



ALTERNATIVE ANALYSIS REPORT

RED BLUFF NO. 1 – STATE TRUST LAND Abandoned Uranium Mine Cleanup Program McKinley County, New Mexico

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March 27, 2025



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List of Acronyms

AML	Abandoned Mine Lands
APE	Area of Potential Effect
AUM.....	Abandoned Uranium Mine
BA/BE	Biological Assessment/Biological Evaluation
Bgs.....	Below Ground Surface
CHDTF	Clean Harbors Deer Trail Facility
cm.....	Centimeters
cpm	Counts per Minute
cps.....	Counts per Second
CR.....	Cultural Resources
CY.....	Cubic Yard
EMNRD.....	Energy, Minerals & Natural Resources Department Mining
IM	Isolated Manifestations
Km	Kilometer
MARP	Mining Act Reclamation Program
MARSSIM	Multi-Agency Radiation Survey and Site Investigation Manual
Mi.....	Mile
MMD	Mining and Minerals Division
Nal	Sodium Iodide
NMED	New Mexico Environment Department
NMSLO	New Mexico State Land Office
NORM	Naturally Occurring Radioactive Material
NRHP	National Register of Historic Places
O&M	Operation and Maintenance
OSI.....	Office of Strategic Initiatives
pCi/g.....	Pico curie per gram
pCi/m ² /s	Pico curie per meter squared per second

PRRL	Post-Reclamation Radiation Level
Ra-226	Radium-226 Isotope
RO	Reclamation Objective
ROCs	Radionuclides of Concern
SAP	Sampling and Analysis Plan
Sec.	Section
TENORM	Technologically Enhanced Naturally Occurring Radioactive Material
U	Uranium
U-238.....	Uranium-238 Isotope
µR/hr	Micro Roentgen per hour
USEPA.....	United States Environmental Protection Agency
V	Vanadium

1.0 Introduction

ENTACT, LLC (ENTACT) has prepared this Alternative Analysis Report (Report) for the NM State Trust land parcel, as part of Stage 2 in the Red Bluff No. 1 (RB1) Abandoned Uranium Mine (AUM) Cleanup initiative under contract #26-667-2030-00005 with the State of New Mexico New Mexico Environment Department (NMED). This Report has been prepared based on research, investigation and assessment activities conducted by ENTACT between August 2025 and January 2026.

This Report includes data, findings and analysis of the known mines located within the State Trust land Parcel of the Red Bluff No.1 Area of Potential Effect (APE) located in McKinley County and the Grants Mining District. The 192-acre RB1 APE encompasses the following mines, as shown in Figure 1, attached:

- State Trust Land Parcel: Red Bluff No. 1 (MMD ID# NM0356)
- AK1, LLC Private Land Parcel: Red Bluff No. 1 Mine (MMD ID# NM0356), and a portion of the Haystack Section 31 (MMD ID# 0103) Mine. Alternatives for this parcel are to be evaluated in a separate Alternatives Analysis report, to be provided under separate cover.
- Marquez Private Land Parcel: Roundy Shaft (MMD ID# NM0144) and Roundy Manol Strip (MMD ID#NM0235). Alternatives for this parcel are to be evaluated in a separate Alternatives Analysis report, to be provided under separate cover.

ENTACT has prepared this RB1 State Trust Lands Alternative Analysis to compare reclamation alternatives, assess their effectiveness, constructability, and cost. This Report focuses on evaluation of the alternatives associated with the Red Bluff No. 1 APE State Trust land parcel Only. Further analysis of alternatives for the remaining APE parcels will be addressed under a separate contract.

Ultimately, the selection of the alternative lies with the New Mexico State Land Office (NMSLO) and the NMED Office of Strategic Initiatives (OSI). Once the selection is made, the design and closure plan will be developed along with the cost estimate.

