. Table 3-33 shows the total revenues, by category, associated with the overall Clark County budget and the General Fund at the end of the 2007–2008 fiscal year. A blank cell with no financial information indicates that the revenue source did not contribute to the county fund. The significant revenue sources for these funds are intergovernmental resources (46 percent), property taxes (25 percent), and licenses and permits (10 percent).

Table 3-33 Clark County Revenues: 2007-2008

Revenue	Overall	General Fund
Property Taxes	791,005,569	331,089,911
Other Taxes	66,010,096	14,341,093
Licenses and Permits	316,607,676	219,886,318
Intergovernmental Resources	1,422,232,908	330,571,827
Charges for Services	166,789,048	60,653,236
Fines and Forfeits	26,708,031	24,644,256
Special Assessments	37,236,673	-
Miscellaneous	291,483,804	136,016,587
Total Revenues	**$3,118,073,805**	**$1,036,753,592**

Source: Clark County 2009

Table 3-34 shows the expenditures for the 2007–2008 fiscal year (July 1 through June 30). Public safety and public works comprise the largest expenditure items within Clark County.

Table 3-34 Clark County Expenditures for Fiscal Year 2007-2008

Expense	
General Government	224,829,526
Judicial	187,097,471
Public Safety	1,048,734,667
Public Works	576,499,730
Health, Welfare, and Sanitation	326,872,672
Culture and Recreation	82,728,864
Community Support	13,127,241

Table 3-34 Clark County Expenditures for Fiscal Year 2007-2008	
Expense	
Intergovernmental Expenditures	114,566,225
Debt Service:	
Principal	110,892,600
Interest	122,112,389
Interest Cost\Fiscal Charges	78,169,949
Total Expenditures	**2,885,631,334**
Difference Between Revenue (Table 3-33) and Expenditures (Table 3-34)	232,442,471
Source: Clark County 2009.	

Nye County: The Nye County Finance Department describes county governmental revenues and expenditures within 5 major funds and approximately 67 non-major funds. The General Fund is the primary operating fund for Nye County (Nye County 2009). Table 3-35 and Table 3-36 summarize the Nye County revenues and expenditures, respectively. Blank cells indicate that the relevant revenue source did not contribute to the county fund, or that the fund did not pay for the relevant expense in Fiscal Year 2007-2008.

Table 3-35 Nye County Revenues: 2007-2008

Revenue	General Fund	Education Endowment Fund	Special Project Fund	Endowment Capital Projects Fund	Repository Oversight Fund	Overall Total incl Non-major Funds
Taxes	14,944,493	-	-	-	-	**20,545,682**
Licenses	135,133	-	-	-	-	**1,956,669**
Intergovernmental	14,066,342	-	11,250,000	-	3,343,065	**38,713,071**
Charges for Services	2,646,579	-	-	-	-	**4,690,031**
Fines and Forfeits	403,155	-	-	-	-	**678,477**
Other	1,445,393	612,796	1,068,554	719,162	-	**7,759,128**
Total Revenues*	**33,691,095**	**612,796**	**12,318,554**	**719,162**	**3,343,065**	**74,343,058**

***** Information taken directly from Nye County 2009; inconsistencies have been noted.

Table 3-36 Nye County Expenditures for Fiscal Year 2007-2008						
Expenditure	**General Fund**	**Education Endowment Fund**	**Special Project Fund**	**Endowment Capital Projects Fund**	**Repository Oversight Fund**	**Overall Total incl Nonmajor Funds**
General Government	12,342,734	-	540,064	-	3,343,065	**20,853,997**
Judicial	6,152,895	-	-	-	-	**6,464,099**
Public Safety	15,614,299	-	20,317	-	-	**19,225,464**
Public Works	114,738	-	355,310	-	-	**9,146,041**
Health and Sanitation	250,306	-	-	-	-	**1,133,407**
Welfare	-	-	-	-	-	**1,616,136**
Culture and Recreation	-	-	35,586	-	-	**413,651**
Community Support	392,940	-	476	-	-	**890,075**
Intergovernmental	298,900	1,119,264	841,088	-	-	**3,526,569**
Capital Projects	-	-	4,208,966	-	-	**5,863,564**
Debt Service:						
Principal	-	-	-	-	-	**2,183,241**
Interest	-	-	-	-	-	**436,848**
Total Expenditures	**35,166,812**	**1,119,264**	**6,001,807**	**-**	**3,343,065**	**71,753,092**
Difference Between Revenue (Table 3-35) and Expenditures (Table 3-36)	(1,475,717)	(506,468)	6,316,747	719,162	0	**2,589,966**
Source: Nye County 2009						

3.10 ENVIRONMENTAL JUSTICE

On February 11, 1997, EO 12898 (Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations) was signed. This EO requires all federal agencies to assess whether their programs, policies, and activities have disproportionately high and adverse human health or environmental effects on minority and low-income populations in the United States.

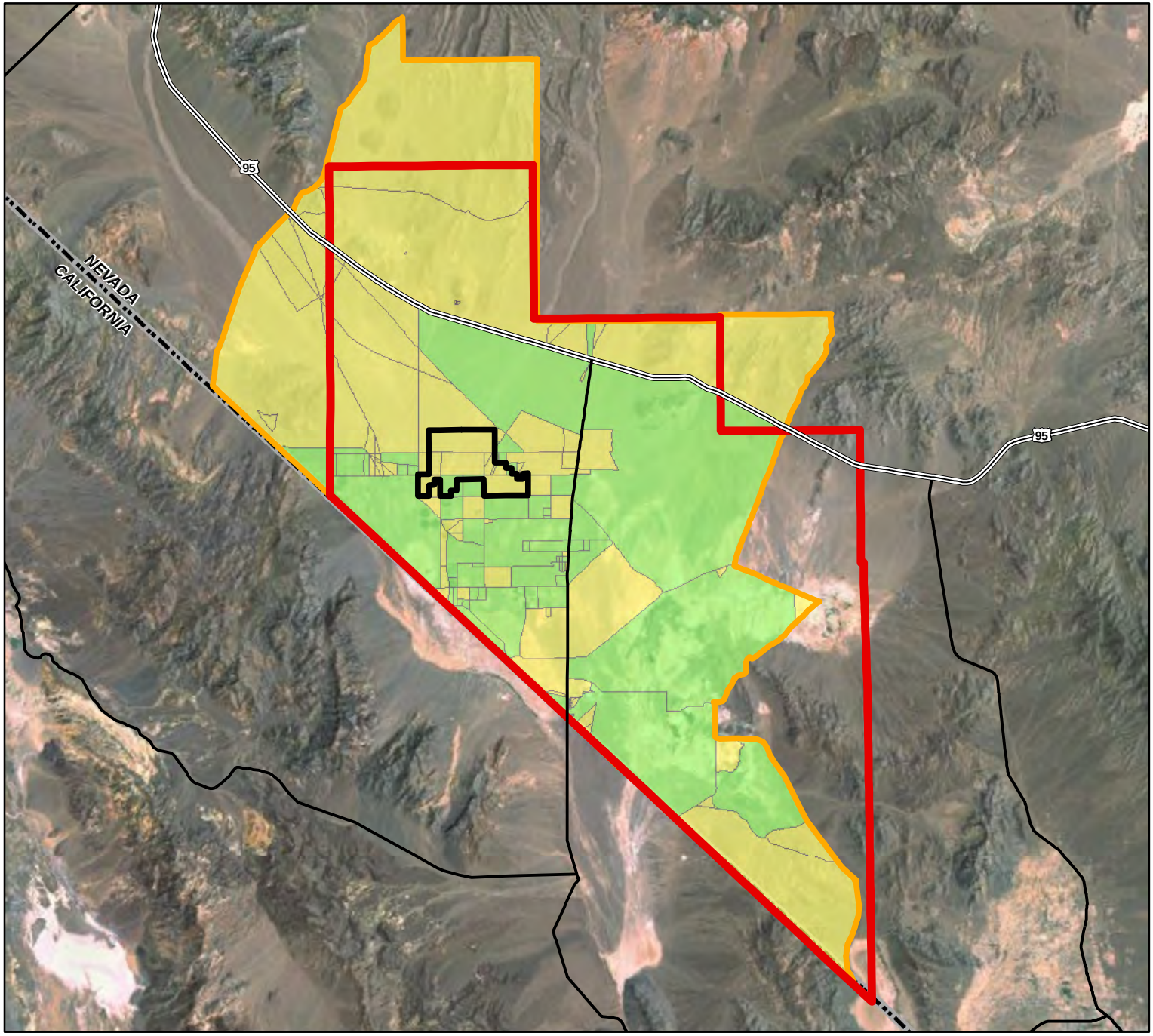
The EPA defines a community with potential Environmental Justice (EJ) populations as one that has a greater percentage of minority or low-income populations than does an identified reference community. Minority populations are those populations having (1) 50 percent minority population in the affected area or (2) a significantly greater minority population than the

reference area (EPA 1998). The EPA has not specified what percentage of the population can be characterized as "significant" in order to define EJ populations. Low-income populations were defined as those individuals that are considered living below poverty levels. The U.S. Census Bureau defines poverty level thresholds for individuals and a family of four as income levels below $8,501 and $17,029, respectively.

The U.S. Census Bureau has no specific designation for the Town of Amargosa Valley. Therefore, the EJ analysis is undertaken at the U.S. Census Block Group level, which allows an assessment of both poverty and minority populations. Within 5 miles of the Project area, there are two Block Groups which extend much farther than the 5-mile radius of the Project area; one in Nevada and one in California (Figure 3-14). The Block Group in California has no population within 5 miles of the Project area and thus was not used in the analysis. The Nevada Block Group encompasses 528 square miles and had a 2000 population of 1,176.

The reference areas are Nye County and the State of Nevada, which are larger geographic areas with which to compare the Census Block Group. Relevant ethnicity data and poverty level for the Census Block Group was used to determine whether populations residing within the affected area constitute a potential EJ population. This was done by comparing minority and poverty level statistics for the Block Group with those reported for Nye County and the State of Nevada. The data used for comparison was from the 2000 Census.

A potential EJ population is determined to exist in a Census Block Group if the minority population (e.g., a non-white population) is more than 10 percentage points higher than the minority population within one of the reference communities (Nye County or the State of Nevada). Table 3-37 summarizes these racial proportions for the referenced groups. As shown in Table 3-26, the minority population in the Amargosa Valley Block Group is 20.7 percentage points higher than that in Nye County and 1.2 percentage points higher than that in Nevada. The majority of the minority population in the Block Group is classified as Hispanic. The percentage of the population below poverty level in the Block Group is 4.1 and 4.3 percentage points higher than that in Nye County and Nevada, respectively.



Amargosa Farm Road
Solar Energy Project
(NVN-84359)

Environmental Justice
Figure 3-14

LEGEND

- Project Area
- Amargosa Valley Town Boundary
- Census Block Group
- Census Block (Population > 0)
- Census Block (Population = 0)

General Reference Features

- US Highway
- State Highway
- State Boundary

Source: Census Data - Tiger 2009, ESRI, 2005;
AV Town Boundary - TerraSpectra Geomatics, 2009;
Highways, Imagery - ESRI, 2005, 2009

September 2010

0 3 6
Miles

Table 3-37 Racial Proportions Summary			
	Nevada	**Nye County**	**Block Group**
Total Population	1,998,257	32,485	1,181
White	1,303,001	27,511	753
Hispanic	393,970	2,713	360
African American	131,509	373	1
American Indian	21,397	587	58
Asian	88,593	242	8
Pacific Islander	7,769	100	1
Other	2,787	68	NA
Mixed	49,231	891	NA
Percentage Minority	34.8	15.3	36.0
Percentage Below Poverty Level	10.5	10.7	14.8
Source: U.S. Census Bureau 2009a			

3.11 LAND USE, RECREATION, TRANSPORTATION AND ACCESS

This section of the EIS characterizes the existing and future land use, recreation, access, and transportation conditions within the ROI. The ROI area varies by resource area. The ROI for land use includes the Town of Amargosa Valley planning area, located in the south-central part of Nevada in Nye County, and covers approximately 505 square miles of rural, unincorporated desert land. The ROI for the transportation and access information encompasses a broader area, including Nye and Clark counties in Nevada, with an emphasis on the communities closest to the Project area, including Amargosa Valley and Beatty, as well as larger communities within 2 hours of the Project area, such as Las Vegas and Pahrump. For recreation resources, the ROI encompasses a radius of approximately 50 miles around the Project area, based on the visual resources ROI, which accounts for all areas within the viewshed of the Project area.

3.11.1 Regulatory Framework

The BLM may grant a right-of-way for use of the land it administers under the FLPMA, 43 USC §§ 1701-1782, specifically § 1732 and § 1761 et seq. Under FLPMA, the Secretary of the Interior is authorized to grant, issue, or renew rights-of-way over, upon, or through such land for utility corridors, roads, trails, highways, railroads, canals, etc. The FLPMA provides the BLM with authority to issue rights-of-way for the use, occupancy, and development of public land. The regulations establishing procedures for the processing of these rights-of-way are found in 43 CFR Part 2800.

FLPMA requires that BLM manage the lands it administers under the principle of "multiple use and sustained yield." 43 USC §§ 1701, 1702, 1732, FLPMA defines "multiple use" to mean:

> "… management of the public lands and their various resource values so that they are utilized in the combination that will best meet the present and future needs of the American people; making the most judicious use of the land for some or all of these resources…; the use of some land for less than all of the resources a combination of balanced and diverse resource uses that takes into accounrt the long-term needs of future generations for renewable and nonrenewable resources including, but not limited to, recreation, range, timber, minerals, watershed, wildlife and fish, and natural scenic scientific and historical values…" 43 USC § 1702(c).

This mandate does not require that every use be allowed on every acre, but rather that a proper balance of uses be struck in BLM's RMPs and other land use decisions. In exercising this discretion, the BLM has defined the appropriate range of, and balance between, the multiple uses of land it administers in the Las Vegas RMP/Final EIS.

BLM Las Vegas RMP and Final EIS (1998) – This land use plan identifies existing and future management direction in the form of objectives and management for 3.3 million acres of public land in Clark and Nye counties, located in southern Nevada. All public land within the planning area, unless otherwise classified as ACEC or Wilderness Study Areas, is available for rights-of-way under FLPMA. Land use permit applications are addressed on a case-by-case basis, where consistent with other resource management objectives and local land uses.

Nye County Comprehensive Plan (Nye County Board of Commissioners 1994) – This plan was developed to protect the health, welfare, and economic well being of the County by creating management objectives for the effects of population growth and decline, and to serve as a framework for local land use plans. It is Nye County's objective to establish long-term partnerships with the renewable energy sector, and has goals to:

- support and encourage the efficient use of energy
- promote the siting of renewable energy research or pilot technology and demonstration projects in Amargosa Valley
- become proactively involved in the federal and state efforts to route and approve renewable energy transmission corridors for distributing power from the Amargosa Valley to the national grid

Amargosa Valley Area Plan (Amargosa Valley Area Plan Committee 2009) – This plan was developed to manage the community's natural resources and provide public services and facilities while protecting the public health, safety, and welfare.

