3.0 Description of the Affected Environment

3.1 Introduction

This chapter describes the environment that would be affected by the development of the Proposed Action and the alternatives analyzed in this EIS. The baseline information summarized in this chapter was obtained from published and unpublished materials; interviews with local, state, and federal agencies; and from field and laboratory studies conducted in the project area. The affected environment for individual resources was delineated based on the area of potential direct and indirect environmental impacts for the proposed project.

In general, the descriptions of the affected environment focus on the land within the project area boundary shown in **Figure 1-1**. For resources such as soils and vegetation, the affected area was determined to be the physical location and immediate vicinity of the areas to be disturbed by the proposed project. For other resources such as water, air quality, and social and economic values, the description of the affected environment is more extensive (e.g., watersheds, regional geology, climate, local communities, etc.).

The specific aspects of each resource that are described in each section were selected because they have the potential to be affected by the proposed Ochoa Mine Project or to affect the construction and operation of the proposed project.

3.2 Geology and Minerals

3.2.1 Regional and Project Area Geology

The following subsections provide an overview of the geology and topography of the region and describe the important geologic features in the project area that are relevant to the proposed project.

3.2.1.1 Physiography and Topography

The proposed project is located in the Pecos Valley Section of the Great Plains Physiographic Province (Fenneman 1928). The Pecos Valley Section is located between the High Plains on the east, the Raton Section to the north, the Edwards Plateau on the south, and the Mexican Sacramento Section of the Basin and Range Province on the west (**Figure 3.2-1**) (Trimble 1990). The Pecos Valley was formed by the Pecos River as it eroded into the mantle of Tertiary sedimentary rocks (capped by the Ogallala Formation) that used to gird the front range of the Rocky Mountains from Texas to Montana. The High Plains to the east of the Pecos Valley is a remnant of the Tertiary rocks that have been stripped away from the mountain front by the Missouri, Platte, Arkansas, and Pecos rivers. The boundary between the Pecos Valley and the High Plains is the Mescalero Ridge, a prominent escarpment that rises 100 to 200 feet above the valley. The Pecos Valley is characterized by rolling hills and mesas. Another prominent feature of the lower half of the valley is the presence of karst topography typified by sinkholes, caves, and enclosed depressions (Hill 1996). The karst topography resulted from the dissolution of evaporite deposits and limestone in the subsurface.

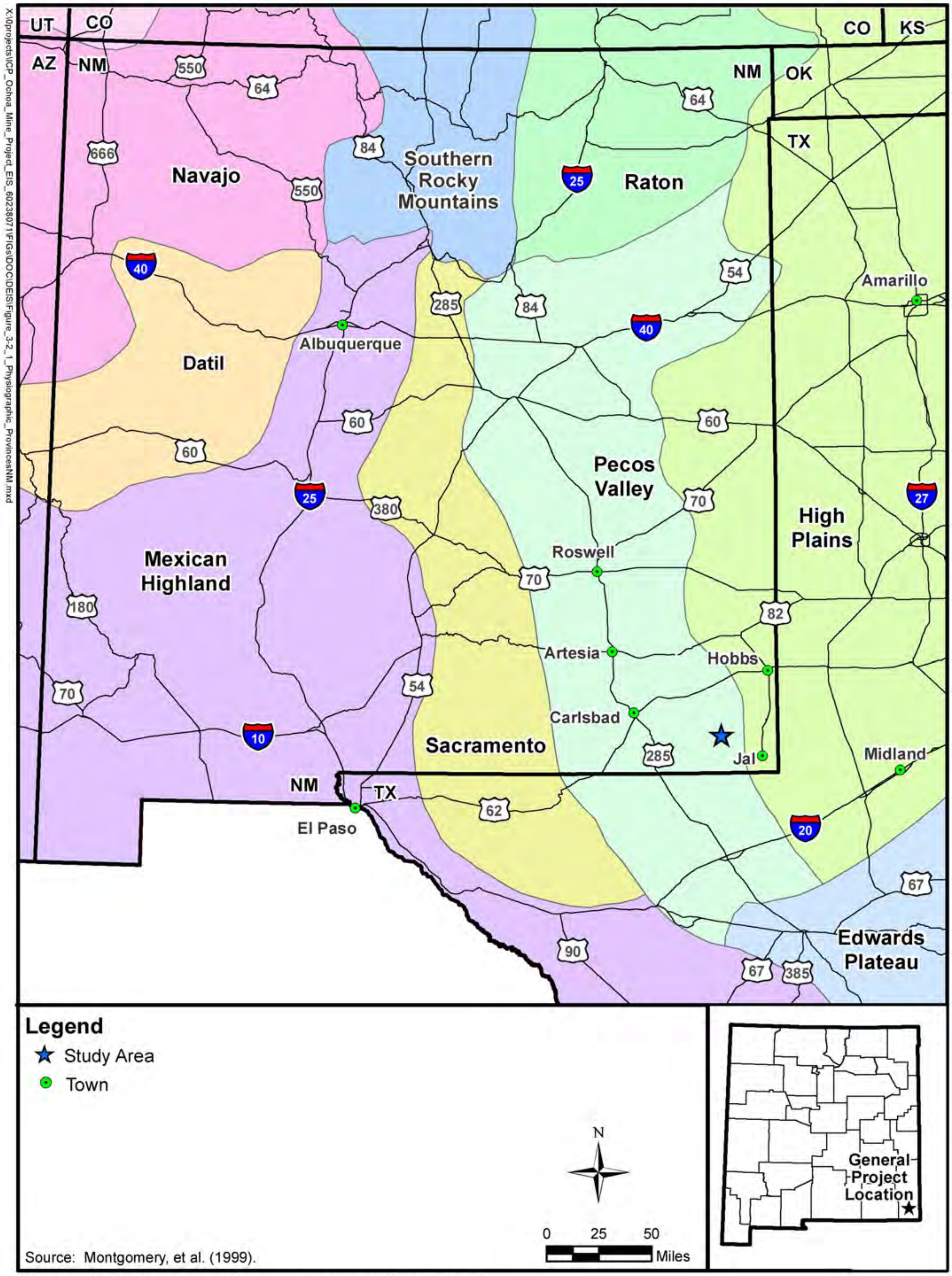


Figure 3.2-1 Physiographic Provinces of New Mexico

The project area lies within the Mescalero Plain, a west sloping pediment between the High Plains and the Pecos River (Reeves 1972). Elevations in the project area range from less than 3,500 to about 3,700 feet above mean sea level (amsl). The topography in the project vicinity is dominated by features thought to be related to subsidence that resulted from natural dissolution of evaporite minerals in the subsurface. There are depressions with no surface drainage, escarpments along the boundaries of subsided areas, and many other smaller features such as sinkholes, caves, and sinking drainages (Vine 1963). Prominent topographic features in the project vicinity include the Antelope Ridge and the San Simon Swale (**Figure 3.2-2**). Antelope Ridge crosses the proposed mine permit area from northwest to southeast and elevations along the ridge range from about 3,650 to 3,700 feet amsl. The San Simon Swale is a broad draw that also trends northwest to southeast to the northeast of the proposed mine permit area. Six miles east of the project area is the San Simon Sink, a closed topographic depression. Another similar feature is a closed topographic feature located in the southern portion of the permit area and is the location of Bell Lake. The San Simon Sink and the Bell Lake Sink are thought to have formed from the dissolution of evaporite rocks in the subsurface leading to subsidence of the surface.

Although caves and karst exist in the vicinity of the project area, the potential for caves and karst features within the project area is currently believed to be low, primarily because the Rustler Formation (the primary formation that hosts caves further west) is buried too deeply for caves to form.

3.2.1.2 Regional Geology

The proposed project is located in the Delaware Basin, a sub-basin of the greater Permian Basin of west Texas and New Mexico (see **Figure 3.2-3**). The Delaware Basin is bounded on four sides by basement uplifts that include the Marathon Fold Belt to the south, the Diablo Platform on the west, the Northwest Shelf to the north, and the Central Platform to the east (Montgomery et al. 1999). The sedimentary rocks in the basin dip gently to the south and east and the deepest part of the basin is on the southeast side in Pecos County, Texas (**Figure 3.2-4**). There are complex bounding fault zones on the east, south, and west sides of the basin. Along the structural boundary along the Northwest Shelf to the north, there are no faults as rocks dip gently to the south from the shelf into the basin (Hill 1996). Internally in the basin, the structure becomes more complex at depth with relatively little faulting and folding of the thick Permian section. Fold structures are common in areas of bedded salt, but large complex structures are present in the deeper parts of the basin.

The Delaware Basin contains up to 30,000 feet of sedimentary rock with deposits ranging in age from Cambrian to Quaternary (Hill 1996; Roche 1997). The Precambrian basement consists mainly of granitic and metamorphic sedimentary rocks, but volcanic rocks also may be present. The Paleozoic section from Cambrian to Pennsylvanian consists of clastic and carbonate rocks deposited in a variety of environments including continental, shallow marine, shelf, and basin. The pre-Permian rocks are largely known from the drilling of the deeper oil and gas wells, but there are limited surface outcrops in mountains and uplifts generally 50 to over 100 miles to the west, southwest, and south of the project area (Hayes 1964).

3.2.1.3 Project Area Geology

The important units in the project area consist of Permian rocks of the Guadalupian and Ochoan Series, which are described below. The units are categorized by their locations relative to the Capitan Reef, which marks the transition from shelf (back reef) to reef (basin margin) to basin.

The stratigraphic relationships are shown in **Figure 3.2-5** and a correlation diagram is shown in **Table 3.2-1**. The project area lies along the basin margin-reef area, defined by the Capitan Limestone, which partially composes the Capitan Reef Complex.

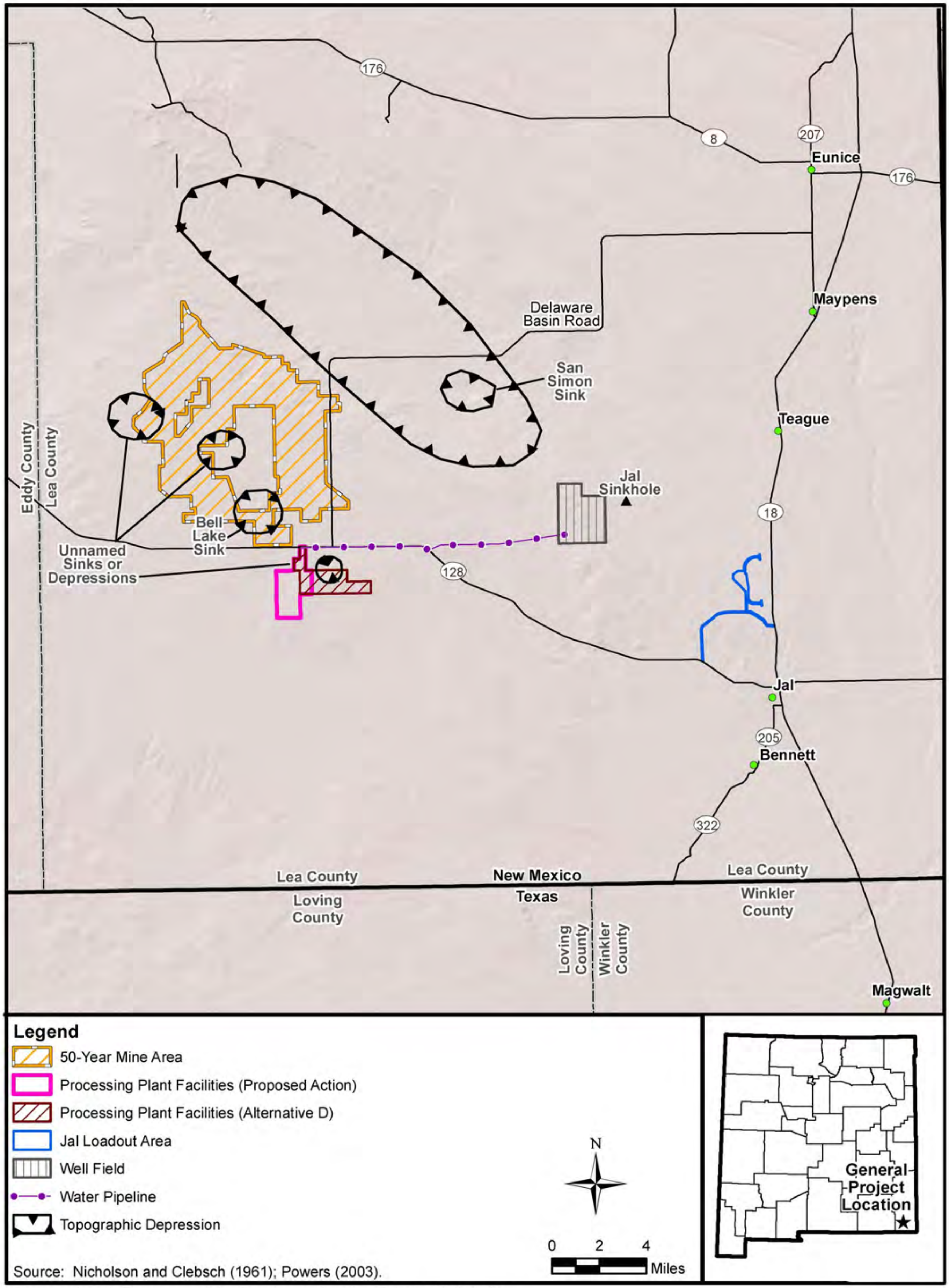


Figure 3.2-2 Topographic Features in the Project Vicinity

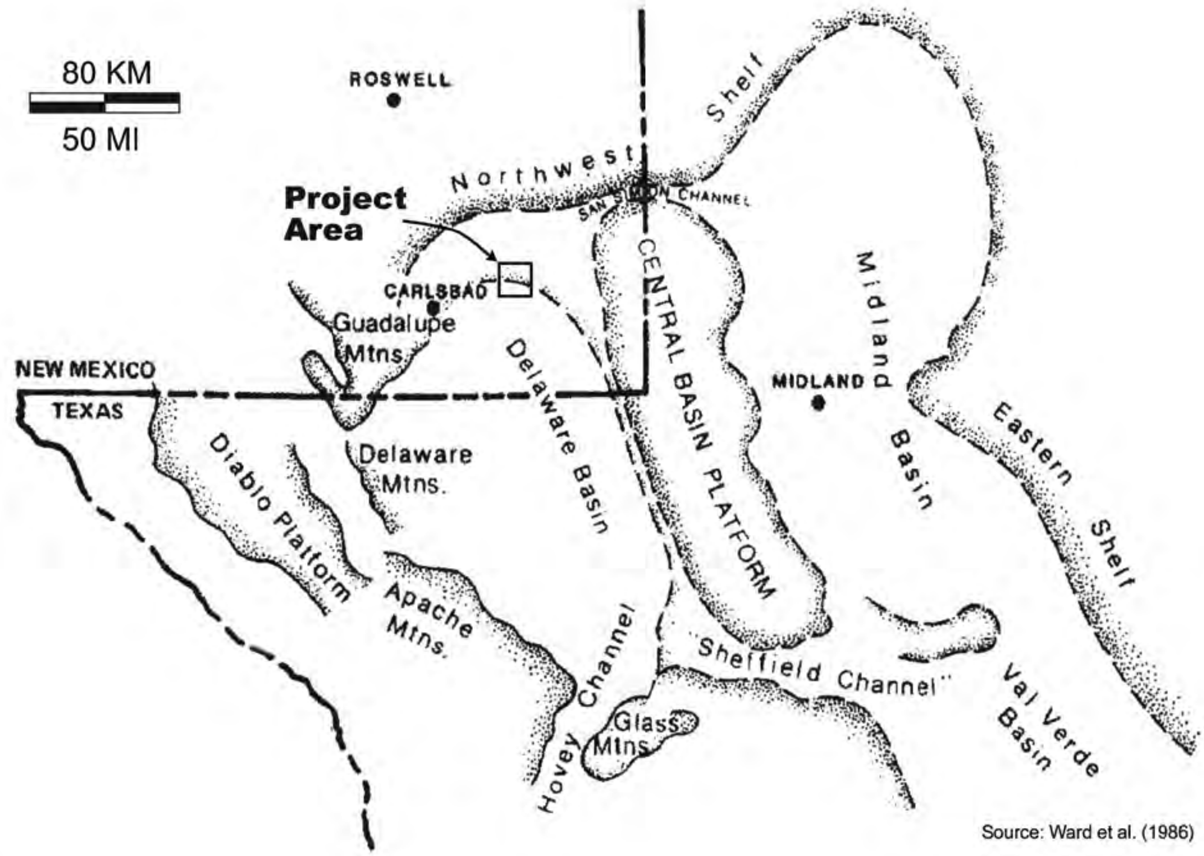


Figure 3.2-3 Major Structural Elements in the Region

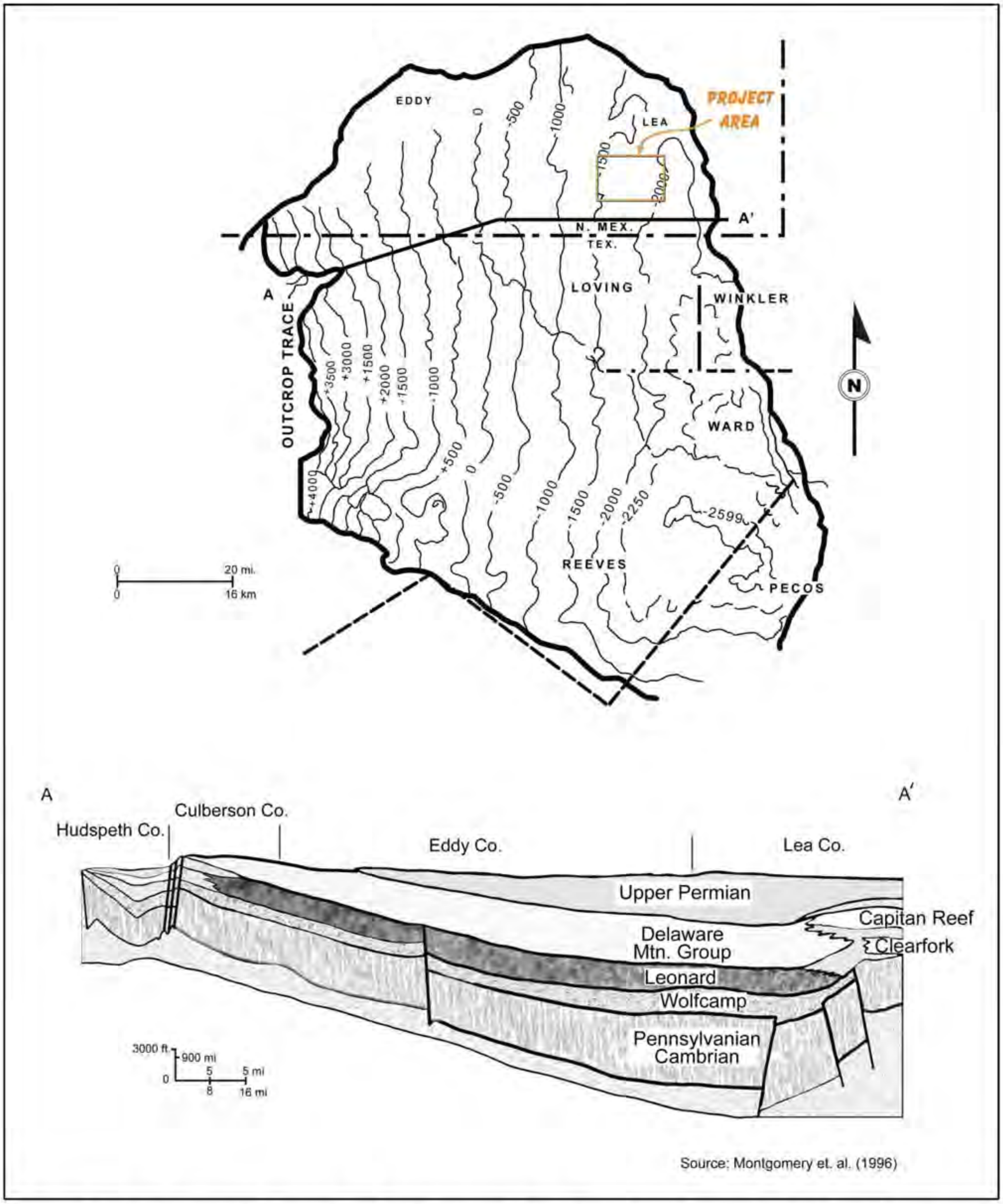
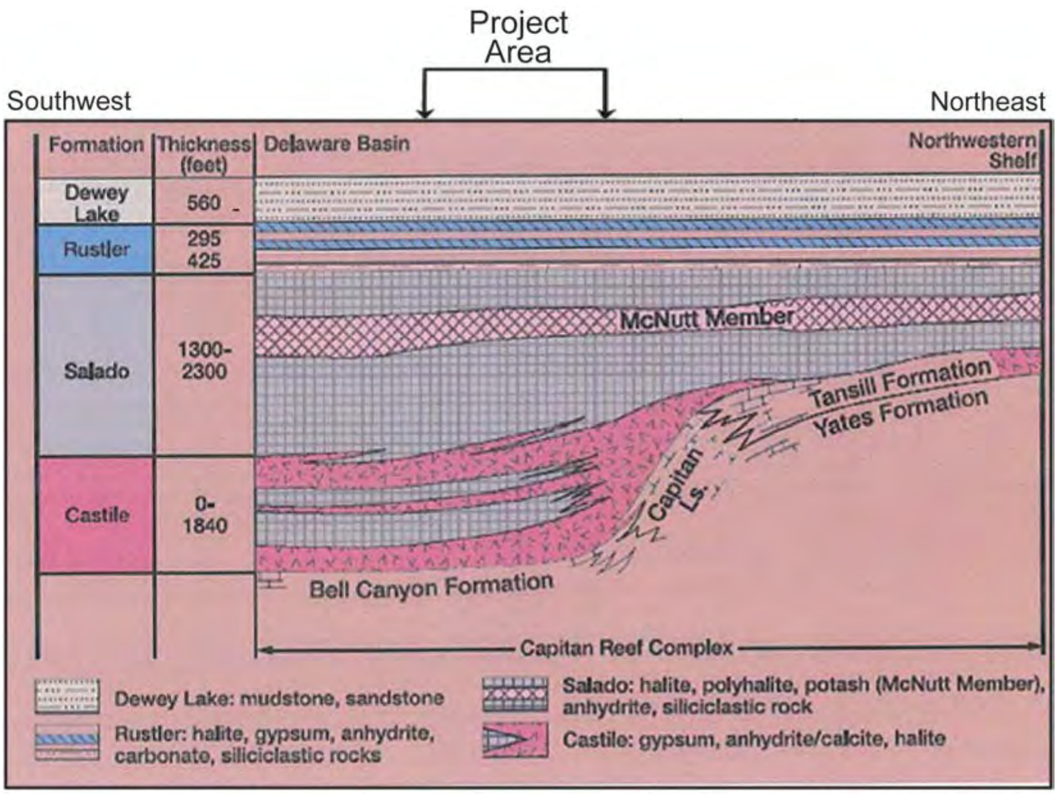


Figure 3.2-4 Structure Contour Map and General East-West Cross Section of the Delaware Basin



Source: Barker et. al (2008)

Figure 3.2-5 Stratigraphic Relationship between Upper Guadalupian-Ochoan Series

Table 3.2-1 Upper Guadalupian-Ochoan Formations in Project Area

		Project Area	Northeast		Approximate Thickness in Project Area (feet)
		Delaware Basin		Central Platform	
System	**Series**	**Basin**	**Basin Margin - Reef**	**Shelf - Back Reef**	
Permian	Ochoan	Dewey Lake Formation			Up to 500
		Rustler Formation			500
		Salado Formation			1,800-2,000
		Castile Formation		No equivalent	1,400-1,500
	Guadalupian	Bell Canyon Formation	Capitan Limestone	Tansill Formation	1,000 (Bell Canyon Formation)
				Yates Formation	
				Seven Rivers	

Sources: Hayes 1964; Hill 1996; Lambert 1983; Oil Conservation Division (OCD) 2012; U.S. Department of Energy (USDOE) 2004.

In addition to the upper Permian rocks, there are surficial exposures of Triassic, Tertiary, and Quaternary deposits in the project area that also are described below and a geologic map of the general project vicinity is provided in **Figure 3.2-6**. It should be noted that Permian rocks are not exposed in the project area.

Permian Rocks

Guadalupian Series. Rock units in the Guadalupian Series of interest in the project area consist of the Capitan Limestone, Bell Canyon Formation, and the upper Artesia Group. These units are time-equivalent: the Capitan Limestone is the basin margin reef-derived unit, the Bell Canyon Formation was deposited in the basin, and the upper Artesia Group consists of back reef and shelf deposits.

Capitan Limestone. At the beginning of the Permian period, the configuration of the present Delaware Basin began to take shape (Hayes 1964). In late Guadalupian time, conditions were favorable for reef growth at the basin margin so the Capitan Limestone reef deposits built upward and toward the basin.

The Capitan Limestone is composed of massive reef material and associated reef talus zones (Hayes 1964). The reef material is thought to have been derived from organisms such as algae and sponges. Diagenetic changes and recrystallization have obscured most of the fossils. The massive reef-building rock built upward and toward the basin and developed on top of its own talus deposits. The talus resulted from erosion of the reef material at the water surface to wave base. Porosity in the massive Capitan reef facies is generally low because of cements, but there are occasional vugs and cavernous porosity (Hill 1996). The Capitan Limestone is not present within the 50-year Mine Plan area, being located 10 miles to the east, but is important as a potential water source for the proposed project.

Bell Canyon Formation. The Bell Canyon Formation is the uppermost formation of the Delaware Mountain Group, a designation for the formations of the Guadalupian Series. It is time-equivalent to the Capitan Limestone and is generally composed of turbidite sandstones that were deposited in a deep water setting (Berg 1979). Carbonate rocks also are present in the Bell Canyon Formation in areas close

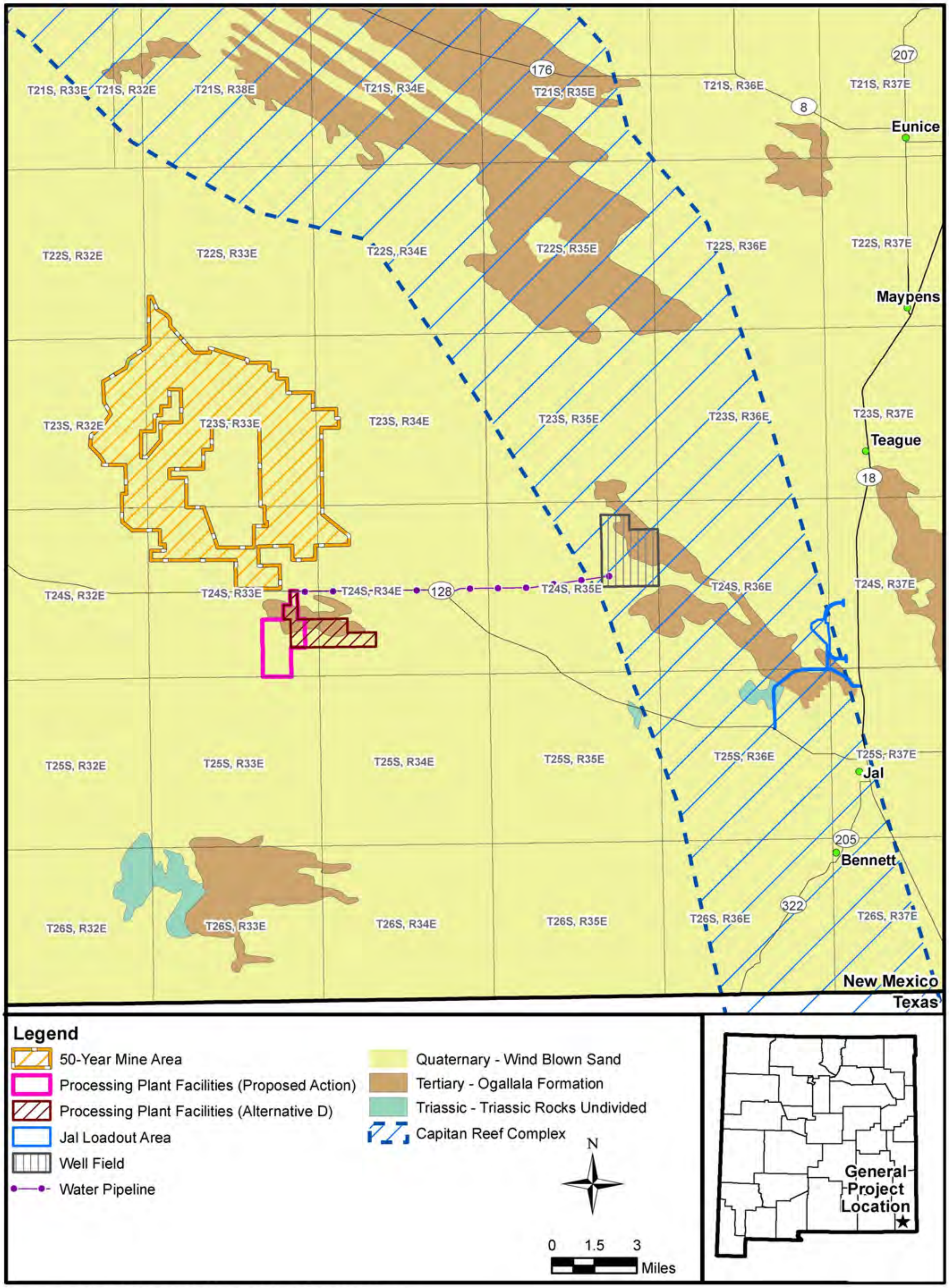


Figure 3.2-6 Geologic Map of the Project Area

to the reef. Bell Canyon sediments interfinger with the talus slope of the Capitan Reef. The Delaware Basin was a “sediment-starved” basin, but during times of sea level drop, clastic sediments were moved to the shelf margin and eventually deposited in the basin by turbidity flows. The turbidity flows deposited sand in elongated sinuous channels with sediment transport from north to south and southwest across the shelf and into the basin (Payne 1976).

Artesia Group. The formations in the upper part of the Artesia Group, Tansill, Yates, and Seven Rivers, are composed of rocks that are the time-equivalent units to the Capitan Limestone. The Seven Rivers Formation, time-equivalent to the lower Capitan Limestone, is largely composed of dolomite in areas close to the reef. Dolomite transitions into gypsum or anhydrite (carbonate) rock toward the shelf. The Yates is equivalent to the middle Capitan Limestone, consisting of up to two-thirds sandstone with intervening beds of dolomite (Lambert 1983). The Yates grades to evaporites in the direction of the shelf. The Tansill Formation is equivalent to the upper Capitan Limestone and is composed of dolomite in the basin margin-reef areas, transitioning into evaporites towards the shelf. The Artesia Group also is not present in the 50-year Mine Plan area, but bears mentioning for the overall description of Gudalupian rocks in the general vicinity.

<u>Ochoan Series</u>

Castile Formation. The Castile Formation marks the end of open marine conditions in the Delaware Basin and the onset of conditions favorable to evaporite deposition. The Castile is mainly composed of anhydrite, but contains two thick halite beds that range from 250 to 330 feet thick (OCD 2012).Although the Castile can be up to 1,600 feet thick, in the project area it is about 1,400 to 1,500 feet thick. Theories abound about the mechanism for the deposition of Ochoan evaporites and whether they are from deep or shallow water deposits (Hill 1996). However, it is certain that a combination of contributing factors were involved including tectonic uplift, paleogeography, and hot, dry climate.

Salado Formation. The Salado Formation is the primary salt formation in the area and the formation from which potash has been mined. The Salado can be 2,000 feet thick, but thickness ranges from 1,800 to 2,000 feet thick in the project area. It contains four distinct members and is mainly composed of halite, but also contains anhydrite, siltstone, polyhalite, and soluble potash minerals. At the base of the Salado Formation is an unnamed lower member composed mainly of massive halite in the basin, but also contains an anhydrite bed that is used to mark the base of the Salado in areas over the reef (Hill 1996). This lower member is used as the repository host at the Waste Isolation Pilot Plant (WIPP) facility about 8.0 miles northwest of the project area. Overlying the lower member of the Salado is the McNutt Potash Member, which contains the potash ore zones that have been mined since the 1920s northwest of the project area. The Vaca Triste Sandstone overlies the McNutt Potash Member and while 10 feet thick, is a highly recognizable and widespread marker bed (Hill1996).

Rustler Formation. The Rustler Formation continues the succession of Ochoan units and is composed of anhydrite, dolomite, siltstone, sandstone, gypsum, halite, and polyhalite and varies from 450 to 550 feet thick in the project area. The top of the Rustler in the 50-year Mine Plan area is about 1,200 to 1,300 feet below the surface. Members of the Rustler Formation from bottom to top are the Los Medaños, Culebra Dolomite, Tamarisk, Magenta Dolomite, and the Forty-niner (**Figure 3.2-7**). The Los Medaños Member is composed of siltstone, gypsum, and fine-grained sandstone. The Culebra Dolomite is a thin-bedded crystalline dolomite that also has vugular porosity (Hill 1996). It is very resistive to weathering and forms prominent outcrops where exposed. The Culebra Dolomite is exposed west of the project area at the southern end of Nash Draw. Above the Culebra, the Tamarisk Member is largely composed of massive anhydrite that weathers to gypsum in outcrops. It also contains minor amounts of halite and siltstone. The evaporite zone in the Tamarisk Member (the M3/H3 zone) contains the polyhalite deposit proposed to be mined. The next member is the Magenta Dolomite, which is 20 to 30 feet thick and often identified by its color when it weathers varying from pink to red to purple (Hill 1996). The uppermost member, the Forty-niner, is composed of gypsum, anhydrite, siltstone, shale, and clay.

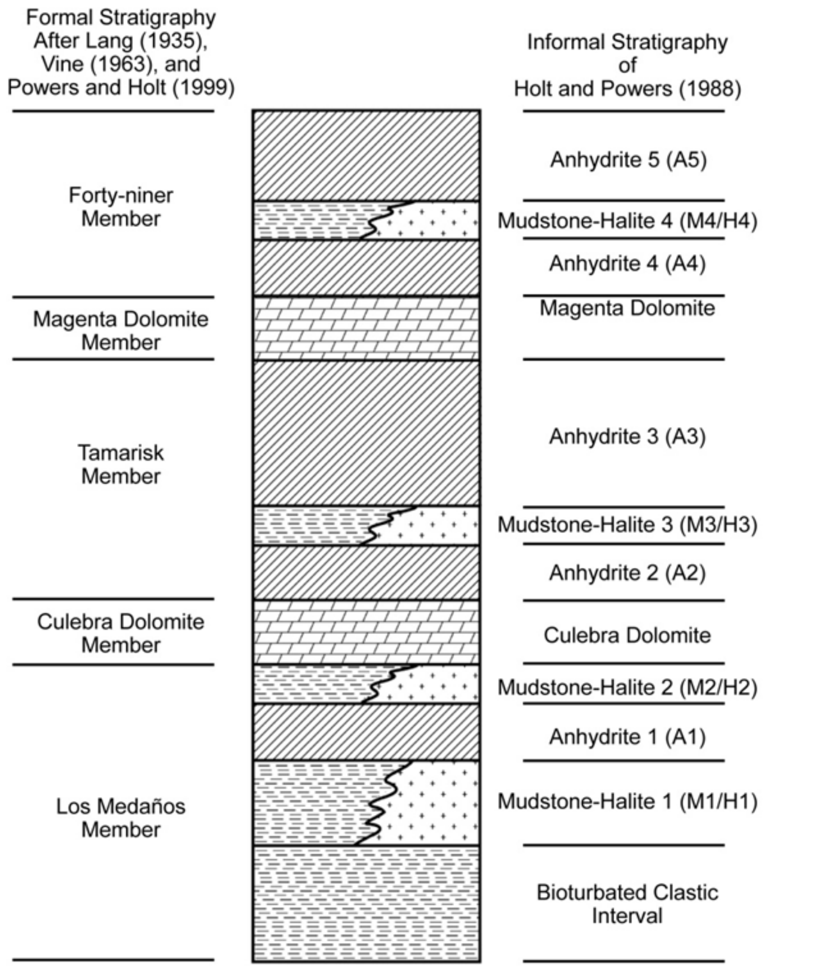


Figure 3.2-7 Stratigraphic Column of the Rustler Formation

Dewey Lake Formation (Red Beds). The Forty-niner Member of the Rustler Formation represents the end of the marine incursions into the basin; the change to continental deposition is represented by the Dewey Lake Formation (Hill 1996)(the Dewey Lake Formation also is informally referred to as the Dewey Lake Red Beds). The Dewey Lake Formation is composed of reddish-orange siltstone with minor sandstone and clay and is not exposed on the surface in the project area or general vicinity. The Dewey Lake Formation appears to have been deposited in a "low-energy" fluvial environment and represent the end of Permian (Hill 1996).

Triassic, Tertiary, and Quaternary Deposits

Triassic-aged rocks, the Santa Rosa Formation and possibly Chinle Formation (or Group) are present in the project area. Undivided Triassic rocks mapped by Dane and Bachman (1958) in the project area are composed of maroon, red, and gray sandstone interbedded with red, sandy shale and purplish limestone. The Chinle Formation consists of red and green mudstone interbedded with lenses of sandstone and conglomerate (Mercer and Orr 1977). Isolated outcrops of Triassic rocks have been mapped in the vicinity of the project area, but not within the 50-year mine area (**Figure 3.2-4**). The

Triassic rocks have been ascribed to various formations, but the cover of surficial deposits, the limited exposures of Triassic rocks, preclude positive definition of the Triassic rock units. The Triassic beds may attain a thickness of 800 feet east of the San Simon Swale, but in the project area the Santa Rosa was assigned a thickness of 200 feet (USDOE 2004).

The Tertiary Ogallala Formation may be absent or very thin in the 50-year mine area, but the proposed loadout facility north of Jal and the plant facilities may partially lie on the Ogallala Formation. Nicholson and Clebsch (1961) identified Ogallala Formation in the upper 125 feet the Continental Oil Company Bell Lake #2 well in Section 30, T25S, and R34E, less than 0.5 mile east of the mine area. The Ogallala Formation is composed of sandstone, silt, and cemented gravel capped by discontinuous caliche layers (New Mexico Bureau of Geology and Mineral Resources 2003). The Ogallala Formation was deposited during the Oligocene when uplift and erosion of the Rocky Mountains caused sediment to be deposited over a large area east of the mountains. In addition to fluvial deposits, the Ogallala contains considerable wind-blown deposits.

Although Tertiary (Oligocene) igneous dikes and sills are present in the northwest Delaware Basin, such igneous rocks have not been identified in the 50-year mine area (Calzia and Hiss 1978). Dikes have been reported in the potash mines and occur as parallel and nearly vertical, with widths up to 12 feet. The dikes appear to die out in the Ochoan rocks and do not appear on the surface. The igneous rocks also have been documented from boreholes.

The oldest Quaternary deposit is the Gatuña Formation, which is present in limited outcrops in the Nash Draw area (Vine 1963). The extent and occurrence of the Gatuña Formation in the project area has not been determined. The Gatuña Formation consists of clasts of Triassic and Ogallala rocks and volcanic ash beds (Lambert 1983). It is thought to have been deposited in depressions formed by collapse due to dissolution of evaporites in the subsurface.

The Mescalero Caliche is an informal unit defined on the basis of persistent caliche beds that are widespread on the Mescalero Plain and is described as consisting of two zones, an upper caliche caprock and a lower zone composed of nodular limestone (USDOE 2004).

Recent geologic materials in the project area consist of layers of alluvium and eolian (windblown) sand (New Mexico Bureau of Geology and Mineral Resources 2003). Where deep channels have been cut into the bedrock or in depressions created by subsidence, recent materials may attain a thickness of 500 feet.

Geologic Structure of the Project Area

There are few tectonic structural features in the Permian and younger section in the project area. The regional dip is 90 to 100 feet per mile (1 degree) to the southeast in western Eddy County and becomes almost flat in the project area in Lea County (Montgomery et al. 1999). Complex block faulting cuts the deeper Permian and Pennsylvanian rocks, but the faults appear to die out in the lower Permian. An example of this kind of fault in the project area is the Bell Lake Fault (Hill 1996). However, west of the project area, the dissolution of evaporite layers combined with the flowage of salt created a somewhat chaotic structure. Because of the plastic nature of salt, it responds to stress by flowing, which results in deformation of adjacent strata. The dissolution of salt layers had the effect of creating basins in which the strata bend downward into the depression against the regional dip. This is visible at Nash Draw to the west of the project area where the structure on top of the Salado Formation forms a closed depression and the rocks exposed on the surface have a chaotic, jumbled appearance.

3.2.2 Mineral Resources

3.2.2.1 Potash

Historic and Current Potash Mining

Potash was discovered in Eddy County in 1925 in a well that was being drilled for oil and gas by the Snowden McSweeney Company (Davis 2009). By the mid-1930s, there were eleven companies exploring for potash in southeastern New Mexico (Barker et al. 2008). The potash in southeastern New Mexico has been a major potash resource (Cheeseman 1978). The remaining potash reserves are estimated to be 500 million tons (U.S. Geological Survey [USGS] 2011). Potash production continues in the Delaware Basin with active mining by Intrepid Potash, Inc. and The Mosaic Company, about 20 miles west and northwest of the project area. Although much of the high-grade zones have been mined out, exploration for commercially viable deposits continues (Muller and Galyen 2009). Intrepid recently has been approved to conduct solution mining of potash minerals in order to extract some of the remaining ore from suspended mines in the main potash mining area.

The potash zones in the Salado Formation present a complicated mineralogy of potash minerals. There are 12 ore zones present, 11 of which are located in the McNutt Potash zone with varying mineralogy and commercial viability (Cheeseman 1978). The ore zones were numbered from the deepest to the shallowest by the USGS, with the First Ore Zone being the deepest and the Twelfth Ore Zone being the shallowest. Mining has occurred in commercial quantities from First, Third, Fourth, Fifth, Seventh and Tenth Ore Zones. The First Ore Zone was the richest in terms of potassium content and has been extensively mined. The major commercial minerals in the ore are sylvite and langbeinite. Non-ore (gangue) minerals include leonite, kainite, carnalite, polyhalite, kieserite, halite, and anhydrite. Potash has a variety of uses with the most common being a component of fertilizer.

Proposed Polyhalite Mining, Ochoa Project

The proposed Ochoa Mine is a departure from the traditional potash mining in the area in that ICP proposes to mine the mineral polyhalite from the Rustler Formation. The polyhalite is present in the M3/H3 zone of the Tamarisk Member of the Rustler Formation (**Figure 3.2-7**). Polyhalite has long been considered as a potential potassium source, but regional and international interest has been directed to mining high-grade sylvite deposits (Muller and Gaylen 2009). Polyhalite offers end-use advantages over sylvite because it does not contain chlorides and can be used on chloride-sensitive crops. Polyhalite is described as “a hydrated potassium-calcium-magnesium-sulfate salt” (Muller and Gaylen 2009). It is distinguished from other potassium minerals in that it has less solubility in water. It is thought to have formed as a replacement mineral from the dissolution of anhydrite by brine solutions.

The polyhalite bed that is the target of the proposed mine occurs about 1,500 to 1,600 feet below the ground surface and about 220 feet below the top of the Rustler Formation (ICP 2011). The zone varies from 4.0 to 6.0 feet thick and averages 5.0 feet thick and was identified on geophysical logs from oil and gas wells and was further defined by extensive cores and logs taken by ICP.

The polyhalite would be recovered using room and pillar mining methods with an expected recovery of 90 percent except in areas of needed support and in the vicinity of active and abandoned oil and gas wells (ICP 2011). The ore will be cut by continuous mining machines and then transported from the working face by shuttle cars. Extraction height is expected to be 6.0 feet that also would include ore as well as an unstable anhydrite bed that occurs directly above the polyhalite zone.

3.2.2.2 Oil and Gas Production and Development

Oil in southeastern New Mexico was discovered in 1909, 8 miles south of Artesia, but the well was never completed as a producer due to mechanical problems (Montgomery 1965). Oil and gas production began in the New Mexico portion of the Delaware Basin in 1924 with the discovery of the Dayton-Artesia Field (Independent Petroleum Association of New Mexico 2009). To the year 2000, 300 reservoirs have produced 4.5 billion barrels of oil mainly from plays on the Northwest Shelf and Central Platform areas (Broadhead et al. 2004). More than 3.5 billion barrels of the total production has come from Permian rocks. The USGS estimates that the greater Permian Basin area, including areas in southeastern New Mexico and west Texas, contains substantial undiscovered oil and gas resources on the order of 1.3 billion barrels of oil and 41 trillion cubic feet of gas (Schenk et al. 2008).

