PERMITS WEST, INC.
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December 31, 2015

Mr. Michael W. Coleman,
New Mexico Mining and Minerals Division
Energy, Minerals and Natural Resources Department
1220 South St. Francis Drive
Santa Fe, New Mexico 87505

RE: Mine permit area and supporting documentation for the Section 11/12 Mine, Permit Application MK046RE

Dear Mr. Coleman,

Thank-you for calling me to discuss the permit area map for the Section 11/12 Mine. As we had previously discussed, I wanted to provide you with a technical memorandum and two survey reports that will form the basis for the Mine Assessment portion of the permit application and will be used to address specific agency comments/concerns.

The technical memorandum was developed and prepared by Hydrosciences Associates, Inc. to address the NMED, SWQB's request for:

- A flood hazard evaluation for facilities within or immediately adjacent to the mapped footprint of Ambrosia Lake. (Item 4. NMED letter of May 8, 2014)
- A hydrologic analysis and recommendations to mitigate any potential flood hazard from Ambrosia Lake that could impact existing or proposed facilities. (Item 4. NMED letter of May 8, 2014)
- A regional geologic map which includes alluvium on a topographic base and shows the locations of the wells previously referenced in Table 2 of the first permit application submittal, and an comprehensive evaluation of the potential for relatively shallow alluvial waters being present in the area of the mine, and possible impact that the mining operation may have on alluvial waters if they are present. The evaluation will include an evaluation of the potential relationship between water observed in Ambrosia Lake and possible shallow alluvial aquifers. (Item 7. NMED letter of May 8, 2014; see also e-mail from the Office of State Engineer, dated March 17, 2014).

The wildlife and botany reports were also developed by Permits West staff to address the need for more complete information on wildlife, wildlife habitat, and plant resources in the mine permit area (see NMDGF letter of March 25, 2014).

We are looking forward to working with you to finalize the radiologic survey and the selection of the baseline/reference area for that survey in next few weeks and would like to schedule a meeting to discuss some of the technical and organizational aspects the permit application. Please call me if you have any questions or need additional information. Best wishes for the New Year!

Sincerely,

Robyn W. Tierney

Robyn Tierney
Natural Resources Specialist
Permits West, Inc.

Attachments: Technical Memorandum (Hydroscience Associates, Inc.); Wildlife Survey Report (Permits West); Plant Survey Report (Permits West)

cc: George O. Lotspeich – Southwest Resources, Inc.;
Frank Welker via e-mail;
Reed Easterwood – Domenici Law Firm, P.C.;
Project File – Permits West, Inc.

HYDROSCIENCE ASSOCIATES, INC.
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TECHNICAL MEMORANDUM

TO: Permits West

FROM: M. Wasiolek

RE: Groundwater conditions near the Section 12 shaft

DATE: November 23, 2015

ISSUE: Southwest Resources, Inc. of Albuquerque has filed a Mine Permit Application and a Close Out Plan with the NM MMD for a former uranium mine located in the southwest corner of Section 12, Township 14N, Range 10W (the "Section 12 mine"), previously operated by Cobb Resources and Hydro-Nuclear. The NM MMD has requested some additional information and analyses related to shallow groundwater in the area. In particular, NM MMD requested: 1) a regional geologic map that includes alluvium on a topographic base and shows the locations of wells listed in Table 2 of the Application; 2) an evaluation of the potential for the presence of shallow groundwater conditions in the area of the mine; and 3) an assessment of the potential impact of the mine on shallow groundwater, if it is present. HAI has been asked by Permits West to provide the requested material and analyses.

In order to accomplish this task, HAI reviewed the available published and unpublished hydrogeologic reports and data for the study area and the San Juan Basin, identified wells in the OSE WATERS database located within 4,800 m (three miles) of the Section 12 shaft, and reviewed historical photography on-line resources such as GOOGLE Earth. A list of the documents and sources relied on is included at the end of this Technical Memorandum.

CONCLUSIONS:

As a result of the analyses performed, the following conclusions were arrived at regarding shallow groundwater in the vicinity of Section 12, T14N R10W:

1. There is no hydrogeologic evidence that a shallow groundwater system exists within the alluvial materials in the vicinity of the Section 12 shaft.

2. Within the San Juan Basin there is an extensive deep artesian aquifer within the Morrison Formation, which in the area of Section 12 is found between 650 and 780 feet below land surface. Groundwater in wells and mine shafts completed in this deep aquifer is under pressure and rises to within approximately 450 of the surface. Water in this aquifer is separated from surface sources of water by several hundred feet of low-permeability shales in the area of the Section 12 shaft and cannot be impacted by infiltration of surface water.

3. Previous operation of the Section 12 mine did not result in discharge of groundwater from the deep aquifer in the Morrison Formation into the Arroyo del Puerto. There will be no harm to any alluvial groundwater resources that might be located farther down the Arroyo del Puerto if future mining operations also avoid discharging into the lake, and if the berm along the western edge of Ambrosia Lake is maintained.

DISCUSSION:

1. There is no hydrogeologic evidence that a shallow groundwater system exists within the alluvial materials in the vicinity of the Section 12 shaft.

The Section 12 mine is located within 15 acres of the SW 1/4 of Section 12, Township 14N, Range 10E, NMPM, on the eastern edge of the 43 acre dry lake known as "Ambrosia Lake."

The potential for the presence of a shallow groundwater aquifer in the vicinity of Section 12 was investigated by identifying wells located within three miles of the Section 12 shaft, and determining their producing intervals and depths to water. If a shallow groundwater aquifer were to be present within the area of Section 12, it would be expected that shallow wells would be present within this radius. The OSE WATERS database was relied on, and the wells identified in that database were cross-checked with Table 1 of Stone et al (1983), Table 2 of Brod and Stone (1981), and Table 1 of Cooper and John (1968), which are reports that tabulate wells, monitor wells, and mine shafts within the San Juan Basin. Table 1 of this Technical

Memorandum lists the wells identified by this procedure. Figure 1 shows the locations of these wells and the Section 12 shaft. A legend for abbreviations in the Table and figures is provided below:

Legend for Figures 1, 2, and Table 1

Figure or Table abbreviation	Well symbol	Description
P & Tr		Permian & Triassic
Psa		Permian San Andres Formation
Jm		Jurassic Morrison Formation
Km		Cretaceous Mancos Shale
Kg		Cretaceous Gallup Sandstone
Qa		Quaternary stream alluvium
Qaf		Quaternary alluvial fan deposits
Qae		Quaternary stream alluvium subject to eolian processes
B-363		Well location & OSE water right file designation

Only one well completed in streambed alluvium was identified as potentially being present within three miles of the Section 12 shaft. This well, B-00143, was reportedly completed in 1960 to a depth of 90 feet approximately two and a half miles north-northeast of the Section 12 shaft in the streambed alluvium of an unnamed stream course that drains into Ambrosia Lake. The well appears in the OSE WATERS database, but not in any of the other well inventory report (Cooper & John, 1968, Brod and Stone, 1981, or Stone et al, 1983), which investigated the hydrogeology of the area and compiled the locations and characteristics of known groundwater wells.

WR File Nbr	Owner	Use	Source	q64	q16	q4	Sec	Tws	Rng	X	Y	Distance	Finish Date	Depth Well	Depth Water	Aquifer
B 00366 *	Rio Algom Mining	MIN	Artesian		1	4	24	14N	10W	241563	3924043	3070	12/31/1955	760		Jm
B 00372	Sabre-Pinon Corp.	MIN			4	1	23	14N	10W	239552	3924525	3105	09/12/1956	796		Jm
B 00994 S5	Rio Algom Mining	MIN	Shallow	4	1	3	17	14N	09W	244128	3925430	3295	04/05/1959	1094		Jm
B 00994 S4	Rio Algom Mining		Shallow	1	1	4	19	14N	09W	243086	3924087	3510	03/16/1970	779		Jm
B 00994	Rio Algom Mining	MIN	Shallow	3	4	3	24	14N	10W	241046	3923554	3555	09/18/1958	857		Jm
B 00373	Rio Algom Mining	MIN	Artesian	4	1	2	22	14N	10W	238453	3924864	3610	12/31/1956	1003		Jm
B 00994 S6	Rio Algom Mining	MIN	Shallow	4	1	2	22	14N	10W	238453	3924864	3610	01/02/1958	827		Jm
B 00363	Rio Algom Mining	MIN	Artesian	2	2	4	22	14N	10W	238835	3924236	3771	04/30/1956	745		Jm
B 01881	Jerry Elkins	STK	Shallow	1	1	1	10	14N	10W	237674	3928251	3792	12/14/2014	1060	800	Jm
B 00143	Andrews	DOM	Shallow	4	3	1	35	15N	10W	239462	3930833	4154	07/18/1960	90	60	Qa
B 00362	Rio Algom Mining	MIN	Artesian	4	1	4	22	14N	10W	238435	3924036	4186	11/30/1956	3093		P & Tr
B 00371	Sabre-Pinon Corp.	MIN			3	1	25	14N	10W	240716	3922861	4278	08/25/1956	752		Jm
B 00364	Anderson Development Corp.	MIN	Artesian	1	2	2	30	14N	09W	243460	3923276	4399	08/31/1956	735		Jm
B 00365	Anderson Development Corp.	MIN	Artesian		2	3	20	14N	09W	244399	3923952	4427	01/31/1956	793		Jm
B 00994 S	Rio Algom Mining	MIN	Shallow	4	3	1	30	14N	09W	242425	3922703	4542	03/23/1968	810		Jm
B 00522 *	UNC-Homestake Ptnrs	MON		2	2	4	25	14N	10W	242009	3922518	4639	02/07/1978	70		Psa

* The location of B 00552 was projected by the OSE from a sub-division lot and appears to be incorrect. According to the well log, the well is completed in Psa, which is not present at the location projected by the OSE.

* WR File Nbrs in red were listed in Table 2 of the first permit Application.

Table 1. Wells in NM OSE Database Located Within 4,800 m of Section 12 Mine Shaft

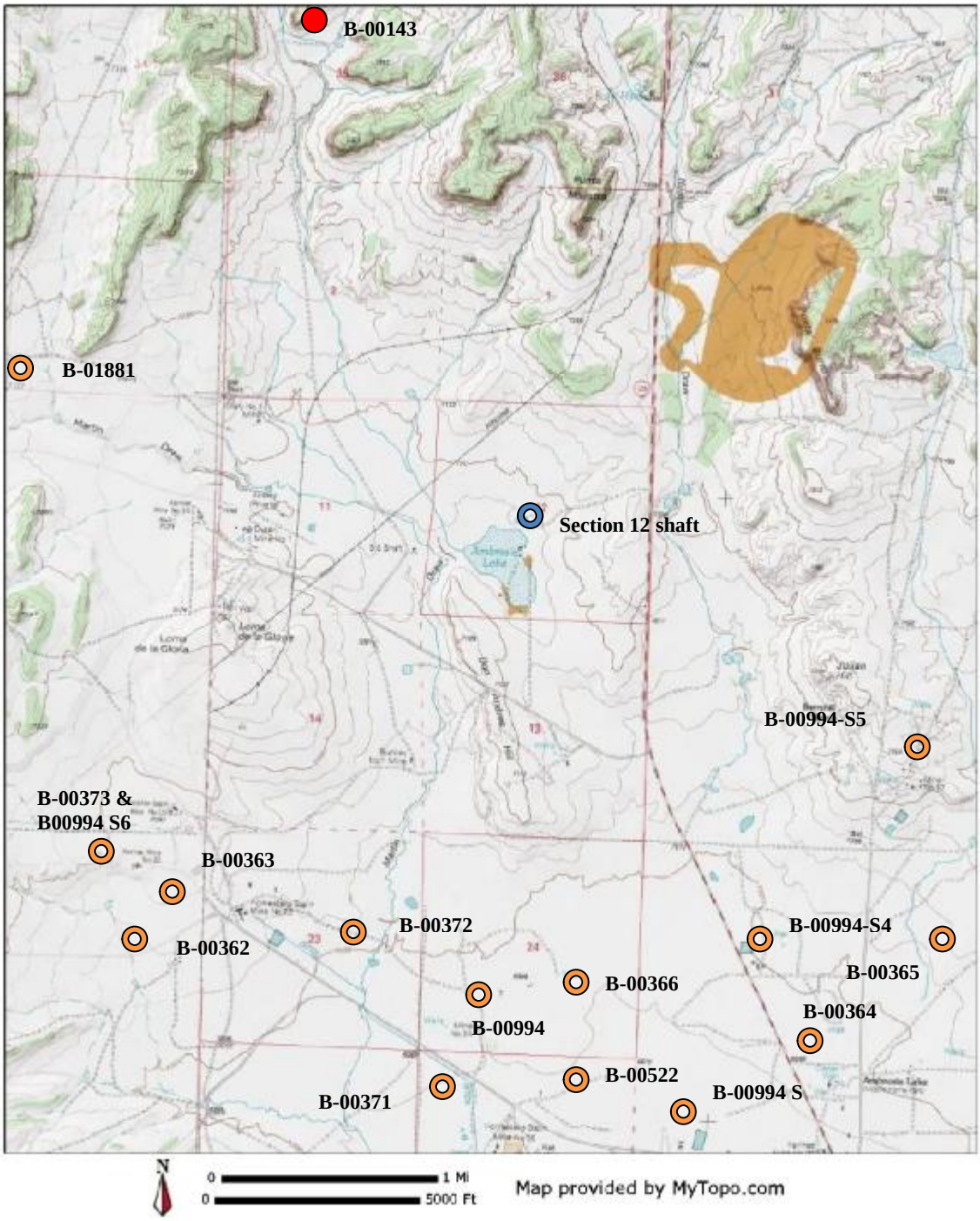

Figure 1. Location of Wells in OSE WATERS Database within 4,800 m of Section 12 Shaft.