3.11.2 Data Collection and Methods

Existing land use and recreation data were collected through analysis of aerial photography, field verification, review of existing studies and plans, and coordination with local and county

agencies. Individuals from the BLM were contacted and the BLM Legacy Rehost (LR2000) database was utilized to verify recreation and land use resources on BLM land within the ROI.

Planned land use and recreation information was collected through review of existing plans for the Amargosa Valley and the BLM. Local, county, and federal agencies were contacted to identify potential or approved developments near the proposed Project.

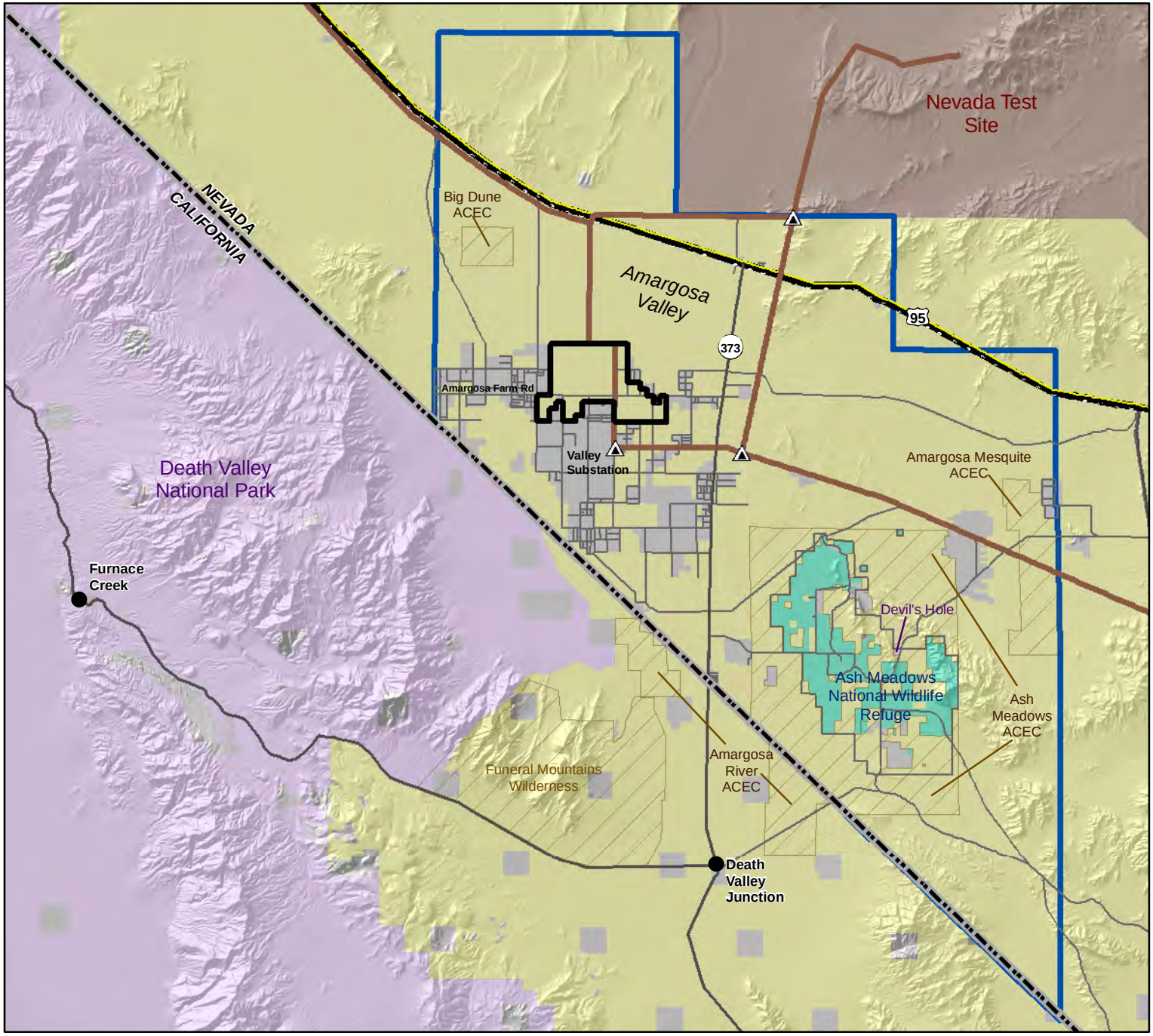
Land jurisdiction does not necessarily imply land ownership; however, in some cases the authority that has jurisdiction may also own the land. Three categories of land ownership were identified and mapped within the land use ROI: federal, local, and private. This information was obtained from available maps, planning documents, and discussions with agencies (Figure 3-15).

3.11.3 Existing Land Use

Existing land use conditions within the ROI are characterized primarily by open desert, utility corridors and facilities, limited industrial (mining and dairy) and commercial development, agriculture, and scattered low-density residences (Figure 3-16).

As described in Section 3.9 – Socioeconomic Resources, approximately 97 percent of Nye County's land area is administered by the federal government.

The BLM is the largest landowner in the ROI. The Southern Nevada District, Pahrump Field Office manages 3.3 million acres of public land in southern Nevada and 700,000 acres in southern Nye County, including the land requested under the Proponent's right-of-way application for the proposed Project. Per the 1998 Las Vegas RMP/EIS, these lands are available for multiple uses, including opportunities for recreation, utility development, mining, wildlife habitat, grazing, and wilderness preservation. The proposed Project conforms to the intent of the 1998 Las Vegas RMP/EIS (BLM 1998).



Amargosa Farm Road Solar Energy Project (NVN-84359)

Jurisdiction
Figure 3-15

LEGEND

- Project Area
- Amargosa Valley Town Boundary

Surface Management

- Bureau of Land Management
- Department of Energy
- National Park Service
- US Fish and Wildlife Service
- Private

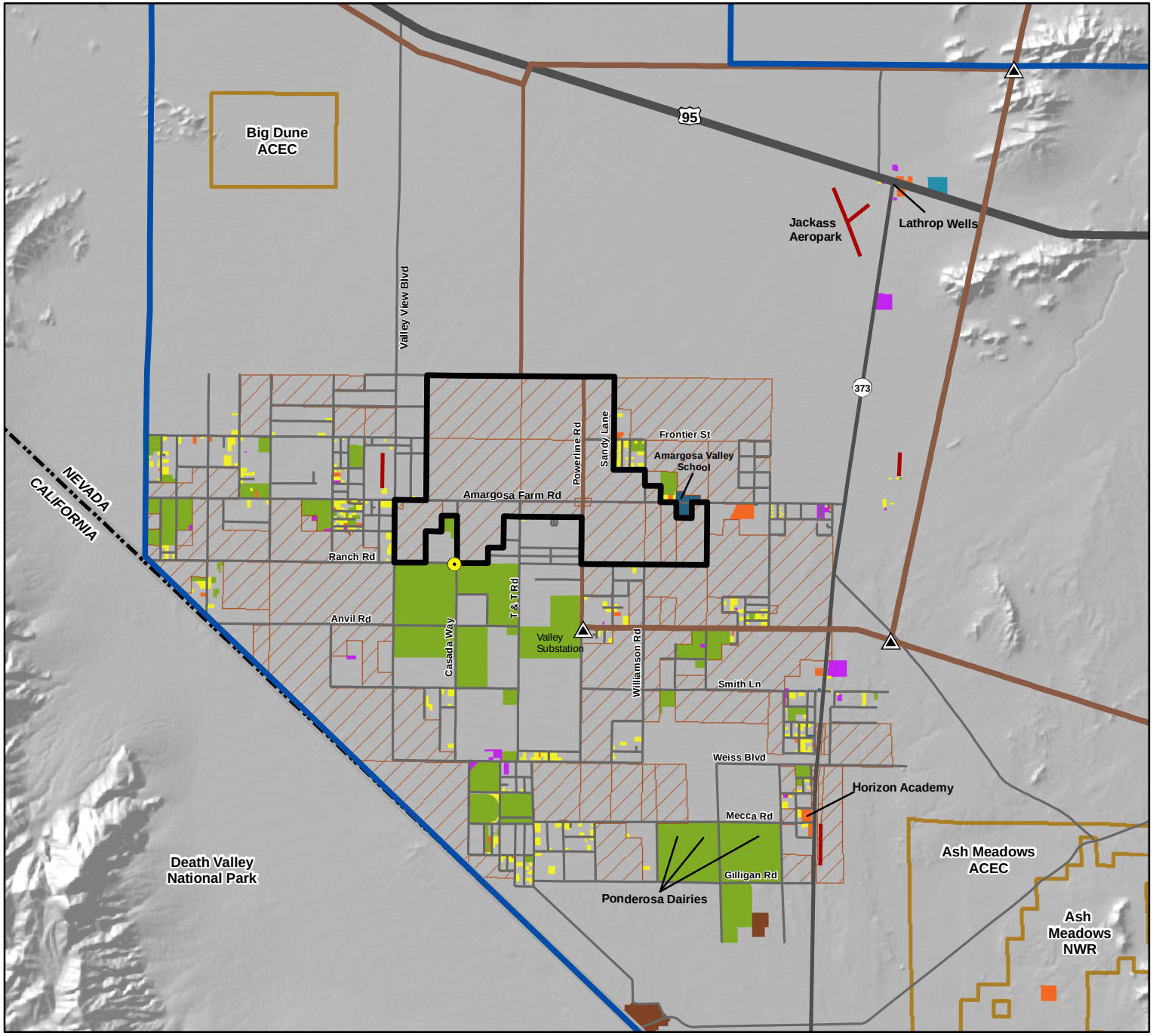
General Reference Features

- Existing Transmission Line (<230kV)
- Existing Substation
- Special Management Area
- State Boundary
- US Highway
- State Highway
- Local Road

Source: Land Ownership, SMA - BLM, 2007; Ash Meadows - USFWS, 2005; Local Roads, AV Boundary - TerraSpectra Geomatics, 2009; Transmission Lines, Substations - Platts, 2009; Highways - ESRI, 2009

September 2010

0 3 6 Miles



Amargosa Farm Road Solar Energy Project (NVN-84359)

Existing Land Use
Figure 3-16

LEGEND

- Project Area
- Amargosa Valley Town Boundary

Current Land Use

- Residential
- Agriculture
- Commercial
- Industrial
- Mining
- Public/Quasi-Public
- Special Development Area

General Reference Features

- Existing Transmission Line (<230kV)
- Existing Substation
- Proposed Project Well
- BLM Land Designated for Disposal
- Special Management Area
- Highway
- Local Road
- Airstrip
- State Boundary

Source: Transmission Lines, Substations - Platts, 2009; BLM Disposal Land - BLM, 2009; AV boundary, Airstrips, Land Use, Local Roads - TerraSpectra Geomatics 2009; Wells - Nevada State Engineer, 2008; Highways - ESRI, 2009

September 2010

0 1 2 Miles

Varieties of leases, easements, and rights-of-way have been granted by the BLM on land they manage within the ROI. Table 3-38 lists those that have been authorized or are pending within a 2-mile buffer around the Project area.

Table 3-38 Authorized and Pending Rights-of-Way Granted

Serial Number	Status	Description
NVN 52385	Authorized	Amargosa Community Pit – Sand and Gravel Facility
NVN 62888	Authorized	Right-of-way – FLPMA, Non-Energy Facilities
NVN 78483	Authorized	Free Use Permit – Government – Sand and Gravel Facility
NVN 83205	Authorized	Sand and Gravel Facility
NVN 83276	Pending	Mine/Reclamation Plan, Sand and Gravel Facility
NVN 84623	Authorized	Sand and Gravel Facility
NVN 85746	Pending	Desert Research Institute Wind Measurement Sites, Right-of-Way – Power Transmission – FLPMA Wind Energy Facilities
NVN 87822	Pending	Sand and Gravel Facility
NVN 35976	Authorized	Sale – Section 209, FLPMA
NVN 48876	Authorized	Access Road (2,640’ x 40’) Right-of-Way – Road, Non-Energy Facilities
NVN 53354	Authorized	Amargosa Valley Road, Right-of-Way – Road, Non-Energy Facilities
NVN 61968FD	Pending	Segregation Outside Las Vegas Valley, BLM Section 206, FLPMA
NVN 73706	Authorized	Nevada Bell, Right-of-Way
NVN 85654	Pending	Cogentrix Solar Transmission Line Right-of-Way Application; overlapping existing right-of-way (NVN-84359)
NVN 66289	Authorized	Ely to Cherry Creek Right-of-Way; Fiber Optic Facilities
NVN 84466	Pending	Pacific Solar Investments, 300 MW solar trough site called Amargosa South
NVN 85657	Pending	Cogentrix Solar Services, Solar thermal Energy Facility Amargosa Valley Big Dune overlapping existing right-of-way (NVN 84466)
NVN 83150	Pending	Cogentrix Solar Services Right-of-Way Application; 1,400 MW Concentrating Solar Trough Project

Source: BLM 2009b

The 1998 Las Vegas RMP/EIS identified 28,257 acres of land in the ROI available for disposal, which means these lands are available for sale, exchange, or recreation and public expansion and development (BLM 1998). Currently, there are approximately 27,904 acres of disposal land

within the ROI. All BLM-managed land requested under the Proponent's right-of-way application is land that has been designated for disposal.

There is no state-owned land within the ROI. The nearest state-owned land is the Belmont Courthouse State Historic Park in northern Nye County, approximately 170 miles away. Within the ROI, a few state-owned facilities are present, including an NDOT-managed rest area at the intersection of US 95 and NV 373. Private land within the ROI includes isolated pockets of residential and commercial development within the Amargosa Valley.

There are no incorporated cities or towns within the ROI or Nye County. The Project area is located in the unincorporated Town of Amargosa Valley, which consists of a rural population of roughly 1,500 people, spread over a large geographic area of approximately 505 square miles. While the BLM has exclusive jurisdiction over land use activities on land that it manages, the Amargosa Valley Area Planning Commission provides guidance to ensure that proposed projects within the Town Planning boundary are constructed and operated in a manner that is consistent with the standards set forth in the Amargosa Valley Area Plan (Amargosa Valley Area Plan Committee 2009).

3.11.3.1 Residential

Residential development in the ROI includes isolated homesteads scattered throughout the Amargosa Valley. According to the Nye County Assessors database, there are approximately 600 parcels of residentially zoned private properties within 2 miles of the Project area, generally to the south and east. Concentrated population areas near the Project site include an area east of Sandy Lane, approximately 0.25 mile east of the Project area; and an area west of Valley View Boulevard along Amargosa Farm Road.