Early exploration and development was conducted along the edge of the deep basin, in areas along the Capitan Reef and along the shelf areas to north and northeast. Oil and gas production began in the project area in the early 1950s with the blowout of the Continental Oil Bell Lake Unit #1 (Section 31, T23S, R34E) on March 13, 1954 (Kinney 1954). The well had been drilled to a depth of 12,616 feet and burned for 15 days until the fire was put out. However, the well continued to flow and was not brought under control for another 51 days when the flow was staunched with 6,500 sacks of cement and 11,000 barrels of mud. The discovery ushered in deep basin drilling, which continues to the present. The Bell Lake Unit #1-A was drilled and completed in a Devonian limestone from an interval from 14,942 to 15,025 feet (Hills 1968). Oil and gas exploration targets range from relatively shallow oil and gas at 5,000 feet deep in the Delaware Canyon Formation to deep gas targets in middle Paleozoic formations in excess of 16,000 feet deep (Crowl et al. 2011). Existing oil and gas wells and approved applications for permits to drill (APDs) in the 50-year mine area are shown on **Figure 3.2-8**. Existing oil and gas wells and approved APDs in the vicinity of the proposed processing plant sites are displayed on **Figure 3.2-9** and in the vicinity of the Jal loadout on **Figure 3.2-10**.

Numerous formations produce oil and gas in the project vicinity, including the Delaware, Atoka, Wolfcamp, Morrow, Woodford Shale, and Bone Spring formations (Engler et al. 2012). From mid-2011 to October 2013, oil and gas permitting and drilling activity substantially increased in the vicinity of the proposed mine area. From June to December of 2011, there were a total of eight new wells and approved APDs. In 2012, the number of undrilled APDs and new wells increased almost eight-fold over 2011 for a total of 63. By October 2013, the number of undrilled APDs and new wells were only slightly higher than 2012. From June 2011 to October 2013, undrilled APDs and new wells totaled 137 and most of the proposed and active new wells targeted the Bone Spring Formation, although a few wells targeted the Delaware Mountain Group (mostly injection or disposal wells), Wolfcamp, and Morrow formations. **Table 3.2-2** summarizes the numbers of new wells and APDs within the vicinity of the mine area. Based on the number of undrilled APDs, this play appears to be ramping up and many more wells could be drilled in the next few years as long as favorable oil prices can sustain the expected drilling activity.

Table 3.2-2 Recent Oil Well Activity in the Mine Area: April 2011 – October 2013

Type of Lease and Status	Number of Wells or APDs
Federal Total	**32**
Active	6
New (Not Drilled or Completed)	26
Private Total	**1**
New (Not Drilled or Completed)	1
State Total	**104**
Active	27
Never Drilled	1
New (Not Drilled or Completed)	76
Grand Total	**137**

Note: None of the recent activity or APDs were for gas wells.

Source: OCD 2013

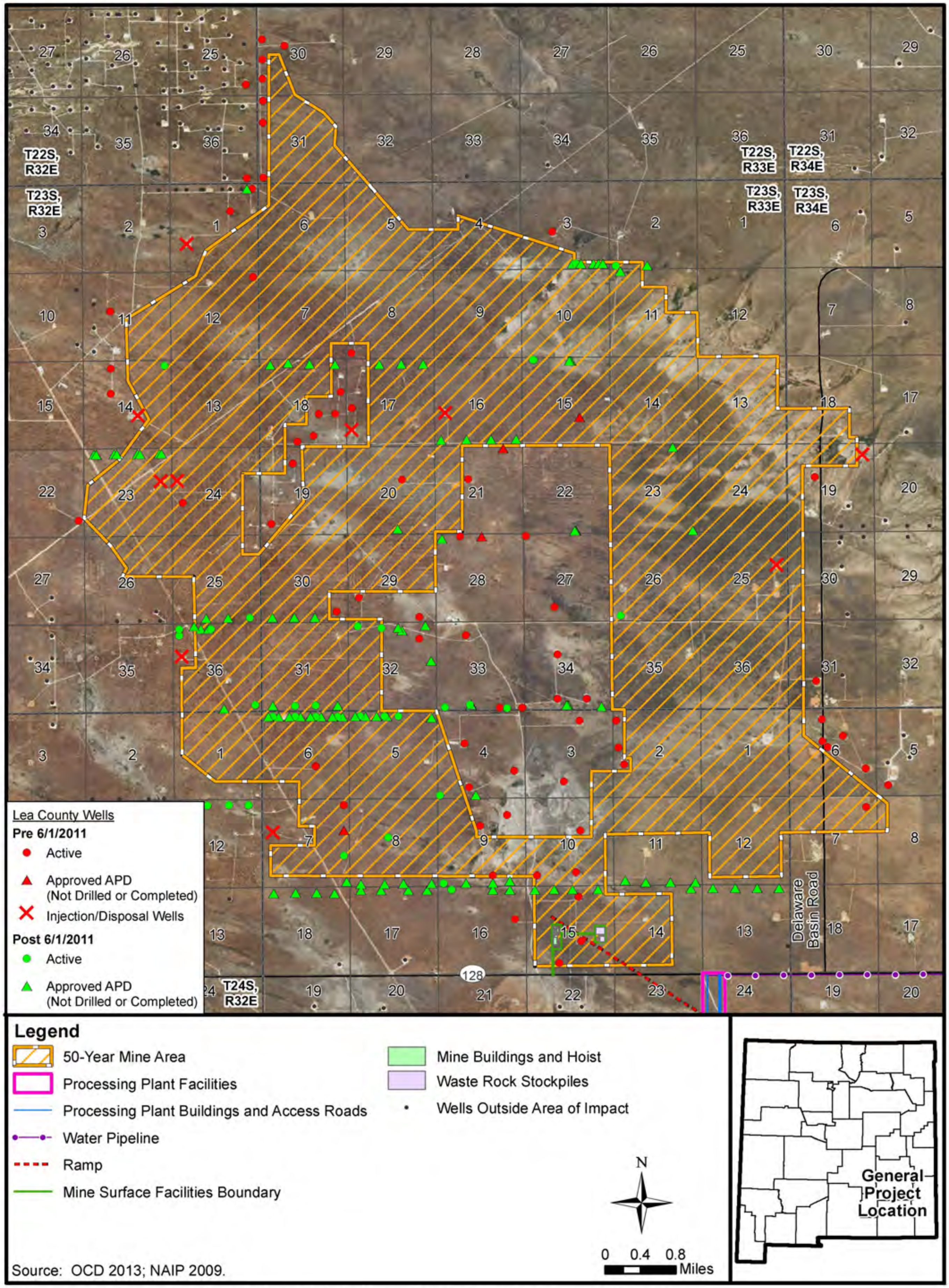


Figure 3.2-8 Recent Oil and Gas Activity In and Near the Proposed Mine Area

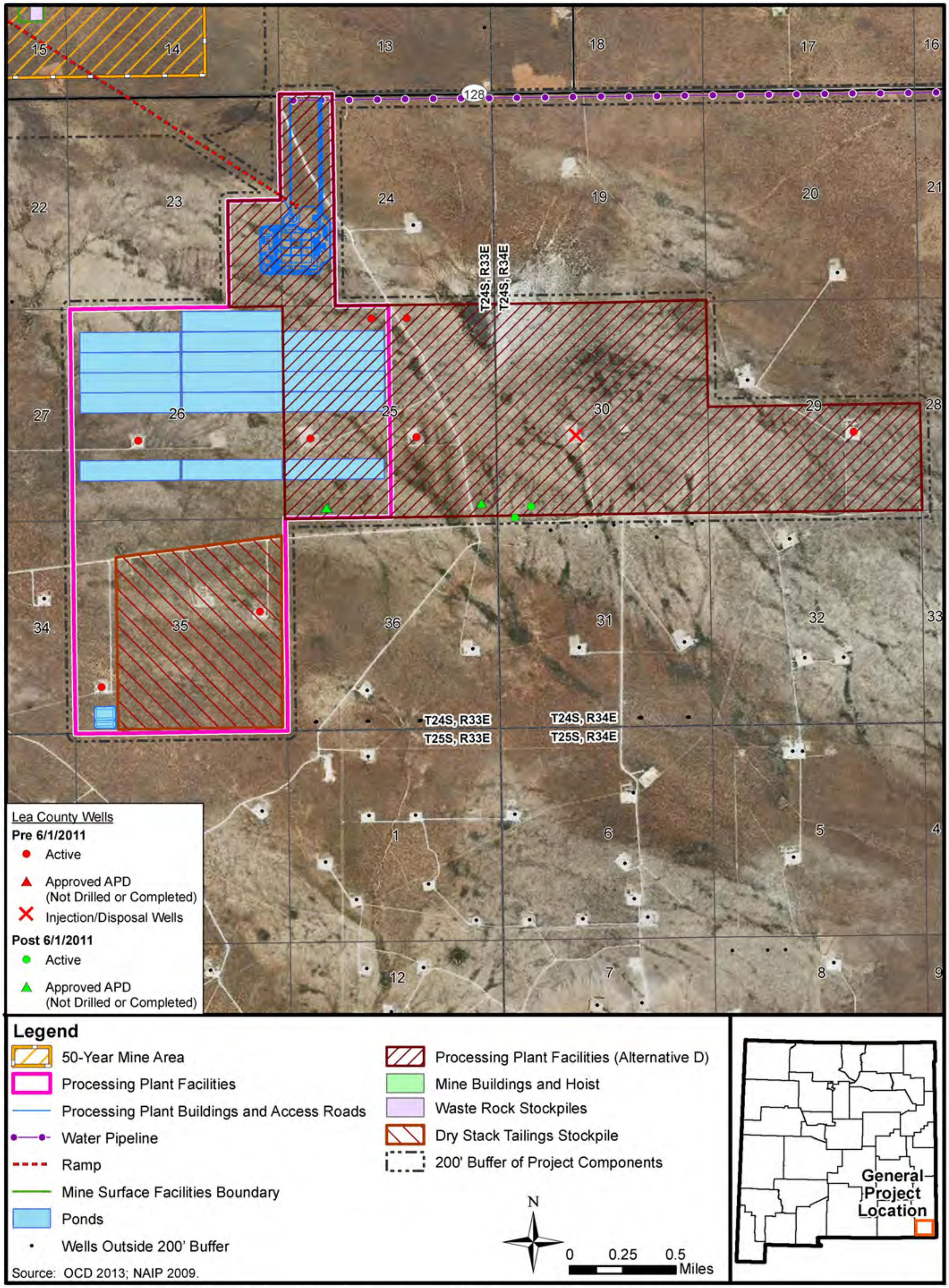


Figure 3.2-9 Recent Oil and Gas Activity in the Vicinity of the Processing Plant Site

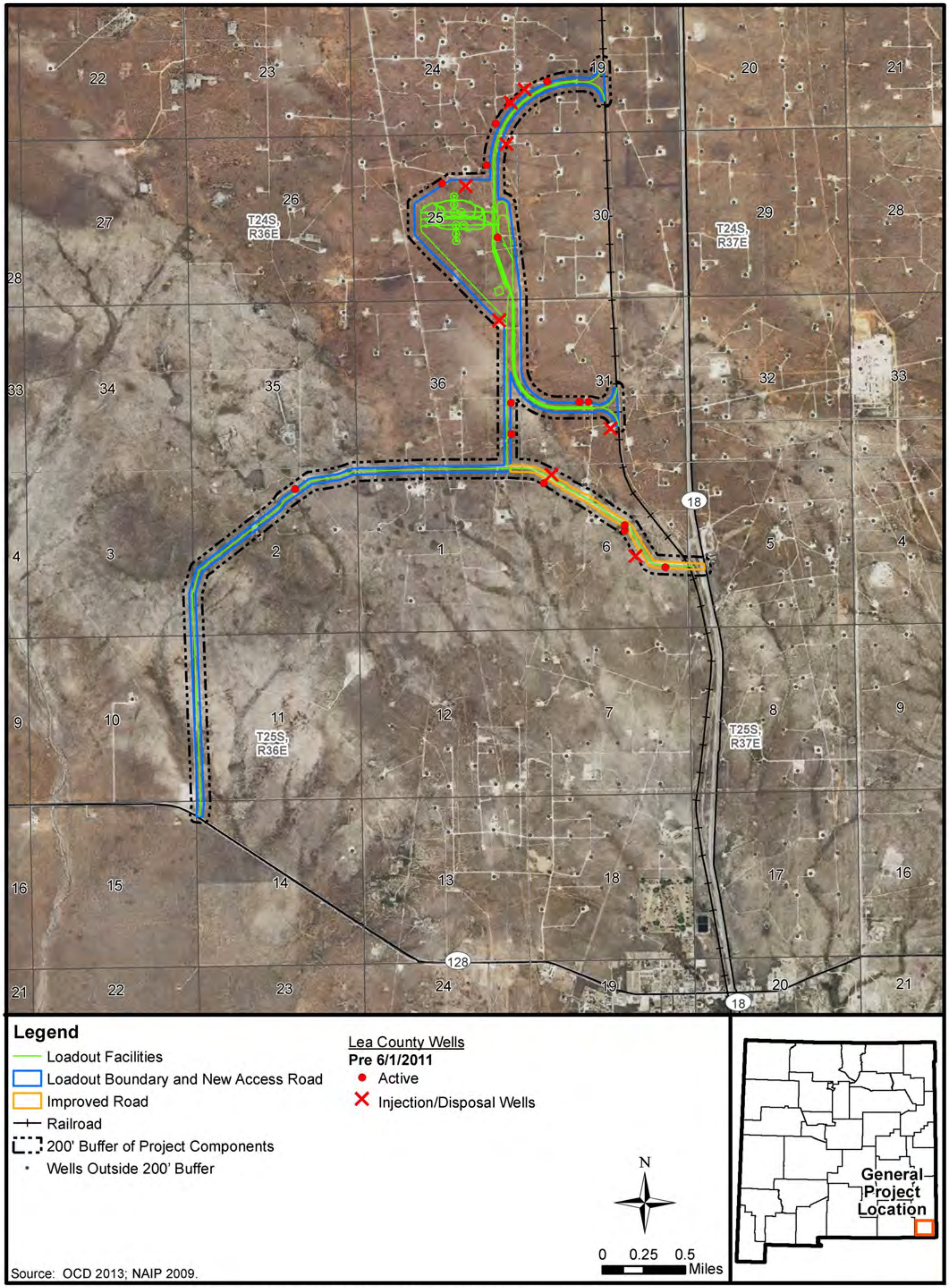


Figure 3.2-10 Oil and Gas Activity in the Vicinity of the Jal Loadout

Because most of the new wells and approved locations in the mine area are horizontal wells, they have been placed in a linear arrangement (see **Figure 3.2-8**) with laterals to be drilled to the south or north. Although these locations are not necessarily drilling islands, the wells and permitted locations would have a lesser impact on polyhalite recovery than the typical previously developed vertical wells on 160-acre spacing. **Figures 3.2-9** and **3.2-10** show little recent activity in or near the processing plant sites and no recent oil and gas activity within 200 feet of the Jal loadout.

It is expected that the horizontal drilling and hydraulic fracturing technology would generate interest in drilling into other formations in the project area. Currently, the most likely new target in southern Lea County is the lower Permian Wolfcamp Shale with potential recovery for the greater Permian Basin in the billions of barrels (Oil and Gas Journal 2013). Wolfcamp reservoirs in the vicinity of the project are composed of limestone interbedded with and sourced by organic shale at depths ranging from approximately 13,000 to 14,000 feet deep (Broadhead et al. 2004). With an estimated in-place 108 million barrels of oil equivalent per square mile, a higher pressure gradient, and better reservoir properties than other comparable shales, the Wolfcamp Shale in the Texas portion of the Delaware Basin is becoming a sought after drilling target (Fairhurst et al. 2012). To date, most of the Wolfcamp production in the project area has been gas from vertical wells. The Johnson Ranch pool underlies a large portion of the proposed mine area and has produced 56.9 billion cubic of gas and 2.4 million barrels of oil since the 1980s (OCD 2013). Engler et al. (2012) reported that there was one horizontal Wolfcamp well in the Johnson Ranch pool and it is likely that more horizontal drilling may occur in the Wolfcamp at Johnson Ranch, given the regional trend for operators to move from gas to oil. However, as of November 2013, there are no recent approved APDs for the Wolfcamp.

3.2.2.3 Potash Mining and Oil and Gas

Although potash was originally discovered by wells that were drilled for oil and gas, conflicts between the oil and gas industry and potash mining emerged early on. In 1939, the federal government, through an order by the Secretary of the Interior, withdrew 42,685 acres from oil and gas leasing in deference to potash mining (1939 Order). The 1939 withdrawal remained in effect until 1951, at which time the Secretary of the Interior issued a new Order withdrawing the 1939 Order allowing for concurrent operations in the prospecting and development and production of oil and gas and potash deposits owned by the U.S. A succession of orders followed (1951, 1965, 1975, 1986, and 2012), with each order except the most recent expanding the SPA. On October 21, 1986, the Order of the Secretary of the Interior (51 FR 39425, October 28, 1986) expanded the SPA to 497,002 acres. The most recent Secretary's Order was published in the FR on December 4, 2012 (77 FR 71822). Commonly referred to as the 2012 Order, it now governs the co-development of federal oil, gas, and potash leasing and development within the SPA. The SPA boundaries are shown in **Figure 3.2-11**, but it should be noted that the proposed project area is not within the SPA and therefore is not bound by the Order.

3.2.2.4 Other Minerals

Other minerals produced in Lea County include sand and gravel, caliche, and salt (USGS 2011).

3.2.3 Geologic Hazards

3.2.3.1 Natural Subsidence

Subsidence is defined as "a gradual settling or sudden sinking of the Earth's surface owing to subsurface movement of earth materials" (Galloway et al. 2005). Subsidence can occur from several conditions including dissolution of subsurface strata, underground mining, withdrawal of subsurface fluids, drainage of organic soils, hydrocompaction, thawing frost, and natural consolidation.

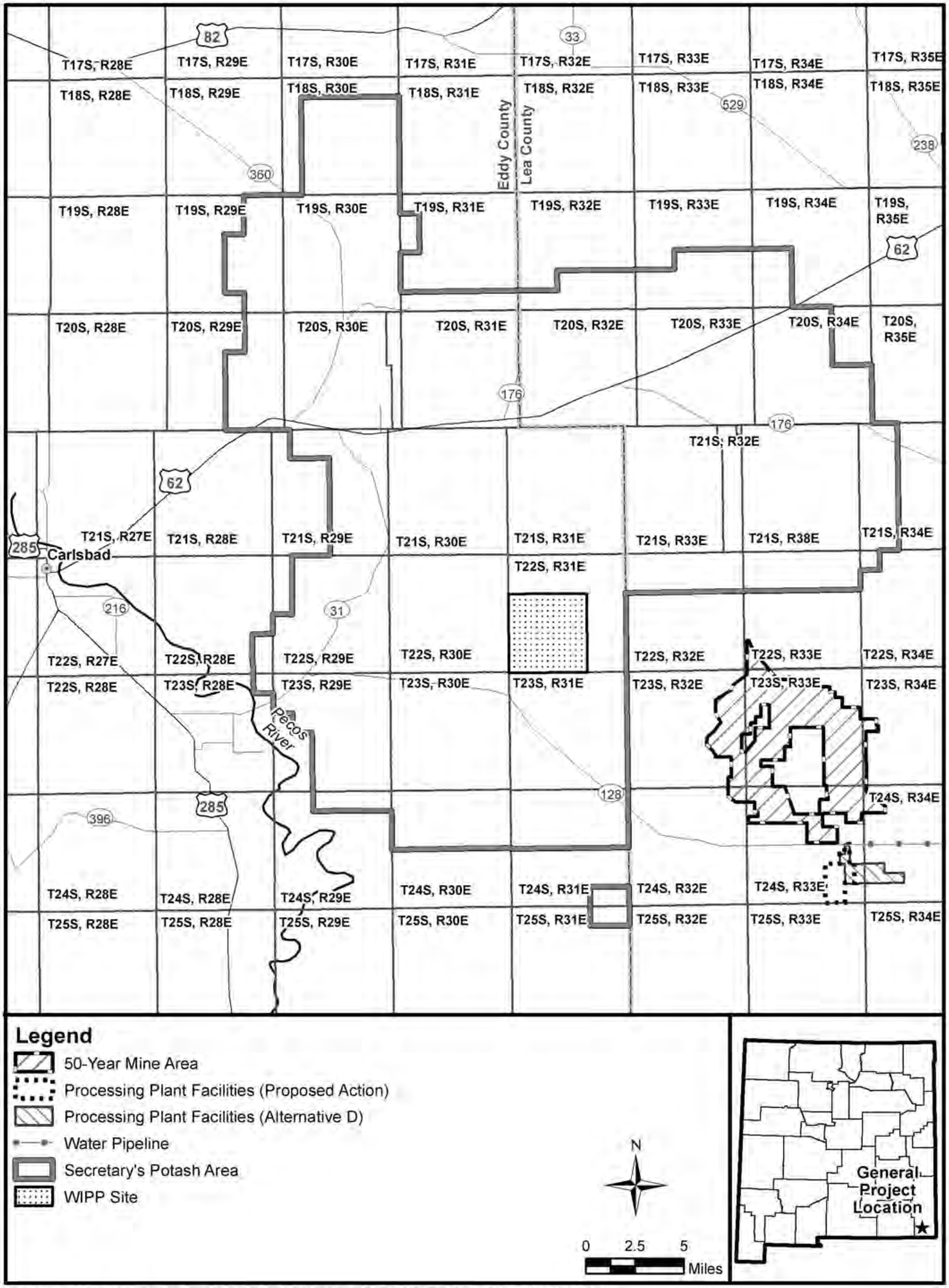


Figure 3.2-11 Secretary's Potash Area and Ochoa Mine Project Area

Subsidence in the Delaware Basin has been caused primarily by the dissolution of subsurface strata or potash mining. Dissolution of subsurface strata may occur as the result of natural conditions as well as the deliberate or inadvertent actions by humans. The mining of potash has caused some ground subsidence in the region. Topographic depressions are widespread in the Delaware Basin, some of which are due to the dissolution of evaporite minerals, called evaporite karst features. On the north side of the Delaware Basin, karst is manifested in a number of features, some that can be identified on the surface and others hidden in the subsurface (Hill 1996). Some of the major features include cavernous or vuggy porosity, sinkholes, breccia pipes, blanket breccia zones, caves, karst valleys, and dissolution breccias. Other karst features can result from the property of anhydrite that causes it to expand in size when it becomes hydrated and turns to gypsum. The expansion can result in buckling and deformation of adjacent rock layers and cracking in the gypsum bed (Bachman 1983). The cracking and deformation of adjacent beds can allow fluids to infiltrate into lower layers.

The Capitan Reef contains cavernous areas in the subsurface and anomalously high porosity, indicating the presence of large vugs, “honeycomb” structure, and evidence of dissolution (Hill 1996). The Capitan Limestone does not outcrop in the project area and is not present in the subsurface in the 50-year mine area. However, the formation of cavernous porosity may be relevant to the formation of some of the depressions in the project vicinity.

Near the project area, there are topographic depression that are strongly suspected to be related to deep-seated evaporite karst, and other depressions whose origin may be due to shallow dissolution. These features consist of broad elongate depressions or smaller nearly circular depressions. These features consist of broad elongate depressions or smaller nearly circular sinks. These features include the San Simone Swale, the San Simon Sink, and the Bell Lake Sink as well as other undocumented topographic depressions in the area (**Figure 3.2-2**). The San Simon Swale is a northwest-southeast depression that covers about 100 square miles in T22S, R33E and R34E, and T23S, R34E and small parts of adjacent townships (Nicholson and Clebsch 1961). The swale is northeast of the Ochoa project area and is covered with stabilized dunes. At the southeast end of the swale is the San Simon Sink, located in Section 18, T23S, R35E. The sink is a roughly circular depression about 0.5 square mile in area and about 100 feet deep. It also contains a secondary collapse structure within the larger sink and it is about 35 feet deep. Nicholson and Clebsch (1961), Reeves (1972), and Lambert (1983) reported that subsidence was active in the sink from 1927 to the early 1930s. It is believed that the San Simon Swale and the San Simon Sink originated from dissolution of evaporates in the subsurface and are indicative of evaporite karst, but the exact mechanism is not known. Since the features are over the Capitan Limestone, it is possible that water under artesian conditions breached the top of the reef and dissolved evaporites in the section above the reef.

Bell Lake Sink is a possible karst feature located within the proposed 50-year mine area. The central part of the sink is primarily located in the northeast quarter of Section 9, T24S, R33E, but portions of Sections 3, 4, and 10 are within the sink area (**Figure 3.2-2**). Another sink close to the project area is located in Section 24, T24S, R33E (Nicholson and Clebsch 1961). The origins of the Bell Lake Sink and the unnamed sink are uncertain, but have been attributed to deep dissolution of evaporites (Lambert 1983). According to Nicholson and Clebsch (1961), both sinks contain abundant gypsum dune sand, which may be indicative of the upward movement of groundwater causing the precipitation of gypsum. As there is no surficial source of gypsum in the area, it most likely came from the subsurface, but prevailing hydrostatic heads preclude such movement to the surface.

Other sinks evidenced by closed depressions on topographic maps are located within or adjacent to the 50-year mine area (**Figure 3.2-2**). These depressions are not documented in the literature reviewed for this report, but given the nature of the area, these features are assumed to have been formed as the result of dissolution and collapse. Across the 50-year mine area the Rustler is consistently about 500 feet thick (±50 feet) (Crowl et al. 2011). Geophysical logs from oil and gas wells around the Bell Lake Sink show no thinning in the Rustler and a well drilled close to the center of the sink has a Rustler thickness of 520 feet. This thickness agrees with a Rustler thickness of 500 feet or more just to the southeast of

WIPP (Lorenz 2006). The Rustler thickness also coincides with mapping in T23S and T24S, R33E. Another map by Lambert (1983) of the thickness of the interval between the Lower Salado and the base of the Castile Formation indicates a fairly constant thickness of that interval over the 50-year mine area and proposed surface facilities.

Because there appears to be no thinning in the Rustler or deeper units, dissolution of deep evaporites does not appear to be the cause of the depressions in the 50-year mine area and in the proposed surface facilities area. Rather, it is possible that these features are the result of dissolution of shallow caliche deposits or other phenomena such as erosion.

Although caves are quite common to the west in the vicinity of Nash Draw, the potential for caves in the project area is low. The major reason for this is that the Rustler Formation (the primary formation that hosts caves in the Nash Draw area) is buried too deeply for caves to form. The Rustler Formation in the Nash Draw area is very shallow or outcrops on the surface, allowing dissolution of evaporites to occur by meteoric waters or shallow groundwater.

3.2.3.2 Anthropogenic Subsidence

Subsidence also can be caused by human activities. In the Delaware Basin, anthropogenic subsidence largely has occurred as a result of potash mining and activities involving the withdrawal or injection of fluids for oil and gas production and brine extraction.

Subsidence is the phenomenon or response that occurs when an underground opening is created. The overlying and surrounding rock or soil around the opening naturally deforms in an effort to arrive at a new overall equilibrium position. This equilibrium-seeking action can result in both vertical and horizontal ground movement, which, if not controlled or minimized, can cause damage to both surface and subsurface structures. The ground movement can result in the development of undesirable surface topography, such as surface cracking or collapse, sinkholes, blockage or re-channelization of streams, and modification of drainage pathways.

While the term “subsidence” usually refers to vertical displacement of a point, subsidence actually encompasses both vertical and horizontal displacements. Horizontal displacement can be greater than vertical displacement when subsidence is small in magnitude.

Potash Mining

Room-and-pillar mining employs a regular grid pattern of passages and pillars, such as that shown in **Figure 3.2-12**). In this mining method a substantial proportion of the target mineral is locked up in the pillars and is often removed during the latter stages of mining (e.g., on retreat, often referred to as “pillar robbing” or “second mining”), usually to the extent that the number, size, or distribution of remaining pillars is insufficient to continue to support the roof.

The surface effects of the collapse of room-and-pillar workings depend on the depth and geometry of the workings, as well as the strength and integrity of the pillars and the surrounding and overlying strata.

The amount of subsidence realized at the surface is dependent on the depth, width, and thickness of the minerals extracted; on the ratio of the extracted void (mined out area) to the retained pillar area; and on the extent of area over which underground pillar failure and subsidence takes place (**Figure 3.2-13**).

The rate of subsidence is largely dependent on the type of material being mined. From a mine design and operations perspective, subsidence issues largely relate to the stability and safety of an excavation in rock as determined by the extent to which disruptive displacements can be prevented and the extent to which disruptive displacements can be controlled. These same primary design objectives similarly influence the potential to affect the surface and the degree of effect at the surface.

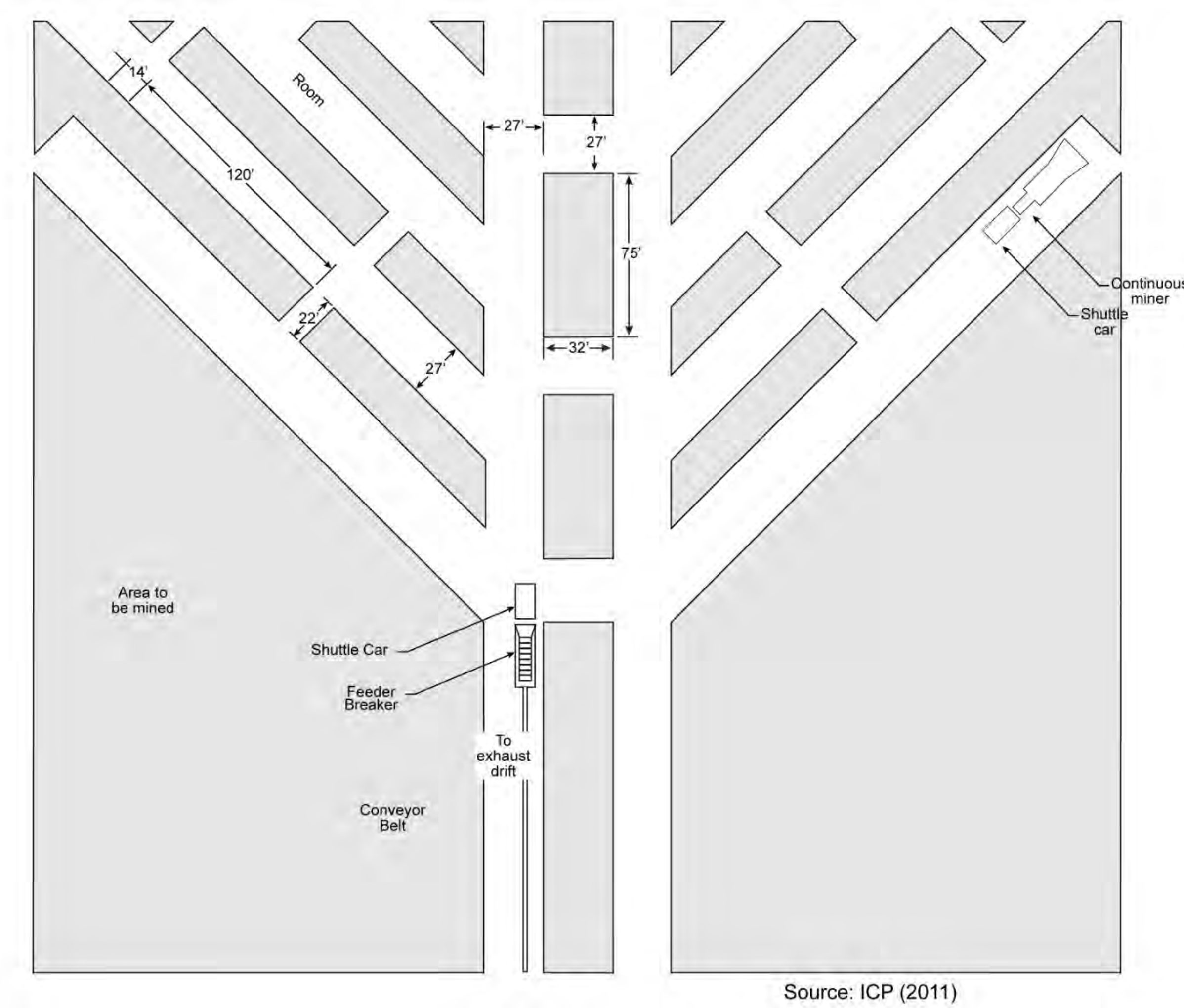


Figure 3.2-12 Plan View of Room-and-Pillar Mining

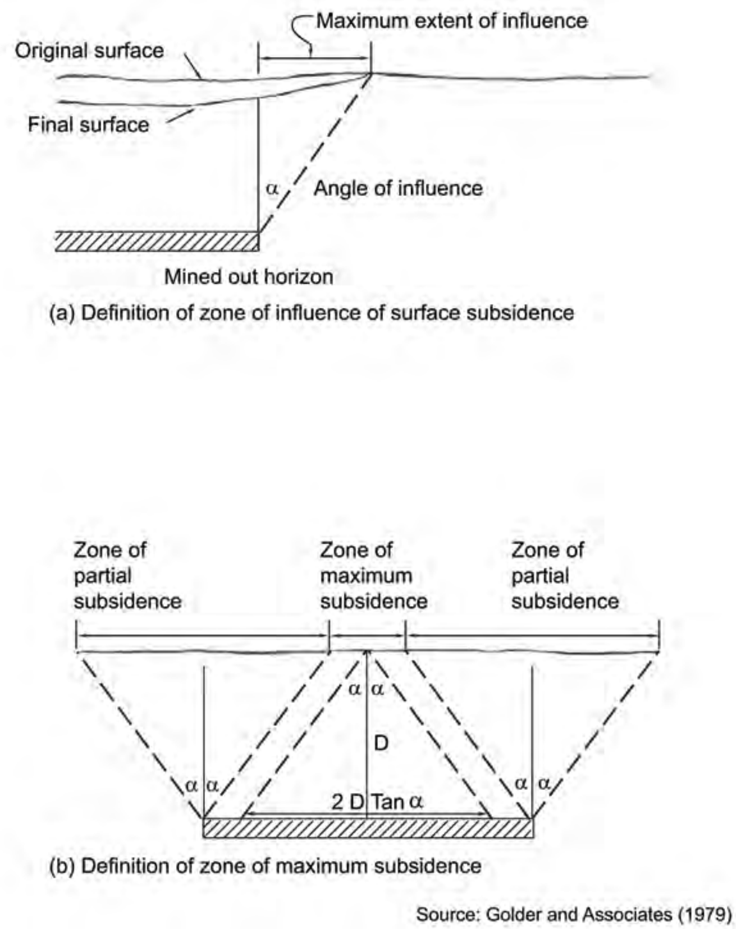


Figure 3.2-13 Subsidence Effects Zones

As a general rule, the amount of maximum subsidence (the depth of subsidence) that could occur cannot exceed the thickness of the zone of mineral extracted (the mining thickness) (Van Sambeek 2008, 2000). Maximum subsidence depth, however, is seldom observed, due to one or more of the following reasons:

- Subsidence actually spreads over an area somewhat larger than the mined area.
- Convergence, or closure of the mined area is never fully complete or total, so some voids inevitably remain, reducing the total amount of subsidence.
- The overlying rocks expand slightly in volume due to breakage as the ground moves downward into the mined area, resulting in a “bulking” effect, which contributes to a reduction in subsidence volume and depth.
- The subsidence process can be slow for rocks that creep, such as salt formations, so several hundred years may be required for full subsidence to occur.

It is important to note that both historic data and anecdotal evidence suggest that for the southeastern New Mexico potash mines, virtual completion of the maximum surface subsidence profile occurs within 5 to 7 years after completion of second mining (Intrepid Potash/Shaw 2008). Minor, protracted subsidence or creep may continue to occur over an extended period of time thereafter. Potash is an elastoplastic rock, which is massive, homogeneous, and isotropic, but possesses load-deformation characteristics that deviate significantly from linearity, causing the rock to slowly flow or deform rather than break. However, catastrophic roof failure reportedly occurred at the Mosaic Potash mine located approximately 15 miles west of the 50-year mine area on March 18, 2012. While the event and its cause are still under investigation, it appears that the roof failure involved the collapse of an area 1,600 feet wide and 3,000 feet long (New Mexico Tech Seismological Observatory 2012), which triggered a magnitude 2.4 earthquake. The roof failure may be related to the type of mineral mined at the Mosaic Mine, which is predominantly langbeinite and sylvite, different from the polyhalite to be extracted at the Ochoa Mine.

<u>Oil and Gas Activities</u>

Oil and gas exploration and production has been occurring since the 1920s and the Delaware Basin has been a prolific oil and gas producing area. Thousands of wells have been drilled through evaporite formations to explore for and produce oil and gas. Because of the extent of the evaporites (salt and anhydrite), drilling and completion operations have to be conducted in a manner that prevents the dissolution of the salt and protects the well during drilling and through the productive lives of the wells, often 20 to 30 years or more.

From the 1920s until the 1950s, oil wells were commonly drilled with cable tool rigs (Cearley 2000). In cable tool drilling, the hole is advanced by pulling a weighted bit up and down with a cable. The method requires “bailing” the well occasionally to remove rock cuttings that accumulate in the bottom of the well. Drilling could not commence if the cuttings were not removed because the bit would pulverize the cuttings without deepening the bore. If water is encountered, the well must be cased through the water zone before drilling can resume. If hydrocarbons are encountered, drilling would have to stop for safety. In early cable tool practice, casing was pounded into the well, but not cemented. Cementing of casing strings started in California in the early 20th Century, but cementing did not come to the mid-Continent area until the 1920s (Smith 1976). Although standardized cementing practices were developed in the 1930s, cementing was often based on guess-work, especially when determining proper setting times. As technology progressed, and cementing became more standardized, procedures and practice were codified into regulations to ensure that cement jobs were done properly. In the Permian Basin, completion practices even into the 1950s required cement at the bottom of intermediate and production casing strings, but allowed unprotected casing to be exposed to as much as 2,000 feet of salt formation (Giroux et al. 1988).

There are several examples in the Permian Basin of catastrophic subsidence as a result of suspected oil field casing corrosion and dissolution of salt. The examples of subsidence associated with oil and gas operations include the Wink Sinks I and II and the Jal Sink (K.S. Johnson et al. 2003; Powers 2003). There are other similar incidents that occurred in areas underlain by salt in Texas and in Kansas (Walters 1978). The Wink Sinks developed in the Hendrick oil field in Winkler County, Texas, near the Town of Wink (**Figure 3.2-14**). Wink Sink I developed in 1980 and Wink Sink II occurred in 2002. The Jal Sink occurred in 2001.

The Jal sinkhole is located about 8 miles northwest of Jal, New Mexico, and about 12 miles east of the proposed 50-year mine area. The geologic settings of the Wink Sinks and the Jal sinkhole are similar as they occurred at the basin margin above the Capitan Reef. In each incident, sinkholes formed around a well location and the sinks had diameters ranging from 200 to over 700 feet (K.S. Johnson et al. 2003; Powers 2003). Although the exact cause of sinkhole development is not known, it is suspected that casing failure allowed unsaturated water to come into contact with, and subsequently dissolve, salt layers. **Figure 3.2-15** shows the postulated development of the Wink Sink showing cavitation and subsidence caused by leaking casing, with ultimate surface collapse not occurring until years after the well was plugged. It is not known if the location of the sinkhole development was enhanced by upward movement of water from the Capitan Reef. Rising heads could have occurred in the Capitan Reef because of lower oil field demand for water in the 1980s and 1990s, but there is no definitive evidence that the reef was involved (Powers 2003).

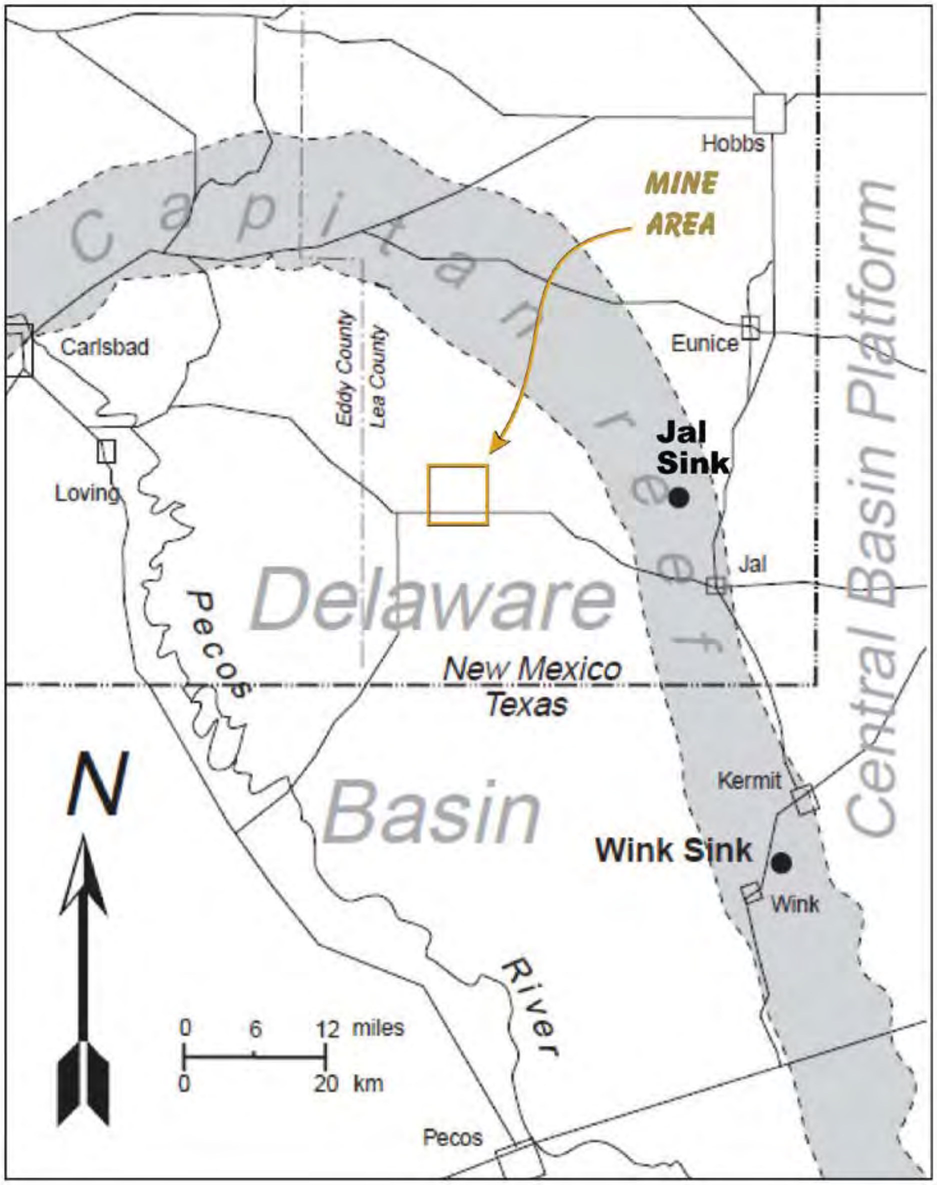
A major concern regarding oil field cement is the potential vulnerability of cements to brine fluids (LaFleur and Lovelace 1969). The damage that brine can inflict is dependent on many variables, but if cement is vulnerable, deterioration can begin within 24 hours of exposure to brine. It can be readily surmised that, if casing were breached adjacent to an uncemented salt zone, the brine created by dissolution could attack the cement where it is present. Overall, cementing of casings in oil and gas wells that penetrate salt sections is often problematic and there is no general rule on how to deal with the problems (Hunter et al. 2009).

3.2.3.3 Seismicity

The proposed project is located in an area with very little earthquake activity and such events that are recorded are of small magnitude. From 1973 to the present there have been 12 recorded events ranging from 2.8 to 4.1 magnitude (USGS 2012).

No active faults have been identified in southeastern New Mexico (USGS and New Mexico Bureau of Geology and Mineral Resources 2006; USGS and Texas Bureau of Economic Geology 2006). The nearest potentially active faults are located about 60 miles south of the project area in the Guadalupe and Delaware Mountains in Texas.

The USGS seismic hazard mapping indicates that ground motion in the project area from a maximum credible event would be less than 10 percent of the acceleration of gravity, with a 2 percent probability of exceedence in 50 years (Petersen et al. 2008).



