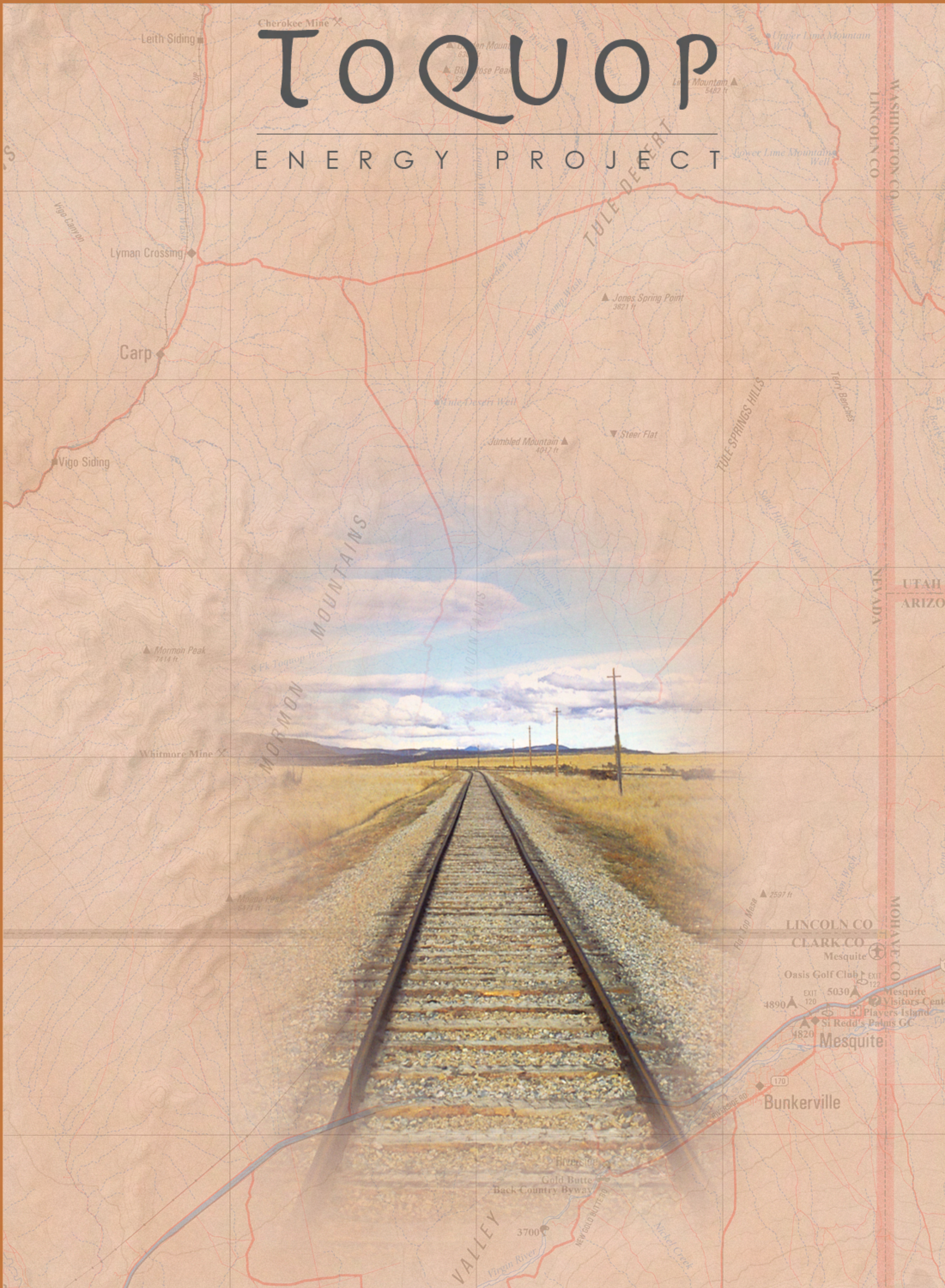
TOQUOP

ENERGY PROJECT



CHAPTER 3.0 - AFFECTED ENVIRONMENT

3.0 AFFECTED ENVIRONMENT

3.1 INTRODUCTION

This chapter characterizes the existing conditions in the project area. In accordance with the National Environmental Policy Act of 1969 (NEPA) and related statutes, the purpose of the affected environment chapter is to describe the human and natural environment that could be affected by the Proposed Action Alternative. The information provided in this chapter is intended to be of appropriate detail to provide an understanding of the general area, respond to the issues that were raised during scoping, and support and clarify the impact analysis provided in Chapter 4. Data were collected for the following resources and resource uses:

- Lands
- Livestock grazing and rangelands
- Recreation and access
- Wilderness and special management areas
- Visual resources
- Climate and air quality
- Noise
- Geology, soils, and minerals
- Groundwater resources
- Surface water resources
- Biological resources (vegetation, wildlife, and special status species)
- Wild horses and burros
- Archaeology and historic preservation
- Paleontological resources
- Public safety, hazardous materials, and solid waste
- Socioeconomic conditions
- Environmental justice

There are several resources that are not discussed because it was determined that the resource is not present in the project area and therefore would not be impacted by the alternatives. These resources include Indian Trust assets, prime and unique farmlands, paleontological resources, and wild and scenic rivers.

Maps are included to illustrate existing conditions for some resources. The maps were developed using spatial data in a geographic information system (GIS) program; the data were generated from existing sources and field survey data.

3.2 LANDS

3.2.1 Data Collection Methods

This section discusses lands and realty actions. Existing land use data were collected through analysis of aerial photography, field verification, review of existing studies and plans, and coordination with the Bureau of Land Management (BLM) Ely Field Office (Map 3-1). Land uses within the project area were mapped using existing data, and the area within 0.5 mile of the Proposed Action Alternative facilities was field-verified. Throughout this section, the area within 0.5 mile of the Proposed Action Alternative is referred to as the study area. The regional area examined for land use includes land outside the study area, but generally within 15 miles of the project (unless otherwise noted), and provides a context for land uses in the general area of the project. Ownership data were collected from the BLM Ely Field Office. Future or planned land use information was collected through review of existing plans.

3.2.2 Existing Conditions

3.2.2.1 Regional Overview

Land located within and adjacent to the study area boundaries is public land administered by the BLM Ely and Las Vegas field offices in Nevada. The study area is approximately 12 miles northwest of the city of Mesquite, 50 miles southeast of the city of Caliente, 6 miles north of the Lincoln and Clark County boundary line, 57 miles west of the city of St. George in Utah, and 10 miles west of the Nevada/Utah/Arizona border (BLM 2003a). In the study area, there are dirt roads, three collocated transmission lines, a natural gas pipeline, and communication facilities (Map 3-1).

Privately owned land located near the project area includes three narrow strips of gypsum mining in holdings near Jumbled Mountain and a few private residences located near Carp, Nevada, stretching north along the Union Pacific Railroad (UPRR) to Leith Siding (Map 3-1). Recently, the BLM sold 13,500 acres, known as Toquop Township, to private owners per appropriate laws and regulations. The parcels are located 2 miles northwest of the city of Mesquite, with the closest point to the Proposed Action Alternative located in Township 11 South, Range 69 East, Section 36, about 6 miles southeast of the power plant site.

The area has experienced little development apart from range improvements.

Along the existing railroad track, there are areas identified as towns, such as Carp, Nevada (Map 3-1). Field observations have found that these areas, although once thriving communities, are now sparsely populated.

3.2.2.2 Power Plant Site

The proposed power plant site is located within Assessor Parcel Number 08-251-01 (BLM 2003a). The Navajo-McCullough electric transmission line, Red Butte-Harry Allen electric transmission line, and the Kern River Natural Gas Transmission Company pipeline cross the southeast corner of the site (BLM 2003a). Running northwest from the site is the right-of-way (ROW) for a permitted water pipeline that would connect to a permitted well field.

No future land uses have been identified for the site. A 12.5-mile-long water pipeline permitted to deliver water to the proposed plant could be extended in the future to serve other users.

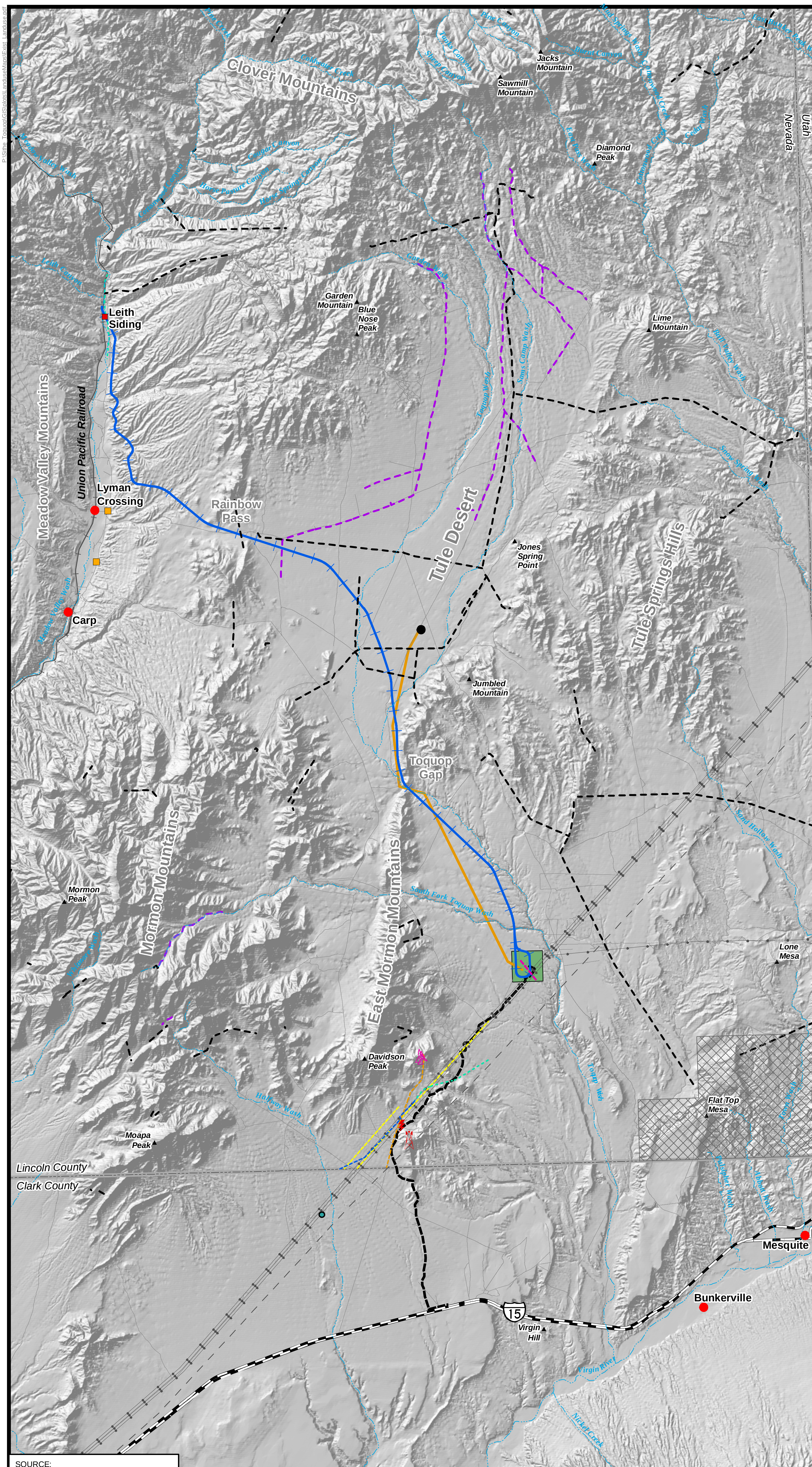
3.2.2.3 Proposed Rail Line

The portion of the existing UPRR that lies within the study area is one of the busiest sections in the country, with trains running once every 40 minutes. BLM databases indicate a town site along the proposed rail line at Leith Siding, but field verification revealed that the area is now uninhabited.

3.3 LIVESTOCK GRAZING AND RANGELANDS

3.3.1 Data Collection Methods

Existing data were collected through coordination with the BLM Ely Field Office and from the Ely Resource Management Plan (RMP)/Environmental Impact Statement (EIS) . Grazing allotments within the project area were mapped using existing data.



Existing Land Use

Toquop Energy Project EIS
Lincoln County, Nevada

LEGEND

Range Improvement

- Fence
- Pipeline

Residence

- House

Utilities

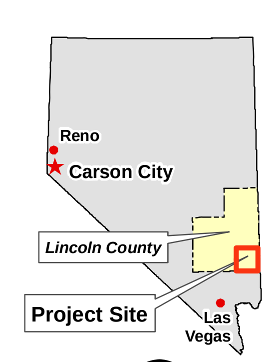
- Communication Tower
- Natural Gas Pipeline
- Powerline Building
- Radio Tower
- Pipeline Application
- Pipeline Right-of-Way
- Powerline
- Telephone Line

General Features

- Proposed Railroad Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road
- Toquop Township

Reference Features

- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest



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Map 3-1

3.3.2 Existing Conditions

3.3.2.1 Regional Overview

Most of the land in the study area is considered rangeland. The BLM administers the grazing program on public land under provisions of the Taylor Grazing Act of 1934, the Federal Land Policy Management Act of 1976, and the Public Rangelands Improvement Act of 1978. These laws direct the BLM to authorize and manage livestock grazing on public land according to the principles of multiple use and sustained yield and to prevent the degradation of rangeland resources by providing for their orderly use, improvement, and development. The BLM's livestock grazing standards were designed to improve public land health and are to be implemented at the watershed, allotment, or pasture level.

3.3.2.2 Power Plant Site

Most of the study area is actively used for grazing (Map 3-2). Authorizations to graze livestock are measured in animal unit months (AUMs), which are defined by BLM as the amount of forage needed to sustain one cow and its calf, five sheep, or five goats for a month (BLM 2005a). The study area falls within six separate grazing allotments (Map 3-2): White Rock (2,880 authorized AUMs), Garden Springs (2,809 authorized AUMs), Summit Spring (715 authorized AUMs), Snow Springs (3,567 authorized AUMs), Henrie Complex (1,373 authorized AUMs), and Gourd Spring (3,458 authorized AUMs). A boundary fence has been constructed within the Gourd Spring allotment to restrict livestock from entering the Mormon Mesa Area of Critical Environmental Concern (ACEC), which is closed to grazing to protect critical Mojave desert tortoise habitat (BLM 2003a). The Beacon allotment (no authorized AUMs) is also within the study area boundaries; however, it is closed to grazing to protect critical desert tortoise habitat. As a result of the Caliente Management Framework Plan Amendment for Management of Desert Tortoise Habitat of 2000, portions of the Henrie Complex allotment (1,373 AUMs) were closed, or had acres, AUMs, or season of use adjusted (BLM 2005a).

3.3.2.3 Proposed Rail Line

The proposed rail line would pass through four grazing allotments: Gourd Spring, Garden Springs, White Rock, and Henrie Complex. Table 3-1 illustrates the number of miles of the proposed rail line that would pass through each allotment.

Table 3-1
Length of Proposed Rail Line by Allotment

Grazing Allotment	Length (miles)
Garden Springs	1.9
White Rock	4.5
Henrie Complex	10.3
Gourd Spring	14.2

SOURCE: Bureau of Land Management 2006; URS geographic information data 2006

3.4 RECREATION AND ACCESS

3.4.1 Data Collection Methods

Data for recreation and access were obtained through analysis of aerial photography; review of existing studies, GIS data, and plans; and coordination with the BLM Ely Field Office. Distances on the existing transportation network were derived from GIS calculations. The regional area examined for recreational use includes land outside the study area but generally within 30 miles of the Proposed Action Alternative (unless otherwise noted) and provides a context for consideration of recreational uses in the general area of the project.

3.4.2 Existing Conditions

3.4.2.1 Regional Overview

The area surrounding the Proposed Action Alternative is primarily undeveloped, sparsely occupied, BLM-administered land. Land use and access patterns in the project area are influenced primarily by traditional usage (livestock grazing) and major transportation corridors.

Recreation

Traditional recreational use includes the hunting of upland game (quail, chukar, pheasant, turkey, cottontail rabbit), waterfowl, and big game (deer, bighorn sheep, mountain lion). Several wildlife water developments in the East Mormon Mountains are adjacent to the project area. Other pursuits are fur trapping (mainly bobcat) and varmint hunting (mostly coyote and jackrabbit). Angling is limited to Lower Virgin River and the Overton Arm of Lake Mead. Seasonal wildflower sighting, bird watching, hiking, off-highway vehicle (OHV) driving, and primitive camping are recreational activities commonly occurring in and on land near the project area. Throughout the vicinity of the project area there are numerous user-defined primitive campsites, including two located approximately 4 miles north of Interstate 15 (I-15) next to the permitted access road.

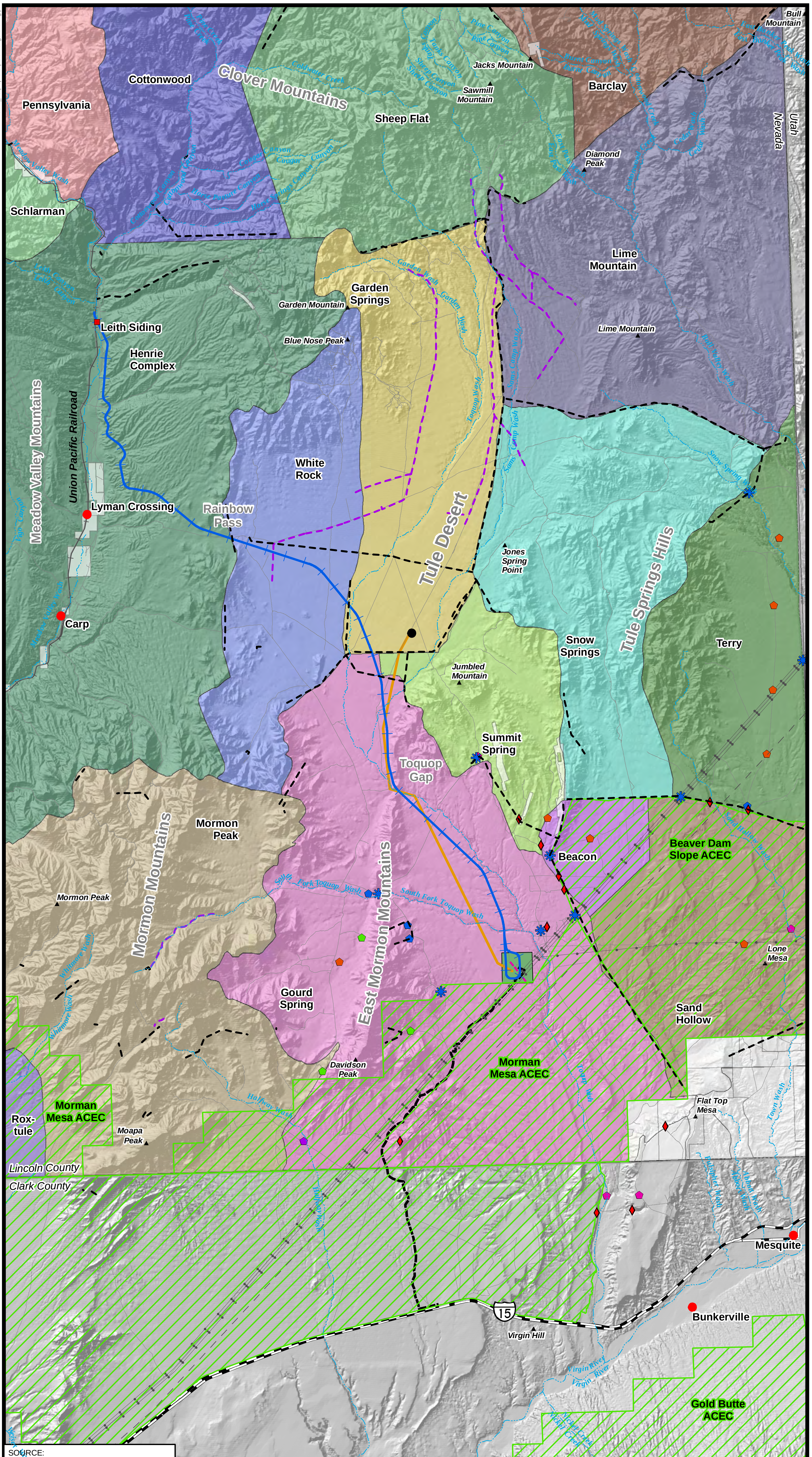
The proposed power plant site is approximately 15 miles north of the Logandale Trails system, a multiple-use motorized- and non-motorized-trails play area. The site is also 20 miles north of the area of Lake Mead's Overton Beach, which is the nearest recreation area to the project site. Lake Mead is part of the Lake Mead National Recreation Area, which encompasses Lake Mead, Lake Mojave, and both Federal and non-Federal land. Nevada state parks in the region include Kershaw-Ryan State Park and Beaver Dam State Park, both about 25 miles north of the Proposed Action Alternative. Additionally, Grant Bowler County Park is located near the Logandale Trails system. These state and county parks are located in very remote, canyon-laden areas and are popular areas for hiking and nature study.

The popularity of OHVs over the last 20 years has encouraged casual four-wheel-drive exploration of primitive and remote public lands. The Toquop Wash is used by OHV recreationists year-round and by many quail hunters in the fall. OHV use in the project area has been increasing. Several high-speed competitive OHV events have occurred in the area since the late 1970s, including small truck/car races conducted by the Silverdust Racing Association, the ACERBIS Nevada Rally for motorcycles, several Best in the Desert Racing Association truck/car/motorcycle/OHV events, and the Nevada 2000 OHV race.

In addition, backcountry areas are a popular venue for non-speed, non-competitive, street-legal, off-highway-capable, and self-guided motorcycle scenic touring. The Caliente/Tule Desert/Mormon Mountains area is used for several self-guided motorcycle scenic tours.

Access/Transportation

I-15 is the only major roadway in the project area and serves as the main north-south route connecting Las Vegas, Nevada, and Salt Lake City, Utah. I-15 is approximately 12 miles south of the proposed power plant site. In this area, the interstate is aligned southwest-northeast. The character of I-15 in the vicinity of the Proposed Action Alternative consists of a paved, divided freeway with paved shoulders, two lanes in each direction, and a posted speed limit of 75 miles per hour. Access to the project site would be from I-15 via the East Mesa Interchange (Exit 109) approximately 9 miles west of Mesquite, Nevada. Exit 109



Grazing Allotments

Toquop Energy Project EIS
Lincoln County, Nevada

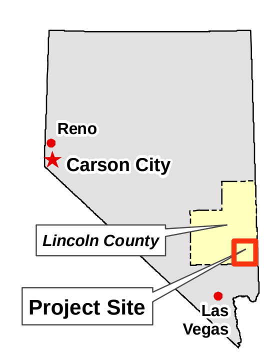
LEGEND

Range Improvements
- Corral
- Exclosure
- Other
- Small Game Guzzler
- Trough
- Cattle Guard
- Gate
- Fence
- Pipeline

Areas Unavailable to Grazing
- Private Land
- Area of Critical Enviromental Concern (ACEC)

General Features
- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road

Reference Features
- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest



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Map 3-2

is a truck rest area, paved but without facilities, that can be accessed directly from eastbound and westbound I-15. Table 3-2 lists the existing and estimated average daily traffic volumes for I-15 near the East Mesa Interchange (Exit 109) and for the East Mesa Interchange off-ramp.

Table 3-2
Existing and Estimated Average Daily Traffic Volumes on 1-15 Near the Project Area

Roadway	Average Daily Vehicle Traffic*	Average Daily Truck Traffic**
I-15 near the East Mesa Interchange (2000)	15,800	1,580
Eastbound	7,900	790
Westbound	7,900	790
I-15 near the East Mesa Interchange (2003 estimate)	18,818	1,882
Eastbound	9,409	941
Westbound	9,409	941
East Mesa Interchange off-ramp (2000)	680	68
Eastbound	280	28
Westbound	400	40
East Mesa Interchange off-ramp (2003 estimate)	810	81
Eastbound	330	33
Westbound	480	48

SOURCE: Leegard 2001
NOTES: *Calculated at 6 percent annual growth rate, based on historical traffic records
**Estimated at 10 percent of average daily vehicle traffic

Four miles of the access road from I-15 to the proposed power plant site are in good condition. The 8-mile section between a turn-off that leads to communications towers and the northern side of Toquop Wash is a graded road with many sharp turns that require slow speeds.

3.4.2.2 Power Plant Site

The proposed power plant site does not include any paved active roads and is located approximately 1 mile from the Toquop Wash area, a popular four-wheel-drive and quail hunting area. There are no developed recreational facilities within the power plant site.

3.4.2.3 Proposed Rail Line

The area of BLM-administered land that the 31-mile-long proposed rail line would occupy includes several dirt roads, mostly used for ranching purposes (refer to Map 3-2). There are approximately 11 instances where the rail line would cross existing maintained dirt roads. In some cases the rail line would cross the same existing road more than once. Some of these unmaintained or unpaved roads have surface conditions that may require the use of four-wheel-drive vehicles, due to roughness, grade, drainage crossings, or other obstructions. These roads also experience light OHV use. Apart from the light OHV use and ranching-related activities that take place on these roads, there is very little other recreational use regularly occurring in the area that the rail line would occupy. There are no paved roads that would bisect the proposed rail line.

3.5 WILDERNESS AND SPECIAL MANAGEMENT AREAS

3.5.1 Data Collection Methods

Data for wilderness and special management areas were obtained through the analysis of aerial photography; review of existing studies, GIS data, and plans; and coordination with the BLM Ely Field Office and the U.S. Forest Service (Forest Service). The existing wilderness designations were derived from GIS calculations. The regional area examined for wilderness and special management areas includes land outside the study area, but generally within 30 miles of the Proposed Action Alternative (unless otherwise noted) (Map 3-3).

3.5.2 Existing Conditions

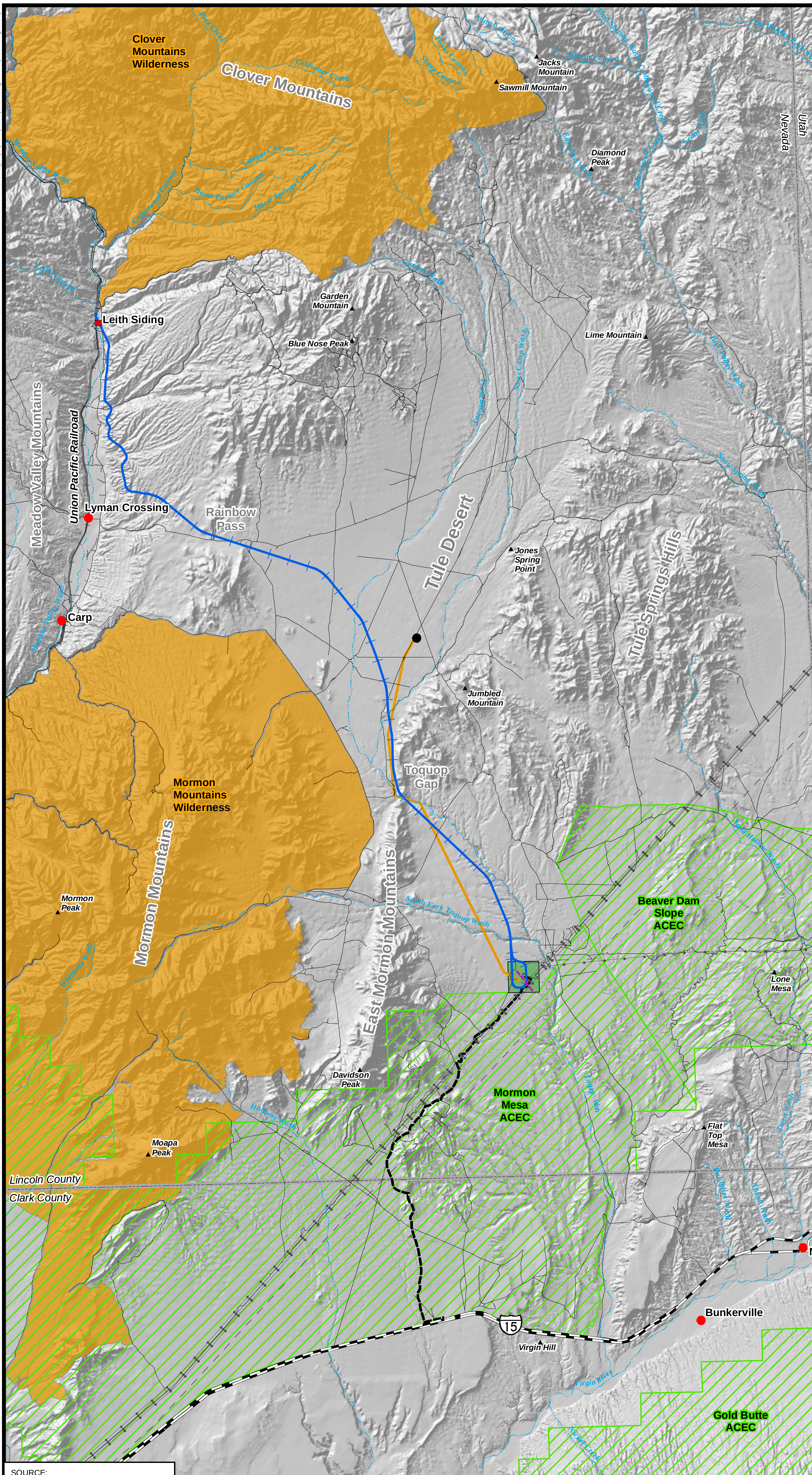
3.5.2.1 Regional Overview

Located north and west of the Proposed Action Alternative, the Mormon Mountains, Clover Mountains, and the Meadow Valley Range wildernesses were dedicated by Congress in 2004. Consequential to the Wilderness designations in 2004, there are no wilderness study areas in or immediately adjacent to the project area. The Mormon Mesa ACEC borders the proposed power plant site to the south and continues to the northern edge of I-15. This ACEC was established through BLM's land use planning process in 1998 (Clark County portion) and 1999 (Lincoln County portion) (refer to Map 3-3).

Wilderness

The Mormon Mountains Wilderness encompasses 162,866 acres and is approximately 4 miles west of the proposed power plant site. The proposed rail line comes within 1 mile of the wilderness near Toquop Gap. The wilderness provides outstanding opportunities for solitude. The rugged terrain, large size and undeveloped nature offers a natural, primitive, and solitary experience. The Mormon Mountains Wilderness includes rolling bajadas with cholla (*Cylindropuntia acanthocarpa*), yucca (*Yucca* sp.) and Joshua trees (*Yucca brevifolia*), uniquely carved canyons forested with single-leaf pinyon pine (*Pinus monophylla*) and juniper (*Juniperus osteosperma*) as well as Colorado pinyon (*Pinus edulis*) and Rocky Mountain juniper (*Juniperus scopulorum*), and jagged mountain peaks topped with isolated stands of old-growth ponderosa pine (*Pinus ponderosa*). The various climates and elevations associated with these features provide important habitat for a wide spectrum of flora and fauna. The lower elevations support habitat for the desert tortoise (*Gopherus agassizii*), Gila monster (*Heloderma suspectum*), white bear poppy (*Arctomecon merriamii*), Clark Mountain agave (*Agave utahensis* var. *nevadensis*), western banded gecko (*Coleonyx variegatus*), sidewinder (*Crotalus cerastes*), and long-nosed leopard lizard (*Gambelia wislizenii*). Animals that live higher in the mountains include desert bighorn sheep (*Ovis canadensis nelsoni*), mule deer (*Odocoileus hemionus*), bobcat (*Lynx rufus*), and mountain lion (*Puma concolor*). An impressive variety of raptors live in the area. Burrowing owl (*Athene cunicularia*), golden eagle (*Aquila chrysaetos*), ferruginous hawk (*Buteo regalis*), red-tailed hawk (*Buteo jamaicensis*), prairie falcon (*Falco mexicanus*), Cooper's hawk (*Accipiter cooperii*), northern harrier (*Circus cyaneus*), merlin (*Falco columbarius*), and American kestrel (*Falco sparverius*) are among those residing in or seasonally frequenting the Wilderness. Throughout the Mormon Mountains region are some of the most abundant and valuable prehistoric sites in Nevada (BLM 2003a).

The Clover Mountains Wilderness is located north of the proposed rail line's point of intersection with the UPRR in Leith Siding. This 85,748-acre wilderness provides opportunities for solitude in this land of rolling hills, rugged peaks, and jagged outcrops of rhyolite, twisting canyons, and perennial waters. The volcanic peaks rise more than 7,000 feet in elevation. High in the mountains live isolated stands of old-growth ponderosa pine and quaking aspen (*Populus tremuloides*). Ash (*Fraxinus* sp.), cottonwood (*Populus fremontii*), quaking aspen, and other riparian vegetation grow along Cottonwood Creek. The Tule Desert encompasses the lowest elevations in the southern portion of the wilderness, with vegetation of sagebrush (*Artemesia tridentata*), Joshua trees, and yucca. Mule deer, desert bighorn sheep, mountain lion, bobcat, badger (*Taxidea taxus*), prairie falcon, and golden eagle have been seen in the area. The Tule Desert provides important habitat for kit fox (*Vulpes macrotis*) and numerous species of reptiles. Sensitive species likely to be found in the wilderness include the pallid bat (*Antrozous pallidus*), California myotis (*Myotis californicus*), and banded Gila monster. (BLM 2003c)



Special Designation and Existing Access

Toquop Energy Project EIS
Lincoln County, Nevada

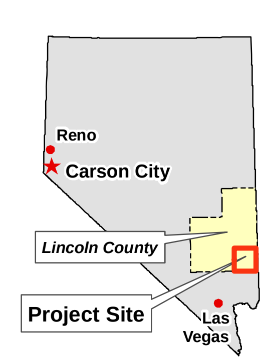
LEGEND

Special Designation
- Wilderness
- Area of Critical Environmental Concern

Existing Access
- Road

General Features
- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road

Reference Features
- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest



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Map 3-3

The third wilderness in the vicinity (approximately 30 miles) of the Proposed Action Alternative is the Meadow Valley Range Wilderness. This 123,488-acre area is due west of the Mormon Mountains Wilderness. Wildlife in the Meadow Valley Range Wilderness consists of fauna similar to that found in the Clover Mountains Wilderness. Vegetation consists of low-desert shrub with the exception of the northern section of the Meadow Valley Mountains, which is pinyon and juniper forest. It consists of three major landforms: the long ridgeline of the Meadow Valley Mountains, a large bajada beginning high on the main ridge sloping easterly toward Meadow Valley Wash, and finally Bunker Hills, 5 miles from the southern portion of the central bajada. (BLM 2003c)

Areas of Critical Environmental Concern

The Federal Land Policy and Management Act provides BLM with the authority to designate and protect resources within ACECs. An ACEC designation is the principal BLM designation for public land where special management is required to protect important natural, cultural, and scenic resources, or to identify natural hazards.