3.11.3.2 Commercial and Quasi-Public

There is limited commercial development within the Amargosa Valley. The closest commercial development is located approximately 6 miles northeast of the Project area at the intersection of NV 373 and US 95. It includes a business park, the Nevada Joe's commercial complex (containing a restaurant, brothel, and convenience store), a fireworks retailer, gas station, helicopter pad, and a materials-laydown yard leased by the Nye County Nuclear Waste Repository Project Office.

The Amargosa Valley Community Complex mixed-use area is located adjacent to Amargosa Farm Road immediately southeast of the Project area. It includes public facilities: an emergency services center (fire department, ambulance service, helipad, and sheriff's substation), library, medical clinic, senior center, park, cemetery, rodeo grounds, AVIA Community Center and Raceway, and the Amargosa Valley School.

A mixed-use commercial area is located adjacent to NV 373 and Mecca Road, approximately 3 miles southeast of the Project area. The area includes the Horizon School complex (boarding school with associated residences), a grocery store, First International Bank, and pizza restaurant.

Two commercial institutions, the Longstreet Hotel and Casino and the State Line Saloon complex (contains a restaurant, RV park, golf course, convenience store, and lounge with gambling) are located 8 miles southeast of the Project area on the Nevada/California border, east and west of NV 373.

Two churches are located in the ROI: the Church of Amargosa located on Amargosa Farm Road and an unknown church located off Maverick Road. Both are located approximately 0.5 mile west of the Project area.

3.11.3.3 Industrial and Agricultural

There is limited industrial development in the ROI. The Ponderosa Dairy, a large dairy operation employing approximately 120 employees, is located roughly 2 miles south of the Project area.

Within the Amargosa Valley, the principal crop grown is alfalfa, which supports the local dairy operations. Other crops include fruits and vegetables, and nut trees (primarily pistachios).

3.11.3.4 Communication Facilities

Three cellular towers are located within the Amargosa Valley Community Complex: one adjacent to the senior center and two located at the emergency services building. There are three Internet provider towers in the local area. The towers are located adjacent to the dairy, adjacent to the health clinic complex, and southwest of the Project area on T&T Road (per personal communication with Jan Cameron, December 16, 2009).

3.11.3.5 Air Facilities

Three private airstrips are located within the Amargosa Valley. One at the Mecca Road alignment and NV 373; one on the east side of NV 373 at the Amargosa Farm Road alignment, and off of Valley View Boulevard; and one the north side of Amargosa Farm Road. The nearest major airport to the Project area is McCarran International Airport, located approximately 3 hours east, in Las Vegas, Nevada.

An abandoned airstrip, formerly Jackass Aeropark, is located approximately 5 miles northeast of the Project area, west of the intersection of US 95 and NV 373.

3.11.3.6 Utilities

The Project area is located approximately 2 miles north of the VEA-owned Valley Substation. A 138kV transmission line, owned and operated by VEA, traverses north paralleling Powerline Road to US 95. Two other VEA transmission lines are located on the eastern edge of the Project area. Additionally, a telephone/telegraph right-of-way owned by Nevada Bell is adjacent to the western edge of the Project area. The right-of-way runs north from Anvil Road to US 95, and continues in the ROI east on Anvil Road and north on NV 373.

3.11.3.7 Mining/Extraction

There are no active mining claims within the Project area (LR2000). There are three active mineral-resource-extraction areas approximately 5 miles from the Project area. Two of these areas are industrial mineral mines with processing plants for cinder and specialty clay products. The location of these mining areas is shown on Figure 3-4.

IMV Nevada mines and processes a variety of specialty clays, approximately 5 miles south of the Project area, south of Anvil Road near School Lane. Currently, IMV maintains mining claims (the Mud Camp Mining claims in Sections 20, 21, and 29 of T16S R50E) on approximately 10,000 acres in the Amargosa Valley near the Nevada/California border. An exploration plan is maintained and extensive ore reserves are identified for future production. From the mine locations, specialty clays are processed at the plant in Section 29 of T17S R49E. A number of products are made using the clays for a wide variety of uses in industrial, construction, and agricultural applications.

Cinder Cone Mine, owned and operated by Cind-R-Lite Block, holds a series of public and private claims for volcanic-mineral materials, such as pumice and cinder. These claims are located in Section 36 of T14S, R48E, 9 miles north of the Project area and north of US 95.

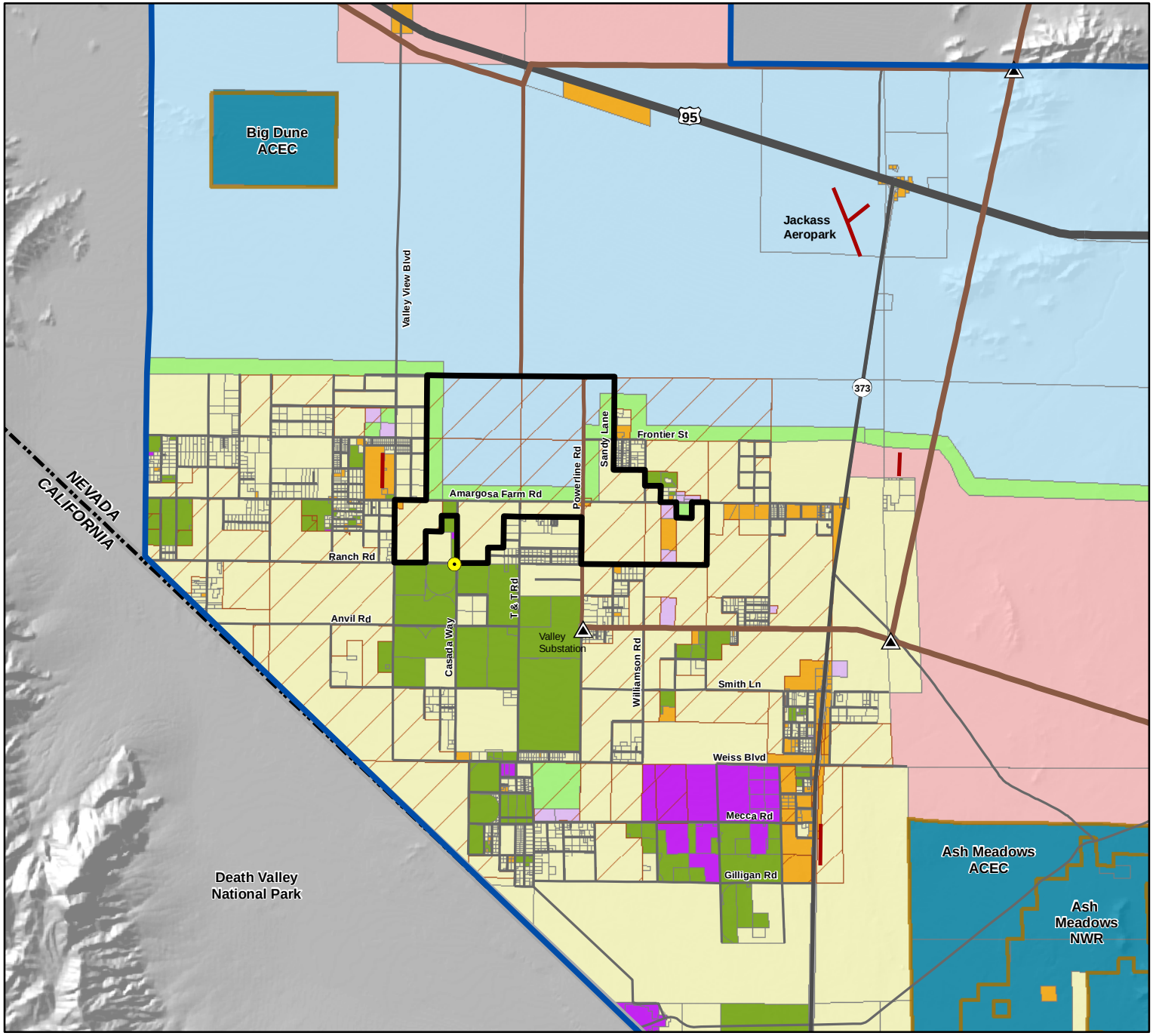
The third area contains claims filed by the Nye County Road Department, which operates a sand and gravel pit that occupies Section 10 of T15S R49E.

3.11.4 Planned Land Use

Planned or future land use refers to the future land uses designated within the ROI federal (BLM) and local (Amargosa Valley Area Plan) jurisdictional entities' plans. These land management plans reflect the goals and policies that guide the physical land development. Under the guidance of the 1998 Las Vegas RMP/EIS, a total of 27,904 acres of established land disposal areas on BLM land in the ROI and surrounding vicinity are currently available for transfer through sale or lease to other uses (BLM 1998). With the development of the proposed Project, approximately 7,000 fewer acres would be available for BLM disposal to other federal actions.

In the ROI, which is outside of the Pahrump Regional Planning District, the County does not provide official guidance for new developments. Based on relevant planning documents for the jurisdictions present in the ROI, the overall land uses, types, patterns, and densities therein are not expected to change substantially (Figure 3-17).

The Amargosa Valley Area Plan (Amargosa Valley Area Plan Committee 2009) limits parceling in the ROI to a minimum of 2 acres for the Low Density Residential land use designation; and to 5 acres for the Rural Density Residential land use designation outside specified higher density areas on the perimeter of the planning area boundary. It also shows a specification of a 0.25-mile Open Space, Parks & Trails land use designation between residential areas and the area where the proposed Project is located.



Amargosa Farm Road Solar Energy Project (NVN-84359)

Future Land Use
Figure 3-17

LEGEND

- Project Area
- Amargosa Valley Town Boundary

Future Land Use

- Residential
- Agriculture
- Industrial
- Community/Utility Facility
- Mixed Use
- Open Space, Park, Trail
- Community Development Reserve
- Special Development Area
- Special Development Area (Federal)

General Reference Features

- Existing Transmission Line (<230kV)
- Existing Substation
- Proposed Project Well
- BLM Land Designated for Disposal
- Special Management Area
- Highway
- Local Road
- Airstrip
- State Boundary

Source: Transmission Lines, Substations - Platts, 2009; BLM Disposal Land - BLM, 2009; AV boundary, Airstrips, Land Use, Local Roads - TerraSpectra Geomatics 2009; Wells - Nevada State Engineer, 2008; Highways - ESRI, 2009

September 2010

0 1 2 Miles

Future land uses shown for the ROI include Special Development Areas, rural density residential, open space, parks & trails, a school, proposed museum and technology park, landfills and utility facilities. The term "Special Development Area" is a mixed-use designation to set aside public or private areas where a variety of land uses might be proposed for approval, including projects under review by the BLM, such as Solar Energy Facilities (Amargosa Valley Area Plan Committee 2009). Nye County's resolution to adopt the plan:

> *"…is a guide toward future land use decisions over the next 20 years, without restricting private property rights or limiting the right to enter into any development agreements. The U.S. Bureau of Land Management would have to consider the plan when making decisions" (Jan Cameron, Pahrump Valley Times, November 2009).*

The Development Agreement made between Nye County and the Proponent "found that the [Development] Agreement is consistent with the County's plans, policies and regulations, including the Amargosa Valley Area Plan and the Master Plan, and that the execution of this Agreement on behalf of the County is in the public interest and is lawful in all respects."

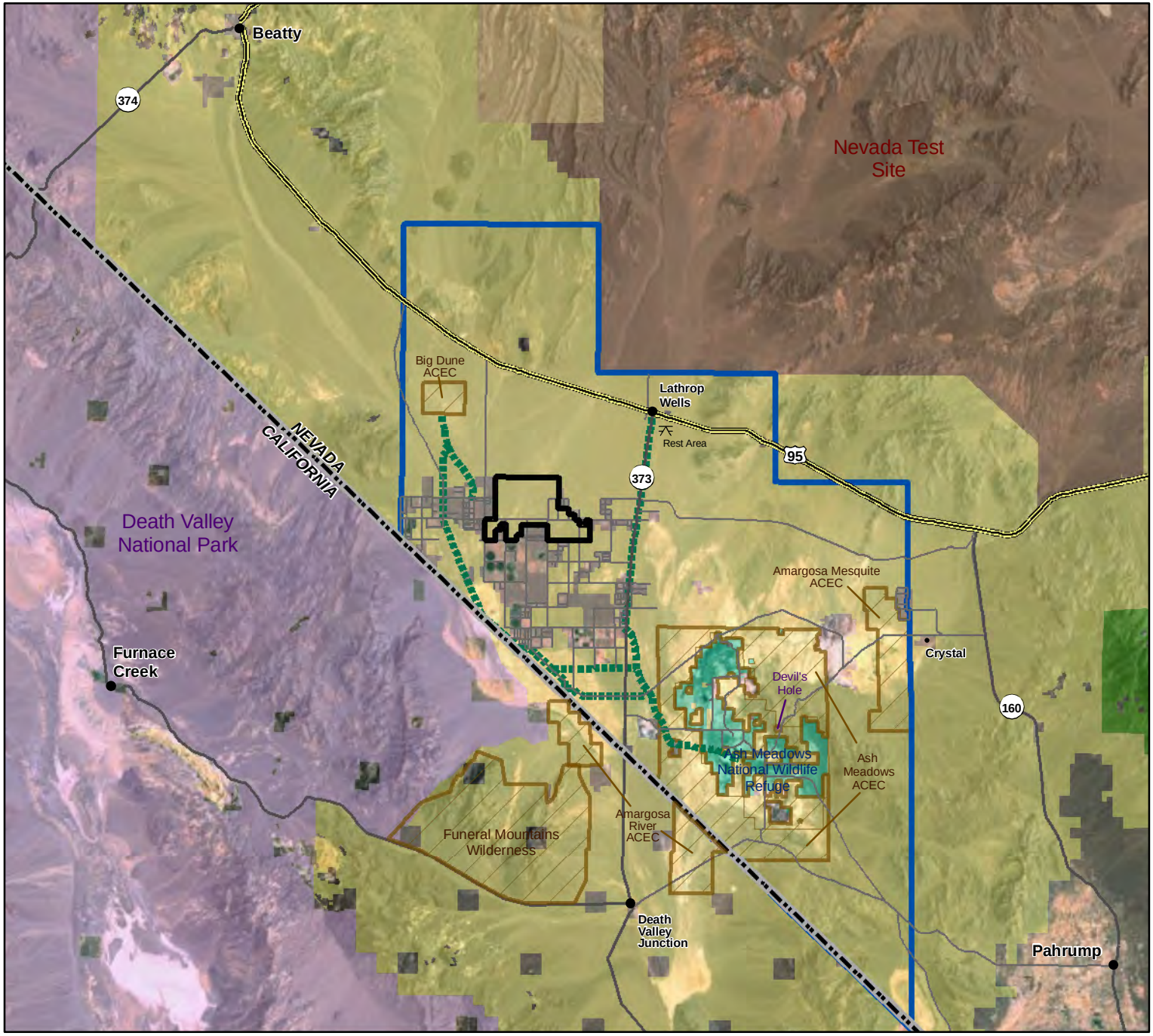
3.11.5 Recreation

For recreation resources, the ROI encompasses a radius of approximately 50 miles around the Project area. The 50-mile radius includes the mountains and valleys surrounding the Amargosa Valley, extending into the Death Valley National Park in California. The mountains and deserts surrounding the Project area offer a variety of dispersed recreation including OHV use in the Big Dune area and on existing roads and dry washes; big and small game hunting in the surrounding desert and mountains; and hiking, camping, and sightseeing in the Funeral Mountains and other accessible areas (Figure 3-18).