2.0 Oversight and Responsibility

The Red Bluff No. 1 Mine is an abandoned uranium mine with the primary mine site located on the State Trust land parcel (PM23 T13N R10W, NE1/4 NE1/4 of Sec. 36) managed by NMSLO. Residual materials remaining from mining operations extend onto private property (AK1, LLC. private land parcel) to the east.

The remaining area of the Red Bluff No.1 APE includes additional AUMs on private lands, including the Roundy Shaft and Roundy Manol Strip Mines on the Marquez private land parcel (PM23 T13N R9W Sec. 30) and potentially a portion of the Haystack Section 31 Mine on the AK1, LLC. private land parcel (PM23 T13N R9W N1/2 of Sec. 31) (ENTACT, LLC, 2026b). The APE is shown in Figure 1.

The NMED OSI is the regulatory body administering the reclamation initiative in a collaborative effort with the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) Mining Act Reclamation Program (MARF) and Abandoned Mine Lands (AML) Program.

3.0 Reclamation Objectives

Reclamation objectives (ROs) consist of media-specific goals for protecting human health and the environment that specify exposure pathways, including exposure routes and receptors, and acceptable radiological concentrations or radiological concentration ranges for each exposure pathway. Three ROs were developed for the RB1 APE:

RO1 - Soils: Reduce surface exposure consistent with Section 3.1 below.

RO2 - Surface Water: Divert/Reduce migration of surface water through exposed ore body, open pits, and waste rock piles.

RO3 - Groundwater: Reduce potential impact of surface water to groundwater through exposed ore body, open pits, and waste rock piles.

3.1 Regulatory Criteria

Consistent with the 2016 *Joint Guidance for the Cleanup and Reclamation of Existing Uranium Mining Operations in New Mexico*, the following will be achieved:

(1) *The concentration of Ra-226 in land averaged over any area of 100 square meters (m^2) shall not exceed the background level by more than—*

(a) 5 pCi/g, averaged over the first 15 cm of soil below the surface, and

(b) 15 pCi/g, averaged over 15 cm thick layers of soil more than 15 cm below the surface.

(2) *Site post-reclamation radiation level (PRRL) for gamma radiation should not exceed the site-specific value of gamma radiation that correlates to 5 pCi/g Ra-226 above background.*

- (a) *Sites at which contaminated material exceeding the target radium activity level discussed above is emplaced in an on-site repository, cover material for the repository must achieve radon flux equal or less than 20 pCi/m²/s. (EMNRD MMD and NMED, 2016).*

4.0 Site Location

The RB1 APE is located approximately 19.3 km (12 mi) northwest of the city of Milan in McKinley County. More precisely, it is located approximately 1 mile northwest of the intersection of New Mexico State Highway 605 (formerly 334) and County Road 23. The northern and a portion of the eastern boundary of the APE runs along an existing fence line that parallels County Road 23. The western boundary of the APE is an existing fence line that extends north and south. The southern portion of the APE has a natural boundary of cliffs.

The RB1 State Trust land parcel is an approximately 7-acre parcel of land located in the southwestern portion of the APE. It is comprised of the top and side slopes of a mesa outcropping. The State Trust land parcel has an existing three-strand barbed wire fence which separates it from the private land parcels (Marquez and AK1, LLC.) located to the east and north within the RB1 APE.

Access to the RB1 State Trust land parcel is limited. The APE can be reached by traveling approximately 1 mile northwest on County Road 23 to an existing gate on the Marquez private land parcel in the northeast portion of the APE. To proceed to the State Trust land parcel, equipment/vehicles must traverse a private access road for approximately 0.5 miles across the Marquez and AK1, LLC private parcels.

5.0 Mine History

There is limited information available about the abandoned uranium mines in the Red Bluff No. 1 APE. Records indicate that the Red Bluff No.1 Mine operated between 1952 and 1962, producing both uranium (U) and vanadium (V). Approximately 1,435 tons of ore were mined from the Todilto Limestone formation. No other extant records were uncovered that would shed light on its operations [(ENTACT, LLC, 2026a), (McLemore, 1983), (McLemore et al, 2002), (Green, M.W., and others, 1980c), (Hilpert, 1969), (Anderson, 1980)].