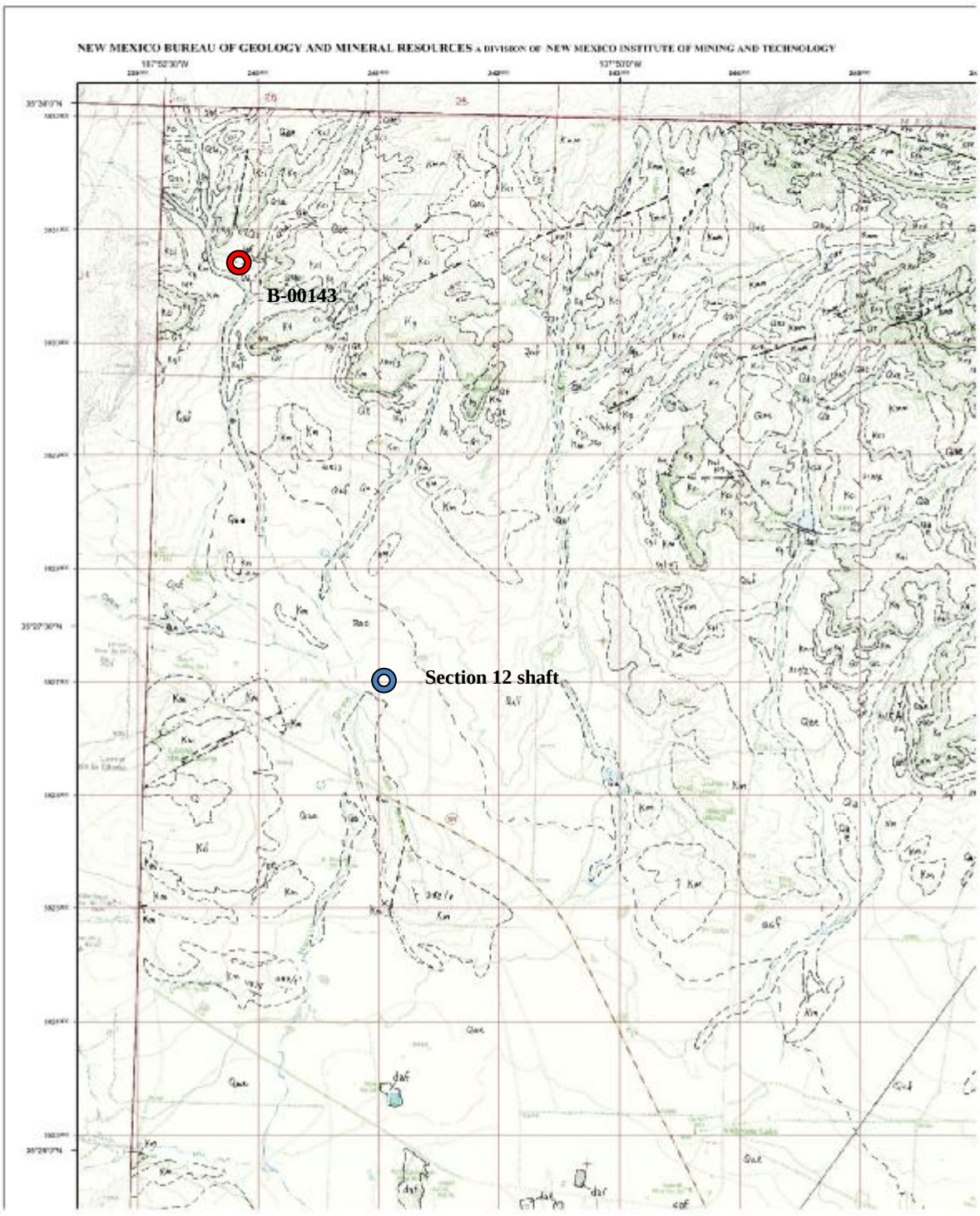

Figure 2. Geologic Map of the Area around the Section 12 Shaft. (modified from Ferguson & McCraw, 2010)

The well log for B-00143 describes the aquifer as "sand and gravel, red shale." Recent geologic mapping by Ferguson and McCraw (2010) identifies the aquifer in the area of the well as stream bed alluvium (Qa), as can be seen on Figure 2. They describe Qa as "Stream alluvium (Quaternary)-Gravel, sand and silty sand in stream channels." Qa is confined on their map to the immediate area of a stream drainage, and is not the same geologic unit as is mapped in the vicinity of Section 12. Outside of stream channels, the Quaternary alluvial deposits are designated as either alluvial fan deposits (Qaf), or as alluvium which has been subjected to eolian processes; ie, windblown sands and silts (Qae). Qae is present in the area of Ambrosia Lake and the Section 12 shaft; it is described by Ferguson and McCraw (2010) as "Primarily stream alluvium subject to eolian processes (Quaternary)- Sand, and silty sand occupying low-lying flat areas, often showing areas of deflation and eolian deposition on lee sides of bedrock hills and structures. Occasional gravel lag deposits." These are different materials than those purportedly tapped by well B-00143.

Other indications that shallow aquifers might be present would be the presence of springs or a groundwater-fed lake. Neither are present in the vicinity of Section 12. Review of topographic maps and previous investigations of the area do not reveal any reports of springs, seeps, or shallow groundwater. Ambrosia Lake itself is a shallow, closed depression which occasionally holds water, but is often dry for years at a time, a condition which has been commented on by various observers for at least the past fifty years. For example, according to Cooper and John, "Ambrosia Lake, Casamero Lake and Smith Lake are natural depressions that are normally dry and contain water only after heavy rains" (Cooper & John, 1968, p. 11). Twenty years later in 1989 Chenoweth described Ambrosia Lake as "a small, ephemeral lake situated in the SW1/4 sec. 12, T14N, R10W. It is now dry and is the site of Cobb Nuclear's Section 12 shaft" (Chenoweth, 1989, p. 297). The eastern part of the lake reportedly held some water during part of 2014, but HAI personnel have observed it to be dry on various occasions during the last 10 years. If the lake were fed by a shallow groundwater aquifer, it would hold water permanently. Its ephemeral nature indicates that it is not fed by groundwater inflow from a shallow aquifer. It is, rather, an ephemeral, playa lake unconnected to a groundwater aquifer. Such features typically form in low areas in the southwest, developing beds of fine silt and clay which impede

downward movement of water during precipitation events and hold it temporarily before it is evaporated.

2. Within the San Juan Basin there is an extensive deep artesian aquifer within the Morrison Formation, which in the area of Section 12, is found between 650 and 780 feet below land surface. Groundwater in wells and mine shafts completed in this deep aquifer is under pressure and rises to within approximately 425 feet of the surface. Water in this aquifer is separated from surface sources of water by several hundred feet of low-permeability shales in the area of the Section 12 shaft and cannot be impacted by infiltration of surface water.

Records for all other wells within three miles of the Section 12 shaft indicate that they pump from the Morrision Formation, usually from the Westwater Canyon Member, or the lower Mancos Shale from a depth of 400 to 650 feet below land surface. In addition to wells listed in Table 1 from OSE WATERS data base, Table 1 of Stone et al (1983) and Table 1 of Cooper and John (1968) list the depths and water levels in a number of additional mine monitor wells and mine shafts within 14N 10W sections 23, 24, 25, and 14N 9W, section 30. These wells and mines are approximately 700 feet in depth, and have depths to water of 425 feet or more below land surface. Granger (1982) reports water levels and mine depths for the nearby Section 23 mine that are comparable.

Between the Westwater Canyon Member and land surface are hundreds of feet of Mancos Shale, a low-permeability geologic unit (Stone et al, 1983). The presence of an artesian head in the Westwater Canyon aquifer is indication that the shale is an effective barrier to vertical movement of groundwater. Groundwater in this deeper aquifer cannot be impacted by activities on the land surface above.

3. Previous operation of the Section 12 mine did not result in discharge of groundwater from the deep aquifer in the Morrison Formation into the Arroyo del Puerto. There will be no harm to any alluvial groundwater resources that might be located farther down the Arroyo del Puerto if future mining operations also avoid discharging into the lake, and if the berm along the western edge of Ambrosia Lake is maintained.

NMED records indicate that records indicate that none of the mines in the area of Section 12 discharged water into the lake or Arroyo del Puerto. Table 1 of *Water quality data for discharges from uranium mines and mills in New Mexico*, compiled by Perkins of the NMED (1980), lists the Section 12 mine as "dry." No discharge from this mine was noted in this report or in any other contemporaneous investigation such as the USEPA's *Water quality impacts of uranium mining and milling activities in the Grants mineral belt*, (1975), or Table 5 of Brod and Stone (1981).

Ambrosia Lake is located in a closed basin, and although ephemeral stream courses empty into it, none flow out. The upper Arroyo del Puerto (also called "Martin Draw" on some maps) swings near the western side of the lakebed, but an earthen berm prevents any occasional flow from that stream course from entering the lakebed, and any water from leaving. Activities within the lake basin at the Section 12 mine would not affect an alluvial aquifer in the Arroyo del Puerto, if one exists in this area, which is doubtful. Prior to discharge of mine water into the Arroyo del Puerto by mines located several miles downstream of Section 12, the alluvial fill of the stream course was reportedly dry (Ganus, 1980). That at the present Arroyo del Puerto contains some sub-surface water from about three miles downstream of Section 12 is due to seepage from mine ponds and discharge of mine dewatering water into the arroyor from uranium mills, particularly Kerr-McGee and United Nuclear Homestake Partners mills, during the 1960-1983 period (Kaufman et al, 1975; NMED, 2010, 2012). Mine and mill reclamation activities and lack of natural recharge will eventually decrease the amount of groundwater in the streambed to an insignificant level.

REFERENCES RELIED ON

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USDOE, 2001. "Ambrosia Lake, New Mexico, disposal site, Long Term Surveillance and Maintenance Program:" Fact Sheet.

USEPA, 1975, *Water quality impacts of uranium mining and milling activities in the Grants mineral belt*, EPA 906/9-75-002.

USGS, Ambrosia Lake 1:24,000 topographic quadrangle.

Wildlife Survey Report
For
Southwest Resources, Inc.
Section 11/12 Mine
McKinley County, New Mexico

November 14, 2015

Prepared By:
Celia Cook

Permits West, Inc.
37 Verano Loop
Santa Fe, NM 87508

1.0 INTRODUCTION

A survey for wildlife and for threatened, endangered, and special status (listed) wildlife was conducted at the site of Southwest Resource's Section 11/12 mine on November 5, 2015. The mine is located near Ambrosia Lake, McKinley County, New Mexico approximately 20 miles north of Milan. The mine is located on private land in the southwest quarter of Section 12, T. 14 North, R. 10 West. An air vent/escape shaft for the mine is located in the southeast quarter of Section 11. The mine is currently inactive. It has changed ownership several times in the last 40 years and was most recently active in the 1980s when uranium prices were more favorable.

Southwest Resources is seeking to complete a mine permit application with the State of New Mexico Mining and Minerals Department. The wildlife survey was performed to ensure that there are no federal or state listed species or otherwise sensitive wildlife occurring on or near the mine project area or in an approximate 0.5 mile buffer around the perimeter of the mine center (i.e., the head frame) located in the northeast quarter of the southwest quarter of Section 12 [Lat. 35.454463°, Long. -107.850745° NAD 83].

2.0 METHODS

Prior to field surveys, the Information, Planning, and Conservation System (IPaC) and the Biotic Information System of New Mexico (BISON –M) websites were evaluated for listed or otherwise sensitive wildlife species and designated critical habitats [NMDGF, USFWS, 2015] that could potentially being impacted by activities at the mine and are known to occur within McKinley County [Appendices A and B].

On November 6, 2015, wildlife biologist Celia Cook of Permits West, Inc., conducted a pedestrian survey of the project area. Weather during the survey was mild with clear skies and light breezes. Temperatures during the survey were in the upper 50s (˚F).

The surveyed area consisted of the facilities area within the center of the mine, Ambrosia Lake to the west of the mine's head frame, the access road to the mine, and the surrounding area up to 0.5 miles from the head frame. General habitat and existing conditions were evaluated. Shrubs and other vertical structures were surveyed for raptor nests. Ambrosia Lake which was mostly dry was surveyed for waterfowl and shorebird use. Unique habitat elements were noted and considered with regards to potential wildlife use. Observed species were identified by direct observation of individuals, or by tracks, scat, and other sign.

3.0 DESCRIPTION OF EXISTING HABITAT

Habitat in the project area consists of a broad grassy valley surrounded by low hills and sandstone outcroppings to the north. Several ephemeral drainages flow from northwest to southeast and accumulate in the depression that is Ambrosia Lake. This approximately 30 acre lake is ephemeral in nature and could more accurately be described as a temporary pond. It does not support any wetland vegetation, but does provide a temporary source of water for wildlife and livestock in the area during

the monsoon season and significant precipitation events**.** During the survey, only a small puddle of water was left in the deepest part of the depression about 400 feet (122 m) northwest of the mine's head frame (Figure 1)**.**

Figure 1. Ambrosia Lake mostly dry in November 2015. Dark area represents mud flat.

There are a couple of small salt cedar (*Tamarix* sp.) trees near the southeast end of the lake, but the vegetation is mostly limited to fourwing saltbush (*Atriplex canescens*), several species of wheatgrass (*Pascopyrum spp.*), common sunflower (*Helianthus annuus*), purple aster (*Aster bigelovii*), and dock (*Rumex* sp.). Further away from the lake and upland, grasses are predominant and include species of grama grass (*Bouteloua* spp.), Indian ricegrass (*Achnatherum hymenoides*), alkali sacaton (*Sporobolus airoides*), galleta (*Hiliaria jamesii*) as well as shrub species such as rabbitbrush (*Chrysothamnus* sp.), snakeweed (*Gutierrezia sarothrae*), prickly pear (*Opuntia* sp.), and fringed sage (*Artemisia frigida*). Weedy annual species were pervasive in all disturbed areas throughout the project area, particularly around the head frame and buildings. These species included Russian thistle (*Salsola* sp*.)* and kochia (*Kochia sp*.). The project area is grazed by cattle and occasionally by elk (*Cervus elaphus*). There are no homes located within 1.5 miles of the mine center.

The project area has been used at least since the early 1900s for homesteading and farming. A berm built circa 1935 is still present north and northwest of the lake, presumably intended for water diversion for crops and/or livestock. An old homestead is located approximately 0.3 miles southwest of the head frame.

Wildlife species using the project area and adjacent lands are typical of grassland/valley landscapes. Rocky Mountain elk probably use the area for winter range and/or as a water source as evidenced by old and more recent scat observed during the survey. Significant herds are present within the Mt. Taylor

area approximately 20 miles east-southeast of the mine. Smaller mammals such as kangaroo rats (*Dipodomys* spp.), pack rats (*Neotoma* spp.), and desert cottontail (*Sylvilagus* sp.) were also present. Representative over-wintering bird species observed during the survey included common raven (*Corvus corax*), horned lark (*Eremophila alpestris*), and western meadow lark (*Sturnella neglecta*). Reptilian species were not observed due to time of year, but are likely to occur throughout the project area during the warmer seasons. Other migratory bird species not observed during the survey may also use the area around the mine for breeding during spring and summer months. A list of species observed during the survey is presented in Sections 5.8 and 5.9.

4.0 THREATENED AND ENDANGERED (T&E) AND SPECIAL STATUS SPECIES

Under Section 7 of the Endangered Species Act of 1973 (as amended), the State of New Mexico (Mining and Minerals Division) is required to consult with the U.S. Fish and Wildlife Service (USFWS) on any proposed action which may affect federally listed threatened or endangered species or species proposed for listing (ESA 16 U.S.C. 1531-1544).

Table 1 presents federal and New Mexico state listed species that have potential to occur in the project area. These species are recognized by the USFWS or the State of New Mexico as declining in McKinley County due to habitat loss, fragmentation, human disturbance, or other factors.

Table 1. Listed wildlife species in McKinley County

SPECIES	STATUS	HABITAT ASSOCIATIONS	POTENTIAL TO OCCUR AT PROJECT SITE**
BIRDS			
Bald Eagle *Haliaeetus leucocephalus*	NM Threatened, Federal Bald and Golden Eagle Protection Act	Cottonwood and other woodlands along lowland rivers or streams.	NP
Mexican spotted owl *Strix occidentalis lucida*	Federal Threatened	Mature, closed canopy and streamside forests, mesic canyons.	NP
Peregrine falcon *Falco peregrinus*	NM Threatened	Large bodies of water with adequate fish and stands of trees in shallows or on shore.	NP
Arctic Peregrine Falcon *Falco peregrinus tundrius*	NM Threatened	Migrant only in New Mexico	NP
Yellow-billed cuckoo *Coccyzus americanus occidentalis*	Federal Threatened	Riparian woodlands, orchards, and woodlots.	NP
Least Tern *Sternula antillarum*	Federal Endangered; NM Endangered	Mud flats and	NP
Southwestern willow flycatcher *Empidonax traillii extimus*	Federal Endangered	Riparian or wetland habitats with dense multi-story vegetation. Willow-cottonwood habitats preferred.	NP
Gray vireo *Vireo vicinior*	NM Threatened	Grasslands and shrublands with significant juniper component	NP
Costa's hummingbird *Calypte costae*	NM Threatened	Desert and foothill montane shrub habitats	NP
Mammals			
Canada lynx	Federal Threatened	Spruce-fir and high elevation forests	NP

SPECIES	STATUS	HABITAT ASSOCIATIONS	POTENTIAL TO OCCUR AT PROJECT SITE**
Lynx canadensis		in mountains with significant snow pack	
Fish			
Zuni Bluehead Sucker *Catostomus discobolus yarrowi*	Federal Endangered NM Endangered	Rivers, ponds, marshes, irrigation ditches	NP

**PRESENCE

K-KNOWN, DOCUMENTED OBSERVATION WITHIN PROJECT AREA.