The BLM Ely Field Office identified two ACECs in its 1999 Proposed Caliente Management Framework Plan Amendment and Environmental Impact Statement for the Management of Desert Tortoise Habitat. These were the Mormon Mesa and Beaver Dam Slope ACECs. In September 2000, BLM's Nevada State Office issued the Approved Caliente Management Framework Plan Amendment and Record of Decision for the Management of Desert Tortoise Habitat. The two ACECs now complement adjoining and nearby ACECs designated for desert tortoise management by other BLM offices in Nevada, Utah, and Arizona (refer to Map 3-3). These ACECs are part of the landscape-scale management strategy intended to facilitate desert tortoise recovery. Current management direction applicable to the Proposed Action Alternative is to grant access to private parcels, Federal oil and gas leases, and mining claims based on NEPA analysis and Endangered Species Act (ESA) Section 7 consultation.

As noted in the 2003 EIS, the proposed power plant site borders the Mormon Mesa ACEC. Except for the northernmost 0.9 mile stretch, the 12.5-mile-long access road from I-15 is within this ACEC. Approximately 5 miles of the access road is in Clark County, and approximately 8 miles are within Lincoln County. BLM's Las Vegas Field Office has management jurisdiction for the Clark County portion of the Mormon Mesa ACEC, and the BLM Ely Field Office has management jurisdiction for the Lincoln County portion.

3.6 VISUAL RESOURCES

3.6.1 Data Collection Methods

This section is a description of the existing visual quality of the lands in the vicinity of the proposed coal-fired power plant and rail line. Scenic quality evaluation forms, which are part of the visual resource management (VRM) system, are used as a baseline to show the inherent aesthetics of the landscape, public value of viewing the landscape, and sensitivity to visual effects from the proposed action. The visual study analysis was conducted in compliance with BLM Visual Resource Inventory Manual 8410-1 (BLM 1986). Additional information on scenic-quality inventory criteria, scenic-quality evaluation forms and map can be found in Appendix B.

BLM is responsible for ensuring that the scenic values of public lands are considered before allowing uses that may have visual impacts. This is accomplished through its VRM system. VRM classes are established through the RMP process and objectives are established for each class. There are four VRM classes and management objectives, as follows:

- **Class I Objective**. The objective of this class is to preserve the existing character of the landscape. This class provides for natural ecological changes; however, it does not preclude very limited management activity. The level of change to the characteristic landscape should be very low and must not attract attention.
- **Class II Objective**. The objective of this class is 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 of form, line, color, and texture found in the predominantly natural features of the characteristic landscape.
- **Class III Objective**. The objective of this class is 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 dominate the view of the casual observer. Changes should repeat the basic elements found in the predominantly natural features of the characteristic landscape.
- **Class IV Objective**. The objective of this class is to provide for management activities that require major modification of the existing character of the landscape. The level of change to the characteristic landscape can be high. 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.

3.6.2 Existing Conditions

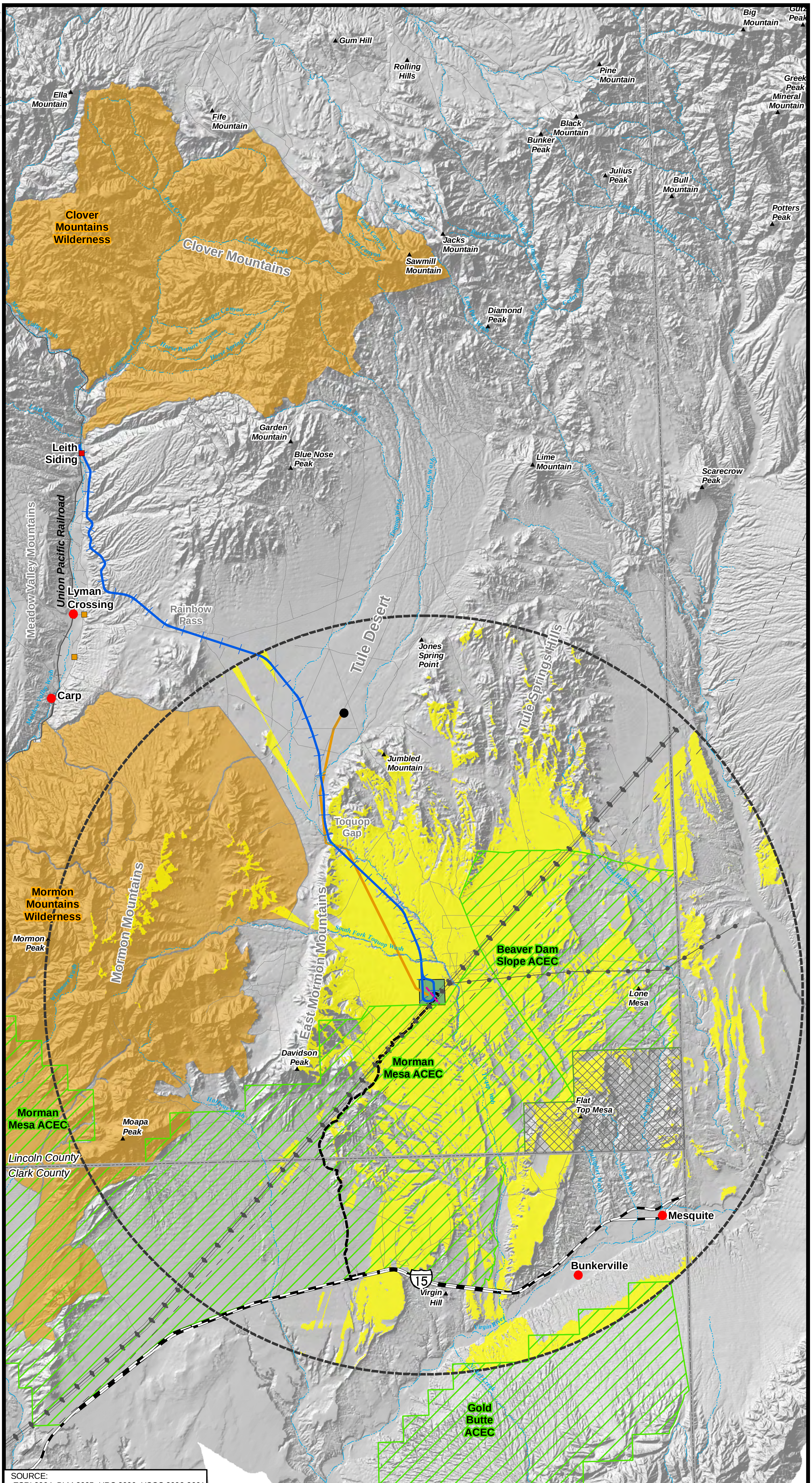
3.6.2.1 Regional Overview

The study area is located within the Basin and Range physiographic province in the southeast corner of Lincoln County, Nevada (Fenneman 1930). The topographic character of the southern portion of the Proposed Action Alternative area is flat to gently sloping hills dissected by Toquop Wash and the South Fork tributary. Seventy-five-foot-tall rock walls of the riparian canyon distinctively characterize the South Fork tributary. The East Mormon Mountains can be seen in the background to the west and the Tule Springs Hills to the north. Transmission lines cross this portion of the study area, which includes the proposed power plant site.

The middle portion of the Proposed Action Alternative, as it crosses the Tule Desert, is extremely flat. Surrounding mountains are clearly visible in all directions. The topographic character of the northern portion of the study area can be described as gently sloping hills bisected by a riparian tributary. Modifications to the area include two homes with associated outstructures to the east of Meadow Valley Wash and UPRR tracks to the west. Vegetation on surrounding hills is short and sparse.

The vegetative character of the project area is predominately Sonora-Mojave creosotebush-white bursage desertscrub dotted with Joshua trees. Riparian areas include blackband rabbit brush (*Chrysothamnus paniculatus*), desert willow, jimsonweed (*Datura wrightii)*, salt cedar (*Tamarix ramosissima*), and desert tobacco (*Nicotiana obtusifolia*). The overall area exhibits hues of tans, greens, brown-reds and grays.

The Mormon Mountains Wilderness, west and south of the Proposed Action Alternative, is visible from most locations in the project area (Map 3-4 and Map 3-5). These mountains have elevations of up to 7,300 feet; however, the East Mormon Mountains, with elevations up to 5,200 feet, would obstruct views of the power plant site from most of the Mormon Mountains. Clover Mountains Wilderness is visible from Meadow Valley Wash (refer to Map 3-5).



Views of Proposed Coal-fired Plant

Toquop Energy Project EIS
Lincoln County, Nevada

LEGEND

- Plant is Visible*
- Proposed Coal-fired Plant Visual Area of Effect
- Residence

Special Designation

- Areas of Critical Environmental Concern
- Wilderness

General Features

- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road
- Toquop Township

*Stack is 730 feet in height.

Reference Features

- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest

Reno
Carson City
Lincoln County
Project Site
Las Vegas

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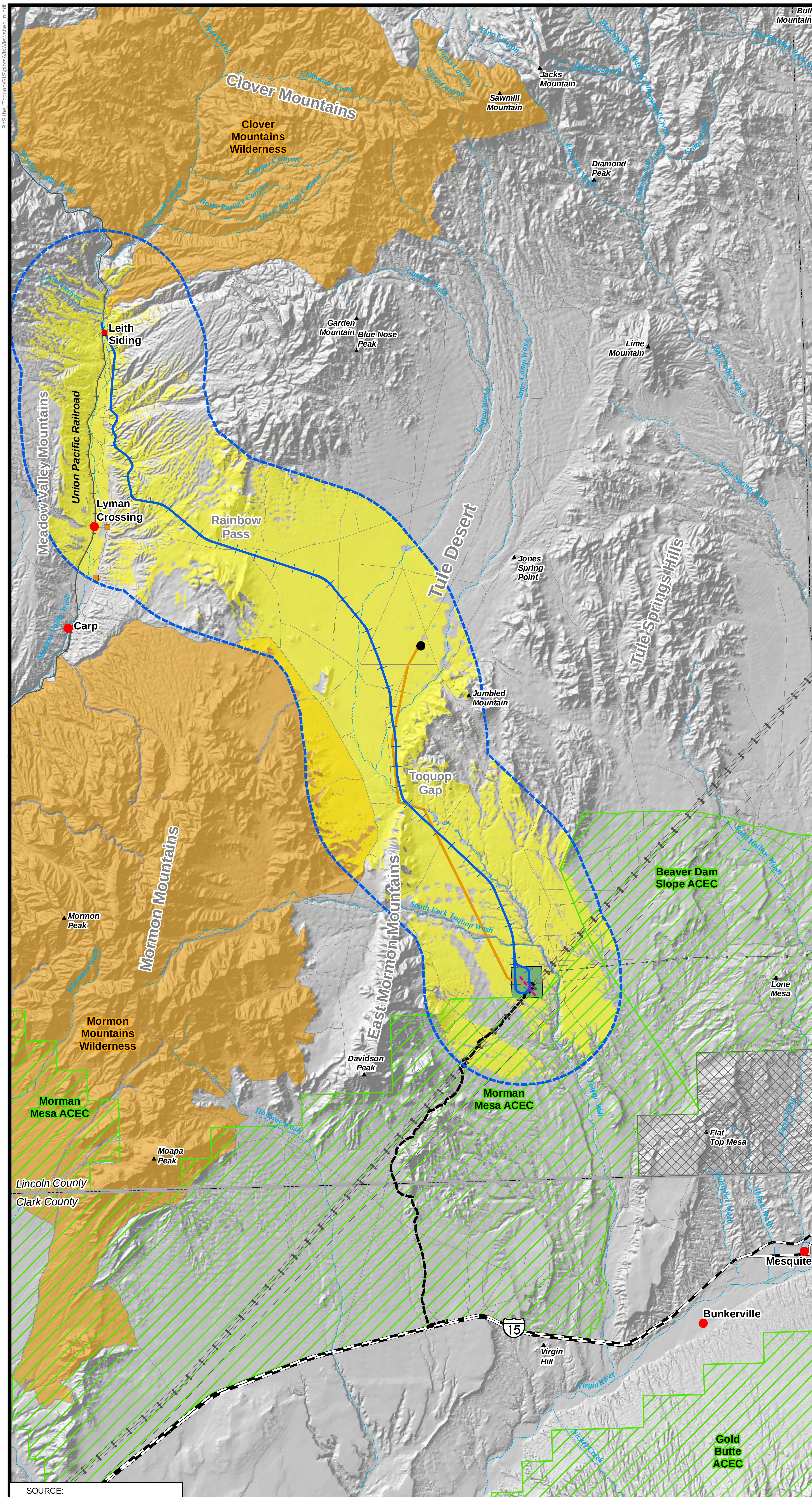
Miles

Map 3-4



Views of Proposed Rail Line

Toquop Energy Project EIS
Lincoln County, Nevada

LEGEND

- Rail Line is Visible*
- Proposed Railroad Line Visual Area of Effect
- Residence

Special Designation

- Areas of Critical Environmental Concern
- Wilderness

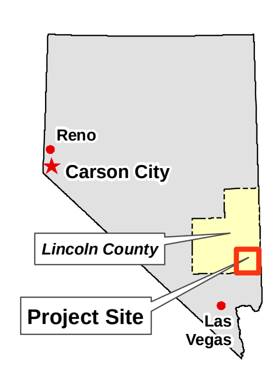
General Features

- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road
- Toquop Township

*Railroad is elevated 4 feet.

Reference Features

- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest



0 2 4
Miles

Map 3-5

3.6.2.2 Power Plant Site

Scenic quality rating units are used by BLM to describe specific natural landscape types found in the larger landscape ecotype. The designations are categorized into three levels—A, B, and C. Appendix B provides the scenic quality ratings observed within the Proposed Action Alternative's visual area of effect. Class A landscapes are associated primarily with mountainous areas.

Class B landscapes are primarily associated with rolling hills of desertscrub grasslands and riparian stringers. Class C landscapes primarily are associated with flat-to-gently sloping desertscrub grasslands. The area in the vicinity of the proposed power plant is identified as Class C. BLM currently manages the land that includes the proposed power plant site as VRM Class IV.

An analysis was conducted to assess where viewers would be located in order to see the 730-foot-tall power plant stack, the highest and most visible plant feature (refer to Map 3-5). A 15-mile viewing radius was evaluated, as distances beyond that would not be visually impacted. Travelers along I-15 could have broken views of the plant stack. Toquop Township, where future development might occur, is approximately 6 miles southeast of the proposed power plant site. Portions of the western parcels atop the Flat Top Mesa could have views of the project. However, the terrain would obstruct plant views from eastern parcels.

3.6.2.3 Proposed Rail Line

Scenic quality rating units that would be traversed by the proposed rail line are provided in Appendix B. The rail line would pass through scenic quality Class B and C areas managed by BLM as VRM Class IV.

An analysis was conducted to assess where potential viewers of the rail line might be located. A 3-mile distance from the line was analyzed; beyond that distance views would not be impacted. It is anticipated that the rail line would sustain one round-trip delivery of coal per day from Leith Siding to the power plant site; therefore, analysis was done for views of the rail line only and does not include rail cars. The majority of viewable locations are managed by BLM as VRM Class IV; however, lands in the Mormon Mountains Wilderness and Clover Mountains Wilderness, managed as VRM Class I, also would have views of the rail (refer to Map 3-5).

3.7 CLIMATE AND AIR QUALITY

3.7.1 <u>Data Collection Methods</u>

Climate data were obtained from the Western Regional Climate Center. Data for assessing the existing conditions of the air-quality study area were available from Federal, state, and local air-quality permitting authorities. Specifically, the Web site for the U.S. Environmental Protection Agency (EPA) Region IX provides information on stationary-air-quality emission sources in those states located in Region IX, which include Arizona, California, and Nevada, as well as attainment classifications, ambient-air concentrations, and Class I area designations (EPA 2006a). The Web sites for state (Arizona Department of Environmental Quality [ADEQ] 2006, Nevada Division of Environmental Planning [NDEP] 2006, and Utah Department of Environmental Quality [UDEQ] 2006) and local permitting authorities (Clark County Department of Air Quality and Environmental Management [CCDAQEM] 2006) provide information about applicable air-quality regulations.

Site-specific meteorological and air-quality data were obtained from a data-monitoring program station that was set up at the southeast corner of the Proposed Action Alternative site. The data were collected in accordance with a monitoring protocol that was submitted to NDEP, Bureau of Air Pollution Control. The site-specific data presented within this EIS are from the period of April 19, 2006, through February 28, 2007, and meet the EPA's and Nevada's monitoring guidance of 90 percent data-capture requirements. A final prevention of significant determination (PSD) submittal eventually would be submitted once a full year of data has been collected.

3.7.2 Existing Conditions

3.7.2.1 Climate

The Proposed Action Alternative site is located within Nevada's southeast desert region, which is characterized by relatively flat, sparsely vegetated desert terrain, punctuated by ridges and buttes (e.g., East Mormon Mountains, Jumbled Mountain, and Davidson Peak) and traversed by various washes (Toquop Wash and South Fork Toquop Wash). Surrounding areas include higher elevations with the Clover Mountains to the north, the Black Rock Mountains to the southeast, and the Mormon Range to the east. Table 3-3 summarizes meteorological conditions in and near the air-quality study area.

Table 3-3
Meteorological Conditions Within and Near the Air Quality Study Area

Monitor	Approximate Distance and Direction From Proposed Site	Winter Average	Spring Average	Summer Average	Fall Average	Annual Average/ Total
Mean Monthly Temperature Average (°F)[a]						
Bunkerville, Nevada	13 mi (21 km)/ SSE	46.5	64.0	84.7	64.9	65.0
Elgin 3 SE, Nevada	30 mi (48 km)/ NNW	43.7	58.1	80.0	62.7	61.1
Mesquite, Nevada	13 mi (21 km)/ SE	47.7	65.9	87.4	67.5	67.1
Lytle Ranch, Utah	19 mi (30 km)/ NE	43.7	60.0	78.9	54.5	59.3
Littlefield, Arizona	17 mi (28 km) / ESE	45.3	63.3	85.4	66.6	65.1
Toquop Onsite Data [c]	-	45.4	65.0	89.0	64.7	66.0
Mean Monthly Precipitation Average (inches)[a]						
Bunkerville, Nevada	13 mi (21 km)/ SSE	2.40	1.15	1.32	1.44	6.31
Carp, Nevada	20 mi (32 km)/ NW	1.95	1.10	0.80	0.88	4.73
Elgin 3 SE, Nevada	30 mi (48 km)/ NNW	4.93	4.11	2.82	2.20	14.06
Mesquite, Nevada	13 mi (21 km)/ SE	2.43	0.92	1.18	1.61	6.14
Lytle Ranch, Utah	19 mi (30 km)/ NE	4.36	2.64	1.54	2.16	10.70
Littlefield, Arizona	17 mi (28 km)/ ESE	2.13	1.98	1.54	1.50	7.15
Toquop Onsite Data [c]	-	0.41	0.00	2.35	1.30	4.06
Mean Monthly Snowfall Average (inches)[a]						
Carp, Nevada	20 mi (32 km)/ NW	0.2	0.0	0.0	0.0	0.2
Elgin 3 SE, Nevada	30 mi (48 km)/ NNW	2.4	0.1	0.0	0.2	2.7
Lytle Ranch, Utah	19 mi (30 km)/ NE	0.6	0.0	0.0	0.0	0.6
Toquop Onsite Data [c]	-	NM	NM	NM	NM	NM
Average Wind Speed (miles per hour)[b]						
Caliente Airport, Nevada	49 mi (79 km)/ NNW	2.6	4.3	4.4	2.8	3.5
Las Vegas-Nellis Airport, Nevada	60 mi (97 km)/ SW	8.0	10.2	10.0	8.0	9.0
Kingman Airport, Arizona	122 mi (196 km)/ S	7.8	10.2	10.6	8.1	9.2
Cedar City Airport, Utah	81 mi (130 km)/ NE	7.1	9.0	8.7	6.9	7.9
Toquop Onsite Data [c]	-	10.4	10.0	10.0	9.5	9.9

SOURCES: Western Regional Climate Center 2006a, 2006b

NOTES: °F = degrees Fahrenheit
mi = mile
km = kilometer
NM = not monitored
[a] For mean monthly temperature, mean monthly precipitation, and mean monthly snowfall, the period used for Bunkerville is 1919–2005, for Carp is 1949–1962, for Elgin 3 SE 2E is 1965–1985, for Mesquite is 1961–2005, for Lytle Ranch is 1988–2005, and for Littlefield is 1951–1995.
[b] For average wind speed values, averages are based on data collected between 1992 and 2002.
[c] Toquop onsite data include the period from April 19, 2006, through February 28, 2007.

The southeastern portion of Nevada has four defined seasons. In the summer, the average temperature (in Fahrenheit) ranges from the upper 70s to the mid 80s, with highs reaching the low 100s. In comparison, the average temperature in the winter is generally in the mid to high 40s (BLM 2003a).

Precipitation values tend to be highest in the winter months, ranging from 1.95 inches (Carp, Nevada) to 4.93 inches (Elgin, Nevada), and lowest in the fall months, ranging from 0.88 inches (Carp, Nevada) to 2.20 inches (Elgin, Nevada). As the data show, some of these monitors record snowfall within the winter months, but the maximum average amount of snowfall per year is still below 3 inches (BLM 2003a).

As Table 3-3 shows, wind speed tends to be highest in the spring and summer months, ranging from 4.3 miles per hour (mph) (Caliente, Nevada) to 10.6 mph (Kingman, Arizona), and lowest in the winter and fall months, ranging from 2.6 mph (Caliente, Nevada) to 8.1 mph (Kingman, Arizona). The closest monitor to the Proposed Action Alternative site is the monitor located in Caliente, Nevada. Average annual wind speeds in Caliente, Nevada, do not exceed 5 mph (Western Regional Climate Center 2006a and 2006b).

Three remote automated weather station (RAWS) monitors provide data that best represent the prevalent wind patterns within the study area (Western Regional Climate Center 2006c). These data were evaluated and the following results were ascertained:

- Wind patterns recorded at the Toquop Wash Nevada RAWS monitor, located approximately 3 miles (5 kilometers [km]) southeast of the proposed plant site, show that winds from the north occur approximately 48 percent of the year, and winds are from the southwest approximately 26 percent of the year. The remaining winds are evenly distributed from the other compass directions.
- Based on wind patterns recorded at the Badger Springs–Ivins RAWS monitor, approximately 22 miles (35 km) northeast of the proposed plant site, winds are predominantly from the south-southwest approximately 33 percent of the year and from the east approximately 23 percent of the year. The remaining winds are distributed from the other compass directions.
- The Kane Springs Nevada RAWS monitor, located approximately 37 miles (59 km) northwest of the proposed plant site, shows wind patterns that are predominantly from the north-northwest approximately 31 percent of the year and from the south approximately 30 percent of the year. The remaining winds are distributed from the other compass directions.

Figure 3-1 and Figure 3-2 present the onsite data wind rose at the 10-meter and 200-meter level, respectively. More details on additional parameters collected for use in the AERMOD model can be found in Appendix 8A – Class II Modeling Report of Air Quality Dispersion Modeling Report – Class II Area Impacts, Toquop Power Project (ENSR Corporation [ENSR]2006b). Site-specific data at the 10-meter level shows wind patterns that are predominantly from the south-southwest approximately 51 percent of the year with a wind speed greater than or equal to 10.3 meters per second and from the north-northwest approximately 30 percent of the year with a wind speed ranging between 5.1 and 7.7 meters per second. The remaining winds are distributed from the other compass directions. Site-specific data at the 200-meter level shows wind patterns that are predominantly from the south-southwest approximately 56 percent of the year and from the north-northwest approximately 19 percent of the year with wind speeds greater than or equal to 10.3 m/s occurring in multiple directions. The remaining winds are distributed from the other compass directions.

3.7.2.2 Air Quality

The existing condition of air quality within the air-quality study area is characterized using the following quantifiable indicators:

- Monitored ambient concentrations of criteria air pollutants for which National Ambient Air Quality Standards (NAAQS) are established in the Clean Air Act (CAA) and regulated by the EPA consisting of nitrogen dioxide (NO_2), carbon monoxide (CO), sulfur dioxide (SO_2), ozone (O_3), particulate matter less than or equal to 10 microns in diameter (PM_{10}), particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$), and lead (Pb).
- Observed levels of visibility, as a measure of air quality, which is monitored in most Class I areas (i.e., areas meeting criteria for relatively pristine air quality are designated as Class I areas under the Federal CAA).

For the purposes of evaluating air quality resource impacts associated with the Proposed Action Alternative, the air-quality study area encompasses a 31-mile (50-km) radius from all actions associated with the Proposed Action Alternative (Map 3-6). The 31-mile (50-km) radius is the area within which meteorological and air-quality data are deemed more representative of the Proposed Action Alternative site, and in which information on background sources was obtained. A 31-mile (50-km) radius was chosen to be consistent with minimum air-quality analyses required for major source air-quality permitting. Specifically, when conducting an air-quality-impact analysis for a major emission source, the analysis considers the geographical area located within at least a 31-mile (50-km) radius. The region of influence is the total area in which measurable impacts of the Proposed Action Alternative are evaluated and may extend well beyond 31 miles (50 km) from the project site.

The air-quality study area is located primarily in southern Nevada, with some portions extending into Arizona and Utah. For most of the air-quality study area, relatively complete information resources are available to support these indicators in the form of visibility data. However, only one ambient air quality monitoring station is located within 31 miles (50 km) of the Proposed Action Alternative site, which provides data for NO_2, PM_{10} and O_3. Ample data are available for the metropolitan Las Vegas area, but it is considered non-representative of the air-quality study area because of the substantial difference in the types of activities that contribute to air-quality impacts.

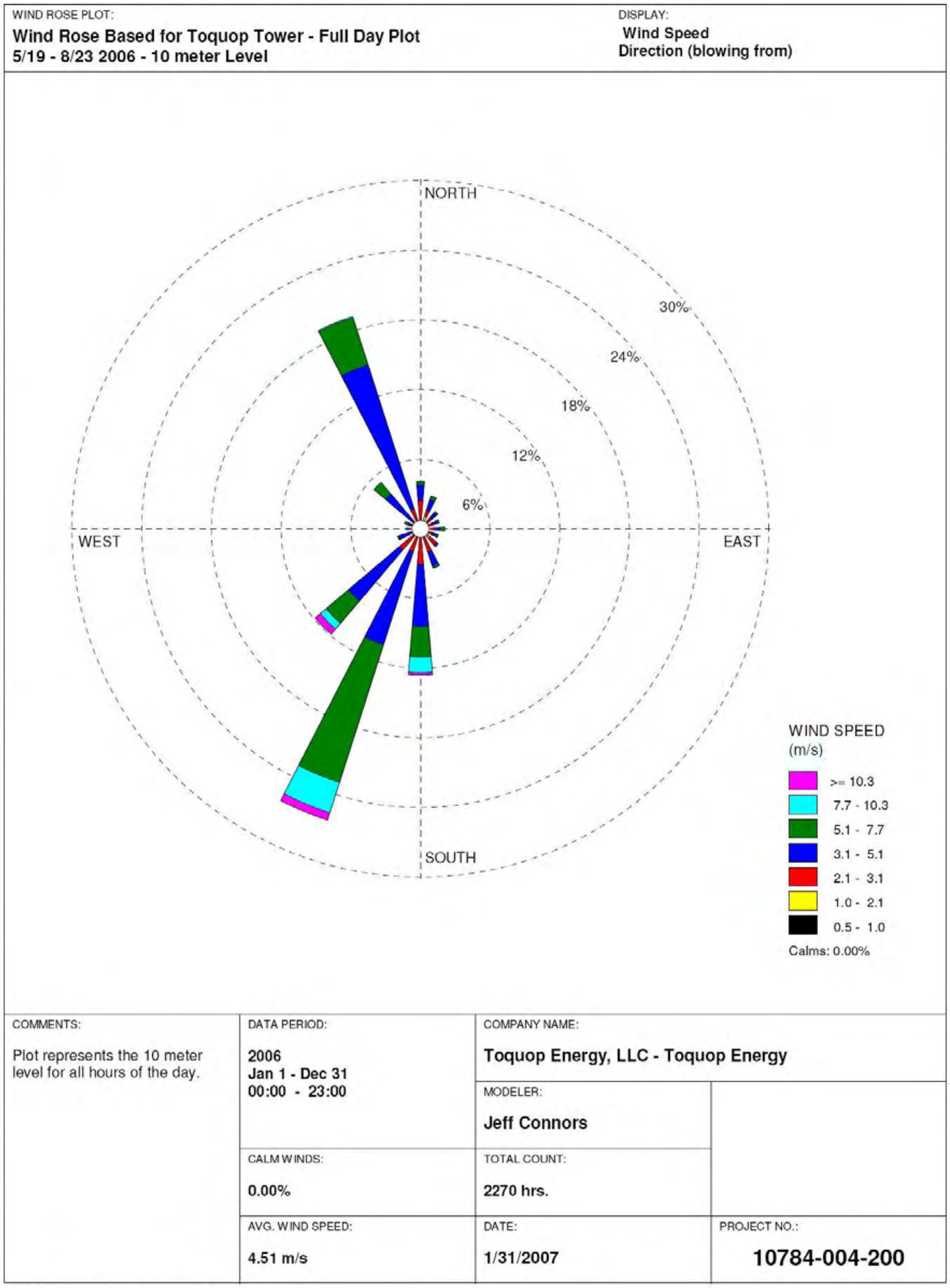
Regulations and Guidelines

The following subsections identify Federal, state, and local laws and regulations that are pertinent to the Proposed Action Alternative, evaluation of the study area, or analysis of the project impacts.

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

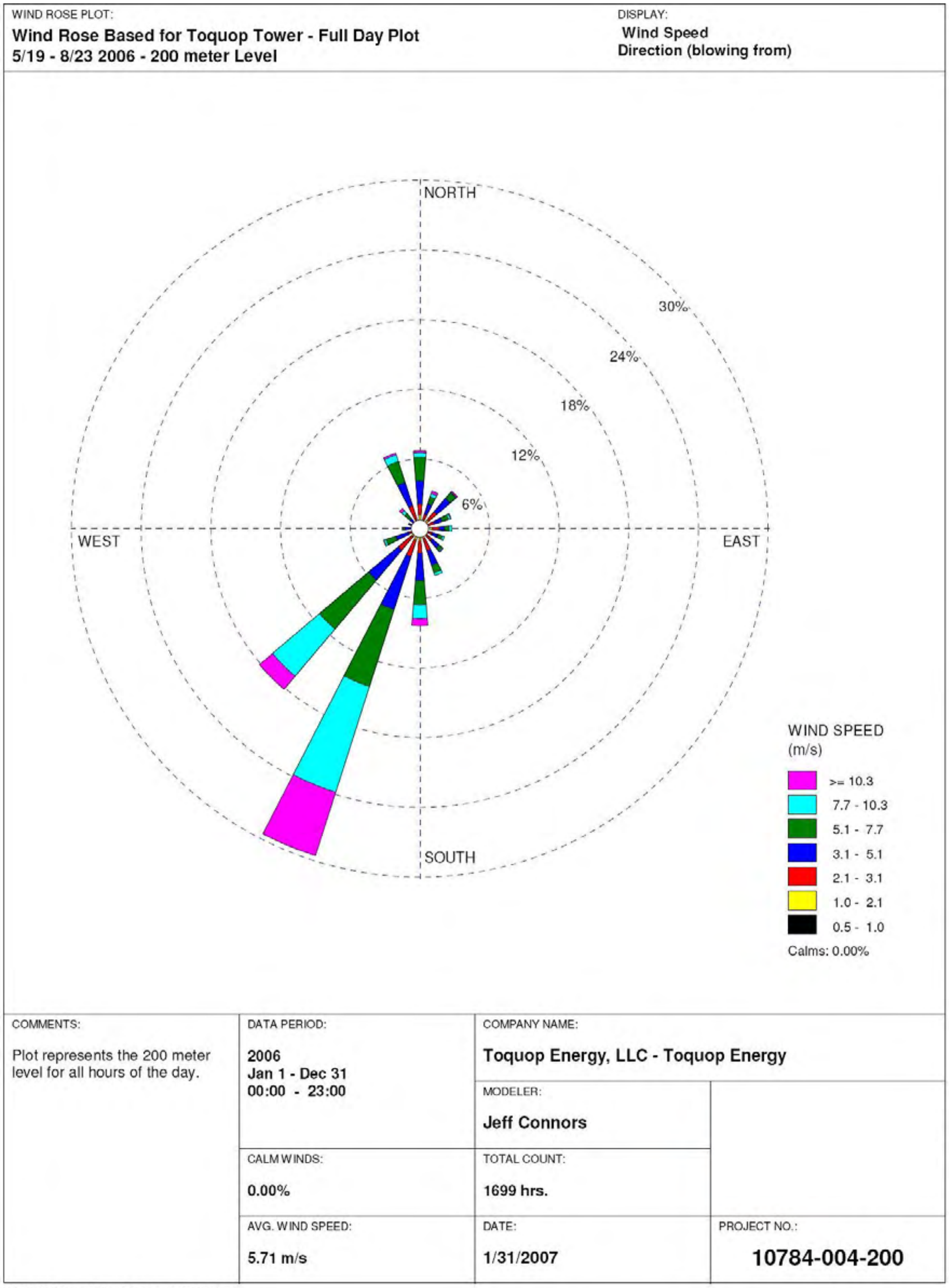
National Ambient Air Quality Standards. As mentioned above, the CAA established NAAQS, which historically have applied to six criteria pollutants—SO_2, CO, NO_2, PM_{10}, O_3, and Pb. These standards are defined in terms of threshold concentration (e.g., micrograms per cubic meter [$\mu g/m^3$]) measured as an average for specified periods of time (averaging times). Short-term standards (i.e., 1-hour, 8-hour, or

Figure 3-1
Onsite Data Wind Rose at 10-Meter Level

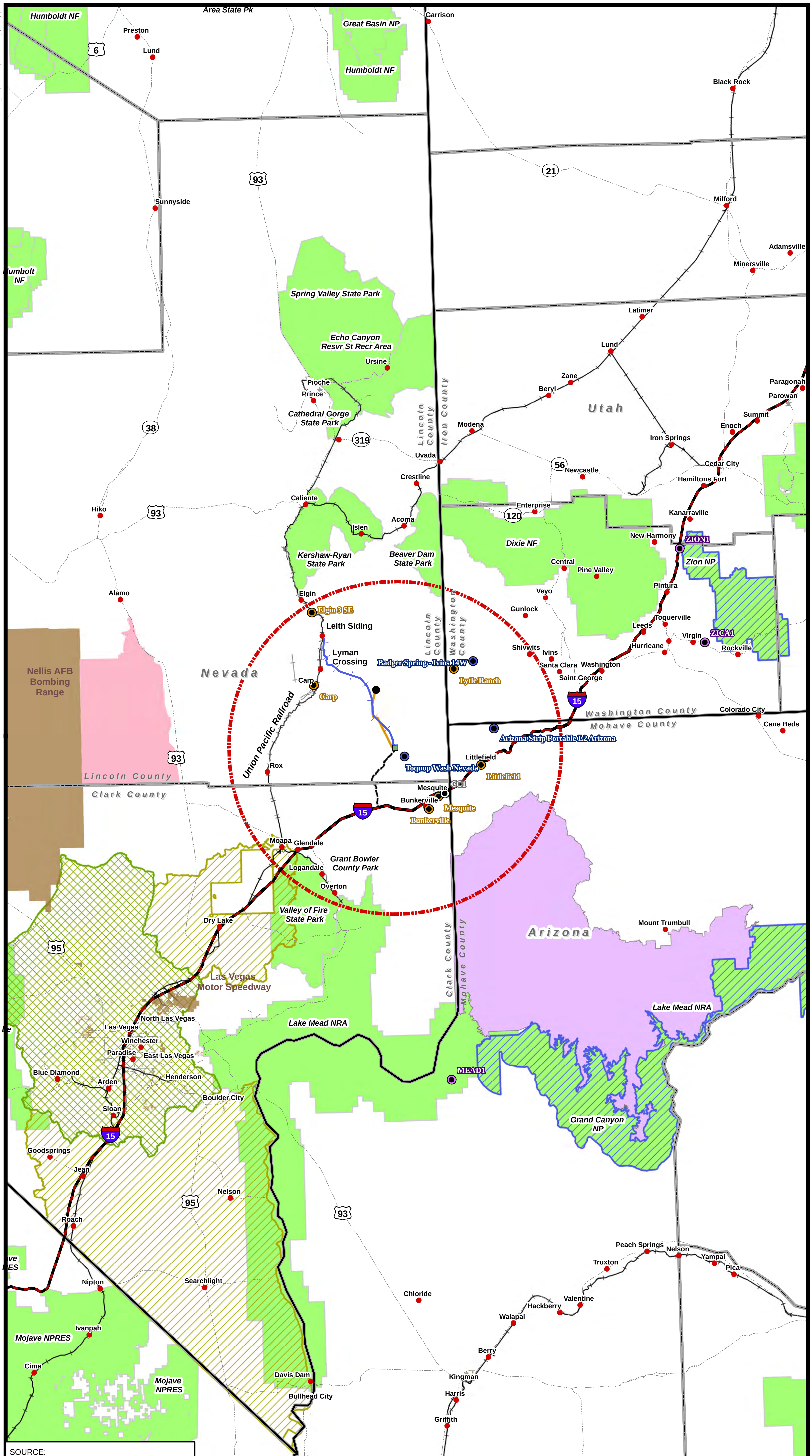


SOURCE: ENSR Corporation 2006
NOTE: m/s = meters per second

Figure 3-2
Onsite Data Wind Rose at 200-Meter Level



SOURCE: ENSR Corporation 2006
NOTE: m/s = meters per second



Air Quality

Toquop Energy Project EIS
Lincoln County, Nevada

LEGEND

Monitoring Stations
- Air Quality
- Meteorological
- RAW
- IMPROVE

Class I Areas
- Class I Areas

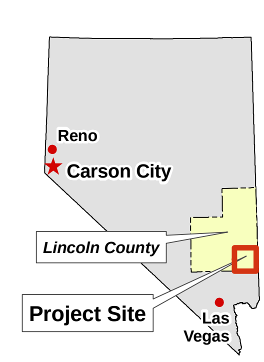
Non-Attainment Area
- Ozone (8-hour standard)
- Particulate Matter (PM_{10})

Surface Management
- Desert Wildlife Refuge
- Parashant National Monument

Study Area
- 50-Kilometer Distance from Plant Site

General Features
- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Access Road

Reference Features
- Existing Road
- Interstate
- Existing Railroad
- National Forest/State Parks
- Major Landmarks
- County Boundary
- State Boundary
- Town/Point of Interest



0 10 20
Kilometers

Map 3-6

24-hour averaging times) were established for pollutants with acute health effects; long-term standards (i.e., annual averaging times) were established for pollutants with chronic health effects. Recently, additional standards have been promulgated for 8-hour average O_3 concentrations and for 24-hour and annual $PM_{2.5}$ concentrations.