Source: Powers (2003)

Figure 3.2-14 Location of Jal and Wink Sinks

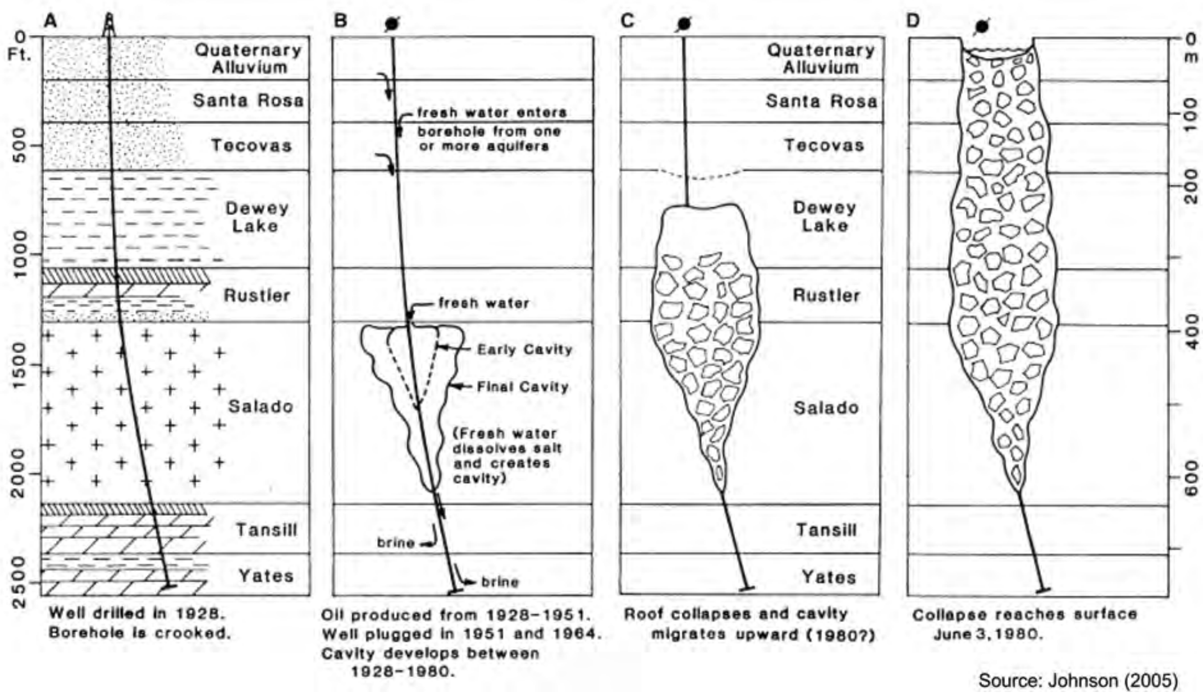


Figure 3.2-15 Development of Wink Sink

3.2.4 Paleontological Resources

3.2.4.1 Regulatory Structure

Federal protection for scientifically important paleontological resources applies to construction or other impacts caused by disturbance of paleontological resources that occur on federally owned or managed lands. Federal legislative protection for paleontological resources stems from the Antiquities Act of 1906 (P.L. 59-209; 16 USC 431 et seq.; 34 Stat. 225), which calls for protection of historic landmarks, historic and prehistoric structures, and other objects of historic or scientific interest on federally administered lands. Another federal law regulating paleontological resources is the Archaeological and Paleontological Salvage Act (23 USC 305). This act provides for funding for mitigation of paleontological resources discovered during federal highway projects, provided that “excavated objects and information are to be used for public purposes without private gain to any individual or organization.” In addition to the foregoing, the National Registry of Natural Landmarks provides protection to paleontological resources.

The BLM manages paleontological resources (fossils) on federal lands under the following statutes and regulations (BLM 2012a):

- FLPMA of 1976 (P.L. 94-579)
- NEPA of 1969 (P.L. 91-190)
- Various sections of BLM’s regulations found in Title 43 CFR that address the collection of invertebrate fossils and, by administrative extension, fossil plants.
- A recently enacted statute, the Paleontological Resources Preservation Act, passed in March 2009, authorizes the BLM to manage and provide protection to fossil resources using “scientific principles and expertise”.
- Petrified (fossilized) wood is protected under BLM regulations at 43 CFR 3620 – 3622.

In addition to the statutes and regulations listed above, fossils on public lands are managed through the use of internal BLM guidance and manuals. Included among these are the BLM Manual 8270 and the BLM Handbook H-8270-1 (BLM 2012a). Various internal instructional memoranda have been issued to provide guidance to the BLM in implementing management and protection to fossil resources.

3.2.4.2 Potential Fossil Yield Classification

Recently, the BLM adopted the Potential Fossil Yield Classification (PFYC) system to identify and classify fossil resources on federal lands (BLM 2007a). Paleontological resources are closely tied to the geologic units (i.e., formations, members, or beds) that contain them. The probability for finding paleontological resources can be broadly predicted from the geologic units present at or near the surface. Therefore, geologic mapping can be used for assessing the potential for the occurrence of paleontological resources.

The PFYC system is a way of classifying geologic units based on the relative abundance of vertebrate fossils or scientifically significant fossils (plants and invertebrates) and their sensitivity to adverse impacts. A higher class number indicates higher potential. The PFYC is not intended to be applied to specific paleontological localities or small areas within units. Although significant localities may occasionally occur in a geologic unit, a few widely scattered important fossils or localities do not necessarily indicate a higher class; instead, the relative abundance of significant localities is intended to be the major determinant for the class assignment.

The PFYC system is meant to provide baseline guidance for predicting, assessing, and mitigating paleontological resources. The classification should be considered at an intermediate point in the analysis, and should be used to assist in determining the need for further mitigation assessment or actions. The BLM intends for the PFYC system to be used as a guideline rather than rigorous categories. Descriptions of the potential fossil yield classes are summarized in **Table 3.2-3**.

Table 3.2-3 Potential Fossil Yield Classification

Class	Description	Basis	Comments
1	Igneous and metamorphic (tuffs are excluded from this category) geologic units or units representing heavily disturbed preservation environments that are not likely to contain recognizable fossil remains.	Fossils of any kind known not to occur except in the rarest of circumstances. Igneous or metamorphic origin. Landslides and glacial deposits.	Ground-disturbing activities will not require mitigation except in rare circumstances.
2	Sedimentary geologic units not likely to contain vertebrate fossils or scientifically significant invertebrate fossils.	Vertebrate fossils known to occur very rarely or not at all. Age greater than Devonian. Age younger than 10,000 years before present. Deep marine origin. Aeolian origin. Diagenetic alteration.	Ground-disturbing activities are not likely to require mitigation.

Table 3.2-3 Potential Fossil Yield Classification

Class	Description	Basis	Comments
3	Fossiliferous sedimentary geologic units where fossil content varies in significance, abundance, and predictable occurrence. Also sedimentary units of unknown fossil potential.	Units with sporadic known occurrences of vertebrate fossils. Vertebrate fossils and significant invertebrate fossils known to occur inconsistently; predictability known to be low. Poorly studied and/or poorly documented. Potential yield cannot be assigned without ground reconnaissance.	Ground-disturbing activities will require sufficient mitigation to determine whether significant paleontological resources occur in the area of a proposed action. Mitigation beyond initial findings will range from no further mitigation necessary to full and continuous monitoring of significant localities during the action.
4	Class 4 geologic units are Class 5 units (see below) that have lowered risks of human-caused adverse impacts and/or lowered risk of natural degradation.	Significant soil/vegetative cover; outcrop is not likely to be impacted. Areas of any exposed outcrop are smaller than 2 contiguous acres. Outcrop forms cliffs of sufficient height and slope that most is out of reach by normal means. Other characteristics that lower the vulnerability of both known and unidentified fossil localities.	Proposed ground-disturbing activities will require assessment to determine whether significant paleontological resources occur in the area of a proposed action and whether the action will impact the paleontological resources. Mitigation beyond initial findings will range from no further mitigation necessary to full and continuous monitoring of significant localities during the action.
5	Highly fossiliferous geologic units that regularly and predictably produce invertebrate fossils and/or scientifically significant invertebrate fossils, and that are at risk of natural degradation and/or human-caused adverse impacts.	Vertebrate fossils and/or scientifically significant vertebrate fossils are known and documented to occur consistently, predictably, and/or abundantly. Unit is exposed; little or no soil/vegetative cover. Outcrop areas are extensive; discontinuous areas are larger than 2 contiguous acres. Outcrop erodes readily; may form badlands. Easy access to extensive outcrop in remote areas. Other characteristics that increase the sensitivity of both known and unidentified fossil localities.	Mitigation of ground-disturbing activities is required and may be intense. Areas of special interest and concern should be designated and intensely managed.

Source: BLM 2007a.

3.2.4.3 Paleontological Resources in the Project Area

The surface units in the project area consist of the Permian Ochoan Series (Rustler Formations and Dewey Lake Red Beds), Triassic Santa Rosa Formation, Gatuña Formation, Mescalero Caliche, and recent alluvial and windblown sand deposits, as described in Section 3.2.1. **Table 3.2-4** provides a summary of the paleontological resources and potential of the geologic units in the project area.

Table 3.2-4 Summary of Potential Paleontological Resources in the Project Area

Geologic Unit	Description of Paleontological Resources	Fossil Potential Based on PFYC
Alluvium and wind-blown deposits	Because such deposits are younger than 10,000 years old, there would be a low potential for fossils.	Class 2—Low potential for the presence of important fossils.
Mescalero Caliche	Caliche is formed by the precipitation of calcium carbonate from water that has percolated into soil layers (Bachman 1985). The presence of fossils is not expected since the calcium carbonate is not produced by organic processes.	Class 1—The nature of the formation of caliche would likely preclude the presence of fossils.
Cave Deposits	Cave deposits (Pleistocene to Recent in age) consisting of breccias, breakdown blocks, and water laid sediments can host a variety of vertebrate fossils (Harris 1993; Hill 1987).	Class 4—There is a high potential for scientifically important fossils to be found in caves. However, the low potential for the presence of caves in the project area limits the possibility of cave deposit-related fossils.
Gatuña Formation	Although vertebrate fossils may be present in the Gatuña Formation (Harris 1993; Kelley 1980; Vine 1963) did not describe fossils in the Nash Draw area and none were noted in the general vicinity of the proposed project (Dehler and Pederson 1998).	Class 2—There is a potential for the occurrence of fossils, but probably are rare.
Ogallala Formation	The Ogallala has the potential to contain important vertebrate fossils, but identified localities occur mainly in Texas (Schulz 1972). However, fossil tracks have been found at the base of the Ogallala northeast of Roswell (Williamson and Lucas 1996).	Class 4—The abundance of documented vertebrate fossil occurrences indicates a high potential.

Table 3.2-4 Summary of Potential Paleontological Resources in the Project Area

Geologic Unit	Description of Paleontological Resources	Fossil Potential Based on PFYC
Santa Rosa Formation	Localities in Texas at the Llano Estacado escarpment contain reptile, amphibian, and other small vertebrate fossils (Lehman and Chatterjee 2005). In the Nash Draw area the formation contains “carbonaceous plant fragments and fossil reptile bones and teeth” (Vine 1963).	Class 3—Vertebrate fossils have been found in the formation, but the presence of vertebrates not predictable in the project area.
Dewey Lake Red Beds	No fossils identified by Vine (1963).	Class 2—There is a potential for the occurrence of fossils, but probably are rare.
Rustler Formation	Work by Walter (1953) described mollusks in the Culebra Member of the Rustler Formation in outcrops in Culbertson County, Texas 50 to 60 miles south of the project area. However, Walter (1953) described fossil localities in the Rustler Formation as “scarce, random occurrences.”	Class 3—Applicable only to the Culebra Member since fossils are present and potentially important for scientific purposes, however widespread and rare. The remaining members of the formation would be considered Class 1 or 2. Mining of the Rustler polyhalite zone is unlikely to discover fossils of any kind given the nature of the deposit.

3.3 Water

3.3.1 Surface Water

Surface water resources have been characterized in this report for the project area. The project area includes the 50-year mine area; the shaft and associated facilities, plant facilities, the Jal loadout area, well field locations, and the water pipeline ROW. Subwatersheds that contain any portion of the project area are discussed in this section, along with a discussion of the Pecos River water rights related interstate compact between New Mexico and Texas, known as the Pecos River Compact of 1948.

3.3.1.1 Precipitation and Evaporation

The climatic conditions in the project area were characterized through the records of weather stations near the project area maintained by the Western Regional Climate Center (WRCC 2012a). Further discussion on local climate conditions is detailed in Section 3.6. The climate of the area is semi-arid with average annual precipitation ranging from 12 to 16 inches. The average monthly high temperatures range from 94 to 98 degrees Fahrenheit (°F) in July with average monthly minimums of 28 to 29°F in December and January. Average annual potential evaporation rates far exceed average annual precipitation. Evaporation rates may approach 73 inches per year in this area (WRCC 2012a), resulting in a large moisture deficit for many months of the year. The large moisture deficit limits stream flow because most precipitation is easily absorbed by the dry soils. However, during times of heavy precipitation the capacity of soils for infiltration is surpassed by the rate of rainfall, causing surface water runoff. Streamflows in the area are limited to periods of heavy precipitation.

3.3.1.2 Subwatersheds and Stream Channels

The Watershed Boundary Dataset (WBD) (Natural Resources Conservation Service [NRCS] 2005) divides the entire nation into drainages or subwatersheds. The nation (including Alaska, Hawaii, and the U.S. Virgin Islands) is divided into 21 regions. Each region is divided into approximately 15 subregions, which are further divided into a similar number of basins, subbasins, watersheds, and subwatersheds. Each level is represented by a 2-digit code, known as the Hydrologic Unit Code (HUC). Effectively, each subwatershed has a unique 12-digit HUC identification number. The project area falls within 13 subwatersheds (NRCS 2005), shown in **Figure 3.3-1**. **Table 3.3-1** lists the 13 subwatersheds that contain a portion of the project area, and within which general project components are located.

Stream channels have been identified using the National Hydrography Dataset (NHD) (USGS 2009). This dataset is associated with the WBD 12-digit HUC numbers. Stream reaches are coded using the corresponding WBD numbers and then additional digits are added to the number to differentiate each stream reach. The NHD also defines the flow regime of identified streams, within the confines of the dataset, and provides a flow network (when one exists) for water resource analyses. **Figure 3.3-1** includes the NHD features within and near the project area. Throughout the following surface water discussions, it is assumed that the streams identified as intermittently flowing channels (streamflow is seasonal and derived in part from groundwater) in the NHD actually exhibit ephemeral flow conditions (streamflow is seasonal with no groundwater contribution) on the ground.

The subwatersheds relate to other drainages in and near the project area in two ways. Some watersheds are hydrologically connected to another subwatershed through the flow of surface water in stream channels or as overland runoff. When a drainage basin is a closed basin, it does not have an outlet into an adjacent drainage. Therefore, precipitation falling inside a closed basin will remain within the boundaries of the drainage or infiltrate into the groundwater.

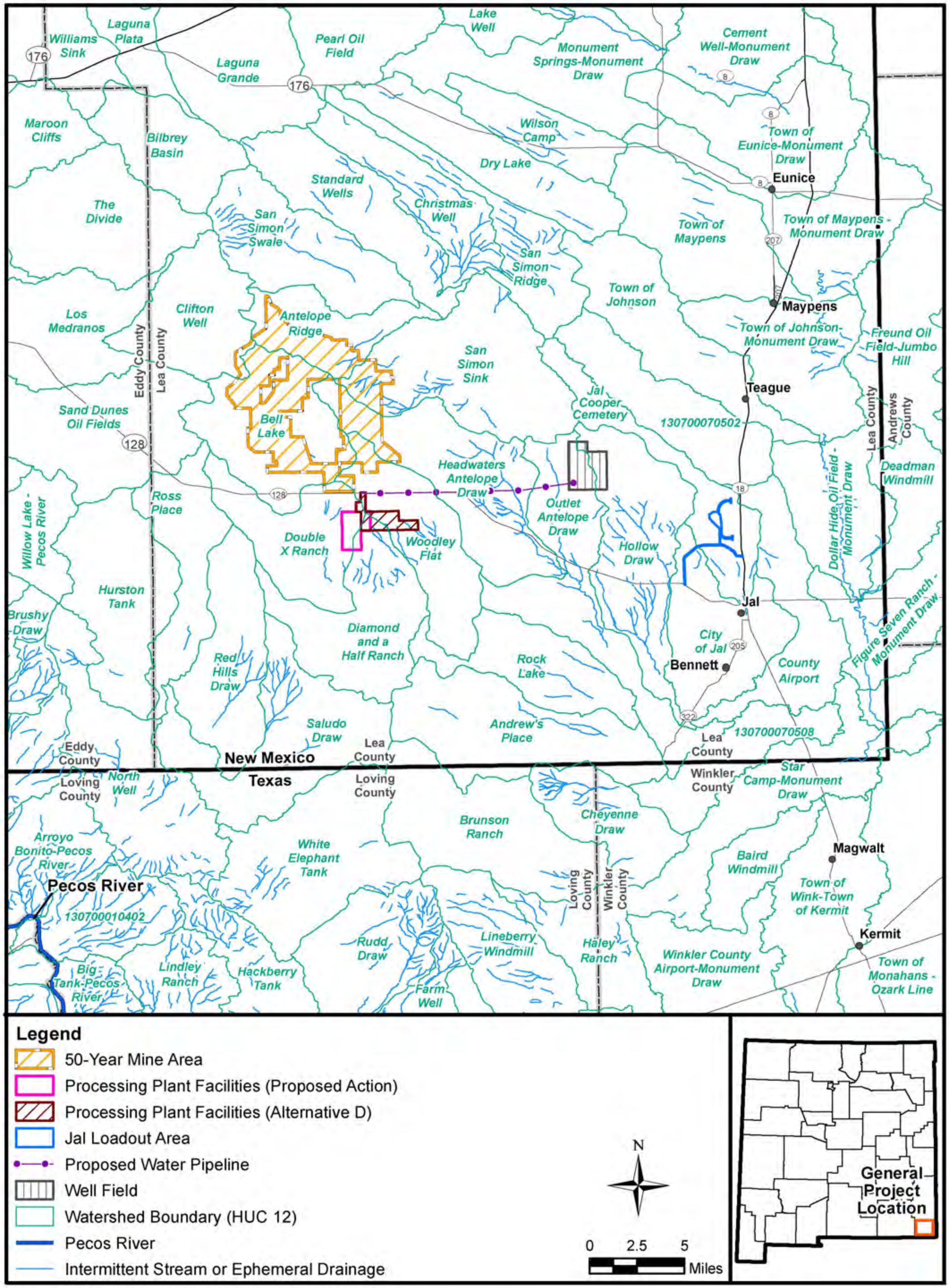


Figure 3.3-1 Subwatersheds in the Project Area

Table 3.3-1 Subwatersheds that Contain Portions of the Project Area

Region	Basin	Sub-basin	Watershed	Subwatershed	HUC-12 ID	Project Components
Rio Grande	Upper Pecos	Black	Salt Lake[1]	Clifton Well	130600111703	Mine Area
	Lower Pecos	Landbeth-Monument Draws	Simon Sink[1]	Antelope Ridge	130700070305	Mine Area
				San Simon Sink[1]	130700070306	Mine Area
			Rock Lake	Bell Lake[1]	130700070401	Mine Area
				Woodley Flat	130700070402	Mine Area, Plant
				Double X Ranch[1]	130700070403	Mine Area, Plant
				Diamond and a Half Ranch[1]	130700070404	Plant
			Antelope Draw	Jal Cooper Cemetery	130700070501	Jal Loadout
				City of Jal	130700070504	Jal Loadout
				Hollow Draw	130700070505	Well field
				Headwaters Antelope Draw	130700070506	Mine Area
				Outlet Antelope Draw	130700070507	Well field

[1] Drainage is hydrologically closed; there is no surface outlet to downstream waters.

Source: NRCS 2005.

Connected Subwatersheds

Woodley Flat. Woodley Flat can be characterized as sloping from north to south, beginning at approximately 3,660 feet amsl in the north to approximately 3,300 feet amsl in the south where it might empty towards the Pecos River. Although this subwatershed is characterized as being a connected drainage, there is minimal topography with multiple low-lying areas, which can be described as playas that capture water where it evaporates or infiltrates. There are several ephemeral stream channels identified that are present in the middle portion of the drainage through an area of increased slope. This subwatershed contains a portion of the plant facilities, and the southeastern portion of the mine area would extend below the drainage.

Jal Cooper Cemetery. Jal Cooper Cemetery also slopes from north to south; elevations range from approximately 3,550 feet amsl in the northwest to approximately 3,050 feet amsl in the south, where it empties into City of Jal Subwatershed towards the Pecos River. Jal Cooper Cemetery Subwatershed contains several ephemeral stream channels at the lower elevations within the southern portion of the subwatershed. The Jal Loadout Facility is located in the southern portion of this drainage.

City of Jal. This subwatershed slopes from north to south, beginning at approximately 3,300 feet amsl in the northwest and dropping to approximately 2,910 feet amsl in the southwest where it drains to Hollow Draw Subwatershed towards the Pecos River. City of Jal Subwatershed has minimal topography, and contains many playas that could collect precipitation and limit surface flows. There are two ephemeral stream channels mapped in the drainage; one crossing the boundary from the Jal Cooper Cemetery Subwatershed and extending for approximately 0.5 mile into this subwatershed, and one in the upper, northwestern portion of the drainage. The only proposed project component in this drainage is a new access road across the upper, northwestern portion.

Hollow Draw. Hollow Draw Subwatershed also slopes from north to south. The highest elevation in the north is approximately 3,500 feet amsl, and the lowest in the south is approximately 2,910 feet amsl where it drains to Outlet Antelope Draw Subwatershed towards the Pecos River. There are multiple ephemeral channels through the mid-elevations of this drainage; however, none exit downstream. There also are six perennial ponds and multiple playas identified. Two portions of the project well fields lie within this subwatershed.

Headwaters Antelope Draw. The highest elevations in this drainage are in the northwest and near 3,740 feet amsl, and the outlet in the southeast is at approximately 3,170 feet amsl, where it drains to Outlet Antelope Draw Subwatershed towards the Pecos River. The lower-elevation, eastern portion of this subwatershed has multiple mapped ephemeral stream channels that connect to the downstream subwatershed, along with two perennial ponds and multiple playas. A portion of the proposed mine area is below the higher elevations of this subwatershed.

Outlet Antelope Draw. Outlet Antelope Draw Subwatershed slopes from north to south. The northwest portion of the drainage reaches approximately 3,500 feet amsl, and the southern portion drops to approximately 2,890 feet amsl. The northern portion of this drainage contains ephemeral channels; however, they do not extend into the lower elevations or connect with any downstream channels. There are two identified perennial ponds, and multiple playas. Part of the proposed well field lies within the northern portion of this drainage.

Closed Subwatersheds

Clifton Well. This subwatershed generally slopes from east to west, and ranges from approximately 3,400 to 3,800 feet amsl. There is one short ephemeral channel identified in the northern portion of the drainage. A portion of the proposed mine area is below the southeastern extent of this subwatershed.

Antelope Ridge. Antelope Ridge Subwatershed slopes from west to east, and ranges from approximately 3,750 to 3,390 feet amsl. There are a few ephemeral channels identified in the southern portion of the drainage. A portion of the proposed mine area is below the southwestern extent of this subwatershed.

San Simon Sink. This subwatershed drains from its edges towards the middle, where the San Simon Sink is located. The edges extend to approximately 3,720 feet amsl, and the sink is at approximately 3,280 feet amsl. There are multiple ephemeral channels mapped, generally concentrated along the southwestern side of the drainage. A portion of the proposed mine area is below the southwestern extent of this subwatershed.

Bell Lake. The slope of this subwatershed is from the north at approximately 3,750 feet amsl and towards the south at approximately 3,530 feet amsl. There are several ephemeral ponds identified near the south end of this drainage and other low-lying areas that capture surface runoff. A large portion of the mine area falls beneath this subwatershed and a small portion of the mine shaft crosses the southern border of the drainage.

Double X Ranch. The Double X Ranch Subwatershed generally slopes from west to east, with a high elevation of approximately 3,650 feet amsl, and a low of 3,350 feet amsl. There are multiple ephemeral stream channels mapped in the upper and middle elevations along the eastern side of the drainage. The majority of the mine shaft and stacking facilities are within the eastern part of this drainage. Portions of the mine plant also fall within this area, and a small amount of the mine area lies beneath the northeastern part of Double X Ranch Subwatershed.

Diamond and a Half Ranch. This subwatershed generally slopes from north to south, beginning at approximately 3,570 feet amsl, and descending to 3,320 feet amsl. Similar to the neighboring Double X Ranch Subwatershed, this drainage also contains multiple ephemeral channels in the upper and middle elevations, along with one identified perennial pond. The lower elevations to the south have very little relief and many low-lying areas. A portion of the tailings stockpile is located within the upper elevations of this subwatershed.

Playas and Salt Ponds

Within the Proposed Action project area, there are a total of 13 waterbodies identified by the NHD (USGS 2009). Of these, 10 are located in the portion of the project area underlain by future mine workings within the proposed 50-year mine area. The three waterbodies that are located in subwatersheds where surface disturbance would occur under the proposed mine plan are within the Jal Cooper Cemetery, City of Jal, and the Double X Ranch subwatersheds. No other subwatersheds contain any NHD waterbody features in the project area. Of these three waterbodies, the one in City of Jal Subwatershed is a perennial feature with little surface area. The remaining waterbodies were identified as intermittent lakes or playas characteristic of the area through aerial photographic interpretation. Playas are created when precipitation runoff leaches salts from the soil during runoff, collects in the low-lying areas, and then evaporates. The salts left behind decrease infiltration rates into the soil and allow water to pool. Within the processing plant site for Alternative D, the evaporation ponds and tailings stockpile would occupy an existing playa approximately 40 acres in size that is primarily located in the northeast corner of Section 25, T24S, R33E. Two additional smaller playas, each less than 5 acres, would also be occupied by plant facilities in Section 30, T24S, R34E. Several ephemeral drainage networks drain southward.

Investigations in the southern Great Plains indicate that playa inundation in the region primarily depends on precipitation and runoff (Bartuszevige et al. 2012; Playa Lakes Joint Venture 2013). In New Mexico, the average interval for an individual playa to be filled may be over three years (Playa Lakes Joint Venture 2013). Playa inundation most often results from supercell thunderstorms or several continuous days of rain, typically in May and June. Water quality varies within an individual playa and between playas because of the variable nature of precipitation, infiltration and evaporation, temperature, and soils (Hall et al. 1999). Water quality characteristics and related effects have been studied on playas historically used for brine disposal (Bristol 1998; Davis and Hopkins 1993; Meteyer et al. 1997), but no comparable baseline water quality data are known from undisturbed playas in the project vicinity. Typically, playa lakes sampled in the southern Great Plains region have alkaline pH values and are saline to hypersaline.

3.3.1.3 Floodplains

The Federal Emergency Management Agency (FEMA) maintains maps of flood-prone areas throughout the nation that they use for administering the National Flood Insurance Program. In Lea County, New Mexico, these maps are part of the Flood Insurance Rate Map (FIRM) series. FIRM maps are coded according to flood potential and level of analysis performed regarding that potential. The project area has been included as an area identified by Zone D, or an area that has an undetermined but possible flood hazard. In other words, although index maps are provided for the area, it has not been mapped for flood hazard (FEMA 2012, 2008).

3.3.1.4 Surface Water Quality

The New Mexico Water Quality Control Commission (NMWQCC) is responsible for setting water quality standards and designating beneficial uses for waterways. All surface waters of the state are assigned the beneficial uses of aquatic life, livestock watering, wildlife habitat, and secondary contact (NMAC 2000). Surface water quality is regulated in New Mexico by the Environment Department, Surface Water Quality Bureau. Water quality parameters are reported to the USEPA under the requirements of the CWA, specifically Sections 303(d) and 305(b). The 303(d)/305(b) Integrated Report lists any streams that are considered impaired because they do not meet water quality standards or are not suitable for assigned beneficial uses. New Mexico’s current 303(d)/305(b) Integrated Report was published in 2010 (NMWQCC 2010), and does not identify any streams or waterbodies in the project area as having impairments (NMWQCC 2010).

3.3.1.5 Surface Water Use

Water use in New Mexico is administered by the New Mexico Office of the State Engineer (NMOSE) under the prior appropriation doctrine, or "first in time, first in right." Any use of water must be permitted through the NMOSE, and is given a priority date based on when the application was received. All rights with "senior" (earlier) priority dates must be satisfied prior to "junior" (later) rights. The lack of surface water rights within the project area reflects the absence of surface water flows.

NMOSE Recorded Beneficial Uses

A search of NMOSE records indicates there are no surface water rights found in the project area (NMOSE 2012).

Pecos River Compact

The Pecos River is west of the project area. The State of New Mexico and the State of Texas are parties to the Pecos River Compact ratified by Congress in 1949. After the ratification, the agreement was the subject of litigation that eventually came before the U.S. Supreme Court. In 1988, the Supreme Court entered an Amended Decree and appointed a River Master to administer the decree.

The Compact and Amended Decree apportion the flows of the Pecos River between the two states. The Compact requires that Pecos River flows coming from Fort Sumner Dam, about 250 river miles north of Carlsbad in De Baca County, be divided, and that flood inflows between the dam and the state line must be delivered to Texas. New Mexico is responsible for fulfilling the decreed amount of water that must cross the state line into Texas. If New Mexico does not comply, the River Master must create a plan to remedy any shortfall (P.S. Johnson et al. 2003).

Although the project area falls within the Pecos River drainage in New Mexico, any surface flow reaching the Pecos River that originated from the project area would do so in Texas east of the Town of Pecos. Some flows in the Pecos River come from groundwater that is recharged in the region.

3.3.2 Groundwater

The Delaware Basin contains regional aquifers in many of the Permian stratigraphic units, but aquifers in the overlying Triassic Dewey Lake Red Beds and the Santa Rosa Formation are local in nature and not continuous throughout the basin. The Salado Formation locally contains brine, as does the Castile Formation, but neither unit acts as an aquifer. The important aquifers for the Ochoa project area are those in the Rustler Formation, the Capitan Limestone, the Artesia Group, the Bell Canyon Member of the Delaware Basin Group, the San Andres Formation, the Santa Rosa Formation, and the Ogallala Formation.

3.3.2.1 Major Groundwater Aquifers in the Delaware Basin

The five main aquifers in the northern part of the Delaware Basin are listed from lowest to highest stratigraphic layer below.

1. Bell Canyon Aquifer of the Delaware Mountain Group
2. Capitan Aquifer, Artesia Group, San Andres Formation
3. Aquifers of the Rustler Formation
4. Santa Rosa Formation
5. Ogallala Aquifer

The following sections will describe these aquifers, with primary emphasis on the Capitan Aquifer, which is proposed as the source of water for the Ochoa Mine Project, described last.

Bell Canyon Aquifer

The Bell Canyon, the deepest aquifer, is the upper member of the Delaware Mountain Group and consists of sinuous channels of sandstone interbedded with black shale and black limestone (Mercer 1983). See **Figure 3.2-5** and Section 3.2.1.3 for more description of the geology. The Lamar Shale Member of the Bell Canyon and the overlying Castile Formation both act as aquitards that confine the aquifer in the Bell Canyon. Groundwater flows northeast with a potentiometric surface of 3,600 feet amsl near Malaga Bend, a potentiometric surface of 3,400 feet amsl beneath WIPP, and a gradient of approximately 25 to 40 feet per mile. The water quality is saline, consisting of sodium chloride brine with total dissolved solids (TDS) ranging from 180,000 to 270,000 milligrams per liter (mg/L). The aquifer underlies the project area and interacts hydraulically with the Capitan Aquifer (Hiss 1975).

Rustler Formation Aquifers

Two of the five members of the Rustler Formation are identified as aquifers in the vicinity of the project, the Culebra Dolomite and the Magenta Dolomite. Unlike the Rustler Formation to the west in Eddy County, in the Ochoa project area it is not collapsed, with only minor dissolution. The Culebra outcrops at the Pecos River.

Culebra Dolomite Aquifer. At WIPP (northwest of the proposed mine area and east of the Pecos River), the Culebra Dolomite acts as a confined aquifer and is documented as a vuggy, crystalline dolomite averaging approximately 25 to 30 feet thick, located stratigraphically between the Los Medaños Member and the Tamarisk anhydrite Member of the Rustler Formation. At Nash Draw (west of the project area), the Culebra has collapsed into blocks due to dissolution in rock members above and below (Mercer 1983).

Groundwater gradient changes are related to permeability variations and groundwater flow is controlled by fracture orientation. Groundwater flow in the Culebra is generally to the southwest in the WIPP area and a similar flow pattern is found near the Ochoa Project (Richey and Wells 1984).

Water quality in the Culebra is highly variable. TDS can be as low as 3,200 mg/L at WIPP, or as high as 420,000 mg/L in Nash Draw. In the project area, the water quality would be expected to be similar to the lower values found at WIPP.

Magenta Dolomite Aquifer. The Magenta Dolomite is a clastic carbonate unit with laminae of anhydrite and dolomite, averaging around 20 to 30 feet thick. Water is found in the siltstone and silty dolomite beds along bedding planes and in fractures. The Magenta Aquifer is confined at WIPP and generally unconfined in Nash Draw, where it is extensively fractured.

Groundwater flow in the Magenta Aquifer depends on the degree of fracturing and collapse. At WIPP, groundwater flow is in the silt beds, silty dolomite, and fractures. The groundwater gradient at WIPP is around 16 to 20 feet per mile, increasing to 32 feet per mile to the west near Nash Draw. Water quality in the Magenta is highly variable, with TDS ranging from a low of around 5,400 mg/L to values as high as 270,000 mg/L.

Santa Rosa Aquifer

The Santa Rosa Formation is an upper Triassic stratigraphic unit that consists of fine to coarse sandstone with siltstone and mudstone. Its thickness ranges from less than a few feet to 176 feet at WIPP. In southern Lea County, the Santa Rosa can be up to 520 feet thick (Richey and Wells 1985). It is found in the low bluffs at the north end of Nash Draw and along the east side of Nash Draw. In the southwestern part of Lea County, it is exposed along bluffs. The Santa Rosa underlies the Ochoa project area and contains the uppermost unconfined aquifer . Groundwater flow in the Santa Rosa is generally to the south toward Texas in the vicinity of the project area. Water quality in the Santa Rosa is variable with chloride in the range of 21 to 252 mg/L, fluoride greater than 1.5 mg/L, sodium in the range of 131 to

563 mg/L, and sulfate ranging up to 934 mg/L (Richey and Wells 1985). In general, water in the Santa Rosa has elevated sodium and sulfate and is only suitable for stock water use.

Ogallala Aquifer

The Ogallala Formation contains the major aquifer in the High Plains aquifer of southeastern New Mexico and west Texas. In southern Lea County, the edge of the Ogallala Aquifer lies just east of Jal and thickens to the east into Texas (Nicholson and Clebsch 1961). The contact between the Ogallala Aquifer and the Santa Rosa Aquifer is about 10 to 15 miles east of the proposed Ochoa mine. The Ogallala Aquifer in southern Lea County near Jal is up to 300 feet thick, with water levels ranging from 3,100 to 3,200 feet amsl and groundwater flow to the southeast into Texas (Nicholson and Clebsch 1961).

In southern Lea County, the hydraulic conductivity is estimated to be between 41 and 48 feet per day (Musharrafieh and Chudnoff 1999). Water quality in the Ogallala is variable, with TDS ranging up to 2,300 mg/L (Richey and Wells 1984).

Capitan Aquifer, Artesia Group, and San Andres Formation

The three main components of the Capitan Reef Complex (Delaware Mountain Group, Capitan and Goat Seep limestones) and the Artesia Group all contain water. The Capitan and Goat Seep limestones, the primary components of the Capitan Aquifer, provide the most water due to much higher permeability compared to the Delaware Mountain Group and the Artesia Group. The San Andres Formation interfingers with both the Cherry Canyon Member of the Delaware Mountain Group and the Capitan Limestone, contains saline water, and is in hydraulic communication with the Capitan Aquifer (Hiss 1975).

The Capitan Aquifer is the primary aquifer in the Capitan Reef Complex described in Section 3.2.1. The Capitan Aquifer is a major source of groundwater in the Guadalupe Mountains of New Mexico and provides water for domestic use to Carlsbad, New Mexico. In Texas, the Capitan Aquifer has been recognized as a minor aquifer (Ashworth and Hopkins 1995), supplying water in Brewster, Pecos, Winkler, Ward, Culberson, and Jeff Davis counties in west Texas. Throughout the Delaware Basin, the Capitan Aquifer provides saline water for use in oil and gas drilling operations.

The Capitan Aquifer forms a nearly closed loop around the margin of the Delaware Basin, as shown in **Figure 3.3-2**. The thickness of the Capitan Aquifer varies from a minimum of a few hundred feet to a maximum of about 2,300 feet and averages about 1,400 to 1,600 feet thick (Hiss 1975).The hydraulic properties, the nature of the aquifer, and its interactions adjacent aquifers varies over the approximately 450-mile extent in New Mexico and west Texas. The aquifer from the Guadalupe Mountains around the northern part of the Delaware Basin in Eddy County and south along the Central Basin Platform through Lea County has been studied the most. The exposures of the Capitan Aquifer in the Apache Mountains and the Glass Mountains received less study because the Capitan Aquifer in west Texas is considered a minor aquifer, whereas in New Mexico it is a major source of water.

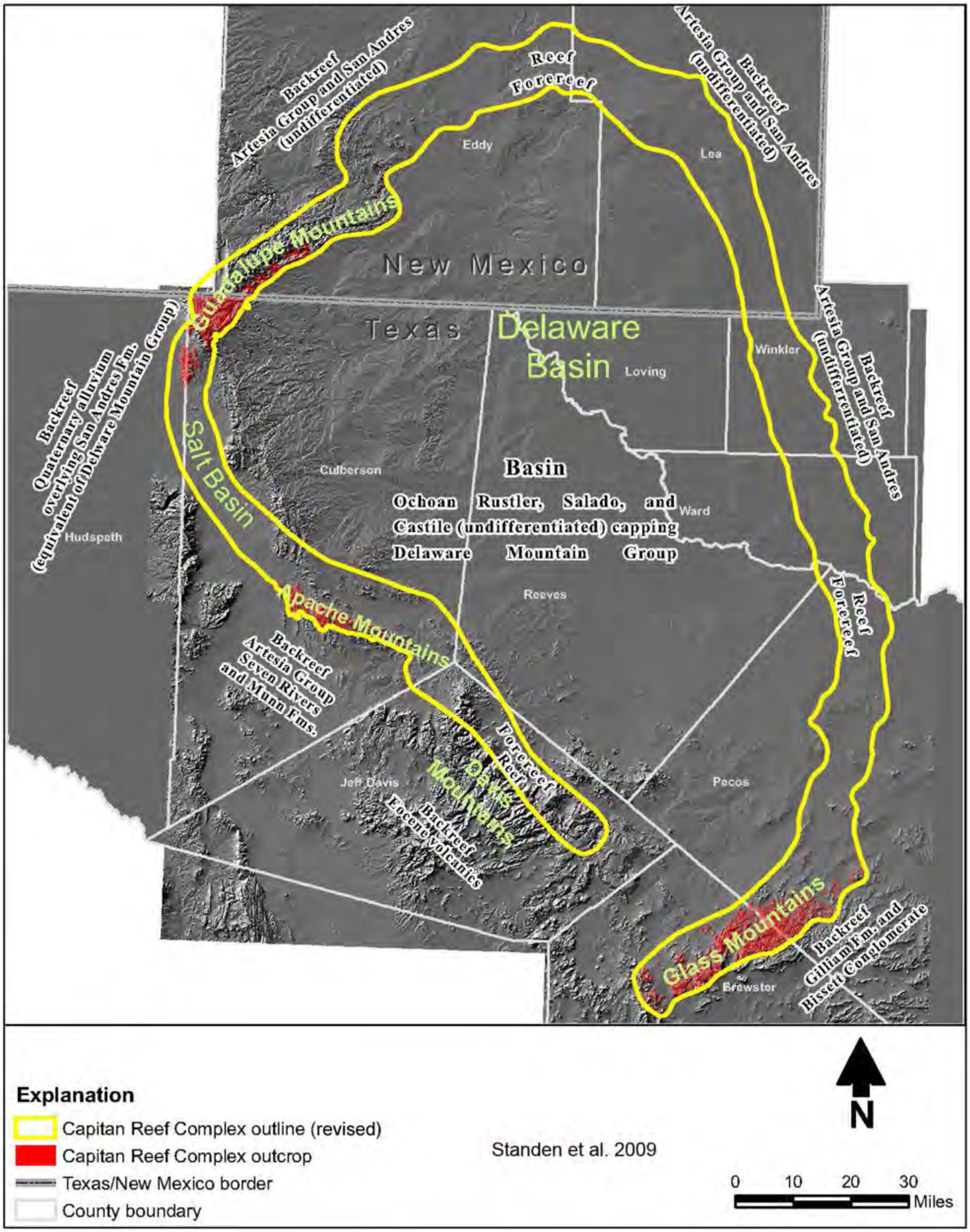


Figure 3.3-2 Capitan Reef Complex in the Delaware Basin

Recharge to the aquifer west of the Pecos River in Eddy County, New Mexico, comes from precipitation in the Guadalupe Mountains, infiltration of seepage along streams, arroyos, and irrigation canals, and from subsurface inflow from the adjacent Artesia Group. The Pecos River loses around 2 cubic feet/second of water, which enters the Capitan Aquifer and the Alluvial Aquifer along the Pecos Valley (Bjorkland and Motts 1959). A more recent study by Barroll et al. (2004) estimated that the Pecos River near Carlsbad gains about 28 to 56 cubic feet/second from groundwater seepage in the river reach from Lake Avalon to Malaga. Overall, the Capitan Aquifer in Eddy County appears to be hydraulically connected to the Pecos River and the Capitan Aquifer west of Carlsbad in the Guadalupe Mountains. An area of constriction along the Eddy/Lea county line associated with the Laguna submarine canyon and Tertiary dikes appears to separate the Capitan Aquifer in Eddy County from the Capitan Aquifer in Lea County.

The eastern Capitan Aquifer lies along the western side of the Central Basin Platform in Lea County, New Mexico, and into Pecos, Ward, and Winkler counties, Texas (Hiss 1975). The depth to the top of the Capitan Limestone is about 3,000 feet amsl. Hydraulic conductivity estimates range from 3 feet/day up to 25 feet/day (near Jal, New Mexico). The Capitan Aquifer contains elevated salinity, with TDS ranging from 2,300 mg/L (Hiss 1975) to almost 70,000 mg/L in one of ICP's test wells (INTERA 2012) with high concentrations of calcium, chloride, magnesium, potassium, sodium, and sulfate.

The San Andres Limestone lies stratigraphically below the Capitan and Goat Seep limestones in the Central Basin Platform area of Lea County in the Delaware Basin (Hiss 1975). The unit is part of the upper Delaware Basin Group and intefingers with the lower part of the Capitan Limestone and also sand units of the Cherry Canyon Formation (Delaware Mountain Group), as shown by Hiss (1975). The San Andres has a lower cherty limestone member and an upper dolomite member. The San Andres Limestone grades northward into evaporites in the Northwest Shelf area of Eddy County and eastward into evaporite sedimentary units in the backreef area of the Central Basin Platform in Lea County.

The San Andres averages around 1,500 feet in thickness (Hiss 1975) and is in hydraulic communication with the Capitan Aquifer in the northern and southern parts of the Central Basin Platform (Hiss 1975). The hydraulic conductivity of the unit in the northern part of the Central Basin Platform is in the range of 0.1 to 0.3 feet/day with a storage coefficient of 1.5E-5 (Hiss 1975). In southeastern New Mexico and Texas, the permeability of the unit is much lower, ranging from 0.0122 feet/day to 2.4E-4 feet/day. In the Central Basin Platform area, the porosity is around 10 percent and the chloride content reported by Hiss (1975) was generally above 100,000 mg/L. More recently, estimates of the TDS in the San Simon Channel, which is composed mainly of the San Andres Formation, have been in the range of 10,000 mg/L (Hill 1996; Wallace 1993). The unit is generally more saline than the Capitan Aquifer. The higher chloride content of the San Andres Limestone reported in the 1970s by Hiss (1975) may have been the result of connate saline brines in the Capitan Aquifer being forced into the San Andres by fresh water recharge from the Guadalupe Mountains and the Glass Mountains prior to incision of the Capitan Reef Complex by the Pecos River (Hiss 1975).

Flows in the eastern Capitan Aquifer are affected by submarine canyons, paleochannels connecting the Delaware and Midland basins, and historic water usage for oil and gas development, especially in Texas. Groundwater flow in the Capitan Aquifer in Lea County during the 1970s was to the southeast toward the potentiometric low near Kermit, Texas, caused by extensive oil and gas pumping and water use in the Hendricks field (Hiss 1975). This southeasterly flow toward the potentiometric low in Texas during the period of heavy groundwater pumping by the oil and gas industry was opposite the westward flow in Eddy County toward the Pecos River during this same time period. The few wells in Lea County that have been monitored in relatively recent years show a substantial recovery of water levels in the Capitan Aquifer since water use for oil and gas development decreased. This suggests that flow from the Glass Mountains northward into Lea County toward the San Simon channel may have resumed. Alternatively, because oil and gas activity continues near Kermit, Texas, albeit at a much lower rate than during the 1970s, the rebound of the Capitan Aquifer may be due to the influx of water from the Artesia Group or the San Andres Formation.

Overall, recharge to the entire Capitan Aquifer is about 27,000 to 37,000 acre-feet/year and water usage from the aquifer ranges from 14,000 to 18,000 acre-feet/year for municipal, industrial, and irrigation uses and about 10,000 to 15,000 acre-feet/year for use by the oil and gas industry. For the Capitan Aquifer over its entire area in southeastern New Mexico and west Texas, there is currently an approximate balance between recharge and water use. On a local scale, however, production can exceed recharge, as is currently the case in Pecos County, Texas.

The hydrology of the Capitan Aquifer is complex and varied. The Pecos River and its associated alluvial aquifer are in hydraulic communication and both provide an important source of water for irrigation in the region. The Capitan Aquifer receives recharge in three main areas where the Capitan Limestone or its equivalents in west Texas are exposed in the Guadalupe, Apache, and Glass mountains. Domestic use of water from the Capitan Aquifer is mainly for the Carlsbad area in Eddy County. In Lea County, New Mexico, and in west Texas, the Capitan Aquifer currently is used as a water source primarily by the oil and gas industry.