The Roundy Shaft Mine operated between 1950 and 1960. The operating depth of the shaft was 115 ft, and the mining method was room-and-pillar. Production records indicated that 35,087 tons of U/V ore were mined over the course of its operation (ENTACT, LLC, 2026a).

The Roundy Manol Strip Mine Complex operated between 1952 and 1971. The Roundy Manol strip mine was actually a series of strip mines that extended across the Marquez private

property in a northwesterly direction, encompassing approximately 15 acres. Production records indicate that 91,513 tons of U/V ore were mined over the course of its operations.

The Haystack Section 31 Mine operated between 1953 and 1975 with multiple surface pits, prospecting trenches and workings located in the north 1/2 of the northwest 1/4 of Section 31 in T13N R9W on the AK1, LLC property, formerly Schmitt Ranch [(Anderson, 1980), (McLemore, 1983), (McLemore et al, 2002)]. One reference recorded the mine to be within the APE as shown in Table 1 below:

Table 1. Haystack Mine Locations

Reference	Latitude/Northing	Longitude/Easting	Within APE
(Anderson, 1980)	N/A	N/A	No
(McLemore, 1983)	35.316667	-107.825	No
(McLemore et al, 2002)	35.318844	-107.835315	Yes

(ENTACT, LLC, 2026B)

The host formation is Todilto Limestone and Entrada Sandstone. There are no production records available for this mine (ENTACT, LLC, 2026b).

6.0 Site Features

Surface mining is a method of removing the uranium ore by removing overlying soil and rock near the Earth's surface. Two common methods of surface mining are strip mining and open pit mining, where strip mines are often long shallow strips, and open pits are wider and typically deeper. The Red Bluff No.1, Roundy Shaft, Roundy Manol Strip, and Haystack Section 31 Mines are abandoned uranium mines located on State Trust land and private land (Marquez and AK1, LLC. properties), both of which are fenced. The surface mines cover an area of approximately 74.3 acres on private land in a northwest to southeast direction in the middle of the APE, and 4.9 acres encompassing most of the State Trust land portion of the APE. As part of the mining operations, approximately 58 waste rock piles are located throughout the property and adjacent to the strip mines/open pits. Both the waste rock piles and the open pits have been overgrown with native and non-native plant species. Debris associated with mining activities is present on the APE and consists of sanitary cans, bottles, equipment fragments, filters, pieces of equipment, lumber, signage and general trash and debris.

No shafts or portals were encountered during the survey with the exception of the closed Roundy Shaft, and a 2.5-ft wide, 18.5-ft deep, pit near the boomerang that is likely a washed-out borehole.

7.0 Current and Future Land Use

The predominant current land use is livestock grazing and that is anticipated to continue for the foreseeable future in this region. Cattle are common in the area, but the grazing history on the State Trust land parcel is uncertain. Grazing by cattle has a direct impact on the growth and distribution of vegetation types, with some plant species being browsed much more heavily than others. These animals can disperse the seeds of various plant species across the landscape, including the exotic and invasive plant species that are present. Trampling of sensitive species by cattle is a potential impact as well as compaction of soil or erosion of soft, sandy soil, especially up and down the banks in and around washes. Additionally, the input of organic matter into the system occurs from cattle. During the field surveys, excrement from cattle was observed throughout the Project Area. The above stipulations of impacts will continue to be true for the land and in the Project Area as long as these animals are present. This should not impact potential habitat for sensitive birds, but burrowing animals, whose burrows may be crushed by heavy animals, could be impacted. Sensitive plants will continue to be at risk of trampling or browsing, apart from the sensitive cactus species, which are unlikely to be browsed.