The NAAQS were set at levels to provide an ample margin of safety in protecting public health and the environment. Primary standards were adopted to protect public health, which includes "sensitive" populations, such as asthmatics, children, and the elderly. Secondary standards set limits that are intended to protect public welfare against decreased visibility as well as damage to animals, crops, vegetation, and buildings. Recently the EPA has made two significant changes to NAAQS and non-attainment area designations, as follows: (1) due to lack of evidence linking health problems to long-term exposure to coarse particle pollution the annual PM_{10} standard has been revoked effective December 17, 2006; and (2) to attain the 24-hour $PM_{2.5}$ standard the 3-year average of the 98^{th} percentile of 24-hour concentrations at each population-orientated monitor within an area must not exceed 35 $\mu g/m^3$, effective December 17, 2006. The values for the primary and secondary NAAQS are provided in Table 3-4.

Table 3-4
National Ambient Air Quality Standards

Pollutant	Averaging Period	NAAQS	
		Primary	Secondary
Sulfur dioxide (SO_2)	3-hour	—	0.5 ppm
	24-hour	0.14 ppm	—
	annual	0.03 ppm	—
Particulate matter less than or equal to 10 microns in diameter (PM_{10})	24-hour	150 $\mu g/m^3$	150 $\mu g/m^3$
Particulate matter less than or equal to 2.5 microns in diameter ($PM_{2.5}$)	24-hour	35 $\mu g/m^3$	35 $\mu g/m^3$
	annual	15 $\mu g/m^3$	15 $\mu g/m^3$
Carbon monoxide (CO)	1-hour	35 ppm	—
	8-hour	9 ppm	—
Nitrogen dioxide (NO_2)	annual	0.053 ppm	0.053 ppm
Lead (Pb)	quarterly	1.5 $\mu g/m^3$	1.5 $\mu g/m^3$
Ozone (O_3)	1-hour	0.12 ppm	0.12 ppm
	8-hour	0.08 ppm	0.08 ppm

SOURCES: U.S. Environmental Protection Agency 2006b, 2006c, 2006d, 2006e, 2006f, 2006g, 2006h, 2006i, 2006j
NOTES: $\mu g/m^3$ = micrograms per cubic meter
ppm = parts per million
NAAQS = National Ambient Air Quality Standards

Geographic areas, which may not coincide with political boundaries, are designated as attainment, non-attainment, or unclassified for each of the six criteria pollutants with respect to the NAAQS. If sufficient monitoring data are available, the EPA may designate an area as attainment if air quality is shown to meet the NAAQS. Areas in which air-pollutant concentrations exceed the NAAQS are designated non-attainment for specific pollutants and averaging times. Typically, non-attainment areas are urban regions and/or areas with higher-density industrial development. Because the status of an area is designated separately for each criteria pollutant, one geographic area may have all three classifications.

Approximately 62 miles (100 km) from the Proposed Action Alternative site, the Las Vegas Valley is designated as non-attainment with respect to the following NAAQS: 8-hour O_3, CO and PM_{10}. More specifically all of Clark County is listed as serious nonattainment for CO, which means the area has a design value for CO of 16.5 parts per million (ppm) or greater, while portions of Clark County are listed as serious non-attainment for PM_{10} and as subpart I non-attainment for 8-hour O_3. The remaining portions of the air-quality study area are designated as attainment or unclassified. An unclassified designation indicates that the status of attainment has not been verified through data collection. When permitting new sources, an unclassified area is treated as an attainment area.

Under the Federal CAA, areas meeting similar criteria for relatively pristine air quality may be designated as Class I areas. Specific provisions are included in Federal, state, and county air-quality regulations to preserve the pristine air quality in Class I areas. One pristine quality airshed, the Grand Canyon National Park Class I Wilderness, is located approximately 59 miles (95 km) southeast of the Proposed Action Alternative site (refer to Map 3-6). The next closest Class I areas include Zion National Park and Bryce Canyon National Park, which are located in Utah, more than 62 miles (100 km) northeast from the Proposed Action Alternative site.

All areas not designated as Class I are, by default, identified as Class II areas. Certain areas deserving of preservation, including Wilderness established by the Wilderness Act of 1964, may be designated as Class II Wilderness, and state or county requirements or permitting policies may be promulgated to protect the air quality in these areas. Class III areas are specially designated areas within which a greater amount of new air pollution is allowed. However, no Class III areas have ever been designated in the United States.

New Source Review (NSR)/PSD Permitting Program. Since the project would be a "major source" of criteria air pollutants, it is therefore subject to the Federal NSR (preconstruction) regulations. A portion of these rules applicable in attainment areas is the PSD regulations. PSD review is a pollutant-specific review and a federally mandated program. It applies to new emission sources in which the area is designated as attainment or unclassified and applies only to pollutants for which a project is considered major. In order to be subject to PSD review, the potential to emit for a criteria pollutant must exceed the PSD thresholds of 100 tons per year if the source is one of the 28 named source categories or 250 tons per year for all other sources. The Toquop Energy Project is a fossil-fuel steam-generating plant with heat input greater than 250 million British thermal units per hour, which is one of the 28 named categories. Therefore the applicable PSD threshold is 100 tons per year. The main requirements of the PSD review process are to demonstrate that the project would incorporate Best Available Control Technology, evaluate existing ambient-air quality in the area of the project, demonstrate that the project would not cause or significantly contribute to a violation for the NAAQS or PSD increments, determine the impacts on soils, vegetation and visibility at Class I areas, and determine the air-quality impacts resulting from the indirect growth associated with the project.

New Source Performance Standards (NSPS). The NSPS promulgated by the EPA pursuant to Section 111 of the CAA establishes emission limitations, work-practice standards, and provisions for monitoring, recordkeeping, and reporting applicable to new stationary sources. The NSPS are codified at 40 Code of Federal Regulations (CFR) Part 60. Since the Toquop Energy Company, LLC (Toquop Energy) facility would be capable of combusting more than 73 megawatts (250 million British thermal units per hour) of heat input from fossil fuel and construction is to be commenced after September 18, 1978, the NSPS set forth in 40 CFR Part 60, Subparts A (General Provisions) and D (Standards of Performance for Electrical Utility Steam Generating Units Constructed After September 18, 1978), are applicable to the Proposed Action Alternative.

National Emission Standards for Hazardous Air Pollutants. The National Emission Standards for hazardous air pollutants include emission limitations, work-practice standards, and provisions for monitoring, recordkeeping, and reporting for pollutants not covered by the NAAQS. These standards were promulgated pursuant to Section 112 of the CAA and are codified at 40 CFR Parts 61 and 63. The Part 63 standards apply to specific source categories and require affected facilities to implement Maximum Achievable Control Technology for specific hazardous air pollutants specified in each subpart.

A few subparts of Part 63 would appear to potentially apply to the Proposed Action Alternative; however, electric-utility steam-electric generating units are exempted from these requirements.

CAA Title IV Acid Rain Program. Title IV of the CAA established the Federal Acid Rain Program, which aimed to reduce SO_2 emissions from fossil-fuel-fired electric generation plants to 50 percent of 1980 levels. The implementing EPA regulations are codified at 40 CFR Parts 72 through 78. The Acid Rain Program is a market-based initiative managed by the EPA Clean Air Markets Division. The primary components of the program include acid-rain permits, marketable SO_2 "allowances," and comprehensive requirements for continuous emissions monitoring systems (CEMS). The Toquop Energy facility would be a coal-burning electrical generation plant subject to this Federal program. Consequently, Toquop Energy is required to file an acid-rain permit application and a compliance plan to the Title V permitting authority, receive SO_2 allowances and registration under the program, and to install, certify, and operate a sophisticated computerized CEMS for SO_2, nitrogen oxide, a diluent stack gas (oxygen or carbon dioxide), stack flow, and opacity. The regulations pertaining to CEMS, codified at 40 CFR Part 75, include extensive installation, certification, data validation, system quality-assurance checks, and quarterly electronic data submittals to the Clean Air Markets Division.

CAA Title V Operating Permit Program. Under the Federal Operating Permit program established by Title V of the 1990 CAA Amendments, Federal, state, and local agencies delegated the authority to administer and enforce the program shall issue air-quality operating permits to major stationary sources of air-pollutant emissions. The implementing EPA regulations are codified at 40 CFR Parts 70 and 71. Unlike the preconstruction review type of permit, as required under the Federal NSR/PSD program, Title V permits simply serve to identify all applicable requirements under the act, create a "permit shield," and establish requirements for monitoring, recordkeeping, reporting and annual compliance certifications. The NDEP was delegated authority to administer the Federal Title V permit program in all areas of Nevada except Clark County. Therefore, the Toquop Energy facility would be required to submit a Title V air permit application to the NDEP within one year after commencement of initial operation (i.e., "first firing").

Clean Air Interstate Rule (CAIR). The EPA issued the CAIR to assure that Americans continue to breathe cleaner air by reducing air pollution that moves across state boundaries. CAIR sets a permanent cap on SO_2 and nitrogen oxides across 28 eastern states and the District of Columbia that contribute to unhealthy levels of ground level O_3, fine particulate matter, or both in downwind states. The Toquop Energy Project is to be located in southeastern Nevada, which is not one of the 28 states identified in the rule. Therefore the CAIR rule does not apply to the Toquop Energy facility.

Clean Air Mercury Rule (CAMR). On May 18, 2005, the EPA promulgated the CAMR, which sets a permanent cap on mercury (Hg) emissions from coal-fired power plants, making the United States the first country in the world to regulate utility Hg emissions. The implementing regulations are set forth at 40 CFR §60.45Da – Standard for Mercury. The CAMR sets standards of performance and establishes a cap-and-trade program to reduce nationwide Hg emissions in two phases. The first cap has been set at 38 tons, while the second cap would reduce emissions to 15 tons by 2018. States were given until November 17, 2006, to impose stricter controls. Mercury allowances or credits then would be distributed to each state and two tribes by the EPA. Under CAMR, a facility must hold enough allowances for the Hg emitted in any given year. Pursuant to 60.45Da(2)(i), an affected unit located in a county-level geographical area receiving less than or equal to 25 inches per year mean precipitation (based on U.S. Department of Agriculture 30-year data) may not discharge into the atmosphere in excess of 97×10^{-6} pounds Hg per megawatt hour or 0.097 pounds Hg per gigawatt hour on an output basis. The Toquop Energy facility would be subject to the CAMR.

State Laws and Regulations

The NDEP has been delegated the authority to administer and enforce the CAA and Federal and state regulations and standards in Lincoln County, Nevada, where the Proposed Action Alternative site would be located. Portions of Clark County, Nevada, Arizona, and Utah are located within 31 miles (50 km) from the Proposed Action Alternative site. The CCDAQEM, ADEQ, and UDEQ enforce air-quality regulations in those areas.

Nevada Laws and Regulations. Nevada Department of Environmental Protection air-quality regulations are codified in the Nevada Administrative Code (NAC) 445B.001 through 445B.899 (Nevada Department of Environmental Protection 2006). These regulations establish ambient-air-quality standards that are equivalent to the NAAQS. The NAC also includes promulgated emission limits and workplace standards for specific source categories that may be applicable to certain activities within the air-quality study area and to the Proposed Action Alternative. NAC 445B.210 includes requirements that reasonable precautions be taken to assure that fugitive-dust emissions are minimized when conducting construction activities. The PSD application was submitted to the NDEP, which is the agency that would issue the permit. The Proposed Action Alternative would be required to obtain a Class I-B operating permit before construction activities can begin (445B.3361). Other air-control regulations that would need to be addressed are the various general provisions (445B.220 through 445B.283) dealing with visible emissions, excess emissions, notification of construction, notification of initial startup and various monitoring systems requirements. The Toquop Energy facility also may have to comply with NDEP's Mercury Air Emissions Control Program (445B.3611 thru 445B.3689) and the Nevada Clean Air Mercury Rule Program (445B.3711 thru 445B.3791).

Clark County Laws and Regulations. Portions of Clark County, Nevada are located within 31 miles (50 km) of the proposed facility site. The CCDAQEM air quality regulations are provided in Sections 00 through 94 of the Clark County regulations. These regulations include promulgated emission limits and workplace standards for specific source categories that may be applicable to certain activities within the air-quality study area. The NDEP would be required to consult with CCDAQEM, pursuant to the "other affected states" provisions of the PSD rules, prior to issuance of a final preconstruction permit.

Arizona Laws and Regulations. Portions of Arizona are located within 31 miles (50 km) of the proposed facility site. ADEQ air quality regulations are provided in Title 18, Chapter 2 of the Arizona Administrative Code (Arizona Secretary of State 2006). These regulations establish ambient-air-quality standards for the state that are equivalent to the NAAQS. The Arizona Administrative Code also includes promulgated emission limits and workplace standards for specific source categories that may be applicable to certain activities within the air quality study area. The NDEP would be required to consult with ADEQ, pursuant to the "other affected states" provisions of the PSD rules, prior to issuance of a final preconstruction permit.

Utah Laws and Regulations. Portions of Utah are located within 31 miles (50 km) of the proposed facility site. UDEQ air-quality regulations are provided in Title R307 of the Utah Administrative Code (UDEQ 2006). These regulations include promulgated emission limits and workplace standards for specific source categories that may be applicable to certain activities within the air-quality study area. The NDEP would be required to consult with UDEQ, pursuant to the "other affected states" provisions of the PSD rules, prior to issuance of a final preconstruction permit.

3.7.2.3 Existing Emission Sources

Four permitted major sources of air-pollutant emissions are located within 31 miles (50 km) of the Proposed Action Alternative site (Table 3-5). A major source is categorized as a source that has the potential to emit more than 100 tons per year of a criteria pollutant or more than 10 tons per year of any hazardous air pollutant or more than 25 tons per year of any combination of hazardous air pollutants.

Table 3-5
Major Sources Located Within and Near the Air Quality Study Area

Facility Name	Facility Type	Location	Approximate Distance from Proposed Site	Direction from Proposed Site	Permitting Authority
Lasco Bathware Inc.	Plastic plumbing fixture manufacturing	Moapa Valley, Nevada	29 mi (47 km)	SW	CCDAQEM
Royale Cement Company	Portland cement manufacturing	Logandale, Nevada	27 mi (43 km)	SW	CCDAQEM
Reid Gardner Station	Electric utility	Moapa, Nevada	29 mi (47 km)	SW	CCDAQEM
Simplot Silica	Industrial sand	Overton, Nevada	30 mi (48 km)	SSW	CCDAQEM

SOURCE: U.S. Environmental Protection Agency 2006a
NOTE: Emissions include criteria pollutants (O_3, CO, NO_2, SO_2, particulate matter, Pb) and hazardous air pollutants.
mi = miles
km = kilometer
CCDAQEM = Clark County Department of Air Quality and Environmental Management

Minor sources located within 31 miles (50 km) of the Proposed Action Alternative site include smaller industrial and commercial operations. A minor source is categorized as a source that has the potential to emit less than 100 tons per year of a criteria pollutant or less than 10 tons per year of any hazardous air pollutant or less than 25 tons per year of any combination of hazardous air pollutants. The prevalent types of portable sources include rock and construction-product industries (e.g., portable crushing and screening plants), hot-mix asphalt plants, and concrete-batch plants (CCDAQEM 2006).

Mobile source emissions from vehicles consist of volatile organic compounds, NO_2, CO, and PM_{10}, which may warrant consideration in an assessment of ambient air quality in the air-quality study area. Consideration of major traffic routes located within the air-quality study area may be reasonably limited to the I-15 corridor, which extends laterally across the southern portion of the air-quality study area. Currently no railroad or access roads exist on the proposed site.

3.7.2.4 Visibility Conditions

The Cooperative Institute for Research in the Atmosphere operates a network of visibility monitoring stations in or near Class I areas, and publishes Interagency Monitoring of Protected Visual Environments (IMPROVE) data. The purpose is to identify and evaluate patterns and trends in regional visibility. Data from four IMPROVE monitors within and near the air-quality study area show that fine ($PM_{2.5}$) and coarse (PM_{10}) particulates were the largest contributors to the impairment of visibility. These particulates impact the standard visual range from each monitor location. The standard visual range is the distance that can be seen on a given day. Standard visual ranges for each of the four monitors on their best (highest visibility), intermediate (average visibility), and worst (lowest visibility) days are provided in Table 3-6.

Table 3-6
Standard Visual Ranges from IMPROVE Monitors Near the Air-Quality Study Area

Monitor [1]	Direction from Proposed Action Alternative Site	Best Visibility Days	Intermediate Visibility Days	Worst Visibility Days
Bryce Canyon National Park, Utah	ENE	148 mi (239 km)	110 mi (177 km)	74 mi (119 km)
Meadview, Arizona	SSE	117 mi (189 km)	102 mi (165 km)	65 mi (105 km)
Zion Canyon, Utah	ESE	132 mi (212 km)	95 mi (153 km)	63 mi (102 km)
Zion National Park, Utah	ESE	173 mi (279 km)	116 mi (186 km)	77 mi (124 km)

SOURCE: Interagency Monitoring of Protected Visual Environments 2006
NOTES: IMPROVE = Interagency Monitoring of Protected Visual Environments
[1] The timeframe of the data for each of the monitors is as follows: Bryce Canyon National Park (2000-2004); Meadview (2004), Zion Canyon (2004); Zion National Park (2001-2003).
mi = miles
km = kilometers

As evidenced in this table, Zion National Park, located on the eastern edge of the air-quality study area, experienced the highest standard visual ranges in each category. The two monitors that demonstrated the worst standard visual range are Meadview and Zion Canyon.

3.7.2.5 Air-Quality Monitor Data

One ambient-air-quality monitoring station is located at Mesquite, Nevada, approximately 13 miles (21 km) southeast of the Proposed Action Alternative site. This station measures ambient concentrations of NO_2, PM_{10}, and O_3. Ambient-air-pollutant concentration data for this monitor, as reported by the EPA, are summarized in Table 3-7.

Table 3-7
Air-Quality Monitor Data from the Air-Quality Study Area

Pollutant	Averaging Period	Measured Concentration			Primary NAAQS
		2003	2004	2005	
PM_{10}	24-hour	254 μg/m^3	134 μg/m^3	316 μg/m^3	150 μg/m^3
	Annual	26 μg/m^3	22 μg/m^3	26 μg/m^3	50 μg/m^3
Nitrogen dioxides (NO_2)	1-hour	0.052 ppm	0.045 ppm	0.049 ppm	-
	Annual	0.009 ppm	0.007 ppm	0.007 ppm	0.053 ppm
Ozone (O_3)	1-hour	0.085 ppm	0.088 ppm	0.106 ppm	0.12 ppm
	8-hour	0.080 ppm	0.084 ppm	0.092 ppm	0.08 ppm

SOURCE: U.S. Environmental Protection Agency 2006k
NOTES: PM_{10} = particulate matter less than or equal to 10 microns
μg/m^3 = micrograms per cubic meter
ppm = parts per million

As is evidenced in this table, annual NO_2, 1-hour O_3, and annual PM_{10} concentrations were below the NAAQS. However, the maximum recorded 8-hour O_3 and 24-hour PM_{10} concentrations were above the NAAQS.

The EPA determines there has been an 8-hour O_3 NAAQS exceedance when the fourth highest value in a given year, rounded to the nearest 0.01 ppm, exceeds the primary NAAQS. There were no monitored O_3 exceedances in 2003. In 2004 the highest maximum 8-hour O_3 concentration was above the NAAQS, but all other values for this year were less than the NAAQS. In 2005, the highest and second highest maximum 8-hour O_3 concentrations were above the NAAQS, but all other values for that year were less than the NAAQS. In each of those years, the fourth highest value, when rounded to the nearest 0.01 ppm, did not exceed the NAAQS. Therefore, no 8-hour O_3 NAAQS exceedances were deemed to have occurred at the Mesquite, Nevada, monitor during 2003 through 2005.

The EPA determines that there has been a 24-hour PM_{10} NAAQS exceedance when the number of days that the PM_{10} concentration is above the NAAQS is greater than one. In 2003 and 2005, the highest maximum 24-hour PM_{10} concentration was above the NAAQS. In both years, only the highest maximum 24-hour PM_{10} concentration was above the NAAQS. All other values for each of those years were less than the 24-hour PM_{10} NAAQS. Therefore, no 24-hour PM_{10} NAAQS exceedances were deemed to have occurred at the monitor during 2003 through 2005.

Onsite background air-quality concentrations were monitored concurrent with the onsite meteorological data. These background values would be added to the modeled maximum impacts to obtain estimates of total ambient-air-quality concentrations for comparison against the NAAQS, and are presented in Chapter 4. The highest monitored background concentrations of NO_2, SO_2, PM_{10}, and Pb are presented below in Table 3-8.

As is evidenced in this table, the highest annual monitored concentrations for NO_2; 3-hour, 24-hour, and annual SO_2; 24-hour PM_{10}; and quarterly Pb were all below the NAAQS.

Table 3-8
Highest Monitored Onsite Background Concentrations

Pollutant	Averaging Period [1]	Measured Concentration (μg/m³)	Primary NAAQS (μg/m³)
Nitrogen oxides (NO_2)	Annual	8.5	100
Sulfur dioxide (SO_2)	3-Hour	28.0	-
	24-Hour	19.1	365
	Annual	7.1	80
PM_{10}	24-hour	37.1	150
	Annual	26.6	Revoked
Lead (Pb)	Quarterly	0.002	1.5

SOURCE: ENSR Corporation 2006c
NOTES: [1] Data based on six months (May 2006 – October 2006) of monitoring at the Toquop Energy Project site.
μg/m³ = micrograms per cubic meter
PM_{10} = particulate matter less than or equal to 10 microns

3.8 NOISE

3.8.1 Data Collection Methods

Section 3.6.2 in the 2003 EIS addressed existing noise sources and levels in the vicinity of the Proposed Action Alternative and provided the basis for the characterization of existing conditions. The noise and vibration resource area potentially is affected by the Proposed Action Alternative differently from the previously proposed gas-fired project for the following reasons:

- The proposed coal-fired power plant has a different and larger site plan than the previously analyzed gas-fired plant to accommodate the coal and coal-handling facilities (which are also noise sources).
- A rail line would be constructed for transporting coal to the power plant site. This component of the project (and the alternative rail line location) would traverse areas not previously evaluated regarding noise or vibration issues.

Simply defined, noise is "unwanted sound." The sound may be unwanted for a variety of personal or societal reasons. In terms of environmental impact analysis, the sound or noise must not be only audible but must unduly and substantially interfere with desirable activities. A brief discussion of noise was presented in the 2003 EIS.

An assessment of the potential for a project to result in adverse noise effects requires an evaluation of the following basic components:

- **Noise-Sensitive Receptor(s)**. With respect to human activities, these are typically residential areas, but also include passive parks and monuments, schools, hospitals, churches, and libraries. The critical questions are whether any of these land uses are present in the vicinity of the project, and if so, whether they are close enough to be affected adversely by project noise. There would be standards for noise protection for plant employees.
- **"Transmission Path" or Medium**. For sound or noise, this is most often the atmosphere (i.e., air). For vibration, the medium is the earth or a structure. The transmission path must support the free propagation of the small vibratory motions comprising the sound and vibration energy. Barriers and/or discontinuities that attenuate the flow of sound or vibration energy may compromise the path.
- **Source**. The sources of sound and vibration are any generators of small back-and-forth motions that transfer their motional energy to the medium where it is propagated. The acoustic characteristics of the source are very important. Sources must generate sound or vibration of sufficient strength, appropriate pitch, and duration such that the sound or vibration may be perceived and is capable of causing adverse effects. The new sources of project noise/vibration are discussed further in Chapter 4.

Without a sensitive receptor located relatively close to project alternatives, there can be no adverse noise or vibration effects. This is why the EIS methodologies used by the U.S. Department of Transportation's Federal Railroad Administration (2005) and Federal Transit Administration (2006) use a simple "screening distance" criteria as the first test of whether noise or vibration impact is likely to occur.

Similarly, if the airborne "path" between the source and the receptor has natural landform or manmade obstructions, or there are discontinuities or non-efficient soil propagation characteristics in the vibration path, or the distance between receptor and source is very large for either air or ground pathways, the sound and/or vibration would be reduced substantially and of insufficient strength to cause adverse effects (or be perceived).

3.8.2 Existing Conditions

3.8.2.1 Results of Previous Analysis

According to the 2003 EIS, the existing noise environment in the vicinity of the Proposed Action Alternative is consistent with its undeveloped and generally uninhabited nature. The sound levels range from 25 A-weighted decibels (dBA) to 50 dBA. The plant site is located many miles from any developed urban areas or sensitive receptors.

3.8.2.2 Power Plant Site

The proposed coal-fired power plant has a different and larger site plan than the previously analyzed gas-fired plant. However, the additional land is within the area previously analyzed in the 2003 EIS and the same conclusions regarding noise apply. Specifically, the existing noise environment is the same for the expanded plant area. Also, no noise- or vibration-sensitive receptors are located in proximity to the additional machinery associated with onsite movement and unloading of the coal-supply train (e.g., shakeout); transport and onsite stockpiling of coal, limestone, or other materials; and mechanized processing (e.g., pulverization, onsite conveyance).

3.8.2.3 Proposed Rail Line

A new rail line would be constructed to allow a train to transport coal from the UPRR main line at or near Leith Siding to the plant site approximately 31 miles to the southeast. Based on evaluation of satellite imagery and field reconnaissance in the area that would be traversed by the proposed rail line, the land use appears to be predominantly of a similar nature to that of the previously analyzed project site, namely undeveloped land with a typically low existing noise environment and no noise- or vibration-sensitive land uses in proximity to the railroad line route. The sound levels are expected to range from 25 dBA to 50 dBA. The only difference is in the vicinity of the line's connection to the existing UPRR line where train activity on the main track presently contributes to elevated sound levels. The project area occasionally is subject to short-duration but noisy overflights by military airplanes and helicopters.

The only perceptible ground vibration in the area of the proposed rail line is likely to be found within approximately 100 feet of the existing UPRR line.

3.8.2.4 Regulatory Setting

There are a number of laws and guidelines at the Federal level relevant to the assessment of ground transportation noise and vibration impacts. These include the following:

- National Environmental Policy Act of 1969 (42 United States Code [U.S.C.] 4321, et. seq.) (PL-91-190) (40 CFR 1506.5)
- Noise Control Act of 1972 (42 U.S.C. 4910)
- Federal Transit Administration Guidelines (FTA-VA-90-1003-06, May 2006; supersedes DOT-T-95-16, April, 1995)
- Federal Railroad Administration Guidelines (Report No. 293630-1, December 1998)
- Occupational Health and Safety Administration Occupational Noise Exposure; Hearing Conversation Amendment (Federal Register 48(46), 9738-9785)
- EPA Railroad Noise Emission Standards (40 CFR 201)
- Federal Railroad Administration Railroad Noise Emission Compliance Regulations (49 CFR 210)
- Federal Railroad Administration Final Rule on the Use of Locomotive Horns at Highway-Rail Grade Crossings (49 CFR Parts 222 and 229)
- U.S. Surface Transportation Board Environmental Rules (49 CFR 1105.7(6))

There are no BLM noise regulations applicable to the project area, or specific noise regulations contained in BLM's Caliente Management Framework Plan (BLM 1999). However, during the project approval process, compliance with the Noise Control Act are responsibilities of the proponent. The Federal Railroad Administration and EPA noise-emission criteria for locomotives and rail cars, and the new Federal Railroad Administration regulation governing the sounding of locomotive warning horns, along with the Occupational Health and Safety Administration rules, are the primary Federal noise regulations applicable to operation of the proposed rail line.

There are no State of Nevada or local-jurisdiction noise regulations or standards applicable to the Proposed Action Alternative (Lincoln County Zoning Ordinance or Washoe County Comprehensive Plan).

3.9 GEOLOGY, SOILS, AND MINERALS

3.9.1 Data Collection Methods

The soils at the power plant site, along the proposed rail line route, and an approximately 1-mile-wide study area surrounding the project area are evaluated. Information on soils was acquired from the U.S. National Resource Conservation Service Web Soil Survey. The Web Soil Survey application contains nationwide soil information digitized from printed soil surveys as well as the State Soil Geographic Database and the Soil Survey Geographic Database. The project area is specifically covered under the National Resource Conservation Service Soil Survey of Lincoln County, Nevada, South Part (National Resource Conservation Service 1990).

Data on geology and minerals were collected and reviewed for southern Lincoln County, with an emphasis on the project area. The data sources include the United States Geological Survey (USGS) maps and online Mineral Resource Data System databases, the BLM LR2000 System Land and Mineral Records (BLM 2007b), the Fluid Minerals Potential Report for the Ely BLM District RMP prepared by ENSR (ENSR 2004a), the Minerals Potential Report for the Ely BLM District RMP prepared by ENSR (ENSR 2004b), and the 2003 EIS for the Toquop Energy Project issued by BLM (BLM 2003a). These reports were reviewed, and existing and potential mineral resources were analyzed for the study area.

3.9.2 Existing Conditions

3.9.2.1 Regional Overview

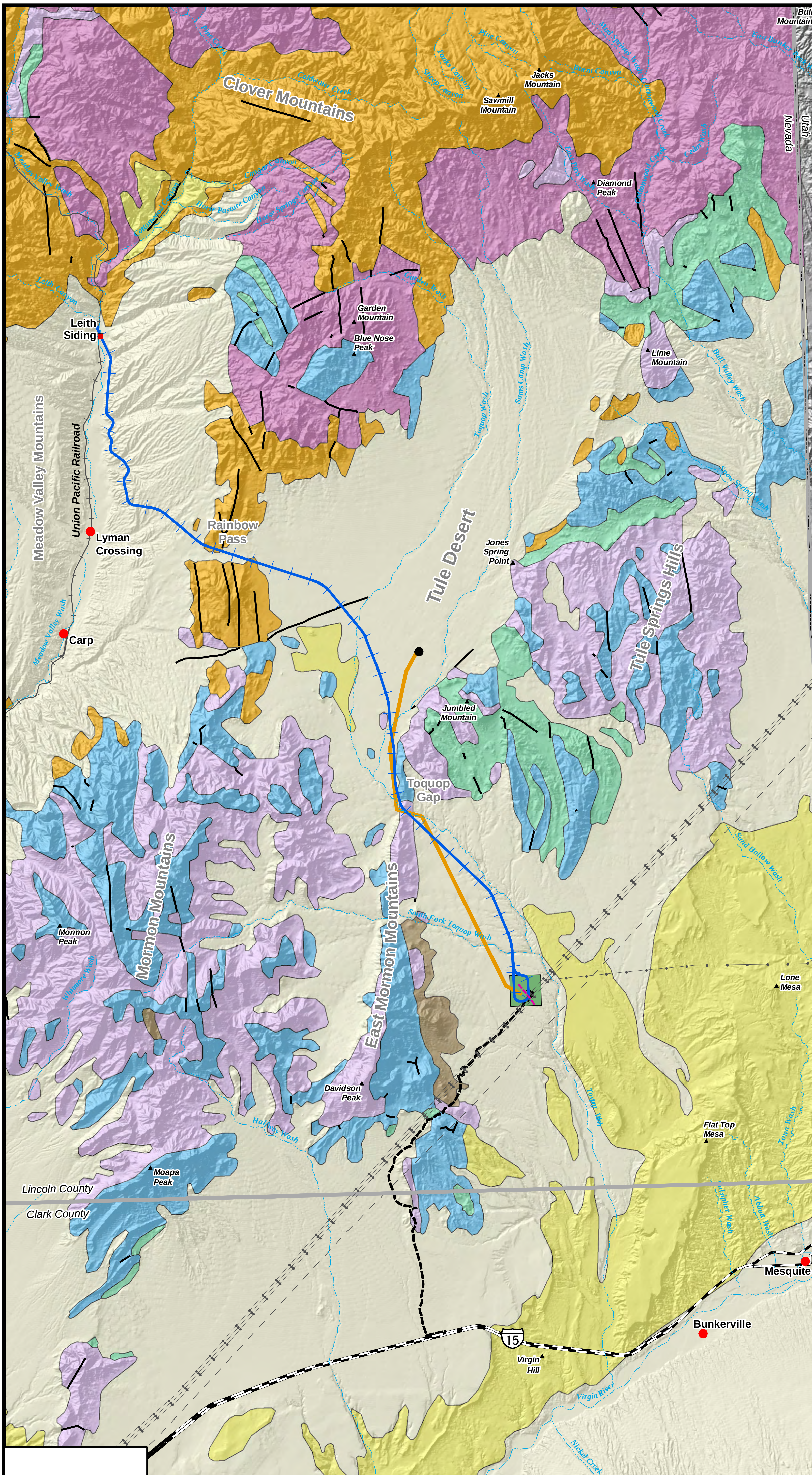
The project area is located in the southeastern corner of Lincoln County, Nevada. The project area includes the low hills around Rainbow Pass, the low-lying Tule Desert, and the gently southward-sloping valley of Toquop Wash. These features are situated between the Clover Mountains to the north, the Mormon Mountains to the west, and the Tule Springs Hills to the east.