3.4 Soils

A variety of data sources were used to identify the baseline soil characteristics in the project area. The project area includes the 50-year mine plan boundary; the shaft and associated facilities; plant facilities, the Jal loadout area; well field locations, and water pipeline ROWs that occur outside of the 50-year mine plan boundary. Information on Major Land Resource Areas and soil types was obtained from NRCS literature or databases, including the Land Resource Regions and Major Land Resource Areas of the U.S., the Caribbean, and the Pacific Basin, U.S. Department of Agriculture (USDA) Handbook 296 (NRCS 2006) and the Soil Survey Geographic Database (SSURGO). Soil baseline characterization for the project area is based on the SSURGO spatial and tabular database from the Lea County Soil Survey (NRCS 2008). SSURGO is the most detailed level of soil mapping done by the USDA NRCS.

3.4.1 Major Land Resource Areas

The proposed project boundary lies within Major Land Resource Area (MLRA) 42, Southern Desertic Basins, Plains, and Mountains (NRCS 2006). This MLRA is distinguished by intermontane desert basins and broad valleys bordered by gently sloping to strongly sloping bajadas, alluvial fans, and terraces. Elevation in this MLRA ranges from 2,600 to 4,950 feet in areas on the plains and basins.

The soils generally are moderately deep to very deep, well drained, and loamy or clayey. Some of the soils are shallow or very shallow over a petrocalcic horizon or bedrock. The dominant soil orders in this MLRA are aridisols, entisols, and mollisols. Aridisols are well developed soils that have a very low concentration of organic matter and form in an arid or semi-arid climate. In contrast, mollisols are fertile soils with high organic matter and a nutrient-enriched, thick surface. Entisols are considered recent soils that lack soil development because erosion or deposition rates occur faster than the rate of soil development.

3.4.2 Soil Types and Limitations in Project Area

The project area consists of arid rangeland. Portions of the project area have been previously disturbed primarily by oil and gas activities and livestock grazing.

Soil characteristics such as susceptibility to erosion and the potential for revegetation are important to consider when planning for construction activities and stabilization of disturbed areas. These hazards or limitations for use are a function of many physical and chemical characteristics of each soil, in combination with the topography, aspect, climate, and vegetation. **Table 3.4-1** summarizes some important soil characteristics to be considered when evaluating the effects of surface-disturbing activities. Explanations of the meanings of each column follow the table. Note that the acreage exceeds the total for the project area described in Chapter 2.0 because it includes the analysis area evaluated for the water pipeline route.

Table 3.4-1 Project Area Soil Limitations

Soil Limitation	Good		Fair		Poor	
	acres	%	acres	%	acres	%
Water Erodible	28,079	93	0	0	315	1
Wind Erodible	352	1	5,894	19	2,2149	73
Shallow Excavations	0	0	6,945	23	21050	69
Potential for Revegetation	0	0	125	0	27,870	92
Topsoil Suitability for Plant Growth	863	3	6,768	22	20,764	68

Source: NRCS 2008.

Water erosion is the detachment and movement of soil by water. Natural erosion rates depend on inherent soil properties, slope, soil cover, and climate. Approximately 1 percent of the soils within the project area are highly erodible by water. Wind erosion is the physical wearing of the earth's surface by wind. Wind erosion removes and redistributes soil. Small blowout areas may be associated with adjacent areas of deposition at the base of plants or behind obstacles, such as rocks, shrubs, fence rows, and roadbanks (Soil Quality Institute 2001). Wind erodible soils comprise approximately 73 percent of the project area. The occurrence of wind erodible soils in relation to the project area is illustrated in **Figure 3.4-1**.

Soil limitations within the study area related to shallow excavations include cutback caving, flooding, large stones, slope, and a cemented pan within the soil profile. Approximately 26 percent of the soils in the project area have a thin cemented pan (20 to 40 inches thick). Approximately 1 percent of project area soils have a shallow depth to hard bedrock. Approximately 91 percent of soils in the project area have limitations associated with cutback caving. In total, 69 percent of the project area has at least one soil limitation related to shallow excavations. The distribution of soils with limitations associated with shallow excavation is illustrated in **Figure 3.4-2**.

Soils with low revegetation potential have chemical characteristics such as high salts, sodium, or pH that may limit plant growth. Saline soils affect plant uptake of water and sodic soils and often have drainage limitations. In addition, the success of stabilization and restoration efforts in these areas may be limited unless additional treatments and practices are employed to offset the adverse physical and chemical characteristics of the soils. Approximately 92 percent of soils within the project area have low revegetation potentials. The distribution of soils with characteristics that limit revegetation within the project area is displayed in **Figure 3.4-3**.

Topsoil suitability describes the adequacy of topsoil to facilitate vegetation growth and in particular revegetation of disturbed areas where the topsoil is spread over the site before seeding. Good topsoil has chemical and physical characteristics like enough nutrients and organic matter for successful seed germination and growth. Approximately 90 percent of the project area has topsoil that is rated fair to poor for suitability for plant growth.

Prime farmland is land that has the best combination of physical and chemical characteristics for producing crops and is available for these uses. It has the combination of soil properties, growing season, and moisture supply needed to produce sustained high yields of crops in an economic manner if it is treated and managed according to acceptable farming methods. These soils have the capability to be prime farmland, but may have not yet been developed for irrigated agriculture uses. No prime farmland occurs within the project area.

Hydric soils are soils that formed under conditions of saturation, flooding, or ponding long enough during the growing season to develop anaerobic conditions in the upper part. These soils are commonly associated with floodplains, lake plains, basin plains, riparian areas, wetlands, springs, and seeps. No hydric soils are mapped within the project area. However, due to the scale of mapping, small areas of hydric soils may not be captured.

X:\0projects\ICP_Ochoa_Mine_Project_EIS_60238071\FIGs\DOC\DEIS\Figure_3-4_1_WindErodibility.mxd

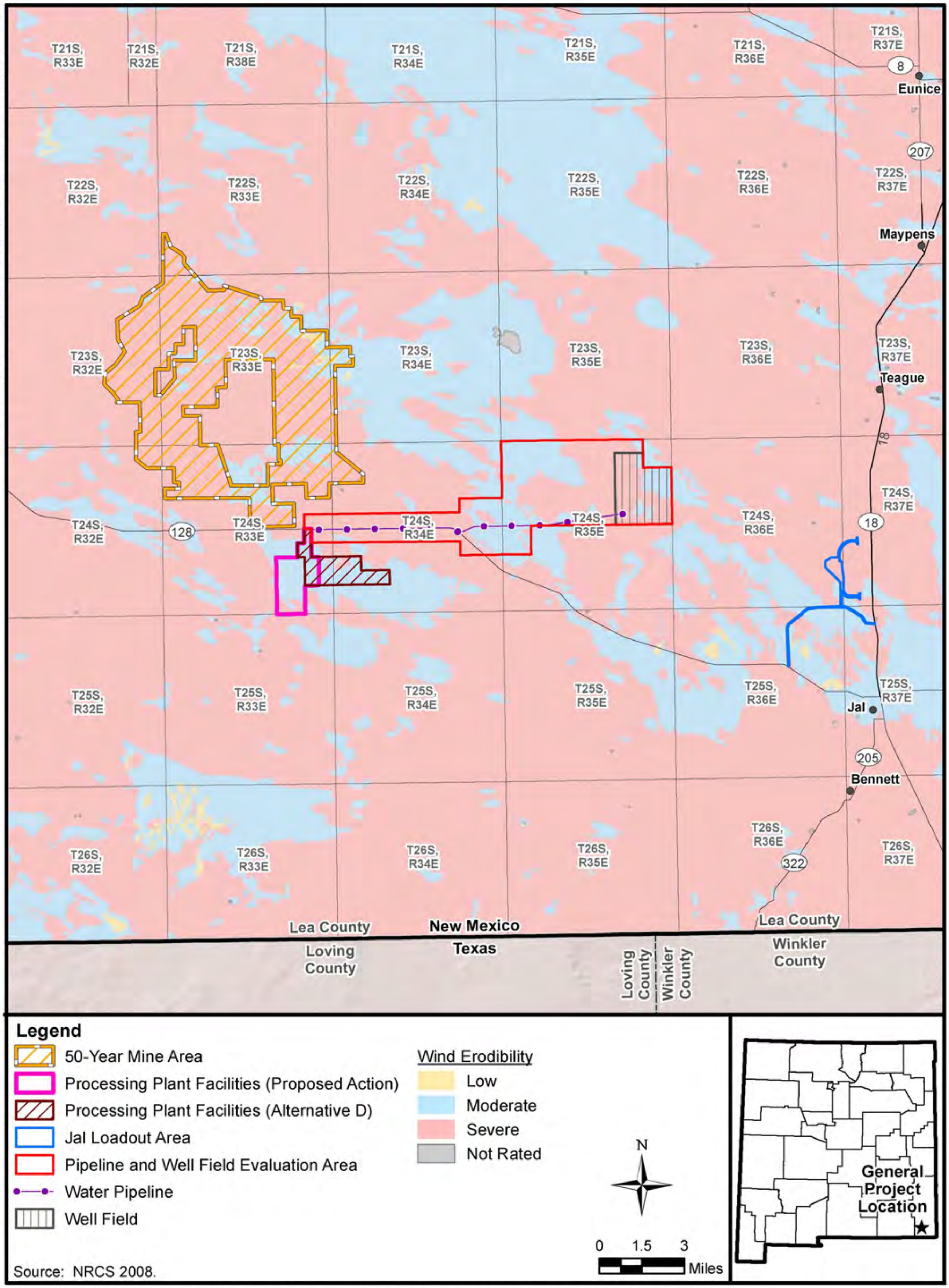


Figure 3.4-1 Distribution of Soils in Project Area Rated for Wind Erodibility

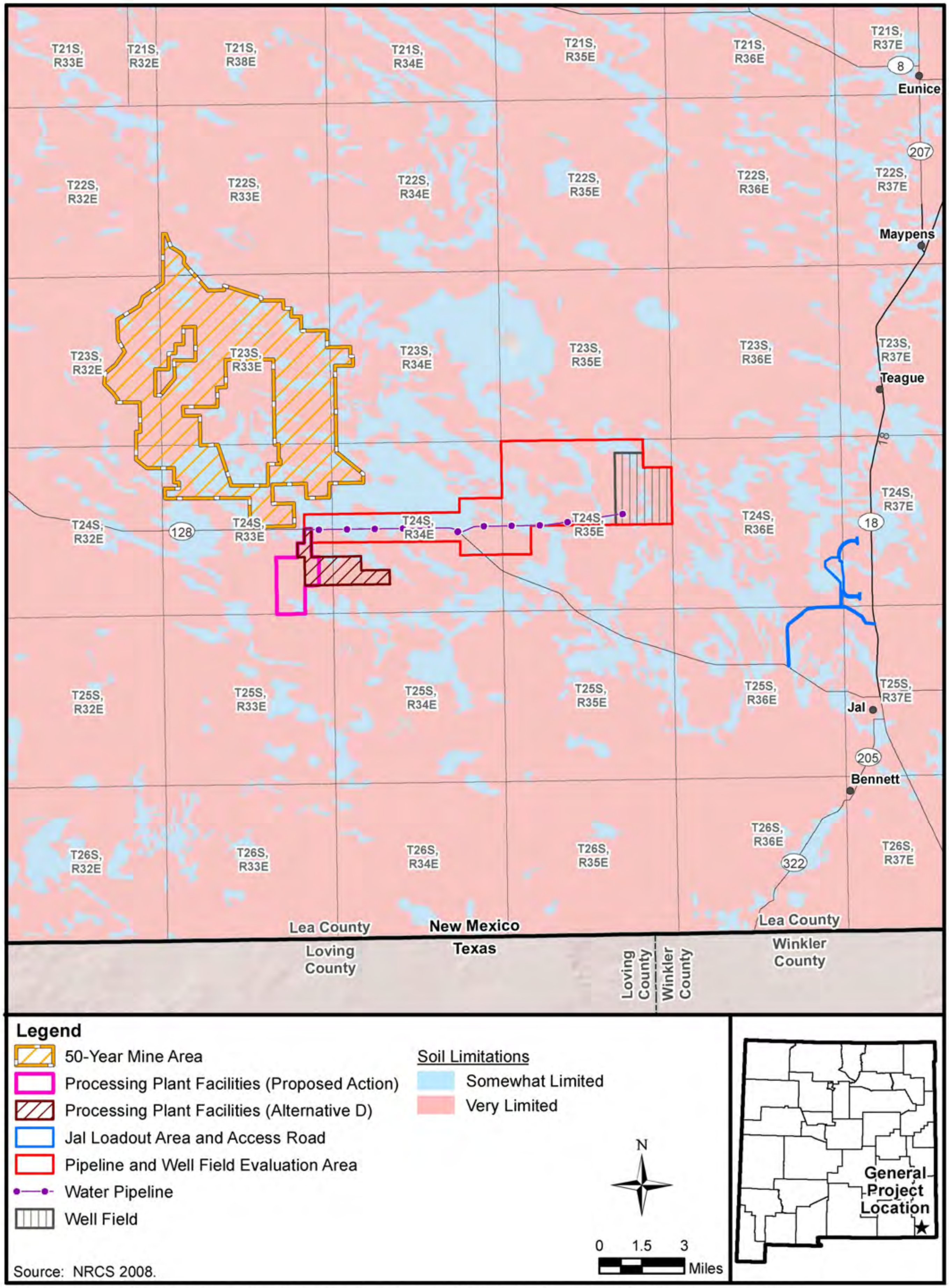


Figure 3.4-2 Distribution of Soils in Project Area with Limitations for Shallow Excavations

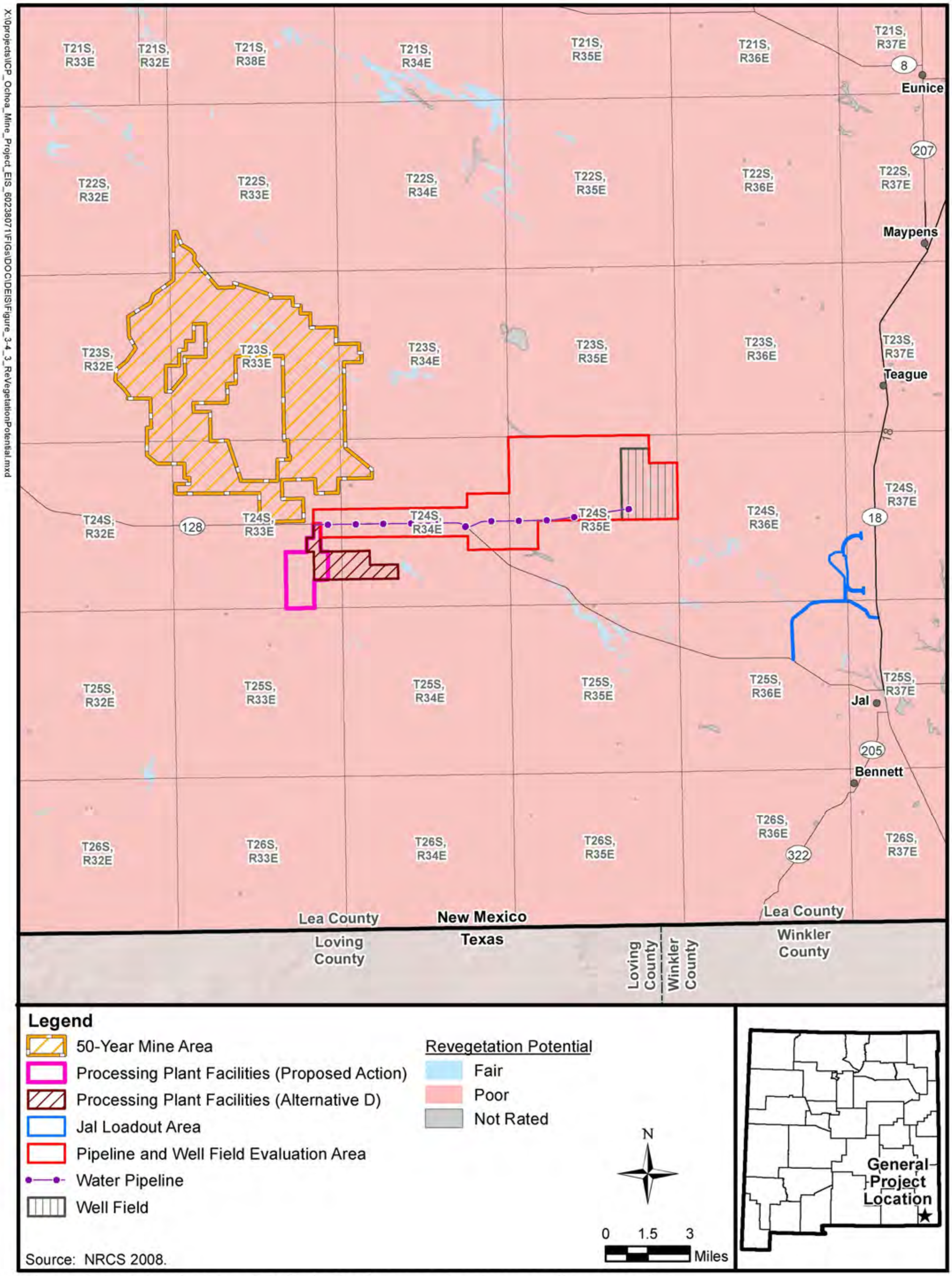


Figure 3.4-3 Distribution of Soils in Project Area by Revegetation Potential

3.5 Air Quality

Air quality in a given location is defined by pollutant concentrations in the atmosphere and generally is expressed in units of parts per million (ppm) or micrograms per cubic meter (μg/m^3). Visibility also is a measure of ambient air quality. Regional air quality also is affected by natural events such as windstorms and wildfires, and larger emissions generating facilities such as power plants, industrial facilities, and vehicle use in urban corridors. Natural events generally are short-lived, lasting from several hours to several days. The effects on air quality during these events may adversely affect human health and the environment, but generally are considered part of the natural physical environment.

Both long-term climatic factors and short-term weather fluctuations are considered part of the air quality resource because they control dispersion and affect ambient air concentrations. The physical effects of air quality depend on the characteristics of the receptors (human or environmental) and the type, amount, and duration of exposure. This section describes the existing air quality resource of the region and the applicable air regulations that would apply to the Proposed Action and alternatives.

The air quality study area for the Ochoa Mine Project EIS is Lea and Eddy counties, New Mexico. Air quality within the study area has the potential to be affected by such activities as emissions from construction and operation of mine-related facilities, oil and gas facilities, the use of access roads, and other construction and management activities.

3.5.1 Air Quality Regulatory Framework

The CAA of 1970 (42 USC 7401 et seq.) as amended in 1977 and 1990 is the basic federal statute governing air pollution. Provisions of the CAA of 1970 that potentially are relevant to the project are listed below.

- National Ambient Air Quality Standards (NAAQS)
- PSD
- New Source Performance Standards (NSPS)
- National Emission Standards for Hazardous Air Pollutants (NESHAP)
- Maximum Achievable Control Technology (MACT) Standards
- Conformity Requirements
- Federal Operating Permits Program
- GHG Tailoring Rule
- GHG Reporting Rule

In addition to the CAA, the FLPMA of 1976 requires the BLM to protect air resources. In addition to federal regulations, the CAA provides states with the authority to regulate air quality within state boundaries. The State of New Mexico has added more stringent ambient air quality standards applicable only to New Mexico.

3.5.1.1 National and State Ambient Air Quality Standards

The CAA amendments of the 1990s require all states to control air pollution emission sources so that NAAQS are met and maintained. The CAA directs the USEPA to delegate primary responsibility for air pollution control to state governments. The State of New Mexico adopted the NAAQS as state air quality standards and has added more stringent ambient air quality standards applicable only to New Mexico. In addition to these requirements, under the CAA, Federal Land Managers (FLM) managing Class I areas have an affirmative responsibility to protect air quality related values (AQRVs).

The NAAQS establishes maximum acceptable concentrations for nitrogen dioxide (NO_2), CO, sulfur dioxide (SO_2), particulate matter (PM), ozone (O_3), and lead (Pb). Given the extremely low levels of lead emissions from Project sources, the lead standards are not addressed in this analysis. These pollutants are known as criteria pollutants. The NAAQS are established by the USEPA and are outlined in 40 CFR 50. New Mexico Ambient Air Quality Standards (NMAAQS) establish additional standards of maximum acceptable concentrations of hydrogen sulfide (H_2S) and TSP.

These standards represent the maximum allowable atmospheric concentrations to protect public health and welfare, and include a reasonable margin of safety to protect the more sensitive individuals in the population. The air quality analysis for the project must show that the project impacts do not contribute to an exceedence of the NAAQS and the NMAAQS in the air quality study area. Together these standards will be referred to as the AAQS. An area that does not meet the AAQS is designated as a nonattainment area on a pollutant-by-pollutant basis. Applicable federal and state criteria are presented in **Table 3.5-1**.

Table 3.5-1 National and New Mexico Ambient Air Quality Standards

Pollutant	Averaging Period	Significance Level[D] (µg/m[3])	NAAQS	NMAAQS
CO	8-hour	500	9 ppm (10 mg/m[3])[1]	8.7 ppm
	1-hour	2,000	35 ppm (40mg/m[3])[1]	13.1 ppm
H_2S	1-hour	1.0	—	0.010 ppm[A,1]
	.5-hour	5.0	—	0.100 ppm[B]
	.5-hour	5.0	—	0.030 ppm[C]
Pb	Rolling 3-month	—	0.15 µg/m[3]	—
NO_2	Annual	1.0	0.053 ppm (100 µg/m[3])	0.050 ppm
	24-hour	5.0	—	0.10 ppm
	1-hour	5.0	0.100 ppm[2]	—
O_3	1-hour	—	0.12 ppm[3]	—
	8-hour	—	0.075 ppm[4]	—
$PM_{2.5}$ *	Annual	0.30	12µg/m[3, 5]	—
	24-hour	1.17	35 µg/m[3, 6]	—
PM_{10} *	Annual	1.0	revoked[7]	—
	24-hour	5.0	150 µg/m[3, 1]	—
Particulates (TSP)	Annual Geometric Mean	1.0	—	60 µg/m[3]
	30-day	—	—	90 µg/m[3]
	7-day	—	—	110 µg/m[3]
	24-hour	5.0	—	150 µg/m[3]

Table 3.5-1 National and New Mexico Ambient Air Quality Standards

Pollutant	Averaging Period	Significance Level[D] (µg/m^3)	NAAQS	NMAAQS
SO_2	Annual	1.0	Revoked[8]	0.02 ppm
	24-hour	5.0	Revoked[8]	0.10 ppm
	3-hour	25.0[10]	0.50 ppm	—
	1-hour	—	0.075 ppm[9]	—

[A] For the state, except for the Pecos-Permian Basin Intrastate Air Quality Control Region (AQCR).

[B] For the Pecos-Permian Basin Intrastate AQCR.

[C] For within 5 miles of the corporate limits of municipalities within the Pecos-Permian Basin AQCR.

[D] Significance levels are listed in 20.2.72.500 NMAC.

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

[2] The 3-year average of the 98th percentile of the daily maximum 1-hour average is not to exceed this standard.

[3] (a) The standard is attained when the expected number of days per calendar year with maximum hourly average concentrations above 0.12 ppm is <= 1, as determined by Appendix H.
(b) The 1-hour NAAQS will no longer apply to an area 1 year after the effective date of the designation of that area for the 8-hour ozone NAAQS. The effective designation date for most areas is June 15, 2004 (40 CFR 50.9; see FR of April 30, 2004 [69 FR 23996]).

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

[5] To attain this standard, the 3-year average of the annual arithmetic mean $PM_{2.5}$ concentrations from single or multiple community-oriented monitors must not exceed 12.0 µg/m^3.

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

[7] The annual PM_{10} NAAQS of 50 µg/m^3 was revoked by USEPA on September 21, 2006; FR Volume 71, Number 200, October 17, 2006.

[8] The 24-hour and annual SO_2 NAAQS was revoked by USEPA on June 22, 2010; 75FR35520.

[9] The 3-year average of the annual 99th percentile of the 1-hour daily maximum must not exceed this standard.

[10] The 3-hour SO_2 standard is a secondary standard.* $PM_{2.5}$ = particulate matter with an aerodynamic diameter of 2.5 microns or less; PM_{10} = particulate matter with an aerodynamic diameter of 10 microns or less; mg/m^3 = milligrams per cubic meter.

Source: New Mexico Environment Department-Air Quality Bureau (NMED-AQB) 2012a; USEPA 2012a.

There are eight AQCRs designated in New Mexico. The proposed project is located in Lea County, which is part of the Pecos-Permian Basin ACQR 155. The minor source baseline date has been triggered in AQCR 155 for NO_2, SO_2, and PM_{10}; therefore, an increment analysis is required for all new sources (NMED-AQB 2012b).The baseline dates for NO_2, SO_2, and PM_{10} were March 16, 1988, July 28, 1978, and February 20, 1979, respectively.

3.5.1.2 Prevention of Significant Deterioration

New emissions sources in an attainment area are required to follow PSD regulations. PSD regulations restrict the degree of ambient air quality deterioration allowed. They apply to proposed new or modified major stationary sources located in an attainment area that have the potential to emit pollutants in excess of predetermined *de minimis* values (40 CFR Part 51) and the Prevention of Significant

Deterioration and Title V GHG Tailoring Rule (Tailoring Rule). As defined in 40 CFR 51 and the Tailoring Rule, a new source will be considered a major stationary source if it:

1. Can be classified in one of the 28 named source categories listed in Section 169 of the CAA, and it emits or has the potential to emit 100 tpy or more of any criteria pollutant regulated by the CAA (USEPA 1990);
2. Is any other stationary source that emits or has the potential to emit 250 tpy or more of any criteria pollutants regulated by the CAA (USEPA 1990); or
3. Is any other stationary source constructed that emits or has the potential to emit 100,000 tpy or more of carbon dioxide equivalent (CO_2e).

The project is not one of the 28 named source categories so the 250 tpy limit applies to the emissions of criteria pollutants from this project. The project is expected be a major PSD source because of its potential to emit emissions of CO_2e. New major (for PSD) sources must follow PSD requirements; minor (for PSD) sources constructed after the minor source baseline date consume increment, but there are no PSD regulations that minor sources must meet.

Allowable deterioration to air quality can be expressed as the incremental increase to ambient concentrations of criteria pollutants, or PSD increment. The PSD increments for criteria pollutants are based on the PSD classification of the area. Class I area status is assigned to federally protected wilderness areas and allows the lowest amount of permissible deterioration. Class II designations allow a higher level of increment consumption relative to Class I areas. There are no designated Class III or heavy industrial use areas in the U.S. **Figure 3.5-1** displays the locations of the Class I and Class II sensitive areas closest to the proposed project.

A project's PSD increment consumption is typically determined through the use of an air quality model. Atmospheric concentrations of NO_2, SO_2, $PM_{2.5}$, and PM_{10} predicted by the air quality model are compared with allowable PSD increments. The allowable PSD increments for Class I and Class II areas are given in **Table 3.5-2**. A comparison of project impacts to PSD Class II increments may be required under the permitting phase of the project but is not typically evaluated under the NEPA.

PSD Class I areas are located within the air quality study area. The nearest Class I areas are Carlsbad Caverns National Park (NP) approximately 43 miles (69 kilometers [km]) and the Guadalupe Mountains NP about 68 miles (109 km) southwest of the project area. Living Desert State Park is the only sensitive Class II areas in the study area.

- In addition to having more stringent PSD increment requirements, FLMs evaluate and determine acceptable effects to AQRVs such as visibility and atmospheric deposition at Class I areas. FLMs review the issuance of a PSD permit for any impacts that exceed guideline thresholds for these parameters. In addition to analysis of the visibility and atmospheric deposition, the change in the acid neutralizing capacity of sensitive lakes is assessed by FLMs.
- The FLMs consider a source location greater than 50 km from a Class I area to have negligible impacts with respect to Class I AQRVs if its total SO_2, NO_X, PM_{10}, and sulfuric acid annual emissions (in tpy, based on 24-hour maximum allowable emissions) divided by the distance (in km) from the Class I area (Q/D) equals 10 or less. In this case, the FLMs would not request further Class I AQRV impact analyses from such sources. In general, the FLM Air Quality Related Values Workgroup (FLAG) recommends that an applicant apply the Q/D test (FLAG 2010) for proposed sources greater than 50 km from a Class I area to determine whether any further visibility analysis is necessary.

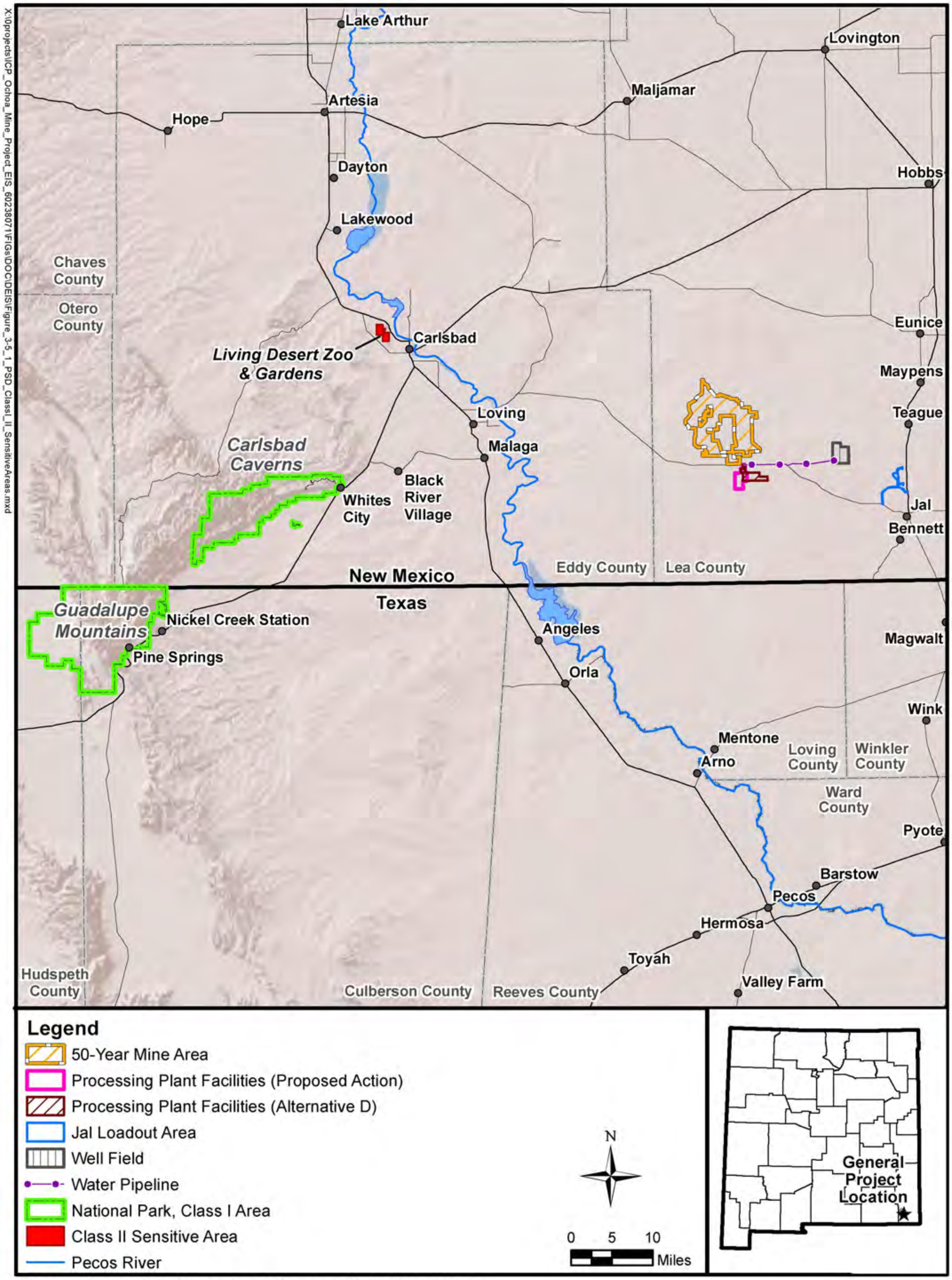


Figure 3.5-1 PSD Class I and Class II Sensitive Areas

Table 3.5-2 Increments for Class I and Class II Areas

PSD Class	Pollutant	Allowable Increment (µg/m^3)		
		Annual Arithmetic Mean	24-hour Maximum	3-hour Maximum
Class I	NO_2	2.5	—	—
	SO_2	2	5	25
	$PM_{2.5}$	1	2	—
	PM_{10}	4	8	—
Class II	NO_2	25	—	—
	SO_2	20	91	512
	$PM_{2.5}$	4	9	—
	PM_{10}	17	30	—

3.5.1.3 New Source Performance Standards

The regulation of new sources, through the development of standards applicable to a specific category of sources, was an important step taken by the CAA. The NSPS apply to all new, modified, or reconstructed sources within a given category, regardless of geographic location or the existing ambient air quality. The standards define emission limitations that would be applicable to a particular source group. The NSPS potentially applicable to the proposed project include the following subparts of 40 CFR Part 60:

- Subpart A – General Provisions
- Subpart OOO – Standards of Performance for Nonmetallic Mineral Processing Plants

Subpart A—General Provisions

Certain provisions of Subpart A apply to the owner or operator of any stationary source subject to a NSPS. Provisions of Subpart A potentially would apply depending on the applicability of emission generating units to be installed as part of the proposed new facilities.

Subpart OOO—Nonmetallic Mineral Processing Plants

While potash is not one of the nonmetallic minerals subject to NSPS Subpart OOO, Subpart OOO may apply to some of the proposed processing operations, including certain activities located at portable or fixed nonmetallic mineral processing plants, including crushers, grinding mills, screening operations, bucket elevators, belt conveyors, storage bins, and enclosed truck loading stations. If a nonmetallic mineral is processed by an affected facility as part of the proposed project, the requirements of Subpart OOO would apply to material handling activities if the equipment is manufactured after the applicability date in the rule. The requirements of Subpart OOO include an emission limit of 0.014 grains per dry standard cubic foot and 7 percent opacity on stack emissions with capture systems, 7 percent opacity from fugitive emissions from affected facilities, and 12 percent opacity from fugitive emissions from crushers. Compliance is determined using USEPA Reference Method 5 or Method 17 for stack emissions and Reference Method 9 for opacity determinations. Recordkeeping and reporting must follow the requirements contained in CAA §60.676.

3.5.1.4 National Emission Standards for Hazardous Air Pollutants

The CAA requires USEPA to regulate toxic air pollutants from large industrial facilities and to develop standards for controlling the emissions of air toxics from sources in an industry group (or source categories). Under the NESHAP, the USEPA promulgated standards pursuant to Section 112 of the 1990 CAA Amendments. The rules are provided in 40 CFR 63. The standards for these sources are known as MACT standards, and are based on emissions levels that are already being achieved by the better-controlled and lower-emitting sources in an industry.

USEPA is required to identify categories of industrial sources that emit one or more of the listed 187 toxic air pollutants. These industrial categories include both major and area sources, including those listed below:

- Major sources of air toxics that emit 10 tpy of a single air toxic or 25 tpy of a combination of air toxics.
- Area sources release smaller amounts of toxic pollutants into the air—less than 10 tpy of a single air toxic, or less than 25 tpy of a combination of air toxics. Although emissions from individual area sources are often relatively small, cumulatively their emissions can be of concern (USEPA 2009).
- In the Air Toxics Strategy, the USEPA identifies the toxic air pollutants that pose a health threat in the largest number of urban areas and regulates sufficient area source categories to ensure that the emissions of these urban air toxics are reduced.

The proposed project is anticipated to be a minor source of hazardous air pollutants (HAPs), and there are currently no applicable area source MACT standards that apply to the proposed project.

3.5.1.5 Conformity for General Federal Actions

According to Section 176(c)(4), of the CAA (40 CFR 51.853), a federal agency must make a conformity determination when considering approval of a project having air emissions that exceed specified thresholds in nonattainment and/or maintenance areas. The proposed project is not located in a nonattainment or maintenance area; therefore, a general conformity analysis is not required.

3.5.1.6 Federal Operating Permits Program

All major stationary sources (primarily industrial facilities and large commercial operations) emitting certain air pollutants are required to obtain Title V operating permits under the Federal Operating Permits Program outlined in 40 CFR Part 70 of the CAA. Whether a source meets the definition of “major” depends on the type and amount of air pollutants it emits and, to some degree, on the overall air quality in its vicinity. Generally, major sources include stationary facilities that emit 100 tons or more per year of a regulated air pollutant including compounds such as CO, PM_{10}, $PM_{2.5}$, volatile organics, SO_2, and NO_X. Major sources of toxic air pollutants (i.e., any source that emits more than 10 tpy of an individual toxic air pollutant or more than 25 tpy of any combination of toxic air pollutants) also are covered under the Federal Operating Permits Program.

The proposed project will be a major source with respect to the Federal Operating Permits Program; therefore, a Title V operating permit will be required.

3.5.1.7 Hazardous Air Pollutants

The proposed project is anticipated to be a minor source of HAPs. HAPs are those pollutants known or suspected to cause cancer or other serious health effects, such as damage to reproduction, birth defects, or adverse environmental impacts. The USEPA has classified 187 air pollutants as HAPs. With the exception of H_2S, neither the State of New Mexico nor the USEPA have established ambient air quality standards for HAPs; however, the 1990 CAA amendments established the NESHAP program, discussed in section 2.4, to regulate emissions of certain HAPs from particular industrial sources.

3.5.1.8 Carbon Dioxide and Other Greenhouse Gases

Carbon dioxide (CO_2) and other GHGs are naturally occurring gases in the atmosphere whose status as a pollutant is not related to their toxicity, but to the added long-term impacts they may have on climate due to their increased levels in the earth's atmosphere. Because they are non-toxic and non-hazardous at normal ambient concentrations, CO_2 and other naturally occurring GHGs do not have applicable ambient standards or emission limits under the major environmental regulatory programs.

On October 30, 2009, the USEPA issued the final mandatory reporting rule for major sources of GHG emissions (40 CFR Part 98). The rule requires a wide range of sources and source groups to record and report selected GHG emissions, including CO_2, methane (CH_4), nitrous oxide, and some halogenated compounds.

On June 3, 2010, the USEPA issued the PSD and Title V GHG Tailoring Rule. The rule tailors the applicability criteria that determine which stationary sources become subject to permitting requirements for GHG emissions under the PSD and Title V programs of the CAA. Under the rule, new facilities with GHG emissions of at least 100,000 tpy CO_2e and existing facilities with at least 100,000 tpy CO_2e making changes that would increase GHG emissions by at least 75,000 tpy CO_2e are required to obtain PSD permits. Facilities that must obtain a PSD permit anyway, to cover other regulated pollutants, also must address GHG emissions increases of 75,000 tpy CO_2e or more. New and existing sources with GHG emissions above 100,000 tpy CO_2e also must obtain operating permits.

The USEPA rules do not require any controls or establish any standards related to GHG emissions or impacts. Therefore, there is no evident requirement at this time that would affect development of the proposed project under the USEPA rules, other than the possibility of major source permitting and monitoring, recordkeeping, and reporting of GHG emissions.

3.5.1.9 New Mexico Air Quality Rules

Title 20, Chapter 2, Section 19 of the NMAC sets out emission standards for potash processing equipment (NMAC 2012). The objective of this Part is to establish particulate matter emission standards for potash, salt, or sodium sulfate processing equipment, and therefore, it may be applicable to the proposed project. The Part establishes equipment specific emission limits and testing requirements.

3.5.2 Regional Air Quality

Air quality in a given location is defined by pollutant concentrations in the atmosphere and is generally expressed in units of ppm or $\mu g/m^3$. Representative ambient background levels of pollutants measured are shown in **Table 3.5-3**. Data for this table were obtained from the NMED dispersion modeling guidance (NMED-AQB 2011). The sites were selected to provide a representative estimate of current background conditions in the project area.

3.5.2.1 Air Quality Attainment Status

As the data shown in **Table 3.5-3** demonstrates, the area surrounding the project area is in attainment for all criteria pollutants.

Table 3.5-3 Ambient Air Quality Background Values

Pollutant	Averaging Period	Concentration	Units	Monitor/ County
NO_2	1-hour	0.053	ppm	2007-2009 Hobbs, New Mexico, in Lea County
	Annual	0.007	ppm	2007-2009 Hobbs, New Mexico, in Lea County
CO	1-hour	2.1	ppm	2003-2006 2ZR Rio Rancho Senior Center (Considered to be representative of all areas in New Mexico except Sunland Park)
	8-hour	1.5	ppm	2003-2006 2ZR Rio Rancho Senior Center (Considered to be representative of all areas in New Mexico except Sunland Park)
SO_2	1-hour	0.023	ppm	2007-2009 5ZP Artesia Average 3-year 100% maximum concentration (considered to be representative of Eastern New Mexico)
PM_{10}	24-hour[1]	46.2	μg/m^3	2007-2009 Hobbs, New Mexico, in Lea County
	Annual	21.1	μg/m^3	2007-2009 Hobbs, New Mexico, in Lea County
$PM_{2.5}$	24-hour	12.4	μg/m^3	2007-2009 Hobbs, New Mexico, in Lea County
	Annual	6.2	μg/m^3	2007-2009 Hobbs, New Mexico, in Lea County
O_3	1-hour	0.076	ppm	2007-2009 Hobbs, New Mexico, in Lea County

[1] High Second High (second highest value).

3.5.2.2 Air Quality Related Values

An AQRV is defined by the National Park Service (NPS) (NPS 2011a) as:

> a resource as identified by the FLM for one or more federal areas, that may be adversely affected by a change in air quality. The resource may include visibility or a specific scenic, cultural, physical, biological, ecological, or recreational resource identified by the FLM for a particular area.

AQRVs include changes in visibility or atmospheric deposition of pollutants to soils and waterbodies. Regional haze is visibility impairment caused by the cumulative air pollutant emissions from numerous sources over a wide geographic area. Visibility impairment is caused by particles and gases in the atmosphere. Some particles and gases scatter light while others absorb light. The primary cause of regional haze in many parts of the country is light scattering resulting from fine particles (i.e., $PM_{2.5}$) in the atmosphere. Additionally, coarse particles between 2.5 and 10 microns in diameter can contribute to light extinction. Coarse particulates and $PM_{2.5}$ can be naturally occurring or the result of human activity. The natural levels of these species result in some level of visibility impairment, in the absence of any human influences, and will vary with season, daily meteorology, and geography (Malm 1999).

Inverse megameter (Mm^{-1}) is the direct measurement unit for visibility impairment data. It is the amount of light scattered and absorbed as it travels over a distance of 1 million meters. Ammonium sulfate is the dominant contributor to the total light extinction (Interagency Monitoring of Protected Visual Environments [IMPROVE] 2012a). The relative fractions of each component vary seasonally.

The visibility at the Guadalupe Mountains NP is one of the better, or less impaired, in the nation. During the regional haze baseline period from 2000 through 2004, the average total light extinction for the 20 percent best days was 10.1 Mm^{-1}; for the worst 20 percent days, it was 49.3 Mm^{-1}; the average over the whole baseline period was 26.2 Mm^{-1}(IMPROVE 2012b). Typically spring and summer are when Guadalupe Mountains NP experiences the most sustained reduction in visible range (IMPROVE 2012a).

There are no lakes that have been designated as acid sensitive located within the Carlsbad Caverns NP and the Guadalupe Mountains NP (NPS 2011b,c).

3.6 Climate and Greenhouse Gas Emissions

3.6.1 Regional Climate and Effects on Air Quality

Southeastern New Mexico has a mild, arid or semiarid, continental climate characterized by light precipitation totals, abundant sunshine, low relative humidity, and a relatively large annual and diurnal temperature range. A climate summary for Jal, New Mexico, is presented in **Table 3.6-1** (WRCC 2012a). In January, the coldest month, average daytime high temperatures are in the mid to upper 50s (°F), and while minimum temperatures below freezing are common, it is rare that temperatures fall below 0°F. The coldest temperature on record at Jal was -11°F on January 11, 1962 (WRCC 2012a). June and July are the warmest months with average daytime highs averaging in the upper 90s and occasionally exceeding 100°F. The hottest temperature recorded at the Jal station was 114°F, and occurred in June 2011 (WRCC 2012a).

State-wide average annual precipitation ranges from less than 10 inches over much of the southern desert to more than 20 inches at higher elevations in the state. A wide variation in annual totals is characteristic of arid and semiarid climates and is illustrated by annual extremes of 2.00 and 25.73 inches at Jal during a period of more than 92 years. In Lea County, summer rains fall almost entirely during brief, but frequently intense thunderstorms. July and August are typically the rainiest months in the proposed project area. Precipitation during the warmest 6 months of the year, May through October, adds up to about 60 percent of the annual total in the Jal area. The southeastern plains of New Mexico receive on average only about 0.5 inch of precipitation each month during the period November through April (WRCC 2012b).

Three important meteorological factors influence the dispersion of pollutants in the atmosphere: mixing height, stability, and wind (speed and direction). Mixing height is the height above ground within which the air is well mixed due to wind-induced turbulence or buoyancy from surface heating. A relatively high mixing height allows the surface-level pollutants to be mixed into a deeper layer, thereby diluting the concentration and reducing the ambient air quality impact from those emissions. Mixing heights vary by several factors: 1) time of day due to the influence of the sun’s heating of the surface inducing buoyant mixing within that layer and the cooling at night; 2) terrain features that may inhibit flow; 3) cloud cover that inhibits daily heating and cooling; 4) turbulence from winds in relation the roughness of the surface; and 5) the passage of weather systems and large-scale convection that act to mix air vigorously. In the project area, average morning mixing heights are approximately 1,600 feet and annual mean afternoon mixing heights are more than 7,800 feet (Holzworth 1972). Mean morning mixing heights tend to be lowest in winter and highest in summer.