S-HABITAT SUITABLE AND SPECIES LIKELY TO OCCUR WITHIN PROJECT AREA

NS- HABITAT SUITABLE BUT SPECIES IS NOT SUSPECTED TO OCCUR WITHIN THE PROJECT AREA

NP-HABITAT NOT PRESENT AND SPECIES UNLIKELY TO OCCUR WITH THE PROJECT AREA AS BREEDER BUT MAY OCCUR AS TRANSIENT OR MIGRANT.

4.1 MIGRATORY BIRDS

All migratory birds (including those listed in Table 1) are protected under the federal Migratory Bird Treaty Act of 1918 (MBTA; 16 U.S.C. 703-712). Birds protected under the act include all common songbirds, waterfowl, shorebirds, hawks, owls, eagles, ravens, crows, native doves and pigeons, swifts, martins, swallows, and others, including their body parts (feathers, plumes, etc.), nests, and eggs. The MBTA protects migratory birds from "take", defined as "to hunt, pursue, shoot, wound, kill, trap, capture, or collect, or any attempt to carry out these activities." In short, any activity that results in the take of migratory birds is prohibited unless authorized by the USFWS. There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

In addition to the general protection of all migratory birds, the USFWS Migratory Bird Program has identified Birds of Conservation Concern as a result of a 1988 amendment to the Fish and Wildlife Conservation Act [USFWS 2008]. The following Table 2 lists migratory birds of Conservation Concern that have potential to occur within the project area. Bird species already presented in Table 1 are not repeated in Table 2.

Table 2. USFWS Birds of Conservation Concern with potential to occur in project area

SPECIES	STATUS	POTENTIAL TO OCCUR AT PROJECT SITE**
Brewer's Sparrow *Spizella breweri*	Sagebrush and grassland habitats with shrub component.	NS
Burrowing Owl *Athene cunicularia*	Disturbed grassland or desert shrub habitats, usually associated with prairie dogs.	NS. No prairie dogs towns; however some areas of kangaroo rat burrows may be suitable.
Flammulated Owl *Otus flammeolus*	Generally associated with woodland pine habitat.	NP
Fox Sparrow *Passerella iliaca*	Coniferous forests and dense mountain scrub.	NP
Golden Eagle *Aquila chrysaetos*	Open habitats with cliffs >30 meters.	S
Grace's Warbler *Dendroica graciae*	Ponderosa pine forests.	NP

SPECIES	STATUS	POTENTIAL TO OCCUR AT PROJECT SITE**
Juniper Titmouse *Baeolophus ridgwayi*	Pinyon pine and juniper woodland.	NP
Lewis's Woodpecker *Melanerpes lewis*	Ponderosa pine woodland	NP
Loggerhead Shrike *Lanius ludovicianus*	Open shrubby areas, fence lines, pastures.	K. within several miles of project area.
Mountain Plover *Charadrius montanus*	Mud flats, lowlands, disturbed areas in pastures.	S
Olive-sided Flycatcher *Contopus cooperi*	Spruce fir and mixed pine forests.	NP
Pinyon Jay *Gymnorhinus cyanocephalus*	Pinyon pine forest and associated open areas.	NP
Prairie Falcon *Falco mexicanus*	Open grasslands with cliff habitat.	S
Swainson's Hawk *Buteo swainsoni*	Grasslands and agricultural fields.	S
Williamson's Sapsucker *Sphyrapicus thyroideus*	Forested habitats.	NP

**PRESENCE

K-KNOWN, DOCUMENTED OBSERVATION WITHIN PROJECT AREA.

S-HABITAT SUITABLE AND SPECIES LIKELY TO OCCUR WITHIN PROJECT AREA

NS- HABITAT SUITABLE BUT SPECIES IS NOT SUSPECTED TO OCCUR WITHIN THE PROJECT AREA

NP-HABITAT NOT PRESENT AND SPECIES UNLIKELY TO OCCUR WITH THE PROJECT AREA AS BREEDER BUT MAY OCCUR AS TRANSIENT OR MIGRANT.

5.0 SURVEY RESULTS

No federal or state listed wildlife species were observed during the November 5, 2015 wildlife survey. Additionally, no suitable habitat for any listed species was observed on or near the project area. The closest critical habitat to the project area is for the Mexican spotted owl, approximately 20 miles east-southeast in the Mt. Taylor range (USFWS 2015).

Suitable habitat for several species of migratory birds, including Birds of Conservation Concern was observed near the mine and surrounding area (within 0.5 miles of the mine center). These species are discussed below.

5.1 GOLDEN EAGLE

Golden eagles are usually found near mountainous areas, high cliffs, and canyons. In the southwest, rimrock terrain adjacent to open desert or grassland areas is preferred. Golden eagles forage over open grasslands, valleys, and desert shrub lands (NMACP 2015). Golden eagles may forage within the project area and use Ambrosia Lake for a water source and hunting area. However, there are no suitable nest structures within 1.0 miles of the project area. The closest suitable cliffs are located 1.5 miles northeast of the mine center.

5.2 PRAIRIE FALCON

Prairie falcons are found in open prairies and grassland habitats similar to that surrounding the mine area. Prairie falcons may forage or cross through the project area. Prairie falcon nests sites are usually located on cliffs and bluffs. The closest bluffs are approximately 1.5 miles northeast of the center of the mine.

5.3 SWAINSON'S HAWK

Swainson's hawks are also found in open prairies and grassland habitats similar to that surrounding the mine area. Swainson's hawks may forage or cross through the project area. Swainson's hawk nests sites are usually located in trees that are at least 15 feet (5 meters in height). There are no trees located within the project area. The closest trees suitable for nest sites for Swainson's hawks are located more than 2 miles away from the center of the mine.

5.4 MOUNTAIN PLOVER

Mountain plovers are often found in disturbed pastures and mudflats. The mud flats and grazed areas around Ambrosia Lake may offer suitable nest and forage habitat for this small shorebird. It is recommended that additional surveys for this species be conducted in the vicinity of the lake prior to any physical disturbance of the lake bed or shoreline.

5.5 LOGGERHEAD SHRIKE

Several loggerhead shrikes were observed along NM Highway 509 south of the mine site. These birds were using the right-of-way fence line and the brush that grew alongside the fence line. The mine area itself did not offer good perch substrates adjacent to brushy habitats, therefore it is unlikely that any loggerhead shrikes use the mine site regularly or nest there. They may, however, pass through the mine area on occasion.

5.6 BURROWING OWL

Burrowing owls are generally associated with disturbed grasslands/agricultural lands and prairie dog colonies. Prairie dogs and their characteristic burrows were not observed within the wildlife survey area during the November survey. A few kangaroo rat burrows were present in the western half of the project area, but these burrows had not been used during the 2015 breeding season by burrowing owls. It is unlikely that any burrowing owls occur in the project area but they may be present in surrounding habitats and thus would perhaps hunt or pass through the project area.

5.7 BREWER'S SPARROW

Brewer's sparrows prefer grasslands with a strong shrub component. The mine area is somewhat lacking in shrubs, making it marginal habitat for the Brewer's sparrow. It is not likely that this species would occur regularly at the mine site, but may pass through on its way to breeding grounds in the northwestern part of the state.

5.8 MIGRATORY SPECIES OBSERVED DURING THE WILDLIFE SURVEY

The following migratory bird species are representative year-round or wintering residents in the project area and were observed during the November 5, 2015 wildlife survey:

American kestrel (*Falco sparverius*)
Northern harrier (*Circus cyanus*) - observed within 3 miles of the project area
Mourning dove (*Zenaida macroura*)
Common raven (*Corvus corax*)
Loggerhead shrike (*Lanius ludovicianus*)-observed within 3 miles of project area
European starling (*Sturnus vulgaris*)
Western meadowlark (*Sturnella neglecta*)

5.9 OTHER SPECIES OBSERVED DURING WILDLIFE SURVEY

Domestic cattle (*Bos taurus*)
Coyote (*Canis latrans*)
Elk (*Cervus elaphus*)
Desert cottontail (*Sylvilagus audubonii*)
Black-tailed jackrabbit (*Lepus californicus*)
Kangaroo rat (*Dipodomys* sp.)

No reptilian or amphibian species were observed during the November 5, 2015 survey, however, it is likely that Ambrosia Lake supports some amphibious species, such as tiger salamander (*Ambystoma tigrinum*) or spadefoot toad (*Spea multiplicata*) and upland areas of the mine support some reptilian species, such as whiptail lizards (*Aspidoscelis* spp.).

6.0 DISCUSSION

All of the migratory bird species discussed above, as well as the species that are year-round or winter residents at the mine site, have the potential to be impacted if present during mining, reclamation, construction, and other activities at the mine. Nesting birds are subject to human disturbance during courtship and nest building periods, and use of equipment in mine activities (e.g. front end loaders, trucks, vehicles) has the potential to disturb nests or nesting birds through collisions or inadvertent destruction of nests.

Likewise, small terrestrial species of wildlife are subject to disturbance from human activity within the mine area and access roads through collisions or general activity at the mine.

Elk using the project area as wintering grounds may be deterred from foraging and movement patterns if activity at the mine resumes during fall and winter months.

Additionally, certain portions of the mine may currently pose hazards to all wildlife that would use it, cross it and/or use Ambrosia Lake as a water resource due to the ongoing radioactivity of the site and

the leaching of uranium ore and perhaps other contaminants into the surface soils and run off that would collect in Ambrosia Lake.

Presently, there are no open shafts or access to the underground portions of the mine, other than the head frame area, two air vents in Section 12, and the air vent in the southeast corner of Section 11 that would be available for bat egress or ingress. Bats and other "on the wing" foragers are likely present over Ambrosia Lake during the summer months, though none of these species are currently listed or protected for McKinley County. Barn swallows (*Hirundo rustica*) and cliff swallows (*Petrochelidon pyrrhonata*) would also use mud from the lake for their nests.

7.0 WILDLIFE MITIGATION RECOMMENDATIONS

Southwest Resources is committed to protecting wildlife during any activity at the mine that would occur concurrent with reclamation or during initiation of further mining of uranium ore. These commitments would include conducting additional breeding bird surveys at least one week prior to reclamation and construction activities at the mine that could occur during the breeding period of May 1- August 30. If reclamation and mine closure occurs, Southwest Resources would coordinate with the New Mexico Mining and Minerals Division to ensure that any potential bat roosts or colonies and/or other wildlife that may be using the underground portions of the mine are protected during closure of the shafts.

8.0 REFERENCES

Executive Order 13186. 2001. Responsibilities of Federal Agencies to Protect Migratory Birds. Federal Register V. 66-11. Washington, D.C. Web. http://www.fws.gov/laws/lawsdigest/EO.htm#eo13186

New Mexico Department of Game and Fish. Biota Information System of New Mexico (BISON-M). McKinley County Threatened and Endangered Species List. November 2015. Web. http://www.bison-m.org/databasequery.aspx.

New Mexico Avian Conservation Partners (NMACP). 2012. Species Accounts for Species of Conservation Concern. November 2015. Web. http://nmpartnersinflight.org

U. S. Fish and Wildlife Service (USFWS). Information Planning and Conservation (IPaC) website. November 2015. Web. http://ecos.fws.gov/ipac/.

U. S. Fish and Wildlife Service (USFWS). 2008. Birds of Conservation Concern. Division of Migratory Bird Management, Arlington, Virginia.

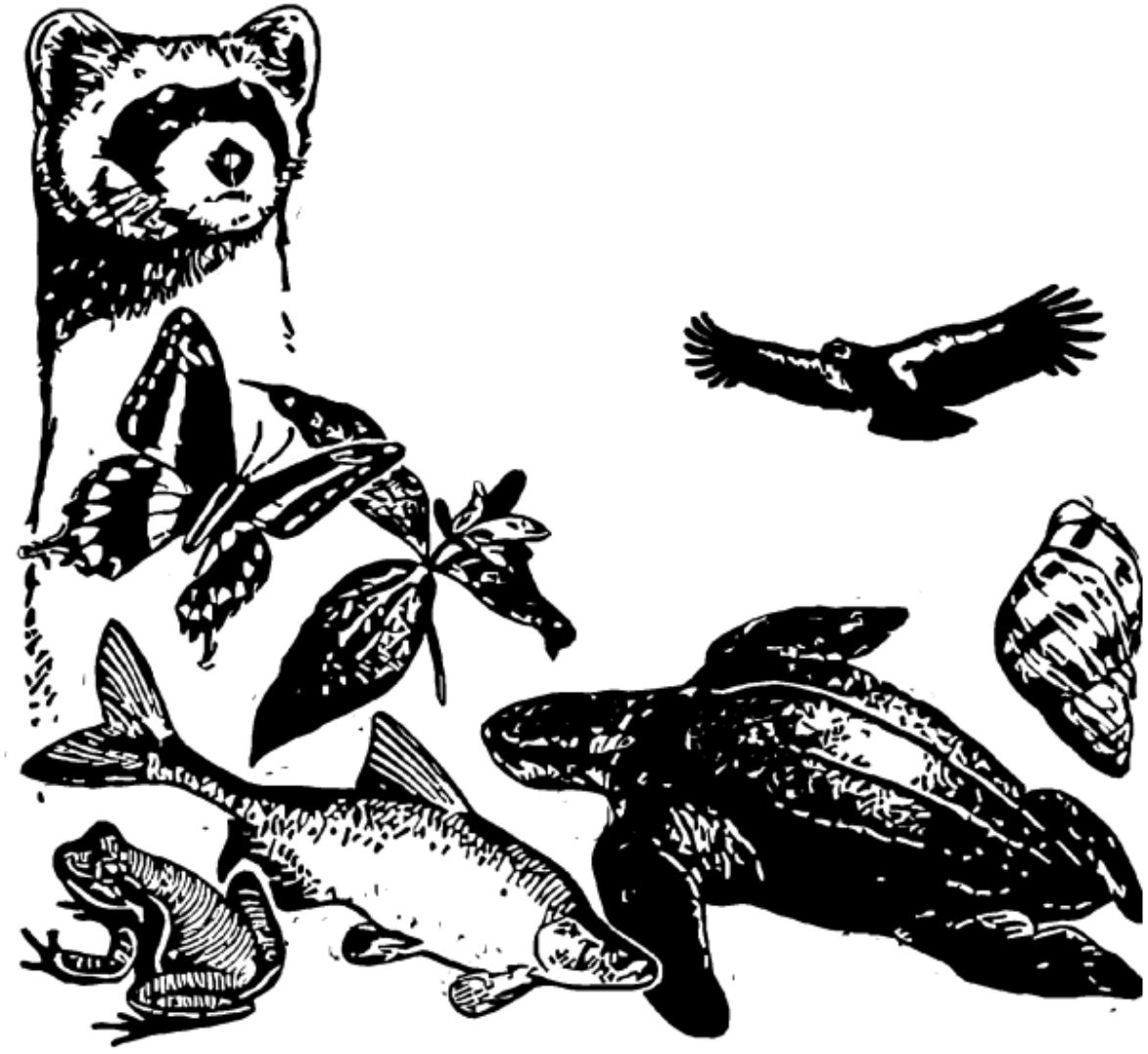
U. S. Fish and Wildlife Service. Environmental Conservation Online System (ECOS) Critical Habitat Mapper. November 2015. Web. http://fws.maps.arcgis.com/.