The project area is located within the Basin and Range physiographic province, which covers a broad area of the western United States. The Basin and Range province is typified by north-south trending mountain ranges and valleys formed by periods of compression and extension resulting in geologic features known as horsts and grabens, which create mountains and valleys. The mountain ranges in Lincoln County are composed of stratigraphic units that range in age from late Precambrian to Tertiary (ENSR 2004a, 2004b). Most of the crustal compression (mountain building) occurred during the Mesozoic period, while the regional extension occurred during the middle to late Tertiary period. The result of the extension was the north-south-trending valleys and mountain ranges separated by typically normal faults. The Mormon Mountains, East Mormon Mountains, and Tule Springs Hills primarily are composed of limestone and dolomite ranging in age from Cambrian to Pennsylvanian. The low hills between those mountains contain Permian to Triassic limestones, and red-bed sandstone, siltstone, and shale. The intermountain basin fill materials are composed primarily of Quaternary alluvial deposits composed of silt, sand, and coarse gravel (Map 3-7).

The project area includes the Meadow Valley Mountains to the west of Leith Siding and Lyman Crossing; the Mormon Mountains, Clover Mountains, East Mormon Mountains, and Tule Desert in the central portion of the project area; and Toquop Wash and the Tule Springs Hills in the eastern portion of the project area. Elevations in the project area range several thousand feet from the valley floor to the mountain top. The geology of the project area is typified by Devonian through Triassic and Tertiary lithologic units including dolomite, limestone, shale, and siltstone, including the well-known Triassic

Geology

Toquop Energy Project EIS
Lincoln County, Nevada



LEGEND

Geology

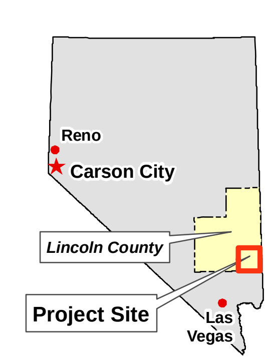
- Alluvial and playa deposits
- Upper volcanic rocks, 6-17 Ma
- Tuffaceous sedimentary rocks, 6-17 Ma
- Lower volcanic rocks, mostly 17-43 Ma
- Sedimentary, volcanic, and intrusive rocks, Mesozoic
- Carbonate and other sedimentary rocks, upper Paleozoic
- Metamorphic and intrusive rocks, Early and Middle Proterozoic
- Carbonate and other sedimentary rocks, lower Paleozoic and Late Proterozoic
- Fault

General Features

- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road

Reference Features

- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest



0 2 4
Miles

Map 3-7

Chinle and Moenkopi Formations, sandstone, tuffaceous sedimentary rocks, and younger alluvial fan deposits (refer to Map 3-7).

The main factor determining soil type in the study area is geography. To characterize soils, the area can be divided into three regions, as follows: (1) from the power plant site through Toquop Gap; (2) from Toquop Gap through Rainbow Pass; and (3) north of Rainbow Pass. Each region differs by parent rock materials, soil textures, and soil chemical properties. Generally, soils in the site vicinity are characterized by coarse textures, hardpans, and rock outcrops. Hardpans are soils that have been cemented by mineral precipitation, usually calcite cement (known as caliche), in desert climate. Soils also characteristically have high erosion factors and corrosivity to steel due to high soil pH (from 7.5 to more than 8.2). Soils may contain biological crusts in some areas.

Mineral deposits are present throughout southeastern Nevada. Lincoln County contains deposits of locatable minerals, including metallic minerals, non-metallic minerals, and salable mineral materials. There are three mining districts in southeastern Lincoln County relevant to this project (USGS 2006). Gourd Springs District is located in the East Mormon Mountains and on Jumbled Mountain and primarily contains gypsum, anhydrite, and barite. Vigo District is located in the Tule Springs Hills and contains gypsum, anhydrite, and manganese. Buckhorn District is located in the Tule Desert flatlands and contains kaolinite clay. Metallic mineral deposits in Lincoln County include gold, manganese, molybdenum, copper, mercury, tungsten, and polymetallic minerals including lead, zinc, and silver. Non-metallic mineral deposits in Lincoln County include perlite, gypsum, vermiculite, barite, clay, and volcanic ash. Salable mineral materials in Lincoln County include sand, gravel, and decorative rock, which are mainly found along mountain fronts (ENSR 2004b) (Map 3-8).

3.9.2.2 Power Plant Site

Geology

The proposed power plant site is located east of the East Mormon Mountains and south of Tule Springs Hills along the northern edge of the Virgin River Depression. According to Langenheim et al. (2001), the Virgin River Basin is one of the deepest alluvial basins in the Basin and Range physiographic province. The power plant site is located in an alluvial basin, west of Toquop Wash. The alluvial material is composed of erosional material from the local mountain ranges and generally consists of fine- to coarse-grained sand, silt, and gravel. Much of the basin fill material in and near the study area consists of the Muddy Creek Formation. Outcrops of the Muddy Creek Formation consist of poorly sorted coarse- to fine-grained sand, and sandstone interbedded with siltstone and mudstone (Kowallis and Everett 1986).

The proposed plant site and rail line are located near eight geologic faults. The closest faults to the power plant site are the Toquop Wash fault located to the north of and the Gourd Spring fault located to the west of the southern half of the alignment. The East Mormon and Camp Boad faults are located farther to the west of the Gourd Springs fault. These faults exhibit considerable lateral and vertical displacement; however, none of these faults are considered active and the potential for damage resulting from movement on these faults is unlikely. The nearest active faults are associated with the Piediment fault zone located approximately 20 miles to the east near the Virgin and Beaver Dam mountains. The seismic impact on the proposed site and associated railroad alignment is likely to be relatively low compared to other areas within the Basin and Range province (Von Seggern and Brune 2000). The closest, most significant earthquake to the proposed site was a magnitude 6.1 earthquake in Caliente that occurred in 1966. This earthquake was approximately 62 miles north of the proposed site (Von Seggern and Brune 2000). In fact, the earthquake hazard map for southern Nevada developed by the USGS indicates a very low earthquake potential and ground acceleration at the site (USGS 1996).

The proposed plant site and rail line are underlain by shallow to thick alluvial sedimentary deposits. The valley fill material located near the proposed well field in the Tule Desert and near the proposed plant site is several hundred to 1,000 feet thick. Well data indicate that these deposits consist of unconsolidated and consolidated sands and gravels with silts and clays to 200 feet. Below these sands and gravel there is a thick (greater than 500 feet) layer of silts, clays, and sands. Below 600 feet, the proportion of coarse-grained sands and gravels increases. A shallow layer of caliche (2 to 5 feet thick) typically overlies alluvial deposits near and around the proposed site.

Soils

The dominant soil series at the proposed power plant site is the Mormon Mesa series. These soils are fine sandy loams over petrocalcic hard pans. Depth to the hardpan layer is between 10 and 20 inches below the surface and may extend to 60 or more inches below the surface in areas. Slopes in the area of the site are listed as between 1 percent and 5 percent. Erosion potentials due to wind are high and moderate due to water runoff. These soils are not classified as prime farmland. The main issue regarding this soil is the shallow depth to the hardpan layer (U.S. Department of Agriculture 2000). A soils map of the area is available online at http://websoilsurvey.nrcs.usda.gov/app/WebSoilSurvey.aspx.

Minerals

The potential for occurrence of minerals in the study area is discussed below. Mineral resource potential, as defined by BLM and reported in the two ENSR reports (ENSR 2004a; 2004b) has four categories as follows:

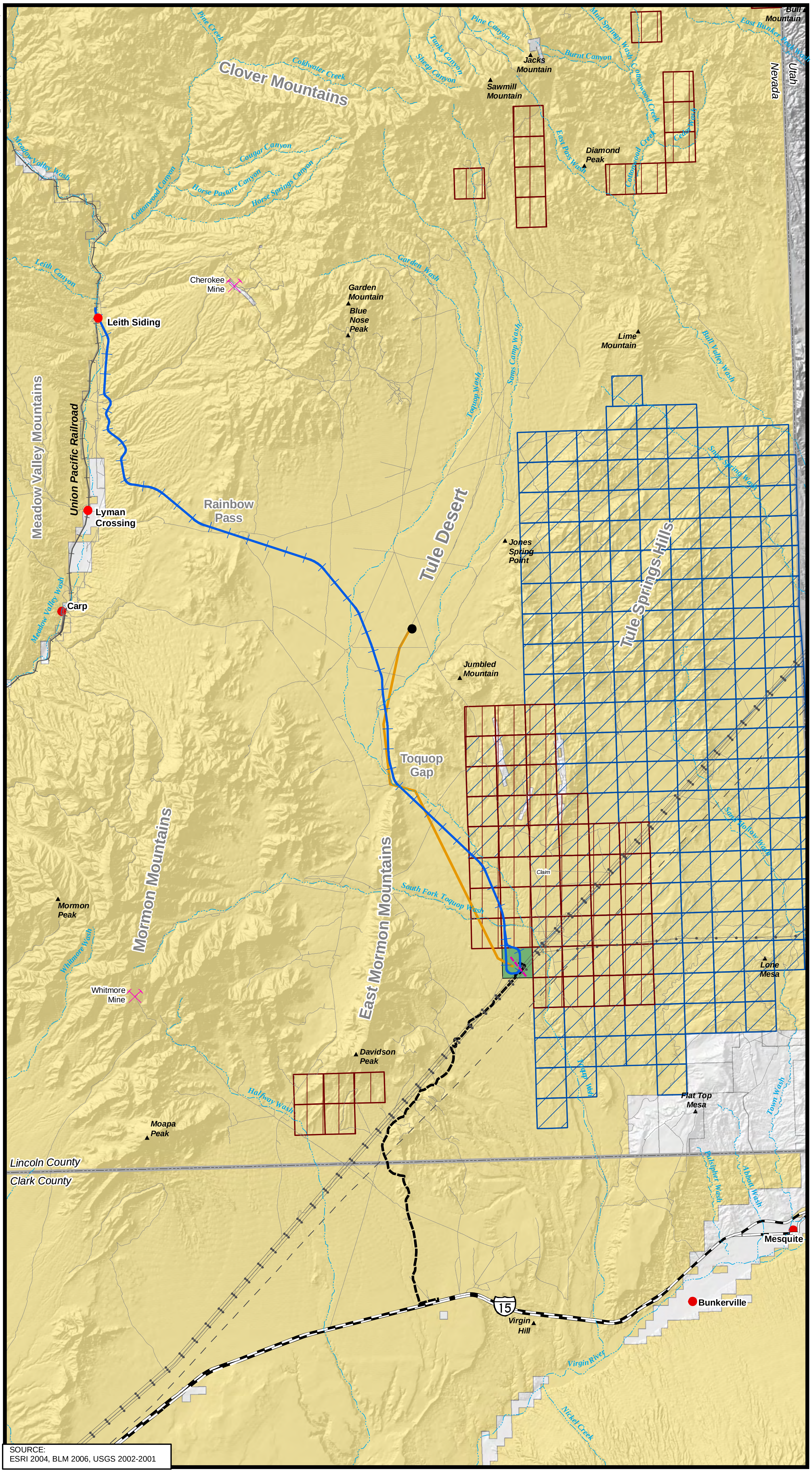
- **No Potential.** The geologic environment, inferred geologic processes, and lack of mineral occurrences do not indicate potential for accumulation of mineral resources.
- **Low Potential.** The geologic environment and inferred geologic processes indicate low potential for accumulation of mineral resources.
- **Moderate Potential.** The geologic environment, inferred geologic processes, and reported mineral occurrences or valid geochemical/geophysical anomaly indicate moderate potential for accumulation of mineral resources.
- **High Potential.** The geologic environment, inferred geologic processes, and reported mineral occurrences or valid geochemical/geophysical anomaly, and known mines or deposits indicate high potential for accumulation of mineral resources.

Locatable Minerals. There are no mineral resources reported in the 640-acre area where the proposed power plant would be sited. Mineral deposits could occur in the bedrock beneath the alluvial cover at the power plant site. Because the alluvium is 2 to 5 feet thick, and there is lack of economic interest in exposed minerals occurrences in the region, so it is unlikely that any potential deposits would be developed. However, there are several reported metallic and non-metallic mineral deposits in the adjacent mountain ranges. Mineral exploration in areas adjacent to the study area would likely continue. With low mineral potential for tungsten and barite, and moderate mineral potential for gypsum and kaolinite, mineral exploration would likely focus more on the non-metallic minerals.

There is a moderate potential for metallic minerals in the southern portion of the Clover Mountains, north of the study area. Several mining claims are present throughout this area. The mineral potential includes polymetallic minerals such as silver, lead, zinc, copper, cadmium, antimony, and manganese. In addition, there is a low mineral potential for metallic minerals in the East Mormon Mountains, west of the study area. There are several mining claims throughout this area where there is low mineral potential for tungsten, barite, and manganese (ENSR 2004b; USGS 2006).

Minerals

Toquop Energy Project EIS
Lincoln County, Nevada



LEGEND

- Oil and Gas Lease
- Mining Claims
- Mining Site

Surface Management

- Bureau of Land Management
- Private

General Features

- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road

Reference Features

- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest

Reno
Carson City
Lincoln County
Project Site
Las Vegas

0 2 4
Miles

Map 3-8

There are abundant mining claims for non-metallic minerals in areas adjacent to the proposed power plant site. There is a moderate potential for kaolinite clay on the east flank of the Mormon Mountains, west of the study area. There are two areas with moderate potential for gypsum—one in the Mormon Mountains and one in the Tule Springs area east of the site (ENSR 2004b; USGS 2006). Mining claims and other minerals data are shown on Map 3-8.

Salable Minerals. Because the power plant site is composed of gravel-bearing alluvium, the potential for salable minerals is high; however, no mineral material disposals have ever been recorded in the vicinity of the power plant.

Fluid (Leasable) Minerals. The proposed power plant site is located in the Toquop alluvial basin, which has high potential for oil and gas mineral resources (ENSR 2004a). There currently is an existing oil and gas lease (BLM Lease #NVN 050916) approximately 5 miles southeast of the proposed power plant site west of Flat Top Mesa (refer to Map 3-8).

There is medium potential for geothermal resources in the Toquop alluvial basin (ENSR 2004a). There currently are no geothermal resource leases in the area.

3.9.2.3 Proposed Rail Line

Geology

The ROW for the proposed rail line trends northwest along Toquop Wash, passes through the Toquop Gap, transverses west-northwest uphill through Rainbow Pass, and then proceeds downhill and north to Leith Siding. The proposed rail line ROW crosses three alluvial basins, transverses a pass in the East Mormon Mountains, and transverses a pass between the Mormon Mountains and the Clover Mountains. The alluvial material in the alluvial basins is composed of erosional material from the local mountain ranges and generally consists of sand, silt, and gravel. The geology of the Toquop Gap consists of dolomite and limestone of Devonian to Cambrian age; limestone with minor amounts of dolomite and shale of Mississippian age; and limestone and sparse dolomite, siltstone, and sandstone of Permian and Pennsylvanian age. The geology of the Rainbow Pass area consists of welded and non-welded silicic ash-flow tuffs and basalt flows, both of Tertiary age.

The northern half of the proposed railroad alignment crosses the East Tule Desert fault, and the terminus is located west of this fault. Three other faults (West Tule Desert, Tule Corral, and East Tule Springs Hills) are located near the northern portion of the alignment. The nearest active faults and earthquake hazards are described in Section 3.9.2.2.

Soils

Soils along the proposed rail line are primarily defined by geographical area. From the power plant site through Toquop Gap, the dominant soils are in the Mormon Mesa series, described in Section 3.9.2.2.

Through the Toquop Gap area, soils are in the St. Thomas-Zeheme-Rock Outcrop association. These soils are shallow, very cobbly loams over bedrock. Depth to bedrock is often less than 14 inches. These soils are moderately vulnerable to both wind and water erosion.

Between Toquop Gap and Rainbow Pass, soils are in two associations—the Aymate-Canutio association and the Geta-Arizo association. These associations are both sandy loams. Aymate-Canutio has a petrocalcic hardpan starting approximately 3 feet below the ground surface. Geta-Arizo soils generally do not have a hardpan layer. Both associations generally have slopes between 1 percent and 3 percent, are highly susceptible to wind erosion, moderately susceptible to water erosion, and are not classified as prime farmland.

North of Rainbow Pass, the dominant soil type is the Cave-Tencee association. These soils are shallow gravelly sandy loams over petrocalcic hardpans. Slopes are generally less than 10 percent. Soils are moderately susceptible to wind erosion and mildly susceptible to water erosion. They are not classified as prime farmland. A second series is present west of the subject area in the streambed area. These soils are in the Arizo-Bluepoint association. These fine sandy soils are moderately susceptible to water and wind erosion, have a 1 percent to 3 percent slope, and are not classified as prime farmland.

Minerals

Locatable Minerals. The proposed rail line transverses the East Mormon Mountains, which have low metallic mineral potential. Several mining claims are present in this area and the mineral potential includes tungsten, barite, and manganese (ENSR 2004b; USGS 2006). Mineral deposits could occur in the bedrock beneath the alluvial cover at the proposed rail line. Because the alluvium is 2 to 5 feet thick, and there is lack of economic interest in exposed minerals occurrences in the region, so it is unlikely that any potential deposits would be developed.

There is moderate potential for metallic minerals in the southern portion of the Clover Mountains, north of the study area. Several mining claims are present throughout this area and the mineral potential includes minerals such as silver, lead, zinc, copper, cadmium, antimony, manganese, and fluorspar (ENSR 2004b; USGS 2006).

There are no additional mineral resources along the proposed rail line. However, there are several reported non-metallic mineral deposits in the adjacent mountain ranges. Mineral exploration in areas adjacent to the rail line area would likely continue. With low mineral potential for tungsten and barite, moderate mineral potential for gypsum and kaolinite, and high mineral potential for perlite, mineral exploration would likely trend more to development of non-metallic minerals.

There are mining claims near the proposed plant site for non-metallic minerals along the proposed rail line. There is high potential for perlite in the Meadow Valley Mountains, located west of Leith Siding. There is a moderate potential for kaolinite on the east flank of the Mormon Mountains. There are two areas of moderate potential for gypsum, one in the Mormon Mountains and one in the Tule Springs area (ENSR 2004b; USGS 2006) (refer to Map 3-8).

Salable Minerals. There are no reported salable mineral resources in the vicinity of the proposed rail line. Sand and gravel are present, but no permits have been issued. The potential for sand and gravel is high.

Fluid (Leasable) Minerals. The proposed rail line would traverse the Tule Desert, cross over the Toquop Gap, and enter the Toquop Basin. Tule Desert and Toquop Basin have high potential for oil and gas mineral resources (ENSR 2004a). Although oil and gas development potential is high, there is low potential where the route crosses Tertiary basalt flows and Paleozoic sedimentary rocks. The proposed route of the rail line traverses oil and gas leases near the proposed power plant site.

Throughout the entire region there is medium geothermal resource potential and, in particular, where the proposed rail line would traverse Tule Desert and Toquop Basin (ENSR 2004a). There is low potential where the route crosses Tertiary basalt flows and Paleozoic sedimentary rocks. There currently are no geothermal resource leases along the proposed route.

3.10 GROUNDWATER RESOURCES

3.10.1 Data Collection Methods

This section characterizes the local groundwater system and its relationship to the regional groundwater system. The scale evaluated for the regional groundwater system encompasses southern Nevada. The groundwater system is directly linked to the geological conditions described in Section 3.9, Geology, Soils, and Minerals. A discussion of the relationship between groundwater and surface flows in the Virgin River, as it relates to potential project-induced impacts, also is presented in this section. The data sources reviewed for this EIS include USGS reports and maps; Nevada Division of Water Resources reports and data obtained from the internet; reports by various scientific organizations (e.g., the Department of Geoscience at the University of Nevada, Las Vegas); the 2003 EIS (BLM 2003a); and consultants' reports specific to the area (e.g., BLM 2003a). Consultants' reports prepared on the regional and local hydrogeology contain a more detailed discussion and analysis of many of the groundwater-related topics presented in this EIS.

3.10.2 Existing Conditions

3.10.2.1 Regional Overview

Regionally, the project area is located within the Basin and Range physiographic province (refer to Section 3.9, Geology, Soils, and Minerals). Hydrologically, Nevada is subdivided into 14 principal hydrographic basins, which are subdivided into a total of 256 hydrographic areas or sub-areas. The proposed site is located in the Colorado River Basin, designated as Basin 13. Within the Colorado River Basin, the proposed site is located within the Tule Desert (Hydrographic Area / Sub-Area 221), the Virgin River Valley (Hydrographic Area/Sub-Area 222), and the Lower Meadow Valley Wash (Hydrographic Area/Sub-Area 205) (Map 3-9).

The proposed power plant site is located within the Virgin River Valley, which abuts the Tule Desert to the north. A singular topographic basin has formed in this area, in which all surface-water drainage is toward the Virgin River and Lake Mead south of the project area. Geologically, much of the Virgin River Valley sits above a deep tectonic basin in which the underlying bedrock is 6 miles below the valley floor (refer to Section 3.9, Geology, Soils, and Minerals).

The Tule Desert or Clover Valley would supply water for the proposed power plant. The Tule Desert is an elongated basin trending in a generally north-northeast direction. The Tule Desert is a singular topographic basin that is surrounded by the Clover Mountains to the north and northwest, the Tule Springs Hills to the east, the East Mormon Mountains to the south, and the Mormon Mountains southwest. With a length of approximately 32 miles and a width of approximately 12 miles, the area of Tule Desert is approximately 125,000 acres. The topography of the floor of the Tule Desert slopes from all directions toward the Toquop Gap, which separates the East Mormon Mountains from the Tule Springs Hills. The Toquop Gap is a significant topographic feature that forms the only natural hydrologic outlet from the Tule Desert. Through this low-lying area, the Toquop Wash drains ephemeral surface-water runoff from the Tule Desert.

Within the Clover Valley Hydrographic Area, all surface water draining the northern portion of the project area flows in a northerly direction into Clover Creek. Clover Creek is an ephemeral drainage that joins the perennial Meadow Valley Wash just north of the town of Caliente. Pine Wash and several small, unnamed drainages originate in the Clover Mountains. These are ephemeral drainages that flow only for short durations as a result of significant precipitation events.

The proposed rail line would be located in three hydrographic areas/sub-areas, with only about 3.2 miles of the rail line in the Lower Meadow Valley Wash (refer to Map 3-9). Meadow Valley Wash is a perennial stream incised through volcanic rocks in the northern part and primarily through basin-fill deposits in the southern part of the Lower Meadow Valley Wash Hydrographic Area.

Groundwater Occurrence

Basin and Range Province. Groundwater occurs within the Basin and Range province in the sediments that have filled the valleys to their current elevations (basin-fill deposits) and in the underlying bedrock. The bedrock also comprises the surrounding hills and mountains. In the Tule Desert and Virgin River Valley, groundwater is stored and conveyed through two principal aquifer systems, as follows: (1) poorly consolidated saturated basin-fill deposits, consisting mainly of silty and clayey sands with occasional clay and gravel layers; and (2) the underlying fractured sedimentary (e.g., limestone, dolostone) or volcanic rocks. A more detailed description of the lithology of these aquifers is presented in Section 3.9, Geology, Soils, and Minerals.

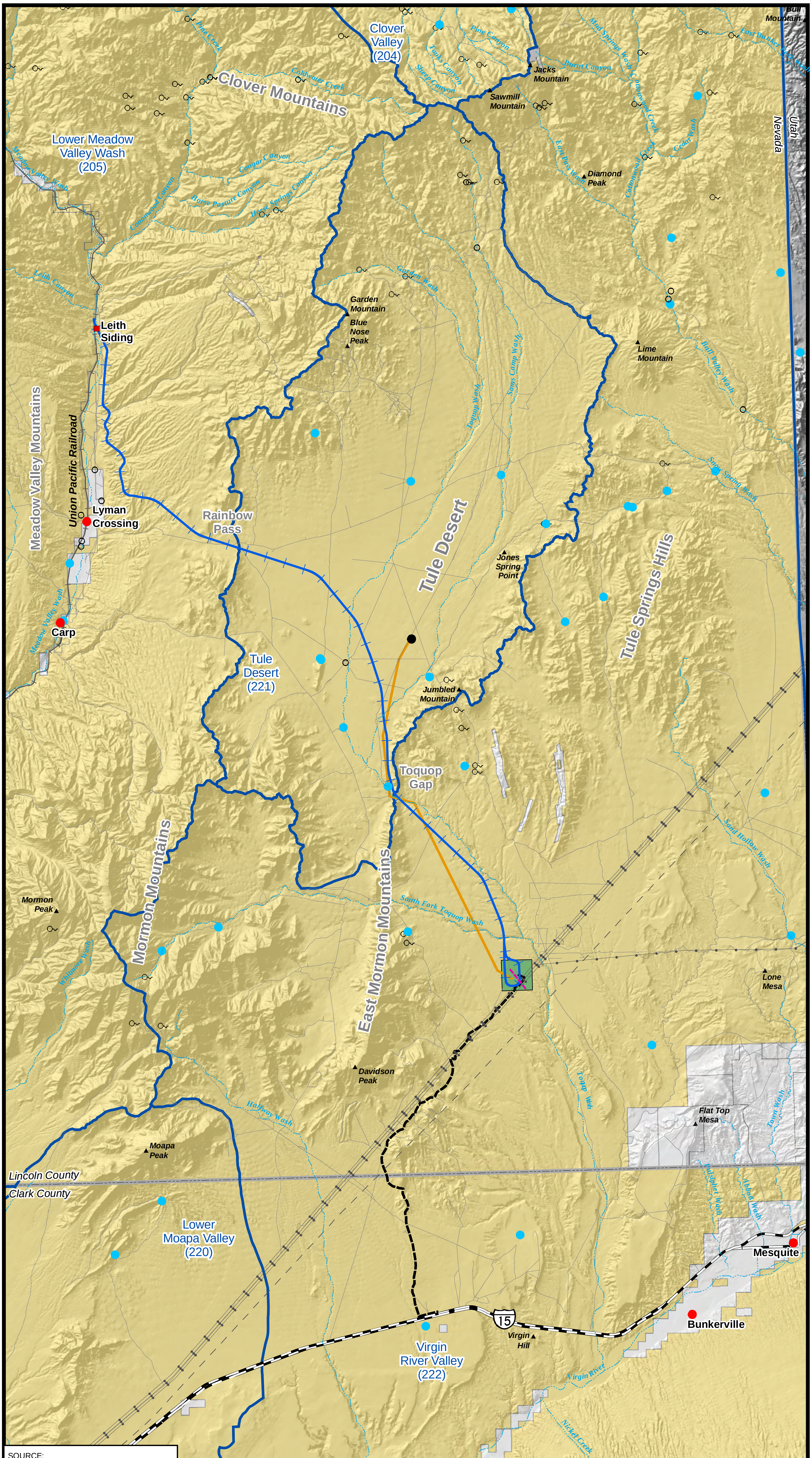
Some basin-fill aquifer systems in the Basin and Range province are localized and relatively shallow. In these deposits, the direction of groundwater flow generally follows topography (from high to low elevation). Groundwater can flow between hydrographic areas, or basins, where basin-fill deposits from adjacent areas merge. An example of this is found at the Toquop Gap, where the basin-fill deposits of the Tule Desert are continuous with those of the Virgin River Valley.

Fractured-rock aquifer systems, beneath the basin-fill deposits, are regional features in which groundwater flow does not coincide with the local topography. Groundwater flow in deep fractured-rock aquifer systems occurs in response to the regionally controlled hydraulic gradient. Regionally, the hydraulic gradient is driven by regional recharge and discharge areas. In general, the regional hydraulic gradient is not significantly influenced by conditions in the overlying basin-fill aquifer systems. Additionally, although individual rock formations are laterally discontinuous and typically highly deformed structurally, the basic rock types are essentially continuous. These formations transcend the boundaries of the hydrographic areas, and as a result, it is very difficult if not impossible to place lateral bounds around the fractured-rock aquifer systems. Further discussion on the basic principles of flow through fractured rock is presented in CH2M HILL (2002a).

Carbonate-Rock Province. For substantial portion (approximately 200 million years) of the geologic history, a portion of the Basin and Range province involved the deposition of massive sequences of carbonate rocks (limestone and dolostone) over much of what is now eastern Nevada, western Utah, and the northwestern tip of Arizona. The geologic history of this portion of the Basin and Range province, including approximately 50,000 square miles in Nevada alone, has formed what is commonly referred to as the carbonate-rock province (Dettinger et al 1995; Mifflin and Hess 1979; Prudic et al. 1995).

The carbonate-rock province is a descriptive term used by geologists in general, but its definition also includes a reference to groundwater used by hydrogeologists. Specifically, Dettinger et al. (1995) describe the carbonate-rock province as "that part of the Basin and Range Province in which groundwater flow is predominately or strongly influenced by carbonate-rock aquifers of Paleozoic age."

Dettinger et al. (1995) and Plume (1996) show the Tule Desert and Virgin River Valley hydrographic areas located just within the southeastern edge of the carbonate-rock province. While carbonate rocks comprise a significant portion of the local mountains and hills that rim the Tule Desert, the lithology does not necessarily comprise the fractured-rock aquifer formations at shallow depths within the Tule Desert and Virgin River Valley hydrographic areas.



Hydrographic Basins and Groundwater Sources

Toquop Energy Project EIS
Lincoln County, Nevada

LEGEND

Hydrographic Basins

Groundwater Sources
- Reservoir
- Spring
- Well

Surface Management
- Bureau of Land Management
- Private

General Features
- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road

Reference Features
- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest

Reno
Carson City
Lincoln County
Project Site
Las Vegas

0 2 4
Miles

Map 3-9

Dominated by limestones and dolostones, the carbonate rocks in the southern Nevada region are brittle and subject to fracturing. With the necessary geochemical conditions, the rocks can be subject to dissolution. This dissolution results in what is known as karst, which can form sink holes at the surface and cavities, or even caves, at depth. Karst development leads to secondary porosity in a rock unit that can further enhance the ability of these rocks to store and transmit groundwater. The large geographic area underlain by these carbonate rocks, together with their secondary porosity and demonstrated capacity to transmit large volumes of groundwater, is evidence that the carbonate rocks of Nevada comprise aquifer systems of regional scale and significance (Dettinger et al. 1995).

The carbonate-rock province has been studied extensively on a regional scale by the USGS (Harrill and Prudic 1998) because of its significance. Computer models of the regional carbonate aquifer systems, developed by the USGS, indicate that the total volume of groundwater that flows through these aquifers is approximately 1.5 million acre-feet per year (af/yr). This volume is for the entire carbonate rock province, and is based on fairly sparse data. Specifically, within the Nevada portion of the Colorado River Basin, the flow through the carbonate aquifer is estimated by the USGS to be more than 200,000 af/yr. These estimates are based on very general assumptions for conditions in the Tule Desert and Virgin River Valley. It is important to note that data on the carbonate rock aquifer system in these areas were limited at the time of the Harrill and Prudic (1998).

3.10.2.2 Local Conditions

Tule Desert Hydrogeology

General studies of the hydrogeology of the Tule Desert area can be found in published literature dating back to the early twentieth century (Carpenter 1915). Specific data were not available until recently, because the groundwater resources of the Tule Desert had been developed only minimally in the past.

As part of the preparation of the 2003 EIS for the Toquop Energy Project (BLM 2003a), an investigation of the feasibility of using groundwater from the Tule Desert for the proposed power plant was conducted. Several monitoring wells and one pilot production well were installed, sampled, and tested in the area of the proposed well field under the original EIS. Information presented in this section is a summary of fieldwork presented in CH2M HILL (2002a), as well as in the 2003 EIS (BLM 2003a).

Groundwater in the Basin-Fill. Borehole data obtained during the preparation of the 2003 EIS (BLM 2003a) showed the boreholes drilled in the well field area of the Tule Desert to contain basin-fill deposits, which consist of older alluvium of probable Pleistocene age (approximately 10,000 to 1.7 million years old) and perhaps Pliocene age (approximately 1.7 to 5 million years old). These deposits are believed to be derived from erosional debris from the surrounding areas that were subject to uplift from faulting (refer to Section 3.9, Geology, Soils, and Minerals). Although these deposits consist principally of unconsolidated coarse sands and gravel with some silt and clay within the uppermost 100 to 200 feet, they typically transition rapidly thereafter to a massive sequence dominated by either silty or clayey sands that are 300 or more feet thick. In some locations, layers of coarse-grained sediments (silty sands and gravel) and layers of clay occur at depths of 600 feet or more (CH2M HILL 2002a).

The available data also suggest that a general pattern to the layering is discernible, but that discrete layers within the basin-fill deposits are laterally discontinuous or of limited areal extent. Although the lower portions of the basin-fill are saturated, a single continuous aquifer unit was not easily identified (BLM 2003a). Consequently, groundwater is likely to be locally perched, which means that it occurs as laterally discontinuous pockets of saturated sediments that are independent of a specific basin-fill aquifer.