Morning atmospheric conditions tend to be stable due to the cooling of the layers of air nearest the ground. Afternoon conditions, especially during the warmer months, tend to be neutral to unstable because of the rapid heating of the surface under clear skies. During the winter, periods of stable afternoon conditions may persist for several days in the absence of synoptic (continental-scale) storm systems to generate higher winds with more turbulence and mixing. The latitude of the proposed project is within the belt of prevailing westerly winds that circle the globe around the earth's northern hemisphere. Winds are affected by local topographic features.

Table 3.6-1 Monthly Climate Summary: Jal, New Mexico

Period of Record: 3/1/1919 to 1/31/2012													
	Jan	**Feb**	**Mar**	**Apr**	**May**	**Jun**	**Jul**	**Aug**	**Sep**	**Oct**	**Nov**	**Dec**	**Annual**
Average Maximum Temperature (°F)	59.9	65.2	72.8	81.7	89	95.6	96.3	94.9	88.8	80.3	68.6	61	79.5
Average Minimum Temperature (°F)	27.9	32.4	38.8	47.6	56.7	65.3	68	66.8	60.2	48.9	36.7	29.2	48.2
Average Total Precipitation (inches)	0.41	0.48	0.42	0.63	1.41	1.3	1.82	1.81	2.05	1.31	0.47	0.46	12.57
Average Total Snow Fall (inches)	1.3	0.7	0.3	0	0	0	0	0	0	0	0.6	0.8	3.6
Average Snow Depth (inches)	0	0	0	0	0	0	0	0	0	0	0	0	0

Source: WRCC 2012a.

3.6.2 Climate Change and Greenhouse Gas Emissions

Ongoing scientific research has identified the potential impacts of anthropogenic (man-made) GHG emissions and changes in biological carbon sequestration due to land management activities on global climate. Through complex interactions on a regional and global scale, these GHG emissions and net losses of biological carbon sinks cause a net warming effect of the atmosphere, primarily by impeding the rate of heat energy radiated by the earth back into space. Although GHG levels have varied for millennia, recent industrialization and burning of fossil carbon sources have caused CO_2e concentrations to increase dramatically, and are likely to contribute to overall global climatic changes. The Intergovernmental Panel on Climate Change (IPCC) recently concluded that warming of the climate system is unequivocal and most of the observed increase in globally average temperatures since the mid-20th century very likely is due to the observed increase in anthropogenic GHG concentrations (IPCC 2007).

The average global temperature has risen about 1.4°F (0.8°C) since 1880, according to recent analysis (NASA 2013). Models indicate that average temperature changes are likely to be greater in the Northern Hemisphere. Northern latitudes (above 24°N) have exhibited temperature increases of nearly 2.1°F since 1900, with nearly a 1.8°F increase since 1970. Without additional meteorological monitoring systems, it is difficult to determine the spatial and temporal variability and change of climatic conditions, but increasing concentrations of GHGs are likely to accelerate the rate of climate change.

As with any field of scientific study, there are uncertainties associated with the science of climate change; however, this does not imply that scientists do not have confidence in many aspects of climate change science. Some aspects of the science are known with virtual certainty because they are based on well-known physical laws and documented trends (USEPA 2012b).

Several activities contribute to the phenomena of climate change, including emissions of GHGs (especially CO_2 and CH_4) from fossil fuel development, large wildfires, activities using combustion engines, changes to the natural carbon cycle, and changes to radiative forces and reflectivity (albedo) of the earth-atmosphere system. It is important to note that GHGs will have a sustained climatic impact over different temporal scales. For example, recent emissions of CO_2 may influence climate for 100 years.

It may be difficult to discern whether climate change is already affecting resources globally, let alone those in the vicinity of the proposed project. In most cases, there is little information about the potential or projected effects of global climate change on natural resources. It is important to note that projected changes are likely to occur over long periods of time (several decades to a century). Therefore, many of the projected changes to climate may not be measurably discernible within the reasonably foreseeable future. Existing climate prediction models are global in nature; therefore, they are not at the appropriate scale to estimate potential impacts of climate change on the study area and vicinity.

While assessing if climate change is affecting a specific region is difficult the research available on climate trends in New Mexico and the Southwest was reviewed and summarized in a recent analysis of climate change vulnerability in the region (The Nature Conservancy 2008). That review indicated that warming trends in the Southwest have exceeded the global averages by nearly 50 percent and precipitation, on average, has increased slightly across New Mexico since the 1970s.

3.7 Vegetation

The following section presents general vegetation resources, including noxious weeds and invasive species, and wetlands. There are no listed special status plant species for Lea County, New Mexico and subsequently, the project area. The study area for vegetation resources is defined as the proposed project area which includes the 50-year mine area, the shaft and associated facilities, the two proposed plant facility locations, the Jal loadout area, well field locations, and water pipeline ROW.

3.7.1 Plant Communities

The project area is located within the Chihuahuan Desert Grassland subregion of the Chihuahuan Desert ecoregion. The Chihuahuan Desert ecoregion extends from the southeastern Arizona to south-central Texas, and more than 500 miles south into Mexico (Griffith et al. 2006). The Chihuahuan Desert ecoregion historically has been dominated by desert grasslands, and shrublands dominated by creosotebush (*Larrea tridentata*). Over the last several hundred years, the extent of desert grasslands has declined, and desert shrublands have become increasingly dominant. The gradual desertification is thought to be caused by grazing, and other anthropogenic activities (Griffith et al. 2006; New Mexico State University 2007). The Chihuahuan Desert Grasslands subregion is found at higher elevations, such as elevated basins between mountain ranges, low mountain benches, plateau tops, and north-facing mountain slopes (Griffith et al. 2006). The Chihuahuan subregion is extremely arid, with annual rainfall ranging from 10 to 15 inches a year (NRCS 2008).

Vegetation communities in the project area were identified by Walsh Environmental Scientists and Engineers (Walsh Environmental) through a desktop analysis, and subsequent field verification (Walsh Environmental 2012a, 2011). The desktop analysis was based on landfire geospatial vegetation data. Field verification was conducted in the spring and fall of 2011. Eight vegetation communities were mapped in the project area including barren/developed/roads, barren/unvegetated wash, coppice dune and sand flat scrub, creosote desert scrub, mesquite upland scrub steppe, mixed desert scrub steppe, shinnery oak shrubland, and playa. Acreages for vegetation cover type in the various components of the project area are summarized in **Table 3.7-1**. Note that the acreage exceeds the total for the project area described in Chapter 2 because it includes the analysis area evaluated for the water pipeline route shown on text and were compiled based field surveys observations and NatureServe vegetation community descriptions (Walsh Environmental 2011). Species nomenclature is consistent with the NRCS Plants Database (NRCS 2012), BLM Carlsbad Field Office, and the New Mexico State Noxious Weed List (NMSA 76-7-1 to 76-7-30). **Figures 3.7-1**, **3.7-2**, and **3.7-3** illustrate the vegetation cover types present within the proposed project boundaries.

Table 3.7-1 Vegetation Community Types within the Project Area

Vegetation Cover Type	Acres	% of Project Area
Barren/Developed/Roads	111	<1
Barren/Unvegetated Wash	42	<1
Coppice Dune and Sand Flat Scrub	3,620	8
Creosote Desert Scrub	618	<1
Mesquite Upland Scrub Steppe	34,332	72
Mixed Desert Scrub Steppe	8,762	18
Shinnery Oak Shrubland	91	<1
Playa	<1	<1
Total	**47,577***	**100**

***** Does not include 84 acres of existing access roads.

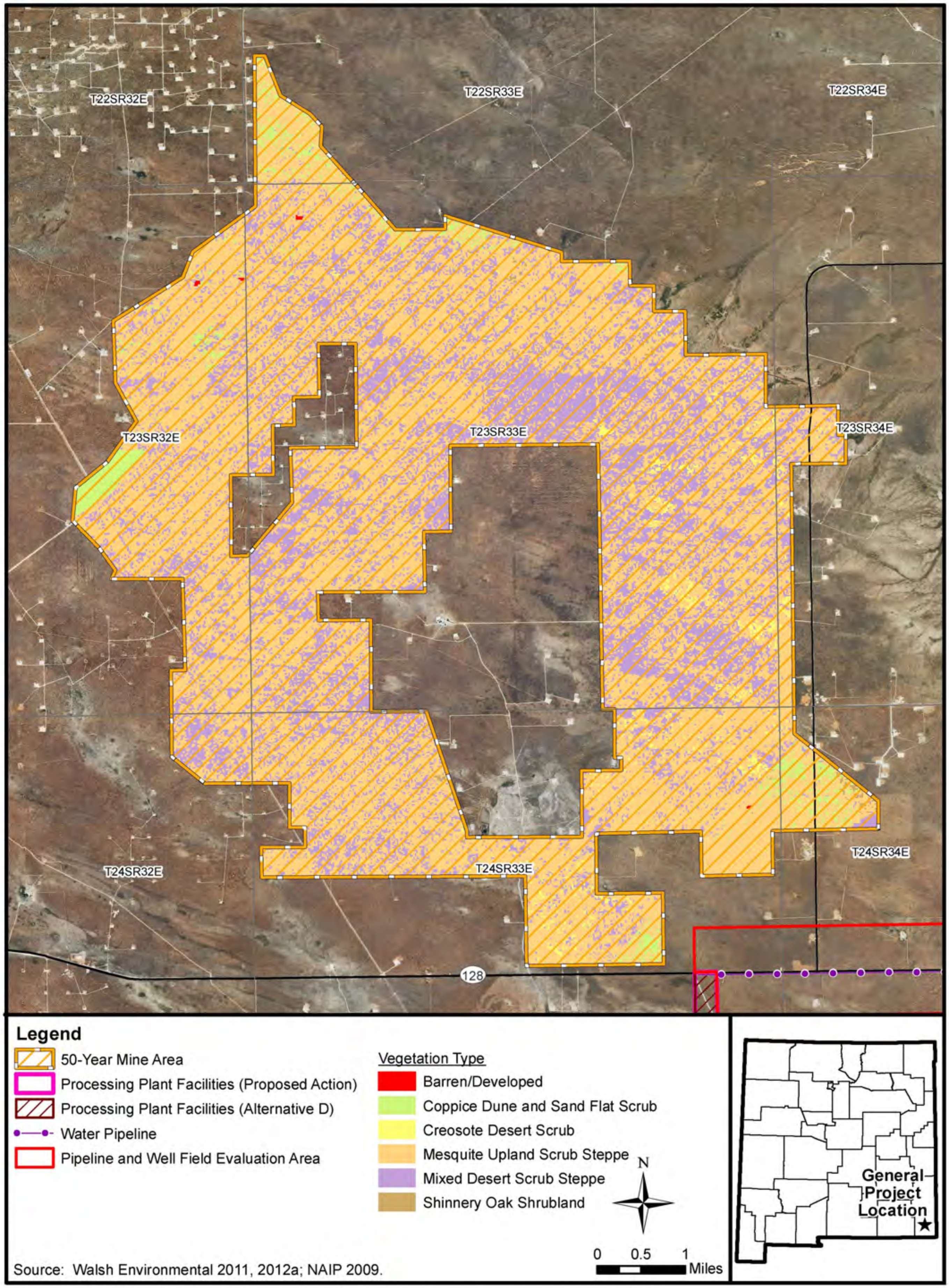


Figure 3.7-1 Vegetation Types within the 50-Year Mine Area and Plant Site

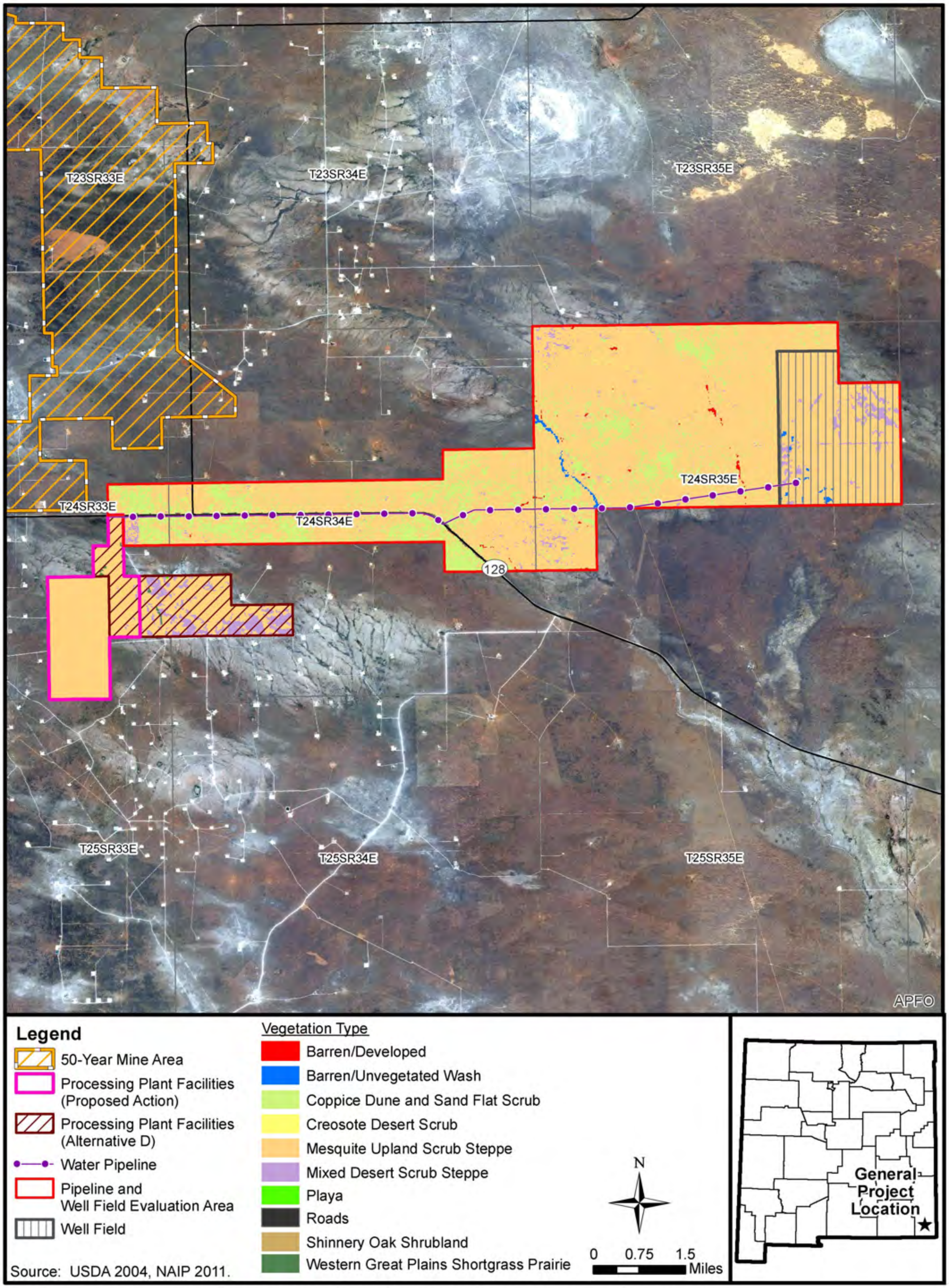


Figure 3.7-2 Vegetation Types within Plant Site, Well Field, and Water Pipeline Area

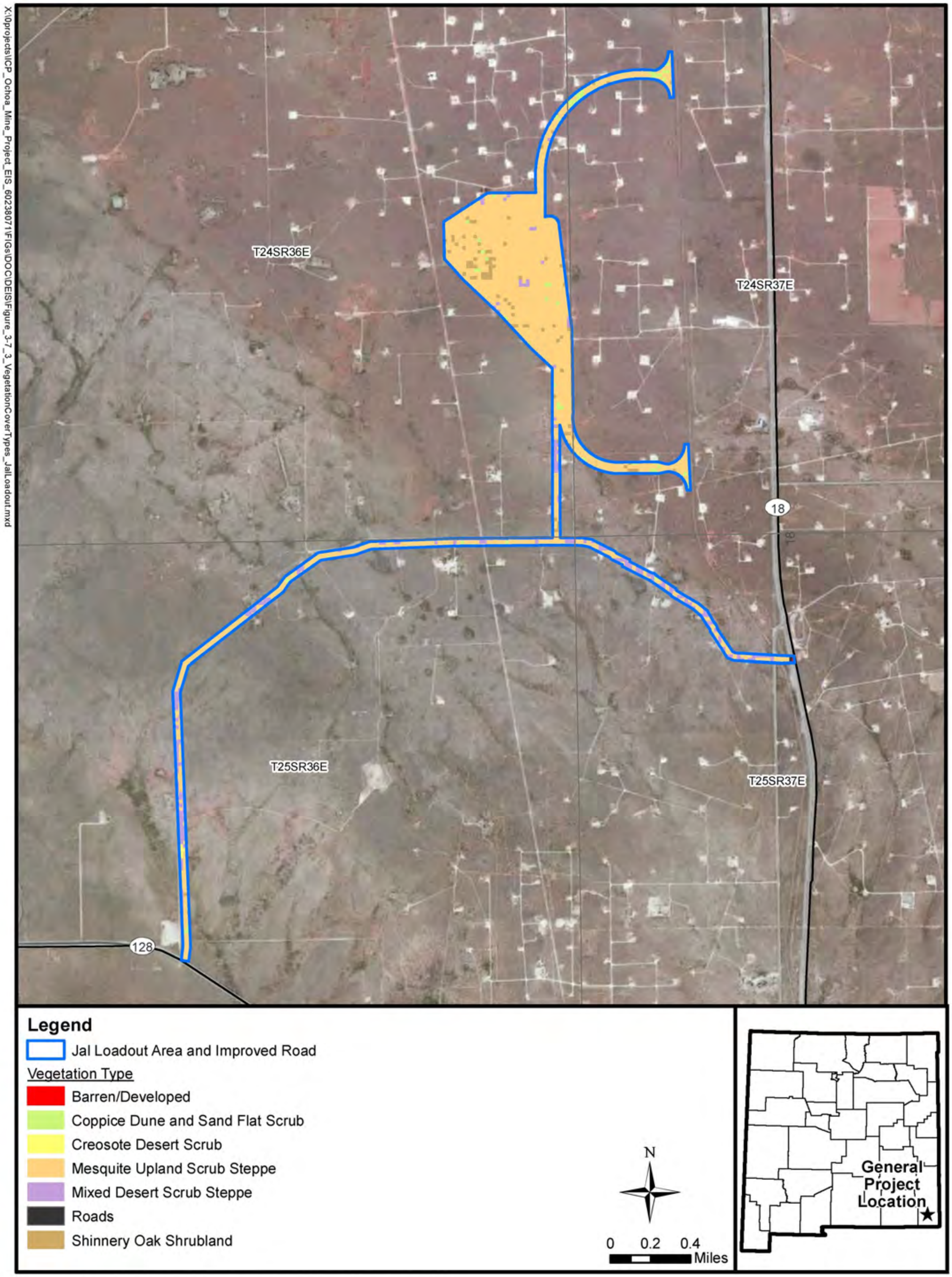


Figure 3.7-3 Vegetation Types at the Jal Loadout

3.7.1.1 Barren/Developed/Roads

Barren/Developed/Roads vegetation community type covers less than 1 percent of the project area. The developed area is predominantly found in the east and south of the project area. Developed areas are characterized by surface disturbance associated with drilling pads, two-track and wider road ROWs, and other activities associated with oil and gas development. These areas are generally sparsely vegetated.

3.7.1.2 Barren/Unvegetated Wash

The barren/unvegetated wash community type covers less than 1 percent of the project area. The vegetation community is characterized by ephemeral washes with variable flow frequency and intensity. The vegetation can vary from upland to hydrophytic species and cover can be sparse and patchy to moderately dense based on the frequency and intensity of flow.

3.7.1.3 Coppice Dune and Sand Flat Scrub

The coppice dune and sand flat scrub vegetation community type covers approximately 8 percent of the project area, predominantly in the northern portion of the 50-year mine area. In the project area, it is typically found in combination with shinnery oak shrubland. This vegetation community is found on low, sandy flats, where wind forms a series of shifting sand dunes and depressions which creates vegetation microclimates. Bare ground is 30 to 45 percent of the cover which combined with the lack of rooted vegetation results increased susceptibly to erosion. Vegetation consists of sand sagebrush (*Artemesia filfolia*), with limited occurrences of honey mesquite (*Prosopis glandulosa*). Species typically found on former and now degraded gypsophilous grassland and steppe communities such as blazing star (*Mentzelia* spp.) and Torrey's joint fir (*Ephedra torreyana*) also are found in this vegetation community.

3.7.1.4 Creosote Desert Scrub

Creosote desert scrub covers approximately 1 percent of the project area in the central and southern portions of the project area in scattered pockets. The vegetation community is found in flat to gently rolling desert basins, on alluvial plains, and down to lower and middle slope sediment debris areas. Vegetation cover is sparse, with little diversity, and dominated by creosote bush (*Larrea tridentata*). Other shrub species observed in this vegetative community included fourwing saltbush (*Atriplex canescens*), desert ceanothus (*Ceanothus greggii*), and javelina bush (*Condalia ericoides*), Herbaceous species observed include black grama (*Bouteloua eripoda*), low woollygrass (*Dasyochloa pulchella*), Lehmann lovegrass (*Eragrostis lehmanniana*), rough menodora (*Menodora scabra*), and bush muhly (*Muhlenbergia porteri*), Substrates are usually non-saline and often calcareous. On plains, soils consist of coarse-textured loams, while in basins, soils are silty and clayey.

3.7.1.5 Mesquite Upland Scrub Steppe

Often found adjacent to mixed desert scrub steppe, a similarly structured community, Mesquite upland scrub steppe is found approximately 72 percent of the project area. The mesquite upland scrub steppe is the result of grasslands being invaded by shrubs probably due to disturbances such as drought, overgrazing, seed dispersal by livestock, and decreases in a natural fire frequency. Vegetation has little diversity, and is dominated by shrubs such as honey mesquite, and broom snakeweed (*Gutierrezia sarathrae*). Associated shrubs include desert buckthorn (*Ceanothus greggii*), rabbitbrush (*Chrysothamnus* spp.), and javelina bush (*Condalia ericoides*). Understory species include grasses such as low woollygrass, Lehmann lovegrass, rough menodora, bush muhly, and sand dropseed (*Sporobolus cryptandrus*), and forbs such as prickly Russian thistle (*Salsola tragus*), annual buckwheat (*Eriogonum annuum*), tulip prickly pear (*Opuntia phaeacantha*), buffalobur nightshade (*Solanum rostratum*), and Rocky Mountain zinnia (*Zinnia grandiflora*).

3.7.1.6 Mixed Desert Scrub Steppe

Mixed desert scrub steppe is found in approximately 18 percent of the project area. Disturbances such as livestock grazing or drought have spread the mixed desert scrub steppe into areas once covered by desert grasslands. The vegetation community is typically found on mid to upper gravelly piedmont slopes. On mid to lower slopes, the mixed desert scrub steppe often transitions into creosote desert scrub. Dominant vegetation in the project area includes whitethorn and catclaw acacia (*Acacia* spp.), with associated species consisting of sand dropseed (*Sporobolus cryptandrus*), honey mesquite, and sand sagebrush. Lehmann lovegrass (*Eragrostis lehmanniana*), a non-native grass species, tends to dominate the understory vegetation in many areas. Other non-dominant species observed during surveys include purple threeawn (*Aristida purpurea*), milkweed (*Asclepias* sp.), buffalograss (*Buchloë dactyloides*), sunflower (*Helianthus* spp.), needle and thread (*Hesperostipa comata*), bush muhly, and soaptree yucca (*Yucca elata*).

3.7.1.7 Shinnery Oak Shrubland

Shinnery oak shrubland occurs in less than 1 percent of the northern portion of the project area. It is typically found on stable dunes, transitions into the coppice dune and sand flat scrub, and mesquite upland scrub steppe communities described above on areas with more unstable, and shifting dunes. The dominant vegetation species is shinnery oak, a low, slow-growing shrub that has large underground stem and root systems. It can resprout following a fire and may persist for long periods of time once established. Plant composition and dune stabilization can be affected by drought, fire, grazing, and vegetation treatments affecting the distribution of the vegetation communities. Other shrub species include sand sagebrush, desert ceanothus, javelina bush, and honey mesquite. Herbaceous species in this community include purple threeawn, annual buckwheat, rough menodora, bush muhly, little bluestem (*Schizachyrium scoparium*), sunflower, blazingstar, and soaptree yucca.

3.7.1.8 Playa

The playa vegetation community occupies less than 1 percent of the project area. It is located in the alternative plant facility location. See Section 3.7.3, Wetlands and Riparian Areas for more information about the playa vegetation community.

3.7.2 Special Status Plant Species

Special status plant species are species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed and federally proposed species protected under the ESA, species that are candidates for listing by the USFWS, species that are listed by the state as threatened or endangered, and BLM sensitive species.

In accordance with the ESA, the lead agency, in coordination with the USFWS, must ensure that any federal action to be authorized, funded, or implemented would not adversely affect a federally listed threatened or endangered species or its critical habitat. The BLM Special Status Species Management Policy 6840 requires the BLM to manage and protect any USFWS candidate species, or state listed species, to prevent the need for future federal listing as threatened or endangered. There are no federal or state listed plant species for Lea County.

3.7.3 Wetlands and Riparian Areas

Waters of the U.S. are defined in 33 CFR 328.3 as all non-tidal waters that are currently, or were used in the past, or may be susceptible to use in interstate commerce; all interstate waters including wetlands; all other waters such as interstate lakes, rivers, streams (including intermittent streams), mud flats, sand flats, wetlands, sloughs, prairie potholes, wet meadows, playa lakes, or natural ponds, of which the use, degradation or destruction could affect interstate commerce; and all impoundments of waters of the U.S. In addition, tributaries of the above listed waters, including arroyos and other intermittent drainages, and wetlands adjacent to the above waters also are considered to be WUS. According to the USACE's 1987

Wetland Delineation Manual, a “three-parameter” approach is required for delineating USACE-defined wetlands (USACE 1987), where areas are identified as wetlands if they exhibit hydrophytic vegetation, hydric soils, and wetland hydrology.

Field vegetation surveys conducted in 2011 by Walsh Environmental did not identify any wetlands within the project area. The Alternative D processing plant location was not surveyed, but based on aerial interpretation, the riparian areas within the boundaries consist of a playa, and several ephemeral stream drainages. Playas are created when surface water runoff leaches salts from the soil during runoff, collects in the low-lying areas, and then evaporates. The salts left behind decrease infiltration rates into the soil and allow water to pond. Playas have variable wet periods and are usually fed by precipitation and associated runoff (Playa Lakes Joint Venture 2013).

Ephemeral washes were observed in the northern portion of the well field, but the remainder of the proposed well field has not been surveyed. These washes can have variable flow frequency and intensity. The vegetation in the washes can vary from upland to wetland species and plant cover can be sparse and patchy to moderately dense, based on the frequency and intensity of flow. Ordinary High Water Mark indicators were not observed in the channels. The ephemeral channels drain southeast toward Antelope Draw, which drains southeast into the Javelina Basin. The USACE has determined that there are no waters of the U.S. in the project area (USACE 2013).

3.7.4 Noxious and Invasive Species

Noxious weeds have become a growing concern in the western U.S. due to their ability to increase in cover and exclude native plants from an area. The spread of noxious weeds caused damage to endangered native species, resulting in reductions in available forage for livestock and wildlife and economic resources. As a result, the State of New Mexico passed the Noxious Weeds Management Act (NWMA), which requires the New Mexico Department of Agriculture (NMDA) to develop a list of noxious weeds, identify methods of control, and educate the public (76-7-1 to 76-7-30 NMSA 1978). The NWMA defines a noxious weed as any weed or plant that is harmful or possesses noxious characteristics, as determined by the board of county commissioners. The board of county commissioners acts as the governing body of the district.

The federal Noxious Weed Act of 1974, as amended (7 USC 2801 et seq.) requires cooperation with state, local, and other federal agencies in the application and enforcement of all laws and regulations relating to the management and control of noxious weeds. The BLM acknowledged the Act by establishing a goal to include noxious weed considerations in NEPA documents. Analysis should include the potential for the spread of noxious weed species and provide preventive rehabilitation measures for each management action involving surface disturbance. There are four categories of noxious weeds identified by the NMDA (Classes A, B, C, and watch species). **Table3.7-2** lists the noxious weed species in the state and their associated status.

Class A species are the highest priority but are not currently present in New Mexico or have limited distribution. Management of Class A species focuses on prevention of new infestations, and eradication of existing infestations.

Class B species are limited to portions of the state. For Class B species, with severe infestations, management includes containing the infestation and limiting any further spread.

Class C species are widespread in the state. For Class C species, management decisions are made at the local level based on the feasibility of control and level of infestation. Watch species are species of concern in the state that have the potential to become problematic. When these species are encountered, their location should be documented and provided to the appropriate authorities.

No noxious or invasive weed species were identified during the vegetation surveys conducted by Walsh Environmental (2011). In 2012, the during the site inspection, the New Mexico Department of Game and Fish observed African rue in the location of the proposed loadout facility (NMDGF 2013). In the state, African rue, Malta star-thistle, and Russian knapweed are of the highest concern. African rue has been observed in the vicinity of the project area. The BLM Carlsbad along with county, state, and federal agencies actively monitor and treat noxious weed species in the area.

Table 3.7-2 Noxious Weed Species of Concern in the State of New Mexico

Common Name	Scientific Name	New Mexico Noxious Weed List Classification
Russian knapweed	*Acroptilon repens*	B
Jointed goatgrass	*Aegilops cylindrica*	C
Tree of heaven	*Ailanthus altissima*	B
Camelthorn	*Alhagi psuedalhagi*	A
Giant cane	*Arundo donax*	Watch
Sahara mustard	*Brassica tournefortii*	Watch
Cheatgrass	*Bromus tectorum*	C
Hoary cress	*Cardaria* spp.	A
Musk thistle	*Carduus nutans*	B
Spotted knapweed	*Centaurea biebersteinii*	A
Purple starthistle	*Centaurea calcitrapa*	A
Diffuse knapweed	*Centaurea diffusa*	A
Malta starthistle	*Centaurea melitensis*	B
Meadow knapweed	*Centaurea pratensis*	Watch
Yellow starthistle	*Centaurea solstitialis*	A
Chicory	*Cichorium intybus*	B
Canada thistle	*Cirsium arvense*	A
Bull thistle	*Cirsium vulgare*	C
Poison hemlock	*Conium maculatum*	B
Pampas grass	*Cortaderia sellonana*	Watch
Wall rocket	*Diplotaxis tenuifolia*	Watch
Teasel	*Dipsacus fullonum*	B
Alfombrilla	*Drymaria arenariodes*	A
Russian olive	*Elaeagnus angustifolia*	C
Quackgrass	*Elytrigia repens*	Watch
Leafy spurge	*Euphorbia esula*	A
Halogeton	*Halogeton glomeratus*	B

Table 3.7-2 Noxious Weed Species of Concern in the State of New Mexico

Common Name	Scientific Name	New Mexico Noxious Weed List Classification
Hydrilla	*Hydrilla verticllata*	A
Black henbane	*Hyoscyamus niger*	A
Dyer's woad	*Isatis tinctoria*	A
Perennial pepperweed	*Lepidium latifolium*	B
Oxeye daisy	*Leucanthemum vulgare*	A
Dalmation toadflax	*Linaria dalmatica*	A
Yellow toadflax	*Linaria vulgaris*	A
Purple loosestrife	*Lythrum salicaria*	A
Parrotfeather	*Myriophyllum aquaticum*	A
Eurasian watermilfoil	*Myriophyllum spicatum*	A
Scotch thistle	*Onopordum acanthium*	A
African rue	*Peganum harmala*	B
Crimson fountaingrass	*Pennisetum setaceum*	Watch
Ravenna grass	*Saccharum ravennae*	A
Giant salvinia	*Salvinia molesta*	A
Saltcedar	*Tamarix* spp.	C
Siberian elm	*Ulmus pumila*	C
Spiny cocklebur	*Xanthium spinosum*	Watch

3.8 Wildlife and Fish

The project area for wildlife and fish includes the 50-year mine area, the shaft and associated facilities, plant facilities, the Jal loadout area, well field locations, and water pipeline ROW.

3.8.1 Terrestrial Wildlife

As discussed in Section 3.7, Vegetation, seven vegetation cover types (i.e., wildlife habitat) and one land use type are located with the project area. The vegetation cover types consist primarily of coppice dune and sand flat scrub, creosote desert scrub, mesquite shrubland, mesquite upland scrub steppe, mixed desert scrub steppe, and shinnery oak shrubland. Mesquite upland scrub steppe is the most common vegetation type within the project area.

Wildlife species and habitats found within the project area are typical of the arid landscape of southeast New Mexico. Available water for wildlife consumption is limited within the project area. Water sources, particularly those that maintain open water and riparian vegetation, support a greater diversity and population density of wildlife species than any other habitat type occurring in the project area.

Information regarding wildlife species and habitat found within the project area was obtained from a review of existing published sources, site-specific surveys conducted in 2011, 2012, and 2013, the BLM, NMDGF, and the USFWS file information.

3.8.1.1 Big Game

Big game species potentially occurring within the project area may be limited due to lack of sufficient forage or cover. The primary big game species are mule deer (*Odocoileus hemionus*) and pronghorn (*Antilocapra americana*) (BLM 1994). Mule deer and pronghorn were observed during baseline surveys for the project area in 2011, 2012, and 2013 (Walsh Environmental 2013, 2012a, 2011). Ungulate pellet surveys conducted in 2012 documented both mule deer and pronghorn pellets and four mule deer does within the processing plant facilities (Walsh Environmental 2012a). Pronghorn also were observed within the project area during surveys conducted for the water pipeline in 2013 (Walsh Environmental 2013). According to the Carlsbad Final RMP/EIS Amendment (BLM 1997), mule deer are found east of the Pecos River in isolated areas that have adequate permanent water sources, adequate cover (dunes, escarpments, blowouts, and hummocks), abundant food sources (shinnery oak and fourwing saltbush), and some topographic relief. These factors and the proximity to oil and gas activity are the primary limiting factors to the distribution of mule deer in the vicinity of the project area (BLM 1994). Habitat for pronghorn primarily consists of grassy rolling uplands and shinnery oak sand dunes (BLM 1994).

Other big game species that may be encountered within the project area include javelinas (*Dicotyles tajacu*) and mountain lions (*Felis concolor*). Javelinas prefer areas of mixed desert shrub or mesquite grassland, and mountain lions may occasionally travel through the mesquite grasslands and shinnery oak dune areas in and near the project area (BLM 2007b).

3.8.1.2 Small Game Species

Small game species that potentially occur within the project area include upland game birds, waterfowl, furbearers, and small mammals. Species include mourning dove (*Zenaidura macroura*), scaled quail (*Callepepla squamata*), black-tailed jackrabbit (*Lepus californicus*), and desert cottontail (*Sylvilagus audubonii*). Furbearers may include, but are not limited to, bobcat (*Lynx rufus*), coyote (*Cannis letrans*), raccoon (*Procyon lotor*), and badger (*Taxidea taxus*) (BLM 2007b, 1994).

3.8.1.3 Nongame Species

A diversity of nongame species (small mammals, raptors, passerines, amphibians, and reptiles) occupy a variety of trophic levels (levels in the food chain) and habitat types within the project area. Nongame mammal species include shrews, bats, squirrels, rabbits, woodrats, and mice. These small mammals provide a substantial prey base for the predators, such as mammals (coyote, badger, skunk), raptors (buteos and owls), and reptiles.

Migratory Birds

Nongame birds encompass a variety of passerine and raptor species including migratory bird species that are protected under the MBTA (16 USC 703-711) and EO 13186 (66 FR 3853). Pursuant to EO 13186, a MOU between the BLM and USFWS outlines a collaborative approach to promote the conservation of migratory bird populations. The purpose of the MOU is to strengthen migratory bird conservation by identifying and implementing strategies that promote conservation and avoid or minimize adverse impacts on migratory birds in coordination with state, tribal, and local governments. This MOU identifies specific activities where cooperation between the BLM and USFWS will contribute to the conservation of migratory birds and their habitat.

Common bird species that may potentially occur within the project area may include, but are not limited to, horned lark (*Eremophila alpestris*), western meadowlark (*Sturnella neglecta*), Chihuahuan raven (*Corvus cryptoleucus*), western kingbird (*Tyrannus vertucalis*), and sage sparrow (*Amphispiza belli*) (BLM 2007b). During breeding bird surveys conducted along the water pipeline ROW, a total of 16 commonly occurring bird species were detected (Walsh Environmental 2013). Most commonly observed were scissor-tailed flycatcher (*Tyrannus forficatus*), ash-throated flycatcher (*Myiarchus cinerascens cinerascens*), black-throated sparrow (*Amphispiza bilineata*), pyrrhuloxia (*Cardinalis sinuatus*), and lark bunting (Calamospiza *melanocorys*). No nests were found. Additionally, no sensitive bird species identified for the project in Section 3.8.3, Sensitive Species were detected in the proposed ROW.

Raptor species that potentially occur as residents or migrants within the study area include eagles, buteos (e.g., red-tailed hawk, Swainson's hawk), falcons (e.g., prairie falcon, American kestrel), owls (e.g., short-eared owl and great horned owl), northern harrier, and turkey vulture (Heron et al. 1985).

Two raptor nests (one Swainson's hawk and one great horned owl) were identified within the project area during the 2011 raptor nest surveys conducted by Walsh Environmental (2011). An additional Swainson's hawk nest occurs immediately adjacent to the northern portion of project area (Walsh Environmental 2011). In 2012, surveys conducted in the mine shaft area, processing facilities, and Jal load-out facility located four occupied Swainson's hawk nests, two of which occurred within the project area (Walsh Environmental 2012a). The other two occupied nests were located to the west of the project area. Ten additional unoccupied nests, with characteristics of Swainson's hawk nests, were located within, or just outside, the processing facility footprint (Walsh Environmental 2012a). Nests previously recorded during 2011 baseline surveys near these sites were revisited to update their status. The Swainson's hawk nest identified in 2011 near the mine shaft was not relocated in 2012 (Walsh Environmental 2012a). Surveys for raptor nests within the half-mile buffer of the ROW resulted in locating seven occupied Swainson's hawk nests, three Swainson's hawk nests with unknown nesting status (either abandoned or unoccupied), and an additional 11 inactive nests of unknown species were found (Walsh Environmental 2013). **Figure 3.8-1** displays the approximate locations of recorded raptor nests in relation to the project area.

Reptiles

Several species of reptiles are known to occur within the study area including the bull snake, western diamond-backed rattlesnake, eastern collared lizard, and Texas horned lizard. These species occupy a wide variety of habitats and are most active during the late-spring, summer, and early fall months (Degenhardt et al. 1996).

Reptile pitfall trap surveys were conducted in 2012 by Walsh Environmental. No lizards were captured during the surveys. However, incidental observations of side-blotched lizards (*Uta stansburiana*) and commonly occurring whiptail species (*Aspidoscelis* spp.) were seen near the trap arrays (Walsh Environmental 2012a).

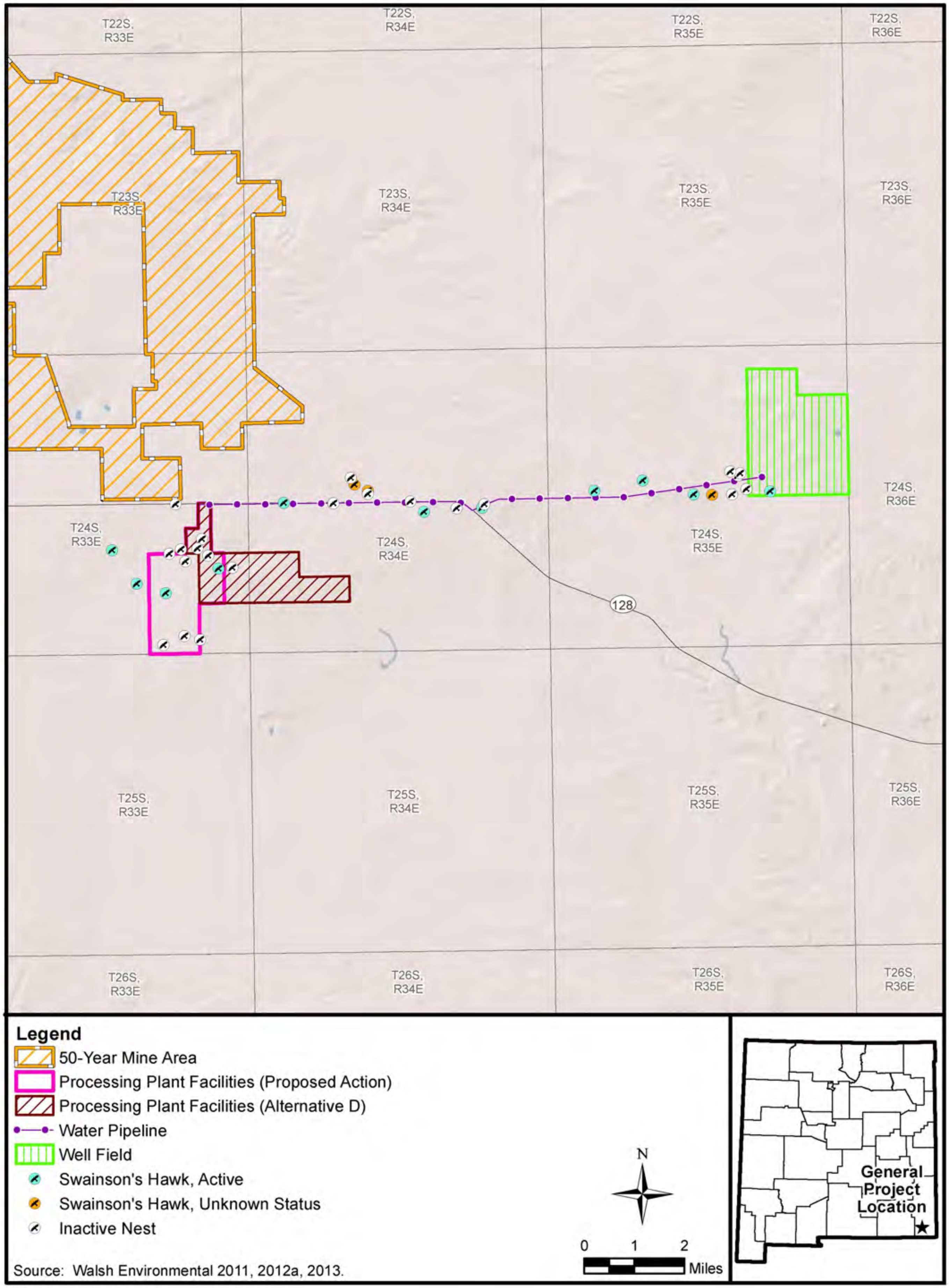


Figure 3.8-1 Raptor Nest Sites

Details on sensitive species such as lesser prairie-chicken (*Tympanuchus pallidicinctus*), burrowing owl (*Athene cunicularia*), Baird's sparrow (*Ammodramus bairdii*), gray vireo (*Vireo vicinior*), cave myotis (*Myotis velifer incautus*), Yuma myotis (*Myotis* yumanensis *yumanensis*), and sand dune lizard (*Sceloporus arenicolus*) are discussed further in Section 3.8.3, Sensitive Wildlife Species.

3.8.2 Aquatic Species

No fisheries occur within the project area. The closest perennial stream to the project area is the Pecos River, which is approximately 30 miles west. The Pecos River supports warm water fisheries.

3.8.3 Sensitive Wildlife Species

Sensitive species are those species for which state or federal agencies afford an additional level of protection by law, regulation, or policy. Included in this category are federally listed species that are protected under the ESA and species designated as sensitive by the BLM. In addition, the State of New Mexico designates threatened and endangered species (NMAC 19.33.6.8) that also are accorded special status.

In accordance with the ESA, the lead agency (BLM) in coordination with the USFWS must ensure that any action that they authorize, fund, or carry out would not adversely affect a federally listed threatened or endangered species. In addition, as stated in Special Status Species Management Policy 6840 (6840 Policy) (Rel. 6-125), it is BLM policy "to conserve and/or recover ESA-listed species and the ecosystems on which they depend so that ESA provisions are no longer needed for these species, and to initiate proactive conservation measures that reduce or eliminate threats to BLM sensitive species to minimize the likelihood of and need for listing of these species under the ESA." The following discussion summarizes known data for the special status species identified for the proposed project by the applicable agencies.

A total of 42 terrestrial and 13 aquatic species were identified as potentially occurring within the project area (Biota Information System of New Mexico [BISON-M] 2009; USFWS 2012). These species, their associated habitats, and their potential for occurrence within the project area are summarized in **Table 3.8-1**. The potential for occurrence was evaluated for each species based on habitat requirements and known distribution. Evaluations determined that 30 terrestrial species and all 13 aquatic species are unlikely to occur within the project area and are not carried further in analyses. The remaining 12 species identified as potentially occurring within the project area are described below.