Southwest Resources Uranium Mine

IPaC Trust Resource Report

Generated November 10, 2015 10:59 AM MST

This report is for informational purposes only and should not be used for planning or analyzing project-level impacts. For projects that require FWS review, please return to this project on the IPaC website and request an official species list from the Regulatory Documents page.



US Fish & Wildlife Service

IPaC Trust Resource Report

Project Description

NAME

Southwest Resources Uranium Mine

PROJECT CODE

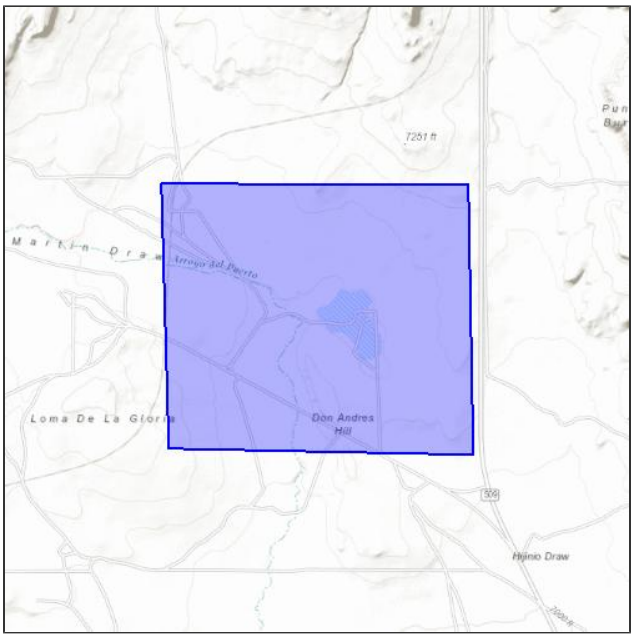
GPTS6-65BAZ-AWJFU-ZIHMT-W5JR7Y

LOCATION

McKinley County, New Mexico

DESCRIPTION

No description provided



U.S. Fish & Wildlife Contact Information

Species in this report are managed by:

New Mexico Ecological Services Field Office
2105 Osuna Road Ne
Albuquerque, NM 87113-1001
(505) 346-2525

Endangered Species

Proposed, candidate, threatened, and endangered species that are managed by the Endangered Species Program and should be considered as part of an effect analysis for this project.

This unofficial species list is for informational purposes only and does not fulfill the requirements under Section 7 of the Endangered Species Act, which states that Federal agencies are required to "request of the Secretary of Interior information whether any species which is listed or proposed to be listed may be present in the area of a proposed action." This requirement applies to projects which are conducted, permitted or licensed by any Federal agency.

A letter from the local office and a species list which fulfills this requirement can be obtained by returning to this project on the IPaC website and requesting an official species list on the Regulatory Documents page.

Birds

Mexican Spotted Owl Strix occidentalis lucida — Threatened

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B074

Southwestern Willow Flycatcher Empidonax traillii extimus — Endangered

CRITICAL HABITAT
There is **final** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B094

Yellow-billed Cuckoo Coccyzus americanus — Threatened

CRITICAL HABITAT
There is **proposed** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B06R

Fishes

Zuni Bluehead Sucker Catostomus discobolus yarrowi — Endangered

CRITICAL HABITAT
There is **proposed** critical habitat designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=E063

Flowering Plants

Zuni Fleabane Erigeron rhizomatus — Threatened

CRITICAL HABITAT
No critical habitat has been designated for this species.

https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=Q1W4

Critical Habitats

Potential effects to critical habitat(s) within the project area must be analyzed along with the endangered species themselves.

There is no critical habitat within this project area

Migratory Birds

Birds are protected by the Migratory Bird Treaty Act and the Bald and Golden Eagle Protection Act.

Any activity which results in the take of migratory birds or eagles is prohibited unless authorized by the U.S. Fish and Wildlife Service (1). There are no provisions for allowing the take of migratory birds that are unintentionally killed or injured.

You are responsible for complying with the appropriate regulations for the protection of birds as part of this project. This involves analyzing potential impacts and implementing appropriate conservation measures for all project activities.

Bald Eagle Haliaeetus leucocephalus — Bird of conservation concern
Season: Wintering
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B008

Brewer's Sparrow Spizella breweri — Bird of conservation concern
Season: Migrating
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0HA

Burrowing Owl Athene cunicularia — Bird of conservation concern
Season: Breeding

Flammulated Owl Otus flammeolus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DK

Fox Sparrow Passerella iliaca — Bird of conservation concern
Season: Wintering

Golden Eagle Aquila chrysaetos — Bird of conservation concern
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0DV

Grace's Warbler Dendroica graciae — Bird of conservation concern
Season: Breeding

Gray Vireo Vireo vicinior — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0G5

Juniper Titmouse Baeolophus ridgwayi — Bird of conservation concern
Year-round

Lewis's Woodpecker Melanerpes lewis — Bird of conservation concern
Year-round

Loggerhead Shrike Lanius ludovicianus — Bird of conservation concern
Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FY

Mountain Plover Charadrius montanus — Bird of conservation concern
Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B078

Olive-sided Flycatcher Contopus cooperi — Bird of conservation concern

Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0AN

Peregrine Falcon Falco peregrinus — Bird of conservation concern

Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FU

Pinyon Jay Gymnorhinus cyanocephalus — Bird of conservation concern

Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0I0

Prairie Falcon Falco mexicanus — Bird of conservation concern

Year-round
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0ER

Swainson's Hawk Buteo swainsoni — Bird of conservation concern

Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B070

Williamson's Sapsucker Sphyrapicus thyroideus — Bird of conservation concern

Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0FX

Willow Flycatcher Empidonax traillii — Bird of conservation concern

Season: Breeding
https://ecos.fws.gov/speciesProfile/profile/speciesProfile.action?spcode=B0F6

Refuges

Any activity proposed on National Wildlife Refuge lands must undergo a 'Compatibility Determination' conducted by the Refuge. If your project overlaps or otherwise impacts a Refuge, please contact that Refuge to discuss the authorization process.

There are no refuges within this project area

Wetlands

Impacts to NWI wetlands and other aquatic habitats from your project may be subject to regulation under Section 404 of the Clean Water Act, or other State/Federal Statutes.

Project proponents should discuss the relationship of these requirements to their project with the Regulatory Program of the appropriate U.S. Army Corps of Engineers District.

DATA LIMITATIONS

The Service's objective of mapping wetlands and deepwater habitats is to produce reconnaissance level information on the location, type and size of these resources. The maps are prepared from the analysis of high altitude imagery. Wetlands are identified based on vegetation, visible hydrology and geography. A margin of error is inherent in the use of imagery; thus, detailed on-the-ground inspection of any particular site may result in revision of the wetland boundaries or classification established through image analysis.

The accuracy of image interpretation depends on the quality of the imagery, the experience of the image analysts, the amount and quality of the collateral data and the amount of ground truth verification work conducted. Metadata should be consulted to determine the date of the source imagery used and any mapping problems.

Wetlands or other mapped features may have changed since the date of the imagery or field work. There may be occasional differences in polygon boundaries or classifications between the information depicted on the map and the actual conditions on site.

DATA EXCLUSIONS

Certain wetland habitats are excluded from the National mapping program because of the limitations of aerial imagery as the primary data source used to detect wetlands. These habitats include seagrasses or submerged aquatic vegetation that are found in the intertidal and subtidal zones of estuaries and nearshore coastal waters. Some deepwater reef communities (coral or tuberficid worm reefs) have also been excluded from the inventory. These habitats, because of their depth, go undetected by aerial imagery.

DATA PRECAUTIONS

Federal, state, and local regulatory agencies with jurisdiction over wetlands may define and describe wetlands in a different manner than that used in this inventory. There is no attempt, in either the design or products of this inventory, to define the limits of proprietary jurisdiction of any Federal, state, or local government or to establish the geographical scope of the regulatory programs of government agencies. Persons intending to engage in activities involving modifications within or adjacent to wetland areas should seek the advice of appropriate federal, state, or local agencies concerning specified agency regulatory programs and proprietary jurisdictions that may affect such activities.

Freshwater Pond

PUB 2.13 acres

Lake

L 43.9 acres

Riverine

R4SBC 38.0 acres

Biota Information System of New Mexico

Maintained by:

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Print Page

Database Query

Your search terms were as follows:

County Name
McKinley

Status
Federal: Endangered
Federal: Threatened
Federal: Proposed
Federal: Candidate
State NM: Endangered
State NM: Threatened

11 species returned.

Taxonomic Group	# Species	Taxonomic Group	# Species
Fish	1	Mammals	1
Birds	9		

Export to Excel

Species ID	Common Name	Scientific Name	Habitat Map	Photo	County	Status
050325	**Canada Lynx**	Lynx canadensis	Yes	no photo	McKinley	Federal: Threatened
040370	**Bald Eagle**	Haliaeetus leucocephalus	Yes		McKinley	State NM: Threatened
040384	**Peregrine Falcon**	Falco peregrinus	Yes		McKinley	State NM: Threatened
040385	**Arctic Peregrine Falcon**	Falco peregrinus tundrius	Yes	no photo	McKinley	State NM: Threatened
042070	**Least Tern**	Sternula antillarum	Yes		McKinley	Federal: Endangered State NM: Endangered
040250	**Yellow-billed Cuckoo (western pop)**	Coccyzus americanus occidentalis			McKinley	Federal: Threatened

						
041375	**Mexican Spotted Owl**	Strix occidentalis lucida	Yes		McKinley	Federal: Threatened
040925	**Costa's Hummingbird**	Calypte costae	Yes		McKinley	State NM: Threatened
040521	**Southwestern Willow Flycatcher**	Empidonax traillii extimus	Yes		McKinley	Federal: Endangered State NM: Endangered
042200	**Gray Vireo**	Vireo vicinior	Yes		McKinley	State NM: Threatened
010496	**Zuni Bluehead Sucker**	Catostomus discobolus yarrowi			McKinley	Federal: Endangered State NM: Endangered

Close Window

Plant Survey Report

For

Southwest Resources, Inc.

Section 11/12 Mine

McKinley County, New Mexico

November 19, 2015

Prepared By:

Robyn Tierney

Permits West, Inc.

37 Verano Loop

Santa Fe, NM 87508

Introduction

This report discusses the results of two botanical surveys of Southwest Resource's Section 11/12 Mine, a 0.50 mile buffer zone around the mine's headframe, and an area around an associated escape/air vent to the west of the mine's headframe in Section 11 known as the "SE air vent/shaft" (Figure 1 at end of this report). The purpose of the July and November 2015 surveys was to identify plants throughout the mine area and to inspect for the presence/absence of two federal and state-listed species including Zuni fleabane (*Erigeron rhizomatus*) and Parish's alkali grass (*Puccinellia parishii*) that are known to occur in McKinley County and may occur within the project area. Information collected from the surveys also will be used to update the mine's permit application and address agency comments with more current information on plant species composition, relative cover, and production in the mine area.

Project Description

The Section 11/12 Mine is an inactive, underground uranium mine located in the southwest quarter of Section 12, T. 14 N., R. 10 W. (Ambrosia Lake, NM USGS quadrangle), approximately 25 miles north of Milan, and 2 miles west of New Mexico Highway 509. The mine is located on the east bank of Ambrosia Lake, a shallow playa-like area that accumulates surface runoff during the summer monsoon season. Don Andres Hill, which is a northeast-southwest trending outcrop of Dakota sandstone is located west-southwest of the mine's headframe and lake.

The vegetation within the project area is classified as a Great Basin Desert Scrub community (Dick-Peddie 1993). Vegetation throughout the mine area has been extensively grazed and is patchy and discontinuous. Dominant species in the project area include four-wing saltbush (*Atriplex canescens*), rabbitbrush (*Ericamera nauseosus* and *Chrysothamnus greenei*), sand dropseed (*Sporobolus cryptandrus*), alkali sacaton (*S. airoides*), and blue grama (*Bouteloua gracilis*).

The majority of soils (62%) within the mine area are comprised of the Sparank-San Mateo-Zia complex, 0 to 3 percent slopes. Sparank soils are found in flood plains on valley floors and valley sides. These soils are derived from calcareous sandstone stream alluvium. A typical Sparank soil profile consists of silty clay loam (0 to 2 inches), clay (2 to 25 inches), and clay (25 to 65 inches). The capacity of the most limiting layer to transmit water (Ksat) is moderately low (0.01 to 0.06 in/hr) and the depth to restrictive features is more than 80 inches as is the depth to water table. These are well drained soils with high runoff potential resulting in frequent flooding. Available water storage in the soil profile, however, is high (about 10.1 inches).

San Mateo soils are also found on flood plains on valley floors and valley sides and are derived from calcareous sandstone stream alluvium. A typical profile of San Mateo soil consists of clay loam (0 to 2 inches), clay loam (2 to 15 inches), sandy clay loam (15 to 30 inches), clay loam (30 to 39 inches), sandy loam (39 to 45 inches) and clay loam 45 to 65 inches). and clay (25 to 65 inches). The capacity of the most limiting layer to transmit water (Ksat) is moderately high high (0.20 to 0.57 in/hr) and the depth to restrictive features is more than 80 inches as is the depth to water table. These are well drained soils with medium runoff potential resulting in frequent flooding. Available water storage in the soil profile is also high (about 10.7 inches).

Zia soils are found on stream terraces on valley floors and alluvial fans valley sides. These soils are derived from calcareous sandstone stream alluvium. A typical profile consists of fine sandy loam (0 to 20 inches), sandy loam clay loam (20 to 28 inches), and fine sandy loam (28 to 70 inches). The capacity of the most limiting layer to transmit water (Ksat) is high (1.98 to 5.95 in/hr) and the depth to restrictive features and the water is more than 80 inches. These somewhat excessively drained soils have low runoff potential and rarely flood. Available water storage in the soil profile is moderate (about 8.1 inches).

Soils in approximately 12% of the area surrounding Ambrosia Lake consist of the Penistaja-Tintero soil complex, 1 to 10 percent slopes (see soil map and report in Appendix A). Penistaja soils are typically found on the side slopes, treads, of cuestas, mesas, and valley sides. These soils are derived from eolian deposits and sandstone/shale slope alluvium. A typical profile of Penistaja soil consists of sandy loam (0 to 3 inches), sandy clay loam (3 to 19 inches), and sandy loam (19 to 65 inches). Depth to restrictive features is more than 80 inches as is the depth to water table. These are well drained soils with low runoff potential.

Tintero soils are similarly found on the side slopes of valleys, mesas, and cuestas and are also derived from eolian deposits and sandstone slope alluvium. A typical Tintero soil profile consists of fine sandy loam throughout the soil column to 48 inches and loamy fine sand to depth (48 to 65 inches). These are moderately well drained soils with low runoff potential.

The elevation of the project area ranges from approximately 7060 feet at the base of the head frame, 7070 feet at the north end of the mine's facilities area and 7030 feet at the fence line along the south end of the mine. Most of areas surrounding the mine's buildings and headframe have been disturbed or compacted by vehicle traffic, blading, scraping, and livestock grazing and consequently, vegetation is patchy, weedy, and discontinuous throughout this part of the permit area.

Portions of the mine area which located immediately adjacent to Ambrosia Lake are classified as Bottomland (R035XA118NM) and Clayey Bottomland (R035XA119NM) Ecological Sites (NRCS 2015). These areas appear to be transitioning to a less productive dry grassland state (Appendix A).

METHODOLOGY

The purpose of the July and November 2015 surveys was to identify common plants throughout the mine area and to inspect for the presence/absence of plant species of concern. Information collected from the surveys will be used to update the mine's permit application and address agency comments with more current information on plant species composition, relative cover, and production in the mine area.