Studies conducted for the 2003 EIS (BLM 2003a) revealed that the depth to groundwater in the basin-fill is generally very deep, and based on the water-level data, it also confirmed the potential for more than one groundwater source in the area. This was based on available data showing that the depth to groundwater for three wells, in proximity to each other, varied by over 320 feet. The water-level data demonstrates that the wells are not hydraulically connected.

Geophysical studies reported in Langenheim et al. (2001) indicate that the thickness of the basin-fill deposits generally increases toward the center of the Tule Desert. Additional discussion of this can be found in the 2003 EIS for the Toquop Energy Project (BLM 2003a).

The Nevada Department of Water Resources (1971) estimated the total volume of groundwater in storage within the uppermost 100 feet of saturated sediments in the Tule Desert to be approximately 530,000 acre-feet. This is based on a specific yield of 10 percent. Specific yield represents the water-storage properties of the basin-fill deposits. The value of specific yield is estimated from the technical literature (CH2M HILL 2002b). There are no field data available to determine the storage properties of the basin-fill deposits directly.

Recharge to groundwater in the Tule Desert basin-fill deposits comes from direct precipitation on the surrounding upland areas, particularly those portions of the Clover Mountains and Tule Springs Hills. The Tule Springs Hills are within the watershed of the Tule Desert. The precipitation in the Clover Mountains and Tule Springs Hills areas percolates down through the subsurface and reaches groundwater in amounts proportional to elevation. As such, as the elevation increases, the proportion of precipitation contributing to recharge increases.

The approach most commonly taken in the hydrologic literature (Glancy and Van Denburgh 1969; Maxey and Eakin 1949; Prudic et al. 1995) is to make the conservative assumption that precipitation falls on the valley floor, but does not infiltrate and recharge groundwater. This is primarily because of the high potential for evaporation. It is important to note that Dixon and Katzer (2002) believe that significant groundwater recharge occurs through the infiltration of runoff in the principal ephemeral washes feeding the Toquop Wash, and that the Toquop Wash contributes to groundwater recharge.

Estimates of groundwater recharge in the Tule Desert vary significantly from 2,100 af/yr (Glancy and Van Denburgh 1969) to approximately 8,968 af/yr (Katzer et al. 2002). Recharge to the basin-fill deposits also could be occurring due to upward leakage from the underlying fractured-rock aquifer (BLM 2003a), but no quantification exists of this potential recharge component. The potential for interconnection between groundwater in the basin-fill and the underlying rock is addressed in the next section and in CH2M HILL (2002a). The CH2M HILL (2002a) report also contains additional discussion on recharge estimates.

Groundwater flow through the Tule Desert is believed to occur in the basin-fill deposits toward the Toquop Gap (BLM 2003a). Some portion of the basin-fill groundwater leaves the Tule Desert hydrographic area and enters the Virgin River Valley hydrographic area. The Toquop Gap, however, is too small to accommodate all of the basin-fill groundwater discharge that, along with current local withdrawals and locally recharged spring flows, must balance the recharge estimates. The reason for this is that high-end estimates of the range of potential discharge rates through the basin-fill deposits in the Toquop Gap are much less than 10 af/yr (CH2M HILL 2002a). Based on this, some groundwater in the basin-fill deposits must enter the underlying fractured-rock aquifer system and flow into the Virgin River Valley through that medium.

Groundwater in the Fractured Rock. The specific composition of the fractured-rock aquifer in the Tule Desert varies laterally across the basin as a result of vertical offset from faulting and local deposits of volcanic origin. Detailed descriptions of the rocks encountered in the test boreholes for the 2003 EIS

(BLM 2003a), presented in CH2M HILL (2002a), showed the uppermost rock formation to be predominantly gray limestone interfingered with brown and red limey siltstone and bands of gray quartzite down to a depth of 2,000 feet in the vicinity of proposed power plant. To the north, in the vicinity of well MW-2 (refer to Map 3-8) (BLM 2003a), the limestone component is generally absent and the limey siltstone component predominates.

The composition of the bedrock in the vicinity of the wells near the power plant is generally consistent with descriptions of the Triassic-aged Moenkopi Formation (205 to 240 million years old), as reported in the geologic literature (Plume 1996; Tschanz and Pampeyan 1970). The siltstone component also is similar to outcrops of the Moenkopi Formation in the Tule Springs Hills, just east of the well field area (refer to Map 3-9). The Moenkopi Formation is identified as being the uppermost (youngest) formation that contains aquifers in carbonate rock (Plume 1996). This is consistent with the predominance of limestone encountered in the boreholes in the vicinity of the proposed power plant site and is supported by local water-chemistry data, which indicate that groundwater from the fractured rock in this area is directly related to groundwater in the regional carbonate aquifer system (BLM 2003a).

To the west of the proposed power plant location, Tertiary-aged volcanic rocks are present to a depth of 2,000 feet (BLM 2003a). These volcanic rocks are part of the Clover Mountains, and include discrete layers of basalt, rhyolite, and tuff, interspersed with layers of clay up to 200 feet thick. In addition, these volcanics likely extend under much of the northern third of the Tule Desert. The rocks also likely comprise the bedrock beneath the basin fill south of the northern third of the Tule Desert along the eastern edge of the Clover Mountains.

All of the rock types encountered in the boreholes (limestone, siltstone, quartzite, and the various volcanic rocks) show evidence of fracturing (BLM 2003a). This fracturing creates a secondary porosity, which provides additional void space to store and transmit groundwater.

Despite the variability in the rocks that comprise the fractured-rock aquifer of the Tule Desert, the groundwater chemistry data indicate a common groundwater flow system within the different rock types. The deuterium analysis (a stable isotope of hydrogen contained in water molecules), used to help differentiate between waters of different origins (CH2M HILL 2002b, Appendix A) in the 2003 EIS (BLM 2003a), indicated similarities between groundwater at the proposed power plant site and a deep upgradient well despite different dominant rock types in the wells (BLM 2003a).

Water chemistry data also indicates a link between the groundwater in the Tule Desert fractured-rock aquifer and regional carbonate-aquifer groundwater (BLM 2003a; CH2M HILL 2002b). Along with being highly depleted in deuterium, the chloride concentrations analyzed from reliable samples were very low (approximately 8 milligrams per liter [mg/L]) (CH2M HILL 2002a). These data collectively comprise a unique chemical signature that is only duplicated in groundwater of the regional carbonate-aquifer system, which is similarly highly depleted in deuterium and typically does not provide a source of chloride (CH2M HILL 2002b).

Additional evidence that groundwater in the fractured rock underlying the Tule Desert Basin-fill is part of the regional aquifer system of the carbonate-rock province comes from carbon-14 data, another isotopic analysis. The application of carbon-14 data, presented in CH2M HILL (2002b), Appendix A, indicates that the groundwater in the fractured rock at this location is very old because the unstable carbon content has almost completely decayed (BLM 2003a). Based on the carbon-14 data, the groundwater originated as precipitation many tens of thousands of years ago and has taken that long to travel to the point where it was extracted. Groundwater of this age is consistent with the age of groundwater in the regional carbonate-aquifer system, which similarly requires several thousand years to flow from the point of recharge across the carbonate-rock province (BLM 2003a).

Water-level data presented in the 2003 EIS (BLM 2003a) from fractured-rock wells in the Tule Desert indicate that water levels in wells penetrating the fractured rock are typically very deep, but remain above the top of rock. This also indicates that the groundwater in the fractured rock is confined under pressure. Additional confirmation that the groundwater is under pressure in the fractured rock is confirmed by the water-level data from immediately adjacent basin-fill wells (BLM 2003a), which reveal water levels that are different from the water levels in the rock.

The fractured-rock data also were analyzed spatially on a map (BLM 2003a) and indicate the magnitude of the horizontal component of hydraulic gradient, approximately 0.02, to be consistent with the relatively poor ability of the fractured rock to transmit water, as discussed below. Although the direction of groundwater flow is dictated locally by the orientation of individual fractures, the direction of groundwater flow is considered to be generally parallel to the direction of hydraulic gradient at the scale of the entire hydrographic area. What this means is that the available water-level data indicate that groundwater flows south through the Tule Desert (BLM 2003a). This agrees with regional studies on the carbonate-rock aquifer systems that have concluded the regional groundwater flow in the fractured-rock aquifer is generally south in the vicinity of the Tule Desert and the northern portions of the Virgin River Valley hydrographic areas (Dettinger 1992; Harrill and Prudic 1998; Prudic et al. 1995).

Unlike groundwater in the basin-fill deposits, groundwater in the fractured rock is recharged in part outside the hydrographic area. Water-chemistry data from springs and wells north of the Tule Desert compared with similar data from the test wells drilled for the 2003 EIS (BLM 2003a) indicate that groundwater enters the Tule Desert fractured-rock aquifer north of the Clover Mountains.

A detailed discussion of the geochemical data from fractured-rock wells of the Tule Desert, and surrounding hydrographic sub-basins, is provided in the 2003 EIS (BLM 2003a). These data show a chemical signature of the Tule Desert hydrographic sub-basin, which is known only to exist in carbonate springs approximately 30 miles north of the northern edge of the Tule Desert hydrographic sub-basin. It can be concluded that groundwater recharge to the Tule Desert must involve southerly interbasin groundwater flow from basins to the north before entering the Tule Desert through faults and fractures in the subsurface volcanic rocks of the Clover Mountains (BLM 2003a). The data used in the 2003 EIS were obtained from Hydrosystems Inc. (2001) and Thomas et al. (2001), and are presented and analyzed in CH2M HILL (2002a).

Several conclusions about the groundwater environment can be reached based on the results of aquifer testing previously conducted in the well field area, as described in CH2M HILL (2002a). The first conclusion is that the ability of the fractured-rock aquifer in the vicinity of the production well to transmit water (aquifer transmissivity) is relatively low (BLM 2003a). The values of transmissivity presented for the fractured-rock aquifer were found to range between 14,500 and 27,000 gallons per day per foot (gpd/ft) of aquifer thickness (BLM 2003a).

Aquifer transmissivity and the magnitude of the horizontal component of hydraulic gradient allows the amount of groundwater flowing through the aquifer to be estimated by multiplying the product of these two parameters by a representative value of the width of the aquifer. By using a conservative value of transmissivity (14,500 gpd/ft, which is the lowest value calculated), along with the observed hydraulic gradient (0.02), and a minimum representative value for the width of the Tule Desert (which for these would be 20,000 feet or approximately 3.8 miles), the flow through this portion of the Tule Desert near the proposed power plant site is approximately 6,500 af/yr (CH2M HILL 2002a). This is a reasonably conservative estimate within the Tule Desert. Outside of this approximately 4-mile-wide width, the values of the parameters used in such a calculation are unknown. Specifically, groundwater also flows within the Tule Desert fractured-rock aquifer outside and parallel to the 4-mile-wide width selected for the calculation above. Although this additional amount cannot be definitively calculated at this time, it would presumably raise the total above 6,500 af/yr.

Significant additional groundwater undoubtedly flows beneath the Tule Desert, but at depths deeper than that for which the transmissivity value used in the calculation above is representative. Additional unquantifiable amounts of groundwater flow within deeper fractured-rock aquifer units (e.g., deep Paleozoic carbonate rocks not encountered within the depths of the wells drilled for the 2003 EIS) beneath the Tule Desert. The support for this premise is based on the existence of very deep (between 3,400- and 10,000-feet deep) wells reported to penetrate the regional Paleozoic carbonate aquifer system (Dettinger et al. 1995, Table 6).

The aquifer testing conducted by CH2M HILL (BLM 2003a) also allowed the ability of the aquifer to store groundwater (storativity) to be determined. Storativity, which is the volume of water pumped by a well, per foot of water-level decline, per unit area of the fractured-rock aquifer, was calculated to range between approximately 0.005 and 0.012 (BLM 2003a). Storativity values this small indicate that the pumping resulted in very little loss of groundwater from storage and confirms the observation that the groundwater is confined under pressure within the fractures of the rock based on typical values of storativity (Fetter 1994; Freeze and Cherry 1979). Based on the value of 0.005 for aquifer storativity, the volume of groundwater within the uppermost portion of the fractured-rock aquifer (i.e., an aquifer thickness of no more than 1,000 feet) is estimated to be approximately 400,000 acre-feet (CH2M HILL 2002a).

Aquifer testing also demonstrated that water levels in the rock and overlying basin-fill deposits behave very similarly in response to pumping, although with much less water-level decline in the basin fill (BLM 2003a). As a result, it appears that there is significant hydraulic interconnection between the two aquifers, and that they effectively act as one unit (BLM 2003a). This conclusion was made at the scale of the proposed well field area for the 2003 EIS (BLM 2003a). The vertical component of hydraulic gradient (change in pressure) also was assessed as slightly upward in the area, which implies that the groundwater has a slight tendency to flow from the rock, where it is under greater pressure, upward into the basin-fill deposits in this area.

Farther to the north of the proposed power plant location, and laterally upgradient, the vertical gradient is downward (BLM 2003a). This downward gradient implies that groundwater tends to flow from the basin-fill deposits into the fractured rock in this area. Although the results of aquifer testing indicate groundwater in the basin-fill and groundwater in the fractured-rock aquifer respond to pumping essentially as a single unit, groundwater in the two aquifers originates from different sources and flows differently, if not independently, through the Tule Desert (BLM 2003a).

The available water-chemistry data indicate groundwater in the basin-fill within the Tule Desert and groundwater in the fractured-rock aquifer within the Tule Desert have different chemical compositions, which reflects different origins (BLM 2003a). This conclusion is based on the similarity to the regional carbonate-rock aquifer system, with no detectable tritium (an unstable isotope of hydrogen). Tritium, if detected, is indicative of water less than 50 years old because high levels of tritium originated with aboveground nuclear testing in the late 1950s. Groundwater in the basin-fill, however, was shown to be less depleted in deuterium, higher in chloride, and to contain detectable tritium.

The results of the aquifer testing also provide insight into how much water the wells can pump (well yield). While the production well was pumped at a rate as high as 1,400 gallons per minute (gpm) for several days, the resulting water-level response indicates that long-term sustained safe yield to be approximately 550 gpm or about 887 af/yr (BLM 2003a).

Springs. Numerous small springs discharge groundwater within and around the Tule Desert (refer to Map 3-9). Most of these springs are located in the Clover Mountains, and a few are in the Tule Springs Hills and East Mormon Mountains. Discharge rates from these springs are typically very low. In general, the discharge from the springs is generally less than 1 gpm, and most of the rates are 0.5 gpm or less (Walker 2002).

Additionally, several springs are located outside the project area. These springs include the Littlefield Springs; the Muddy Springs, located in Moapa Valley approximately 20 miles west-southwest of the project area; and the series of springs that rim the Overton Arm of Lake Mead.

A deuterium analysis was used on samples of spring water to provide the general origin of the water that discharges from a given spring (CH2M HILL 2002b, Appendix A). Deuterium data from the springs within both the Tule Desert and the Virgin Valley hydrographic areas indicate the springs are recharged by local precipitation and the water likely travels a relatively short distance, a few miles or less, before discharging (BLM 2003a).

Higher values of deuterium (lower negative values) represent water that originated as precipitation at relatively lower elevations. The lowest elevation springs (e.g., Gourd, Peach, Tule, Summit, Snow, Sam's Camp #4) are in the East Mormon Mountains and Tule Springs Hills, as well as the foothills of the Clover Mountains. These springs all have values of deuterium that range between -76.5 per mil (parts per thousand) from Peach Springs and -83 per mil from Tule Spring with most around -77 per mil (BLM 2003a).

Springs in the Mormon and Clover mountains are typically at higher elevations than the Tule Springs Hills (for example, Davies, Horse and Hackberry in the Mormon Mountains; Garden, Box, Upper Box, Sam's Camp #1, #2 and #3, Shoemake #1, #2 and #3, Sheep, and Mud Hole in the Clover Mountains), and have correspondingly lower (more negative) values of deuterium relative to the springs at lower elevations (BLM 2003a). The lower the deuterium value is, the more "depleted" the sample is. As such, the springs are more depleted in deuterium. This is based on the deuterium values for these Clover and Mormon mountains springs being between -86 per mil and -88 per mil.

Both sets of deuterium values, the values from the lowest elevation springs and the higher elevation Mormon and Clover mountains springs, contrast with values of deuterium on the order of -100 per mil that correspond to deep, regionally flowing groundwater in the carbonate aquifer systems (BLM 2003a). Accordingly, local recharge is the source for all of the springs that are near the well field area (Peach, Gourd, Tule, and Summit). This is consistent with the findings by Prudic et al. (1995), who states that many small springs in the local mountains typically represent perched local systems that are not connected to surrounding and underlying groundwater. Further discussion on the origin of the discharge of the local springs can be found in CH2M HILL (2002a).

The origin of the water that discharges from some of the principal springs outside the project area is regional, but not related to the groundwater in the fractured rock within the Tule Desert (BLM 2003a). The sources of the Littlefield Springs reportedly include both a portion of the Virgin River that infiltrates upstream in Utah and emerges downstream at Littlefield, and local recharge from the Beaver Dam Mountains (Cole and Katzer 2000; Trudeau et al. 1983). In addition, the available water-chemistry data from the Littlefield Springs indicate that the spring discharge is chemically unrelated to the groundwater in the fractured-rock aquifer within the Tule Desert (BLM 2003a). Specifically, relative to groundwater from wells in the Tule Desert, the Littlefield Springs are less depleted in deuterium, and contain significantly higher concentrations of chloride, sulfate, and total dissolved solids (TDS) relative to the test wells in the Tule Desert (CH2M HILL 2002a).

The source of water to the Muddy Springs, 20 miles west-southwest of the project area, is from the regional carbonate-rock aquifer system recharged north of the Clover Mountains, but the discharge of these springs has no relation to the groundwater in the Tule Desert (BLM 2003a). A comparison of the water chemistry of these springs with groundwater from wells in the Tule Desert indicates that the Muddy

Springs are less depleted in deuterium, and contain considerably higher concentrations of chloride and TDS.

Water discharging from springs around the Overton Arm of Lake Mead has been found to be of multiple origins, with most of the discharge resulting from local recharge (such as the discharge at Kelsey Spring) (Pohlmann et al. 1998). Rogers Spring appears, however, to have a regional carbonate-aquifer origin, but from sources that are not common with the fractured-rock aquifer of the Tule Desert (Pohlmann et al. 1998). The discharge from Rogers Spring is much less depleted in deuterium and is significantly higher in chloride and TDS than groundwater from wells drilled in the Tule Desert for the 2003 EIS (BLM 2003a).

Clover Valley Hydrogeology

Groundwater Occurrence. Limited hydrogeology data are available for the Clover Valley hydrographic area. Recent well siting investigations conducted by the Lincoln County Water District (LCWD) are the most comprehensive hydrogeology information for the area to date. It is anticipated that water from a regional source would be encountered between 1,200 to 1,500 feet below ground surface (bgs). This estimate is based on an unpublished water-level contour map of the groundwater basins to the north of Clover Valley and water-level data from LCWD-constructed monitor and test wells in Tule Desert to the south of Clover Valley. The direction of groundwater flow is likely south-southeast.

No wells have been completed in carbonate rocks in the Meadow Valley area; therefore, water levels within the carbonate rocks are not known. Water levels within the basin-fill are shallow throughout most of the area. Measured depth to groundwater from six wells located in the Lower Meadow Valley Wash area varied between 13 to 58 feet bgs (BLM 2007c).

The few wells that have been drilled in Clover Valley serve domestic and stock-watering purposes. These wells are between 38 and 499 feet bgs deep, with water levels ranging between 8 and 299 feet bgs (BLM 2007c). These wells are likely completed in the younger alluvium or from one of the extrusive volcanic units and produce water from those zones. They may produce enough water to sustain a family ranch, but they would not be useful for providing a sustainable municipal water supply.

Groundwater Recharge and Flow. Recharge from surrounding Clover and Delamar mountains was estimated by Rush (1964) to be 1,300 af/yr. Recharge from Meadow Valley Mountains, estimated to be 1,000 af/yr, probably flows southward toward the Muddy River Springs area and does not significantly contribute to Meadow Valley Wash hydrographic area (Burbey 1997).

Groundwater flow within the Meadow Valley Wash area in both shallow alluvium and carbonate rocks is inferred to be from north to south. It is estimated that between 4,000 and 8,000 af/yr of groundwater may leave the area as a subsurface outflow near Glendale, located at the southernmost part of the valley (BLM 2007c). The amount of discharge surpasses the amount of recharge; therefore, additional sources of recharge must be available. These sources include (1) recharge from volcanic rocks in the northern part of the hydrographic area, (2) infiltration of surface water, and/or (3) subsurface inflow from outside the hydrographic area (Burbey 1997).

The first two sources are not believed to be significant. There are two distinct subsurface flow systems in the Meadow Valley Wash area. The first system likely extends from Clover and Delamar mountains in the north toward southwest and supports spring discharge in the Muddy Springs area. The second flow system extends as a narrow zone southward from the Mormon Mountains, and may recharge Rogers and Blue Point springs located in the Overton Arm of Lake Mead (Burbey 1997).

The groundwater storage in the carbonate rocks of the Lower Meadow Valley Wash area has been estimated to be about 2.7 million acre-feet, while local storage (within the basin-fill) has been estimate at about 700,000 acre-feet (Burbey 1997).

Springs. As noted in the Tule Desert section above, there are several existing wells and springs in the Clover Valley hydrographic area; however, none are representative of deep water sources nor are they highly productive. Springs are recharged locally from the surrounding hills and mountains and are likely structurally controlled by extensive faulting in the area. The springs exhibit limited discharge, with likely increases in flow during the spring snow melt and summer monsoons.

Virgin River Valley Hydrogeology

Groundwater Occurrence. A great deal of the Virgin River Valley sits above a structural depression with the underlying bedrock as much as 6 miles deep below the valley floor (refer to Section 3.9, Geology, Soils, and Minerals). Due to this, the accessible groundwater occurs predominantly in the various deposits comprising the basin-fill of this hydrographic sub-basin.

The basin-fill principally consists of the Muddy Creek Formation, which typically is overlain by a veneer of Older Alluvium where alluvial fans and terraces abut the local mountains and hills (Glancy and Van Denburgh 1969; Metcalf 1995). The Older Alluvium consists of the full range of sediments from silt and clay to gravel and boulders. This unit generally thickens toward the center of the valley, and is essentially indistinguishable from the Muddy Creek Formation. Along the floodplain of the Virgin River, the river has cut through the Older Alluvium and deposited sediments commonly referred to as Younger Alluvium (Glancy and Van Denburgh 1969; Woessner et al. 1981).

Groundwater Recharge and Flow. Groundwater enters the Virgin River Valley from the north via the regional flow system, described above, that applies to the Tule Desert. In addition, groundwater flow comes from areas to the east of the Tule Desert. Groundwater also enters the Virgin River Valley as recharge from the east, coming from Beaver Dam Wash and mountain-front recharge from the Beaver Dam and Virgin mountains (Las Vegas Valley Water District and The MARK Group 1992). Groundwater in the Virgin River Valley also is recharged directly by the Virgin River, and locally by residual irrigation water applied to crops in the Virgin River floodplain. Once in the Virgin River Valley, the direction of groundwater flow is generally toward the southwest parallel to the Virgin River (Dixon and Katzer 2002; Las Vegas Valley Water District and The MARK Group 1992).

Conceptually, groundwater flow from the Tule Desert into the Virgin River Valley occurs primarily through the fractured-rock aquifer and provides very little direct hydraulic communication between saturated portions of the basin-fill materials of each hydrographic area (i.e., Toquop Gap, which is much less than 1 mile wide, is the only area where basin-fill sediments of each area merge). Groundwater also flows from the Tule Desert generally southward in the fractured-rock until the rock is truncated by the northern edge of the Virgin River Depression (CH2M HILL 2002a). From that point, groundwater discharges into the basin-fill (Muddy Creek and underlying unconsolidated or semiconsolidated formations) of the Virgin River Depression (BLM 2003a). Once in the basin-fill aquifer system of the Virgin River Valley, groundwater flows southwest, parallel to the Virgin River, toward the Overton Arm of Lake Mead (Dixon and Katzer 2002; Las Vegas Valley Water District and The MARK Group 1992).

Published literature contains a range of estimates of the amount of ground inflow, including groundwater recharge, to the Virgin River Valley. Glancy and Van Denburgh (1969) roughly estimated the combined inflow and recharge to be approximately 6,700 af/yr Prudic et al. (1995), using the USGS computer models of groundwater flow through the regional carbonate aquifer system, estimated the flow to be approximately 14,000 af/yr. The computer-derived estimate, however, is based on very general assumptions for conditions. At the time of that analysis, there were no available data from the Tule

Desert. More recently, Dixon and Katzer (2002) performed a comprehensive water-budget analysis on the Virgin River Valley and have concluded that the total recharge to the Virgin River groundwater system is on the order of 85,000 af/yr.

Aquifer Characteristics. Transmissivity for the Muddy Creek Formation in the Virgin River Valley is reported to be relatively low with typical values less than 10,000 gpd/ft (Johnson 2000). Higher transmissivity has been discovered within the Muddy Creek Formation where faulting has reportedly facilitated the development of potential localized conduits between the Muddy Creek Formation and the underlying fractured rock (Johnson 2000). The total volume of groundwater in storage within the uppermost 100 feet of saturated sediments in the Nevada portion of the Virgin River Valley has been reported by Las Vegas Valley Water District and The MARK Group (1992) to be approximately 2.9 million acre-feet, based on a specific yield of 10 percent.

Dixon and Katzer (2002) estimate the available perennial yield of the basin-fill aquifer system in the Virgin River Valley to be approximately 40,000 af/yr, which includes estimates of the current level of pumping (12,000 af/yr). The perennial yield of a groundwater basin is commonly defined as the rate at which water can be withdrawn continuously, from year to year, without producing an undesirable effect (Todd 1980).

River/Groundwater Interaction. The Virgin River is considered a "losing" river within the project area, which means that water from the river infiltrates the subsurface and recharges groundwater. This classification is based on the following:

- Observed reductions in river flow downstream, as reported by Glancy and Van Denburgh (1969), Metcalf (1995), and Woessner and others (1981).
- Lower water levels for groundwater relative to the elevation of the river, reported in Las Vegas Valley Water District (Las Vegas Valley Water District and The MARK Group 1992).
- Water-chemistry data indicating the groundwater in the Younger Alluvium immediately adjacent to the river is chemically similar to the Virgin River, but dissimilar to groundwater in other basin-fill deposits (Older Alluvium and Muddy Creek Formation) (Metcalf 1995).
- Water-chemistry data indicating that the Virgin River downstream of Littlefield is composed exclusively of flows from Beaver Dam Wash, Littlefield Springs, and upstream (Utah) Virgin River flow. Evidence that the local and regional groundwater systems in the Virgin River Valley do not flow into the Virgin River is specifically addressed in CH2M HILL (2002a).

3.10.2.3 Groundwater Quality

Tule Desert

Water samples from the wells in the vicinity of the proposed well field indicate that the water quality of the basin-fill deposits appears to be generally very good (BLM 2003a). This is based, however, on data from only two wells that are screened exclusively in the basin-fill deposits. The TDS concentration provides a general indication of water quality, and these TDS concentrations are 320 mg/L and approximately 200 mg/L, respectively, which represents very good quality water (BLM 2003a). Based on samples from the Tule Well, the general character of the groundwater in the basin-fill deposits is calcium-sodium sulfate.

The database on the quality of water in the fractured rock also is quite limited. TDS values from wells completed in the fractured-rock aquifer are approximately 520 mg/L and 500 mg/L, respectively. These data are representative of good quality water, but not quite as good as the groundwater in the overlying basin-fill. The general character of the groundwater in the fractured rock is sodium sulfate, based on the chemical data presented by CH2M HILL (2002b).

In addition to the generally lower values of TDS in the basin-fill groundwater, relative to the fractured-rock groundwater, other differences in the chemistry and water quality between these two aquifers are indicative of the separate nature of these aquifers, despite their tendency to act hydraulically as a single unit in response to pumping. Specifically, when compared with the basin-fill aquifer, the values in the fractured-rock aquifer are significantly lower with respect to chloride, significantly higher with respect to silica, and significantly lower with respect to deuterium (BLM 2003a).

Clover Valley

Water-quality data from seven springs located in the Clover Valley hydrographic area were obtained as a part of hydrogeochemical study designed to determine the mineral resource potential in the area (BLM 2007c). The water from these springs may be classified as calcium bicarbonate and calcium-sodium bicarbonate. The concentration of TDS provides a general indication of water quality. TDS concentrations from these springs varied between 150 mg/L to 345 mg/L, indicating a very good quality of water. Concentration of arsenic from one spring was measured at 0.025 mg/L, exceeding the primary Federal drinking water standard of 0.01 mg/L. No water-well-quality data were available from Clover Valley hydrographic area.

Virgin River Valley

Water-quality data described in Glancy and Van Denburgh (1969), Las Vegas Valley Water District and The MARK Group (1992), and Metcalf (1995) indicate the general character of the groundwater in the floodplain of the Virgin River to be mixed sodium, potassium, or magnesium-sulfate-type water. Groundwater from wells above the floodplain tends to have a composition of predominantly sodium sulfate plus chloride (BLM 2003a). TDS concentrations in wells along the river are very high with values ranging from approximately 2,100 mg/L to over 3,000 mg/L, which indicates relatively poor quality water. The TDS concentrations in wells above the floodplain are generally much lower, around 400 mg/L to 620 mg/L. Some of these wells above the floodplain, however, have TDS values that approach 2,000 mg/L. Wells operated by the Virgin Valley Water District that penetrate the Muddy Creek Formation have had problems in the past producing water that meets drinking-water standards, but the water quality tends to improve in the immediate vicinity of faulted areas (Johnson 2000).

3.10.2.4 Groundwater Use

Tule Desert

Basin-fill deposits in the Tule Desert are not extensively developed for water supply. Only one well that taps groundwater in the basin-fill is known to exist within the Tule Desert, and this well supports seasonal livestock grazing. In addition, some springs in the Tule Desert hydrographic area, particularly in the Clover Mountains, have been tapped to provide stock water (BLM 2003a).

Groundwater in the fractured-rock aquifer within the Tule Desert has not been developed. Permitted groundwater rights filed with the Nevada State Engineer’s Office are limited to one LCWD well, with diversion rate of 6 cubic feet per second (cfs) (4,345 af/yr). Other active water-well rights include one LCWD and three Virgin Valley Water District wells that have been protested. Diversion rates for these wells vary between 6 and 10 cfs (4,345 and 7,242 af/yr), and are associated with municipal or quasi-municipal use. An additional six applications for 30 cfs (21,725 af/yr) were filed by LCWD in March 2007 and are still pending (BLM 2007c).

Clover Valley

Groundwater rights within the Clover Valley hydrographic area are associated with municipal, irrigation, and stock water use. Permitted yields vary between 0.001 and 6 cfs (0.7 and 4,345 af/yr). Four LCWD applications for a total of 20 cfs (14,480 af/yr) that were filed in 2001 are being protested (BLM 2007c).

Virgin River Valley

The basin-fill deposits in the Virgin River Valley, principally the Muddy Creek Formation, have been developed to supply both potable water to the communities of Mesquite and Bunkerville, Nevada, and to provide water for irrigation along the Virgin River (BLM 2003a). Currently, the Virgin Valley Water District maintains wells that pump approximately 4,000 af/yr. Within the Arizona portion of the Virgin River Valley, groundwater pumping for primarily agricultural use is reported currently to be approximately 8,000 af/yr (Dixon and Katzer 2002). The current total groundwater withdrawal from the Virgin River Valley hydrographic area is therefore approximately 12,000 af/yr.

In addition, Tule, Gourd, and Snow Water springs along the eastern flanks of the East Mormon Mountains and Tule Springs Hills have been tapped to provide stock water.

As the underlying carbonate rocks within the Virgin River Valley are at tremendous depths, this source of groundwater has not been developed.

3.11 SURFACE WATER RESOURCES

3.11.1 Data Collection Methods

This section addresses surface water hydrology, wetlands, riparian areas, floodplains, and waters of the United States. Additional hydrologic information is presented in Section 3.10, Groundwater Resources.

Data on surface water flows for washes that cross the project area are not recorded by the USGS for this part of southern Lincoln County. The closest surface water data recorded by the USGS are from gaging stations located on the Virgin River, Beaver Dam Wash, Meadow Valley Wash, and the Muddy River. The data sources reviewed for this EIS include USGS water reports and topographic maps, Nevada Division of Water Resources reports and data, reports by various scientific organizations (e.g., the National Oceanic and Atmospheric Administration), and the 2003 EIS (BLM 2003a).

Wetlands, riparian areas, floodplains and waters of the United States were identified using a combination of field surveys and a review of the available data for the Proposed Action Alternative area. Recent aerial photographs and topographic maps were examined to identify potential jurisdictional waters within the project area. Additionally, National Wetlands Inventory maps were examined to identify the presence of any previously mapped wetlands within or near the project area. Federal Emergency Management Agency floodplain maps were reviewed to identify the types of floodplains in the area.

Teams conducted field investigations to determine the extent of jurisdictional waters occurring within the footprint of the proposed power plant and a 200-foot-wide corridor along the proposed rail line alignment. The team also recorded information concerning the jurisdictional limits of the washes and presence of desert riparian vegetation within the project area.

Following the field surveys, the data that were collected, including the width and approximate length of each channel segment, were compiled and mapped. The total acres of jurisdictional waters within the project area was determined by multiplying the average width of each wash segment by its length, and then totaling the values of all segments. Additional information is included in the jurisdictional delineation submitted to the U.S Army Corps of Engineers (USACE).

3.11.2 Existing Conditions

3.11.2.1 Regional Overview

The proposed power plant site and rail line are located in the Colorado River Basin. Specifically, the proposed rail line is located within the Tule Desert hydrographic area, the Virgin River Valley hydrographic area, and the Lower Meadow Valley Wash hydrographic area within the Colorado River Basin. All surface water in the entire project area eventually flows into Lake Mead, and ultimately the Colorado River, via either the Virgin River or the Muddy River.

In general, the average annual precipitation within the Tule Desert hydrographic area, the Virgin River Valley hydrographic area, and the Lower Meadow Valley Wash hydrographic area is less than 10 inches per year. This rainfall is the source of surface water within the project area. The greatest amount of rainfall within these three hydrographic areas occurs during January through March with summer thunderstorms occurring from July through September. In elevations greater than 4,000 feet above mean sea level, annual precipitation can exceed 10 inches and can average between 13 to 16 inches per year (Walker 2002).

Surface water is linked to groundwater due to infiltration of surface water into the alluvial sediments within the hydrographic basins. Surface water is one source for groundwater in the area. The surface water system also is directly linked to the geological conditions described in Section 3.9, Geology, Soils, and Minerals. A discussion of the relationship between surface water flows and groundwater in the Virgin River, as it relates to potential project-induced impacts, also is presented in this section.