<u>Mammals</u>

Pale Townsend's Big-eared Bat (BLM). The pale Townsend's big-eared bat is found throughout New Mexico from low desert to high mountain habitats (Findley et al. 1975). Within its range, this bat is common in deserts, woodlands, and pine forests (Arizona Game and Fish Department [AGFD] 1993). This subspecies prefers caves, mines, and buildings that maintain stable temperatures and airflow for nursery colonies, bachelor roosts, and winter shelter (AGFD 1993; Findley et al. 1975; Harvey et al. 1999). The pale Townsend's big-eared bat does not make major migrations and appears to be relatively sedentary, not traveling far from summer foraging grounds to winter hibernation sites (Harvey et al. 1999). Its distribution is correlated with suitable roost and hibernation sites, primarily caves and underground mines.

Surveys conducted using AnaBat detectors between May and October 2012 (Walsh Environmental 2012b) did not detect the occurrence Townsend's big-eared bat within the project area. Based on these findings and the species' known distribution and habitat requirements, the potential for this species to occur within the project area is considered to be low.

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Mammals					
Pale Townsend's big-eared bat (*Corynothinus townsendii pallescens*)	BLM	This subspecies is primarily a cave dweller and is the bat most associated with inactive mines in the southwest. The subspecies occurs in desert shrublands, piñon-juniper woodlands, coniferous forests and mixed grass prairies. They will roost in trees, caves, or man-made structures. This is the only subspecies of bat commonly found in New Mexico during winter.	Low. This species could occur within suitable habitats within portions of the project area, but was not detected during the 2012 AnaBat surveys.	No	BISON-M 2009; Findley et al. 1975; Walsh Environmental 2012b
Cave myotis (*Myotis velifer incautus*)	BLM	Subspecies inhabits mine shafts, tunnels, caves, and bridges, in desert areas of creosote bush, paloverde, brittlebush, and cacti. Even though they typically inhabit xeric areas, they are never more than a few miles from some water source such as tanks, canals, or creeks.	High. This species was detected within portions of the project area during the 2012 AnaBat surveys.	No	BISON-M 2009; Findley et al. 1975; Walsh Environmental 2012b
Big free-tailed bat (*Nyctinomops mactotis*)	BLM	This species prefers coniferous and mixed wood habitats. They can be found in piñon-juniper woodland, pine and mixed coniferous forests, desert grassland, and other desert communities. Roosting habitat is primarily on rocky cliffs, but also includes caves, rock fissures, bridges, and buildings.	Low. This species could occur within suitable habitats within portions of the project area, but was not detected during the 2012 AnaBat surveys.	No	BISON-M 2009; Findley et al. 1975; Walsh Environmental 2012b

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Fringed myotis (*Myotis thysanodes thysanodes*)	BLM	Subspecies occurs in a wide variety of vegetation types including mixed shrub, grassland, sagebrush, piñon-juniper woodland, pine and mixed conifer forests, riparian woodlands, and cropland. They are known to roost in caves, mines, and buildings.	High. This species was detected within portions of the project area during the 2012 AnaBat surveys.	No	BISON-M 2009; Findley et al. 1975; Walsh Environmental 2012b
Western small-footed myotis (*Myotis ciliolabrum melanorhinus*)	BLM	Subspecies occurs in shortgrass plains, sacaton grassland, sycamore, cottonwood, rabbitbrush, oak savanna, oak woodlands, piñon-juniper woodland, chaparral woodlands, and coniferous forest habitats.	High. This subspecies occupies a variety of habitats and was detected during the 2012 AnaBat surveys within the project area.	No	BISON-M 2009; Findley et al. 1975; Walsh Environmental 2012b
Yuma myotis (*Myotis yumanensis yumanensis*)	BLM	This subspecies is considered abundant in deserts, grasslands, and woodlands, and the riparian communities of these zones, from 4,000 to 7,000 feet. It forages at the water surface and its distribution is along permanent watercourses.	High. This species occupies a variety of habitats and was detected during the 2012 AnaBat surveys within the project area.	No	BISON-M 2009; Findley et al. 1975
Grey-footed chipmunk (*Neotamias canipes canipes*)	BLM	Subspecies is most commonly found in forested habitats; however, it also occurs in piñon-juniper woodlands, shrublands, and desert communities. It typically inhabits downed logs at the edge of clearings. It also inhabits dense stands of mixed timber and on brushy hillsides, particularly where crevices in rocks offer hiding places.	None.	Yes. This project area does not occur within the known range of this species.	BISON-M 2009; Findley et al. 1975

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Black-footed ferret (*Mustela nigripes*)	FE	Species occur in mixed shrub habitat type. Closely associated with the black-tailed prairie dog *Cynomys ludovicianus ludovicianus*) whose burrows provide cover for ferrets. The black-footed ferret is a prairie dog obligate species and the reduction in ferret populations is directly related to the reduction in prairie dog density.	None.	Yes. No prairie dog colonies are currently known to exist within the project area.	BISON-M 2009; BLM 1997; Findley et al. 1975
Arizona black-tailed prairie dog (*Cynomys ludovicianus arizonensis*)	BLM	Formerly, this subspecies was widespread and abundant east of the Rio Grande and in southwestern New Mexico. Of the five prairie dog species, the black-tailed prairie dog is the only one found on the short and mid-grass plains east of the Rockies. Black-tailed prairie dogs avoid areas with tall grass, heavy sagebrush, and other thick vegetation cover	Low. Potential habitat for the subspecies does not currently occur within the project area.	Yes. No prairie dog colonies are currently known to exist within the project area.	BISON-M 2009
Guadalupe pocket gopher (*Thomomys bottae guadalupensis*)	BLM	This subspecies occurs in any type of habitat with suitable soils for burrowing. They are documented in a wide range of elevations, from high tolow desert zones. They have been associated with open canyon woodlands, chaparral, grasslands, and pine forests. The subspecies is primarily nocturnal.	None.	Yes. This project area does not occur within known range of this subspecies.	BISON-M 2009

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Pecos River muskrat (*Ondatra zibethicus ripensis*)	BLM	Subspecies inhabits waterways that have a constant and fairly stable source of water without potential for frequent flooding events.	None.	Yes. This project area does not occur within known range of this subspecies.	BISON-M 2009
Birds					
Northern beardless tyrannulet (*Camptostoma imberbe ridgwayi)*	NM-E	Subspecies typically inhabits lower elevations in dense stands of mesquite (*Prosopis* spp.) and associated vegetation-typically along stream courses. In New Mexico, it regularly summers only in Guadalupe Canyon, Hidalgo County	None.	Yes. The potential occurrence by this subspecies would be highly unlikely, based on its known habitat and distribution in New Mexico.	BISON-M 2009; NMDGF 2008
Common black-hawk (*Buteogallus anthracinus anthracinus*)	NM-T	Found in the southwestern U.S. in cottonwood (*Populus* spp.) and other woodlands along permanent lowland streams. The principal prey of fish, amphibians, and reptiles.	None.	Yes. The potential occurrence by this subspecies would be highly unlikely, based on its known habitat and distribution in New Mexico.	BISON-M 2009; Johnsgard 1990; NMDGF 2008
Varied bunting (*Passerina versicolor versicolor*)	NM-T	In New Mexico, this species is a neotropical migrant. It typically summers in small numbers and inhabits dense, shrubby vegetation associated with relatively arid canyons.	None.	Yes. The project area does not occur within the known range or habitat for this subspecies.	BISON-M 2009; NMDGF 2008

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Neotropic cormorant (*Phalacrocorax brasilianus*)	NM-T	This species is a widespread waterbird of Central and South America. Nesting occurs in stands of trees or shrubs in or near water in areas that are free from human disturbance.	None.	Yes. The potential occurrence by this subspecies would be highly unlikely, based on its known habitat and distribution in New Mexico.	BISON-M 2009; NMDGF 2008
Bald eagle (*Haliaeetus leucocephalus alascanus*)	NM-T	In New Mexico, the subspecies nests in large cottonwoods or ponderosa pines, typically in the vicinity of water. A plentiful supply of fish and small mammals is required for prey. It tolerates limited disturbance during the nesting season.	None.	Yes. Potential occurrence by this subspecies within the project area would be highly unlikely.	BISON-M 2009; BLM 1997; Johnsgard 1990; NMDGF 2008
Aplomado falcon (*Falco femoralis septentrionalis*)	FE; NM-E	The subspecies requires extensive, contiguous desert grasslands characterized by relatively tall, dense grass cover and scattered yucca (*Yucca* spp.) and mesquite (*Prosopis glandulosa*).	Low. This rare subspecies could occur as a rare migrant near the project area.	Yes. Potential occurrence by this subspecies within the project area would be highly unlikely and would likely be limited to migrating individuals.	BISON-M 2009; BLM 1997; Johnsgard 1990; NMDGF 2008
Peregrine falcon, American (*Falco peregrines anatum*)	NM-T	In New Mexico, this subspecies breeds locally in mountain areas and migrates throughout the state. Nests are often located on cliff faces with an overhanging ledge or rock outcrop.	Low. No falcon nest sites have been identified as occurring within the vicinity of the project area.	Yes. The project area does not occur within suitable nesting habitat for this subspecies. Potential occurrence would be limited to migrating and foraging individuals.	BISON-M 2009; BLM 1997; Johnsgard 1990; NMDGF 2008

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Peregrine falcon, Arctic (*Falco peregrines tundrius*)	NM-T	This subspecies is a very rare migrant in New Mexico.	Low. This migrant subspecies could potentially forage within suitable habitat within the project area during migration.	Yes. Potential occurrence would be limited to migrating and foraging individuals.	BISON-M 2009; BLM 1997; Johnsgard 1990; NMDGF 2008
Northern goshawk (*Accipiter gentilis atricapillus*)	BLM	Subspecies occurs at elevations where stream conditions provide sufficient permanent moisture for emergent plants, deciduous trees, and shrubs. At low elevation, its habitat is characterized by cottonwood and sycamore, at mid-elevation by white alder (*Alnus rhombifolia*) and bigleaf maple (*Acer macrophyllum*), and at high elevation by willow.	None.	Yes. The project area does not occur within the known range or habitat for this subspecies.	BISON-M 2009; Johnsgard 1990
Common ground-dove (*Columbina passerine pallescens*)	NM-E	This subspecies inhabits brushy, well-watered valleys, and frequents riparian woodlands and shrublands, especially mesquite thickets along streams and canyon bottoms. Within New Mexico, it occurs primarily in the southern counties that border Mexico.	None.	Yes. The project area does not occur within the known range or habitat for this subspecies.	BISON-M 2009; NMDGF 2008
Ferruginous hawk (*Buteo regalis*)	BLM	The species is associated with open fields. Nest sites include trees, ledges, large rock outcrops, and low cliffs in sagebrush valleys and rolling grasslands.	Low. Nesting and foraging habitat for this species is not likely to occur within the project area, but is unlikely.	Yes. The potential occurrence by this subspecies would be highly unlikely, based on its distribution in New Mexico.	BISON-M 2009; Johnsgard 1990

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Broad-billed hummingbird (*Cynanthus latirostris magicus*)	NM-T	Subspecies primarily inhabits riparian woodlands at low to moderate elevations. In New Mexico, this subspecies is a regular summer resident only in Guadalupe Canyon of southwestern New Mexico (Hidalgo Co.).	None.	Yes. The project area does not occur within the known range or habitat for this subspecies.	BISON-M 2009; NMDGF 2008
Lucifer hummingbird (*Calothorax Lucifer*)	NM-T	Species occupies slopes and adjacent canyons in arid montane areas, especially where there are flowering plants such as agaves (*Agave* spp.), ocotillo (*Fouquieria splendens*), and other chaparral species. New Mexico's breeding population of this migratory species is found primarily in the Peloncillo Mountains (Hidalgo Co.).	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009; NMDGF 2008
White-faced Ibis (*Plegadis chihi*)	BLM	This species inhabits open water edges, such as shoreline and marsh habitats with cattails, rushes, and other riparian species.	None.	Yes. The potential occurrence by this species would be highly unlikely, based on its known habitat.	BISON-M 2009
Thick-billed kingbird (*Tyrannus crassitostris*)	NM-E	Species occurs innative broadleaf riparian habitats characterized by mature cottonwoods and sycamores. In New Mexico, it summers regularly only in Guadalupe Canyon, Hidalgo County.	None.	Yes. The potential occurrence by this species would be highly unlikely, based on its known habitat and distribution in New Mexico.	BISON-M 2009; NMDGF 2008

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Western Burrowing owl (*Athene cunicularia hypagaea*)	BLM	Subspecies breeds and forages in a wide variety of arid and semiarid environments including grassland, desert, and shrub-steppe habitats, and agricultural areas. It generally nests in burrows excavated by small mammals, particularly prairie dogs and ground squirrels.	High. Habitat for this subspecies may potentially exist with the project area.	No	BISON-M 2009
Brown pelican (*Pelecanus occidentalis carolinensis*)	NM-E	Subspecies usually occurs in marine habitats in warmer waters in North America; except for the lower Colorado Basin and vicinity, it only rarely occurs inland. The subspecies feeds exclusively on fish, which it usually obtains by diving head-first from heights of up to 20 meters.	None.	Yes. The potential occurrence by this subspecies would be highly unlikely, based on its known distribution in New Mexico.	BISON-M 2009; BLM 1997
Lesser prairie-chicken (*Tympanuchus pallidicinctus*)	FP; BLM	Species occurs in short- and tall-grass prairie and shrub steppe with sagebrush and yucca components. Breeding occurs on lek sites (or strutting grounds) that are typically located on sparsely vegetated elevated areas, ridgelines, or hilltops.	Moderate. Lek sites for this species have been documented northwest of the project area.	No	BISON-M 2009
Sprague's pipit (*Anthus spragueii*)	FC	This species is primarily a migrant in New Mexico.It requires large expanses of native grasslands of intermediate height, sparse to intermediate vegetation density, low forb density, little bare ground, and a shallow litter depth.	Low. This species is considered a winter migrant within the project area.	Yes. The potential occurrence by this species would be highly unlikely, based on the lack of suitable habitat within the project area.	BISON-M 2009

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Loggerhead shrike (*Lanius ludovicianus excubitorides*)	BLM	Subspecies occurs in creosote bush and large succulents (*Ferocactus pringlei*, and *Echinocactus platyaconthus*) habitats in southern New Mexico	High. Nesting and foraging habitat for this species could potentially occur within the project area.	No	BISON-M 2009
Baird's sparrow (*Ammodramus bairdii*)	NM-T; BLM	In New Mexico, it is primarily a migrant. This species utilizes short-grass prairie and other grasslands.	Moderate. This winter migrant could potentially occur within the project area within suitable habitat.	No	BISON-M 2009; NMDGF 2008
Black tern (*Chlidonias niger surinamensis*)	BLM	Subspecies breeds in large marshes, usually greater than 50 acres and forages in marshes and aquatic areas. It nests in small, loose colonies, in still water. It constructs a floating nest of dead rushes in marshes, or on grass tufts in wetlands.	None.	Yes. The potential occurrence by this subspecies would be highly unlikely, based on its known habitat.	
Bell's vireo (*Vireo bellii*)	NM-T	Species occurs in dense shrubland or woodland along lowland stream courses, with willows (*Salix* spp.), mesquite (*Prosopis* spp.), and seepwillows (*Baccharis glutinosa*) being characteristic plant species.	None.	Yes. The potential occurrence by this subspecies would be highly unlikely, based on its known habitat and distribution in New Mexico.	BISON-M 2009; NMDGF 2008

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Whooping Crane (*Grus americana*)	Experimental; Non-essential Population; NM-E	This species primarily utilizes wetlands and cropland ponds bordered by agricultural fields for roosting and feeding during migration.	None.	Yes. Potential occurrence of this species within the project area would likely be limited to migrating individuals and would be highly unlikely due to the lack of suitable stop-over habitat.	BISON-M 2009
Reptiles					
Western river cooter (*Pseudemys gorzugi*)	NM-T	Species primarily inhabits streams, preferring waters with slow to moderate current, firm substrate, and abundant aquatic vegetation.	None.	Yes. The project does not occur within the known range or habitat for this species.	BISON-M 2009; Degenhardt et al. 1996
Texas horned lizard (*Phrynosoma cornutum*)	BLM	Species inhabits open deserts and grasslands with sparse vegetation. Sometimes associated with prairie dog towns. Individuals may bury themselves in loose soils that are sandy, loamy, or rocky and will hide under rocks.	Moderate to High. This species could occur within suitable habitats within portions of the project area.	No	BISON-M 2009; Degenhardt et al. 1996
Sand dune lizard (*Sceloporus arenicolus*)	NM-T; BLM	Species occurs in areas of shinnery oak sand dunes and their peripheries, where the uneven sandy terrain and wind-created blowouts are essential habitat requirements.	Low. Modeled habitat for this species does not occur within or near the project area.	No	BISON-M 2009; Degenhardt et al. 1996; NMDGF 2008; 77 FR 36872

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Mottled rock rattlesnake (*Crotalus Lepidus Lepidus*)	NM-T	Species occurs in steep, rugged mountainous areas or desert canyons and hillsides.	None.	Yes. The project does not occur within the known range or habitat for this subspecies.	BISON-M 2009; Degenhardt et al. 1996; NMDGF 2008
Grey-banded kingsnake (*Lampropeltis alterna*)	NM-E	Species occurs at elevation up to the lower limit of the juniper zone. The grey-banded kingsnake inhabits rocky igneous or limestone areas with desert vegetation. It occurs at the southern end of the Guadalupe Mountains.	None.	Yes. The project does not occur within the known range or habitat for this species.	BISON-M 2009; Degenhardt et al. 1996; NMDGF 2008
Western ribbon snake (*Thamnophis proximus diabolicus*)	NM-T	Subspecies in habitats streams, ponds, marshes, and even stock tanks. It is rarely found away from permanent water sources. Individuals may be found in dense streamside vegetation, often basking on overhanging branches.	None.	Yes. The project does not occur within the known range or habitat for this subspecies.	BISON-M 2009; Degenhardt et al. 1996
Plainbelly water snake (*Nerodia erythrogaster transversa*)	NM-E	Subspecies is semi-aquatic and inhabits rivers, irrigation ditches, and rocky intermittent streams with abundant fish and frogs. Often hides in dense streamside vegetation.	None.	Yes. The project does not occur within the known range of this subspecies.	BISON-M 2009; Degenhardt et al. 1996; NMDGF 2008

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Fish					
Headwater catfish (*Ictalurus iupus*)	BLM	Species occupies clear temperate waters generally with a moderate gradient in headwater streams, or in fluctuating tailwaters of dams in the Pecos River.	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009
Greenthroat darter (*Etheostoma lepidum*)	NM-T	Species occurs in swift-flowing streams and springs, especially vegetated riffle areas with gravel and rubble substrates.	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009; NMDGF 2008; Propst 1999
Pecos gambusia (*Gambusia nobilis*)	NM-E	Species occurs mainly in ponded habitats and gypsum sink holes on Bitter Lake National Wildlife Refuge and at Blue Spring.	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009; BLM 1997; NMDGF 2008; Propst 1999
Bigscale logperch (*Percina macrolepida*)	NM-T	Species occurs in deep rivers, preferably with a strong current and rubble-gravel substrate; however, it also is found in rivers with nearly imperceptible flow and in impoundments.	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009; NMDGF 2008; Propst 1999
Pecos pupfish (*Cyprinodon pecosensis*)	NM-T	Species occurs in a variety of habitats ranging from saline springs and gypsum sinkholes to desert streams with highly fluctuating conditions.	None.	Yes. Saline habitat is known to occur within and near the project area but there is no perennial waterbody and it is not known to occur.	BISON-M 2009; BLM 1997; NMDGF 2008; Propst 1999

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Grey redhorse (*Moxostoma congestum*)	NM-T	Species typically inhabits is deep, slow-velocity waterbodies with a variety of substrates (most commonly silt or limestone bedrock). It is known to occur in the Pecos and Black rivers.	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009; NMDGF 2008; Prost 1999
Pecos bluntnose shiner (*Notropis simus pecosensis*)	NM-T	Subspecies mainly occurs in pool and run mesohabitats within wide, shallow, sand-bed reaches of the Pecos River. Substrates are largely shifting sand and small gravel.	None.	Yes. The project area does not occur within the known range or habitat for this subspecies.	BISON-M 2009; BLM 1997; NMDGF 2008; Propst 1999
Rio Grand shiner (*Notropis jemezanus*)	BLM	Species inhabits large open rivers with laminar flows and a minimum of aquatic vegetation and larger streams with gravel, sand or rubble bottoms, which are sometimes overlain with silt.	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009
Blue sucker (*Cycleptus elongates*)	NM-E; BLM	Species typically inhabits smooth, hard-bottomed reaches of larger streams where current velocity is rapid and deep. Known to occur in the Pecos River from north of Carlsbad downstream to the New Mexico/Texas border and the lower reaches of the Black River.	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009; NMDGF 2008; Propst 1999
Mexican tetra (*Astyanax mexicanus*)	NM-T	Species inhabits low-velocity pools in small streams and spring systems.	None.	Yes. The project area does not occur within the known range or habitat for this species.	BISON-M 2009; NMDGF 2008; Propst 1999

Table 3.8-1 Sensitive Wildlife Species Potentially Occurring Within the Project Area

Common Nam (Scientific Name)	Status[1]	Habitat Information[2]	Potential for Occurrence within the Project Area	Eliminated from Detailed Analysis	References
Invertebrates					
Pecos springsnail (*Pyrguopsis pecosensis*)	NM-T; BLM	Species is endemic to two perennial tributaries of the Black River. Species lives within a few meters of the stream issuing from Blue Springs, where it utilizes the shelter of dead tree-branches and on damp soil.	None.	Yes. Mesic habitats occupied by this species would not be affected within the project area.	BISON-M 2009; NMDGF 2008
Ovate vertigo snail (*Vertigo ovate*)	NM-T	Species inhabits mud and pebble substrate in its spring habitat, primarily along the edges of the water. Extant populations are known from mesic habitats of Blue Spring. At Blue Spring, the species is most common at the spring source and along the natural channel, which is approximately 2 meters in width and 1 to 2 meters in depth.	None.	Yes. Mesic habitats occupied by this species would not be affected within the project area.	BISON-M 2009; NMDGF 2008

[1]Status:

FE	=	Federally listed as endangered.
FT	=	Federally listed as threatened.
FP	=	Federally proposed for listing.
FC	=	Federal candidate.
NM-E	=	State-listed as endangered in New Mexico.
NM-T	=	State-listed as threatened in New Mexico.
BLM	=	BLM sensitive species.

Cave Myotis (BLM). In New Mexico, the cave myotis can be found in desert floodplains, rocky canyonlands, and desert grassland, which include creosote, brittlebush, paloverde, and cacti (AGFD 1993; Findley et al. 1975; Harvey et al. 1999). Limited roost habitat such as caves, mines and occasionally man-made structures often determine the presence of this species (Findley et al. 1975; Harvey et al. 1999). Additionally, the cave myotis typically roosts near water (AGFD 1993). The species is likely to hibernate in the numerous caves located in Lincoln, Chaves, and Eddy counties (Findley et al. 1975).

Surveys conducted using AnaBat detectors between May and October 2012 (Walsh Environmental 2012b) detected the occurrence of multiple *Myotis* species within the project area. The *Myotis* genus, categorized as “high-frequency bat species”, is difficult to identify to species using the AnaBat detector. Exceptions within this group include the fringed myotis and western pipestrelle, which have distinctive calls and can be identified to species (Walsh Environmental 2012b). The 2012 surveys indicated that at least three, but as many as six, high-frequency bat species were detected within the project area (Walsh Environmental 2012b). The six species detected include the cave myotis. Based on the presence of this species during the 2012 surveys and the known distribution and habitat, the potential for this species to occur within the project area is considered high.

Big Free-tailed Bat (BLM). The big free-tailed bat prefers to roost in rugged, rocky areas in desert scrub habitats in cliff faces, crevices, and fissures (AGFD 1993; Harvey et al. 1999). Vegetation present within preferred habitat includes creosote bush, blackbrush, sandsage, snakeweed, mesquite, and rabbitbrush (AGFD 1993). The bat is known to roost in crevices high up on cliff faces but it also has been known to roost in buildings (AGFD 1993; Harvey et al. 1999). Surveys conducted using AnaBat detectors between May and October 2012 (Walsh Environmental 2012b) did not detect the occurrence of big free-tailed bats within the project area. Based on these findings and the species’ known distribution and habitat requirements, the potential for this species to occur within the project area is considered low.

Fringed Myotis (BLM). The fringed myotis occupies a wide range of habitats ranging from desert scrub communities to higher elevation coniferous and pine forests (AGFD 1993; Harvey et al. 1999). Fringed myotis use mines, caves, and buildings for roosting sites (AGFD 1993; Findley et al. 1975; Harvey et al. 1999). The species seems to “prefer oak woodlands, from which it forages out into nearby habitats including low desert, chaparral, and ponderosa pine“(AGFD 1993).

Surveys conducted using AnaBat detectors between May and October 2012 (Walsh Environmental 2012b) detected the occurrence of fringed myotis within the project area (Walsh Environmental 2012b). Based on the presence of this species during the 2012 surveys and the known distribution and habitat, the potential for this species to occur within the project area is considered high.

Western Small-footed Myotis (BLM). The western small-footed myotis seems to prefer arid habitats associated with cliffs, talus fields, and prairies with steep riverbanks (Harvey et al. 1999). This distribution mainly includes ponderosa pine habitats, but the species also may be found in low desert up through spruce-fir habitats (Findley et al. 1975). This species roosts in crevices in rock faces and clay banks and may use the spaces beneath and between boulders in talus fields. Hibernation sites include caves and mines (Harvey et al. 1999).

Surveys conducted using AnaBat detectors between May and October 2012 (Walsh Environmental 2012b) detected the occurrence of multiple *Myotis* species within the project area. The *Myotis* genus, categorized as “high-frequency bat species”, is difficult to identify to species using the AnaBat detector. Exceptions within this group include the fringed myotis and western pipestrelle, which have distinctive calls and can be identified to species (Walsh Environmental 2012b). The 2012 surveys indicated that at least three, but as many as six, high-frequency bat species were detected within the project area (Walsh Environmental 2012b). The six species detected include the western small-footed myotis. Based on the presence of this species during the 2012 surveys and the known distribution, the potential for this species to occur within the project area is considered high.

Yuma Myotis (BLM). In New Mexico, the Yuma myotis is a water-surface forager (AGFD 1993; Findley et al. 1975; Harvey et al. 1999). Its distribution is tied to permanent watercourses, usually lower than the coniferous forest zone. The Yuma myotis prefers desert, grassland, woodland, and associated riparian communities, between 4,000 to 7,000 feet in elevation (Findley et al. 1975). Unlike many other bat species, the Yuma myotis is not known to roost in caves or mines, but prefers buildings and under bridges (AGFD 1993).

Surveys conducted using AnaBat detectors between May and October 2012 (Walsh Environmental 2012b) detected the occurrence of multiple *Myotis* species within the project area. The *Myotis* genus, categorized as “high-frequency bat species”, is difficult to identify to species using the AnaBat detector. Exceptions within this group include the fringed myotis and western pipestrelle, which have distinctive calls and can be identified to species (Walsh Environmental 2012b). The 2012 surveys indicated that at least three, but as many as six, high-frequency bat species were detected within the project area (Walsh Environmental 2012b). The six species detected include the Yuma myotis. Based on the presence of this species during the 2012 surveys and the known distribution and habitat, the potential for this species to occur within the project area is considered high.

<u>Birds</u>

Burrowing Owl (BLM). The burrowing owl is a ground-nesting bird that is strongly dependent on the presence of burrows constructed by prairie dogs, ground squirrels, or badgers. Prime burrowing owl habitat must be open, have short vegetation, and contain an abundance of burrows. No burrowing owls have been observed during previous surveys of the project area (Walsh Environmental 2011); however, the potential for this species to occur within the project area is considered to be high.

Lesser Prairie-chicken (FP, BLM). In southeastern New Mexico, lesser prairie-chickens are found in isolated areas east of the Pecos River in shinnery oak habitat (BLM 2007b, 1994; New Mexico LPC/SDL Working Group 2005). The EIS associated with the Proposed RMP Amendment (BLM 2007b) states “Lesser prairie-chicken populations south of State Highway 380 in Eddy and Lea counties are rare on BLM properties and surrounding areas; however, there have been sightings of scattered small groups and individuals.”

The BLM Special Status Species Proposed RMPA and EIS (BLM 2007b) identified “zones” for the lesser prairie-chicken based on lek sites, and vegetation and habitat composition. The plant site and northern and western portions of the mine area are located within Isolated Population Areas. Additionally, the northern portion of the mine area is located within a Habitat Evaluation Area. **Figure 3.8-2** shows the proximity of the project area to known lesser prairie-chicken habitat. Spring lesser prairie-chicken listening surveys conducted by Walsh Environmental (2013, 2012a, 2011) did not detect any lesser prairie-chickens within the project area. Based on the species’ known distribution and habitat requirements, the potential for this species to occur within the project area is considered low.

Loggerhead Shrike (BLM). The loggerhead shrike is associated with a wide variety of vegetation types throughout its large range (New Mexico Avian Conservation Partners Website [NMACP] 2010). In New Mexico, this species is associated with open country with short vegetation, including desert grasslands, shrublands, and open woodlands or juniper savannahs (NMACP 2010). Breeding is often associated with isolated trees or large shrubs, while nesting sites can be found in thorny shrubs (NMACP 2010). In desert areas, tall yucca stems are often used as hunting perches. Foraging often occurs in open areas with short grass, but the presence of shrubs is critical (NMACP 2010). Based on the species’ known distribution and habitat requirements, the potential for this species to occur within the project area is considered moderate to high.

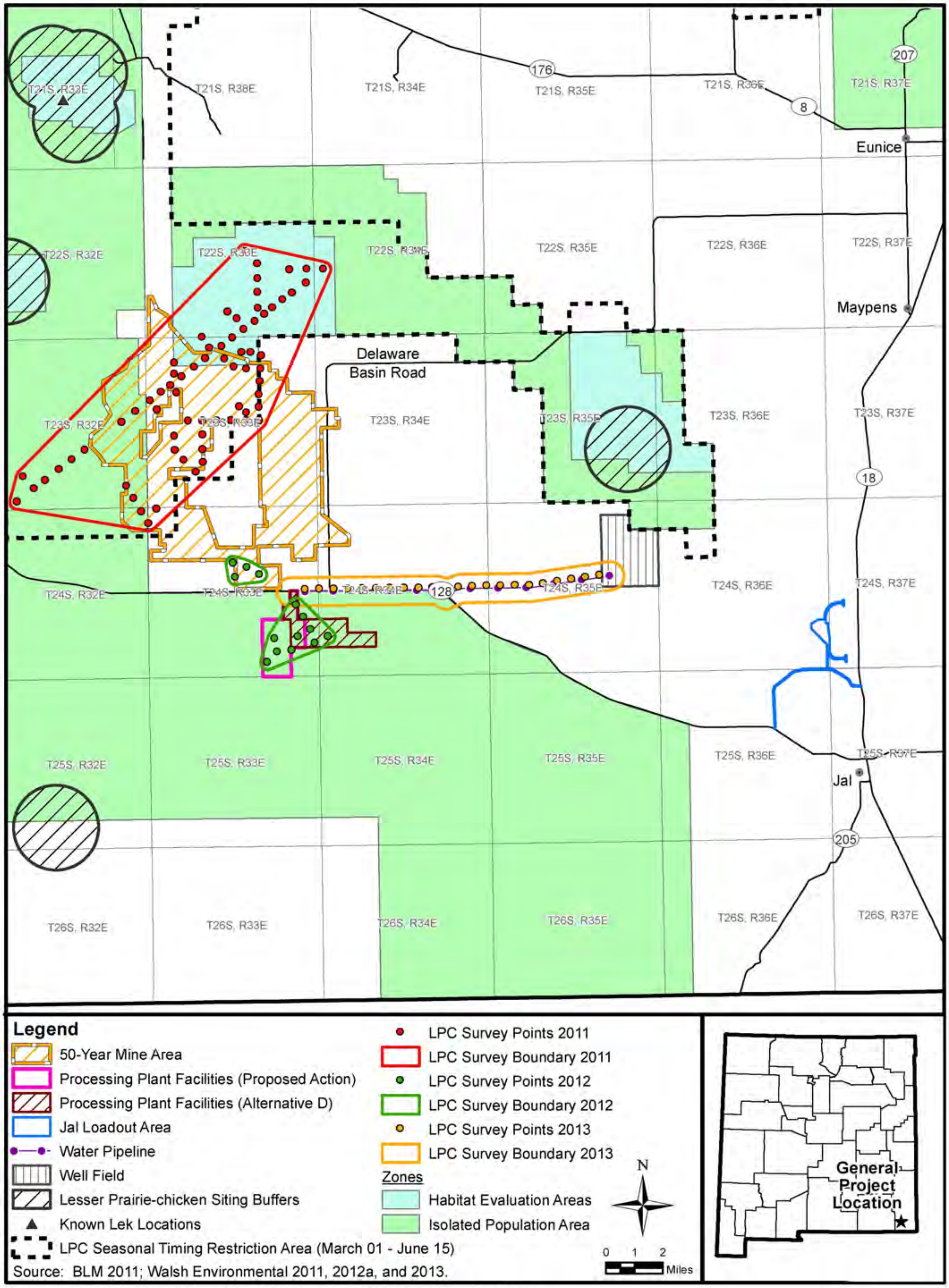


Figure 3.8-2 Lesser Prairie-chicken Habitat Near Project Area

Baird's Sparrow (NM-T, BLM). The Baird's sparrow breeds in shortgrass prairies. In New Mexico, it has been found in habitats ranging from desert grasslands in the south to prairies in the northeast, and mountain meadows in the San Juan and Sangre de Cristo mountains (BISON-M 2009). They are primarily migrants in New Mexico moving through the eastern plains and southern lowlands, but wintering birds also occur locally in grasslands to the west of the project area (NMDGF 2008). Based on the species' known distribution and habitat requirements, the potential for this species to occur within the project area is considered moderate.

Reptiles

Texas Horned Lizard (BLM). The Texas horned lizard inhabits flat, open, generally dry country with little plant cover, except for bunchgrass and cactus (BISON-M 2009). It can be found in open deserts and grasslands up to 6,000 feet in elevation (Degenhardt et al. 1996). Strictly terrestrial, this lizard can bury itself in loose soil that is sandy, loamy, or rocky (BISON-M 2009). No lizards were captured during the 2012 pitfall trap surveys conducted for the project area (Walsh Environmental 2012a). Based on the species' known distribution, the potential for this species to occur within the project area is considered moderate to high.

Sand Dune Lizard (NM-T, BLM). In southeastern New Mexico, the sand dune lizard is restricted to habitats associated with active and semi-stabilized sand dunes (BLM 2007b), and the associated blowouts (open, low-lying areas between active dunes) found between dunes (New Mexico LPC/SDL Working Group 2005). Habitat must support scattered stands of shinnery oak (*Quercus havardii*) and sand sage (*Artemisia filifolia*) as co-dominated plant species (BLM 2007b). The sand dune lizard is mainly threatened by activities that impact or remove the shinnery oak habitat (New Mexico LPC/SDL Working Group 2005). The species has been found mainly in northeastern Chaves County southward and eastward through eastern Eddy County and southern Lea County (BLM 2007b).

The BLM Special Status Species Proposed RMPA and EIS (BLM 2007b) proposed a Conservation Strategy Planning Area that includes known habitats for the sand dune lizard within southeastern New Mexico. The known distribution includes a mosaic of shinnery oak dunal habitat types within 20 km of an occupied site, measured from the outer edge of that contiguous habitat site (BLM 2007b). The nearest known location of sand dune lizard habitat is approximately 15 miles north of the project area. **Figure 3.8-3** displays the sand dune lizard protected habitat closest to the project area. No lizards were captured during the 2012 pitfall trap surveys conducted for the project area (Walsh Environmental 2012a). Based on the species' known distribution, the potential for this species to occur within the project area is considered low.

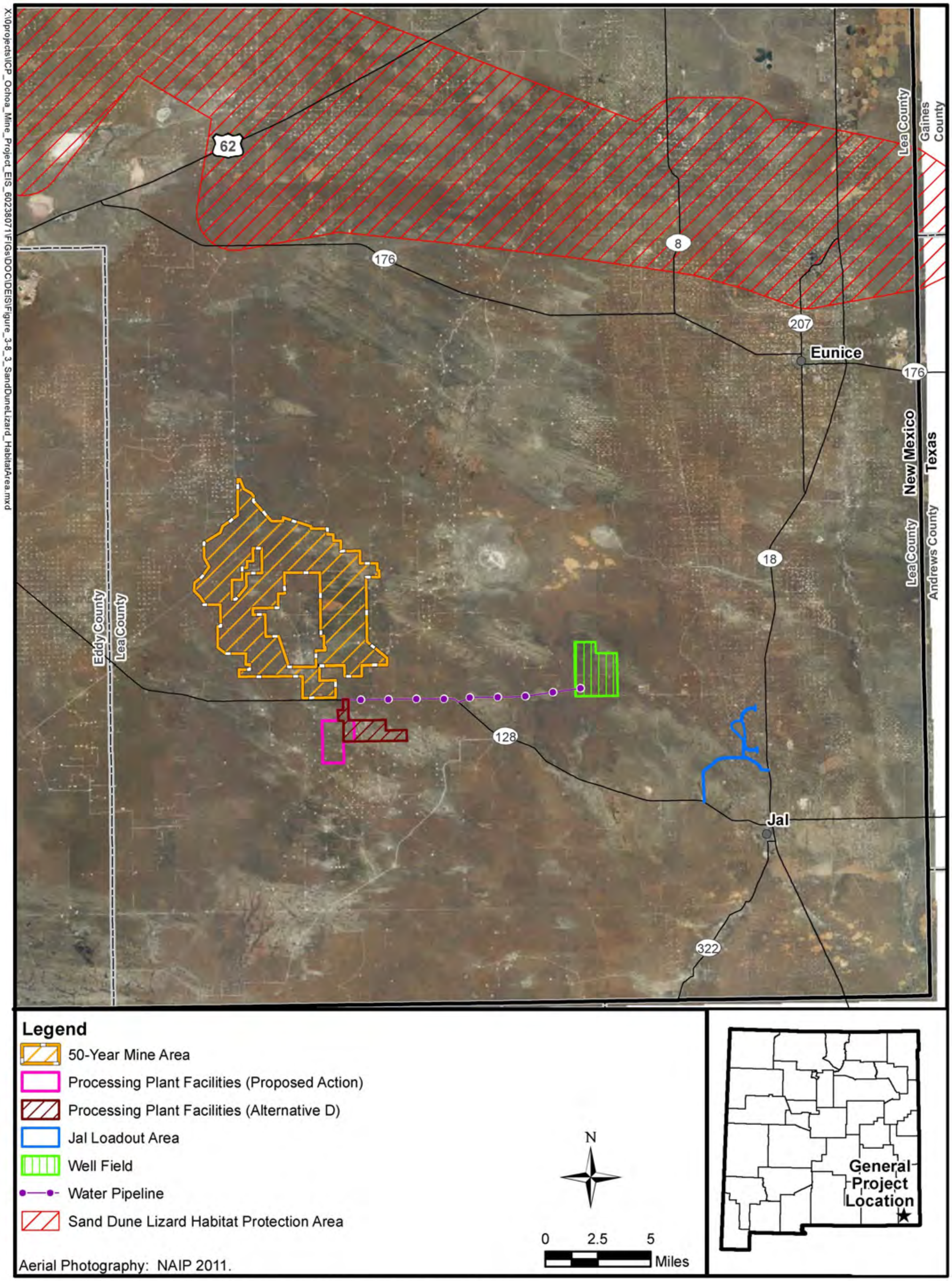


Figure 3.8-3 Sand Dune Lizard Habitat near Project Area

3.9 Rangelands/Livestock Grazing

The following section presents range resources in the proposed project area. The study area for range resources is defined as the proposed project area, which includes the 50-year mine plan boundary; the shaft and associated facilities; the two plant facilities locations, the Jal loadout area; well field locations, and water pipeline ROWs that occur outside of the 50-year mine plan boundary. There are 10 grazing allotments that occur in the project area, the majority of which are cattle allotments; one allotment also is used for saddle horses (Fairview).

Many of the grazing allotments in the project area are authorized under Section 15 of the Taylor Grazing Act of 1934 (43 USC 315). Section 15 addresses grazing leases on public lands outside of the original grazing district boundaries that were authorized under the Act. A lessee on a Section 15 grazing allotment must have a base property (outside of the allotment) that is capable of producing crops or forage that can be used to support the livestock authorized, and is adjacent to the leased public lands unless no applicant owns adjoining lands. On Section 15 grazing allotments, granted by lease rather than permit as used for the other allotments, the grazing fees are charged as payment for forage consumed as measured by AUMs, instead of on an acreage basis as is done for other grazing allotments.

Table 3.9-1 summarizes each grazing allotment within the project area, including acreage calculations, current stocking rates, and permitted uses. Land ownership is predominantly public with a small portion of four allotments encompassing private land. The majority of the allotments are grazed using a deferred rotational grazing scheme, where at least one pasture each year is allowed to recover ungrazed during a growing season. **Figure 3.9-1** illustrates the grazing allotments found within the project area.

The grazing allotments are categorized into one of three management categories: Improve (I), Maintain (M), or Custodial (C)." These categories are based on present conditions, potential for improvement, other resource conflicts, and opportunities for positive economic return on public investments. An allotment can be reassigned to a different management category if resource conditions in the allotment change, or new and/or better data becomes available. The highest priority for management are allotments assigned to the I category. The second priority is allotments in the M category. Issues that arise on allotments in the C category are addressed when conflicts arise. Management goals for the allotments in the I category are geared towards improving resource conditions, while for allotments in the M category, management goals are to maintain current resource conditions. For allotments in the C category, custodial management works to prevent resource deterioration. In the project area, the allotments assigned to the M category include Fairview, Red Tank, and Swag. Only one allotment, Antelope Ridge, is assigned to the I category. The rest of the allotments are ranked in the C category. Management activities generally include vegetation treatments to improve rangeland health and forage.

Range improvements in the project area include base water, water wells, storage tanks, water pipelines, troughs, retention dams, fences, windmills, and corrals. Range study trend plots are located in the 50-year mine area and one of the processing plant facility locations.

Table 3.9-1 Grazing Allotments in the Project Area

Grazing Allotment Name	Livestock		Total Allotment Active AUMs	Allotment Acreage in Project Area	Active BLM AUMs in Project Area	Season of Use	% of Public Land
	Type	Number					
Antelope Ridge	Cattle	950	9,576	1,895	233	3/1 - 2/28	84
Fairview	Cattle/Horse	363/7	3,703/71	425	56	3/1 - 2/28	85
Jal Northwest	Cattle	4	48	25	<1	3/1 - 2/28	100
Ochoa Northwest	Cattle	1	4	1,600	0[1]	3/1-6/30	100
Red Tank	Cattle	830	3,686	<1	<1	3/1 - 2/28	37
Red Tank II	Cattle	29	348	7,627	348	3/1 - 2/28	100
San Simon Swale	Cattle	53	636	9,058	122	3/1 - 2/28	100
Swag	Cattle	160	1,805	2,335	446	3/1 - 2/28	94
Swag II	Cattle	7	84	6,972	84	3/1 - 2/28	100
Sand Dune	Cattle	50	598	7,778	184	3/1 - 2/28	100

[1] The BLM portion of this allotment associated with the AUMs identified lies completely outside the project area.

Note: The number and class of livestock, active animal unit months (AUMs), and stocking rates come from the full grazing lease or permit numbers. Due to market conditions, rainfall, and amount of forage produced each year, actual numbers of livestock grazed and AUMs used are lower than the values above. Grazing permittees or lessees have the option to take the non-use option as conditions warrant.

Source: BLM 2012b.