The potential presence/absence for Zuni fleabane (*Erigeron rhizomatous*) listed as Threatened by the U.S. Fish and Wildlife Service (USFWS, IPaC 2015) and Parish's alkali grass *(Puccinellia parishii*), a State Endangered species, and a USFWS species of concern were also evaluated in this survey.

The Section 11/12 mine was surveyed on July 23, 2015 and again on November 6, 2015, by botanist Robyn Tierney. Prior to completing both surveys, the U.S. Fish and Wildlife Service's *Information for Planning and Conservation* (IPaC 2015) website was reviewed for plant species of concern (endangered, threatened, and sensitive species) that are known to occur, or may occur within McKinley County.

All plants observed in the project area were identified and a list of plant species observed was compiled. This list was also compared with Tables 2.3 and C.1.1.1 of the U.S. Department of Energy's (DoE) 1987 Environmental Assessment titled "*Remedial Action at the Amboisia Lake Uranium Mill Tailings Site Ambrosia Lake, New Mexico"* (DOE/EA 0322, June 1987) and a table containing a compilation of both current observed species and the previously identified species from the DoE Environmental Assessment is presented at the end of this report.

Weather during the July23, 2015 survey was sunny, with high temperatures in the low 90's F. Weather during the November 6, 2015 survey was also sunny, with temperatures in the upper 50s F. Both surveys were conducted as pedestrian surveys of the Section 11/12 mine facilities area and the area surrounding the SE air vent/escape shaft in Section 11. Photographs of the project area from the two surveys are contained in Appendix B.

SURVEY RESULTS

Plant Species of Concern to the U.S. Fish and Wildlife Service (USFWS): Two species of concern that may occur within McKinley County were identified from the USFWS IPaC (2015) and the New Mexico Rare Plants (NMRPTC 1999, revised 2015) databases (Table 1). Neither species was observed during the July and November 2015 surveys.

Table 1. Species of concern, status, habitat and potential to occur in the project area

SPECIES STATUS	HABITAT	POTENTIAL TO OCCUR IN THE PROJECT AREA*
Erigeron rhizomatus Zuni fleabane USFWS Threatened	Species is found on nearly barren detrital clay hillsides with soils derived from shales of the Chinle or Baca formations (often seleniferous); most often found on north or east-facing slopes in open piñon-juniper woodlands at 7,300-8,000 ft. (NMRPTC 1999, Sivinski and Lightfoot Sivinski and Tonne 1991, Sivinski and Tonne 2004, USFWS 2007, Knight 1988, Christie 2004).	**No appropriate habitat**: Project area is nearly 1,000 feet lower in elevation and there are no barren detrital clay hillsides with soils derived from Chinle or Baca shale formations within the project area. (NP)

SPECIES STATUS	HABITAT	POTENTIAL TO OCCUR IN THE PROJECT AREA*
Puccinellia parishii Parish's alkali grass New Mexico State Endangered	The species requires continuously damp soils during its late winter to spring growing period and is found near white-crusted akaline springs, seeps, and seasonally wet areas that occur at the heads of drainages or on gentle slopes at 2,600-7,200 ft. range-wide (NMRPTC 1999).	**Habitat suitable**: there are no white-crusted alkaline springs, or seeps, in the project area, and while Ambrosia Lake may contain water from surface runoff generated during summer rains, it generally does not remain wet during the late winter to spring growing period. (NS)

Status USFWS – U.S Fish and Wildlife Service (ECOS, 2014)
Endangered – An animal or plant species in danger of extinction throughout all or a significant portion of its range.
Threatened – An animal or plant species likely to become endangered within the foreseeable future throughout all or a significant portion of its range.

Potential to Occur
K – Known, documented observation within project area.
S – Habitat suitable and species suspected to occur within the project area.
NS – Habitat suitable but species is not suspected to occur within the project area.
NP – Habitat not present and species unlikely to occur within the project area

The project area was also evaluated during both surveys for the white alkaline crusts and wetland conditions favored by Parish's alkali grass. Such alkaline and crustal conditions were not observed during the July survey when the lake contained water or during the November survey when the lake was nearly dry.

Plant species that were observed during the surveys are listed in Table 2. Identification of unknown plants was based on keys from Ivey (2008), Heil et al, (2013), and Weber and Wittman (2012). Taxonomic nomenclature was standardized to meet USDA Plants Database (2015) standards.

Table 2. Plants observed in the vicinity of the Section 11/12 Mine during July 23 and November 5, 2015 surveys. Asterisk (*) indicates presence in previously submitted Table C.1.1, from Environmental Assessment titled "Remedial Action at the Amboisia Lake Uranium Mill Tailings Site Ambrosia Lake, New Mexico" (DOE/EA 0322, June 1987)

Shrubs and Subshrubs

Artemesia frigida	Fringed sagewort
Atriplex canescens	Fourwing saltbush*
Chrysothamnus greenei	Greene's rabbitbrush*

Ephedra torreyana	Torrey's joint fir*
Ericameria nauseosa var. *bigelovii*	Bigelow's rabbitbrush*
Gutierrezia sarothrae	Broom snakeweed*
Krascheninnikovia lanata	Winterfat*
Lycium pallidum	Pale wolfberry*
Sarcobatus vermiculatus	Greasewood*

Cacti

Opuntia polyacantha	Starvation pricklypear

Grasses and Grass-like Plants

Achnatherum hymenoides	Indian ricegrass*
Aristida purpurea var. *nealleyi*, *longiseta*	Purple threeawn*
Bouteloua gracilis	Blue grama*
Dasyochloa pulchella	Fluff grass*
Elymus elymoides	Bottlebrush squirreltail*
Elymus trachycaulum	Slender wheatgrass
Hesperostipa comata	Needle and thread grass*
Hordeum jubatum	Foxtail barley
Munroa squarrosa	False buffalograss
Pascopyrum smithii	Pubescent wheatgrass*
Pleuraphis jamesii	Galleta*
Poa fendleriana	Muttongrass
Sporobolus airoides	Alkali sacaton*
Sporobolus cryptandrus	Sand dropseed*
Sporobolus flexuosus	Mesa dropseed

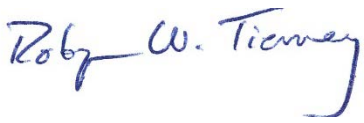
Forbs

Ambrosia acanthicarpa	Bur ragweed
Asclepias subverticillata	Horsetail milkweed

Astragalus spp. (2)	Milkvetch species
Bassia scoparia	Burningbush
Chamaesyce micromeris	Desert spurge
Cryptantha spp. (2)	Catseyes, Cryptantha
Dimorphocarpa wislizeni	Spectacle-pod
Erigeron sp.	Daisy fleabane
Erodium cicutarium	Filaree
Grindelia squarosa	Curlycup gumweed*
Helianthus annuus	Common sunflower*
Heterotheca villosa	Hairy goldenaster
Lactuca serriola	Prickly lettuce*
Machaeranthera bigelovii	Bigelow's tansyaster*
Mentzelia multiflora	Desert blazingstar*
Oenothera albicaulis	Whitestem evening primrose*
Penstemon sp.	Beardtongue species*
Phacelia sp.	Scorpionweed species*
Portulaca oleracea	Common purslane
Rumex crispus	Curly dock*
Salsola tragus	Russian-thistle
Selaginella sp.	Clubmoss
Sphaeralcea coccinea	Scarlet globemallow*
Sphaeralcea incana	Grey globemallow*
Verbisina enceliodes	Golden crownbeard*
Xanthisma spinulosum	Spiny goldenweed
Xanthium strumarium	Common cocklebur

DISCUSSION

No plant species of concern to the U.S. Fish and Wildlife Service or the State of New Mexico will be impacted by the permitting, reclamation, or operation of the Section 11/12 Mine.



Signature of Author: _____ November 19, 2015
Robyn W. Tierney

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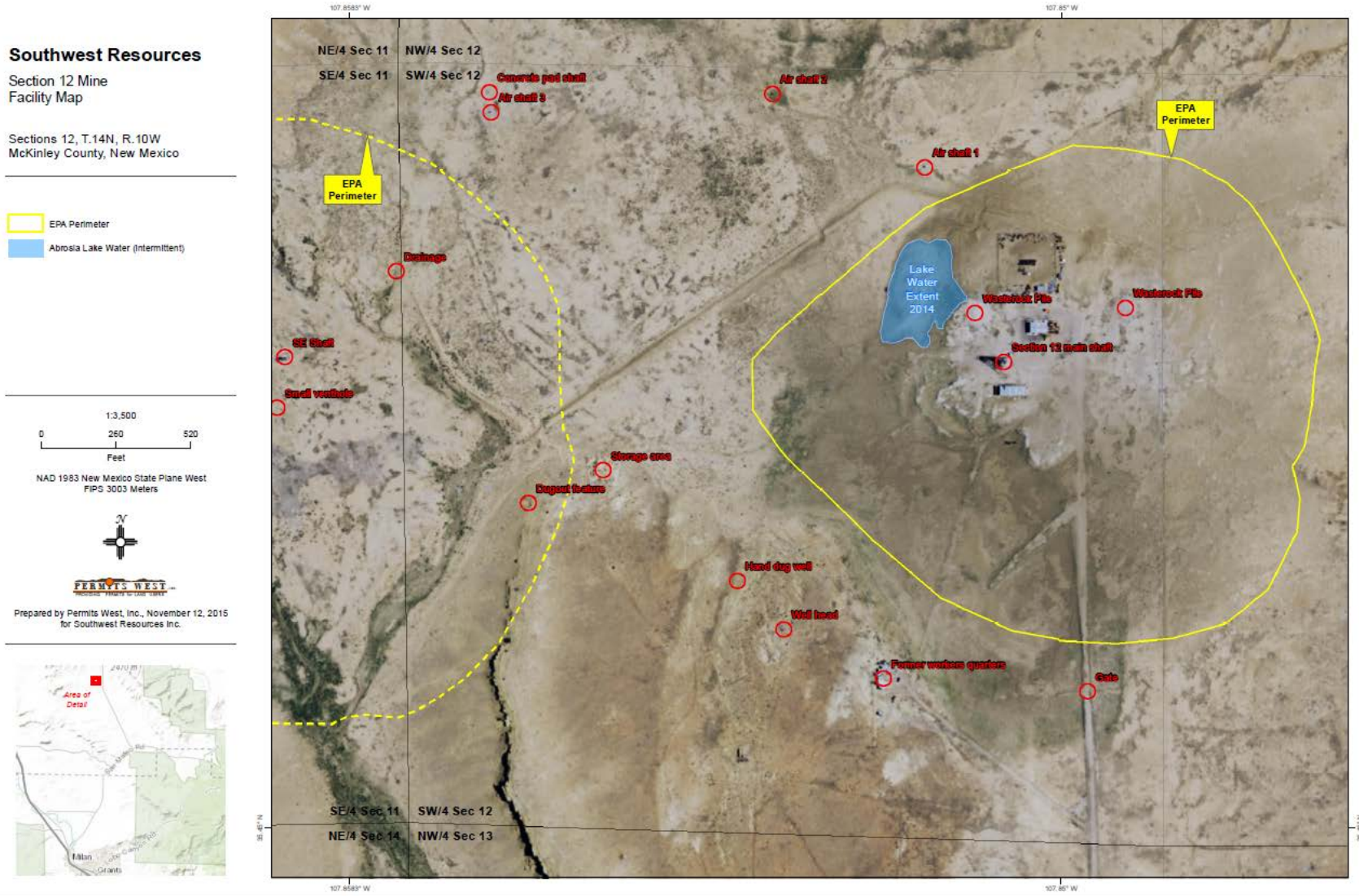
Southwest Resources
Section 12 Mine
Facility Map
Sections 12, T.14N, R.10W
McKinley County, New Mexico
EPA Perimeter
Abrosia Lake Water (Intermittent)
1:3,500
0
260
520
Feet
NAD 1983 New Mexico State Plane West
FIPS 3003 Meters
N
PERMITS WEST
Prepared by Permits West, Inc., November 12, 2015
for Southwest Resources Inc.
Area of Detail
Milan
Grants
NE/4 Sec 11
NW/4 Sec 12
SE/4 Sec 11
SW/4 Sec 12
Concrete pad shaft
Air shaft 3
Air shaft 2
Air shaft 1
EPA Perimeter
EPA Perimeter
Drainage
Lake Water Extent 2014
Wasterock Pile
Wasterock Pile
Section 12 main shaft
SE Shaft
Small ventilate
Storage area
Dugout feature
Hand dug well
Well head
Former workers quarters
Gate
SE/4 Sec 11
SW/4 Sec 12
NE/4 Sec 14
NW/4 Sec 13
107.8583° W
107.85° W
35.47° N

Appendix A
Custom Soil Resource Report for McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties

Section 11/12 Mine, T 14N., R 10W.

United States Department of Agriculture

NRCS

Natural Resources Conservation Service

A product of the National Cooperative Soil Survey, a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local participants

Custom Soil Resource Report for McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties

Section 11/12 Mine, T 14N., R 10W.

Preface

Soil surveys contain information that affects land use planning in survey areas. They highlight soil limitations that affect various land uses and provide information about the properties of the soils in the survey areas. Soil surveys are designed for many different users, including farmers, ranchers, foresters, agronomists, urban planners, community officials, engineers, developers, builders, and home buyers. Also, conservationists, teachers, students, and specialists in recreation, waste disposal, and pollution control can use the surveys to help them understand, protect, or enhance the environment.

Various land use regulations of Federal, State, and local governments may impose special restrictions on land use or land treatment. Soil surveys identify soil properties that are used in making various land use or land treatment decisions. The information is intended to help the land users identify and reduce the effects of soil limitations on various land uses. The landowner or user is responsible for identifying and complying with existing laws and regulations.

Although soil survey information can be used for general farm, local, and wider area planning, onsite investigation is needed to supplement this information in some cases. Examples include soil quality assessments (http://www.nrcs.usda.gov/wps/portal/nrcs/main/soils/health/) and certain conservation and engineering applications. For more detailed information, contact your local USDA Service Center (http://offices.sc.egov.usda.gov/locator/app?agency=nrcs) or your NRCS State Soil Scientist (http://www.nrcs.usda.gov/wps/portal/nrcs/detail/soils/contactus/?cid=nrcs142p2_053951).

Great differences in soil properties can occur within short distances. Some soils are seasonally wet or subject to flooding. Some are too unstable to be used as a foundation for buildings or roads. Clayey or wet soils are poorly suited to use as septic tank absorption fields. A high water table makes a soil poorly suited to basements or underground installations.

The National Cooperative Soil Survey is a joint effort of the United States Department of Agriculture and other Federal agencies, State agencies including the Agricultural Experiment Stations, and local agencies. The Natural Resources Conservation Service (NRCS) has leadership for the Federal part of the National Cooperative Soil Survey.

Information about soils is updated periodically. Updated information is available through the NRCS Web Soil Survey, the site for official soil survey information.