8.0 Ecological Setting

A Biological Assessment/Biological Evaluation (BA/BE) was performed as part of the Stage 2 investigation (Sundance Consultants, LLC, 2025). Four soil classifications are present in the APE: Penistaja-Tintero complex, Todest fine sandy loam, Uranium mined lands, and rock outcrop-vessilla complex. During the BA/BE, 47 plant genera and species were identified. Seven non-native species of noxious weeds were observed, along with 12 bird species, 1 mammal, and 3 reptile sightings.

The activities planned under the Proposed Action will cause some disturbance in the APE, but they are not likely to impact federally or state-listed species and other sensitive species. After conducting analyses of the habitat needs and species-specific concerns, adverse effects to these species are highly unlikely. No wetlands were identified (Sundance Consultants, LLC, 2025).

The surveys emphasize the lack of sensitive species or habitats in the APE. Based on these considerations, the reclamation activities are anticipated to proceed with no restrictions other than a pre-construction nesting survey to reduce the potential of impacts to migratory birds, as provided in the BA/BE (Sundance Consultants, LLC, 2025).

9.0 Historical and Archeological Setting

A Cultural Resource (CR) Inventory was also performed as part of the Stage 2 investigation (Resi Solutions, 2025). The inventory resulted in the identification of 120 cultural resources within the APE, including 19 newly recorded sites, and 101 Isolated Manifestations (IMs) were documented. CR sites exist within and adjacent to the proposed reclamation limits.

Based on the results of the archeological survey, it was concluded that five CR sites warrant listing in the National Register of Historic Places (NRHP) for their research potential related to pre-contact components. One CR site is recommended as Unevaluated for NRHP. In total, seven CR sites are recommended for avoidance during construction activities. These CR sites will be demarcated with orange fencing to prevent disturbance during the reclamation field activities.

10.0 Geological Setting

10.1 Surface Geology

Geologically, the Project Area is comprised of upper and middle Jurassic rocks (Appendix A, Figure 3) that are widely distributed and include sedimentary, igneous, and metamorphic rocks. Middle Jurassic rock has a range of shallow-marine, fluvial, and deltaic settings, with significant carbonate and clastic sedimentation. In the western United States, upper Jurassic rock, particularly the Morrison Formation, is a clastic deposit of lacustrine and fluvial mudstone, siltstone, sandstone, and conglomerate. The APE is relatively flat with a few small hills. Several drainage areas showed significant erosion. The southernmost portion of the APE had a granite rock outcrop and a sandstone cliff face (Sundance Consultants, LLC, 2025).

Four soil classifications are present at the Project Area: Penistaja-Tintero complex, Todest fine sandy loam, Uranium mined lands, and rock outcrop-vessilla complex. The Todest series of soils consist of moderately deep to limestone, well drained, moderately permeable soils on dip slopes of cuestras with slopes of 2 to 8 % (EA Engineering, Science, and Technology, Inc., 2026). Penistaja series consists of very deep, well drained, moderately permeable soil that is formed in mixed alluvium, fan alluvium, slope alluvium and controlled landscapes where slopes range from 35 to 70 %. Uranium mine lands make up 53.33 acres of the APE (Sundance Consultants, LLC, 2025).

10.2 Surface Water

The APE displays notable erosional features consisting of drainages that may have been excavated during mining operations, which now receive runoff from the surrounding terrain. Debris piles adjacent to these drainages were an indication of past disturbance. Periodic heavy runoff has eroded the sand channel walls and created shallow canyons. Runoff occasionally accumulates in low areas located at the bottom of the channels.

A culvert is located under County Road 23 approximately 0.9 miles north of the intersection with State Route 605. The culvert is a corrugated steel pipe that drains surface water from the north side of the road, from outside of the APE, into the Marquez private land parcel inside of the APE. The culvert discharges to the area near the Roundy Manol Mine open pits, specifically the “Boomerang Pit.”