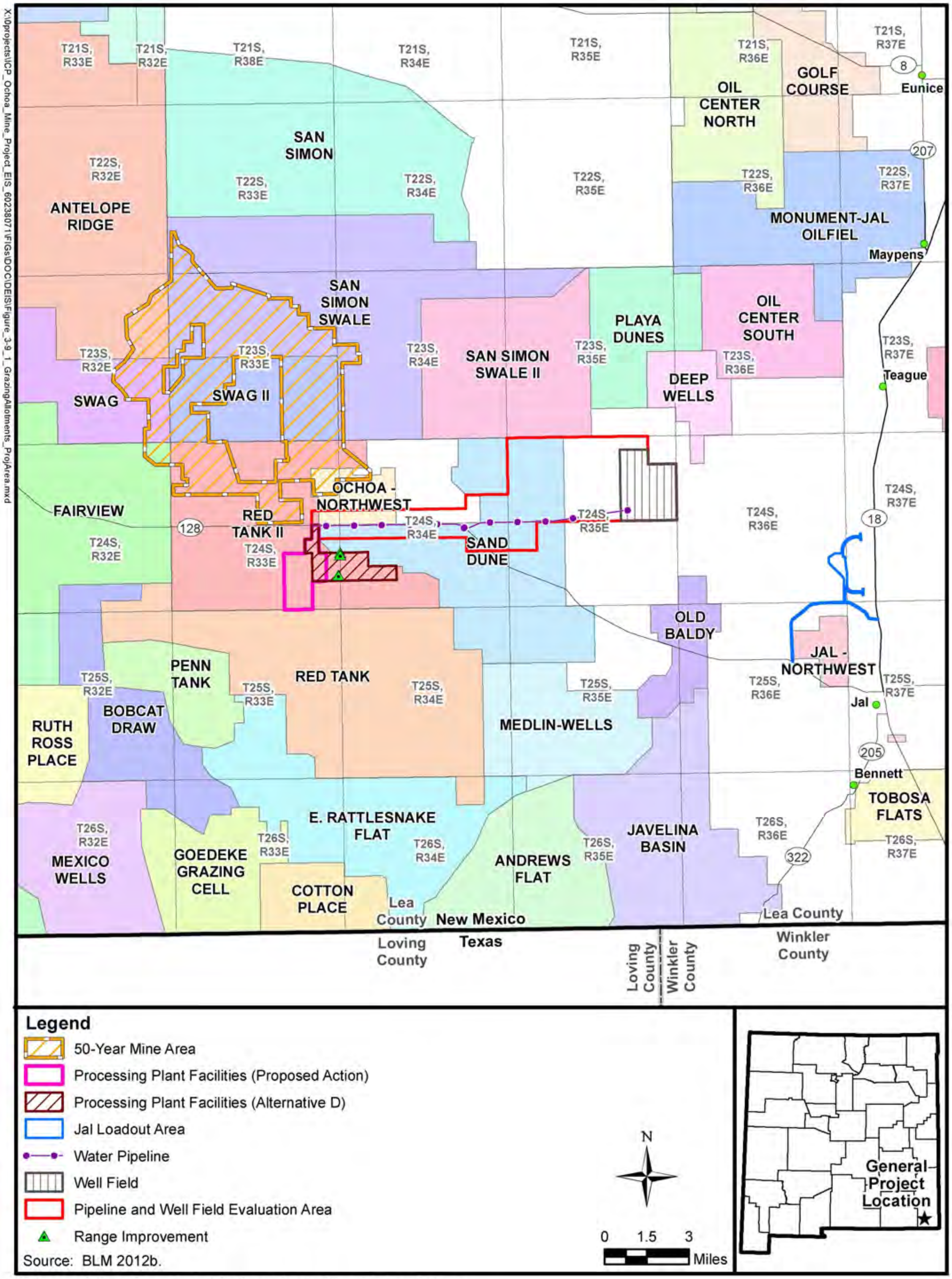


Figure 3.9-1 Grazing Allotments in the Project Area

3.10 Lands and Realty

The project area for lands and realty includes the 50-year mine area, the shaft and associated facilities, plant facilities, the Jal loadout area, the well field, and water pipeline ROW. Land use is currently comprised of livestock grazing, recreation, and oil and gas wells and associated infrastructure. Due to the nature of the existing land uses, approximately 2 percent (707 acres) of the project area has surface disturbance.

3.10.1 Land Ownership

As noted in **Table 3.10-1**, the State of New Mexico is the predominant landowner in the project area, managing 53 percent of the surface lands. Revenue generated from activities on state lands is paid to beneficiaries such as schools and hospitals (New Mexico State Land Office 2011). Private/fee land and federal lands, administered by the BLM, make up the remainder of the landowners within the project *area boundary.*

Table 3.10-1 Land Ownership

	50-Year Mine Boundary		Plant Site		Jal Loadout		Pipeline ROW/ Well Field	
Ownership	**% Ownership**	**Acres**	**% Ownership**	**Acres**	**% Ownership**	**Acres**	**% Ownership**	**Acres**
Federal Lands	18	5,007	100	1,842	3	13	<1	6
State Lands	59	16,053	0	0	19	85	18	293
Private	23	6,142	0	0	79	361	82	1,332
Total	**100**	**27,202**	**100**	**1,842**	**100**	**459**	**100**	**1,631**

Some of the BLM land within the project area has been identified for disposal in the RMP/EIS currently under development by the BLM Carlsbad Field Office. Final decisions on parcels available for disposal will not be made until the RMP revision process has been completed.

3.10.2 Transportation

The project area is transected by one state road and numerous county and BLM gravel roads and unimproved access roads. New Mexico Highway 128 (NM 128) crosses the southern portion of the project area in an east-west direction, initiating southeast of Carlsbad and connecting with Jal before entering into Texas. Within the project area, primary roads include Delaware Basin Road, a paved county road, that initiates at NM 128 and runs north; Brininstool Road initiates at NM 128 and runs north; and Diamond Road initiates at NM 128 and runs south. **Figure 3.10-1** depicts the regional road network relative to the project area.

Most of the roads within the project area are BLM-maintained access roads, but there are a number of secondary non-maintained user-created two-track roads. **Table 3.10-2** details traffic on NM 128 where it crosses the project area. Average annual daily traffic increased substantially from 2008 to 2009, peaking in 2010 before declining 27 percent from 2010 to 2012. The majority of daily traffic categorized as heavy commercial, is most likely related to oil and gas operations.

Table 3.10-2 Current Traffic Volume Near the Project Area

Route	AADT 2007	AADT 2008	AADT 2009	AADT 2010	AADT 2011	AADT 2012	% Change Heavy Commercial (2007 – 2012)	% Change 2007 – 2012
NM 128 from Eddy/Lea County Line to Junction NM 205 in Jal	505	495	1,894	1,917	1,402	1,408	70	179

AADT = annual average daily traffic.

Source: Valencia 2012, 2013.

3.10.3 Rights-of-Way

There are two common types of ROWs within the BLM Carlsbad Field Office area—ROW grant authorizations and sundry ROWs. Sundry ROWs may include pipelines, roads, and power lines within oil and gas leases. There are no designated utility corridors in or adjacent to the project area. The nearest designated utility corridor is approximately 15 miles northwest of the project area. ROWs for oil and gas pipelines, roads, water pipelines, and transmission lines are permitted in and near the project area. **Table 3.10-3** summarizes the number of permitted ROWs within the project area by ROW of type. Oil and gas pipelines followed by roads make-up the majority of permitted ROWs.

Table 3.10-3 Rights-of-Way within Project Area

	Oil and Gas Pipeline	Water Pipeline	Roads	Transmission Lines	Unknown
Number of ROWs	18	8	16	10	9

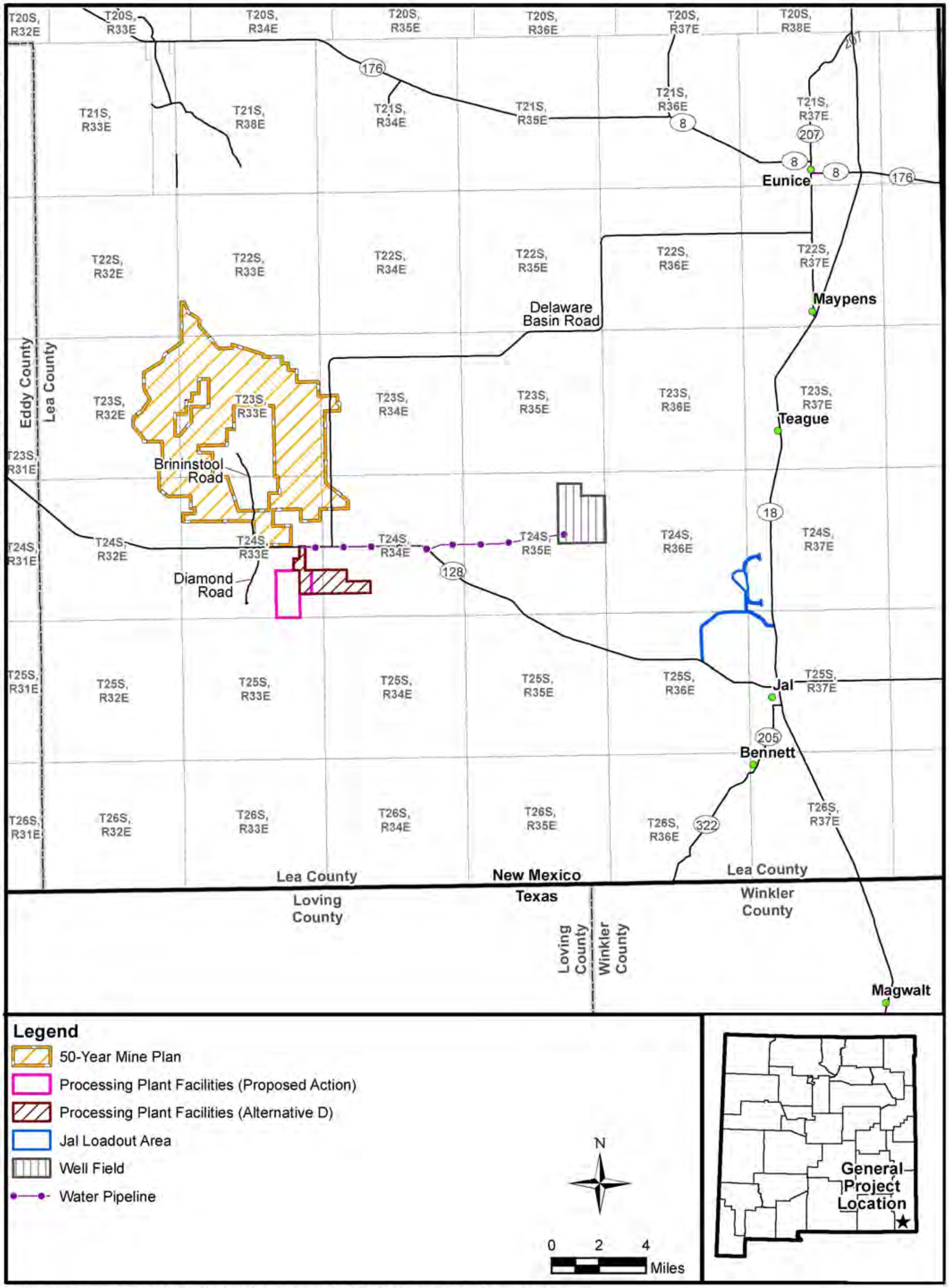


Figure 3.10-1 Regional Road Network Serving The Project Area

3.11 Recreation

The project area for recreation includes the 50-year mine area, the shaft and associated facilities, plant facilities, the Jal loadout area, well field locations, and water pipeline ROW. Recreation in the project area is currently comprised of off-highway vehicle (OHV) activities as well as hunting, camping, and picnicking. All public lands in the BLM Carlsbad Field Office Area are designated as limited, open, or closed to OHV activities. All of the BLM-administered land in the project area is designated as open to OHV use. Hunting is another recreational activity which may take place within the project area. A variety of species, from big game to varmints and upland birds, may be hunted in the project area (Younger 2012). The lack of designated recreation areas and associated facilities, assist in contributing to the undesirable recreational nature of the project area. There are no designated Recreation Management Areas within or adjacent to the project area. Hackberry Special Recreation Management Area is the nearest designated recreation area to the proposed project, 20 miles to the northwest. The nearest Area of Critical Environmental Concern and Wilderness Study Area are 17 and 47 miles away, respectively.

3.12 Visual Resources

The proposed project is located in the Pecos Valley Section of the Great Plains Physiographic Province (Fenneman 1928). The Pecos Valley Section is located between the High Plains on the east, the Raton Section to the north, the Edwards Plateau on the south, and the Mexican Sacramento Section of the Basin and Range Province on the west (**Figure 3.2-1**) (Trimble 1990). The project area includes the 50-year mine area, the shaft and associated facilities, plant facilities, the Jal loadout area, well field locations, and the water pipeline ROW. The affected environment is characterized by little variety or contrast in vegetation, a variety in colors and contrast of the soil, rock, and vegetation, as well as existing and abandoned oil and gas facilities. The project area is sparsely populated.

The BLM is responsible for managing the public lands for multiple uses, while ensuring that the scenic values of public lands are considered before allowing uses that may have adverse visual impacts. The BLM accomplishes this by assigning areas according to its Visual Resource Management (VRM) system. Each VRM class describes the degree of modification allowed to the basic elements of the landscape. The following are the minimum management objectives for each class, based on BLM Handbook H-8410-1, Visual Resource Inventory.

- Class I: Natural ecological changes and very limited management activity are allowed. Any contrast created within the characteristic landscape must not attract attention. This classification is applied to Visual Areas of Critical Environmental Concern, wilderness areas, wild and scenic rivers, and other relatively undisturbed landscapes.
- Class II: Changes in any of the basic elements (form, line, color, texture) caused by a management activity should not be evident in the landscape. A contrast may be seen but should not attract attention.
- Class III: Changes should repeat the basic elements found in the predominant natural features of the characteristic landscape. Contrasts to the basic elements caused by a management activity may be evident and begin to attract attention in the landscape. The changes, however, should remain subordinate in the existing landscape.
- Class IV: Contrasts may attract attention and be a dominant feature in the landscape in terms of scale. However, the changes should repeat the basic elements of the landscape.

Federal lands within the proposed project boundary are managed as VRM Class IV, in which the level of change of the characteristic landscape can be high. Management activities may dominate the view and be the primary focus of viewer attention. However, every attempt should be made to minimize the visual impact of activities through careful location of facilities, minimal disturbance, and repetition of the basic landscape elements of color, form, line, and texture.

3.13 Cultural Resources

Cultural resources are defined as the specific locations and/or tangible remains and material evidence resulting from, or associated with, past human activity. Cultural resources encompass a diverse array of property types including buildings, structures (e.g., bridges, canals, railroads), sites, objects, and districts. In addition, certain cultural resources may be defined as cultural landscapes, which are classified either as historic sites, historic designed landscapes, historic vernacular landscapes, or ethnographic landscapes (NPS 1998). Finally, certain places of traditional, cultural, or religious importance to a living community or cultural group may qualify for consideration as Traditional Cultural Properties, or TCPs (Parker and King 1998).

3.13.1 Regulatory Framework

Federal historic preservation laws provide a mandate and procedures for the identification, documentation, evaluation, and protection of cultural resources that may be affected by federal undertakings, which can include private undertakings operating under federal license, or on federally managed lands. The NEPA requires federal agencies involved in undertakings to consider the potential effects to the “human environment”—an all-encompassing term which has been interpreted to include cultural resources.

NHPA of 1966, as amended, requires federal agencies to consider an undertaking’s effects on historic properties, which are defined as cultural resources (including both historic and archaeological sites) listed or determined officially eligible for listing on the NRHP. Section 106 of the NHPA and accompanying implementing regulations specified in 36 CFR 800 (“Protection of Historic Properties”) establish a collaborative consultation/review process and specific sequential procedures which enable federal agencies to identify historic properties that may be directly or indirectly affected by a proposed federal undertaking.

As the lead federal agency, the BLM’s compliance with the NHPA is guided by a National Programmatic Agreement (NPA) established between the BLM, the Advisory Council on Historic Preservation (ACHP), and the National Conference of State Historic Preservation Officers (SHPO). The NPA resulted in the development of operational protocols by the BLM offices in each state. In New Mexico, the Protocol Agreement (BLM 2004) between the BLM and New Mexico SHPO defines how the BLM and SHPO will interact and cooperate under the NPA, and provides direction for implementing the NHPA.

Under the New Mexico Protocol Agreement (BLM 2004), adverse impacts to NRHP-eligible sites discovered prior to or during construction would be mitigated through data recovery. A monitoring and data recovery or treatment plan that is reviewed and approved by the BLM and SHPO must be developed and implemented prior to construction for any NRHP-eligible sites that would be damaged. The treatment plan details the steps to be taken if any previously unknown archaeological sites are discovered during project-related construction. A NAGPRA Plan of Action may be developed as part of the treatment plan. If discoveries are made, all construction activities would cease in the area of the discovery, and the BLM Authorized Officer (AO) would be notified. Steps would be taken to protect the site from vandalism or further damage, such as fencing or other security measures, until the BLM could evaluate the nature of the discovery.

If construction or other project personnel discover what might be human remains, funerary objects, or items of cultural patrimony on federal land, the Native American Graves Protection and Repatriation Act (NAGPRA) would apply. Construction would cease in the area of the discovery, and the BLM AO and BLM law enforcement officer would be notified within 24 hours. Steps would be taken to protect the remains from vandalism or further damage, such as fencing or other security measures. On state or private land, the New Mexico state burial law would apply.

3.13.2 Eligibility Criteria for Listing Cultural Resources on the NRHP

The NRHP is the nation's inventory of significant cultural resources. For purposes of Section 106 compliance and compliance with the NEPA, resources determined officially NRHP-eligible through consultation as well as those already listed on the NRHP warrant impact assessment. To qualify as a historic property, a property must generally be at least 50 years old, and must meet the integrity criteria requiring that a resource must "possess integrity of location, design, setting, materials, workmanship, feeling, and association," NRHP Criteria for Evaluation (36 CFR 800.4).The property also must meet at least one of the following criteria:

- **Criterion A—**that are associated with events that have made a significant contribution to the broad patterns of our history; or
- **Criterion B—**that are associated with the lives of persons significant in our past; or
- **Criterion C—**that embody the distinctive characteristics of a type, period, or method of construction, or that represent the work of a master, or that possess high artistic values, or that represent a significant and distinguishable entity whose components may lack individual distinction; or
- **Criterion D—**that yielded, or may be likely to yield, information important in prehistory or history.

The area of potential effects (APE) to cultural resources associated with a specific federal undertaking is defined in 36 CFR 800.16(d) as "the geographic area or areas within which an undertaking may directly or indirectly cause changes in the character or use of historic properties, if any such properties exist. The area of potential effects is influenced by the scale and nature of an undertaking and may be different for different kinds of effects caused by the undertaking."

The APE should include the following:

- All alternative locations for all elements of the project;
- All locations potentially subject to ground disturbance resulting from mine construction activities;
- All locations from which elements of the project (e.g., aboveground facilities) might be visible;
- All locations in which the project might cause permanent changes to traffic patterns, land use, and public access.

The project APE for cultural resources corresponds to the project area, within which ground disturbance associated with mine construction, operation, and/or reclamation would occur. The project area includes the 50-year mine area, the shaft and associated facilities, plant processing facilities, the Jal loadout facility and associated access road; well field locations, and water pipeline ROW. Where applicable, the APE for indirect impacts includes those ancillary facilities, or other project elements, that are visible from historic properties in which setting contributes to their NRHP eligibility.

3.13.3 Culture History

The proposed project falls within the Southeastern New Mexico Archaeological Region. This region contains the following cultural/temporal periods: Paleoindian (ca. 12,000 – 8000 B.C.), Archaic (ca. 8000 B.C. – A.D. 950), Ceramic (ca. A.D. 600 – 1540), Protohistoric and Spanish Colonial (ca. A.D. 1400 – 1821), and Mexican and American Historical (ca. A.D. 1822 to early 20th Century). Sites representing any or all of these periods are known to occur within the region. A more complete discussion of these cultural/temporal periods can be found in *The Human Landscape in Southeastern New Mexico: A Class I Overview of Cultural Resources Within the Bureau of Land Management's Carlsbad Field Office Region* (Railey 2012).

3.13.4 Cultural Resources Investigations

To date, four Class III cultural resources inventories have been conducted within proposed disturbance areas.

- Class III cultural resource survey for the proposed ICP potash processing facilities (Hroncich-Conner and Walley 2012a), with supplemental research at site LA 172156 (Hill 2012);
- Class III cultural resource survey of the proposed ICP potash mine shaft area (Hroncich-Conner and Walley 2012b); and
- Class III cultural resource survey of the proposed ICP potash loadout facility and associated access road (Hroncich-Conner and Walley 2012c).
- Class III cultural resource survey of the proposed ICP water pipeline ROW (Boone Archaeological Services 2013) and two Capitan water wells and associated access roads (Boone Archaeological Services 2011).

Three of the inventories encountered cultural resources, including a total of 27 archaeological sites, one historic railroad, and 219 isolated manifestations. Four of the archaeological sites have been recommended as eligible for listing on the NRHP under Criterion D with a recommendation of avoidance or mitigation of adverse effects. Fourteen of the archaeological sites are recommended as not eligible for listing on the NRHP with a recommendation of no further treatment. Nine sites have undetermined eligibility. The 219 isolated occurrences are ineligible for listing on the NRHP and require no further investigation. No archaeological sites were identified during the inventory of the well field and water pipeline ROW.

Following are brief summaries of the four Class III cultural inventories associated with the proposed project.

3.13.4.1 Processing Plant Site Survey

Between December 13, 2011 and January 15, 2012, Marron and Associates completed a Class III cultural resources inventory for ICPs proposed potash processing facilities (Hroncich-Conner and Walley 2012a). The survey area included all of Sections 26 and 35 in T24S, R33E, as well as portions of Sections 23 to 25. The inventory identified one previously recorded archaeological site (LA 108617) and four newly recorded archaeological sites (LA 172154, LA 172155, LA 172156, and LA 172157). **Table 3.13-1** summarizes the eligibility findings.

Table 3.13-1 Eligibility Determination of Recorded Sites at Processing Plant Site

LA #	Ownership	Component	Eligibility
108617	BLM/State	Prehistoric	Eligible
172154	BLM	Prehistoric	Eligible
172155	BLM	Prehistoric	Eligible
172156	BLM	Historic	Not eligible
172157	BLM	Historic	Not eligible

Prehistoric site LA 172154 consists of buried and surface lithic artifacts, ceramic fragments, groundstone, and multiple thermal features, and was assigned to the Early to Late Pueblo Phase of the

Jornada Mogollon (AD 115 – 1440). Prehistoric site LA 172155 consists of a scatter of lithic, ceramic and groundstone artifacts and two associated thermal features and was assigned to an undetermined phase of the Jornada Mogollon (AD 500 –1450). Both LA 172154 and LA 172155 are recommended as eligible for the NRHP under Criterion D with a recommendation of avoidance or mitigation of adverse effects.

Historic site LA 172156 consists of the remains of a possible residential structure and a large scatter of glass, metal and porcelain artifacts from the Euro-American, U.S. Territorial to Statehood/WW II (AD 1880 to 1945) period. The original survey report (Hroncich-Conner and Walley 2012a) recommends site LA 172156 as eligible for the NRHP under Criterion D. Prior to making the eligibility determination, Bruce Boeke (BLM Carlsbad archaeologist) requested additional research and testing at the site to clarify information recorded during the original survey and to evaluate its significance and NRHP eligibility based on additional data (Hill 2012). Based on the additional research, the BLM determined the site ineligible for listing on the NRHP because the possibility for further data from the site's physical remains is remote.

Historic site LA 172157 is comprised of a diffuse scatter of glass and metal artifacts from the Euro-American, Statehood/WW II (AD 1920 to 1930) period. It was recommended as ineligible for listing on the NRHP and no further investigation is required.

The previously recorded site is designated as LA 108617. It is a prehistoric site with an unknown cultural affiliation consisting of surface and buried lithic waste material, a single sandstone mano fragment, and two thermal features. It is recommended as eligible for the NRHP under Criterion D, with a recommendation of avoidance or mitigation of adverse effects.

The isolated manifestations consist primarily of isolated prehistoric artifacts such as chipped-stone, groundstone fragment and burned caliche, although several isolated historic-period metal and glass artifacts also were found. None of these are NRHP eligible and no further work on isolated finds is necessary.

3.13.4.2 Shaft Area Survey

From January 31, 2012 to February 1, 2012, Marron and Associates completed a Class III cultural resources inventory for ICPs proposed potash mine shaft in Section 15 of T24S, R33E (Hroncich-Conner and Walley 2012b). The inventory identified one archaeological site (LA 172167) and three isolated manifestations.

Site LA 172167 is a diffuse Jornada Mogollon (AD 500 – 1400) artifact scatter consisting of chipped stone, one ceramic fragment, one groundstone fragment, and burned caliche. The site is recommended as eligible for listing on the NRHP under Criterion D, with a recommendation of avoidance or mitigation of adverse effects.

The isolated occurrences are all single pieces of chipped stone with no other associated artifacts or features. None of these are NRHP eligible and no further work on isolated finds is necessary.

3.13.4.3 Jal Loadout Facility

Between April 23 and May 9, 2012, Marron and Associates completed a Class III cultural resources inventory of ICP's proposed loadout facility and associated access roads (Hroncich-Conner and Walley 2012c). The inventory identified 21 newly recorded archaeological sites, one historic railroad, and 144 isolated manifestations. Based on a review by the BLM archaeologist, 12 sites have been determined to be ineligible for NRHP listing and nine sites are undetermined. **Table 3.13-2** summarizes the eligibility findings.

Table 3.13-2 Eligibility Determination of Recorded Sites at Jal Loadout

LA #	Ownership	Component	Eligibility
172906	State	Prehistoric	Undetermined
172907	Private	Prehistoric	Not eligible
172908	Private	Prehistoric	Undetermined
172909	Private	Prehistoric	Not eligible
172910	Private	Prehistoric	Undetermined
172911	Private	Prehistoric	Undetermined
172912	Private	Prehistoric	Undetermined
172913	Private	Prehistoric	Not eligible
172914	Private	Prehistoric	Undetermined
172915	Private	Prehistoric	Not eligible
172916	Private	Prehistoric	Undetermined
172917	Private	Prehistoric	Not eligible
172918	Private	Prehistoric	Not eligible
172919	Private	Prehistoric	Not eligible
172920	Private	Historic	Not eligible
172921	Private	Prehistoric	Not eligible
172922	Private	Prehistoric	Undetermined
172923	BLM	Prehistoric	Not eligible
172924	State	Prehistoric	Undetermined
172925	Private	Prehistoric	Not eligible
172926	Private	Prehistoric	Not eligible

Eight of the sites (LA 172908, LA 172910, LA 172911, LA 172912, LA 172914, LA 172916, LA 172922, and LA 172925) are prehistoric lithic scatters with surface and buried artifacts in an intact stratigraphic sequence. While they are of an unknown cultural and temporal affiliation, the presence of buried artifacts presents the potential to date each site. Site LA 179216 produced a biface reminiscent of Paleoindian (ca. 12,000 – 6,200 B.C.) lithic technologies. Sites LA 172910 and LA 172925 contain thermal features—clusters of burned caliche and charcoal/ash—in addition to the lithic artifacts.

Seven prehistoric sites (LA 172907, LA 172909, LA 172917, LA 172918, LA 172919, LA 172921, and LA 172923) are diffuse surface lithic scatters with no buried materials, little to no deposition, and no diagnostic artifacts.

One historic site—LA 172920—which consists of a surface scatter of porcelain and glass fragments and metal artifacts from the Anglo/Euro-American, Statehood to WW II (AD 1919 to 1939) was determined to be a roadside dump with no further research potential.

Five prehistoric sites (LA 172906, LA 172913, LA 172915, LA 172924, and LA 172926) produced surface lithic artifacts, and in the case of LA 172926, two features characterized as rock enclosures. The limited subsurface testing at these sites did not produce buried cultural artifacts but revealed the presence of substantial sand accumulation.

The historic railroad alignment (Historic Cultural Properties Inventory 131099) extends through the eastern portion of the proposed loadout area and runs north to south. It was built between 1928 and 1930, extends 104 miles from between Lovington, New Mexico, and Monahans, Texas, and is still in use. The railroad is a short-line operation of limited extent and historical significance.

The isolated manifestations consist primarily of isolated prehistoric artifacts such as chipped-stone fragment and burned caliche, although several isolated historic-period metal and glass artifacts also were found. None of these are NRHP-eligible and they require no further investigation.

3.13.4.4 Well Field and Water Pipeline

A Class III inventory in a 30-foot area along the proposed water pipeline centerline was completed and submitted to the SHPO and the BLM in June, 2013 (Boone Archaeological Services 2013). No archaeological sites were identified.

A Class III inventory of 129 acres of state land in the northern portion of the well field in Section 2 in T24S, R35E was completed in October, 2011, and submitted to the BLM and the State Land Office. Eleven isolated occurrences were identified, none of which are eligible for NRHP listing.

3.13.5 Native American Traditional Values

Ethnographic resources are associated with the cultural practices, beliefs, and traditional history of a community. Examples of ethnographic resources include places in oral histories or myths, such as particular rock formations, the confluence of two rivers, or a rock cairn; large areas, such as landscapes and viewscapes; sacred sites and places used for religious practices; social or traditional gathering areas, such as dance areas; natural resources, such as plant materials or clay deposits used for arts, crafts, or ceremonies; and places and natural resources traditionally used for non-ceremonial uses, such as trails or camping locations.

Federal law and agency guidance require the BLM to consult with Native American tribes concerning the identification of cultural values, religious beliefs, and traditional practices of Native American people that may be affected by BLM undertakings. This consultation includes the identification of places (i.e., physical locations) of traditional cultural importance to Native American tribes. Places that may be of traditional cultural importance to Native American people include, but are not limited to, locations associated with the traditional beliefs concerning tribal origins, cultural history, or the nature of the world; locations where religious practitioners go, either in the past or the present, to perform ceremonial activities based on traditional cultural rules or practice; ancestral habitation sites; trails; burial sites; and places from which plants, animals, minerals, and waters possessing healing powers or used for other subsistence purposes, may be taken. Some of these locations may be considered sacred to particular Native American individuals or tribes.

In 1992, the NHPA was amended to explicitly state that “properties of traditional religious and cultural importance to an Indian tribe or Native Hawaiian organization may be determined to be eligible for inclusion on the NRHP.” If a resource has been identified as having importance in traditional cultural practices and the continuing cultural identity of a community, it may be considered a TCP. The term “traditional cultural property” came into use within the federal legal framework for historic preservation and cultural resource management in an attempt to categorize and include historic properties containing traditional cultural significance. NPS guidelines define a TCP as a resource “that is eligible for inclusion on the NRHP because of its association with cultural practices or beliefs of a living community that (a) are rooted in that community’s history, and (b) are important in maintaining the continuing cultural identity of the community" (Parker and King 1998). To qualify for nomination to the NRHP, a TCP must be more than 50 years old, must be a place with definable boundaries, must retain integrity, and must meet NRHP cultural resource evaluation criteria outlined in National Register Bulletin 15 (NRHP Staff 1997).

In addition to NRHP eligibility, some places of cultural and religious importance to the tribes also must be evaluated to determine if they should be considered under other federal laws. These include, but are not limited to, the NAGPRA, the American Indian Religious Freedom Act of 1978, the Archaeological Resources Protection Act of 1979, and EO 13007 (Sacred Sites) of 1996.

The BLM conducts Native American consultation regarding TCPs and sacred sites during land use planning and its associated environmental impact review. Native American consultation is conducted to identify TCPs and sacred sites whose management, preservation, or use would be incompatible with proposed projects. The BLM has little knowledge of tribal sacred or traditional use sites, and these sites may not be apparent to archaeologists performing surveys in advance of project approval. To date, no TCPs or sacred sites have been identified in the vicinity of the proposed project area, but Native American consultation is still underway.

3.14 Health and Safety; Hazardous Materials

3.14.1 Introduction

The affected environment for hazardous materials, health, and safety includes air, water, soil, and biological resources that potentially could be affected by an accidental release of hazardous materials during storage and use at the mine and associated facilities. The project area for direct and indirect impacts for hazardous materials and solid waste encompasses the proposed project operations boundaries.

3.14.1.1 Regulatory Definitions of Hazardous Materials

"Hazardous materials," which are defined in various ways under a number of regulatory programs, can represent potential risks to both human health and the environment when not properly managed. The term hazardous materials includes the following materials that may be utilized or disposed of in conjunction with mining operations:

- Substances covered under Occupational Safety and Health Administration and MSHA Hazard Communication Standards (29 CFR 1910.1200 and 30 CFR 42): The types of materials that may be used in mining activities and that would be subject to these regulations would include almost all of the materials identified above.
- "Hazardous materials" as defined under U.S. Department of Transportation regulations at 49 CFR, Parts 170-177: The types of materials that may be used in mining activities and that would be subject to these regulations would include sodium cyanide, explosives, cement, fuels, some paints and coatings, and other chemical products.
- "Hazardous substances" as defined by Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and listed in 40 CFR §302.4, Table 302.4: The types of materials that may contain hazardous substances that are used in mining activities and that would be subject to these requirements would include sodium cyanide, solvents, solvent containing materials (e.g., paints, coatings, degreasers), acids, and other chemical products.
- "Hazardous wastes" as defined in the RCRA: Procedures in 40 CFR 262 are used to determine whether a waste is a hazardous waste. The types of materials used in mining activities and that could be subject to these requirements could include liquid waste materials with a flash point of less than 140°F, spent solvent containing wastes, corrosive liquids, and lab assay wastes. Hazardous wastes are regulated under Subtitle C of RCRA.
- Any "hazardous substances" and "extremely hazardous substances" as well as petroleum products such as gasoline, diesel, or propane, that are subject to reporting requirements if volumes on-hand exceed threshold planning quantities under Sections 311 and 312 of Superfund Amendments and Reauthorization Act (SARA): The types of materials that may be used in mining activities and that could be subject to these requirements would include fuels, coolants, acids, and solvent-containing products such as paints and coatings.
- Petroleum products defined as "oil" in the Oil Pollution Act of 1990: The types of materials used in mining activities and that would be subject to these requirements include fuels, lubricants, hydraulic oil, and transmission fluids.

In conjunction with the definitions noted above, the following provides information regarding management requirements during storage and use of particular hazardous chemicals, substances, or materials:

- The SARA Title III List of Lists or the Consolidated List of Chemicals Subject to Emergency Planning and Community Right-to-Know Act and Section 112(r) of the CAA.
- Certain types of materials, while they may contain potentially hazardous constituents, are specifically exempt from regulation as hazardous wastes. Used oil, for example, may contain toxic metals, but would not be considered a hazardous waste unless it meets certain criteria. Other wastes that might otherwise be classified as hazardous are managed as "universal wastes" and are exempted from hazardous waste regulation as long as those materials are handled in ways specifically defined by regulation. An example of a material that could be managed as a universal waste is lead-acid batteries. As long as lead-acid batteries are recycled appropriately, requirements for hazardous waste do not apply.
- Pursuant to regulations promulgated under CERCLA, as amended by SARA, release of a reportable quantity of a hazardous substance to the environment must be reported within 24 hours to the National Response Center (40 CFR Part 302). The NMED also requires immediate reporting of a release of a hazardous substance as soon as possible, but not later than 24 hours after the event, to the NMED (2010a). ICP has SPCC plans in place to prevent and contain a hazardous material spill (ICP 2011). The storage of hazardous materials is regulated by the Hazardous Waste Bureau (NMAC 20.4.1) under the NMED (NMED 2010b).

3.14.1.2 Project-related Hazardous Materials

The types of hazardous materials to be used in the proposed mining and processing operations and the approximate quantities onsite are summarized in **Table 3.14-1**.

Table 3.14-1 Hazardous Materials Onsite for Mining and Processing

Material	Approximate Amount
Antifreeze	>500 gallons
Cleaning solvents	>50 gallons
Diesel fuel	>25,000 gallons
Grease, petroleum-based	>50 gallons
Hydraulic fluid	>1,000 gallons
Oil	>1,000 gallons
Magnesium chloride	As needed for roadway dust suppression
Sulfuric acid	Weekly deliveries
Chlorine bleach	Weekly deliveries

3.14.1.3 Regulatory Definition of Solid Waste

Solid waste consists of a broad range of materials that include garbage, refuse, wastewater treatment plant sludge, non-hazardous industrial waste, and other materials (solid, liquid, or contained gaseous substances) resulting from industrial, commercial, mining, agricultural, and community activities (USEPA 2006a). Solid wastes are regulated under different subtitles of RCRA and include hazardous waste (discussed in the previous section) and non-hazardous waste. Non-hazardous wastes are regulated under RCRA Subtitle D. In New Mexico, solid waste rules are found in the NMAC. Disposal of solid waste is regulated under NMAC 20.9.2.0 to 20.9.2.22; disposal of hazardous waste is regulated under NMAC 20.9.8.

3.14.1.4 Solid Wastes Generated from Mining Operations

The solid wastes at the proposed mine and processing facilities would include hazardous waste, solid non-hazardous waste, and sanitary waste. Hazardous waste would consist of “universal wastes,” which include florescent bulbs, aerosol paint can residue and filters, and batteries. Solid non-hazardous materials (for example, construction debris and trash) would be disposed at an off-site licensed facility. Appropriate materials (used oil, lead acid batteries, and antifreeze) would be recycled. Sanitary wastes would be dealt with by construction of a new septic system, which would be installed to service the proposed mill. Solid wastes that are expected to be generated include hazardous waste from the aerosol can aspirator and used oil.

3.14.1.5 Health and Safety

Mining operations often have a controlled entrance to the mine site. Additionally, mining operations are usually fenced to limit access and promote onsite security. Mine employees are often required to take multiple forms of safety training and adhere to safety regulations. Public uses for the region surrounding the project area include hunting, camping, OHV use, and picnicking. The project area also is utilized by grazing lessees, oil and gas operations, as well as motorists traveling on local roads and state and U.S. highways.

3.15 Socioeconomics

3.15.1 Analysis Area

Lea and Eddy counties and the communities of Jal, Eunice, Hobbs, and Carlsbad comprise the primary study area for socioeconomic effects of the proposed project. Lea County is responsible for providing most of the local government administrative and public services to the project area. Based on proximity to the project and the residency of workers of other area potash mines, other recent industrial projects, the inventory of temporary housing, and the competition for housing from workers in the oil and gas industry, the majority of the construction and operations workforces would likely reside in Jal, Eunice, Hobbs, and Carlsbad. **Figure 3.15-1** is a map of the proposed Ochoa Project and nearby communities and **Table 3.15-1** displays the highway and road distances from the proposed project to selected communities. The 2010 population data presented in **Table 3.15-1** and throughout the section are from the 2010 Census of Population and Housing (U.S. Census Bureau 2011a).The citation is not repeated throughout the text.

Table 3.15-1 Highway Travels Distances from the Proposed Ochoa Mine to Nearby Communities

Community	One-way Travel Distance (miles)	2010 Population
Lea County, New Mexico		
Jal	23	2,047
Eunice	46 (via NM128 and 18) 35 (via County Road 21 [CR 21], also called Delaware Basin Road)	2,922
Hobbs	65 (via NM 128 and 18) 55 (via CR 21)	34,122
Lovington	87 (via NM 128 and 18) 80 (via CR 21)	11,009
Eddy County, New Mexico		
Loving	38	1,413
Carlsbad	47	26,138
Artesia	86	11,301
Other		
Kermit, Texas	43	5,299
Andrews, Texas	67	10,448

Source: Google Maps 2011; U.S. Census Bureau 2011a.

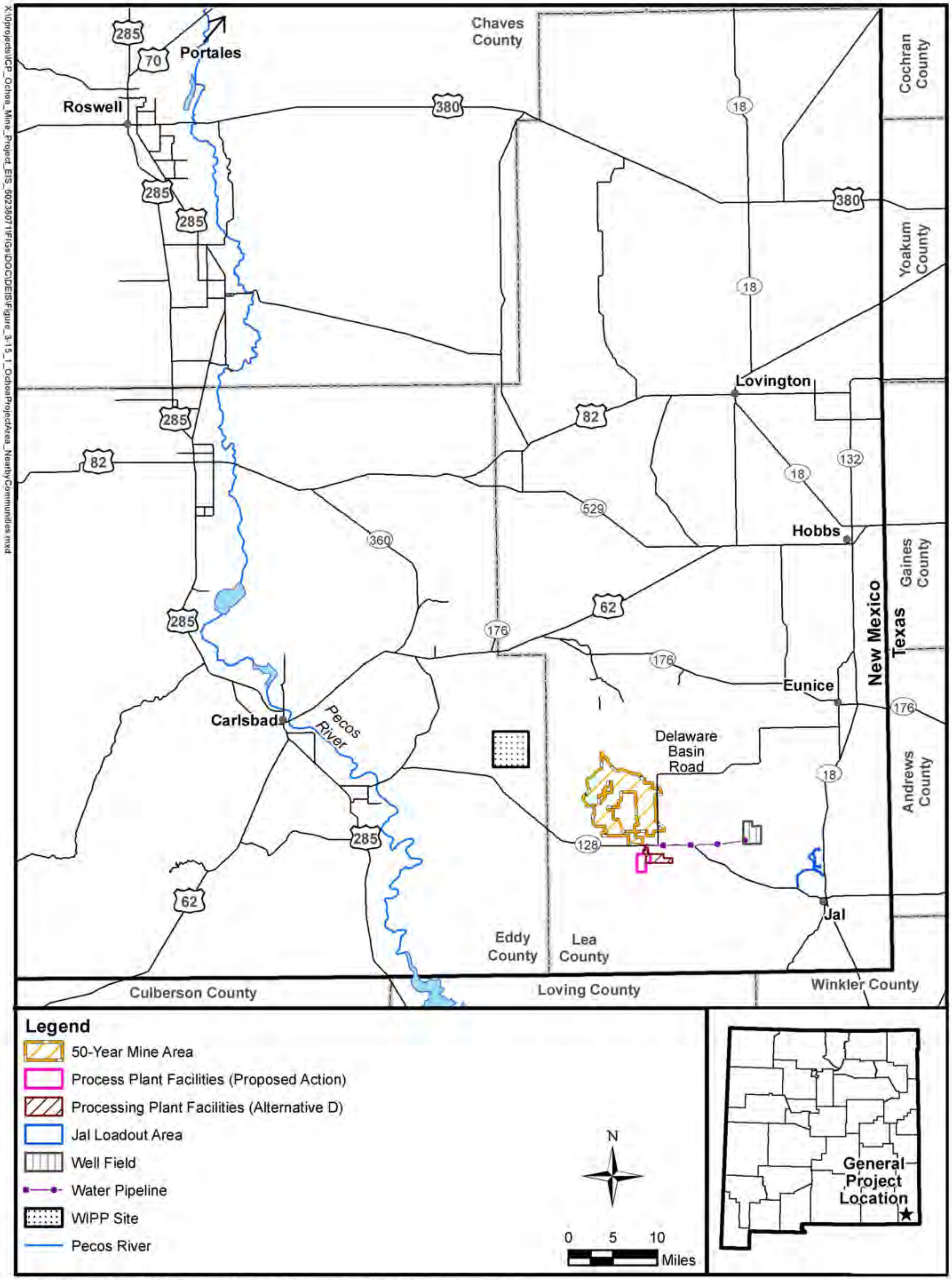


Figure 3.15-1 Ochoa Project Area and Nearby Communities

3.15.2 Socioeconomic Setting

Cattle and sheep ranching was a primary reason for the settlement of southeastern New Mexico by people of European descent. Beginning in the late 1920s, the economies of Lea and Eddy counties became increasingly reliant on natural resource extraction (Eddy County 2008; Lea County 2009). Oil and natural gas have been produced for over 80 years in the region. In 2010, Lea County was the top oil producing county in New Mexico and Eddy County had the second largest oil production. In that year, Eddy County ranked third in natural gas production in the state and Lea County ranked fourth (New Mexico Energy, Minerals, and Natural Resources Department [NMEMNRD] 2011). Active oil and gas development continues to occur in the region with more than 80 active drilling rigs located in Lea and Eddy counties in October, 2012. Substantial oil and gas development is also occurring in nearby areas of Texas (Baker Hughes, Inc. 2012).

Potash mining and processing is another key component of the southeastern New Mexico economy. New Mexico produces more potash than any other state in the country (NMEMNRD 2011). Currently the active potash mines in the New Mexico are all located in Eddy County, with a new mine project beginning construction in 2012. The study area’s reliance on oil and gas and potash extraction results in periods of robust economic activity, increased employment in relatively high-paying occupations and local government fiscal health, as is presently the case. Conversely, when oil and gas or potash prices fall and employment declines, the study area experiences declining population and local government revenues. Local governments are keenly aware of such boom and bust cycles, and the rapidity which changes can occur, and consequently factor in such considerations as they seek to diversify their economies and plan and finance housing and public infrastructure (Honeyfield 2012; Lea County 2011).

Lea and Eddy counties are part of a “New Energy Corridor,” which extends from Midland-Odessa through Andrews and Gaines counties in Texas to Portales, New Mexico, on the north. The corridor encompasses existing and proposed nuclear, alternative, and renewable energy facilities (Lea County 2011).

Farming and ranching are important to both counties as part of the region’s heritage and culture. These activities and outdoor recreation and tourism also contribute to the area’s economic diversity.

The following briefly describes the communities near the Ochoa Mine project area and recent economic activities in Lea and Eddy counties.

3.15.2.1 Lea County

Oil and gas is the primary economic driver of the Lea County economy, although new industrial activities have emerged in recent years that are serving to diversify the Lea County economy and add to the area’s economic and population growth.

The URENCO NEF near Eunice became operational in 2010 and future expansion is anticipated. Sun Edison and Southwestern Public Service are developing a five-site commercial solar energy facility in the area: four sites are in Lea County including two near Jal (Lea County 2011).

Other industrial projects expected to contribute to economic diversification in Lea County include Eldorado Biofuels, which plans to use wastewater produced from oil and gas drilling to grow algae for biofuel, and International Isotopes, which plans to convert a byproduct produced by URENCO to materials used in medical materials, microprocessors, and solar panels (Lea County 2011). Joule Unlimited, Inc. is constructing a commercialization demonstration project to extract ethanol and diesel from bacteria in a salt-water brine mixed with carbon dioxide midway between Hobbs and Carlsbad (Joule Unlimited, Inc. 2012).