Surface Water Hydrology

The principal surface water feature in the vicinity of the project area is the Virgin River, which flows southwesterly about 13 miles south of the project area. The Virgin River originates in southern Utah, flows through a gorge in the Beaver Dam Mountains, and crosses through the lower Virgin River Valley until it reaches the Overton Arm of Lake Mead on the Colorado River. Seasonal flow in the Virgin River is quite variable, ranging from 162,200 af/yr (Glancy and Van Denburgh 1969) to as high as 933,000 af/yr (Holmes et al. 1997) The principal flows into the Virgin River include seasonal runoff, inflow from the local tributaries (i.e., Beaver Dam Wash and Toquop Wash), direct rainfall, and irrigation return flows.

Toquop Wash, the South Fork of the Toquop Wash, Sam's Camp Wash, Garden Wash, Whitimore Wash, Halfway Wash, and the Meadow Valley Wash are the major ephemeral washes located in the project area (BLM 2003a). These washes contribute surface water flows to the Virgin River and Muddy rivers only during significant localized thunderstorm events and broader regional rainstorms. These washes capture surface runoff from the Tule Springs Hills, the Tule Desert, the Mormon Mountains, and East Mormon Mountains, and flow southward (BLM 2003a). Although Meadow Valley Wash, at the western boundary of the project area (west of the UPRR), is larger, Toquop Wash is the most prominent wash crossing through the project area.

Small springs have been identified in the hills and mountains that surround the project area (BLM 2003a). Based on observation, however, these springs do not contribute to surface water in the washes that cross the area. Flows from these springs are generally very low (less than 1 gallon per minute) and are either captured for stock water, evaporate, or seep into the alluvial soils. The identification and discussion of these springs is presented in Section 3.10.

Surface Water Quality

Most surface-water-quality data in the area have been collected for the Virgin River. The Virgin River typically has a moderate-to-high silt load during most of the year, except at low flows. These suspended solids create the muddy appearance of the river. The estimated annual quantity of suspended solids passing Littlefield is reported by Glancy and Van Denburgh (1969) to be 2.7 million tons. TDS in the river range from 1,000 to 3,000 mg/L (Glancy and Van Deburgh 1969; Woessner et al. 1981). These TDS compounds include calcium, sodium, sulfate, and chloride (BLM 2003a). When flows in the river are low, TDS is typically higher than when the flows are high. Springs and irrigation returns to the river generally increase the TDS in the river (BLM 2003a).

Wetlands, Riparian Areas, Floodplains, and Waters of the U.S.

Wetland and riparian habitats in Nevada cover a very small percentage of the total area of the state; however, because of the type of habitat that they provide, they have a comparatively high species diversity and endemism and provide essential habitat for wildlife. Wetlands are areas that are saturated by water for a sufficient amount of time to support vegetation that is adapted to saturated soil conditions. The presence of vegetation, like cottonwood, willow (*Salix* spp.), mesquite (*Prosopis*, spp.), desert willow (*Chilopsis linearis*), or catclaw (*Acacia* spp.), serves as an indication that sufficient water is available throughout the year for these riparian species. Desert riparian vegetation also provides cover and habitat for wildlife species. Ephemeral washes, washes that generally carry flows only during flood events and/or spring runoff, are ecologically important because they convey flood flows, perform floodplain functions, serve as travel corridors for wildlife, and provide habitat for wildlife species.

Wetlands and other jurisdictional/navigable waters are regulated by the USACE through Section 404 of the Clean Water Act (CWA). The EPA enforces the regulations of the CWA. The USACE can claim jurisdiction over wetlands and require permitting activities for any disturbance if the wetlands meet criteria set forth in Section 404 of the CWA. The USACE also can claim jurisdiction over stream channels and ephemeral washes that connect to jurisdictional/navigable waters. The USACE's jurisdiction on a stream channel or ephemeral wash is limited to the ordinary high-water mark (OHWM). The OHWM for non-tidal streams is defined as follows:

> [the] line on the shore established by the fluctuations of water and is indicated by physical characteristics, such as a clear, natural line impressed on the bank, shelving, changes in the character of the soil, destruction of terrestrial vegetation, the presence of litter or debris, or other appropriate means that consider the characteristics of the surrounding area (33 CFR Part 328.3).

Any action within jurisdictional waters requires a permit from the USACE prior to groundbreaking activities taking place. USACE permit mechanism thresholds are based on the type of project and amount of potential disturbance. Isolated, intrastate wetlands that do not connect to jurisdictional waters are not considered within the jurisdiction of the USACE.

There are no wetlands, as defined by the USACE, within the proposed power plant site, or along the proposed rail line. The site and rail line route are located in an area designated as Zone D on the Federal Emergency Management Agency floodplain maps. Flood hazards in Zone D areas are considered possible but as of yet are undetermined, as an analysis of flood hazards has not been conducted.

The Toquop Wash originates in the Clover Mountains north of the entire project area and travels in a south-southeasterly direction through the Toquop Gap. Floodwaters within the Toquop Wash eventually flow into the Virgin River. The South Fork of the Toquop Wash originates in the Mormon Mountains west of the project area and travels in an easterly direction until it joins with the Toquop Wash northeast of the proposed plant site. Sam's Camp Wash and Garden Wash also originate in the Clover Mountains north of the project area and travel in a south-southeasterly direction, generally paralleling the Toquop Wash across the Tule Desert. All three washes—Sam's Camp Wash, Garden Wash, and the Toquop Wash—eventually join together near the Toquop Gap. The Whitimore Wash originates west of the Mormon Mountains and eventually joins the Muddy River south of Glendale. Halfway Wash originates in the Mormon Mountains and eventually flows into the Virgin River. The perennially flowing Meadow Valley Wash eventually connects with the Muddy River, and ultimately Lake Mead and the Colorado River. With the exception of the Meadow Valley Wash, all other washes in the project area are ephemeral washes, carrying flows only in flood situations. All of the other, unnamed washes within the project area are tributaries to the named washes discussed above.

3.11.2.2 Power Plant Site

A major surface water feature within the vicinity of the power plant site is Toquop Wash. As previously discussed, Toquop Wash is an ephemeral stream and produces surface water flows only during significant localized thunderstorm events and broader regional rainstorms. Generally, surface water flows in this wash soak into the surrounding alluvial sediment or evaporate. Toquop Wash captures surface runoff from the Tule Springs Hills, Tule Desert, and East Mormon Mountains.

There are no springs within the footprint of the power plant site. Additional information on springs in the project area can be found in Section 3.10, Groundwater Resources.

Surface water quality within the power plant site would be very poor with the amount of sediment and minerals picked up and transported by seasonal rainstorm flows.

No major washes traverse the power plant site; however, several smaller, ephemeral washes traverse the plant site and eventually connect with the Toquop Wash. A jurisdictional delineation defining the widths of the washes identified in the power plant site has been submitted to the USACE.

3.11.2.3 Proposed Rail Line

The major surface-water features in the vicinity of the proposed rail line are Meadow Valley Wash, a perennial stream, and Toquop Wash, an ephemeral stream. Generally, surface water flows in these washes soak into the surrounding alluvial sediment or evaporate, although flows in the Meadow Valley Wash can be more significant due to the larger basin area of the wash. Meadow Valley Wash captures surface runoff from the eastern side of the Meadow Valley Mountains, the western side of the Mormon Mountains, and portions of the Clover Mountains. Toquop Wash captures surface runoff from the Tule Springs Hills, the Tule Desert, the eastern side of the Mormon Mountains and East Mormon Mountains.

The proposed rail line would cross the following named washes—the South Fork of the Toquop Wash, Toquop Wash, Sam's Camp Wash, Garden Wash, and the Meadow Valley Wash. The South Fork of the Toquop Wash has an OHWM of 50 feet within the proposed ROW for the line. This wash is approximately 75 feet deep with sheer rock walls and riparian vegetation, mainly desert willows (*Chilopsis linearis*) . The rail line would cross the Toquop Wash at the Toquop Gap. The OHWM of the Toquop Wash within the proposed rail line corridor is 24 feet wide. The Toquop Wash contains riparian vegetation (mainly desert willows). Sam's Camp Wash has an OHWM of 70 feet in total width, and Garden Wash has an OHWM that ranges from 20 to 42 feet in the corridor of the proposed rail line.

After crossing the Tule Desert, the proposed rail line would cross the Meadow Valley Mountains and drop into the Meadow Valley Wash to connect with the UPRR at Leith Siding. The portion of the line route within the Meadow Valley Wash at Leith Siding was not assessed as part of the jurisdictional delineation, because the area has been disturbed by flooding and subsequent efforts by UPRR to repair flood damage to its rail line. Normal conditions no longer exist in this portion of the Meadow Valley Wash. The EPA is currently conducting a CWA investigation UPRR's activities in this portion of the Meadow Valley Wash. However, the washes that are tributaries to the Meadow Valley Wash were assessed. The results of the field investigations and descriptions of the washes that would traverse the proposed rail line are described in the jurisdictional delineation submitted to the USACE.

3.12 BIOLOGICAL RESOURCES

3.12.1 Data Collection Methods

USGS topographic maps, aerial photographs, and several technical documents on area resources were reviewed to assess the topography, predominant landforms, and major vegetation associations within and adjacent to the project area. Wildlife and special status species information presented is based on coordination with regulatory and resource agency personnel and the best available scientific information on the distribution and abundance of the affected species. This includes the most recent results of survey and monitoring efforts, consultation with technical experts, and detailed review of pertinent biological and management literature.

3.12.2 Existing Conditions

The project area has a variety of physical features that offer a diversity of habitat types, represented by a characteristic assemblage of plant species. Topography is characterized by mountain ranges punctuated with intervening valleys, broad basins, and dry lakebeds. The vegetation throughout the area is broadly classified as Mojave desertscrub, while Mojave-Great Basin Desert transitional species are more common at the higher elevations. The large size of the area, together with its geology, soils, climate, and anthropogenic influences, have combined to produce a mosaic of floristic components and associated wildlife species. Dry air masses, high summer temperatures, infrequent precipitation, and a high rate of evaporation characterize the climate of the study area and surrounding region. Precipitation averages less than 10 inches annually and occurs primarily during the winter months. For most of the region, the availability of water and soil moisture is a critical factor that determines the broad distribution of vegetation types and associated wildlife species.

3.12.3 Vegetation

The project area is located within the northeastern Mojave Desert region of the desert floristic province. Low, widely spaced shrubs dominate the Mojave Desert vegetation. The species composition of the Mojave Desert has common elements with the Great Basin to the north and many succulent species common to the Sonoran Desert to the south and east. The most widely distributed plant is the creosotebush (*Larrea tridentata*), which covers extensive areas in nearly pure stands, often in close association with white bursage (*Ambrosia dumosa*).

Vegetative communities of a given region are largely determined by prevailing environmental variation and disturbance history. Individual plant communities generally can be separated along environmental gradients (Whittaker 1967). Gradients in soil moisture, soil fertility, temperature, slope, and other physical parameters affect the distribution of individual species, and this in turn affects the type of plant community that develops at a given location. Since plant species generally respond individually to environmental gradients (Sawyer and Keeler-Wolf 1995), it is often difficult to differentiate recurrent and ecologically meaningful combinations of species as plant communities. Despite these limitations, plant community classification serves an important function in organizing vegetation data into relatively distinct units. These units occur with some consistency in the landscape and are amenable to study and management.

3.12.3.1 Vegetation Communities

Vegetative communities in the project area were identified using the Provisional Digital Land Cover Map for the southwestern United States (Southwest Regional Gap Analysis Project 2004). Within the project area, six major vegetation communities were identified as follows:

- Sonora-Mojave creosotebush-white bursage desertscrub
- Mojave mid-elevation mixed desertscrub
- North American Warm Desert bedrock cliff and outcrop
- North American Warm Desert wash
- Sonora-Mojave mixed salt desertscrub
- Inter-Mountain Basins Semi-Desert shrub steppe

Sonora-Mojave creosotebush-white bursage desertscrub is the predominant vegetation community and represents the largest area at approximately 90 percent (1,213 acres), followed by Mojave mid-elevation mixed desertscrub at about 7 percent (94 acres), and North American Warm Desert bedrock cliff at approximately 2 percent (27 acres). The remaining three vegetation communities represent 0.84 percent (11 acres) of the project area and include unvegetated features such as washes, cliff and outcrop areas, alluvial fans, dunes, and playas. The six plant community types identified in the project area are described below and depicted in Map 3-10. Several other vegetation communities are represented in the areas adjacent to the project area and also are included for reference in Map 3-10. The acreages for each of the six plant communities within the project area are presented in Table 3-9.

Table 3-9
Vegetation Communities in the Project Area

Vegetation Community	Area in Acres	Percent of Area
Sonora-Mojave creosotebush-white bursage desertscrub	1,213.43	90.16
Mojave mid-elevation mixed desertscrub	93.53	7.0
North American Warm Desert bedrock cliff and outcrop	27.12	2.0
North American Warm Desert wash	9.13	0.7
Sonora-Mojave mixed salt desertscrub	1.68	0.1
Inter-Mountain Basins Semi-Desert shrub steppe	0.51	0.04
Total	1,345.40	–

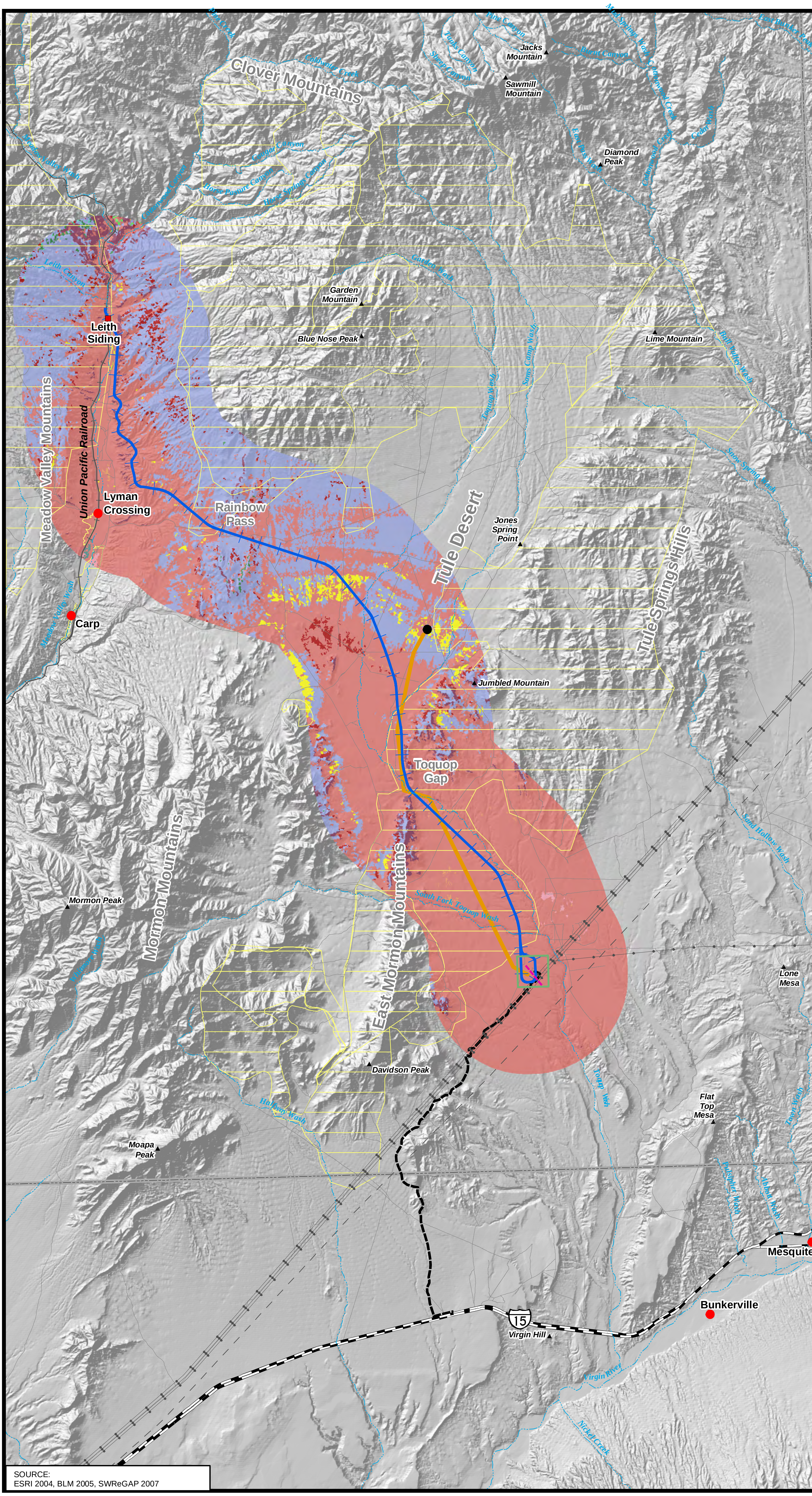
SOURCE: Southwest Regional Gap Analysis Project 2004

Sonora-Mojave Creosotebush-White Bursage Desertscrub

Sonoran-Mojave creosotebush-white bursage desertscrub land cover forms the vegetation community in broad valleys, lower bajadas, plains, and low hills in the Mojave and lower Sonoran deserts across approximately 90 percent of the project area (1,213 acres). This desertscrub is characterized by a sparse to moderately dense layer (2 to 50 percent cover) of small-leaved, drought-tolerant, and broad-leaved shrubs. Creosotebush and white bursage are typically dominants, but many different shrubs, dwarf-shrubs, and cacti may be present or form typically sparse understories.

Mojave Mid-Elevation Mixed Desertscrub

The second most prevalent vegetation association, Mojave mid-elevation mixed desertscrub, represents 7 percent (approximately 94 acres) of the total vegetation cover in the project area. This land-cover type represents the extensive desertscrub in the transition zone above creosote-burrobush desertscrub and below the lower montane woodlands that occurs in the eastern and central Mojave Desert, around



Vegetation

Toquop Energy Project EIS
Lincoln County, Nevada

LEGEND

Fire History

- Burned Area

Vegetation

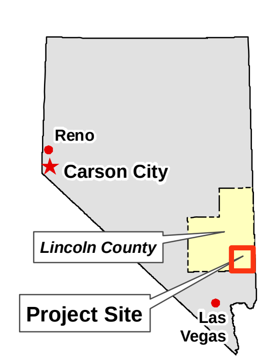
- Great Basin Xeric Mixed Sagebrush Shrubland
- Inter-Mountain Basins Big Sagebrush Shrubland
- Inter-Mountain Basins Semi-Desert Shrub Steppe
- Mojave Mid-Elevation Mixed Desert Scrub
- North American Warm Desert Bedrock Cliff and Outcrop
- North American Warm Desert Playa
- North American Warm Desert Riparian Mesquite Bosque
- North American Warm Desert Wash
- Sonora-Mojave Creosotebush-White Bursage Desert Scrub
- Sonora-Mojave Mixed Salt Desert Scrub

General Features

- Proposed Rail Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road

Reference Features

- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest



0 2 4
Miles

Map 3-10

elevations of 2,300 to 5,900 feet. It is also common on lower slopes in the transition zone into the southern Great Basin. The vegetation in this land-cover type is quite variable. Codominants and diagnostic species include blackbush (*Coleogyne ramosissima*), Eastern Mohave buckwheat (*Eriogonum fasciculatum* var. *foliolosum*), Nevada jointfir (*Ephedra nevadensis*), spiny hopsage (*Grayia spinosa*), spiny menodora (*Menodora spinescens*), beargrass (*Nolina bigelovii*), buckhorn cholla (*Opuntia acanthocarpa*), Mexican bladdersage (*Salazaria mexicana*), Joshua tree (*Yucca brevifolia*), and Mojave yucca (*Yucca schidigera*).

North American Warm Desert Bedrock Cliff and Outcrop

Two percent (27 acres) of the project area is characterized by the North American Warm Desert wash vegetation association. This ecological system is found from subalpine to foothill elevations and includes barren and sparsely vegetated landscapes (generally less than 10 percent plant cover) of steep cliff faces, narrow canyons, and smaller rock outcrops of various igneous, sedimentary, and metamorphic bedrock types. Also included are unstable scree and talus slopes that typically occur below cliff faces. Species present are diverse and may include elephant tree (*Bursera microphylla*), ocotillo (*Fouquieria splendens*), beargrass, teddy bear cholla (*Opuntia bigelovii*), and other desert species, especially succulents.

North American Warm Desert Wash

The North American Warm Desert wash association is found on 0.7 percent (9 acres) of the project area. This ecological system is restricted to intermittently flooded washes or arroyos that dissect bajadas, mesas, plains, and basin floors throughout the warm deserts of North America. Although often dry, the intermittent fluvial processes define this system, which are often associated with rapid sheet and gully flow. The vegetation of desert washes is quite variable ranging from sparse and patchy to moderately dense and typically occurs along the banks, but may occur within the channel. The woody layer is typically intermittent to open and may be dominated by shrubs and small trees such as catclaw (*Acacia greggii*), brickellbush (*Brickellia laciniata*), desert broom (*Baccharis sarothroides*), desert willow (*Chilopsis linearis*), burrobush (*Hymenoclea salsola*), mesquite (*Prosopis* spp.), desert smoke tree (*Psorothamnus spinosus*), desert almond (*Prunus fasciculata*), little leaf sumac (*Rhus microphylla*), bladder sage (*Salazaria mexicana*), or greasewood (*Sarcobatus vermiculatus*).

Sonora-Mojave Mixed Salt Desertscrub

Representing only a small amount of the total habitat, Sonora-Mojave mixed salt desertscrub covers approximately 0.1 percent (2 acres) of the project area. This land-cover type includes extensive open-canopied shrublands of typically salty basins in the Mojave and Sonoran deserts. Stands often occur around playas. Substrates are generally fine-textured, saline soils. Vegetation is typically composed of one or more saltbush species such as fourwing saltbush (*Atriplex canescens*) or cattle saltbush (*Atriplex polycarpa*). Iodinebush (*Allenrolfea occidentalis*), pickleweed (*Salicornia* spp.), seepweed (*Suaeda* spp.) or other halophytic plants are often present.

Inter-Mountain Basins Semi-Desert Shrub Steppe

Inter-Mountain Basin Semi-Desert scrub steppe is the least common vegetation association within the project area, representing only a small fraction 0.04 percent (0.5 acre) of the total vegetation cover. This land-cover type occurs throughout the intermountain western United States, typically at lower elevations on alluvial fans and flats with moderate to deep soils. This semi-arid shrub-steppe is typically dominated by grasses (less than 25 percent cover) with an open shrub layer, but includes sparse mixed shrublands without a strong grass layer. Characteristic grasses include Indian ricegrass (*Achnatherum hymenoides*), blue grama (*Bouteloua gracilis*), James's galleta (*Pleuraphis jamesii*), Sandberg bluegrass (*Poa secunda*), and alkali sacaton (*Sporobolus airoides*). The shrub layer is often a mixture of shrubs and dwarf-shrubs including fourwing saltbush, sand sagebrush (*Artemisia filifolia*), rabbitbrush (*Chrysothamnus* spp.), jointfir (*Ephedra* spp.), broom snakeweed (*Gutierrezia sarothrae*), and winterfat (*Krascheninnikovia lanata*).

3.12.3.2 Field Survey Results for Vegetation

Species identified in the project area during field surveys include creosotebush, white bursage, shadscale (*Atriplex confertifolia*), thornbush (*Lycium* spp.), and Joshua tree. Other species found in the area include ratany (*Krameria parvifolia*), rattlesnake weed (*Chamaesyce albomarginata*), burrobush , desert trumpet (*Eriogonum inflatum*), Nevada joint-fir and broom snakeweed. In the higher elevations, north of the Toquop Gap area, creosotebush is less prominent and blackbush becomes more common. Plant species within washes include blackband rabbitbrush (*Chrysothamnus paniculatus*), desert willow, jimsonweed (*Datura wrightii*), salt cedar (*Tamarix ramosissima*) and desert tobacco (*Nicotiana obtusifolia*).

A large-scale fire in June 2005 altered the plant composition along sizeable sections of the Proposed Action Alternative rail line. In these areas, annual invasive plants such as cheatgrass (*Bromus tectorum*), red brome (*Bromus rubens)*, Mediterranean grass (*Schismus* spp.) and filaree (*Erodium cicutarium*) were the dominant ground cover during surveys conducted in 2006. Cactus species that occur throughout the project area include buckhorn cholla, beavertail prickly pear (*O. basilaris*), golden cholla (*O. echinocarpa*), grizzly bear prickly pear (*O. erinacea*), hedgehog cactus (*Echinocereus engelmanii*) and barrel cactus (*Ferocactus cylindraceus*). Excluding golden cholla, cacti in the burned sections of the project area showed poor survival rates.

3.12.3.3 Noxious and Invasive Weeds

Invasive species refer to those non-native species that out-compete native vegetation, reducing the quantity and diversity of native plants. In Nevada, a noxious weed is, or is likely to be, detrimental or destructive and difficult to control or eradicate (NAC 555.010). While an invasive species may be designated as noxious, not all noxious species are invasive. A comprehensive list of the State of Nevada noxious weeds is located in Appendix C.

Nine species of noxious and/or invasive, non-native plant species were observed in the project area during surveys conducted in May and June 2006. Documented in or near the project area are red brome, cheatgrass, Mediterranean grass, salt cedar, Russian thistle (*Salsola tragus*), African mustard (*Malcolmia africana*), Sahara mustard (*Brassica tournefortii*), tall whitetop (*Lepidium latifolium*), and field dodder (*Cuscuta campestris*). Of these species, only red brome and Mediterranean grass were seen in large numbers within the project area, sometimes accounting for up to 100 percent of the ground cover. Additionally, hoary cress (*Cardaria draba*) and Russian knapweed (*Acroptilon repens*) are found in the surrounding areas and could potentially spread into the project area. Tall whitetop, Sahara mustard, hoary cress, Russian knapweed, and salt cedar are designated as noxious under Nevada statutes.

3.12.4 <u>Wildlife</u>

3.12.4.1 Wildlife Habitats

The project area has a variety of plant communities and landscape features that provide for a diversity of wildlife habitat types. While these habitat types correspond with the vegetation community types discussed in Section 3.12.3, they also are defined by a number of distinct landscape features such as springs and seeps, washes and gullies, rock outcrops, cliffs and taluses, and cave entrances. All contribute to the diversity and abundance of wildlife in the area as they generally provide microhabitats for wildlife uniquely adapted to or dependent on these features.

Most wildlife species are adapted to the local arid conditions, including sparse vegetative cover and limited sources of permanent water. However, seeps and springs provide perennial sources of water and a high concentration of vegetation and cover that contribute to increased wildlife diversity in these areas. Large mammals, such as desert bighorn sheep (*Ovis canadensis nelsoni*), coyote (*Canis latrans*), and mountain lion (*Puma concolor*), use these water sources and return to them regularly. Bats typically forage over these areas because of increased abundance of invertebrate prey. More common bird species may nest and forage in these areas year-round, while migratory bird species may forage and rest in these areas during their migration.

A number of unnamed washes and drainages occur throughout the project area. These areas generally have more structured and complex vegetative assemblages and higher wildlife diversity than the surrounding bajadas. Washes function as movement corridors for wildlife and serve as congregation and feeding areas for a variety of bird species.

Rocky terrain in the Tule Springs Hills and the East Mormon and Mormon Mountains provide habitat for many species of small mammals, birds, and reptiles. Along with different vegetation communities that normally occur with increasing elevation in these ranges, differences in slope and aspect result in a variety of microhabitats that support a number of wildlife species. Notable groups of species that occur in these areas include bats, which rely on rocky outcrops for roosting sites, and raptors, which use cliff faces and rocky ledges for roosting or nesting.

3.12.4.2 Mammals

Most desert mammals are nocturnal, but occasionally a few may be seen during the day. Several carnivores occupy the various habitats that occur in or near the project area. These include the bobcat (*Lynx rufus*), mountain lion, kit fox (*Vulpes macrotis*), gray fox (*Urocyon cinereoargentus*), and badger (*Taxidea taxus*). Several active kit fox and other predator dens were encountered during surveys.

Typical small mammal species that occur within the region include the black-tailed jackrabbit (*Lepus californicus*), desert cottontail rabbit (*Sylvilagus audobonii*), desert wood rat (*Neotoma lepida*), white-tailed antelope squirrel (*Ammospermophilus leucurus*), round-tailed ground squirrel (*Spermophilus*), pocket gopher (*Thomomys bottae*), kangaroo rat (*Dipodomys* sp.), various cricetid mice (*Onychomys* sp., *Reithrodontomys megalotis*, *Peromyscus* sp.), and pocket mice (*Chaetodipus* and *Pergonathus* sp.).

Mule deer (*Odocoileus hemionus)* and desert bighorn sheep reside in the region. Although they inhabit primarily mountainous terrain, portions of the project area are frequented regularly by these two species. In particular, the Toquop Gap acts as a year-round movement corridor for bighorn sheep between the Tule Springs Hills and the East Mormon Mountains. Evidence of both species was observed during surveys in the Toquop Gap area. Also, a variety of bat species such as the western pipistrelle (*Pipistrellus hesperus*), several species of myotis (*Myotis* sp.), and others make use of the project area either as resident foragers or migrants. Roosting habitat varies among the species, but it is characterized typically by steep rocky outcrops with crevices, caves, abandoned mines, or large trees. The only suitable roosting habitat in the project area was identified along Toquop Wash, which lies primarily in the Toquop Gap vicinity.

3.12.4.3 Birds

A wide variety of avian species occur in or migrate through this region of southern Nevada. However, because the project area is predominately a Mojave Desert environment, the diversity of breeding birds is fairly limited. Based on known habitat associations, typical nesting species found in the vicinity of the project area include the black-throated sparrow (*Amphispiza bilineata*), cactus wren (*Campylorhynchus brunneicapillus*), horned lark (*Eremophila alpestris*), greater roadrunner (*Geococcyx californianus*), ash-throated flycatcher (*Myiarchus cinerascens*), western kingbird (*Tyrannus vociferans*), chukar (*Alectoris* sp.), Say's phoebe (*Sayornis saya*), verdin (*Auriparus flaviceps*), common raven (*Corvus corax*), lesser night-hawk (*Chordeiles acutipennis*), Gambel's quail (*Callipepla gambelii*), and the loggerhead shrike (*Lanius ludovicianus*).

Birds of prey that also might nest in or near the project area include the great-horned owl (*Bubo virginianus*), western burrowing owl (*Athene cunicularis*), prairie falcon (*Falco mexicanus*), American kestrel (*Falco sparverius*), red-tailed hawk (*Buteo jamaicensis*), golden eagle (*Aquila chrysaetos*), peregrine falcon (*Falco peregrinus*), and turkey vulture (*Cathartes aura*). A red-tailed hawk nest and fledgling were documented in the project area during field surveys.

3.12.4.4 Reptiles

Reflective of their adaptations to an arid environment, reptiles are well-represented in the project area and surrounding region. Some of the more common species include the side-blotched lizard (*Uta stansburiana*), western whiptail (*Aspidosceles tigris*), zebra-tailed lizard (*Callisaurus draconoides*), desert horned lizard (*Phrynosoma platyrhinos*), desert iguana (*Dipsosaurus dorsalis*), chuckwalla (*Sauromalus ater*), long-nosed leopard lizard (*Gambelia wislizenii*), desert collared lizard (*Crotaphytus bicinctores*), western banded gecko (*Coleonyx variegatus*), desert tortoise, and the Gila monster (*Heloderma suspectum*).

Species of snakes that may be encountered in the area include the western blind snake (*Leptotyphlops humilis*), ground snake (*Sonora semiannulata*), spotted leaf-nose snake (*Phyllorhynchus decurtatus*), coachwhip (*Masticophis flagellum*), patch-nosed snake (*Salvadora hexalepis*), gopher snake (*Pituophis catenifer*), glossy snake (*Arizona elegans*), long-nosed snake (*Rhinocheilus lecontei*), common king snake (*Lampropeltis getula*), night snake (*Hypsiglena torquata*), lyre snake (*Trimorphodon biscutatus*), sidewinder (*Crotalus cerastes*), Mojave rattlesnake (*C. scutulatus*), and speckled rattlesnake (*C. mitchellii*).

3.12.4.5 Amphibians

A number of amphibians occur in the northeastern Mojave Desert. For the most part, these are restricted to areas around ephemeral or permanent water sources. Amphibian species that potentially may occur within or near the project area in Meadow Valley Wash include the Great Basin spadefoot (*Spea intermontana*), western toad (*Bufo boreas*), red-spotted toad (*Bufo punctatus*), Great Plains toad (*Bufo cognatus*), Pacific tree frog (*Hyla regilla*), bull frog (*Rana catesebiana*), and the southwestern toad (*Bufo microscaphus*).

3.12.5 Special Management and Special Status Species

Conservation management and special protections for flora and fauna are provided for mainly by state and Federal laws, regulations and policies, with management carried out by authorized agencies.

3.12.5.1 State Authorities

The State of Nevada provides for and authorizes conservation management and protection for a number of species under Nevada Revised Statutes (NRS), NAC, and various policies and regulations. Laws and authorities addressing wildlife as defined by the State of Nevada are found principally in NRS chapters 501 through 506 and corresponding NAC chapters 501 through 505. Laws and authorities addressing wild land plants are in NRS chapters 525 and 528 and corresponding NAC chapters 527 and 528.

Administration of the state's wildlife and wild land plants is by the Nevada Department of Wildlife and the Nevada Division of Forestry, respectively. Mule deer, bighorn sheep, mountain lion, cottontail rabbit, chukar, Gambel's quail, and mourning dove are among wildlife classified as game species; whereas bobcat, kit fox, and gray fox are among those classified as fur-bearing species. In general, management methods and intensities are based on a sustainable-population principle with protection against illegal harvest enforced. The Nevada Division of Forestry similarly manages wildland plants, notably coniferous species. However, because certain wildlife and flora are vulnerable to decline, special management status and protections may be asserted. Under NRS chapter 501, wildlife may be classified as protected with further classifications of sensitive, threatened, or endangered as warranted. Similarly under NRS 527.270, native plants may be declared as threatened with extinction and protected.

By nature, authorities to manage plant and animals overlap between the state and Federal natural resource management agencies.

3.12.5.2 Migratory Birds

The Migratory Bird Treaty Act (16 U.S.C. 703 et seq.) and Executive Order 13186, Responsibilities of Federal Agencies to Protect Migratory Birds, state that all migratory birds and their parts (including eggs, nests, and feathers) are fully protected in the United States. This is, in part, to assure that environmental analyses of Federal actions required by NEPA or other established environmental review processes evaluates the effects of agency actions and agency plans on migratory birds. Therefore, this treaty protects almost all birds that occur, or migrate through, the project area. The following species are not protected under the treaty order: European starling (*Sturnus vulgaris*), rock pigeon (*Columba livia*), and house sparrow (*Passer domesticus*). For migratory game, the treaty order is carried out cooperatively with the states (e.g., Nevada Department of Wildlife), which set and enforce legal harvest laws and regulations.

3.12.5.3 Special Status Species

Special status species include those declared as threatened or endangered under the Federal ESA, as amended; candidate species proposed for ESA listing; species of concern or those identified by the U.S. Fish and Wildlife Service (USFWS), BLM, or the State of Nevada as unique or rare. Nye milkvetch, straw milkvetch, and meadow valley sandwort do not have special designations but are identified by a resource specialist as unique or rare. Table 3-10 provides a list of special status species in the project area.