10.3 Geology

Appendix A, Figure 2 shows the local geology at the APE, taken from the Geologic Map of the Dos Lomas USGS Quadrangle, Cibola and McKinley Counties, New Mexico (Cather, 2011). The uranium ore bearing rock of interest at the APE is the Todilto Formation, a light gray to tan Jurassic age limestone. At the APE, the Todilto Formation appears to be laterally continuous, and less than 10 feet thick with bedding up to about 6 inches thick, based on observations of local outcrops. Small scale local folding (up to an amplitude of approximately 5 feet) was observed in most excavations indicating a generally planer surface with small scale variations in expected depth. Based on measurements (strike and dip) and GPS coordinates collected at surface exposures of the Todilto Formation, conservative calculations conclude a formation attitude (dip and dip direction) of between 3° and 6°, N32°E. Strike and dip measurements were taken at seven locations, shown as SD1 through SD7 on Appendix A, Figure 1.

Further upslope, erosion of the Todilto Formation left the Jurassic age Entrada Formation exposed. The red cliff on the southwestern boundary of the APE is composed of the Entrada Formation (Appendix A, Figure 2). Regionally, two members are noted in the Entrada Formation, the Upper Sandstone Member and the Medial Silty Member (Appendix A, Figure 3). The upper sandy member forms prominent cliffs and is composed mainly of medium- to fine-grained sand with prominent crossbedding. The Medial Silty Member is described as a silty, very fine-grained sandstone with fairly flat bedding and well cemented with a predominantly calcium carbonate cement (Harshbarger, 1957).

Where the Todilto Formation dips below ground surface, the bedrock is covered by a layer of Quaternary age eolian and alluvial deposits (Appendix A, Figure 1).

Subsurface geology at the APE is expected to follow the regionally observed stratigraphic sequence (Appendix A, Figure 3). In the down-dip direction, the Summerville Formation can be found stratigraphically above the Todilto Formation and below the Bluff Sandstone that outcrops approximately 1600 feet to the NE of the APE boundary (Appendix A, Figure 2).

The stratigraphically lowest formation observed at the APE is the Entrada Formation. The Wingate Sandstone is located stratigraphically below the Medial Silty Member of the Entrada Sandstone locally (Appendix A, Figure 3).

10.4 Hydrogeology

The APE is located in the San Mateo Creek Basin, which is part of the larger structural San Juan Basin. Aquifers within the San Juan Basin are primarily artesian based on the regional geologic structure. The major component of groundwater flow is through sandstone of relatively higher permeability than adjacent units. Finer grained units, including mudstones, shales, and silts, act as confining units [(Stone, 1983), (New Mexico Environment Department, 2008)].

10.5 Groundwater

Site-specific geologic observations and nearby domestic well records indicated that the geology and hydrogeology follow regionally observed patterns. Groundwater in the region generally flows with the dip of the lithology to the northeast in the San Mateo Creek Basin (U.S. EPA, 2018). The shallowest aquifer in the vicinity of the APE is the Wingate Formation, which is stratigraphically beneath the cliff forming Entrada Formation. Based on nearby domestic wells, local saturation of the Wingate Formation likely begins at a depth of approximately 280 feet below ground surface (bgs).

The top of the Wingate Formation is approximately 200 feet bgs next to the “Boomerang” pit at the APE (Figure 3). The Wingate Formation is therefore expected to be dry under most of the APE. Additionally, the Entrada Formation, Medial Silty Member, likely acts as the confining unit locally and is located at a depth of approximately 150-200 feet bgs next to the “Boomerang” pit (Figure 3). Future work is planned to confirm the geology.

11.0 Radiological Assessment

ENTACT performed site characterization within the APE limits in the second half of 2025 and January 2026 that consisted of a site radiological walkover survey, and radioactive

characterization sampling and analysis activities to characterize the radioactive material concentrations in soil and rocks to support reclamation design and ultimate AUM closure.