3.11.5.1 Special Management Areas

Big Dune, a unique sand dune area approximately 4 miles northwest of the Project area, is one of the more popular recreational areas in the ROI. The BLM manages this area primarily as an OHV recreation area, and as an ACEC for several sensitive beetle species. Other recreational opportunities include wildlife viewing, photography, and sandboarding and sandskiing on open dunes. The Big Dune recreational area is accessed primarily from Valley View Boulevard approximately 2 miles south of US 95. Developed facilities include a parking and vending area. Dispersed camping areas on the east and west sides of the dune is available as well. A Recreation Management Plan for the 1,920-acre area is being developed by the BLM.

The Ash Meadows NWR, managed by the USFWS, is located approximately 7 miles southeast of the Project area. Ash Meadows is a unit of the Desert Refuge Complex, which protects and manages valuable ecosystems in the Southwest. The Comprehensive Conservation Plan (2009) for the Desert NWR Complex provides guidance for the refuge and ensures public involvement in management decisions.



Amargosa Farm Road Solar Energy Project (NVN-84359)

Recreation and Transportation Figure 3-18

LEGEND

- Project Area
- Amargosa Valley Town Boundary

Surface Management

- Bureau of Land Management
- Department of Energy
- National Park Service
- US Fish and Wildlife Service
- Private

General Reference Features

- US Highway
- State Highway
- Local Road
- Rest Area
- Future Trail / Recreation Corridor
- Special Management Area
- State Boundary

Source: Land Ownership, SMA - BLM, 2007; Trails, Local Roads, AV Boundary - TerraSpectra Geomatics, 2009; Transmission Lines, Substations - Platts, 2009; Ash Meadows - USFWS, 2005; Highways - ESRI, 2009

September 2010

0 4 8 Miles

The Ash Meadows unit includes a variety of recreational opportunities and facilities and includes Devils Hole, a detached unit of the NPS Death Valley National Park, which is managed as a wildlife refuge to an endangered species of pupfish. Encompassing over 23,000 acres of spring-fed wetlands, it contains a rare desert wetland ecosystem that provides habitat for 25 endangered or threatened species found only at Ash Meadows. Recreation opportunities include: hunting, boating, hiking, wildlife observation, environmental education, and photography. Facilities include a visitor center, boat launch, and picnic area, all of which are accessible by NV 373.

The Ash Meadows ACEC's 37,152 acres surround the Ash Meadows NWR. The ACEC is located approximately 5 miles southeast of the Project area and is managed for special status species habitat.

The Amargosa Mesquite ACEC is located approximately 12 miles east of the Project area and is managed for the neotropical bird habitat within its 6,891 acres.

South of the Nevada/California border, the Amargosa River ACEC encompasses 21,552 acres in three distinct geographic units, and are located in northeastern San Bernardino and southeastern Inyo counties, California, near the communities of Tecopa and Death Valley Junction. Eighty-nine percent of the ACEC is on private land, but the BLM has no jurisdiction on private land. Only one of the three separate units in this ACEC is in close proximity to the Project area: the Upper Amargosa Mesquite Bosque Unit, approximately 8 miles south of the Project area, is located west of CA 127 and immediately north of the Funeral Mountains Wilderness. It contains 2,720 areas of public land administered by the BLM. This ACEC contains significant historic and cultural, biological and scenic values centered on the river for which it is named. The Upper unit is considered semi-primitive, with no developed campgrounds or facilities and limited motorized vehicle access. Recreation opportunities include sightseeing, bird and wildlife viewing, and photography. The most common activity is casual use vehicle touring. The Amargosa River ACEC Implementation Plan/Environmental Assessment (2006) serves as the guidance document for this ACEC.

Also in California, approximately 4 miles southwest of the Project site, is the eastern boundary of the Death Valley National Park. Death Valley National Park covers approximately 5,262 square miles, 95 percent of which is designated as wilderness. Death Valley National Park's recreational opportunities include backcountry road sightseeing, biking, hiking, camping, wildlife observation, and stargazing. There are no developed recreational facilities present for approximately 7 miles into Death Valley National Park from Lee's Camp Road. This road is a common approach for recreational users going into the park from the Amargosa Valley, and is a continuation of Amargosa Farm Road (personal communication with Jan Cameron, December 16, 2009). Echo Canyon Road, a road that requires a 4-wheel-drive vehicle and that the NPS maintains and recommends for a backcountry drive, continues south from Lee's Camp Road into the park.

On the southeastern end of Death Valley National Park in Inyo County, within the ROI at approximately 7 miles south of the Project site, is the Funeral Mountain Wilderness Area. The area encompasses 25,708 acres managed by the BLM Barstow Field Office, and comprises portions of the Funeral Mountains ranging in elevations from 2,200 to 7,000 feet. Recreation opportunities include dispersed hunting, non-commercial trapping, hiking, horseback riding, and

camping within the wilderness area and non-vehicular access to Death Valley National Park. The Funeral Mountain Wilderness is closed to vehicular traffic, but is open to non-vehicular recreational traffic.

3.11.5.2 Future Recreation

All public land not included within a special management area is managed as an Extensive Recreation Management Area. The objective of these lands is to manage them, emphasizing dispersed and diverse recreation activities (BLM 2008).

The Amargosa Valley Area Plan has designated Open Space, Parks, and Trail corridors parallel to NV 373 east of the Project site, north from Frontier Road to Mojave Road and along Mojave Road west of the Project site (Amargosa Valley Area Plan Committee 2009).

3.11.6 Transportation and Access

The ROI for transportation and access includes Nye and Clark counties in Nevada, with an emphasis on the communities of Amargosa, Beatty, Pahrump, and Las Vegas. US 95 is located approximately 5 miles north of the Project area. Running east and west through the Amargosa Valley, US 95 is the major regional transportation route between Las Vegas and Reno. It serves local travelers between Las Vegas and Beatty and is a major connector route from Las Vegas to points north and west. This principal arterial route is part of the National Highway System, but is maintained by NDOT. The Lathrop Wells Rest Area, maintained by NDOT, is located at the intersection of US 95 and NV 373.

NV 373 (CA 127 in California) is a major rural collector route that runs north and south approximately 3 miles east of the Project area. It is a major travel route to Death Valley National Park from US 95 and a local travel route for residents and travelers within the local community. NV 373 is also a primary travel route to Ash Meadows NWR. Within the ROI, NDOT operates automatic traffic recording data sites along US 95 and NV 373. The 5-year Annual Average Daily Traffic for these sites is listed in Table 3-39.

At the eastern extent of the ROI, NV 160 is a regional travel route approximately 18 miles east of the Project area. It is used by residents and travelers to Pahrump and the small community of Crystal, Nevada. NV 160 is also an alternate travel route for recreational visitors to Death Valley National Park and Humboldt-Toiyabe National Forest for eastbound travelers along US 95.

At the western extent of the ROI, NV 374 is a travel route primarily for recreation travelers between Beatty and Death Valley National Park.

Table 3-39 5-Year Annual Average Daily Traffic for the Amargosa Valley Area					
Station/Route/Location	**2003**	**2004**	**2005**	**2006**	**2007**
Station 0230019/US 95, Maine St., 1.5 mile south of NV 373/Death Valley Junction Road	2,800	3,200	2,850	2,900	2,800
Station 0230020/NV 373, Death Valley Junction Road, 0.5 mile south of US 95	570*	760	560	560*	560
Station 0230021/US 95, Maine St., 0.2 mile north of NV 373	2,500	2,500*	2,600	2,550	2,600
Station 0230078/Valley View Boulevard, 0.1 mile west of US 95	100	140	140	160	150
*Data adjusted or estimated					

Within the Amargosa Valley, local access routes provide direct access to local destinations such as commercial, agricultural, and residential areas. Primary transportation corridors (local two-lane roadways) in the ROI include:

- Amargosa Farm Road – An east-west connector road along the southern edge of the Project area. The Proponent is currently working with the Nye County Public Works Department to realign Amargosa Farm Road. The new alignment would be located 1,320 feet (0.25 mile) south of its current alignment to follow the southern perimeter of the solar fields.

- Valley View Boulevard – A north-south connector road that connects US 95 to the Amargosa Valley Community. The road is located along the western edge of the Project area. The road is used by residents and recreational users accessing the Big Dune area from the east.

- Powerline Road – A north-south connector road that connects the two main east-west connector roads within the Amargosa Valley. The northerly east-west connector road is the above described Amargosa Farm Road and the second is Mecca Road, which is 5 miles south of Amargosa Farm Road.

Other improved and unimproved local roads in the ROI include Sandy Lane, Frontier Road, Williamson Road, Atomic Road, Barnett Street, Senior Center Road, School Lane, Casada Way, and T&T Road. Numerous improved and unimproved roads follow the section lines and half section lines for access to dispersed agriculture and residential areas throughout the ROI.

3.11.6.1 Future Transportation

The Amargosa Valley Area Plan (Amargosa Valley Area Plan Committee 2009) identifies long-range plans for developing future roadway networks in the Amargosa Valley. The plan identified multiple extensions and improvements to secondary roads in the ROI, south of the Project area. The extensions would serve to connect the existing street grid south of the Project area, and north to create three additional connections to US 95. The plan also notes that a portion of the abandoned T&T railroad route has the potential to serve the proposed Yucca Mountain Nuclear Waste operation with rail access through a portion of the Amargosa Valley.

3.12 VISUAL RESOURCES

This section focuses on the inventory, identification, and description of existing visual resources that could be affected by the construction, operation, and maintenance of the proposed Project. Based on methods derived from the BLM VRM System (Manual H-8410-1) and consultation with Las Vegas Field Office VRM staff, the visual resource inventory for the Project focuses on scenic quality and landscape sensitivity (scenery), distance zones (sensitive viewers), and visual resource inventory and management classes.

3.12.1 Regional Setting

The proposed Project is located within the Mojave Desert section of the Basin and Range Province. The Basin and Range Province is distinguished by isolated, roughly parallel mountain ranges separated by closed desert basins (Fennemen 1931). Mountain ranges trend north to south with distinctive alluvial areas at their bases (known locally as *bajadas*). The Mojave Desert is characterized by dominant stands of low-growing creosote bush, burrobush, and saltbush, with varied occurrences of Joshua tree and yuccas.

The proposed Project is located in the Amargosa Valley, a basin loosely surrounded by the Yucca Mountains approximately 13 miles to the north, the Spring Mountains approximately 23 miles to the east, and the Funeral Mountains stretching approximately 12 miles from the south extending to within 8 miles to the west. The Amargosa Valley encompasses approximately 500 square miles. The valley generally drains to the south towards the Amargosa River and is traversed by several small washes. The topographic nature of the valley is generally flat with subtle elevation change.

There are approximately 80 residences and related community facilities within a 2-mile radius from the Project site. These populated areas contain denser vegetation that is not native to this portion of the Mojave Desert, including Cottonwoods and extensive amounts of Salt Cedar.

Modifications that have affected the landscape setting associated with the proposed Project include industrial/commercial and agricultural development associated with the Town of Amargosa Valley, industry related to farming (including center-pivot irrigated agricultural fields) and ranching, mining (gravel pits to the south and a large volcanic cider mine to the north), and community/commercial facilities to the northeast, east, and southeast of the site.

Regional modifications (within 5 miles) include one double-circuit wooden pole transmission line, approximately 2 miles to the south; two substations (one 2 miles to the south, and one 5 miles southeast of the Project site); and a single-circuit transmission line running parallel to NV 373 on the east side. Other regional cultural modifications include major transportation corridors US 95, NV 373, and numerous local roads that border the Project site on three sides.

The local setting within, and immediately adjacent to the Project area, has been modified by several utility lines including single-pole, wooden distribution lines (one crossing the Project site east to west and one crossing north to south), two cell phone towers, and a radio transmission tower directly east of the site.

3.12.2 Regulatory Framework – VRM System

Pursuant to FLPMA, the BLM is required to consider scenic values of public lands as a resource that merits management and preservation, as determined through the land use planning process. As a response to the FLPMA, the BLM devised the VRM System, with the primary objective of managing public lands in a manner that will protect the quality of the scenic (visual) values of these lands (Information Bulletin No. 98-135). In this regard, the VRM system (BLM Handbook H-8410-1) provides guidance relating to the VRI methodology that the BLM implements to inventory scenic values, as well as assess potential effects to such resources based on the analysis of visual contrast. Following are descriptions of the VRI that were inventoried for the Project.

3.12.2.1 Visual Resource Inventory

Consistent with procedures and concepts as described above, VRI data were collected and/or developed when appropriate per Manual H-8410-1 (Visual Resource Inventory). The primary VRI includes Scenic Quality, Distance Zones, Visual Sensitivity all of which are combined to develop VRI Classes. In addition, public viewing locations (including their sensitivity to changes in the landscape) were identified and described (see section 3.12.2.3).

Scenic Quality – Scenic quality is defined by the BLM as the measure of the visual appeal of a tract of land. Scenic Quality Rating Units (SQRU) are established based on like physiographic characteristics including similar visual patterns, textures, colors, variety, etc. Once the SQRUs are delineated, an evaluation occurs and each SQRU is ranked A, B, or C based on; landform, vegetation, water, color, adjacent scenery, scarcity, and cultural modifications (existing conditions). Scenic quality was provided by the BLM for inclusion in the VRI and subsequent impact analysis to scenery. Existing conditions based on the occurrences of cultural modifications within the landscape contribute to the overall visual character associated with a given area. Existing conditions can range from natural to completely modified based on the visual influence of transmission lines, transportation routes, and other structural features.

Distance Zones – Distance Zones represent the relative visibility of the landscape from viewing locations such as travel routes or observation points of sensitive views. KOPs are established to represent typical viewing distances and conditions associated with sensitive viewers. Three zones have been identified by the BLM which include foreground/middleground (0 to 5 miles), background (5 to 15 miles), and seldom-seen (areas that are not visible within the foreground-

middleground and background distance zones). A viewshed analysis is performed and combined with the distance zones information to finalize the inventory of distance zones.