Table 3-10
Special Status Species in the Project Area

SPECIES		STATUS		
Common Name	**Scientific Name**	**USFWS**	**BLM**	**State**
PLANTS				
Three-corner milkvetch	*Astragulus geyeri* var. *triquetrus*	XC2	N	CE
Nye milkvetch	*Astragulus nyesis*			
Sticky buckwheat	*Eriogonum viscidulum*	XC2	N	CE
Las Vegas buckwheat	*Eriogonum corymbosum*		N	CE
Straw milkvetch	*Astragalus lentiginosus*			
White bearpoppy	*Astragalus merriami*		S	
Las Vegas bearpoppy	*Astragalus califorinica*		N	CE
Meadow Valley sandwort	*Arenaria stenomeres*			
Beaver Dam breadroot	*Pediomelum castoreum*	XC2		
FISH				
Virgin River chub	*Gila seminuda*	LE	S	P
Woundfin	*Plagopterus argentissimus*	LE	S	P
Meadow Valley Wash speckled dace	*Rhynichthys osculus* ssp. *11*		N	
Meadow Valley Wash desert sucker	*Catostomus clarkii*	XC2	N	P

SPECIES		STATUS		
Common Name	**Scientific Name**	**USFWS**	**BLM**	**State**
AMPHIBIANS				
Southwestern toad	*Bufo microscaphus*		N	
REPTILES				
Desert tortoise	*Gopherus agassizii*	LT	S	P
Western chuckwalla	*Sauromalus obesus ater*	XC2	N	
Gila monster	*Heloderma suspectum*	XC2	N	P
BIRDS				
Southwestern willow flycatcher	*Empidonax traillii extimus*	LE	S	P
Western yellow-billed cuckoo	*Coccyzus americanus*	C	S	P
Yuma clapper-rail	*Rallus longirostris yumanensis*	LE		P
Golden eagle	*Aquila chrysaetos*		S	P
Ferruginous hawk	*Buteo regalis*	XC2	S	P
Swainson's hawk	*Buteo swainsoni*		N	P
Loggerhead shrike	*Lanius ludovicianus*	XC2	S	P
Burrowing owl	*Athene cunicularia*	XC2	S	P
Prairie falcon	*Falco mexicanus*		S	P
Phainopepla	*Phainopepla nitens*		N	
Le Conte's thrasher	*Toxostoma lecontei*		N	
Crissal thrasher	*Toxostoma crissale*		N	
Peregrine falcon	*Falco peregrinus*	D	N	P
MAMMALS				
Pallid bat	*Antrozous pallidus*		N	P
Townsends big-eared bat	*Corynorhinus townsendii*		N	P
Big brown bat	*Eptesicus fuscus*		N	
Spotted bat	*Euderma maculatum*	XC2	S	P
Greater western mastiff bat	*Eumops perotis californica*	XC2	N	
Allen's big-eared bat	*Idionycteris phyllotis*	XC2	N	P
Silver-haired bat	*Lasionycteris noctivigans*		N	
Western red bat	*Lasiurus borealis*		N	P
California leaf-nosed bat	*Macrotus californicus*	XC2	N	P
California myotis	*Myotis californicus*		N	
Western small-footed myotis	*Myotis ciliolabrum*	XC2	N	
Long-eared myotis	*Myotis evotis*	XC2	N	
Little brown myotis	*Myotis lucifugus*		N	
Fringed myotis	*Myotis thysanodes*	XC2	N	P
Cave myotis	*Myotis velifer*	XC2	N	
Long-legged myotis	*Myotis volans*	XC2	N	
Yuma myotis	*Myotis yumanensis*	XC2	N	
Big free-tailed bat	*Nyctinomops macrotis*	XC2	N	
Brazilian free-tailed bat	*Tadarida brasiliensis*		N	P
Western pipistrelle	*Pipistrellus hesperus*		N	
Hoary bat	*Lasiurus cinereus*		N	
Desert Valley kangaroo mouse	*Microdipodops megacephalus albiventer*		N	
Desert bighorn sheep	*Ovis canadensis nelsoni*		S	G

SOURCE: Nevada Natural Heritage Program 2007; U.S. Fish and Wildlife Service 2007

NOTES: BLM = Bureau of Land Mangement USFWS = U.S. Fish and Wildlife Service

LE: USFWS listed, endangered CE: Critically endangered flora, protected by Nevada state law

LT: USFWS listed, threatened D: Endangered Species Act -delisted

XC2: USFWS former category 1 or 2 candidate for listing, now listed as "species of concern"

S: BLM sensitive species - USFWS listed, proposed or candidate for listing, or protected by Nevada state law

N: BLM sensitive species, listed as sensitive by BLM state office

P: Protected wildlife by Nevada Revised Statutes

G: Managed as game species by State of Nevada

The ESA requires that all Federal agencies undertake programs for the conservation of endangered and threatened species and are prohibited from authorizing, funding, or carrying out any action that would jeopardize a listed species or destroy or modify its critical habitat. A species may be classified as “endangered” when it is in danger of extinction within the foreseeable future throughout all or a significant portion of its range. A “threatened” designation is provided to those animals and plants likely to become endangered within the foreseeable future throughout all or a significant portion of their ranges. Federally designated critical habitat is defined as the geographic area containing the physical or biological features essential to the conservation of a listed species or as an area that may require special management considerations or protection.

BLM sensitive species are those species that are not already included as special status species under federally listed, proposed, or candidate species; or State of Nevada protected species. BLM sensitive species designation is normally used for species that occur on BLM-administered lands, where BLM is able to significantly affect the conservation status of the species through management.

3.12.5.4 Special Status Plant Species

No federally listed threatened or endangered plant species were identified as occurring in or near the project area. The following plant species were identified for consideration by BLM and/or USFWS: sticky buckwheat (*Eriogonum viscidulum*), three-corner milkvetch (*Astragalus geyeri* var. *triquetrus*), Beaver Dam breadroot (*Pediomelum castoreum*), Las Vegas bearpoppy (*Arctomecon californica*), Meadow Valley sandwort (*Arenaria stenomeres*), straw milkvetch (*Astragalus lentiginosus*), white bearpoppy (*Arctomecon merriamii*), Las Vegas buckwheat (*Eriogonum corymbosum*), and all cacti and yucca (which are protected by Nevada state law [NRS 527.060-.120]). The only species found during surveys were the Meadow Valley sandwort, which was identified in small numbers along the banks of Toquop Wash in the Toquop Gap area, and Las Vegas buckwheat northeast of the proposed power plant site. Yucca and cacti species are also present in the project area.

The white bearpoppy (*Arctomecon merriamii*) and Las Vegas buckwheat are BLM sensitive species that were identified as potentially occurring in the project area. These species typically on well-developed gypsum or rocky limestone habitats. No white bearpoppy or suitable habitat was documented in the project area. Las Vegas buckwheat is known to occur at one locality outside the project area, near Toquop Wash; however, targeted surveys within the proposed power plant site or ROWs did not document its presence. No other special status plant species were documented in or near the project area.

3.12.5.5 Special Status Wildlife

Consultation with the USFWS indicated that there are six ESA-protected species that may be in the project area—the Virgin River chub (*Gila seminuda*), woundfin (*Plagopterus argentissimus*), southwestern willow flycatcher (*Empidonax traillii extimus*), yellow-billed cuckoo (*Coccyzus americanus*), Yuma clapper rail (*Rallus longirostris yumanensis*), and desert tortoise. Of these, only the desert tortoise is known to occur in the project area. The two species of fish identified are found in the Virgin River approximately 16 miles south of the project area. The three species of birds identified are dependent on either aquatic or riparian habitats such as those associated with Meadow Valley Wash or the Virgin River. The closest suitable habitat for these species within Meadow Valley Wash is outside the project area, approximately 4 miles upstream from Leith Siding. Recent floods and alteration of the landscape in Meadow Valley Wash have eliminated any potential habitat that may have been present in the project area.

Virgin River Chub and Woundfin

The Virgin River chub and woundfin both occur within the Virgin River, which is located approximately 16 miles south of the project area. Toquop Wash, which flows into the Virgin River, crosses the project area approximately 16 miles upstream of its confluence with the Virgin River. The range of both fish species extends from La Verkin Springs, Utah, downstream to Lake Mead (USFWS 1994a). The present distribution of this species includes the mainstream Virgin River from La Verkin Springs, Utah, downstream to near the Mesquite Diversion, Nevada. Critical habitat has been designated for part of the Virgin River from La Verkin Springs, Utah, to the confluence with Halfway Wash. Toquop Wash is ephemeral and flows only during periods of heavy rainfall. There is no aquatic habitat for either fish species within Toquop Wash or any other place within the project area. Habitat within the Virgin River would not be affected by the use of 2,500 af/yr of water from the proposed well field (refer to Section 4.10).

Southwestern Willow Flycatcher

The southwestern willow flycatcher, listed as federally endangered, has been documented in Meadow Valley Wash approximately 20 miles north of the beginning of the proposed rail line at Leith Siding. The breeding range of the southwestern willow flycatcher includes Arizona, southern California, New Mexico, southern Utah and Nevada, southwestern Texas, and northwestern Mexico. Dense thickets of willow, salt cedar, and/or cottonwoods along riparian corridors typically characterize breeding habitat for this species. The area of Meadow Valley Wash associated with the project area is heavily disturbed, lacks surface water, and is characterized by creosotebush scrub. No breeding habitat (as described above) for flycatchers occurs in the project area. The closest suitable nesting habitat for this species is located a minimum of 4 miles north (outside) of the project area, where mature cottonwoods, willows, and salt cedar gradually emerge. Potential habitat exists approximately 1 mile west of the proposed rail line (Figure 3-11).

Western Yellow-billed Cuckoo

The western yellow-billed cuckoo, a candidate for Federal listing, has been documented along the Meadow Valley Wash, approximately 9 miles north of the project area. However, populations in southern Nevada are considered small and disjunct, with the most recent record of nesting pairs documented in Beaver Dam Wash in 1979 (USFWS 2004), approximately 40 miles southeast of the project area. Since 1990, there have been only sporadic sightings of single birds throughout the state (Neel 1999). Yellow-billed cuckoos nest in tall poplar or cottonwood trees and willow riparian woodlands in the West, and require large patches of dense trees. No habitat of this nature is found in or near the project area. The closest potential habitat for this species is located in Meadow Valley Wash approximately 4.5 miles upstream of the beginning of the rail line at Leith Siding.

Yuma Clapper Rail

The Yuma clapper rail is federally listed as an endangered species. Its preferred habitat is sedimented, shallow-water cattail (*Typha* spp.) and bulrush (*Scirpus acutus*) marshes. Nests are commonly found at or near the water's edge. Stands of cattail and bulrush dissected by narrow stream channels apparently support the densest populations of Yuma clapper rails. Records for this species typically are associated with the lower Colorado River south of Lake Mead. Minimal potential habitat for this bird species is present within Meadow Valley Wash, outside of the project area. The lack of occurrence records for this species in this region of Nevada indicates that this species likely does not occur this far north. There is no potential habitat for the Yuma clapper rail within the project area.

Desert Tortoise

Desert tortoises in the Mojave Desert are generally confined to warm creosotebush, white bursage, and shadscale scrub habitats with well-drained sandy loam soils. Soil friability, or its tendency to break apart, is an indicator of tortoise habitat. Desert tortoises need soils they are capable of digging into for burrows or accessible rocky outcrops with openings (caves) that provide adequate coverage. These rocky outcrops are often located along the banks of large washes and are typically composed of caliche. The Mormon Mesa critical habitat unit is located adjacent to the southernmost end of the proposed rail line, south of the section permitted for the Toquop Energy power plant (Map 3-11). No critical habitat is located in the area of the proposed power plant and ancillary facilities, except where the permitted access road would cross critical desert tortoise habitat as discussed in the 2003 EIS (BLM 2003a).

Biologists conducted 100 percent coverage, presence-or-absence tortoise surveys per established BLM and USFWS tortoise survey protocols for the entire rail line 200-foot ROW (100 feet on each side of centerline). Consultation with USFWS biologists determined that standard zone-of-influence surveys would be inefficient and unnecessary considering the terrain and the amount of recently burned habitat. Therefore, to assess the population outside the project area, USFWS recommended 8 to 10 equilateral triangles (0.5 mile on each side) placed adjacent to the project area. Locations for these triangle transects were selected to represent the various vegetation associations, topographic features, and habitat conditions (grazed, burned, etc.) in the region. The relative abundance of tortoises in the areas was then determined using the "total corrected sign" methodology. Total sign was 97 and total corrected sign was 95. No surveys west of Meadow Valley Wash were conducted since the County Road, the wash, and the existing UPRR pose substantial barriers to tortoises crossing into the project area.

A total of three live tortoises and one carcass were found within the 679-acre project area. Sixty-six tortoise burrows were found in the project area; however, only eight of these showed signs of recent (i.e., present year) activity. Scat groupings also were found scattered throughout the project area in proximity to burrows. The northern section of the project area contains moderately dense tortoise populations (fewer than 5 tortoises per 100 acres), while the remaining middle and southern sections exhibited low density (fewer than 1 tortoise per 100 acres). Triangular surveys found the same pattern in density, with the northernmost transects documenting more tortoise sign than the southern portions of the project area. Detailed information on the tortoise surveys is located in the Desert Tortoise Survey Report (JBR Environmental Consultants Inc. 2006).

BLM Sensitive Species

Desert bighorn sheep are found in dry, generally inaccessible mountainous areas, in foothills near rocky cliffs, and near seasonally available water sources. Bighorn sheep require access to freestanding water during the summer months, and throughout the year during drought conditions. The diet of bighorn sheep consists primarily of grasses, shrubs, and forbs. The desert bighorn sheep is known to occur within the project area. This species is protected by a designation by BLM as a sensitive species and by Nevada state law, and the desert bighorn is managed by the Nevada Division of Wildlife (NDOW) as a game species. The Toquop Gap locality within the project area is occupied desert bighorn habitat and sign was observed during field surveys.

Some of the BLM sensitive species of bats listed in Table 3-10 may forage over or migrate through the project area. However, the paucity of roosting habitat (large trees, cliffs, caves, etc.) and available water precludes the majority of these species from roosting within the project area. Within Toquop Gap there is an area of potential roosting habitat for species of bats that utilize cliff roosts. A tank with clean water is located approximately 328 feet from this habitat. The tank provides bats (and other wildlife) with an open water source, which is uncommon in this area. These chiropteran species have been assigned to the BLM sensitive species list because their foraging habitats in forested or riparian areas and their roosting sites are under threat by human-caused disturbances. Likewise, the NDOW is looking more carefully at the conservation of all bats in Nevada and recently published a conservation plan on this topic.

One heteromyid mouse, the Desert Valley kangaroo mouse (*Microdipodops megacephalus albiventer*), which has been listed by BLM as a sensitive species, is documented in the project area where fine-grained substrates and shrub-steppe habitats exist. Individuals of this species were particularly abundant near the Tule water wells. This species is designated with special status by BLM because it is an endemic taxon to Nevada and nearby Utah that encompasses an extremely small geographic range; also its ecology and population status are uncertain at this time. NDOW has classified this subspecies as imperiled, but mentions that its taxonomic status is in need of genetic review.

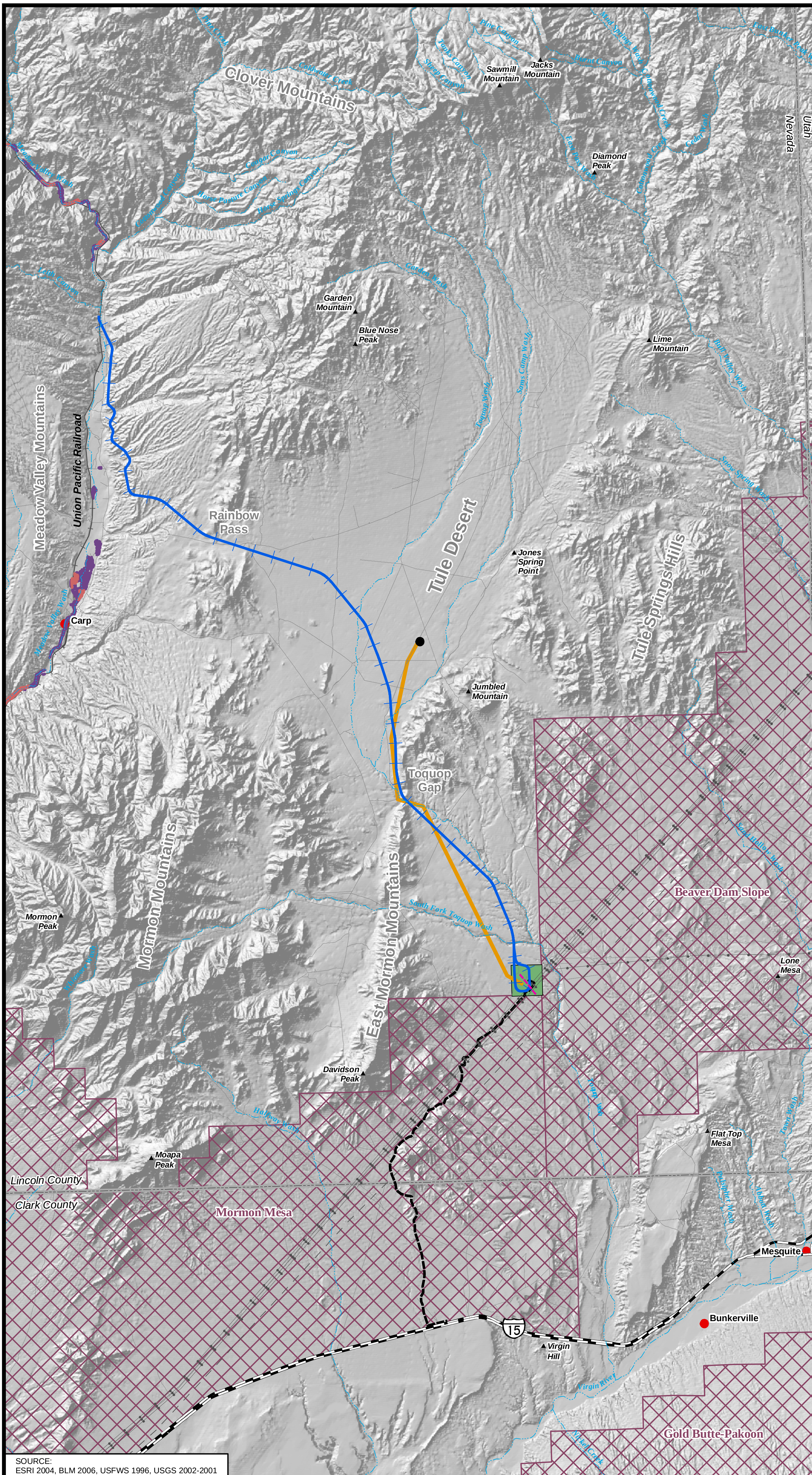
Habitat for the western burrowing owl occurs within the flat, open areas along the project area. Burrowing owls do not dig their own burrows and are reliant on abandoned burrows to nest. They are commonly found alongside desert tortoises and often use abandoned tortoise burrows or kit fox dens to nest. Burrowing owls were documented within the project area during field surveys. The burrowing owl's special status has resulted primarily from increased disturbance to and subsequent loss of breeding habitats throughout the range of the species.

Other raptor species that are listed as BLM sensitive species and that might nest in the project area include the peregrine falcon (*Falco peregrinus*), prairie falcon, ferruginous hawk (*Buteo regalis*), Swainson's hawk (*Buteo swainsoni*), and golden eagle. Many of these raptor species use cliff faces and rocky ledges of mountain ranges on which to roost or nest. Numerous threats from humans (hunting and capture of individuals, habitat loss, and exposure to synthetic chemicals) were the cause for special status listing of most of these species listed herein.

Four passerine species designated by BLM as sensitive species—southwestern willow flycatcher, LeConte's thrasher (*Toxostoma lecontei*), Crissal thrasher (*T. crissale*), and phainopepla (*Phainopepla nitens*)—occur or potentially occur in the project site. These species characteristically inhabit brushy areas in desert shrub-steppe habitats or in dense woody vegetation near riparian areas. Their designation as special status species is attributable to habitat degradation and a potential for population decline. Also, these species exist at the margin of their respective ranges in the project area—where resources would be expectedly less predictable and the probability of local extirpation by stochastic factors expectedly higher.

Two BLM sensitive species of fish, the Meadow Valley Wash desert sucker (*Catostomus clarki*) and the Meadow Valley Wash speckled dace (*Rhinichthys osculus* ssp. 11), are known to occur in the Meadow Valley Wash. Both species are known to occur approximately 1.5 miles north of the project area; however, neither has been recorded near or in the project area. While neither species were recorded in the project area, it is reasonable to assume they are at least periodically present.

The only BLM sensitive species among amphibians in the region is the southwestern toad (*Bufo microscaphus*). This species inhabits a wide array of riparian habitats in the region, and its population is continuous throughout the Virgin and Muddy river systems. Additionally, this is a protected species in Nevada, Utah, and Arizona, and the major threat to its survival is hybridization with *Bufo woodhousii*, which is facilitated by construction of dams in the region. Other threats to its survival include human-induced habitat degradation and destruction with subsequent changes to the population dynamics of native competitors. The BLM-sensitive Gila monster and chuckwalla potentially occur in the project area. Of the two, only the Gila monster is protected by the State of Nevada.



Desert Tortoise Critical Habitat & Southwestern Willow Flycatcher Habitat

Toquop Energy Project EIS
Lincoln County, Nevada

LEGEND

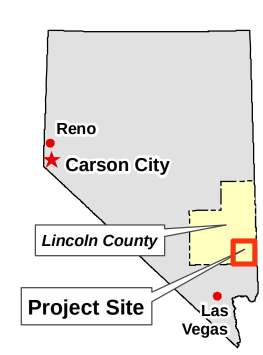
- Desert Tortoise Critical Habitat
- Southwestern Willow Flycatcher Suitable Habitat
- Southwestern Willow Flycatcher Potential Habitat

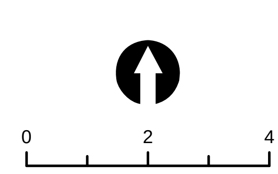
General Features

- Proposed Railroad Line
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Natural Gas Pipeline and Transmission Line Interconnection
- Permitted Access Road

Reference Features

- Existing Road
- Interstate
- Existing Railroad
- Existing Transmission Line
- Existing Natural Gas Pipeline
- River, Stream, or Wash
- Mountain Peak
- Town
- Point of Interest





Map 3-11

Suitable habitat for both the Gila monster and chuckwalla in the project area is mostly restricted to the various larger washes that cross the project area. Chuckwallas are typically found within large, rocky outcrops where they can escape predators and high ambient temperatures. Sporadically exposed caliche formations within the larger washes provide this type of suitable habitat for chuckwallas. These large, open desert washes also provide potential habitat and movement corridors for the Gila monster. Several occurrence records for Gila monsters have been documented near the project area (Nevada Natural Heritage Program 2005).

3.13 WILD HORSES AND BURROS

3.13.1 Regional Overview

On December 15, 1971, Congress enacted the Wild and Free-Roaming Horse and Burro Act, authorizing BLM to manage wild horses and burros on public lands and mandating that wild and free-roaming horses and burros be protected from unauthorized capture, branding, harassment, or death. Those areas of public land that were used as habitat for wild horses and burros in 1971 were delineated as herd-management areas (HMAs).

The Blue Nose Peak HMA includes approximately 10 square miles of the project area. The BLM has designated one as the appropriate management level for this HMA, which refers to the number of wild horses that can be sustained by the available resources in that area. In the Draft Ely RMP and EIS (BLM 2005a), alternatives proposed include the removal of the Blue Nose Peak HMA from its current status due to lack of suitable habitat.

3.14 ARCHAEOLOGY AND HISTORICAL PRESERVATION

3.14.1 Data Collection Methods

Cultural resource inventories were conducted to identify archaeological and historic resources in two separate project components—the proposed power plant site (640 acres) and the proposed 31-mile-long, 200-foot-wide rail line construction ROW (752 acres)—each defined as areas of potential effects for direct impacts from construction. A Class I existing information inventory provided the locations of previously recorded sites in the proposed power plant site and rail line ROW, as well as sites within a 1-mile radius, defined as areas of potential effects for indirect impacts. The results of the Class I inventory provided the groundwork for development of site expectations and a Historic Properties Identification Plan, used to guide the Class III intensive field survey of the proposed power plant site and rail line ROW. During the field survey, archaeologists walked parallel transects, 15 to 30 yards apart. When artifacts were encountered, the isolate or site boundary was mapped using a global positioning system (GPS) and was recorded on Intermountain Antiquities Computer System (IMACS) forms. No artifacts were collected during the survey.

3.14.2 Existing Conditions

3.14.2.1 Regional Overview

The cultural history of the region is briefly summarized in this section and is based on archaeological and historic research compiled in the 2003 EIS. Additional background information can be found in BLM's draft Ely Resource Management Plan (2005b) and the State Historic Preservation Office's Archaeological Element (Lyneis 1982).

The project area is in the Mojave Desert, where humans have lived for approximately 12,000 years, mostly as mobile hunter-gatherers (Lyneis 1982; Willeg and Aikens 1988). Early Paleoindian groups focused heavily on hunting large game. Later Archaic peoples put greater emphasis on plant resources, as evidenced by an increasing profusion and sophistication of ground-stone technology through time. The archaeological record indicates that over the past 8,000 years, increasing population density in the Great Basin restricted the movement of groups, and stimulated groups to exploit a diversity of indigenous foods collected during well-planned rounds of seasonal movements throughout their territory (Fowler and Madsen 1971).

Virgin River and Muddy River Anasazi farming settlements, which began to be developed around A.D. 300, represent a shift from the hunter-gather lifeway typical of the rest of the Great Basin (Fowler and Madsen 1971). These Anasazi groups were more sedentary—living in pit houses overlooking horticultural fields near rivers. The Anasazi farmers continued to also hunt and gather indigenous plant foods in surrounding lands, such as the Toquop Wash and Meadow Valley Wash area, much as earlier groups had, although perhaps less intensively. Approximately 1,000 to 1,200 years ago, a rapid population decline occurred in the area and, again, hunter-gather groups occupied the area.

Considerable debate exists as to the nature of this shift and whether it represents a change in settlement and subsistence patterns (perhaps in response to climate change), or a replacement of Anasazi peoples by Numic-speaking groups expanding from the southeastern California area (Fowler and Madsen 1971; Madsen and Rhode 1994). When European explorers arrived, the Southern Paiute inhabited the project area. The Mojave and Walapai lived south of the Southern Paiute, and the territory of the Western Shoshone was northwest of the Southern Paiute.

Historic-era use of the area was limited because of the generally rugged terrain and lack of mineral resources (Sterner and Ezzo 1996; White et al. 1991). Travelers commonly followed a corridor along the Virgin River Valley, and mining interests generally were limited to small-scale operations in the adjacent mountains. In the mid-nineteenth century, Mormons began settling on farms and ranches along the Virgin River and Muddy River valleys. Springs, such as Abe Spring and Tule Springs, were used historically as watering holes for livestock.

3.14.2.2 Power Plant Site

The Class I inventory identified eight previously recorded cultural resources in the area of potential effect for indirect impacts. These include three prehistoric rock alignments, one historic dump, one can scatter, one isolated Elko projectile point, and two cryptocrystalline flakes. In addition, nine previously recorded cultural resources were identified in the proposed power plant site. These include six prehistoric rock alignments, one prehistoric lithic scatter, one historic telephone line, and one isolated Great Basin stemmed projectile point.

During the Class III intensive field survey, two additional prehistoric rock alignments were identified in the proposed power plant site.

In summary, 19 cultural resources are situated in the areas that might be affected by the proposed project activities. Seven prehistoric rock alignments are recommended as eligible for nomination to the National Register of Historic Places, while 12 sites are recommended as ineligible.

3.14.2.3 Proposed Rail Line

The Class I inventory identified two previously recorded cultural resources in the area of potential effect for indirect impacts. These include the historic Leith Siding and one isolated cryptocrystalline flake.

During the Class III intensive pedestrian survey, ten additional cultural resources were identified in the proposed rail line construction ROW. These include the historic Lone Tree Ranch irrigation ditch and nine isolated artifacts (five flakes, one obsidian cobble, one millingstone fragment, one historic can, and a crevice-placed stick).

In summary, 12 cultural resources are situated in areas that might be affected by project activities. Two historic sites (Leith siding and Lone Tree Ranch irrigation ditch) are recommended as eligible for nomination to the National Register of Historic Places, while ten sites are recommended as ineligible.

3.15 PALEONTOLOGICAL RESOURCES

3.15.1 Data Collection Methods

Local geologic maps and literature were reviewed to identify the potential for paleontological resources to be present in the project area.

3.15.2 Existing Conditions

According to the Lincoln County geologic maps, the project area is in an area of old alluvial gravels cemented together by calcium carbonate (Tschanz and Pampayan 1970). The environmental assessment for the Lincoln County Land Act of 2000 reported fossil-bearing strata east of the project area (Livingston 2001), particularly in the Badland soil series. The Kern River 2003 Expansion Project reported fossils in Quaternary sediments and soils of the Muddy Creek Formation (Dames & Moore 1992, 1990). However, no paleontological resources were identified during the pedestrian survey of the project area.

3.16 PUBLIC SAFETY, HAZARDOUS MATERIALS, AND SOLID WASTE

3.16.1 Data Collection Methods

On June 23, 2006, URS conducted a Phase I environmental site assessment in and around the project area.. The assessment followed the proposed rail alignment from its termination point near the power plant site north to the location where it would meet with the existing UPRR, north of Leith Siding. The site visit was conducted by means of a “windshield” survey using a four-wheel-drive vehicle to access roads in the vicinity of the alignment. Approximately 60 miles of desert roads were surveyed. When objects of interest or manmade structures were found, the investigator stopped to visually observe the areas on foot.

3.16.2 Existing Conditions

3.16.2.1 Regional Overview

The project area is generally undeveloped.

3.16.2.2 Power Plant Site

The site is generally undeveloped, and no hazardous- or solid-waste concerns were identified.

3.16.2.3 Proposed Rail Line

The following locations were observed visually, and potential hazardous-material or solid-waste concerns were noted as follows:

- A line camp and ranch about 0.125-mile north of Toquop Gap, along the proposed rail line, three abandoned trailers, two abandoned trucks, and other items such as fencing, an outhouse, a watering pool, and an unused storage tank were observed. A newly installed well in the area was fenced off and locked.
- An abandoned line camp near the intersection of the proposed rail line and Garden Wash, at the Tule Desert Well. No environmental concerns were observed.
- The Lyman Crossing area, approximately 0.5-mile west of the proposed rail line, active farms, a log-type cabin, and a trailer were observed on private land. The potential for hazardous material issues does exist; however, no inventory has been conducted on private land.
- Approximately 2 miles north of the Lyman Crossing and 0.25-mile east of the proposed rail line, an abandoned farm was observed on private land. The potential for hazardous material issues does exist; however, no inventory has been conducted on private land.

Overall, visual survey of the proposed rail line concluded that the area is primarily undisturbed desert environment.

3.17 SOCIOECONOMIC CONDITIONS

3.17.1 Data Collection Methods

The following characterization of existing social and economic conditions describes employment, income, demographics, fiscal and budgetary information, and community facilities in the region that may be affected by the Proposed Action Alternative. Socioeconomic data from various Federal, state, and local sources are used in this analysis. Census data for 1990 and 2000 are the most uniform detailed data series at the regional and local levels. NEPA guidelines direct the use of some additional data series. Other data serve to update the existing conditions descriptions post-Census 2000. Some of the more recent data series are available only for the larger geographic units.

The social and economic conditions of the study area include regional and local areas that may be affected economically and socially by the Proposed Action Alternative due to the proximity of project facilities. For the regional analysis, data were collected to depict social and economic conditions for Lincoln and Clark counties in Nevada. For the local analysis, data were collected for cities—Mesquite, Caliente, Ivins, Santa Clara, and St. George—within commuting distances of the Proposed Action Alternative.

3.17.1.1 Areas of Influence

The local area of influence comprises communities within commuting distance of the project sites that would likely have daily intersection or connection with project activities. It is defined by distance (taking the road network into account); the locations of the water resources connected to the project; and social, economic, and health-care characteristics.

The region of influence includes additional areas that would not necessarily have as much daily interaction with the project sites, but would maintain other connections to the project.

Local Area of Influence

The local area of influence is defined as the area within 50 miles of the power plant site or the northern end of the rail line. The local area of influence includes the cities of Caliente and Mesquite located, respectively, in Lincoln and Clark counties. Although driving distance from the proposed power plant site to Caliente is more than 50 miles, the town may provide employees for the Proposed Action Alternative.

The portion of Arizona within a 50-mile radius of the study area is very sparsely populated. The cities of St. George and Santa Clara, and the town of Ivins in Washington County, are in the state of Utah and are considered because they are 35 miles east of the city of Mesquite, just within commuting distance of the site of the proposed power plant. The perimeter of the local area is, on average, about 55 miles by road from the project site, a distance that could be traveled in 80 to 100 minutes (Map 3-12).

Regional Area of Influence

The regional area of influence was defined as both Lincoln and Clark counties in Nevada because of the existing communities in the area that might provide services to communities within the local area of influence. Lincoln County has one incorporated city, which is Caliente, but also has four unincorporated communities—Panaca, Ash Springs, Alamo, and Pioche. The areas from which the bulk of scoping comments were received, and the content of those comments, also are considered in the definition of the region of influence. Also included in the regional area of influence is Washington County in southwestern Utah.

3.17.2 Existing Conditions

3.17.2.1 Population

The U.S. Census Bureau was the primary source of data pertaining to demographics, social conditions, and economics. The Nevada Small Business Development Center Web site also was used to acquire population estimates for 2005. As illustrated in Table 3-11, the United States and Lincoln County had similar annual growth rates between 1990 and 2000, whereas Clark County experienced a surge in population with an annual growth rate of 6 percent. The city of Mesquite experienced an annual growth rate of 13.4 percent and, as evidenced by the population estimate of 2005, just over 7,000 residents were added within 5 years. The number of households in Mesquite also increased dramatically by more than 2,900 within the last decade. Overall, Lincoln County did not experience significant growth in the number of households from 1990 to 2000, and remains a rural area. Cities within the study area in the state of Utah also experienced growth. From 1990 to 2000, the city of St. George increased by over 20,000 residents and experienced a 4.5 percent annual growth rate. The town of Ivins had an annual growth rate of 7.7 percent between those years and the city of Santa Clara had 5.5 percent.