3.15.2.2 Hobbs

Hobbs (2010 population 34,122) is a regional commercial center and the largest city in southeastern New Mexico. For much of its existence, Hobbs has served as an oil and gas service center. The city hosts two colleges, a private prison, and a racetrack and casino (Economic Development Corporation of Lea County 2012). Commercial air service to regional hubs, including Houston's Bush Intercontinental Airport, is provided via the Hobbs airport. Hobbs has the largest temporary and rental housing base in Lea County, approximately 1,600 motel rooms and Recreational Vehicle (RV) spaces, and an extensive retail trade and consumer services base, which together attract many oil and gas and construction workers. The recent development of the Zia Park Casino and racetrack represents an important expansion of the city's tourism base (Honeyfield 2012).

3.15.2.3 Jal

Jal (2010 population 2,047) is the closest community to the proposed Ochoa Project. Jal's economy has historically been based on oil and gas development. In the past, several oil and gas exploration and production firms had regional and field offices in Jal, but some closed as part of the recent consolidation in the natural gas industry and Jal experienced a period of economic and population decline. More recently, a number of oil producers, oilfield service companies, and construction contractors have located offices and service yards in and near Jal, URENCO intends to open a warehousing facility in Jal, and Eldorado Biofuels is developing its demonstration plant in the city (Lea County 2011; Schrader 2012a). There are one large and several small RV parks in Jal, along with several convenience stores/gas stations.

3.15.2.4 Eunice

Eunice (2010 population 2,922) is the second closest community to the proposed Ochoa Mine in terms of road distance (via the Delaware Basin Road, a paved Lea County road). Similar to other communities in the area, the Eunice economy was traditionally based on oil and gas development, but is becoming more diversified with the opening of URENCO's NEF facility, the opening of the International Isotopes facility, and expansion of the Waste Control Specialists low-level radioactive waste disposal facility east of Eunice in Andrews County, Texas. A large RV park was developed in Eunice to accommodate a portion of the URENCO construction workforce, and several smaller parks and motels serve demand from oil and gas workers (Lea County 2011; Moore 2012a; White 2012). The increase in economic activity tied to the URENCO facility, oil and gas development, and other industrial development has prompted investments in existing and new businesses in the community.

3.15.2.5 Eddy County

In addition to oil and gas, potash mining and processing is a major component of the Eddy County economy. Other major employers include the USDOE's WIPP and the Federal Law Enforcement Training Center (FLETC). The WIPP, located about 30 miles east of Carlsbad, began operations as the nation's first transuranic waste storage facility in 1999. FLETC, located near Artesia, provides law enforcement training for local, state, federal, and international agencies (City of Carlsbad 2009; Eddy County 2008). Farming and ranching, tourism, (principally associated with Carlsbad Caverns National Park), and outdoor recreation also are key components of the local economy.

3.15.2.6 Carlsbad

Carlsbad (2010 population 26,138) is located on the Pecos River, about 47 miles west of the Ochoa Project site. Carlsbad is the Eddy County seat, hosts service companies for the potash and oil and gas industries, and is a regional trade and services center. Carlsbad serves as a gateway community for visitors to Carlsbad Caverns NP and other destinations in the region, offering approximately 1,700 motel rooms and RV spaces. Carlsbad has a growing population of retired senior citizens due to its climate, setting, and outdoor recreation attractions and opportunities (City of Carlsbad 2009).

3.15.2.7 Loving

Loving (2010 population 1,413) is located at the intersection of NM 128 and U.S. 285, 38 miles west of the Ochoa Mine site and 9 miles south of Carlsbad. The community is primarily residential in nature with a small business community consisting of several convenience gas stations and retail stores, small service firms supporting the mining industry, and agriculture-oriented firms that operate seasonally. There are no motels in Loving.

3.15.2.8 Kermit and Andrews, Texas

Kermit (2010 population 5,299) is located 21 miles south of Jal and Andrews (2010 population 10,448) is located 44 miles east of Jal. Both communities are within a reasonable commuting distance of the Ochoa project area, provide a range of essential convenience retail, eating and drinking establishments, and temporary housing for oil and gas and construction workers. However, housing availability is severely limited due to current demand associated with ongoing development surrounding these communities.

3.15.3 Population and Demographics

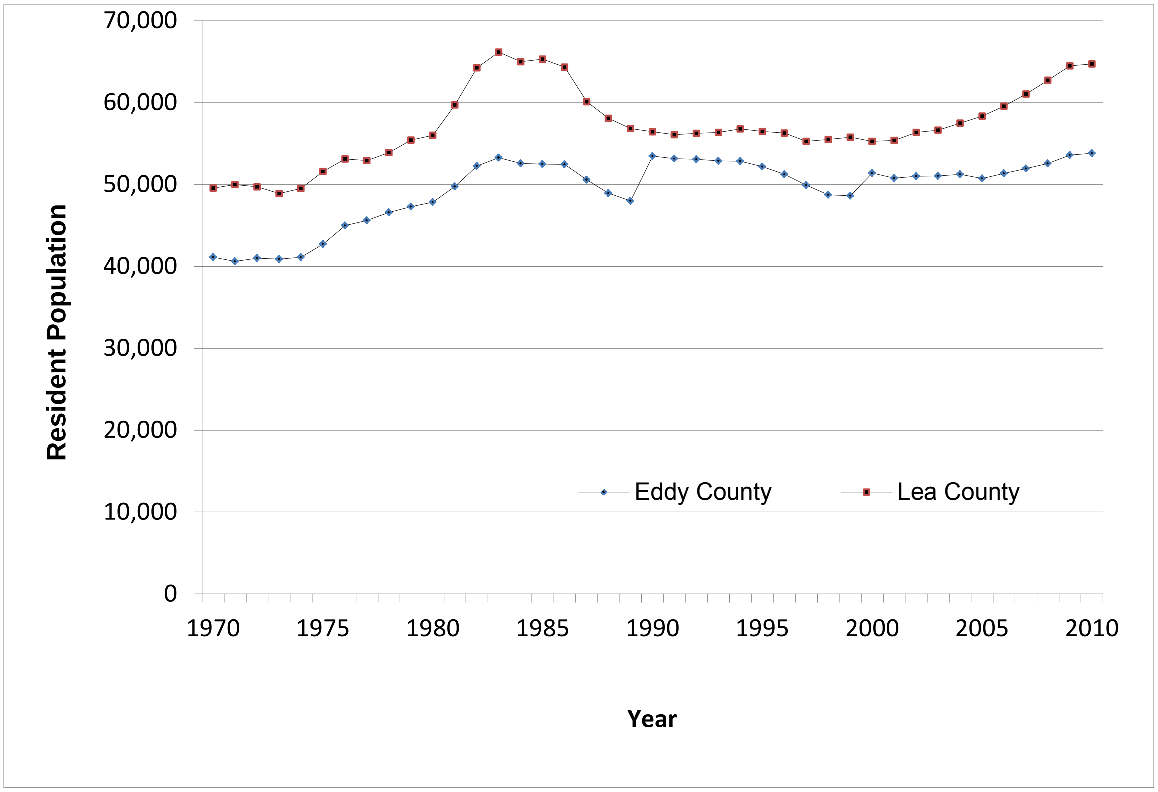
Both Lea and Eddy counties experienced an extended period of population growth spanning the late 1970s and early 1980s (**Figure 3.15-2**). Oil and gas development was the major driver of this growth. In 1983, the population of both counties peaked, at 66,164 in Lea County and at 53,266 in Eddy County. Both subsequently experienced substantial declines, Lea County losing almost 15 percent of its population in the ensuing 6 years. During the same period Eddy County's population declined by about 10 percent.

Lea County population began climbing again in 2004, driven by resurgence in oil and gas development and construction of the URENCO facility. Lea County was the fourth fastest growing county in New Mexico between 2000 and 2010, outpacing the state's growth rate by over three percentage points (16.6 percent versus 13.3 percent) (Lea County 2011).

Beginning in 1990, Eddy County experienced another cycle of renewed growth, decline and growth. The county's population stabilized at between 51,000 and 52,000 residents from 2000 through 2007, and then climbed to 53,829 in 2010. The most recent growth has been driven by resurgence in oil and gas development, high potash prices, and expanded operations of the FLETC in Artesia.

Table 3.15-2 displays settlement patterns in Lea and Eddy counties. Lea County settlement patterns remained relatively stable over the past decade. About 5 percent of the Lea County population resides in Eunice, 53 percent in Hobbs, 3 percent in Jal, 17 percent in Lovington, with 22 percent living in smaller communities and unincorporated areas of the county. Of the 320 URENCO operations workers employed in late 2011, 81 percent lived in Hobbs. In Eddy County, about half of the residents reside in Carlsbad, 21 percent in Artesia, with the remainder living in smaller communities and unincorporated areas of the county.

The median age of Lea County residents is about 37.3 years, just slightly older than the statewide median of 36.7 years, but 5.4 years older than the median age in Eddy County. Both counties have about 60 percent of their population in the 18 to 64 age group (**Table 3.15-3**), although Eddy County has a substantially larger share (29 percent) of residents under the age of 18 than either New Mexico as whole (25 percent) or Lea County (26 percent).



Sources: U.S. Census Bureau 2011a, b, 2002a, 1992, 1982

Figure 3.15-2 Lea and Eddy County Population, 1970 to 2010

Table 3.15-2 Population Settlement within Eddy and Lea Counties, 2000 to 2010

Area	2000	2005	2010	Change
Lea County	55,511	56,109	64,727	9,216
Eunice	2,562	2,643	2,922	360
Hobbs	28,657	28,609	34,122	5,465
Jal	1,996	2,010	2,047	51
Lovington	9,471	9,831	11,009	1,538
Remainder of the County	12,825	13,016	14,627	1,802
Eddy County	51,658	50,236	53,829	2,171
Artesia	10,692	10,375	11,301	609
Carlsbad	25,625	25,165	26,138	513
Loving	1,326	1,321	1,413	87
Remainder of the County	14,015	13,375	14,977	962

Sources: U.S. Census Bureau 2011b, c, 2002b.

Table 3.15-3 Age Distribution And Median Age of The Resident Population 2010

Location	Under 18 Years	18 to 64 Years	65 Years and Over	Median Age (years)
New Mexico	25.2%	61.6%	13.2%	36.7
Lea County	26.1%	59.9%	14.0%	37.3
Eddy County	29.4%	59.8%	10.8%	31.9

Sources: U.S. Census Bureau 2011b,c, 2002b.

3.15.4 Employment, Labor Force, and Economic Structure

Changes in local labor market conditions over time portray economic conditions in the study area more so than do the changes in population. The increases in employment in both counties from 2005 through 2008 illustrate the economic expansion due to increases in oil and gas activity and mining, the start of construction of the URENCO facility, and residential construction, tourism and recreation, lifestyle migration, and expansion of the FLETC (**Table 3.15-4**). The global recession that began in late 2007 affected Lea County in 2009 and 2010 as energy prices dropped and residential and commercial construction slowed. Despite the recession, Lea County total covered employment (workers covered by unemployment insurance) expanded by almost 12 percent between 2005 and the second quarter of 2011.

Table 3.15-4 Trends in Total, Mining and Construction Employment, Lea and Eddy Counties, 2005 to 2010 and Second Quarter 2011

Industry	2005	2006	2007	2008	2009	2010	2011 (Second Quarter)
Lea County							
Mining	5,387	6,236	6,682	6,994	5,539	5,857	6,136
Construction	1,687	1,765	2,187	2,834	2,408	2,088	2,447
Total Covered Employment	25,319	26,687	28,108	29,496	26,756	26,642	28,299
Eddy County							
Mining	2,820	3,123	3,357	3,756	3,556	4,024	4,750
Construction	1,058	1,111	1,489	1,950	1,808	1,696	1,869
Total Covered Employment	20,238	20,239	22,019	23,232	23,296	23,545	24,730

Source: New Mexico Department of Workforce Solutions(NMDWS) 2011a,b.

Other key private industries in the local economy include retail trade, health care, and accommodation and food services. The latter reflects Lea County's position as a regional trade center and hub for oil and gas activity and the role of tourism and recreation in Eddy County.

The mining sector, which includes oil and gas extraction and potash mining, and the construction industry, have long been mainstays of the regional economy, directly and indirectly providing jobs and capital investment. Mineral production and company and employee spending also generate taxes to support state and local governments and public education. While there was some volatility in these sectors in Lea County, mining averaged 5,857 jobs and construction averaged 2,088 jobs during 2010, 22 percent and 8 percent of total covered employment, respectively. Mining sector employment in Eddy County has climbed steadily since 2005, increasing by 1,930 jobs (68 percent) through the second quarter of 2011. Mining represented 17 percent of the annual average covered employment during 2010 in Eddy County and construction represented 7 percent. Other indicators of the industry's importance, reflected in data reported by the NMDWS (2011c) include the following:

- In the fourth quarter of 2010, 269 establishments were reported in the mining sector in Lea County: 68 active in oil and gas extraction, 1 in conventional mining, and 200 in support activities. During the same period, 122 establishments were reported in the mining sector in Eddy County.
- In 2009, the Lea County mining sector reported total employee earnings of $491 million, equivalent to 23.3 percent of the total personal income in the county during that year. In 2009, the Eddy County mining sector reported total employee earnings of $440 million, equivalent to 21.6 percent of the total personal income in the county during that year.

Farm employment accounted for 2.1 percent of Lea County employment and 2.6 percent of Eddy County employment in 2009, both comparable to the statewide average. Public sector employment, including public education, was 11 percent in Lea County and 13 percent in Eddy County during 2009, both substantially below the 20 percent statewide (**Table 3.15-5**). Operations of the FLETC in Artesia, the BLM office in Carlsbad, Carlsbad Caverns NP and the Guadalupe Ranger District of the Lincoln National Forest contributed to the a higher percentage of government employment in Eddy County compared to Lea County.

Table 3.15-5 Annual Employment, by Major Category, 2009: New Mexico and Lea and Eddy Counties

Geographic Area	Full and Part Time Employment by Category				% of Total Employment		
	Farm	Non-farm Private	Government	Total	Farm	Non-farm Private	Government
New Mexico	24,673	832,371	215,955	1,072,999	2.3	77.6	20.1
Lea County	740	30,680	3,825	35,245	2.1	87.0	10.9
Eddy County	815	25,993	4,116	30,924	2.6	84.1	13.3

Source: U.S. Bureau of Economic Analysis 2011.

Table 3.15-6 displays Lea and Eddy County average annual labor force and unemployment trends for 2008 through 2011. Unemployment in 2008 was very low, reflecting the robust pre-recession economic conditions, strong oil, natural gas and potash prices, and industrial construction activities. The higher unemployment rates in 2009 and 2010 reflect declines in gas prices and lower construction employment, with the subsequent decrease in unemployment in 2011 likely reflecting the positive effects of higher oil prices on the pace of energy development and higher employment that year (see **Table 3.15-5**).

Table 3.15-6 Labor Force, Employment and Unemployment

	2008	2009	2010	2011
Lea County				
Labor Force	29,518	28,381	28,275	28,593
Unemployment	843	2,088	2,165	1,433
Unemployment Rate	2.9%	7.4%	7.7%	5.0%
Eddy County				
Labor Force	27,534	28,099	28,869	29,183
Unemployment	837	1,534	1,734	1,283
Unemployment Rate	3.0%	5.5%	6.0%	4.4%

Sources: U.S. Bureau of Labor Statistics 2012.

Farming and Ranching

Agriculture is another important element of the area's economic base. Many local ranchers graze cattle on public lands, allowing them to use available private irrigated lands to grow hay for use as winter feed or to sell as a cash crop. Data from the 2007 Census of Agriculture (the most current available) reveals the following regarding farming and ranching in the area (USDA 2009).

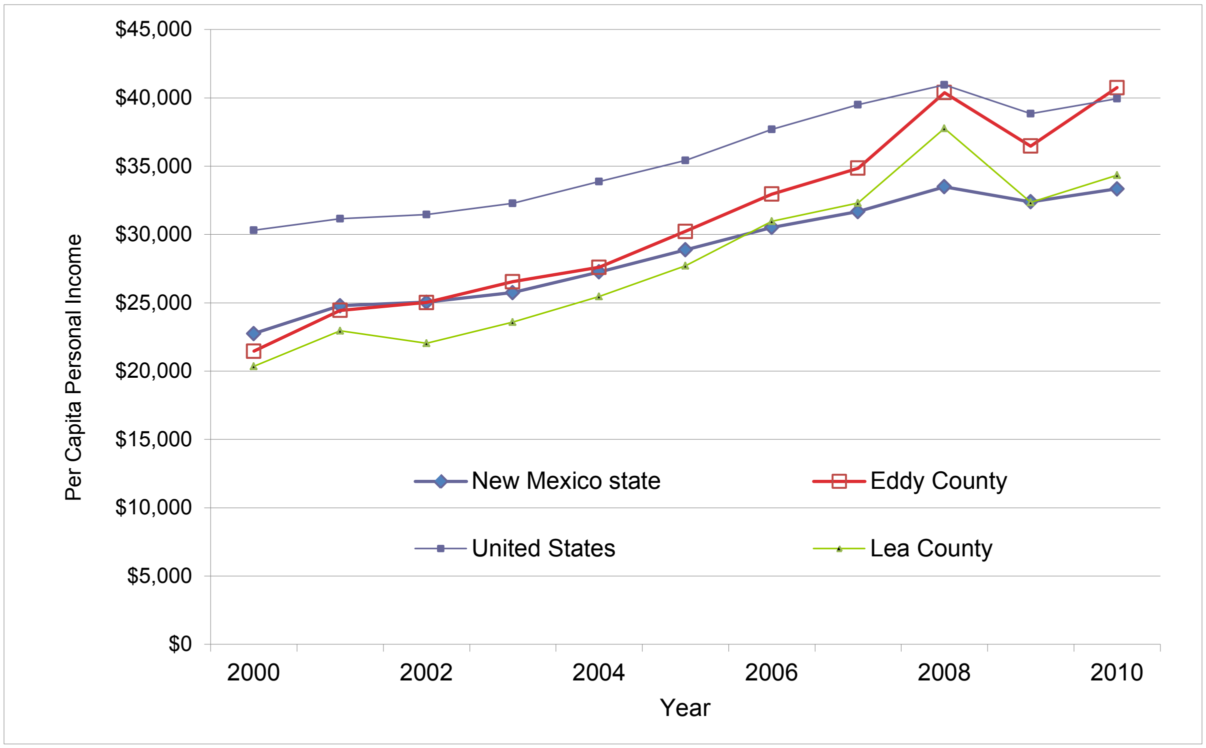
- There were 557 farms and ranches in Lea County, with a total associated land area of 2.37 million acres. The corresponding totals for Eddy County were 543 farms and ranches and a total associated land area of 1.11 million acres.
- In 2007, farms and ranches in Lea County recorded $93.6 million in crop and livestock sales. The top commodities, in terms of market value, were milk and dairy products, hay and other forage, cattle and calves, and cotton. Farms and ranches in Eddy County produced $94.8 million in crop and livestock sales. The top commodities, in terms of market value, were cattle and calves, milk and dairy products, hay and other forage, cotton, and pecans.
- Dairy operations are an important element of the agriculture sector with 32 dairy farms reporting a total of more than 32,000 dairy cattle in 2007.
- More than half of all farms and ranches were operated by individuals reporting a primary occupation other than agriculture.
- Approximately half of all farms and ranches reported less than $5,000 in sales of livestock or farm products in 2007; while more than 1-in-5 reported annual sales of $50,000 or more.

3.15.5 Personal Income and Poverty

Personal income is an important measure of economic well-being for individuals and communities. For the period of 2000 to 2008, Lea County registered a 111 percent increase in total personal income (doubling in just 8 years), from $1.12 billion to $2.37 billion. The corresponding increase in Eddy County was 92 percent, from $1.03 billion to $2.12 billion. The gains in personal income registered locally outpaced by considerable margins the 62 percent statewide increase (U.S. Bureau of Economic Analysis 2012).

Total personal income declined in both counties, primarily due to a slowdown in the pace of energy development triggered by the continuing economic recession. Renewed income growth occurred in both counties in 2010, lead by an increased pace of energy development, the initiation of processing operations at URENCO and expanded FLETC operations.

For many years, per capita income in Lea and Eddy counties lagged the statewide and national averages (**Figure 3.15-3**). As a result of steady gains, per capita incomes in both counties now exceed the statewide average and that in Eddy County exceeded the national average in 2010.



Source: U.S. Bureau of Economic Analysis 2012, 2011.

Figure 3.15-3 Per Capita Income Trends, 2000 to 2010: US, New Mexico, Lea and Eddy Counties

After adjusting for inflation, real per capita personal income increased by 50 percent in Eddy County from 2000 to 2010, compared to a 33 percent increase in Lea County, and 16 percent statewide, and 4 percent across the nation.

The trends in total and per capita personal income in both Lea and Eddy counties manifest themselves in modest reductions in the local incidence of poverty. In 2010, an estimated 18.0 percent of all Lea County residents had incomes below the established poverty income (as compared to 18.2 percent in 2000). With area population growth, the number of people in poverty actually increased in the last decade by approximately 1,600 residents, as compared to 2000. In Eddy County, an estimated 16.6 percent of all residents had incomes below the established poverty level in 2010, with approximately 200 fewer residents in poverty compared to 2000 (U.S. Census Bureau 2011d).

3.15.6 Housing

Housing availability and affordability are issues in both Lea and Eddy counties, particularly rental housing for workers and middle and low income families (Eddy County 2008; Lea County 2011). Carlsbad, Hobbs, Eunice, and Jal all have developed housing plans and have efforts underway to address current and anticipated housing needs. Substantial housing development recently occurred in Hobbs, Carlsbad, and Eunice, and these communities have aggressive housing incentive plans for developers.

3.15.6.1 Housing Stock

Lea County housing stock increased overall more than 1,500 units between 2000 and 2010, to 24,919 units (**Table 3.15-7**). Eunice had the largest percentage increase in housing stock in the county during the decade, but at 932 units, Hobbs' increase was the largest absolute increase. Jal added 52 units during the decade. Much housing demand in the smaller communities in Lea County is being met with manufactured homes. All of the residential building permits for new units issued in Eunice and Jal between 2000 and 2010 were for manufactured homes.

Eddy County had a net increase of 336 housing units (1.5 percent) during the 2000 to 2010 period to 22,586 units. However, the overall increase was tempered by a net reduction of 178 units in Carlsbad.

Table 3.15-7 Total Housing Stock by County and Community 2010

			Change	
	2000	**2010**	**Absolute**	**%**
Lea County	23,405	24,919	1,514	6.5
Eunice	1,110	1,264	154	13.9
Hobbs	11,968	12,900	932	7.8
Jal	957	1,009	52	5.4
Lovington	3,823	3,956	133	3.5
Remainder of the County	5,547	5,790	243	4.4
Eddy County	22,249	22,585	336	1.5
Artesia	4,593	4,724	131	2.9
Carlsbad	11,421	11,243	-178	-1.6
Loving	516	541	25	4.8
Remainder of the County	5,719	6,077	358	6.3

Source: U.S. Census Bureau 2011a, 2002b.

3.15.6.2 Vacancies

Although the 2010 Census identified a substantial number of vacant and available units in both Lea and Eddy counties (**Table 3.15-8**), the reality is that very few units were available for rent at the time of this assessment (first quarter 2012). The resurgence of oil and gas development in the region, the construction and ongoing operation of the URENCO NEF facility, and the strong potash market resulted in absorption of most rental units in the area (Honeyfield 2012; Moore 2012a; Schrader 2012a).

3.15.6.3 Housing Development

Housing shortages have been associated with expansions in the oil and gas industry, by construction and expansion of industrial facilities, and by retirement migration to Eddy County. Substantial housing development recently occurred in Hobbs, Carlsbad, and Eunice, and these communities have aggressive housing incentive plans for developers.

Table 3.15-8 Housing Vacancies by County and Community 2010

Location	2010 (No.)	Total Occupied (No.)	Total Vacant (No.)	Vacancy Rate (%)
Lea County	24,919	22,236	2,683	11
Eunice	1,264	1,073	191	15
Hobbs	12,900	11,629	1,271	10
Jal	1,009	788	221	22
Lovington	3,956	3,572	384	10
Remainder of the County	5,790	5,174	616	11
Eddy County	22,585	20,411	2,174	10
Artesia	4,724	4,277	447	9
Carlsbad	11,243	10,257	986	9
Loving	541	487	54	10
Remainder of the County	6,077	5,390	687	11

Source: U.S. Census Bureau 2011a.

Hobbs

The 2009 City of Hobbs Housing Needs Assessment (RRC Associates, Inc. 2009) identified a need for over 1,800 units to accommodate future economic expansion, demand associated with in-commuters who would prefer to live in Hobbs and to house replacements for retiring workers, and to address overcrowding. Several new apartment projects have been completed or are underway in Hobbs. Additionally, Hobbs has established a $5 million housing trust fund to provide incentives for the development of affordable housing. The Hobbs City Commission recently approved incentives for 329 market-rate rental units and expects the total number of market rate rental units stimulated by incentives to exceed 500 by the end of 2012. The incentives also are expected to support another 75 affordable rental units (Honeyfield 2012).

Eunice

The Affordable Housing Plan for the City of Eunice (Lea County 2011) recommends development of 74 additional rental units in the city over the next 5 years to address existing and projected workforce demand, and to accommodate some low-income renters and seniors. In addition, the plan recommends construction of ten homes for sales and rehabilitation of five homes. During the third quarter of 2012, nine single family homes were under construction and the developer was planning to construct 40 to 60 apartment units and a roughly an equal number of senior housing units (Moore 2012b).

Jal

The Affordable Housing Plan for the City of Jal (Lea County 2011) reports that rental units within the town are extremely scarce and few home sales have been recorded. This lack of available housing has limited Jal's opportunity to capitalize on nearby energy and industrial growth. The plan reports that community leaders are attempting to change this situation through community revitalization and housing development. As of the third quarter 2012, there were 40 to 50 apartment units in the planning stage (Schrader 2012b).The plan proposes development of a mixed income rental development to address Jal's low-income renter, senior, and workforce housing needs and also supports development of new "for sale" housing.

Carlsbad

The City of Carlsbad completed a Housing Analysis and Strategic Plan for the Greater Carlsbad Area (City of Carlsbad 2009). The plan concluded that Carlsbad's housing shortage was affecting the community's quality of life and hindering its economic expansion. The housing analysis identified an existing need for market-rate temporary housing, up to 240 market-rate ownership units and approximately 1,600 units for low-income and cost-burdened households. The housing analysis also identified needs for transitional housing, rehabilitation of existing units that were in poor condition, and expanded supply of units for retirees. Since the completion of the housing plan, a number of single family subdivisions and multi-family housing projects have been approved. During early 2012, more than 400 multi-family units were under construction or undergoing rehabilitation in Carlsbad and a substantial number of single family units were under construction (Shumsky 2012).

3.15.6.4 Temporary Housing Resources

Each of the larger communities within the socioeconomic study area offers a number of motels and RV parks that are often used by temporary construction workers. A 2012 survey identified 44 motels with 2,567 rooms and 19 RV parks with a total of 1,382 spaces in the four primary communities (**Table 3.15-9**) although there are likely a number of smaller RV parks that were not included in the inventory. As might be expected, the majority of the motels and RV parks are located in Hobbs and Carlsbad, but Eunice also has a substantial inventory of RV spaces (White 2012). During early 2012, most motels in the study area had high occupancy levels because of the surge in oil and gas development.

Table 3.15-9 Summary of Temporary Housing in the Study Area, by Community

	Hotels/Motels		RV Parks	
	Locations	Number of Rooms/Units	Locations	Number of Spaces
Eunice	2	40	3	425
Hobbs	21	1,200	6	376
Jal	1	17	4	200
Carlsbad	20	1,310	6	381
Total for Area	**44**	**2,567**	**19**	**1,382**

Sources: Carlsbad Chamber of Commerce 2012; City of Jal 2011; Google Maps 2011; Hobbs Chamber of Commerce 2011; Schrader 2012b; White 2012.

3.15.7 Public Infrastructure, Services, and Local Government Fiscal Conditions

Public infrastructure and services within the socioeconomic study area are provided by Lea County and the cities of Jal, Eunice and Hobbs, by Eddy County and the City Carlsbad, and by a number of special districts and volunteer agencies. Public services provided by Lea County to the project area include law enforcement and road maintenance. The project area is located within the service area of the Jal Volunteer Fire Department and Ambulance Service for emergency response.

3.15.7.1 Water

Water systems likely to be affected by the proposed Ochoa Project include municipal systems in Jal, Eunice, Hobbs, and Carlsbad. All four systems have adequate treatment and storage system capacity to accommodate some growth. The Jal system could accommodate a 20 to 25 percent increase in population, along with some corresponding commercial and industrial development

(Schrader 2012a).The Eunice system uses about 25 percent of its water rights and the city recently replaced some water mains (Moore 2012). Hobbs has adequate water and system capacity to accommodate foreseeable development demands (Honeyfield 2012). Carlsbad has adequate water treatment and storage capacity, but has experienced water supply shortages requiring implementation of water use restrictions (Shumsky 2012). In 2011, Mosaic Potash allowed the city to use some of its water rights to make up the shortfalls. Carlsbad may curtail water sales to some commercial users if water shortages become more severe (Tully 2012).

3.15.7.2 Wastewater

Municipal wastewater systems in Jal, Eunice, Hobbs and Carlsbad would likely be affected by demand associated with the proposed Ochoa Project. The Jal system could accommodate a 20 to 25 percent increase in population (Schrader 2012a).Eunice recently completed a $7.5 million wastewater treatment plant, with capacity to accommodate twice the city’s current population (Moore 2012a). Hobbs completed a $30 million wastewater treatment facility within the past two years. The new plant can accommodate a 30 percent increase above current usage (Honeyfield 2012). Carlsbad is completing a $17 million expansion of its wastewater treatment capacity to accommodate foreseeable growth (Shumsky 2012).

3.15.7.3 Solid Waste Disposal

Solid waste disposal services for the area around the proposed Ochoa Mine site and communities in Lea County are provided by the Lea County Solid Waste Authority. The authority operates a single landfill, located approximately 5 miles east of Eunice. The landfill accepts residential, commercial, private, and public waste material. The 340-acre site has a remaining life of approximately 80 years (Lea County 2011). Eddy County operates the Sandpoint Landfill, located approximately 12 miles east of Carlsbad.

3.15.7.4 Law Enforcement

The Lea County Sheriff’s Department has primary responsibility for law enforcement in the immediate project area. Sherriff’s Department currently has 53 commissioned patrol officers, and 11 unfilled positions. A Lea County Sheriff’s Deputy stationed in Jal. High oilfield wages and housing shortages complicate the department’s recruitment and retention efforts. Construction of a new Sheriff’s Department Administrative Facility is currently underway in Lovington, near the existing detention facility. Completed in 2005, the Lea County Detention Center is designed to house 400 adult and 32 juvenile inmates. The daily inmate population averages approximately 310 in number (Wilmeth 2012).

The Eddy County Sheriff’s Department is based in Carlsbad and would respond to accidents and law enforcement incidents on the highways along the segment of NM 128 that is in Eddy County and the segments of U.S. 285 and NM 31 that link to NM 128, providing access to the Ochoa Project area. The Eddy County Sheriff’s Department operates a countywide dispatch center, which allows for direct communications between all emergency response entities as well as a secondary radio system that can interface directly with surrounding counties.

The cities of Eunice, Hobbs, Jal, and Carlsbad each operate municipal police departments that provide law enforcement services within the respective municipalities.

The New Mexico State Police provides statewide law enforcement, and has primary responsibility for safety, traffic enforcement, accident investigation, and first response on state and federal highways throughout the state. The study area is located in District 3, based in Roswell. Officers are based in Hobbs, Carlsbad, and Artesia.

Due to the large geographic areas and extensive road networks in the area, law enforcement and other emergency response times can be lengthy.

3.15.7.5 Emergency Response (Fire and Ambulance)

Lea County Emergency Management is responsible for planning responses to emergencies and natural disasters in Lea County. Municipal fire departments and ambulance services are located in Eunice, Hobbs, Jal, and Carlsbad. The Jal Volunteer Fire Department and Ambulance Service, which covers the Ochoa Project area, has 24 volunteer firefighters and 8 vehicles including 4 first response units and 2 tankers. Jal also has 8 emergency medical technicians, certified ambulance volunteers and 2 ambulance units (Schrader 2012a).

3.15.7.6 Health Care

Hospital services in southern Lea County are provided by the Lea Regional Medical Center (LRMC), located in Hobbs. LRMC is accredited by the Joint Commission and has 201 licensed beds, 31 active and 21 courtesy physicians, and a total of 560 hospital employees (LRMC 2012). Nor-Lea Hospital located in Lovington also provides hospital and health care services. Health care clinics are located in Eunice and Jal. An accredited acute care hospital, the Carlsbad Medical Center with 115 beds, is located in Carlsbad. Several providers serve the region with air ambulance/medevac service, coordinating initial response with the local hospitals and emergency responders, and transporting patients to regional trauma centers in Albuquerque, El Paso, or elsewhere when necessary.

3.15.7.7 Public Education

School districts serving the area are based in Eunice, Hobbs, Jal, and Carlsbad. The Ochoa Project area is located in the Jal Public Schools district (Carrera 2012).

Eunice Public Schools (2012 school year enrollment 618) operate an elementary school, a middle school and a high school (Eunice Public Schools 2012). Hobbs Municipal Schools (2012 school year enrollment 8,698) operates 12, K through 5^{th} grade elementary schools; 1 kindergarten only school; 3, 6^{th} through 8th grade junior high schools; 1, 9^{th} grade only high school; 1, 10^{th} through 12^{th} grade high school; and 1 special education facility (Hobbs Municipal Schools undated). Jal Public Schools (2012 school year enrollment 377) operate 1 elementary school and 1 combined middle/high school (Carrera 2012). The Carlsbad Municipal School District (2012 school year enrollment 6,080) operates 11 primary schools, 2 middle schools, and 1 high school (Carlsbad Municipal Schools 2012). There also are private schools in Eunice, Hobbs, and Carlsbad.

3.15.7.8 Mining as it Relates to Public Sector Fiscal Conditions

Public sector fiscal conditions in the region are integrally linked to natural resource development and the presence of public lands. The State of New Mexico and many local entities derive substantial revenues from development activity. Major revenue sources include payments in lieu of taxes (PILTs) on federal lands, gross receipts taxes (GRTs) on the taxable value of commodities sold and purchases by energy firms, their vendors and employees, mineral royalties, severance taxes, and *ad valorem* taxes on the value of production and mining equipment. Recent receipts from several of these sources are highlighted below:

- PILTs are transfers from the federal government to counties with eligible property. The transfers help defray the costs of providing emergency services on those lands and offset some of the property tax revenue foregone due to the public ownership of lands and minerals. In fiscal year 2011, PILTs totaling $1.1 million and $3.5 million were made to Lea County and Eddy County, based on 425,017 and 1.58 million acres of qualifying lands, respectively. (U.S. Department of the Interior 2011).
- Federal mineral royalties (FMR) are collected on mineral production from federal lands. Approximately one-half of the FMR receipts are returned to the state in which the production occurs. In New Mexico, the FMR funds accrue primarily to the general fund, with subsequent disbursements to public education and other programs.

- New Mexico imposes a severance tax, conservation tax, and an emergency school tax on the sales value of oil and gas produced, regardless of ownership. The current combined tax rate is 7.09 percent. The total proceeds from those taxes are typically more than double the receipts from federal mineral royalties (NMEMNRD 2011).
- Similar in some respects to a sales tax, the New Mexico GRT is levied on the sales and leases of most goods, property, and services. The rate varies between 5.125 percent, which is the state base rate, and 8.6875 percent, depending on the county or municipality.
- Lea and Eddy counties and other local taxing authorities assess and collect *ad valorem*/property taxes on mineral production and mining-related equipment located within its taxing boundaries.

3.15.7.9 Taxable Value

Table 3.15-10 displays the taxable value for Lea and Eddy counties and municipalities near the proposed Ochoa Project. The taxable values for the counties are substantial, in excess of $3.0 billion each, reflecting the value of oil, gas and mineral production. The taxable value of the selected municipalities, based primarily on residential, commercial, and some industrial properties, ranges from $4.4 million for Loving to $225.2 million for Carlsbad.

Table 3.15-10 Lea and Eddy County Taxable Values for Property Taxes: Fiscal Year 2011

County/Community	Net Taxable Value
Lea County	$ 3,095,336,309
Lovington	$ 47,231,852
Eunice	$ 12,099,029
Hobbs	$ 220,536,016
Jal	$ 7,620,098
Eddy County	$ 3,156,099,067
Carlsbad	$ 225,198,032
Loving	$ 4,447,406

Source: New Mexico Department of Finance and Administration (NMDFA) 2012a.

3.15.7.10 County Budget Summaries

Table 3.15-11 below displays fiscal year 2011 budget summaries for Lea and Eddy counties. Fiscal year 2011 total revenues exceeded expenditures in Eddy County, resulting in a fund balance of $43.3 million for the year. Conversely, fiscal year expenditures exceeded revenues by $1.5 million in Lea County, resulting in transfers from other sources.

Table 3.15-11 Lea and Eddy County Budget Summary, Fiscal Year 2011

Revenues and Expenditures	Eddy	Lea
General Operating Revenues	$ 31,502,589	$ 35,400,021
Other Revenues	$ 17,719,441	$ 24,427,822
Total Revenues	$ 49,222,030	$ 59,827,843
General Operating Expenditures	$ 21,288,270	$ 28,490,453
Other Expenditures	$ 23,561,214	$ 32,866,295
Total Expenditures	$ 44,849,484	$ 61,356,748
Net Transfers	$ 4,372,546	$ (1,528,906)

Source: NMDFA 2012b.

3.15.7.11 Municipal Budget Summaries

Table 3.15-12 displays municipal budget summaries for communities near the Ochoa Project site. Fiscal Year 2011 revenues exceeded expenditures in all communities.

Table 3.15-12 Municipal Budget Summary, Fiscal Year 2011

Revenues and Expenditures	Eddy		Lea			
	Carlsbad	Loving	Eunice	Hobbs	Jal	Lovington
General Operating Revenues	$30,576,120	$ 859,546	$ 5,036,375	$53,752,177	$ 1,372,052	$7,480,121
Other Revenues	$35,000,586	$242,474	$ 4,668,637	$37,216,247	$ 1,928,955	$5,850,448
Total Revenues	$65,576,706	$102,020	$ 9,705,012	$90,968,424	$ 3,301,007	$13,330,569
General Operating Expenditures	$25,383,920	$ 778,266	$ 3,224,165	$43,433,463	$ 1,253,723	$7,144,689
Other Expenditures	$34,933,876	$190,941	$ 5,638,912	$40,772,081	$ 1,732,884	$4,812,351
Total Expenditures	$60,317,796	$969,207	$ 8,863,077	$84,205,544	$ 2,986,607	$11,957,040
Net Transfers	$ 5,258,910	$ 132,813	$ 841,935	$ 6,762,880	$ 314,400	$1,373,529

Source: NMDFA 2012c.

3.15.8 Social Organization and Conditions

This section focuses on those social conditions within Lea and Eddy counties, which are likely to be affected by the proposed Ochoa Project. Information for this section was obtained from public scoping comments, newspaper articles, interviews with local officials and staff, and secondary sources, as cited.

Residents of Lea and Eddy counties are familiar with potash mining, other forms of natural resource development, and major construction projects. This familiarity results in general acceptance of natural resource development and the economic benefits associated with mineral extraction and major construction projects.

Ranching, outdoor recreation, oil and gas development and production, and potash mining are all elements of the southeastern New Mexico social and economic fabric. When two or more of these activities occupy the same general area, the potential for conflict arises. In the case of the proposed Ochoa Project, ranching, outdoor recreation and oil and gas development and production are all present within and near the study area.

3.15.8.1 Ranching and Grazing

Portions of nine grazing allotments are contained within the project area. Range improvements located in the project area include base water, water wells, storage tanks, water pipelines, troughs, retention dams, fences, and corrals. A range study trend plot is located in the 50-year mine plan area. Ranching and grazing operator's concerns include the effects of mine development on range improvements. There also is concern for access, loss of forage, and for mining's effects on water and air quality, dust, noise and the value of nearby ranching property.

3.15.8.2 Outdoor Recreation

The primary outdoor recreation activity occurring in and near the project area is OHV use, although some hunting, camping, and picnicking also may occur. There are no designated recreation areas or facilities within the project area. To date, public concerns for effects on outdoor recreation have not surfaced in association with the proposed Ochoa Project.

3.15.8.3 Oil and Gas

There are almost 100 producing oil and gas wells located within the boundaries of the proposed mine and plant site. There also are gathering systems, pipelines and other ancillary facilities such as tank batteries. Agave Energy is completing a gas processing and treating plant west of the Ochoa Mine site and plans to complete an acid gas injection well at the facility (Agave Energy 2012). The concerns of the oil and gas industry include the potential effects of development and operations of the proposed project on existing oil and gas facilities and operations, potential effects of subsidence on oil and gas facilities, potential effects on access to well facilities, and any constraints that the proposed project may have on future oil and gas development.

3.16 Environmental Justice

Environmental justice is defined as the fair treatment and meaningful involvement of all people regardless of race, color, national origin, or income with respect to the development, implementation, and enforcement of environmental laws, regulations, and policies (USEPA1998). EO 12898, Federal Actions to Address Environmental Justice in Minority Populations and Low-Income Populations, tasks “each Federal agency [to] make achieving environmental justice part of its mission by identifying and addressing, as appropriate, disproportionately high adverse human health and environmental effects of its programs, policies, and activities on minority populations and low-income populations.”

Implementation of EO 12898 for NEPA requires the following steps:

1. Identification of the presence of minority and low-income populations and Indian Tribes in areas that may be affected by the action under consideration.
2. Determination of whether the action under consideration would have human health, environmental, or other effects on any population.
3. Determine of whether such environmental, human health or other effects would be disproportionately high and adverse on minority or low-income populations or Indian Tribes.
4. Provision of opportunities for effective community participation in the NEPA process, including identifying potential effects and mitigation measures in consultation with affected communities and improving the accessibility of public meetings, crucial documents, and notices (USEPA 1998).

3.16.1 Minority Populations

Table 3.16-1 presents 2010 Census information on the prevalence of minority populations in Lea and Eddy counties, and the communities likely to accommodate mine employees. As shown, the concentration of minority populations in each of these geographies is lower than the New Mexico statewide average, with the exception of Hobbs, which is slightly but not meaningfully higher than the statewide average.

Table 3.16-1 Percentage of Minorities in Geographic Comparison Areas, 2010

Geographic Area	Percentage of Total Population				Variance in the Percentage of Minority Population with the Statewide Average
	White Alone and Non-Hispanic	Hispanic or Latino	Other Racial and Ethnic Minorities	Total Racial and Ethnic Minorities	
United States	63.7	16.3	20.0	36.3	-23.2
New Mexico	40.5	46.3	13.2	59.5	n/a
Lea County	43.0	51.1	5.9	57.0	-2.5
Eunice	50.1	47.5	2.4	49.9	-9.6
Hobbs	38.3	53.7	8.0	61.7	2.2
Jal	49.9	48.1	2.0	50.1	-9.4
Eddy County	52.2	44.1	3.7	47.8	-11.7
Carlsbad	53.1	42.5	4.4	46.9	-12.6

Source: U.S. Census Bureau 2011b.

There are a few household but no communities or settlements of any type within 2 miles of the mining area and proposed location of plant facilities. The proposed rail loadout in Jal would be located in an industrial area, on an existing rail line that is served by a major highway. The area around the proposed Ochoa Project is very sparsely populated, with the City of Jal, 23 miles to the east, the nearest concentration of population. Census Tract 9 in Lea County, which essentially covers the lower quarter of Lea County and includes the City of Jal, incorporates the entire Ochoa Project area, including the 50-year mine plan area and the proposed Jal rail loadout facility. The population of Census Tract 9 was 2,175 residents, 2,047 of whom lived in Jal.

3.16.1.1 Low Income Population

Table 3.16-2 identifies the prevalence of low-income populations in Lea and Eddy counties and the communities likely to accommodate mine employees. The share of population below the poverty level in Lea County as a whole is 2.7 percentage points above the statewide average, largely due to the higher prevalence of poverty in Hobbs. The communities nearest the Ochoa Project area are below the statewide poverty levels, as are the overall rates of poverty in Eddy County.

In conclusion, the 2010 Census and direct observation indicate an absence of human habitation within the Ochoa Project area, an extremely low population density surrounding the project area and a comparatively low prevalence of minority and low-income populations in communities likely to host substantial numbers of project workers.

Table 3.16-2 Low Income Population

Geographic Area	Percentage of Total Population Below 100% of Poverty Level	Percentage of Low-income Population Above/Below Statewide Average
United States	12.4	n/a
New Mexico	18.4	n/a
Lea County	21.1	2.7
Eunice	15.6	-2.8
Hobbs	24.2	5.8
Jal	17.9	-0.5
Eddy County	17.2	-1.2
Carlsbad	16.5	-1.9

Note: The poverty data for the U.S., state, Lea and Eddy counties are 2010 estimates.

Sources: U.S. Census Bureau 2011d.