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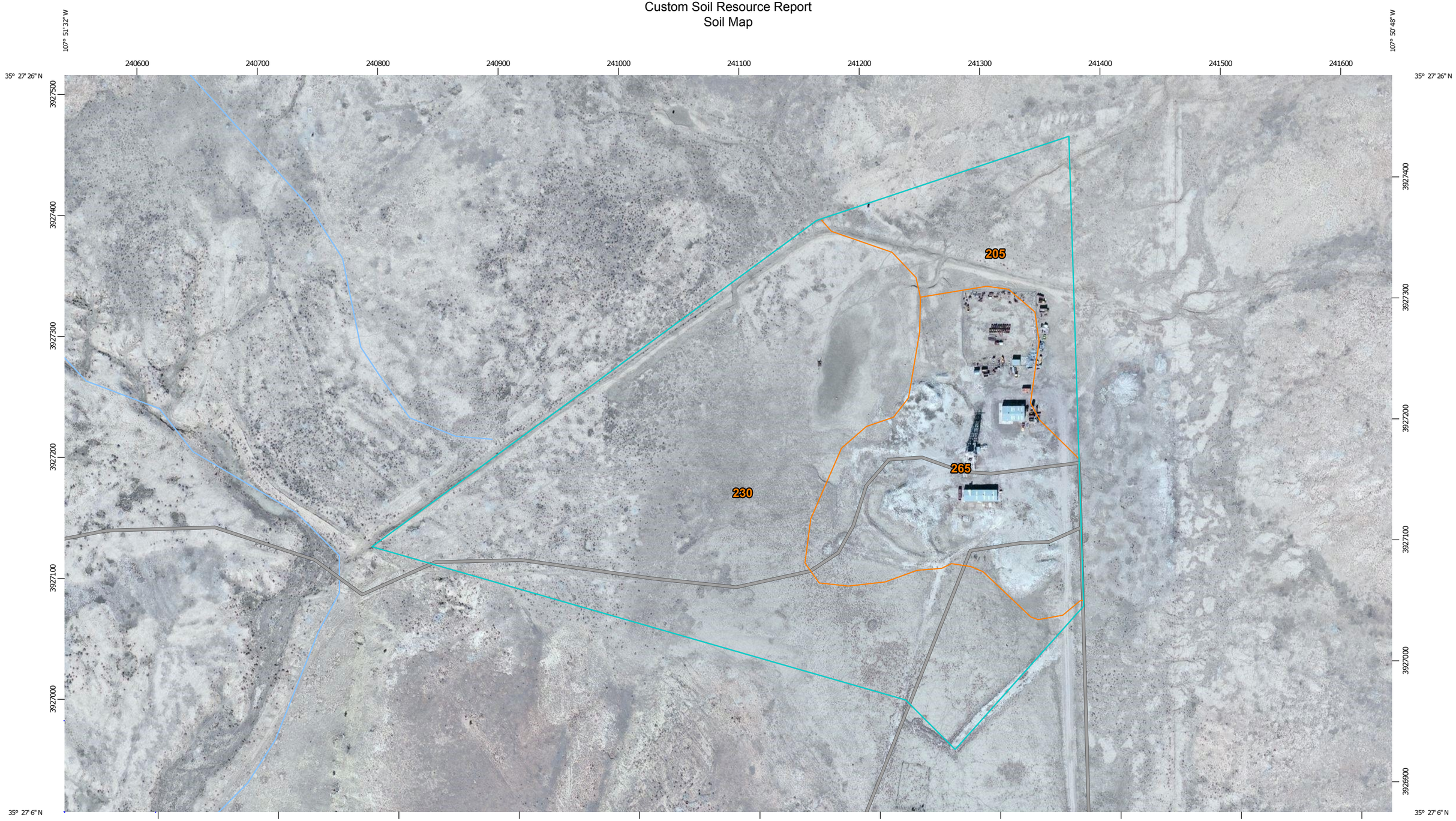
Contents

Soil Map

The soil map section includes the soil map for the defined area of interest, a list of soil map units on the map and extent of each map unit, and cartographic symbols displayed on the map. Also presented are various metadata about data used to produce the map, and a description of each soil map unit.



Map Scale: 1:2,970 if printed on B landscape (17" x 11") sheet.

N

0 40 80 160 240 Meters

0 100 200 400 600 Feet

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)
- Area of Interest (AOI)

Soils
- Soil Map Unit Polygons
- Soil Map Unit Lines
- Soil Map Unit Points

Special Point Features
- Blowout
- Borrow Pit
- Clay Spot
- Closed Depression
- Gravel Pit
- Gravelly Spot
- Landfill
- Lava Flow
- Marsh or swamp
- Mine or Quarry
- Miscellaneous Water
- Perennial Water
- Rock Outcrop
- Saline Spot
- Sandy Spot
- Severely Eroded Spot
- Sinkhole
- Slide or Slip
- Sodic Spot
- Spoil Area
- Stony Spot
- Very Stony Spot
- Wet Spot
- Other
- Special Line Features

Water Features
- Streams and Canals

Transportation
- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background
- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties
Survey Area Data: Version 11, Sep 26, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 21, 2010—Nov 7, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Map Unit Legend

McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties (NM692)			
Map Unit Symbol	**Map Unit Name**	**Acres in AOI**	**Percent of AOI**
205	Penistaja-Tintero complex, 1 to 10 percent slopes	5.2	12.9%
230	Sparank-San Mateo-Zia complex, 0 to 3 percent slopes	25.0	62.6%
265	Uranium mined lands	9.8	24.4%
Totals for Area of Interest		**39.9**	**100.0%**

Map Unit Descriptions

The map units delineated on the detailed soil maps in a soil survey represent the soils or miscellaneous areas in the survey area. The map unit descriptions, along with the maps, can be used to determine the composition and properties of a unit.

A map unit delineation on a soil map represents an area dominated by one or more major kinds of soil or miscellaneous areas. A map unit is identified and named according to the taxonomic classification of the dominant soils. Within a taxonomic class there are precisely defined limits for the properties of the soils. On the landscape, however, the soils are natural phenomena, and they have the characteristic variability of all natural phenomena. Thus, the range of some observed properties may extend beyond the limits defined for a taxonomic class. Areas of soils of a single taxonomic class rarely, if ever, can be mapped without including areas of other taxonomic classes. Consequently, every map unit is made up of the soils or miscellaneous areas for which it is named and some minor components that belong to taxonomic classes other than those of the major soils.

Most minor soils have properties similar to those of the dominant soil or soils in the map unit, and thus they do not affect use and management. These are called noncontrasting, or similar, components. They may or may not be mentioned in a particular map unit description. Other minor components, however, have properties and behavioral characteristics divergent enough to affect use or to require different management. These are called contrasting, or dissimilar, components. They generally are in small areas and could not be mapped separately because of the scale used. Some small areas of strongly contrasting soils or miscellaneous areas are identified by a special symbol on the maps. If included in the database for a given area, the contrasting minor components are identified in the map unit descriptions along with some characteristics of each. A few areas of minor components may not have been observed, and consequently they are not mentioned in the descriptions, especially where the pattern was so complex that it was impractical to make enough observations to identify all the soils and miscellaneous areas on the landscape.

The presence of minor components in a map unit in no way diminishes the usefulness or accuracy of the data. The objective of mapping is not to delineate pure taxonomic classes but rather to separate the landscape into landforms or landform segments that have similar use and management requirements. The delineation of such segments on the map provides sufficient information for the development of resource plans. If

intensive use of small areas is planned, however, onsite investigation is needed to define and locate the soils and miscellaneous areas.

An identifying symbol precedes the map unit name in the map unit descriptions. Each description includes general facts about the unit and gives important soil properties and qualities.

Soils that have profiles that are almost alike make up a *soil series*. Except for differences in texture of the surface layer, all the soils of a series have major horizons that are similar in composition, thickness, and arrangement.

Soils of one series can differ in texture of the surface layer, slope, stoniness, salinity, degree of erosion, and other characteristics that affect their use. On the basis of such differences, a soil series is divided into *soil phases*. Most of the areas shown on the detailed soil maps are phases of soil series. The name of a soil phase commonly indicates a feature that affects use or management. For example, Alpha silt loam, 0 to 2 percent slopes, is a phase of the Alpha series.

Some map units are made up of two or more major soils or miscellaneous areas. These map units are complexes, associations, or undifferentiated groups.

A *complex* consists of two or more soils or miscellaneous areas in such an intricate pattern or in such small areas that they cannot be shown separately on the maps. The pattern and proportion of the soils or miscellaneous areas are somewhat similar in all areas. Alpha-Beta complex, 0 to 6 percent slopes, is an example.

An *association* is made up of two or more geographically associated soils or miscellaneous areas that are shown as one unit on the maps. Because of present or anticipated uses of the map units in the survey area, it was not considered practical or necessary to map the soils or miscellaneous areas separately. The pattern and relative proportion of the soils or miscellaneous areas are somewhat similar. Alpha-Beta association, 0 to 2 percent slopes, is an example.

An *undifferentiated group* is made up of two or more soils or miscellaneous areas that could be mapped individually but are mapped as one unit because similar interpretations can be made for use and management. The pattern and proportion of the soils or miscellaneous areas in a mapped area are not uniform. An area can be made up of only one of the major soils or miscellaneous areas, or it can be made up of all of them. Alpha and Beta soils, 0 to 2 percent slopes, is an example.

Some surveys include *miscellaneous areas*. Such areas have little or no soil material and support little or no vegetation. Rock outcrop is an example.

McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties

205—Penistaja-Tintero complex, 1 to 10 percent slopes

Map Unit Setting

National map unit symbol: 1xk1
Elevation: 6,200 to 7,100 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 49 to 53 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Penistaja and similar soils: 45 percent
Tintero and similar soils: 40 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Penistaja

Setting

Landform: Dip slopes on cuestas, mesas, fan remnants on valley sides
Landform position (three-dimensional): Side slope, tread, talf
Down-slope shape: Convex, concave
Across-slope shape: Concave, linear, convex
Parent material: Eolian deposits and slope alluvium derived from sandstone and shale

Typical profile

A - 0 to 3 inches: sandy loam
Bt - 3 to 19 inches: sandy clay loam
Bk - 19 to 65 inches: sandy loam

Properties and qualities

Slope: 1 to 5 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): Moderately high to high (0.57 to 1.98 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 8.5 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: B
Ecological site: Loamy (R035XA112NM)

Description of Tintero

Setting

Landform: Fan remnants on valley sides, mesas, dip slopes on cuestas
Landform position (three-dimensional): Side slope, tread, talf
Down-slope shape: Convex, concave
Across-slope shape: Convex, concave, linear
Parent material: Eolian deposits and slope alluvium derived from sandstone

Typical profile

A - 0 to 4 inches: fine sandy loam
Bt - 4 to 16 inches: fine sandy loam
Bk1 - 16 to 48 inches: fine sandy loam
Bk2 - 48 to 65 inches: loamy fine sand

Properties and qualities

Slope: 1 to 10 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: None
Frequency of ponding: None
Calcium carbonate, maximum in profile: 10 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Available water storage in profile: Moderate (about 7.9 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 7e
Hydrologic Soil Group: A
Ecological site: Sandy (R035XA113NM)

230—Sparank-San Mateo-Zia complex, 0 to 3 percent slopes

Map Unit Setting

National map unit symbol: 1xk8
Elevation: 6,300 to 6,900 feet
Mean annual precipitation: 10 to 13 inches
Mean annual air temperature: 49 to 54 degrees F
Frost-free period: 120 to 140 days
Farmland classification: Not prime farmland

Map Unit Composition

Sparank and similar soils: 40 percent
San mateo and similar soils: 35 percent
Zia and similar soils: 20 percent
Minor components: 1 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Sparank

Setting

Landform: Flood plains on valley floors, valley sides
Landform position (three-dimensional): Side slope, tread, talf
Down-slope shape: Linear, concave
Across-slope shape: Linear, concave
Parent material: Stream alluvium derived from calcareous sandstone

Typical profile

A - 0 to 2 inches: silty clay loam
C1 - 2 to 25 inches: clay
C2 - 25 to 65 inches: clay

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: High
Capacity of the most limiting layer to transmit water (Ksat): Moderately low (0.01 to 0.06 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to slightly saline (0.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 5.0
Available water storage in profile: High (about 10.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: D
Ecological site: Clayey Bottomland (R035XA119NM)

Description of San Mateo

Setting

Landform: Valley sides, valley floors on flood plains
Landform position (three-dimensional): Side slope, tread, talf
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Stream alluvium derived from calcareous sandstone

Typical profile

A - 0 to 2 inches: clay loam
C1 - 2 to 15 inches: clay loam
C2 - 15 to 30 inches: sandy clay loam
C3 - 30 to 39 inches: clay loam
C4 - 39 to 45 inches: sandy loam
C5 - 45 to 65 inches: clay loam

Properties and qualities

Slope: 0 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Well drained
Runoff class: Medium

Capacity of the most limiting layer to transmit water (Ksat): Moderately high (0.20 to 0.57 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Frequent
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Very slightly saline to slightly saline (2.0 to 4.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 10.0
Available water storage in profile: High (about 10.7 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: C
Ecological site: Bottomland (R035XA118NM)

Description of Zia

Setting

Landform: Stream terraces on valley floors, alluvial fans on valley sides
Landform position (three-dimensional): Side slope, tread, rise
Down-slope shape: Concave, linear
Across-slope shape: Concave, linear
Parent material: Eolian deposits over fan and stream alluvium derived from calcareous sandstone

Typical profile

A - 0 to 3 inches: fine sandy loam
Bw - 3 to 12 inches: fine sandy loam
2C1 - 12 to 20 inches: fine sandy loam
2C2 - 20 to 28 inches: sandy loam
2C3 - 28 to 70 inches: fine sandy loam

Properties and qualities

Slope: 1 to 3 percent
Depth to restrictive feature: More than 80 inches
Natural drainage class: Somewhat excessively drained
Runoff class: Very low
Capacity of the most limiting layer to transmit water (Ksat): High (1.98 to 5.95 in/hr)
Depth to water table: More than 80 inches
Frequency of flooding: Rare
Frequency of ponding: None
Calcium carbonate, maximum in profile: 5 percent
Salinity, maximum in profile: Nonsaline to very slightly saline (0.0 to 2.0 mmhos/cm)
Sodium adsorption ratio, maximum in profile: 2.0
Available water storage in profile: Moderate (about 8.1 inches)

Interpretive groups

Land capability classification (irrigated): None specified
Land capability classification (nonirrigated): 6c
Hydrologic Soil Group: A
Ecological site: Sandy (R035XA113NM)

Minor Components

Escawetter

Percent of map unit: 1 percent
Landform: Flood plains
Landform position (three-dimensional): Side slope
Down-slope shape: Linear
Across-slope shape: Linear
Ecological site: Sandy Bottom 6-10" p.z. Perennial (Provisional) (R035XB273AZ)

265—Uranium mined lands

Map Unit Composition

Uranium mined lands: 95 percent
Estimates are based on observations, descriptions, and transects of the mapunit.

Description of Uranium Mined Lands

Typical profile

C - 0 to 60 inches: variable

Soil Information for All Uses

Ecological Site Assessment

Individual soil map unit components can be correlated to a particular ecological site. The Ecological Site Assessment section includes ecological site descriptions, plant growth curves, state and transition models, and selected National Plants database information.