Visual Sensitivity – Visual Sensitivity represents the relative sensitivity of a given tract of land and is based upon; type of user, amount of use, public interest, adjacent land uses, special areas, and other factors. Landscape sensitivity can range from high to moderate to low and largely is associated with SQRUs. It is important to note that although related, the sensitivity of the landscape does not equate to sensitivity of viewers or viewing locations within that landscape. Visual Sensitivity, mapped in the form of Sensitivity Rating Level Units (SLRUs) were provided by the BLM for the purposes of this analysis.

3.12.2.2 Visual Resource Management Classes

The VRIC classes are reviewed by the BLM in contect with other resource plans and objective and updated accordingly to determine VRM classes (depicted on Figure 3-19) ranging from Class I to Class IV. Following are the management objectives associated with VRM Classes:

- **Class I** – To preserve the existing character of the landscape. The level of change to the characteristic landscape should be very low and must not attract attention. Class I designation is reserved for special areas that requires maintaining a natural environment unaltered by man such as designated Wilderness Areas, Wilderness Study Areas, etc.

- **Class II** – To retain the existing character of the landscape. The level of change to the characteristic landscape should be low. Management activities may be seen, but should not attract the attention of the casual observer. Any changes must repeat the basic elements found in the predominant natural features of the characteristic landscape.

- **Class III** – To partially retain the existing character of the landscape. The level of change to the characteristic landscape should be moderate. Management activities may attract attention but should not be dominate the view of the casual observer. Changes must repeat the basic elements found in the predominant natural features of the characteristic landscape.

- **Class IV** – To provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements.

The proposed Project site is located in a designated Class IV landscape. VRM data for the Project site and adjacent area was developed by the Las Vegas Field Office, the results of which can be found in Section 3.12.4. This data establishes the baseline for which Project impacts are measured against for resource management compliance.

3.12.3 Data Collection Methods

3.12.3.1 Methodology

Figure 3-19 illustrates the methodology associated with the VRI and subsequent impact assessment for the Project. The inventory methods discussed below are consistent with the concepts found within BLM Manual H-8410-1 – VRI.

The Area of Potential Visual Effect (APVE) was defined using the BLM's definition of background distance zone, which is 5 to 15 miles. The visual resources inventory was conducted on federal, state, and private land within the APVE that may be affected by construction and operation of the proposed Project. A viewshed analysis, based on BLM direction, was conducted using GIS mapping to assess where the Project could be visible within a 50-mile radius of the proposed right-of-way. This larger area defines the visual ROI that will be assessed for the Project. The results of the viewshed analysis were used to establish KOPs which were used for subsequent analysis in Chapter 4. Data collected within the APVE and ROI were based on reviews of aerial photographs, topographic maps, planning documents, consultation with the BLM and affected municipalities, and field investigations.

3.12.3.2 Sensitive Viewers

The term sensitive viewers refers to sensitive viewing locations and their associated viewers. Residences, travel routes, or trails are examples of locations where viewers typically are sensitive to visual modifications of the landscape. Key Observation Points (KOPs) represent critical viewpoints or typical viewing conditions associated with sensitive viewers in the context of the Project. Potential sensitive viewers that may have views of the proposed Project are typically identified and field verified within the defined APVE background distance zone of 15 miles (BLM Manual H-8410-1); however, based on the large scale of the Project and per BLM direction, sensitive viewers were also identified in the ROI. The identification of sensitive viewers was based on a review of aerial photography, a review of regional and local topographic maps, the results of the 50-mile radius viewshed analysis, agency and public input, and field investigations including photo documentation using high-resolution photography. Sensitive viewers are anticipated to include:

- Travel routes – highways and roads used by origin/destination travelers, designated scenic or historic byways, and recreation destination roads (i.e., roads that provide recreation access)
- Recreation areas – existing recreation sites used for picnicking, camping, hiking, scenic overlooks, rest areas, or other recreational activities
- Residences – single-family, detached structures, and permanent mobile homes or mobile home parks

Sensitive viewers and subsequent KOPs were approved by the BLM and illustrated in Figure 3-21.

Figure 3-19 | VISUAL RESOURCE AND CONTRAST RATING METHODOLOGY | Amargosa Solar Energy Project

PROJECT DESCRIPTION
- Solar collection fields
- Power block
- Access road
- Transmission lines
- Road re-alignment

VISIBILITY ANALYSIS
(50 miles)

REGION OF INFLUENCE (ROI)

INVENTORY
(Affected Environment)

CHARACTERISTIC LANDSCAPE DESCRIPTION
SCENIC QUALITY (provided by the BLM)

Landscape Features:
- Landform
- Vegetation
- Water
- Color
- Adjacent scenery
- Cultural modifications

Existing Conditions:
- Transmission lines
- Agricultural and Industrial facilities
- Travel routes (paved and unpaved roads)

SENSITIVE VIEWERS AND KEY OBSERVATION POINTS

Viewer Type:
- Roads
- Trails
- Campgrounds
- Residences
- Recreation Areas

Viewer Sensitivity:
- Use volume
- Viewing duration
- Scenic/historic status
- Type of use
  - travel routes
  - recreation areas
  - residences

Viewing Conditions/ Orientation:
- Superior
- Level
- Perpendicular
- Screened
- Backdropped
- Inferior
- Parallel

VISUAL RESOURCE INVENTORY (VRI) AND CLASSES

Scenic Quality:
(provided by the BLM)
- Vegetation
- Water
- Color
- Adjacent scenery
- Cultural modifications

Distance Zones:
- Foreground/middleground (0-3, 3-5 miles)
- Background (5-15 miles)
- Seldom seen (not visible and beyond 7 miles)

Sensitivity Level Rating Units (SLRUs):
- User type
- Amount of use
- Public interest
- Adjacent land uses
- Special areas
- Other factors

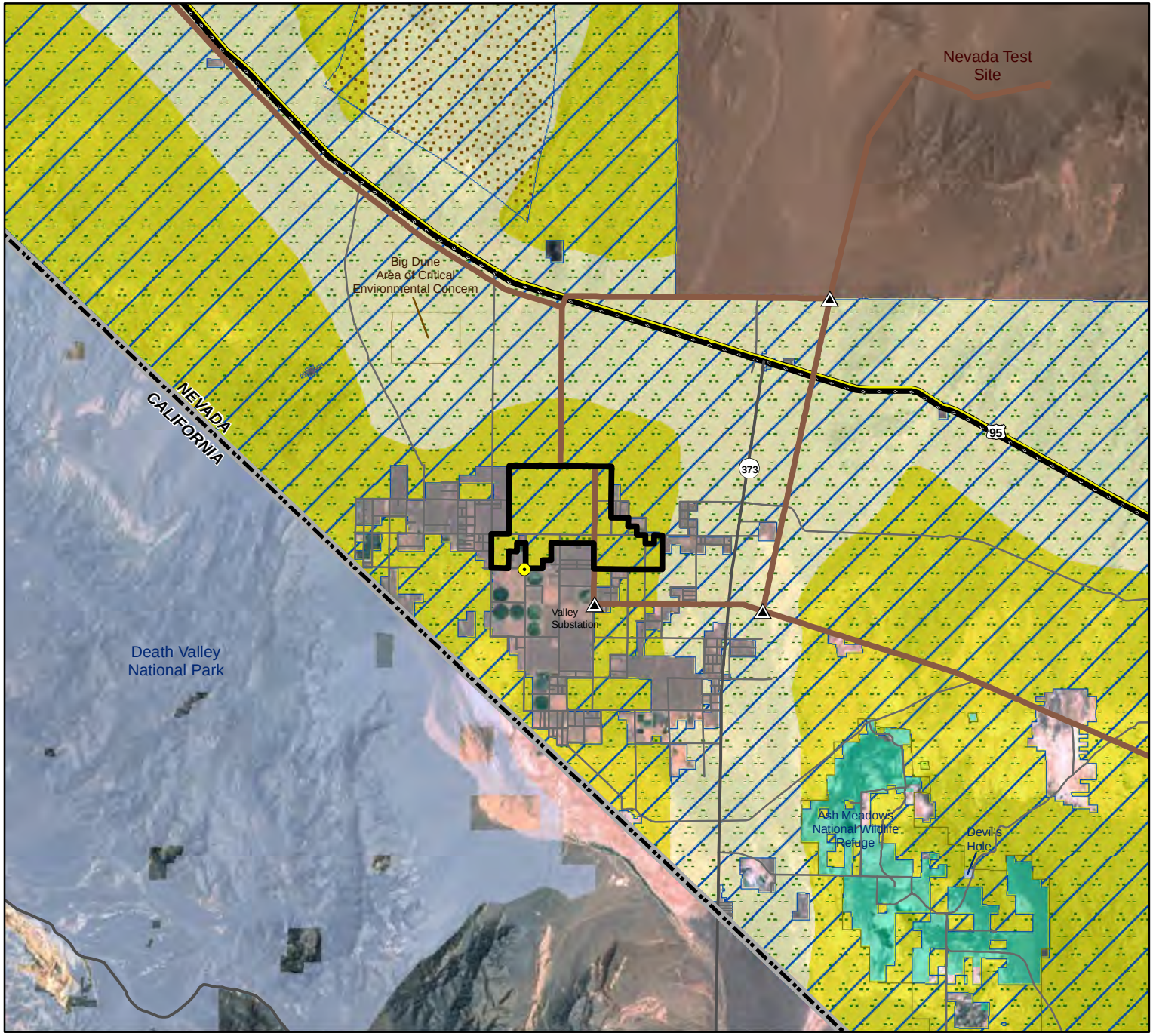
VISUAL RESOURCE CONTRAST RATING
(Environmental Consequences)

PROPOSED PROJECT ACTIVITY DESCRIPTION
Level of Contrast Based on:
- Existing cultural modifications (structures and roads)
  - form, line, color, texture
- Vegetation Patterns
  - form, line, color, texture
- Landforms and water-related elements
  - form, line, color, texture

SCENIC QUALITY IMPACTS BASED ON:
- Project contrast
- Vegetation
- Structures
- Landform
- Water

SENSITIVE VIEWER IMPACTS BASED ON:
- Project contrast
- Sensitivity
- Elevation
- Distance
- Screening or backdropping

Project Compliance with Visual Resource Management Classifications (Class IV)



Amargosa Farm Road Solar Energy Project (NVN-84359)

Visual Resource Management Inventory (VRI) Figure 3-20

LEGEND

Project Area

Surface Management
- Department of Energy
- National Park Service
- US Fish and Wildlife Service
- Private

Visual Resource Inventory Class
- Class IV

Visual Resource Management Class
- Class III
- Class IV

Scenic Quality
- B
- C

General Reference Features
- Existing Transmission Line (<230kV)
- Existing Substation
- Proposed Project Well
- State Boundary
- US Highway
- State Highway
- Local Road

Source: Land Ownership, VRM, Scenic Quality - BLM, 2007;
Ash Meadows - USFWS, 2005;
Local Roads - TerraSpectra Geomatics, 2009;
Wells - Nevada State Engineer, 2008;
Transmission Lines, Substations - Platts, 2009;
Highways, Imagery - ESRI, 2009

September 2010

0 2 4 Miles

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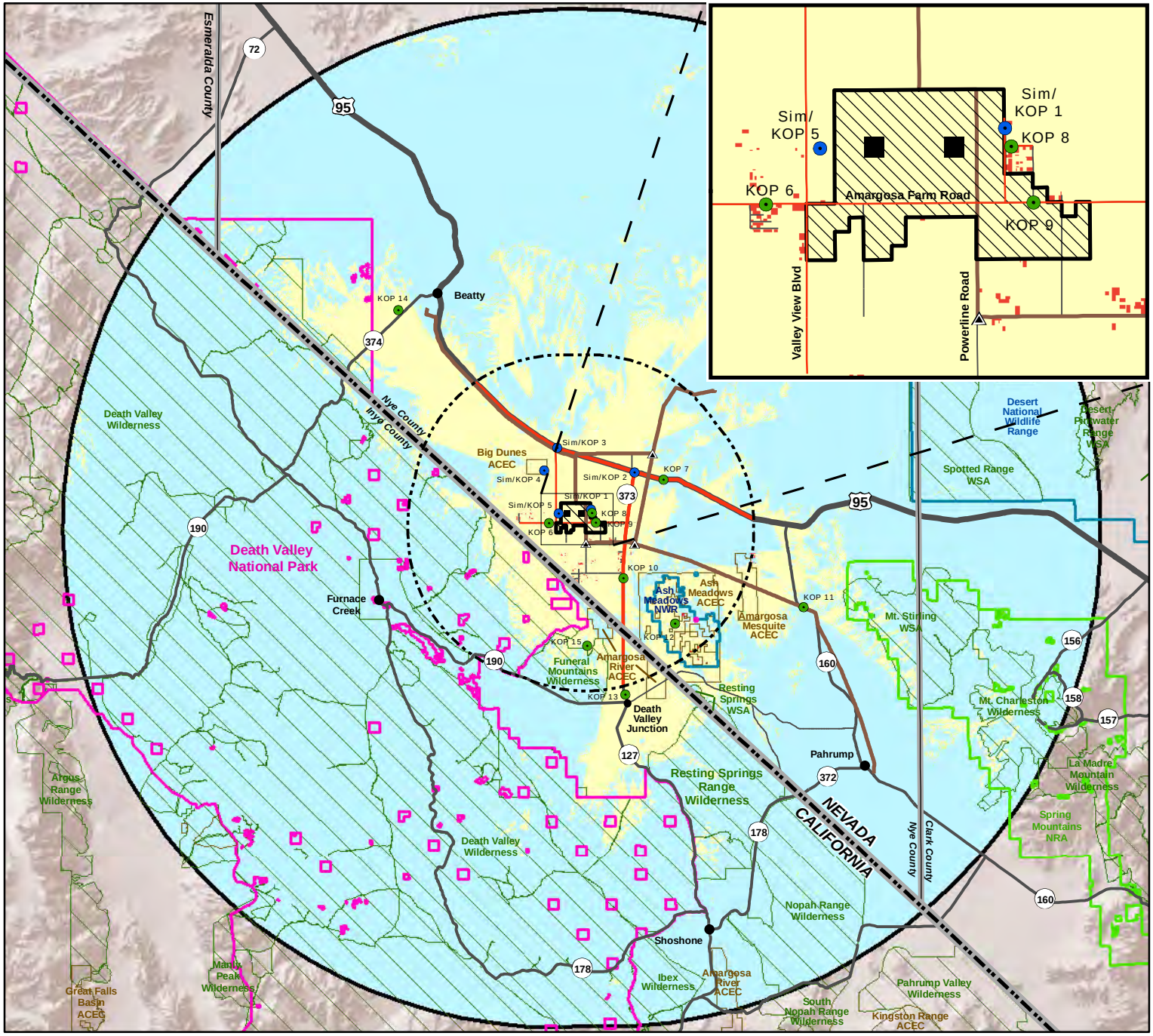

Amargosa Farm Road Solar Energy Project (NVN-84359)

Viewshed Analysis, Sensitive Viewers, and Key Observation Points Figure 3-21

Project Components

- Project Area
- Power Block

Project Features

- Background Zone (15-mile)
- Sensitive Viewer Inventory Boundary (50-mile)

Sensitive Viewers

- Residence
- Travel Route
- Key Observation Point (KOP)
- Simulation Key Observation Pont (Sim/KOP)

Seen/Unseen

- Unseen
- Seen

General Reference Features

- Substation
- Below 230kV Transmission Line
- National Park
- National Recreation Area (NRA)
- National Wildlife Refuge (NWR)
- Wilderness Area
- Area of Critical Environmental Concern (ACEC)
- US Highway/ Interstate
- State Highway
- Local Road
- State Boundary
- County Boundary

Source: BLM, 2009; USFWS, 2005; ESRI, 2009; EPG, 2009; Platts, 2008

September 2010

0 9 18 Miles

In the context of this visual study, viewer sensitivity is defined as the degree of concern for changes to the landscape that, in the context of the proposed Project, may range from high to moderate to low. The sensitivity rating is based on the following five criteria: (1) type of use, (2) volume of use, (3) viewing duration, (4) concern for aesthetics, and (5) scenic or historic status. Scenic or historic status may increase the amount of use and viewing duration for viewers. Note that viewer sensitivity is explicit to sensitive viewers and although related, differs from the sensitivity levels associated with BLM's specific VRI (see Section 3.12.2.1). Table 3-41 provides a list of inventoried sensitive viewers. The described definition of sensitivity is associated with the sensitive viewers potentially affected by the Project and not associated with the sensitivity of the landscape.