ENTACT's 2025 APE gamma walkover survey results were used to assign preliminary Multi-Agency Radiation Survey and Site Investigation Manual (MARSSIM) classifications to regions of the APE surface based on presumption of impacts, which is to be confirmed as removal is being performed during reclamation activities. The MARSSIM classification system has three categories: Class 1 (Impacted), Class 2 (Potentially Impacted) or Class 3 (Non-Impacted). The class descriptions were then utilized to guide development and implementation of ENTACT's 2025 Radiological Sampling and Analysis Plan (SAP).

11.1 Background Levels

Twenty samples were collected from the top 1.5 feet (approximately three 15 cm layers) from a region of one of the MARSSIM Class 3 areas exhibiting gamma radiation levels at or near the statistically-determined background of 17,000 counts per minute (cpm) from the 2025 ENTACT gamma walkover (ENTACT, LLC, 2025a). The highest gamma radiation level detected within the chosen background region was 17,460 cpm. Radiological background soil concentrations in the samples collected from this designated background region average to 1.56 pCi/g radium-226 (Ra-226) with a standard deviation of 0.18 pCi/g Ra-226, which is similar to the 2 pCi/g Ra-226 estimated background at the nearby Schmitt Decline (EA Engineering, Science, and Technology, Inc., PBC, December 2025).

11.2 External Exposure Rate

Over 500,000 data points were collected during the 2025 ENTACT gamma walkover field survey (ENTACT, LLC, 2025a), and the median background count rate was statistically determined to be 17,000 counts per minute (cpm), which correlated to an exposure rate of 14.45 $\mu\text{R/hr}$. The field survey cpm values are the measured values as recorded in counts per second (cps) and multiplied by 60 to convert the time unit. The highest recorded exposure rate, as measured with the Ludlum Model 19, was 1,100 $\mu\text{R/hr}$. The lowest exposure rate, as measured, was 10 $\mu\text{R/hr}$.

11.3 Soil Concentrations

Over 1,000 soil samples were collected and analyzed during the 2025 and 2026 ENTACT Stage 2 sampling events. As discussed in the Radiological SAP, soil samples were collected in continuous soil core samples (hereafter, "core(s)") acquired by direct push technology (DPT) drilling. Soil sample locations were selected based on a random-start triangular grid

pattern in compliance with MARSSIM methodology [(USEPA, 2001), (ENTACT, LLC, 2025b)]. Each borehole was logged by collecting gamma radiation readings at each 15 cm depth layer, and each core was scanned at each 15 cm section down its length. The borehole and core scanning data combined with the site-specific geological report (EA Engineering, Science, and Technology, Inc., 2026) revealed layers at which the radioactive materials were concentrated. Samples were collected from 15 cm depth layers of each core that indicated a layer boundary based on the borehole logging and core scan data. This variance from the SAP improved sample collection time, laboratory processing time, and the cost effectiveness of the project without any loss to the precision in the remedial action plan. Analytical results from the preliminarily assigned MARSSIM (USEPA, 2001) classified areas indicate soil concentrations up to 406.5 pCi/g.

11.4 Areas of Elevated Radioactivity

Impacted material appears to be restricted to the immediate areas surrounding the abandoned mine sites within the APE, according to the gamma walkover survey completed by ENTACT in 2025 (ENTACT, LLC, 2025a). The former mine features observed primarily included surface mining remnants, such as open pits, waste rock piles (homogenous and multi-layered), exposed ore beds, and surface deposits. Surface mine remnants are located within the State Trust land parcel, the Marquez private land parcel and the AK1, LLC. private land parcel of the RB1 APE. Historic subsurface features were limited to one closed mine shaft on the Marquez private land parcel proximate to the Roundy Shaft and Roundy Manol Strip mines.