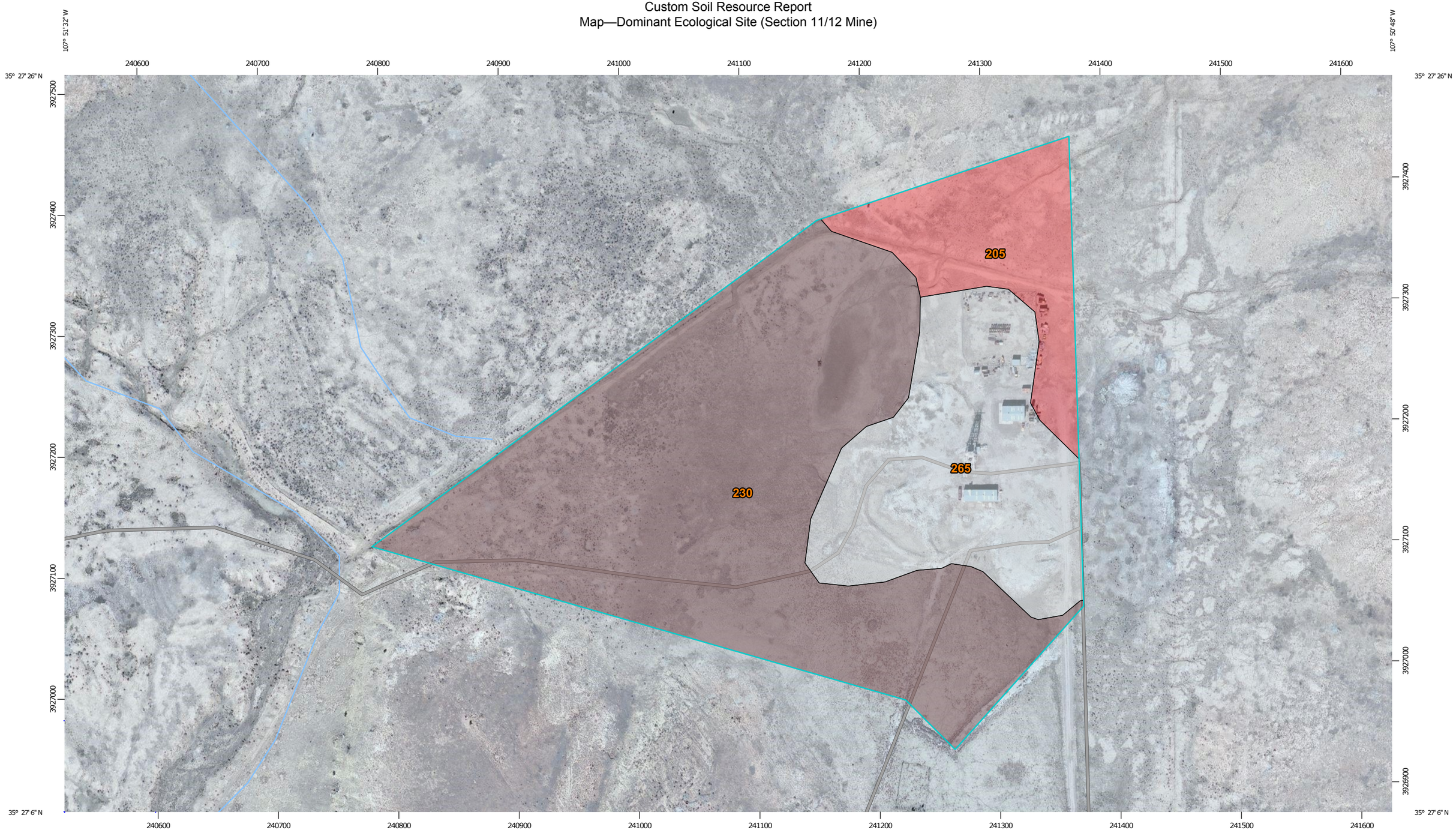
All Ecological Sites — Rangeland (Section 11/12 Mine)

An "ecological site" is the product of all the environmental factors responsible for its development. It has characteristic soils that have developed over time; a characteristic hydrology, particularly infiltration and runoff, that has developed over time; and a characteristic plant community (kind and amount of vegetation). The vegetation, soils, and hydrology are all interrelated. Each is influenced by the others and influences the development of the others. For example, the hydrology of the site is influenced by development of the soil and plant community. The plant community on an ecological site is typified by an association of species that differs from that of other ecological sites in the kind and/or proportion of species or in total production.

An ecological site name provides a general description of a particular ecological site. For example, "Loamy Upland" is the name of a rangeland ecological site. An "ecological site ID" is the symbol assigned to a particular ecological site.

The map identifies the dominant ecological site for each map unit, aggregated by dominant condition. Other ecological sites may occur within each map unit. Each map unit typically consists of one or more components (soils and/or miscellaneous areas). Each soil component is associated with an ecological site. Miscellaneous areas, such as rock outcrop, sand dunes, and badlands, have little or no soil material and support little or no vegetation and therefore are not linked to an ecological site. The table below the map lists all of the ecological sites for each map unit component in your area of interest.

Map—Dominant Ecological Site (Section 11/12 Mine)



Map Scale: 1:2,970 if printed on B landscape (17" x 11") sheet.

N

Meters: 0 40 80 160 240

Feet: 0 100 200 400 600

Map projection: Web Mercator Corner coordinates: WGS84 Edge tics: UTM Zone 13N WGS84

MAP LEGEND

Area of Interest (AOI)

- Area of Interest (AOI)

Soils

Soil Rating Polygons

- R035XA112NM
- R035XA119NM
- Not rated or not available

Soil Rating Lines

- R035XA112NM
- R035XA119NM
- Not rated or not available

Soil Rating Points

- R035XA112NM
- R035XA119NM
- Not rated or not available

Water Features

- Streams and Canals

Transportation

- Rails
- Interstate Highways
- US Routes
- Major Roads
- Local Roads

Background

- Aerial Photography

MAP INFORMATION

The soil surveys that comprise your AOI were mapped at 1:24,000.

Warning: Soil Map may not be valid at this scale.

Enlargement of maps beyond the scale of mapping can cause misunderstanding of the detail of mapping and accuracy of soil line placement. The maps do not show the small areas of contrasting soils that could have been shown at a more detailed scale.

Please rely on the bar scale on each map sheet for map measurements.

Source of Map: Natural Resources Conservation Service
Web Soil Survey URL: http://websoilsurvey.nrcs.usda.gov
Coordinate System: Web Mercator (EPSG:3857)

Maps from the Web Soil Survey are based on the Web Mercator projection, which preserves direction and shape but distorts distance and area. A projection that preserves area, such as the Albers equal-area conic projection, should be used if more accurate calculations of distance or area are required.

This product is generated from the USDA-NRCS certified data as of the version date(s) listed below.

Soil Survey Area: McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties
Survey Area Data: Version 11, Sep 26, 2014

Soil map units are labeled (as space allows) for map scales 1:50,000 or larger.

Date(s) aerial images were photographed: May 21, 2010—Nov 7, 2010

The orthophoto or other base map on which the soil lines were compiled and digitized probably differs from the background imagery displayed on these maps. As a result, some minor shifting of map unit boundaries may be evident.

Table—Ecological Sites by Map Unit Component (Section 11/12 Mine)

McKinley County Area, New Mexico, McKinley County and Parts of Cibola and San Juan Counties					
Map unit symbol	**Map unit name**	**Component name (percent)**	**Ecological site**	**Acres in AOI**	**Percent of AOI**
205	Penistaja-Tintero complex, 1 to 10 percent slopes	Penistaja (45%)	R035XA112NM — Loamy	5.2	12.9%
		Tintero (40%)	R035XA113NM — Sandy		
230	Sparank-San Mateo-Zia complex, 0 to 3 percent slopes	Sparank (40%)	R035XA119NM — Clayey Bottomland	25.0	62.6%
		San Mateo (35%)	R035XA118NM — Bottomland		
		Zia (20%)	R035XA113NM — Sandy		
		Escawetter (1%)	R035XB273AZ — Sandy Bottom 6-10" p.z. Perennial (Provisional)		
265	Uranium mined lands	Uranium mined lands (95%)		9.8	24.4%
Totals for Area of Interest				**39.9**	**100.0%**

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R035XA112NM — Loamy Ecological Site

Plant Community Photos

MLRA 36; WP-2; Loamy

Grassland


•Blue grama, sand dropseed, bottlebrush squirreltail, western wheatgrass, winterfat, and 4-wing saltbush.
•Grass cover fairly uniform with some large (>1m) bare patches.
•Penistaja fine sandy loam, Cibola Co., NM.

Juniper-Invaded


•Blue grama with some galleta, 3-Awns, ring muhly, and juniper
•Grass cover fairly uniform to patchy.
Penistaja fine sandy loam, Cibola Co., NM.

Shrub-Dominated

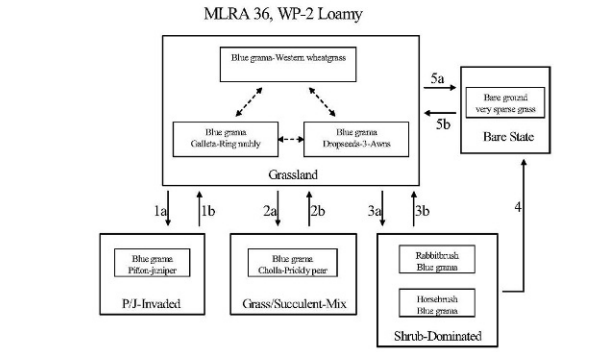

•Rubber rabbitbrush, low-vigor blue grama, ring muhly.
•Sparce grasscover in shrub interspaces.
•Penistaja fine sandy loam, Cibola Co., NM.

Bare State


•Isolated plants of blue grama and ring muhly with a few cholla and 4-wing saltbush.
•Bare ground interconnected and isolated grass patches.
•Remnants of blue grama pedestalled.
•Penistaja fine sandy loam, Cibola Co., NM.

Historic Climax Plant Community

Plant Communities and Transitional Pathways (diagram)



1a. Loss of grass cover, resource competition, seed dispersal, lack of fire. 1b. Brush control, prescribed fire, prescribed grazing.

2a. Drought, overgrazing, dispersal of succulent propagules, lack of fire. 2b. Brush control, prescribed grazing, prescribed fire.

3a. Loss of grass cover, resource competition. 3b. Brush control, prescribed grazing, seeding?

4. Brush control without grass recovery.

5a.Severe loss of grass cover, soil sealing and decreased infiltration, erosion. 5b.Break up physical soil crusts, range seeding, prescribed grazing.

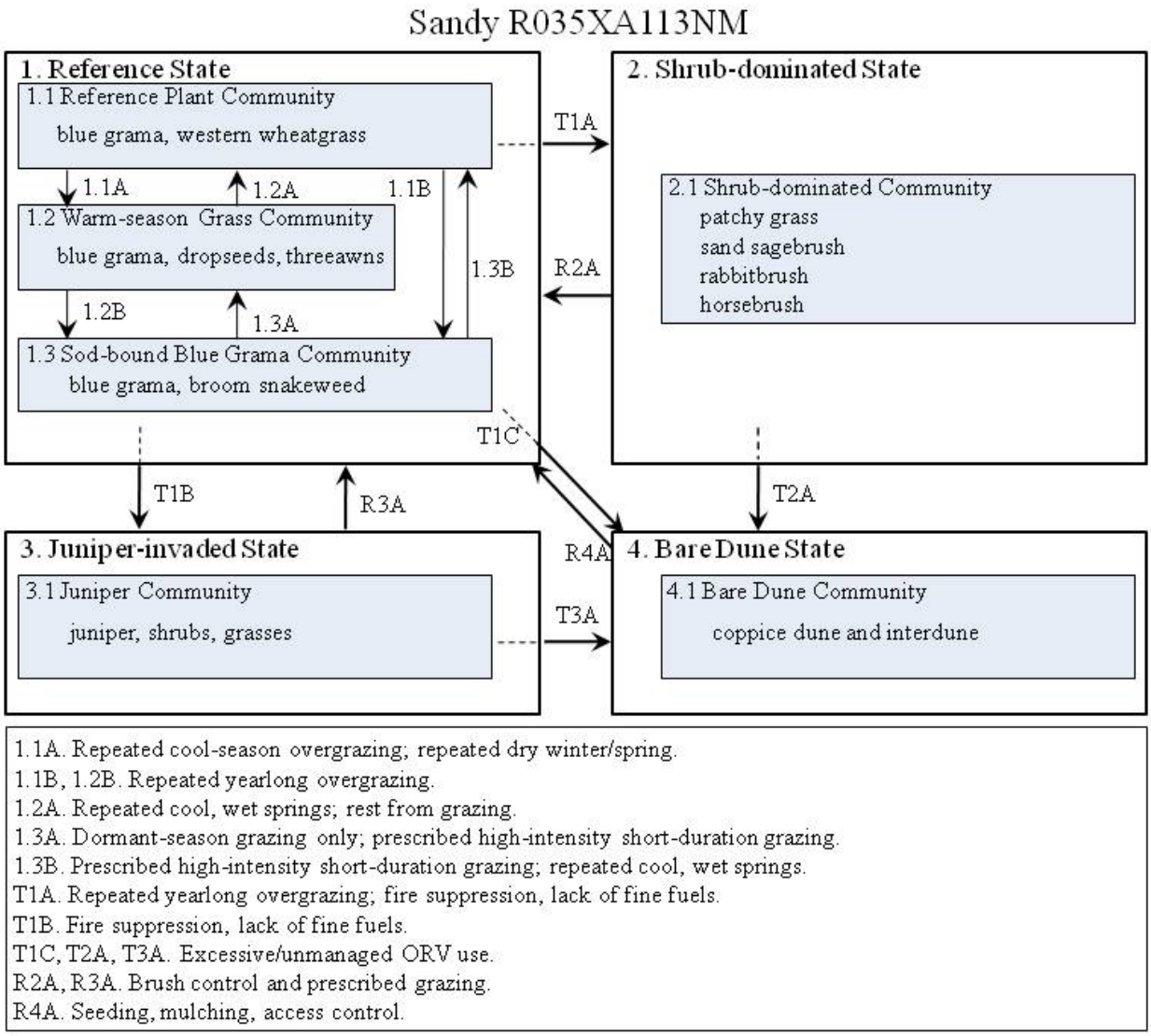
State Transition Diagram for R035XA112NM — Loamy Ecological Site

Ecological Dynamics Description

Overview

The Loamy site is one of the broadest ecological sites in WP-2 encompassing a wide range of soil series. It is associated with Sandy, Shallow Sandstone, Malpais, Limy, Shallow, Swale, and Savannah sites. Loamy sites occur as distinct units adjacent to or as part of complex or association with soil map units correlated to the above sites. The historic plant community of the Loamy site is a grassland characterized by a mixture of cool and warm-season grasses, and occasional shrubs and forbs. Blue grama and western wheatgrass are the dominant grasses. Fourwing saltbush and winterfat are characteristic shrubs. Loss of herbaceous cover and resulting decreased competition by grasses may favor piñon/juniper invasion or the encroachment of shrubs, typically, rabbitbrush or horsebrush. Seed dispersal and the reduction of natural fire frequency may also contribute to the invasion of piñon/juniper. Decreased available soil moisture due to drought and overgrazing, seed dispersal, and decreased fire frequency may promote the transition to a Grass/Succulent state. A severe loss of herbaceous cover, soil sealing, and reduced infiltration may cause the transition to a Bare state. While Piñon/Juniper-Invaded, Grass Succulent-Mix, and Shrub-Dominated may result from similar transitional drivers, it is unclear what factor or combination of factors ultimately determine the transition pathway.

R035XA113NM — Sandy Ecological Site



State Transition Diagram for R035XA113NM — Sandy Ecological Site

Ecological Dynamics Description

Overview

The Sandy Ecological Site typically occurs on upland plains, adjacent to or in a mosaic with Deep Sand or Loamy Ecological Sites. The reference plant community of the Sandy site has a grassland aspect characterized by warm- and cool-season grasses, scattered shrubs, and forbs. Blue grama is the dominant grass species accompanied by subdominant western wheatgrass. Fourwing saltbush and winterfat are the dominant shrubs. This site is susceptible to juniper invasion and shrub encroachment. Loss of grass cover and lack of fire may facilitate the transition to the Juniper State. Decreased grass cover due to overgrazing and drought in conjunction with resource competition may cause the transition to the Shrub-dominated State.