3.12.3.3 Scenic Corridors

There are no designated scenic corridors in the Project area. US 95 is not a designated scenic highway; however, NDOT has determined that the highway is eligible as a scenic corridor called Mojave Desert Vista (from Clark County to the NV 266 junction, south of Goldfield, Nevada). The proposed scenic corridor concentrates on preserving the existing rural character of the region, including panoramic views and existing vegetation, improved recreation/travel information for Amargosa Valley at the rest area, and enhance the recreational opportunities afforded by the Big Dune recreation area and Ash Meadows NWR through signage improvements.

3.12.4 Visibility Analysis

Due to surrounding topography of Amargosa Valley, it was likely that sensitive viewers in the background distance zone (5 to 50 miles) would be screened from various Project components (e.g., solar fields, transmission lines within the Project area, and power blocks). Based on the results of the viewshed analysis and consultation with the BLM, 15 KOPs were selected to represent critical viewing conditions for each sensitive viewer group: travel routes, recreation areas, and residences. A summary of the KOPs by located is provided in Table 3-40. Detailed descriptions, including images and locations, are provided in the Contrast Rating Worksheets located in Appendix D.

Table 3-40 Key Observation Points

KOP #	Description
KOP #1	View facing west from Sandy Lane
KOP #2	View facing southwest from Lathrop Wells Rest Area
KOP #3	View facing south from US 95
KOP #4	View facing southeast from Big Dune Recreation Area
KOP #5	View facing west from Valley View Estates
KOP #6	View facing east-northeast from Amargosa Farm Road

Table 3-40 Key Observation Points	
KOP #	**Description**
KOP #7	View facing west-southwest from US 95
KOP #8	View facing west from Atomic Road
KOP #9	View facing northwest from Amargosa Farm Road
KOP #10	View facing north-northwest from NV 373
KOP #11	View facing west from SR 160
KOP #12	View facing northwest from Crystal Springs boardwalk at Ash Meadows NWR
KOP #13	View facing north-northwest from NV 373/CA 127 at Death Valley Junction, CA
KOP #14	View facing east-southeast from Rhyolite Cemetery near Beatty, NV
KOP #15	View facing south from Funeral Mountain Wilderness Area
KOP #16	View facing west from Sandy Lane (Scenic Quality Contrast Worksheet)

3.12.4.1 Project Specific Distance Zones and Visibility

Distance zones represent the relative visibility of a given landscape from sensitive viewing locations or KOPs.In the context of impact assessment, the BLM's established distance zones were used as the framework to establish Project specific distance zones appropriate for impact assessment which is further discussed in Section 4.12.

Visibility relates to the physical elements of the landscape and / or viewing locations that effect how the Project area is currently viewed. Visibility typically includes, but is not limited to; viewing position, screening (i.e., vegetation, topography, and existing municipal structures), and backdropping and/or skylining. Viewing position could range from superior, where the viewer is looking down at the Project area, to inferior, where the viewer is looking up at the Project area.

Screening is described as minimally, partially, and completely screened, and pertains to elements such as vegetation and topography that inhibit the visibility of the Project area. Landscape features can also can be skylined or backdropped by adjacent terrain, vegetation, or structures. When a landscape feature is backdropped, the color, texture, and form of the feature are subdued, thus reducing visibility. When a landscape feature is skylined, portions of it will appear above the horizon line and would be seen in the context with typically blue sky.

Table 3-41 Sensitive Viewers and Viewer Sensitivity Analysis

		Sensitivity					Visibility		
		Use Volume	**Viewing Duration**	**Aesthetic Concern**	**Scenic/ Historic**	**Overall Sensitivity**	**Screening**	**Comments**	**KOP**
Travel Routes									
U.S. Highway	US 95	High	Short	Moderate		Moderate	Partial (vegetation, topography)		Yes (2)
State Routes	State Route (NV) 374	Low	Moderate	Moderate		Moderate	Minimal to partial (topography, vegetation)		No
	NV 373	Moderate	Moderate	Moderate		Moderate	Yes (topography, vegetation)		Yes
	CA 127	Low	Moderate	Moderate		Moderate	Yes (topography, vegetation)		No
	State Route 160	Moderate	Short	Moderate		Moderate	Partial (topography, vegetation)		Yes
	Lathrop Wells Rest Area	Moderate	Moderate	Moderate		Moderate	Minimal to partial (topography, development)		Yes
Local Access Routes	Amargosa Farm Road	Moderate	Long	Moderate		Moderate	Minimal		Yes (2)
	Sandy Lane	Low	Long	Moderate		Moderate	Minimal		No
	Valley View Boulevard	Moderate	Long	Moderate		Moderate	Minimal		No
	Williamson Road	Moderate	Long	Moderate		Moderate	Partial (vegetation)		No
	Atomic Road	Moderate	Long	Moderate		Moderate	Partial (vegetation)		No

Table 3-41 Sensitive Viewers and Viewer Sensitivity Analysis

		Sensitivity					Visibility		
		Use Volume	**Viewing Duration**	**Aesthetic Concern**	**Scenic/ Historic**	**Overall Sensitivity**	**Screening**	**Comments**	**KOP**
	Barnett Street	Moderate	Long	Moderate		Moderate	Partial (vegetation)		No
	Frontier Road	Moderate	Long	Moderate		Moderate	Partial (vegetation)		No
	Senior Center Road	Moderate	Long	Moderate		Moderate	Partial (vegetation)		No
Recreation									
	Ash Meadows NWR – Visitor Center	Moderate	Moderate	High		High	Minimal to complete (topography, vegetation)		No
	Ash Meadows NWR – Crystal Springs Boardwalk Trail	Moderate	Moderate	High		High	Minimal to complete (topography, vegetation)		Yes
	Ash Meadows NWR – Crystal Reservoir boat launch	Moderate	Moderate	High		High	Minimal to complete (topography, vegetation)		No
	Ash Meadows NWR – Peterson Reservoir boat launch	Moderate	Moderate	High		High	Minimal to complete (topography, vegetation)		No
	Ash Meadows NWR – Devils Hole	Moderate	Moderate	High		High	Minimal to complete (topography, vegetation)		No
	Ash Meadows NWR – Point of Rocks Springs picnic area	Moderate	Moderate	High		High	Minimal to complete (topography, vegetation)		No

Table 3-41 Sensitive Viewers and Viewer Sensitivity Analysis

		Sensitivity					Visibility		
		Use Volume	**Viewing Duration**	**Aesthetic Concern**	**Scenic/ Historic**	**Overall Sensitivity**	**Screening**	**Comments**	**KOP**
	Amargosa Community Park	High	Moderate	High		High	Partial (vegetation)		No
	Amargosa River ACEC	Low	Moderate	High	Scenic	High	Complete (topography and vegetation)	No numbers for visitors, just comments on *rarely visited*	No
	Funeral Mountains Wilderness Area – unnamed hiking trails	Low	Moderate	High		High	Minimal	No numbers for visitors, just comments on *rarely visited*	Yes
	Death Valley National Park	High	Long	High	Scenic	High	Complete (topography)		No
	Death Valley National Park – Indian Pass	Low	Long	High		High	Complete (topography)		No
	Big Dune	Moderate	Long	Moderate		Moderate	Minimal to partial (topography, vegetation)		Yes
Residences									
	Amargosa Valley (east of Sandy Lane)	High	Long	High		High	Partial to Complete (vegetation)		Yes
	Amargosa Valley (downtown)	High	Long	High		High	Partial to Complete (development and vegetation)		Yes
	Dispersed Residences (west of Valley View Boulevard)	High	Long	High		High	Minimal to complete (topography, vegetation)		Yes

Table 3-41 Sensitive Viewers and Viewer Sensitivity Analysis

		Sensitivity					Visibility		
		Use Volume	**Viewing Duration**	**Aesthetic Concern**	**Scenic/ Historic**	**Overall Sensitivity**	**Screening**	**Comments**	**KOP**
	Dispersed Residences (south of Amargosa Farm Road)	High	Long	High		High	Complete (topography, vegetation)		No
	Death Valley Junction	High	Long	High		High	Complete (topography)		Yes
Community Facilities									
	Amargosa Senior Center	Moderate	Moderate	Moderate		Moderate	Partial (vegetation)		No
	Amargosa Valley School and Community Center	Moderate	Moderate	Moderate		Moderate	Partial (vegetation)		No
	AVIA Community Center/Amargosa Raceway	Moderate	Moderate	Moderate		Moderate	Partial to Complete (development and vegetation)		No
Historical									
	Tom Kelly Bottle House, Rhyolite	Moderate	Moderate	Moderate	Historic	Moderate	Complete (topography)	Only official SHPO Property in Rhyolite	No
	Rhyolite cemetery	Moderate	Moderate	Moderate		Moderate	Minimal to Complete (topography, vegetation)		Yes

3.12.5 Inventory Results

Scenic Quality

The Project area is sited on terrain and vegetation characterized by flat to slightly rolling plains, with minimal vegetative diversity associated with creosote flats. Based on scenic quality inventory data provided by the BLM (see Figure 3-20), the Project area is characterized as Class C scenery. The natural character of the setting has been modified by cultural modifications including transmission lines, access roads and structures associated with the Town of Amargosa Valley. The majority of the visual ROI is also associated with Class C scenery extending east to west from the Rock Valley Wash to the Amargosa River and north to south from US 95 to the Nevada/California border. Although not directly affected by the Project, Class B lands exist within the ROI and are associated with the mountain ranges characteristic of the Basin and Range.

Distance Zones

The Project is located approximately five miles south of US 95, approximately 4 miles west of NV 373, and ranging from 800 feet thru 5 miles from Amargosa Valley residents. Based on distance zone data provided by the BLM, the Project area is within the foreground/middleground Distance Zone.

Sensitivity Level Rating Units

The Project area was designated by the BLM as a Low Sensitivity Level. VRI data is available at the Southern Nevada District Office for the public to review.

Visual Resource Inventory Class

As previously stated, VRIC is a combination of Scenic Quality (Class C) , Distance Zones (foreground/middleground), and Sensitivity Levels (Low). The Project area is located within a Class IV VRIC.

Visual Resource Management Class

The proposed Project would be located on BLM designated VRM Class IV land. The management objective for Class IV lands is, "*To provide for management activities which require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. These management activities may dominate the view and be the major focus of viewer attention. However, every attempt should be made to minimize the impact of these activities through careful location, minimal disturbance, and repeating the basic elements*" (BLM VRM Manual 8410-1 VRI).

3.12.5.2 Cultural Modifications

- Cultural modifications that have modified natural landscape character were inventoried within the APVE using aerial photography and were field verified and include: Transmission/Distribution lines – electrical utility structures
- Industrial facilities – farm and ranching related facilities, mining
- Highways – paved with two or more traffic lanes and a median
- Primitive roads – regularly maintained dirt/gravel or unimproved roads
- Residences – Armargosa Valley residences and dispersed residences
- Community Facilities – local schools, community centers, churches

3.12.5.3 Nighttime Lighting

Existing or potential sources of nighttime light in the ROI include the residences of Amargosa Valley and several industrial or commercial operations, including mining facilities, commercial businesses on US 95, and agricultural facilities. Another source of lighting is the traffic along US 95. Las Vegas is a potential source of skyglow (i.e., nighttime light) in the region and is approximately 80 miles from Amargosa Valley.

3.12.5.4 Sensitive Viewers

Sensitive viewers within the 15-mile APVE and 50-mile ROI were initially identified as potential sensitive viewers. Sensitive viewers that were visually separated (screened) by topography and/or vegetation from the proposed Project were determined to have no effect and were documented as such. Refer to Table 3-41 for inventoried sensitive viewers.

Travel Routes

U.S. Highways – Travelers on these highways typically have moderate sensitivity and are typically focused on commuting to a destination with moderate concern of aesthetics.

- **US 95 (KOP 3, KOP 7)** – This eligible scenic corridor is a major regional transportation highway for local travelers between Las Vegas and Beatty, and a major connector route from Las Vegas and the Reno area that eventually connects to California. Travelers along this route typically are focused on utility over aesthetics and would have a short viewing duration of the Project in the background to middleground distance zone. The proposed Project would be back-dropped by the northeastern edge of the Funeral Mountains (Death Valley National Park) to the southwest, and partially backdropped by the Resting Spring Mountain Range to the southeast for east-bound travelers (KOP 3) and by the Funeral Mountains for west-bound travelers.

State Routes – These routes typically have travelers with moderate sensitivity with a moderate concern for aesthetics. Travelers on these routes are more frequent (local) travelers with a concern for shorter trips (commute) to their destinations over aesthetics.

- **NV 373 (KOP 10) –** This local travel route is used primarily by residential travelers and travelers to local community facilities. NV 373 is a primary travel route to Ash Meadows NWR and an alternate route to Death Valley National Park. The proposed Project would be in the middleground with partial screening due to vegetation and slight rolling topography from a level viewpoint. Travelers would typically travel at a moderate rate of speed connecting to local residences and local commercial facilities (e.g., convenient stores, casino, bank).