Table 3-11
Population and Households in the Area of Influence

	Population (1990)	Population (2000)	Population Estimate (2005)[1]	Percent Annual Growth 1990-00	Households (1990)	Households (2000)
United States	248,709,873	281,421,906	296,410,404	1.2	91,947,410	105,480,101
Counties						
Lincoln	3,775	4,165	4,391	1.0	1,325	1,540
Clark	741,459	1,375,765	1,796,380	6.0	287,025	512,253
Washington	48,560	90,354	118,885	5.0	15,256	29,939
Cities/Towns						
Mesquite	1,871	9,389	13,523	13.4	596	3,564
Caliente	1,111	1,123	1,148	0.1	393	411
St. George	28,502	49,663	64,201	4.5	9,450	17,359
Ivins	1,630	4,450	6,738	7.7	470	1,432
Santa Clara	2,322	4,630	5,864	5.5	584	1,220

SOURCES: Nevada Small Business Development 2007; St. George Chamber of Commerce 2007; U.S. Census Bureau 1990, 2000

NOTE: [1] July 1, 2005, U.S. Census Bureau population estimates

Population projections by county are illustrated in Table 3-12. According to the Nevada Small Business Development Center, it is anticipated that by 2010, Lincoln County will have grown by 22.3 percent and Clark County by 27.0 percent. According to the St. George Chamber of Commerce, Washington County, Utah, will experience the highest growth at 30.0 percent. By 2020, Lincoln County will have increased its growth by 19.7 percent over its 2010 figures, while Clark County is expected to increase by 33.5 percent and Washington County by 55.0 percent. Increases in home value and cost of living, as well as lack of available land for development throughout Clark County, are expected to increase population growth in Lincoln County. Also, those who prefer to live in rural settings as opposed to urban surroundings might be drawn to the area. Two planned communities proposed in Lincoln County include one in the Coyote Springs Valley along Highway 93, and one in the Toquop Township area. Roughly 40,000 residents are expected in the Toquop Township area once developed. It is anticipated that within the next 30 years, the combined population from these two developments could be as high as 250,000.

Table 3-12
Population Projections By County

	2005	2010	2020
Lincoln County, Nevada	3,886	4,754	5,694
Clark County, Nevada	1,796,380	2,281,997	3,045,813
Washington County, Utah	125,010	162,544	251,896

SOURCE: St. George Chamber of Commerce, Nevada Small Business Development Center

According to the St. George Chamber of Commerce, Washington County has the highest rate of annual growth in the state at 3.9 percent (St. George Chamber of Commerce, 2007). Between 2004 and 2005, approximately 4,900 individuals moved to Washington County from other counties in Utah, while 5,600 individuals relocated from other states (St. George Chamber of Commerce, 2007).

3.17.2.2 Employment and Economy in the Areas of Influence

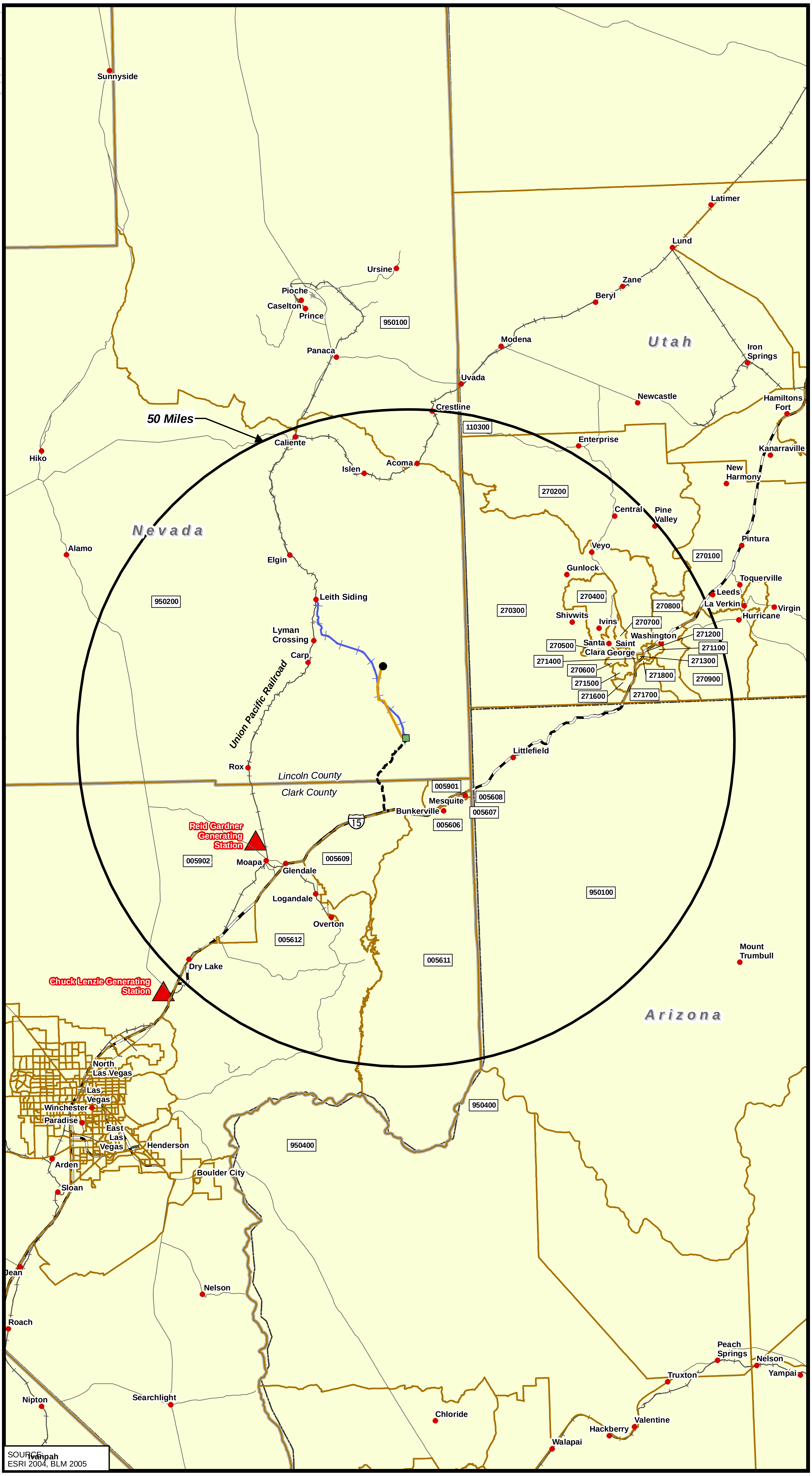
The U.S. Census Bureau and Bureau of Economic Analysis databases were used to determine total employment by industry. The Bureau of Economic Analysis Regional Economic Information System (BEA REIS) includes only states, counties, and metropolitan areas and was used to describe the regional area of influence. The BEA REIS determines total employment by industry by place of employment. The 2000 U.S. Census was used to describe total employment by industry for cities within the local area of influence including Caliente, Mesquite, Santa Clara, and St. George, as well as the town of Ivins.

Regional Area of Influence

In 2003, the median income for Lincoln County was $36,032 (U.S. Census Bureau 2005). The total number of jobs and percentage of total employment by industry in Lincoln County for 2004 are illustrated in Table 3-13. Most of the recent data for Lincoln County were not available for disclosure; however, based on available data, government and government enterprises were the highest sector of employment at 31.6 percent with the state and local sector accounting for the majority of county earnings. The retail trade sector also was a large employer at 13.3 percent.

Local Area of Influence

Toquop Energy Project EIS
Lincoln County, Nevada



LEGEND

Census Data

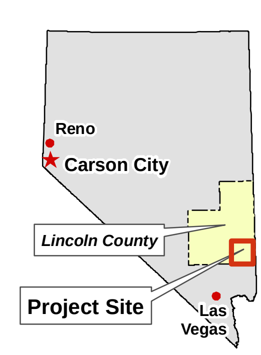
- Census Tract Limits
- 110700 Census Tract ID#

General Features

- Proposed Rail Line
- 50-Mile Distance from Plant Site
- Generating Station
- Proposed Plant Site (640 acres)
- Permitted Well Field
- Permitted Water Pipeline
- Permitted Access Road

Reference Features

- Existing Road
- Interstate
- Existing Railroad
- Town/Point of Interest



0 10 20
Miles

Map 3-12

Table 3-13
2004 Lincoln County, Nevada – Total Employment by Industry

Industry	Jobs	Percentage of Total
County total	1,946	100.0
Farm employment	147	7.6
Non-farm employment	1,799	92.4
Agricultural services, forestry, fishing, and other	(D)	(D)
Mining	(D)	(D)
Construction	(D)	(D)
Manufacturing	(D)	(D)
Transportation and public utilities	58	3.0
Wholesale trade	(D)	(D)
Retail trade	258	13.3
Finance, insurance, and real estate	(D)	(D)
Services	(D)	(D)
Government and government enterprises	615	31.6
Federal, civilian	41	2.1
Military	(L)	(D)
State and local	566	29.1
State	(D)	(D)
Local	(D)	(D)

SOURCE: Bureau of Economic Analysis Regional Economic Information System 2004
NOTES: (D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.
(L) Less than 10 jobs, but the estimates for this item are included in the totals.

In 2003, the median income for residents of Clark County was $43,728 (U.S. Census Bureau 2005). The BEA REIS reported that for 2004, Clark County had a total employment of 997,791. Table 3-14 shows the total number of jobs by industry and percentages of total employment in 2004. In Clark County, the service industry (including hotel, gaming, and tourism) accounted for 26.7 percent of the county earnings, followed by the retail trade industry at 10.7 percent.

Table 3-14
2004 Clark County, Nevada – Total Employment by Industry[1]

Industry	Jobs	Percentage of Total
County total	997,791	100.0
Farm employment	343	0.03
Non-farm employment	997,448	99.9
Agricultural services, forestry, fishing, and other	318	0.03
Mining	1,511	0.2
Construction	100,449	10.1
Manufacturing	25,175	2.5
Transportation and public utilities	34,452	3.5
Wholesale trade	24,094	2.4
Retail trade	106,795	10.7
Finance, insurance, and real estate	101,079	10.1
Services	266,023	26.7
Government and government enterprises	93,993	9.4
Federal, civilian	10,487	1.1
Military	11,362	1.1
State and local	72,144	7.2
State	13,600	1.4
Local	58,544	5.9

SOURCE: Bureau of Economic Analysis Regional Economic Information System 2004
NOTE: [1] Includes both full- and part-time employment.

In 2003, the median income for residents of Washington County was $39,738 (U.S. Census Bureau 2005). The BEA REIS reported that for 2004, Washington County had a total employment of 58,633. As illustrated in Table 3-15, the service industry accounted for 33.3 percent of the county's earnings followed by retail trade at 14.6 percent and construction at 12.6 percent.

Table 3-15
2004 Washington County, Utah – Total Employment by Industry[1]

Industry	Jobs	Percentage of Total
County total	58,633	100.0
Farm employment	528	0.9
Non-farm employment	58,105	99.1
Agricultural services, forestry, fishing, and other	(D)	(D)
Mining	(D)	(D)
Construction	7,373	12.6
Manufacturing	2,958	5.0
Transportation and public utilities	2,868	4.9
Wholesale trade	985	1.7
Retail trade	8,532	14.6
Finance, insurance, and real estate	5,664	9.7
Services	19,522	33.3
Government and government enterprises	5,912	10.1
Federal, civilian	479	0.8
Military	547	0.9
State and local	4,886	8.3
State	894	1.5
Local	3,992	6.8

SOURCE: Bureau of Economic Analysis Regional Economic Information System 2004
NOTE: [1] Includes both full- and part-time employment.
(D) Not shown to avoid disclosure of confidential information, but the estimates for this item are included in the totals.

Local Area of Influence

Because data for the town of Ivins and the cities of Mesquite, Caliente, St. George, and Santa Clara were retrieved from different data sources, categories in the county and city tables would differ. The U.S. Census Bureau records employment for cities by place of residence.

Per capita income for the city of Mesquite in 1999 was $20,191 (U.S. Census Bureau 2000). The service industry accounted for the earnings of half of the city's residents. Similar to the city of Caliente, the retail trade sector accounts for 10 percent of jobs (Table 3-16).

Table 3-16
2000 City of Mesquite, Nevada – Total Employment by Industry

Industry	Jobs	Percentage of Total
City total	3,727	100.0
Agricultural services, forestry, fishing, and other	6	0.2
Mining	7	0.2
Construction	295	8.0
Manufacturing	101	2.7
Transportation and public utilities	82	2.2
Wholesale trade	40	1.1
Retail trade	372	10.0
Finance, insurance, and real estate	188	5.0
Services	1,876	50.3
Educational, health and social services	313	8.4

SOURCE: U.S. Census Bureau 2000

Per capita income for the city of Caliente in 1999 was $20,555 (U.S. Census Bureau 2000). In 2000, the educational, health, and social services sector accounted for 25.1 percent of the city's annual earnings, followed by 16.1 percent in retail trade (Table 3-17).

Table 3-17
2000 City of Caliente, Nevada – Total Employment by Industry

Industry	Jobs	Percentage of Total
City total	335	100.0
Agricultural services, forestry, fishing, and other	10	3.0
Mining	14	4.2
Construction	21	6.3
Manufacturing	3	1.0
Transportation and public utilities	21	6.3
Wholesale trade	5	1.5
Retail trade	54	16.1
Finance, insurance, and real estate	17	5.1
Services	28	8.4
Educational, health and social services	84	25.1

SOURCE: U.S. Census Bureau 2000

Per capita income for the city of St. George in 1999 was $17,022 (U.S. Census Bureau 2000). In 2000, the educational, health, and social services sector accounted for 18.1 percent of the city's annual earnings, closely followed by the retail trade sector at 17.4 percent (Table 3-18).

Table 3-18
2000 City of St. George, Utah – Total Employment by Industry

Industry	Jobs	Percentage of Total
City total	20,118	100.0
Agricultural services., forestry, fishing, and other	113	0.6
Mining	37	0.2
Construction	2,499	12.4
Manufacturing	1,171	5.8
Transportation and public utilities	783	3.9
Wholesale trade	600	3.0
Retail trade	3,503	17.4
Finance, insurance, and real estate	1,338	6.7
Services	2,741	13.6
Educational, health and social services	3,651	18.1

SOURCE: U.S. Census Bureau 2000

Per capita income in the town of Ivins in 1999 was $16,743 (U.S. Census Bureau 2000). In 2000, the educational, health, and social services sector accounted for 16.8 percent of the town's annual earnings, closely followed by the retail trade sector at 16.5 percent, the services sector at 13.9 percent, and the construction sector at 12.6 percent (Table 3-19).

Table 3-19
2000 Town of Ivins, Utah – Total Employment by Industry

Industry	Jobs	Percentage of Total
Town total	1,858	100.0
Agricultural services, forestry, fishing, and other	13	0.7
Mining	2	0.1
Construction	234	12.6
Manufacturing	109	5.9
Transportation and public utilities	126	6.8
Wholesale trade	48	2.6
Retail trade	307	16.5
Finance, insurance, and real estate	72	3.9
Services	258	13.9
Educational, health and social services	313	16.8

SOURCE: U.S. Census Bureau 2000

Per capita income in the city of Santa Clara in 1999 was $15,957 (U.S. Census Bureau 2000). The educational, health, and social services sector accounted for 22.4 percent of the city's annual earnings, followed by construction at 11.1 percent, and services at 10.9 percent (Table 3-20).

Table 3-20
2000 City of Santa Clara, Utah – Total Employment by Industry

Industry	Jobs	Percentage of Total
City total	1,914	100.0
Agricultural services, forestry, fishing, and other	8	0.4
Mining	2	0.1
Construction	213	11.1
Manufacturing	65	3.4
Transportation and public utilities	75	3.9
Wholesale trade	45	2.4
Retail trade	327	17.1
Finance, insurance, and real estate	155	8.1
Services	208	10.9
Educational, health and social services	428	22.4

SOURCE: U.S. Census Bureau 2000

Construction and utilities are key industries that could be affected by the Proposed Action Alternative. Census tract-level data were used to determine the number of employees who are already employed in these sectors within the local area of influence and who might provide a labor pool for the proposed project . As illustrated in Table 3-21, there were a considerable number of local employees who worked in the construction industry in 2000. In Census Tract 9502 in Lincoln County, Nevada, where all of the construction on the project would take place, there is a relatively high percentage (14 percent) of the population employed by the construction industry. Less than 0.2 percent is employed by the utilities industry in Census Tract 9502. In all of the census tracts located in Nevada, 10.5 percent of the employees worked in the construction industry while 1.6 percent was employed in the utilities industry. In Arizona, the percentage was higher in the construction industry at 22.3 percent, while those in the utilities industry were still low at 1.9 percent. Census tracts in Utah demonstrate similarity to employees with previous experience in the proposed construction area at 13.4 percent and 0.6 percent.

Table 3-21
Distribution of Employment in the Local Area of Influence, Year 2000 Employment by Industries of Importance to the Project

Census Tracts	Employed Civilian Population 16 Years and Over				
	Total	Number in Two Selected Industries		Percentage in Two Selected Industries	
		Construction	Utilities	Construction	Utilities
Nevada	**6,339**	**666**	**102**	**10.5**	**1.6**
9502	813	114	2	14	0.2
56.06	783	19	0	2.4	0
56.07	1,334	136	0	10.2	0
56.08	648	58	13	9.0	2.0
56.09	384	40	28	10.4	7.3
56.11	449	40	21	8.9	4.7
56.12	395	48	14	12.2	3.5
59.01	962	82	7	8.5	0.7
59.02	571	129	17	22.6	3.0
Utah	**35,646**	**4,776**	**208**	**13.4**	**0.6**
2701	2,295	323	14	14.1	0.6
2702	877	104	17	11.9	1.9
2703	2,616	391	19	15.0	0.7
2704	1,758	216	20	12.3	1.1
2705	2,127	241	12	11.3	0.6
2706	2,059	217	12	10.5	0.6
2707	2,888	518	0	18.0	0
2708	2,941	471	12	16.0	0.4
2709	3,189	536	18	16.8	0.6
2710	1,268	196	0	15.5	0
2711	2,640	253	27	9.6	1.0
2712	989	174	0	17.6	0
2713	1,768	155	0	8.8	0
2714	1,482	267	12	18.0	0.8
2715	1,779	194	20	10.9	1.1
2716	1,506	144	0	9.6	0
2717	2,476	306	17	12.4	0.7
2718	988	70	8	7.1	0.8
Arizona					
9501	1,915	428	37	22.3	1.9

SOURCE: U.S. Census Bureau 2000

The top employers in the area as of 2005 appear in Table 3-22. The largest employers in Clark County are actually located in Las Vegas, Nevada, which falls about 6 miles outside of the local area of influence. Like Clark County, the majority of employers in Mesquite are in the casino and hotel industries, as well as in public school districts. Employment in Lincoln County is largely in the public and healthcare sector, with one of its largest employers in the technology industry. In St. George, the major employers hire between 2,000 and 2,999 employees in the public education, retail, and health care sectors.

Table 3-22
Major Employers in the Areas of Influence

	Employer	Category	Number of Employees
Lincoln County, Nevada	Applied Technology Division, LLC	Engineering services	100 to 199
	Lincoln County School District	Elementary and secondary schools	100 to 199
	Lincoln County	Executive and legislative offices combined	100 to 199
	Grover C. Dils Medical Center	General medical and surgical hospitals	80 to 89
	Child and Family Division	Residential mental and substance abuse care	70 to 79
Clark County, Nevada	Clark County School District	Elementary and secondary schools	>10,000
	Bellagio, LLC	Casino hotels	9,500 to 9,999
	Clark County	Executive and legislative offices combined	9,000 to 9,499
	Wynn Las Vegas, LLC	Casino hotels	8,500 to 8,999
	MGM Grand Hotel, LLC	Casino hotels	8,000 to 8,499
	Mandalay Corporation	Casino hotels	8,000 to 8,499
City of Mesquite, Nevada	Oasis Resort	Entertainment and recreation	970
	Casablanca Resort	Entertainment and recreation	958
	Virgin River Resort	Entertainment and recreation	855
	Eureka Hotel and Casino	Casino hotels	350
	Mesquite Vistas	Real estate	160
	Clark County School District	Education	156
	Primex Plastics	Retail, trade, and personal services	136
	City of Mesquite	Public administration	125
	Mesa View Regional Hospital	Health services	100+
	Smith's Food and Drug	Retail, trade and personal services	100
St. George, Utah	Wal-Mart	Retail, trade and personal services	2,000 to 2,999
	Washington County School District	Elementary and secondary schools	2,000 to 2,999
	IHC – Intermountain Health Care	Health care	2,000 to 2,999
	Dixie College	Higher education	500 to 999
	St. George City	Local government	500 to 999
	Federal Government	Federal government	250 to 499
	SkyWest Airlines	Air transportation	250 to 499
	Washington County	Local government	250 to 499
	Cross Creek Manor	Residential care	250 to 499

SOURCES: City of Mesquite 2003; Nevada Workforce 2006; St. George Chamber of Commerce 2007

It can be assumed that a significant portion of residents from the town of Ivins and the city of Santa Clara work in both the public school and retail sectors, as well as commute to the larger city of St. George for employment opportunities. Census data support this assumption as the majority of employed residents in the town of Ivins have reported a commute time of 10 to 34 minutes. The majority of employed residents in the city of Santa Clara typically commute 10 to 24 minutes to their places of employment.

Unemployment rates could determine the proportion of potential construction workers and permanent employees from within the local and regional area of influence that would be employed by the Toquop Energy Project. As seen in Table 3-23, the unemployment rate for Lincoln County in 2006 was similar to that of the United States while Clark County's unemployment rate was similar to Nevada's at 4 percent. The city of St. George was 0.1 percent higher than Washington County, with the state of Utah having a 2.9 percent unemployment rate, lower than both the United States and Nevada. Unemployment rates for the cities of Mesquite, Caliente, Ivins, and Santa Clara are undetermined, as the U.S. Department of Labor does not report unemployment rates for cities and towns with a population of fewer than 25,000 residents.

Table 3-23
Percentage of Unemployment, Areas of Influence, 2006

	2006
United States	4.6
States	
Nevada	4.2
Utah	2.9
Counties	
Clark County, Nevada	4.0
Lincoln County, Nevada	4.8
Washington County, Utah	2.6
Cities	
St. George, Utah	2.7

SOURCE: U.S. Department of Labor 2005

Wages

Because the Proposed Action Alternative would take place in Lincoln County, Nevada, county wages would apply. According to the State of Nevada's Department of Training, Rehabilitation and Employment, 2006 mean wages for occupations in the construction service varied from $19.09 to $19.95 an hour. Mean wages for other related forms of employment for the project are listed in Table 3-24. According to the Nevada Department of Employment, Training, and Rehabilitation, wages for construction and extraction workers in 2006 were ranked among the highest in Lincoln County, with the county's median income listed at $52,000. General and operations managers had an annual mean income of $92,817, while the income for business and financial operations occupations was $52,265 (Nevada Department of Training, Rehabilitation and Employment 2007). Because these incomes are more than 30 percent below the median income, workers are considered able to afford living in this area.

Table 3-24
2006 Wages for Lincoln County, Nevada

Occupation	Mean Wages	Total Annual Income
Construction and extraction	$19.09	$39,707
Construction trades workers	$19.95	$41,496
Installation, maintenance, and repair occupations	$13.73	$28,558
Vehicle and mobile equipment mechanics, installers	$15.65	$32,552
Other installation, maintenance and repair	$13.34	$27,747
Maintenance and repair workers, general	$14.98	$31,158
Transportation and material moving	$13.70	$28,496
Materials moving workers	$15.04	$31,283

SOURCE: Nevada Department of Training, Rehabilitation and Employment 2007

Fiscal Conditions

Because 98 percent of land in Lincoln County, Nevada, is managed by BLM and the project would be located on Federal public lands, the Payment in Lieu of Taxes Act of 1976, as amended (31 U.S.C. 6901-6907) would apply. Payments in Lieu of Taxes (PILT) are Federal payments to local governments that help offset a lack of opportunity for property taxes, since Federal land is nontaxable. Land eligible for PILT includes BLM-administered public land and Federal land in the National Forest System and National Park System. PILT payments are determined on a formula basis, with the number of Federal acres constituting the principal determining variable. The logic behind PILT is that Federal land within county boundaries is not part of the county's tax base. Therefore, the county should be compensated for lost revenue opportunities. PILT payments are based on the number of acres of Federal entitlement land, as defined in 31 U.S.C. 6902, within each county. The number of qualified acres is multiplied by a dollar amount per acre set by law. Payments are subject to limitations based on population. Congress sets annual PILT program funding limitations that also may affect the amount of the payments under the program. The payments provide additional support to county governments that have certain Federal land within their boundaries. Examples of how PILT payments have been used include the improvement of local school, water, and road systems. Payment eligibility is reserved for local governments that provide services such as those related to public safety, environment, housing, social services, and transportation, and that contain nontaxable Federal lands. PILT payments are made for tax-exempt Federal land administered by BLM, National Park Service, and USFWS (all agencies of the U.S. Department of the Interior), land administered by the Forest Service, and for Federal water projects and some military installations (U.S. Department of the Interior 2006). The 2006 entitlement acreage by agency is shown for Lincoln County and the state in Table 3-25.

Table 3-25
2006 Entitlement Acreage by Agency in Lincoln County and the State of Nevada

Area	BLM	Forest Service	U.S. Bureau of Reclamation	NPS	USACE	USFWS	Total	BLM as Percentage of Total
Lincoln County	5,615,527	30,672	0	0	205	764,302	6, 410,706	87.6
Nevada	47,824,624	5,840,289	88,203	774,668	205	2,244,909	56,772,898	84.2

SOURCE: U.S. Department of the Interior 2006
NOTE: BLM = Bureau of Land Management, NPS = National Park Service, USACE = U.S. Army Corps of Engineers, USFWS = U.S. Fish and Wildlife Service

In 2006, BLM-managed land accounted for 87.6 percent of all entitlement acreage in Lincoln County as compared to 84.2 percent of BLM share statewide. It is the greatest source of PILT payments in Lincoln County. These entitlement acreages have varied slightly in recent years, but the relative share of agency PILT payments has remained fairly constant. PILT payments are computed and disbursed by BLM on or before September 30 of each year. In 2006, PILT payments in Lincoln County from BLM were $419,802 for 6,410,706 acres (U.S. Department of the Interior 2006).

3.17.2.3 Housing Values

Potential employees of the Proposed Action Alternative who would commute to and from the site may choose to reside to purchase a home or rent in the regional area of influence. In the year 2000, the median value of homes in Lincoln County was $80,300, and in Caliente it was $64,500. Clark County had a higher median value at $139,500, with Mesquite at $133,500. Washington County was comparable to Clark County, with a median home value of $139,800 for the county and $143,200 in St. George. Given the real estate boom in housing in recent years, home values have increased in many areas of the United States.

In 2005, the median home value in Lincoln County rose to $96,300, while Clark County saw a dramatic increase with a reported median home value of $289,300, more than double the value reported in 2000. Washington County reported a median home value of $203,400. Home values for the towns and cities within the local area of influence were not reported for 2005.

In 2006, the fair market rent in Lincoln County ranged from $517 a month for a one-bedroom apartment to $875 a month for a three-bedroom (City-data.com 2007). According to the Lincoln County master plan, approximately one-quarter of the 1,678 existing homes in the county are available for rental purposes. In Clark County, fair market rent was higher and ranged from $728 a month for a one-bedroom apartment to

$1,195 a month for a three-bedroom apartment. In Washington County, fair market rent was similar to that of Lincoln County, where prices ranged from $529 a month for a one-bedroom and $875 a month for a three-bedroom apartment.

Housing authorities within the local area of influence such as the city of St. George have programs in place to assure affordable housing for low-income families and individuals, including Federal and state housing programs (City of St. George 2002). According to both the city of St. George and Clark County's Housing Authority, low-income residents can qualify for Section 8 housing, which would enable them to rent private homes at affordable prices if their income falls below 30 percent of the area's median income.

3.17.2.4 Public Facilities and Services

Local Utility Service

Utility companies that might provide services to the proposed power plant and associated facilities would be located in Lincoln County and the city of Mesquite. Lincoln County has the following power providers in the area: Alamo Power District, Lincoln County Power District Number 1, Panaca Power and Light, and Penoyer Valley Electric. Lincoln County Power District 1 services all of Lincoln County with electricity generated at Hoover Dam. The telephone provider for the county is Lincoln County Telephone Systems Inc., which also provides internet service.

The electric power provider for the city of Mesquite is Overton Power District Number 5 and the telephone provider is Rio Virgin Telephone. Overtown Power District Number 5 services cities and towns in the northwest quadrant of Clark County. Rio Virgin Telephone services residents and businesses from mile marker 100 in Clark County up to the Utah state line. Mesquite falls within the Virgin Valley Water District.

Education and Training

The public school districts that cover the bulk of the local and regional areas of influence are the Lincoln County, Clark County, Santa Clara, and Washington school districts. The closest schools to the proposed project site are in the town of Ivins and the cities of Mesquite, Caliente, St. George, and Santa Clara. In Lincoln County, there are four elementary schools, two middle schools, and two high schools (Lincoln County 2006). There are a total of 660 students enrolled. Currently, there is available space for 50 more students; however, given expected increases in population in both the Coyote Spring and Toquop areas, the school district is developing policies to accommodate that growth by adding new sites and facilities (Lincoln County 2006). Due to population projections for the remaining counties, there are policies in place to accommodate growth by creating new facilities including the expansion of roads and utilities to serve future development. For example, the city of St. George is working closely with the school district to identify and reserve lands for additional educational facilities (City of St. George 2002).

Health Conditions and Health Care

There are no hospitals or medical-care facilities in the study area. The nearest is the Grover C. Dils Medical Center, a 20-bed facility (Hospital-Data n.d.) owned by Lincoln County and located in the city of Caliente. Dixie Regional Medical Center (DRMC), a 137-bed facility (Hospital-Data n.d.) in St. George, also serves residents living in the city of Mesquite and surrounding areas. In November 2003, DRMC added a 64-bed facility that specializes in cardiovascular medicine (St. George Chamber of Commerce 2006). Currently, DRMC has a medical staff of 132 full-time physicians and 25 part-time physicians with plans of expanding services through the development of two new facilities (City of St. George 2002). The town of Ivins also has the Snow Canyon Clinic, which provides additional health care.

Public Safety

In terms of public safety, communities that would provide immediate services to potential employees or residents within the study area were evaluated. According to the Lincoln County master plan, the Lincoln County Sheriff's Department provides services throughout the project area and has a total of 20 employees who work from the County Correctional Facility in Pioche and a substation in Alamo. Equipment includes one patrol car for each of the 11 patrol officers, the sheriff, and the captain. Also, there are multiple vehicles including a van for transporting prisoners to the correctional facility, two pickup trucks, one unmarked vehicle, and six four-wheel drive vehicles (Lincoln County 2006). The response time to the project area is two hours. Also providing assistance on major roadways is the Nevada Highway Patrol.

3.18 ENVIRONMENTAL JUSTICE

BLM is responsible for abiding by environmental justice mandates including Title VI of the Civil Rights Act of 1964, as amended (42 U.S.C. 2000d to 2000d-71), Executive Order 12898 of 1994, and the implementing regulations for both. Title VI prohibits recipients of Federal financial assistance from discriminating on the basis of race, color, or national origin in their programs or activities.

In accordance with Executive Order 12898, it is the responsibility of Federal agencies to identify and address "disproportionately high and adverse human health or environmental effects of its activities on minority populations and low-income populations." The general purposes of the Executive Order are to (1) focus the attention of Federal agencies on the human-health and environmental conditions in minority and low-income communities with the goal of achieving environmental health, (2) foster nondiscrimination in Federal programs that substantially affect human health or the environment, and (3) give minority communities and low-income communities public participation in, and access to, public information on matters relating to human health and the environment. The first task in such an endeavor is to identify minority and low-income population groups at geographic levels of analysis appropriate to the project under study.

The Council on Environmental Quality subsequently prepared Environmental Justice: Guidance Under the NEPA (Council on Environmental Quality 1997). That document includes guidelines for each major phase of the NEPA process, including the phase that characterizes the existing conditions of the affected environment. The guidance was applied to an evaluation of the populations that would potentially be affected by the Toquop Energy Project to determine their status as environmental justice populations.

3.18.1 Data Collection Methods

Demographic data obtained from the U.S. Census Bureau were used to compare the demographic profiles of the counties and municipalities within the areas of influence to those of the state of Nevada. A key indicator of the potential for environmental justice concerns is whether an area's proportion of minority and/or low-income population exceeds the proportion of such populations in a larger area of reference (such as the statewide population).

3.18.2 Existing Conditions

The data in Table 3-26 indicate that the majority of residents in the region of influence are white. According to the U.S. Census Bureau, the term "Hispanic" is used to reference ethnicity and not race. Therefore, a person can be counted as being both white and Hispanic.

Lincoln County and several of the closest cities to the proposed project site (Mesquite and Caliente) generally have smaller proportions of minority populations than is represented in the overall state population. In Mesquite, there is a slightly larger proportion of Hispanic residents (24.8 percent) than in overall Clark County (22 percent) or the State of Nevada (19.7 percent). The data also indicate that the percentages for minority populations in Clark County are similar to those for the state, as Clark County contains the majority of the population of Nevada. The counties and towns in Utah that are closed to the proposed project area also are overwhelming white populations, with the percentage of white residents ranging from 92 to over 97 percent. These proportions are larger than is found statewide in Utah.

The percentage of individuals below the poverty level within city and county boundaries also is shown in Table 3-26. The data indicate that the proportions of low-income individuals in both the city of Mesquite and Clark County are similar to statewide proportions. Data for Lincoln County and the city of Caliente show higher rates of individuals living below the poverty line than Clark County or the state overall. In Utah, to the proportion of the population living below the poverty line is somewhat higher in Washington County (11.2 percent) and St. George (11.6 percent).

Table 3-26
Distribution of Minority and Poverty Population in the Areas of Influence (percent)

	City of Mesquite	City of Caliente	Lincoln County	Clark County	State of Nevada	City of St. George	Town of Ivins	City of Santa Clara	Washington County	State of Utah
Demographic characteristics										
Race										
White alone	80.3	87.3	91.5	71.6	75.2	92.3	94.0	97.3	93.6	89.2
Black or African-American alone	0.6	2.0	1.8	9.1	6.8	0.2	0.1	0.2	0.2	0.7
Asian	1.3	0.6	0.3	5.3	4.5	0.6	0.3	0.3	0.4	1.7
American Indian and Alaska Native	1.0	3.0	1.8	0.8	1.3	1.6	1.2	0.3	1.5	1.3
Some other race[1]	14.7	3.7	2.7	9.1	8.4	3.5	2.3	0.8	2.6	4.8
Two or more races	2.2	3.5	1.9	4.2	3.8	1.8	2.1	1.1	1.6	2.3
Hispanic	24.8	7.3	5.3	22.0	19.7	6.7	3.9	2.0	5.2	9.0
Individuals below poverty level	10.2	22.3	16.5	10.8	10.5	11.6	6.8	3.5	11.2	9.4

SOURCE: U.S. Census Bureau 2000
NOTE: [1] Includes Native Hawaiian and other Pacific Islanders