Catalog of states and community pathways

Reference State

Reference Plant Community: In the reference plant community, blue grama is the dominant grass species accompanied by subdominant western wheatgrass. Other species that occur in significant numbers include Indian ricegrass, sand dropseed, and spike dropseed. In addition to western wheatgrass and Indian ricegrass, other species such as needle and thread, bottlebrush squirreltail, and New Mexico feathergrass contribute to an important cool-season grass component on this site. Principal shrubs include fourwing saltbush, winterfat, and sand sagebrush. Rocky Mountain beeplant is often the most noticeable forb. Continuous heavy grazing will cause a decrease in cool-season grasses, especially western wheatgrass. The Warm-season Grass Community, dominated by blue grama with subdominant dropseeds, threeawns, and galleta, may result. Western wheatgrass is adapted to fine- to medium-textured soils, and may be naturally less dominant on coarser textured soils (7). Conversely, dropseeds are adapted to coarse- to medium-textured soils and may be naturally more dominant on soils with loamy sand surface textures (7). The Sod-bound Blue Grama Community may occur in response to increased fall/spring moisture following drought (2, 5) or continuous heavy grazing.

Diagnosis: Grass cover is relatively uniform; however, bare ground makes up a large percent of the total ground cover, and grass production during unfavorable years may only average 250 pounds per acre. Shrubs are scattered with canopy cover averaging 5%. Evidence of erosion such as rills and gullies is infrequent.

Additional States:

Shrub-Dominated State: This state is characterized by the predominance of shrubs, especially sand sagebrush, horsebrush, or rabbitbrush. Perennial grasses are subordinate. The grass component is typically a low-vigor, blue grama community with more threeawns, dropseeds, ring muhly, sandhill muhly, and bare ground than in the Reference State.

Diagnosis: Grass cover is patchy, usually dominated by low-vigor blue grama. Shrub cover averages 20% or more. Evidence of wind erosion, such as pedestalling of plants, blowouts, and soil deposition, may be common.

Transition to the Shrub-Dominated State (T1A). Loss of grass cover due to overgrazing or extended drought may facilitate the transition to the Shrub-Dominated State.

Key indicators of approach to transition:

—Loss of cool season grasses

—Decrease in grass and litter cover

—Increases in cover of bare ground

—Increases in shrub seedlings

Restoration Pathway to the Reference State (R2A). Brush control is necessary to reduce the competitive influence of shrubs and reestablish grass dominance. Chemical control or mowing for 2 consecutive years is effective in controlling sand sagebrush. Root plowing and other mechanical control methods that sever the plant below the sprouting zone may reduce horsebrush and rabbitbrush densities. Some positive results have been reported in controlling rabbitbrush with herbicides (1, 8). Follow-up spraying after the initial treatment is necessary to control horsebrush (9). Single treatments may actually increase horsebrush densities. Complete shrub removal should be attempted only after erosion hazard is evaluated. Seeding may be necessary if adequate seed source is not present. Rest from grazing followed by prescribed grazing afterward will help ensure grass establishment.

Juniper-invaded State. This state is characterized by the presence of juniper. Blue grama, dropseeds, galleta, Indian ricegrass, and threeawns are the primary grass species. Western wheatgrass may be present.

Diagnosis: Juniper is present. Grass cover is variable, ranging from relatively uniform to patchy with large, interconnected bare areas.

Transition to Juniper-invaded State (T1B). Loss of grass cover, resource competition, and lack of fire are believed to facilitate juniper invasion. Climatic periods of mild winters and wet summers may produce conditions favorable to juniper establishment, and result in episodic events of juniper expansion (6). Seed dispersal by wildlife and livestock may contribute to the spread of juniper. Birds, rodents, deer and other small mammals may eat the fruits of juniper and aid in spreading juniper seed (3). Sheep and goats may browse juniper and can act as dispersal agents in some areas. Overgrazing and competition for resources in conjunction with drought may favor juniper invasion. During years of limited rainfall, good grass cover may suppress juniper seedling survival by competing directly for soil moisture. Resource competition is more important during juniper seedling establishment when their roots are in the same zone as the grasses (3). Overgrazing may facilitate the establishment of juniper seedlings by providing competition-free areas, but livestock exclusion alone would not prevent juniper establishment. During wet years, competition for available soil moisture is reduced, and juniper seedlings may even establish in good stands of grass (3). Additionally, the natural spatial variability of ground cover may allow woody species to establish on bare areas within good grass stands when adequate moisture is available (4). Where fire was historically important in the development of plant communities on Sandy Ecological Sites by suppressing juniper seedlings, then overgrazing and fire suppression can disrupt natural fire frequencies and may facilitate juniper invasion.

Key indicators of approach to transition

—Decrease or change in composition or distribution of grass cover

—Increase in size and frequency of bare patches

—Increase in amount of juniper seedlings

Restoration Pathway to the Reference State (R3A). Mechanical or chemical brush control can be used to remove juniper and facilitate grass recovery. After brush control, rest from grazing followed by prescribed grazing will assist in grass reestablishment and persistence.

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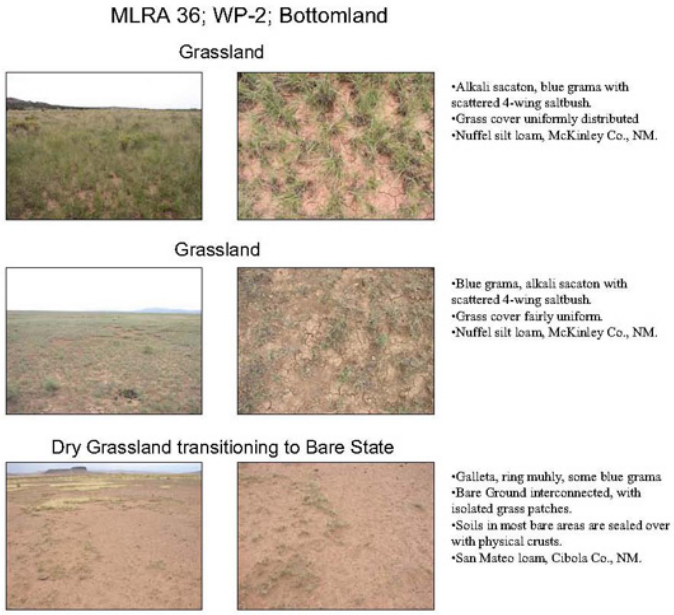
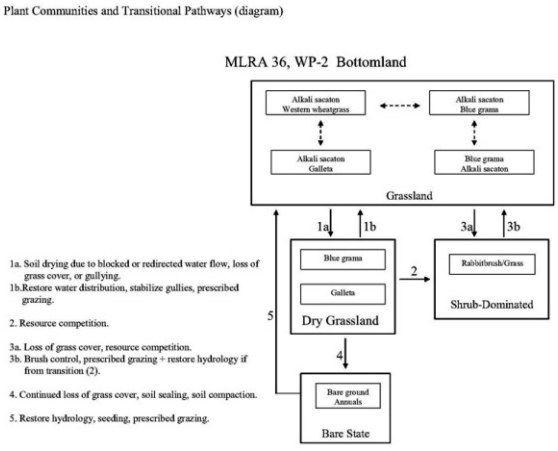
R035XA118NM — Bottomland Ecological Site

Plant Community Photos



Historic Climax Plant Community



State Transition Diagram for R035XA118NM — Bottomland Ecological Site

Ecological Dynamics Description

Overview

This site occurs on floodplains or stream terraces on valley floors. It occurs as a distinct unit or as part of a mosaic with Clayey Bottomland sites. The historic plant community of the Bottomland site is a highly productive grassland characterized by both warm and cool-season grasses, scattered shrubs, and forbs. Alkali sacaton is the dominant grass species with western wheatgrass occurring as the sub-dominant. Fourwing saltbush and rabbitbrush are common shrubs. Decreased available soil moisture due to changes in hydrology can cause a transition to a less productive Dry Grassland State. Continued loss of grass cover, soil surface sealing, or continuous disturbance may result in a state with extensive areas of bare ground (Bare State). Loss of grass cover and decreased soil moisture can increase competition by shrubs, facilitating shrub encroachment and result in a Shrub-Dominated state.

R035XA119NM — Clayey Bottomland Ecological Site

Plant Community Photos

MLRA 36; WP-2; Clayey Bottomland

Grassland Transitioning to Dry-Grassland


•Alkali sacaton, blue grama, galleta, with few scattered 4-wing saltbush
•Grass cover relatively uniform to patchy with large bare areas
• Sparank clay loam, Cibola Co., NM.

Shrub-Dominated

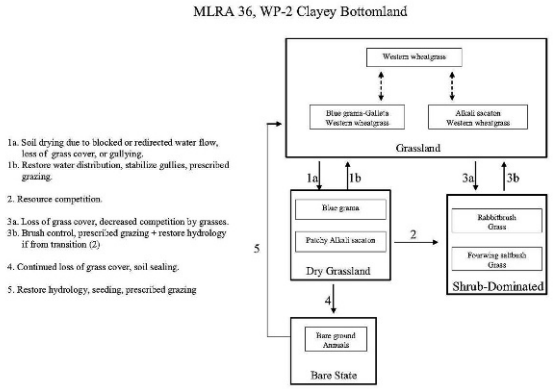

•Fourwing saltbush, blue grama.
•Grass cover patchy, low vigor blue grama.
•Note small gully starting to form.
•Grasses and shrubs pedestalled, bare areas deflated.
•Sparank clay loam, Cibola Co., NM.

Shrub-Dominated


•Fourwing saltbush, sparse western wheatgrass.
•Grass cover sparse.
•Limited evidence of erosion.
•Venadito clay, Cibola Co., NM.

Dry-Grassland Transitioning to Bare Stare

•Very patchy alkali sacaton, galleta, blue grama with few scattered 4-wing saltbush.
•Grass cover very patchy with large bare areas.
•Bare areas sealed by physical crusts.
• Sparank clay loam, Cibola Co., NM.



State Transition Diagram for R035XA119NM — Clayey Bottomland Ecological Site

Ecological Dynamics Description

Overview

This site occurs on swales, depressions, and flood plains on valley floors. It occurs as a distinct unit or as part of a mosaic with Bottomland sites. The historic plant community of the Clayey Bottomland site is a productive grassland characterized by both warm and cool-season grasses, scattered shrubs, and forbs. Western wheatgrass is the dominant grass species. Fourwing saltbush and rabbitbrush are the more common shrubs. Decreased available soil moisture due to blocked or redirected flow of run-on water, loss of grass cover, or gullying can cause a transition to a less productive Dry Grassland State. Continued loss of grass cover and soil surface sealing may result in a state with extensive areas of bare ground. Alternatively, loss of grass cover and soil drying can decrease competition by grasses, facilitating shrub encroachment and result in a Shrub-Dominated state.

Appendix B – Photographs from July 23 and November 6, 2015 surveys

November 6, 2015

July 23, 2015

July 23, 2015

November 6, 2015

Southwest Resources

Section 12 Mine
Facility Map

Sections 12, T.14N, R.10W
McKinley County, New Mexico

EPA Perimeter

Abrosia Lake Water (intermittent)

1:3,500

0 260 520

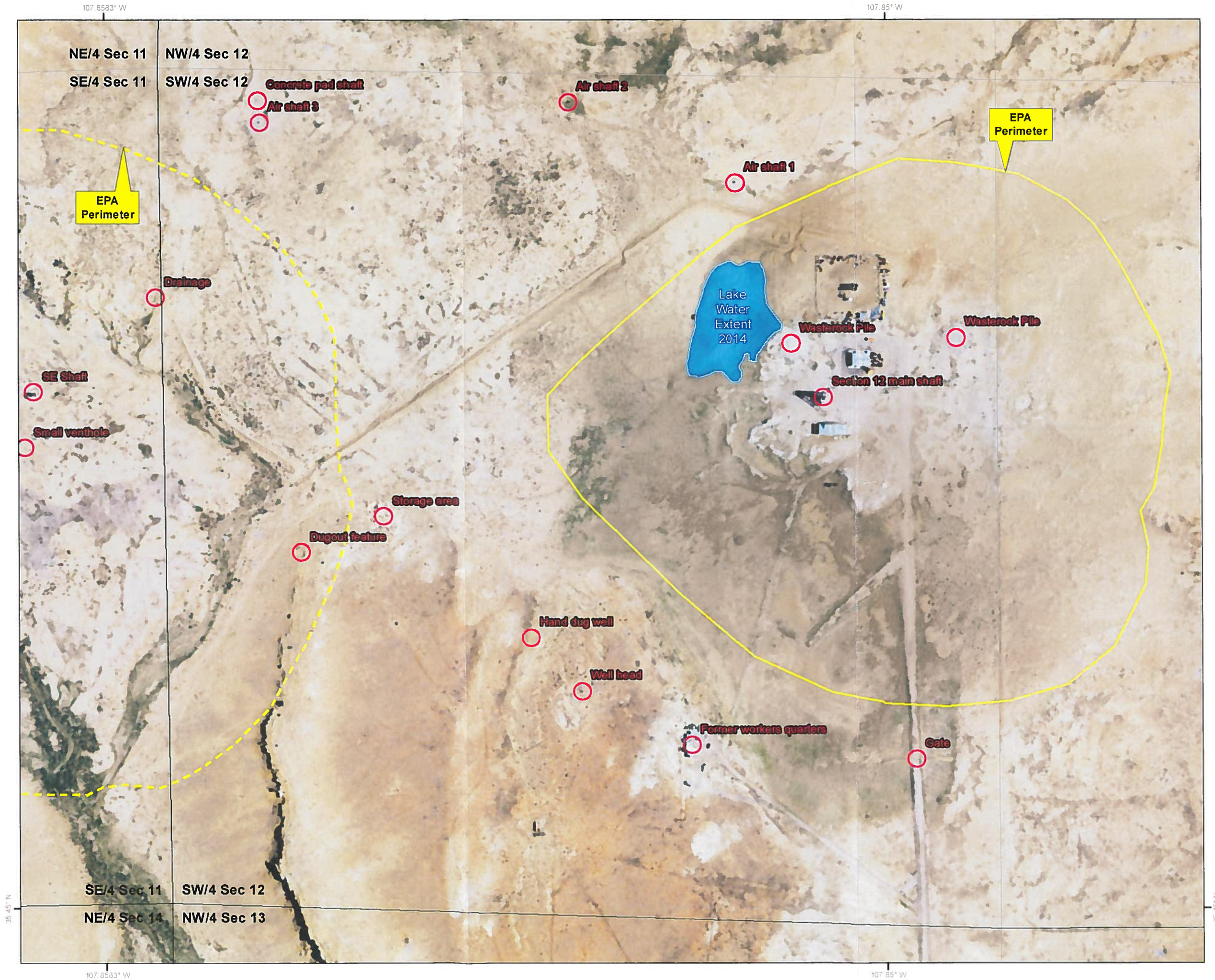
Feet

NAD 1983 New Mexico State Plane West
FIPS 3003 Meters

N

PERMITS WEST INC.
PROVIDING PERMITS for LAND USERS

Prepared by Permits West, Inc., November 12, 2015
for Southwest Resources Inc.



Southwest Resources

Section 12 Mine
Proposed Mine Permit Area Map

Sections 12, T.14N, R.10W
McKinley County, New Mexico

- Mine Shaft or Vent
- Proposed Reference Area
- Proposed Mine Permit Area

1:3,500

0 260 520

Feet

NAD 1983 New Mexico State Plane West
FIPS 3003 Meters

N

PERMITS WEST
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Prepared by Permits West, Inc., December 3, 2015
for Southwest Resources Inc.