- **NV 160 (KOP 11) –** This regional travel route is used primarily by local commuters to and from Pahrump and the small community of Crystal and US 95. Travelers along NV 160 are typically traveling at a moderate rate of speed, although the road is an alternate travel route for recreational visitors to Death Valley National Parkand Humboldt-Toiyabe National Forest. The proposed Project would be located in the background distance zone (more than 15 miles) and backdropped by the Funeral Mountains. Some sections of NV 160 provides a superior view of Amargosa Valley.

- **CA 127 (KOP 13) –** This travel route is a continuation of NV 373 into California. CA 127 is primarily for travelers to Death Valley Junction; an alternate connection to Pahrump, Nevada and Death Valley National Park from Nevada; and a primary travel route to Ash Meadows NWR from California. The Project would be in the background with partial screening due to vegetation and slight rolling topography from a level viewpoint.

- **NV 374 (KOP 14) –** This travel route is used primarily by recreation travelers between Beatty and Death Valley National Park. Travelers along this route typically travel at a moderate rate of speed with a higher concern for aesthetics. The proposed Project would be visible in the background distance zone (more than 15 miles) from a superior viewing position.

- **Lathrop Wells Rest Park (KOP 2) –** Lathrop Wells Rest Park is an NDOT rest area for travelers along US 95. Visitors to the rest area would have short duration, level, and partially screened background views of the Project.

Local Access Routes – These routes typically have travelers with moderate sensitivity based on a moderate concern for aesthetics and moderate viewing durations due to local speed limits and local commuter routes. These routes provide direct access to local destinations such as commercial, agricultural, and residential areas that are frequented daily.

- **Sandy Lane –** This local street is adjacent to the Project site along the eastern boundary. Travelers would have the proposed Project in the foreground with no screening and a level vantage point.

- **Amargosa Farm Road (KOP 6, KOP 9) –** This local connector road is adjacent to the Project site along the southern boundary. Travelers heading east-bound would view the Project in the foreground distance zone with no screening and a level vantage point (KOP 6). West-bound travelers (KOP 9) will have level, partially screened to unobstructed foreground views of the Project. The realignment of Amargosa Farm Road

is part of the proposed Project which would result in direct, unobstructed views of the solar facility on the north side of the future road.

- **Valley View Boulevard** – This road is a primary travel route for residences and local travelers that connects US 95 to the Amargosa Valley community. The first mile off of US 95 is an alternate travel route to Big Dune recreation area with the primary entrance to Big Dune off of US 95, approximately 5 miles northwest of Valley View Boulevard. Travelers along Valley View Boulevard would have level views of the proposed Project in the middleground to foreground distance zone as one travels south. The potential for skylining would be greater for travelers along Valley View Boulevard than any other viewer in the ROI.

Recreation Areas

These areas typically have visitors (viewers) with primarily high sensitivity to landscape change based on their expectation for high quality landscapes and long viewing durations. For some recreation viewers, aesthetics are second to the actual recreation activity, such as target shooting or OHV activities.

- **Ash Meadows NWR (KOP 12)** includes recreation travel routes, trails, and trailheads, as well as wilderness and wildlife viewing opportunities. Due to a high concern for aesthetics and wildlife viewing and concern for solitude, viewer sensitivity would be high. Users would have level to slightly inferior views of the proposed Project in the background distance zone. However, the potential for direct unobscured views is low due to topography and vegetation. Death Valley National Park manages Devils Hole, a 40-acre site within Ash Meadows. Distant views of the proposed Project from Devils Hole would be completely screened by topography.

- **Death Valley National Park** is a major tourist destination drawing approximately 1 million visitors (viewers) per year. Visitors to all formalized trailheads, in-park travel routes, visitor centers, and campgrounds/picnic areas will not have views of the proposed Project because the topography of the Funeral Mountains physically separates formal recreation areas with the park and Amargosa Valley.

- **Big Dune (KOP 4)** – Big Dune recreation area is an area of approximately 1,000 acres consisting of natural sand dunes on BLM land that is easily accessible to the public. The primary recreation is OHV use on informal trails throughout the recreation area. OHV users typically focus their attention on their immediate surroundings, typically decreasing their overall concern/expectations for aesthetics. These moderate sensitivity viewers would view the Project in the middleground for short durations. In addition to OHV activities, Big Dune offers primitive camping, including recreational vehicle camping.

- **Funeral Mountains Wilderness (KOP 15)** – The wilderness located approximately 10.5 miles south of the Project area offers dispersed recreation within the wilderness area and non-vehicular access to Death Valley National Park. The Funeral Mountain Wilderness is closed to vehicular traffic, but is open to non-vehicular pedestrian traffic who would have a superior, background view of the proposed Project. Several unnamed

trails are oriented north-south in the narrow valleys between mountains and offers views of the Amargosa Valley (KOP 15). Visitors to Funeral Mountain Wilderness are anticipated to have moderate to long viewing durations and a high concern for aesthetics.

- **Amargosa River ACEC** – Three distinct units comprise the Amargosa River ACEC, with the nearest unit being the Upper Amargosa Mesquite Bosque Unit – a 2,720-acre site west of CA 127 and south of the Nevada/California state line. The ACEC is situated around the Amargosa River and is located 8 miles south of the Project area. The proposed Project would not be seen from the Upper Amargosa Mesquite Bosque Unit. The Upper Amargosa Mesquite Bosque Unit was established primarily as a unit of the Amargosa River ACEC due to its recreation value and the natural setting "provides opportunities for activities such as sightseeing, bird and wildlife viewing, photography, and solitude." The Upper unit visitors would not have views of the Project area due to topography and vegetation.

Residences

Each grouping of residences listed below are anticipated to have a high sensitivity based on a long viewing duration, and heightened concern for aesthetics or changes in the landscape. Development within Amargosa Valley can be characterized as low density (1-acre lots and larger). All residences are located within the Amargosa Valley in which the proposed Project would be located and all have level viewing positions. A large number of residences immediately adjacent to the Project area have dense and mature vegetation borders around their respective properties, which tend to screen views toward the Project area. The majority of the vegetation screening is Salt Cedar, an evergreen invasive tree that is known for its size and dense foliage.

- **Valley View Estates (KOP 5)** – Residential viewers in Valley View Estates and along the western side of Valley View Boulevard are typically more dispersed and would view the proposed Project in the foreground. Two partially constructed houses along Frontier Road between Valley View Boulevard and the Project site have no vegetative screening and would have level, unobstructed foreground views of the Project.

- **Residents along Sandy Lane (KOP 1)** would have direct, unobstructed foreground views of the proposed Project from a level viewing position. However, for some viewers, mature vegetation partially screens views toward the Project area. The residential units of Sandy Lane would be within 50 feet of the Project right-of-way and 700 feet of the proposed Project facilities.

- **Residences east of Sandy Lane (KOP 8 representational of these residences)** – Residential viewers in Amargosa Valley east of the Project site would have foreground, unobstructed to completely screened views of the Project, respectively. A large number of residences in this area have mature vegetation that follow property lines in a straight, linear fashion which provides screening of the Project area.

- **Residences south of Amargosa Farm Road** – Residences south of the Project area are dispersed and are typically located within farming complexes. Residences in this area

would have level, foreground to middleground partially to fully screened views of the proposed Project.

Community Facilities

- **Amargosa Valley School and adjacent Community Center** – Providing services to local residents, these facilities are level with the proposed Project and are generally surrounded by vegetation and residential structures. Views of the proposed Project would therefore be partially to fully screened and in the foreground of viewers using these facilities. Sensitivity to landscape change is typically moderate because views are largely focused inward and the facilities themselves occur with a modified rural- to suburban setting.

- **Community Park, Amargosa Senior Center, and AVIA Community Center** – These facilities offer local residents recreational and social opportunities, with the park having outdoor recreational opportunities. The community park and Senior Center have vegetative screening along the western boundary of their respective properties, partially screening foreground views of the proposed Project. Viewers from the AVIA Community Center would have foreground to middleground views of the proposed Project, partially screened by residences and their associated vegetation closer to the Project area. Sensitivity is anticipated to be moderate for viewers using these facilities.

Historic Features

- Rhyolite is a historic Ghost Town and associated cemetery with no commercial business or occupied residences. The cemetery (KOP 14) is located approximately 25 miles northwest from the Project area with potential views in the background. Visitors to Rhyolite are typically there for a short duration as most are passers-thru to other destinations. Viewers would have superior views with short to moderate time durations. Due to topography between the Project site and Rhyolite, the majority of the ghost town, including Tom Kelly Bottle House (the only SHPO listed property in Rhyolite) is completely screened by Ladd Mountain. For the remaining properties not screened by Ladd Mountain, rolling topography as well as atmospheric conditions due to the distance from the Project reduces the potential visibility of the proposed Project.

3.13 HUMAN HEALTH AND SAFETY/HAZARDOUS MATERIALS

Certain chemicals and materials to be used during the construction and operational phases of the proposed Project are characterized as hazardous materials. In addition, construction and operational activities would generate certain hazardous and non-hazardous solid waste streams. This section discusses existing conditions in the Project area relevant to hazardous materials and hazardous and non-hazardous waste. Regulations that would govern the management of these materials and waste during construction and operation are described. The types of materials to be used or types of waste generated during construction and operations, and the potential impact on the human environment are described in Chapter 4.

3.13.1 Affected Environment

A consideration for health and safety/hazardous materials analyses is the proximity of residential and other sensitive receptors, such as schools, daycare centers, emergency response facilities, and long-term care facilities. The nearest sensitive receptor is the area surrounding the Amargosa Community Complex, which is located approximately 0.5 mile east of the proposed Project site and adjacent to the community center, town offices, the emergency services center, sheriff's substation, a town library, the health clinic, and the Amargosa Valley School. The Amargosa Valley Community Complex also includes a residential area between Sandy Lane and Williamson Road. Several homesteads are located west of Valley View Boulevard, approximately 0.5 mile west of the proposed Project site. The area north and south of the Project site is primarily undisturbed desert land.

The general population may include sensitive subgroups that may be at greater risk from exposure to emitted pollutants. These sensitive subgroups include the very young, the elderly, and those with existing illnesses. In addition, the location of the population in the area surrounding the Project site may have a large bearing on health risk. The potential impact on sensitive receptors from construction and operation of the proposed Project is described in Chapter 4.13.

3.13.2 Potential Hazardous Wastes, Contaminated Soils/Groundwater

There is potential for the Project site to have some level of contamination due to prior land uses or from surrounding land uses. Examples of past and current land uses that could have resulted in unknown contamination include the following:

- Rural residences and farms that commonly have old or inactive underground storage tanks
- Pesticide-polluted runoff from agricultural properties
- Commercial and industrial sites (historic and current) that could have soil or groundwater contamination from unreported hazardous substance spills

The importance of disclosing information about potentially hazardous sites is to protect worker health and safety and to minimize public exposure to hazardous materials during construction and waste handling. If encountered, contaminated soil may qualify as hazardous waste, thus requiring handling and disposal according to local, state, and federal regulations.

Table 3-42 lists potential contaminant sources within 2 miles of the Project site. This information was obtained from the Wellhead Protection Plan for Nye County Operated Systems in Amargosa Valley (2006).

Table 3-42 Inventory of Potential Contaminant Sources Within 2 Miles of the Project Area		
Facility ID	**Risk**	**Comments**
Substations	A – high	Electrical Substation
Storage Facility Exchange	A, C – high	Heavy equipment, trailers, tanks, railroad freight car line
Turquoise ST PSP	A,C – high	PSP, construction vehicles, heavy equipment
Avia Community Center	A,C – high	Cinder block building, shelter, asphalt parking
Amargosa Raceway Park	B – mod	Sand drag, baseball field, playground, asphalt parking
Amargosa Desert Memorial Cemetery	D – mod	Cemetery, decaying corpses
Amargosa Valley Volunteer Fire Department	A,C, D – mod	Multiple buildings, parking lot, ambulance, fire, sheriff
Amargosa Valley Medical Center	D – low	Medical care facility, parking lot
Amargosa Valley Library	B, C – mod	Library, Community Environmental Monitoring Program Station
Amargosa Valley Community Center	A, C – mod	Large building
Amargosa Valley Maint. Facility	A, C – high	Equipment storage yard
Amargosa Elementary School	B, C – mod	School building, parking lot
Amargosa Valley Park Ballfield	B, C – high	Park and ball field, maintenance building
Farm Equipment Storage Unused	A, C – high	Scrap pile for old and used farm equipment
PSP Property 514 Farm Rd.	A, C – high	Drums, cars, tractor, metal shed
Amargosa Valley Country Store	A, B, C – mod	Local general store, aboveground storage tank
Church of Amargosa	B – mod	Church building, parking lot, playground
Heavy equipment dumpsite	A, C – high	Construction site, water tanks, fuel trucks
Irrigated field NW Corner	B – mod	Irrigated field
Irrigated field SE Corner	B – mod	Irrigated field with some scrap vehicles
LG Pine Nursery Irrigated Field	B, C – high	Nursery, irrigated field
VEA Substation	A – high	Switching Station
West Anvil Agricultural. Pump Fuel Tank	A – high	Irrigated field, water pump, fuel tanks
West Anvil Farm Equipment Storage	A, B, C – high	Farm equipment storage, old trucks, farm equipment, metal building
Irrigated Field Equipment Storage	B – mod	Old mobile homes, rusty car, 55 gallon drum, semi trailer
Antenna Array Prop. 858	A, B, C – high	Antenna array, fuel tank, sheet metal shed, vehicles
Industrial Building	A, B, C – high	Aboveground storage tank, mobile homes, buildings

Table 3-42 Inventory of Potential Contaminant Sources Within 2 Miles of the Project Area		
Facility ID	**Risk**	**Comments**
Funeral Mountain Ranch	B – high	Hay and straw farm, above ground diesel tanks, used vehicles, farm equipment, junk
Private Farm Fuel Tanks	A – high	Farm homesite, farm equipment, horses, fuel tanks
Corral with a two-story Shed	A, C – low	Sheds
Commercial Building	A, B, C – high	Metal building, containers
A = volatile organic compounds, B = synthetic organic compounds, C = inorganic compounds, D = microbiological		

3.13.3 Regulatory Framework

3.13.3.1 Hazardous Materials

Use, storage, and disposal of hazardous materials are regulated by numerous local, state, and federal laws. Table 3-43 summarizes regulations applicable to storage and use of hazardous materials.

Table 3-43 Summary of Applicable Regulations for the Use, Storage, and Disposal of Hazardous Materials	
Regulation	**Requirements/Applicability**
CERCLA or Superfund, as amended by the Superfund Amendments and Reauthorization Act of 1986 (SARA): 42 USC § 9601 et seq. Title 40 CFR Part 302	Requires notification to various agencies when there is a release of hazardous substances from a facility.
Emergency Planning and Community Right to Know Act of 1986 (EPCRA), commonly known as SARA Title III: 42 USC § 11001 et seq.; Title 40 CFR Parts 350, 355 370, and 372	Requires inventory reporting, planning, and reporting for storage and release of hazardous and acutely hazardous materials.
EPCRA, § 302 (Pub. L. 99–499), 42 USC 11022	Requires agency notification if extremely hazardous substances are stored in excess of Threshold Planning Quantities.
EPCRA, § 311, (Pub. L. 99–499, 42 USC 11021)	Requires that either material data safety sheets for all hazardous materials or a list of all hazardous materials be submitted to Nevada Emergency Response Commission and local fire department.
EPCRA, § 313, (Pub. L. 99–499, 42 USC 11023)	Requires annual reporting of releases of hazardous materials.
OSHA 29 USC Section 651 et seq., Title 29 CFR Part 1910 Safety and Health Regulations for Construction: Title 29 CFR Part 1926	Specifies standards for hazardous materials storage, handling, and worker protection in emergencies.

Table 3-43 Summary of Applicable Regulations for the Use, Storage, and Disposal of Hazardous Materials	
Regulation	**Requirements/Applicability**
Oil Pollution Prevention: Title 40 CFR Part 112	Requires the preparation of a SPCC Plan if storage capacity exceeds certain volumes, and should there be a reasonable possibility that the tank(s) may discharge oil into navigable waters of the United States.
Hazardous Materials Transportation §§ 49 CFR 171-172	Requires transporters of hazardous materials to properly label, manifest, package, and ship hazardous materials.
Chemical Accident Prevention Provisions, Title 40 CFR Part 68	Requires the preparation of a Risk Management Plan if certain listed toxic or flammable substances are used in excess of the listed threshold quantity.
Chemical Facility Antiterrorism Standard (CFATS), 6 CFR Part 27	Requires facilities that possess any "chemicals of interest" above threshold quantities must register and provide specified information to the Department of Homeland Security.
Hazard Communication (HAZCOM) Program 29 CFR § 1910.1200 Safety and Health for Construction 29 CFR § 1926.1 et seq	Requires employers to implement HAZCOM Standard that gives workers the right to know the hazards and identities of chemicals in their workplaces (29 CFR 1910.1200) Requires written procedures and personnel protective equipment for employees working with hazardous materials.

Comprehensive Environmental Response, Compensation, and Liability Act, 42 USC Section 9601 et seq.; Title 40 CFR Part 302. CERCLA (also known as Superfund) prescribes that the National Response Center be notified for any release of a reportable quantity of a hazardous substance (42 USC Section 9603); describes notification requirements for any potentially injured parties in connection with any such release (42 USC Section 9611(g)); and sets forth requirements for demonstration of financial responsibility in connection with the storage of hazardous substances (42 USC Section 9608(b)).

Superfund regulations define "hazardous substance" as any material appearing on lists referenced in Section 101, 42 USC Section 9601(14). The EPA's regulation, at Title 40 CFR Section 302.4, sets forth the list of hazardous substances under CERCLA and the reportable quantities for each.

Emergency Planning and Community Right to Know Act of 1986, 42 USC Section 11001 et seq.; Title 40 CFR Parts 350, 355, 370, and 372. The EPCRA is a stand-alone law passed in 1986 as part of the SARA, and is known as SARA Title III. Its purpose is to encourage and support emergency planning efforts at the state and local levels, and to provide the public and local governments with information to react to hazardous materials emergencies, as well as providing access to information about hazardous materials to the public.

The EPCRA requires each state to have a State Emergency Response Commission (SERC). The Nevada SERC is established by NRS 459.738. The SERC designates planning districts within the state and appoints Local Emergency Planning Committees (LEPC) to coordinate the

activities of each planning district. The SERC has designated each county as a planning district, and each county has designed the LEPC with the approval of the SERC.

EPCRA specifies what kinds of chemical releases and quantities require notification, to whom reports and notification are required to go to, and establishes threshold planning quantities. The provisions of EPCRA require industries to comply with reports of storage, manufacture, and releases to specific agencies. Along with these reporting requirements, fees required by NAC 459.9918, 459.99181, and 459.99182, and NRS 459.744 are collected and granted to state and local agencies to provide assistance in planning, training, and equipment activities to prevent, respond to, and mitigate hazardous materials incidents.

Occupational Safety and Health Standards, 29 USC Section 651 et seq.; Title 29 CFR Part 1910 and Safety and Health Regulations for Construction, Title 29 CFR Part 1926. These standards require employee training, PPE, safety equipment, and written procedures, programs, and plans for ensuring worker safety when working with hazardous materials or in hazardous work environments. Although intended primarily to protect worker health and safety, these requirements affect general facility safety. To comply with these requirements, the Project will prepare and implement appropriate worker health and safety plans and policies.

Oil Pollution Prevention, Title 40 CFR Part 112. The Oil Pollution Prevention regulations require the preparation of an SPCC Plan if oil is stored at the facility in excess of 1,320 gallons in aboveground storage, and should there be a reasonable possibility that the tank(s) may discharge oil into navigable waters of the United States. The SPCC regulations place restrictions on the management of petroleum materials; therefore, SPCC regulations have some bearing on hazardous materials management.

Hazardous Materials Transportation Act, 49 CFR 171-172. The Hazardous Materials Transportation Act regulates transportation of hazardous materials, and is implemented by the USDOT under 49 CFR Parts 171-179. Analogous requirements are promulgated for hazardous waste under 40 CFR Part 263 by the EPA. The Hazardous Materials Transportation Act requires chemical manufacturers and hazardous waste generators and transporters to follow certain preparation, packaging, handling, loading/off-loading, routing, emergency planning, notification, and insurance requirements.

The Hazardous Materials Transportation Act requirements supplement the RCRA requirements regarding hazardous wastes. To comply with these requirements, employees who are involved in the shipping or receiving of chemicals, or shipping parts, products, or subassemblies that could be contaminated with hazardous substances, wastes (or residue) must follow the specified procedures for packaging, labeling, and shipping of these regulated materials.

Chemical Accident Prevention Provisions, Title 40 CFR Part 68. Title 40 CFR Part 68 requires the preparation of a Risk Management Plan if certain listed toxic or flammable substances are used in excess of the listed threshold quantity. The Risk Management Plan addresses in detail the emergency plan implemented at the facility and the response actions planned by the facility in the event of a hazardous materials release. The Risk Management Plan is based on studies identifying potential hazards associated with the handling of the listed materials used at the facility.

Two chemicals listed as Chemicals of Interest in the regulation, propane and acetylene, would be used on-site. However, only propane will be stored or used on-site during construction or operation of the Project in excess of the applicable threshold quantity. A maximum of approximately 76,000 pounds of propane will be stored above the threshold of 10,000 pounds. The amount of acetylene that will be stored on-site will be well below the applicable threshold of 10,000 pounds.

Pursuant to Title 40 CFR Section 68.126, flammable substances listed in Tables 3 and 4 of Section 68.130 are excluded from all provisions of the Federal Chemical Accident Prevention regulations when said substances are used as fuel or held for sale as fuel at a retail facility. Therefore, a Risk Management Plan would not be required for the proposed Project.

Chemical Facility Antiterrorism Standard, Title 6 CFR Part 27. The CFATS of the Department of Homeland Security regulations requires that facilities that use or store certain hazardous materials in substantial quantities submit information to the Department of Homeland Security so that a vulnerability assessment can be conducted to determine what security measures should be implemented to ensure facility security. The administering agency is the Department of Homeland Security.

The Project proposes to use two chemicals listed as Chemicals of Interest in the regulation: propane and acetylene. However, only propane will be stored or used on-site during construction or operation of the Project in excess of the applicable threshold quantity. A maximum of approximately 76,000 pounds of liquefied petroleum gas (LPG) (principally propane) will be stored and present in each of the two power generation units on the Project site; this is above the threshold of 60,000 pounds. The amount of acetylene that will be stored on-site will be well below the applicable threshold of 10,000 pounds. The CFATS will apply to the Project for propane.

3.13.3.2 Wastes, Hazardous and Regulated Non-Hazardous Solid Waste

The laws and regulations applicable to hazardous wastes and regulated, non-hazardous solid wastes that would be generated at the proposed Project facility are summarized in Table 3-44.

Table 3-44 Summary of Regulations Applicable to Hazardous and Non-Hazardous Wastes

Regulation	Requirements/Applicability	Administering Agency
Federal		
RCRA 42 USC s/s 6901 et. Seq. (1976) 40 CFR Part 260, 261, 262 Hazardous Waste Management applicable to Generators	Requires hazardous waste generators to obtain an EPA Identification number and annually register with the NDEP to accumulate and store hazardous waste for no more than 90 days and ship hazardous waste under a manifest to a licensed disposal site. Requires generator to identify and profile hazardous waste, store hazardous waste in appropriate containers, label containers stored on-site and transported to disposal site, and train	EPA Region IX, NDEP

Table 3-44 Summary of Regulations Applicable to Hazardous and Non-Hazardous Wastes		
Regulation	**Requirements/Applicability**	**Administering Agency**
	operators in hazardous waste management.	
RCRA 42 USC s/s 6901 et. Seq. (1976) 40 CFR 263 Hazardous Waste Transportation, NRS 459	Requires hazardous waste generator to use registered transporters of hazardous waste that have an EPA ID number, use manifests to accompany waste shipments, and proper cleanup of any hazardous waste discharges.	EPA Region IX, NDEP, NDOT
Universal Waste 60 FR 25542, May 11, 1995, as amended at 64 FR 36488, July 6, 1999; 70 FR 45520, Aug. 5, 2005 40 CFR 273	Requires management, employee training, and proper disposal of universal waste that includes batteries, fluorescent lamps, mercury switches, and pesticides.	EPA Region IX, NDEP
Used Oil Solid Waste Disposal Act, as amended (42 USC 6905, 6912(a)), 6921 through 6927, 6930, 6934, and 6974); and CERCLA (42 USC 9601(37) and 9614(c)). 40 CFR 279 NAC Chapter 444	Requires generators of used oil to prevent spills and correctly label, store, transport, and dispose/recycle used oil.	NDEP, EPA Region IX

Resource Conservation and Recovery Act, 42 USC Section 6901 et seq. RCRA establishes requirements for the management of solid wastes (including hazardous wastes). The statute also addresses program administration, implementation and delegation to states, and enforcement provisions and responsibilities. Provisions are established for the generation, storage, treatment, and disposal of hazardous waste, including requirements addressing generator record keeping, labeling, manifests, emergency response information, training, and contingency plans.

Solid Wastes, Title 40 CFR Parts 240 – 257. These regulations were established by the EPA to implement the provisions of the Solid Waste Disposal Act. The regulations establish the criteria for classification of solid waste disposal facilities (landfills), provide operating standards for landfills, and provide storage requirements of solid wastes.

- Part 243 addresses general storage standards and recommended practices for solid wastes
- Part 246 addresses source separation for materials recovery guidelines
- Part 257 addresses the criteria for classification of solid waste disposal facilities and practices

Hazardous Wastes, Title 40 CFR Parts 260-268, 273, and 279. These regulations were established by the EPA to implement the provisions of RCRA. The regulations establish the

criteria for classification of materials as hazardous wastes, define hazardous waste generator requirements, and specify requirements for management of used oil and universal wastes.

- Parts 260 through 268 provide the basic framework for characterizing, transporting and manifesting hazardous waste, as well as the storage requirements and requirements for disposing of hazardous wastes to land
- Part 273 addresses management of hazardous universal wastes (i.e., batteries, mercury containing equipment, and lamps)
- Part 279 addresses management of used oil and universal wastes (i.e., batteries, mercury containing equipment, and lamps)
- The EPA implements the regulations at the Federal level. However, Nevada is an authorized state, and so the regulations are implemented by state agencies and authorized local agencies in lieu of the EPA.

Hazardous Materials Regulations, Title 49 CFR Parts 171–180. The USDOT has established standards for the transportation of hazardous materials and hazardous wastes. The standards include requirements for labeling, packaging, and shipping of hazardous materials and hazardous wastes, as well as training requirements for personnel completing shipping papers and manifests, vehicle placards, and security plans.

3.13.4 Spills

Title 40, CFR, Part 112 requires that any facility with aboveground storage capacity of 1,320 gallons or greater of oil design and implement a SPCC Plan. An SPCC Plan will be required for the proposed Project due to the amount of fuel to be stored onsite.

The proposed Project will be required to obtain a hazardous materials storage permit from the Nevada State Fire Marshal before any hazardous materials are stored on site in excess of the amount set forth in the International Fire Code, 2006 Edition. A list of hazardous materials stored on-site that are over the threshold will be submitted to the Nevada State Fire Marshal annually.

The EPCRA requires facilities that maintain Extremely Hazardous Substances on-site in quantities greater than corresponding Threshold Planning Quantities to cooperate in emergency plan preparation. The Proponent will cooperate in emergency plan preparation and designate a facility emergency coordinator to participate in the emergency response plan process with the LEPC. The LEPC is responsible for developing an emergency response plan for their emergency planning district, and providing information about chemicals in the community to citizens.

The National Oil and Hazardous Substances Pollution Contingency Plan, provides framework for the federal government to respond to both oil spills and hazardous substance releases. Under the plan, national and regional response teams are established to help plan, coordinate, and respond to discharges of oil or hazardous substances. The Proponent will be required to notify the National Response Center of any discharges or releases. In the event of a hazardous substance release, the National Oil and Hazardous Substances Pollution Contingency Plan authorizes the lead agency to initiate appropriate removal action. Decisions of action will be based on threats to

human or animal populations, contamination of drinking water supplies or sensitive ecosystems, high levels of hazardous substances in soils, weather conditions that may cause migration or release of hazardous substances, the threat of fire or explosion, or other significant factors affecting the health or welfare or the public or the environment.

3.13.5 Fuels and Fire Management

The Project area is located on federally managed land within Amargosa-Indian Springs; NV050-16 Wildland Urban Interface Fire Management Unit (FMU) (BLM 2004). The wildland portion of this FMU mainly consists of creosote bursage and Mojave scrub vegetation, with scattered stands of mesquite/acacia woodland (BLM 2004). The proposed project falls within an area and vegetation type where fire is uncommon according to historic BLM fire records (Oliver 2010). Between 1980 and 2003, three human/other caused fires have burned a total of 0.2 acres within the FMU (Oliver 2010).

Wildland fire protection on all BLM public lands within the FMU is provided by the BLM Southern Nevada District Office. Structural fire protection on private lands within this FMU is provided by the Amargosa Valley Volunteer Fire Department.