A general gamma walkover of the whole 192-acre APE was performed, using 10-foot transect spacing, and identified approximately 12 areas of elevated activity. These areas ranged from single small mounds to large, combined mounds of waste materials, shallow rocky pits, large deep soil-lined pits, and exposed bedrock mesa. Exposure rates were measured during the walkover survey and were found to vary from background to 1,100 $\mu\text{R/hr}$. The gamma responses were measured in cpm during the survey itself and varied from background at 17,000 cpm to 1,378,140 cpm (see Figure 4).

Additional details of the APE features are shown in hill shade elevation map in Figure 2 and the APE feature location map in Figure 3. The general surface mine features observed within the APE are described below. Specific to the RB1 State Trust land parcel, dominant surface features consist of waste rock piles and exposed ore beds.

11.4.1 Open Pits

The surface mines in the APE were most likely mined through a combination of excavation and blasting. These include both shallow “rock pit” type areas and deeper open pits as described below.

The rock pit type areas are full of large slabs of fractured rock. Features that appear to be blasting-charge holes are visible in some of the exposed rock bases. The walls of these areas contain the natural layered limestone along with visible ore veins and naturally occurring fractured rock. It is difficult to distinguish between natural fracturing and rock fragmentation resulting from mining activities. These areas have very little soil at the base because they are generally surrounded by natural rock formations and waste rock piles, which prevent soil from washing into the pit. Exposure rates exceeded 1,000 $\mu\text{R/hr}$.

As stated above, in several of these pits, the ore bed is clearly visible along the walls. Additionally, small rocks from the walls and fractured rocks at the bottom of the pit are generally high-activity material and are the highest activity material found on the APE.

The larger open pits featuring soil walls and bases were also found within the APE. These pits contained soil between 1 and 2 feet thick in the bases, as a result of erosion and washed-in sediment. Measured radiation levels were significantly lower in these areas than in the rock pits, since no rock formations containing ore were visible along the sidewalls or the base.

11.4.2 Homogenous Piles

Numerous small waste rock piles were observed throughout the APE. Most of these were around the surface mining sections that resembled rock pits. These piles were primarily composed of pea gravel to larger 2 to 5-inch diameter stones. These piles typically were only a few feet above grade and consist of higher-activity material. Yellow oxidation on the uraninite ore was a common feature. Exposure rates exceeding 1,000 $\mu\text{R/hr}$ at a distance of one meter from the ground were measured near these piles.

Additional piles were found on the APE that were more homogeneous, consisting of soil and pea gravel or pea gravel-sized fractured limestone. Some of these homogeneous piles were in the Roundy Shaft area and along the Roundy Manol Strip. Most of these were lower activity concentrations than those found around the rock pits.

Full characterization of the activity concentrations will be finalized upon receipt of laboratory data and reported in the forthcoming sampling report.

11.4.3 Multi-Layered Piles

Large mounds of soil and rock are present in the APE, usually directly adjacent to the surface mine features (open pits), often exceeding 20 feet tall, and combined with adjacent piles to form large ridges around some areas. Sampling has shown layers with varying activity within

the piles (Attachment 1, Page 1). It is assumed that these piles consist of a mix of overburden and low-grade ore.

The large mounds in the Roundy Manol Strip area, while of varying activity layers, are entirely comprised of material that exceeds expected cleanup criteria.

The mounds next to the largest surface mine in the northwestern corner of the Marquez SW 1/4 property, hereafter referred to as the “Boomerang”, do not contain contamination exceeding clean-up criteria and may be suitable for use as backfill based on data currently available.

11.4.4 Exposed Ore Beds

These include both those in the rocky pits as well as the bedrock outcropping on the Red Bluff No. 1 (State Trust land parcel and AK1 private parcels) and Haystack mesa. The exposed ore beds in the rocky pits have been described with the open pits, Section 11.4.1 above. The ore material found along the northwestern face of the mesa may be overburden or low-grade material that was pushed aside during the removal of the high-grade ore. This material is primarily fractured limestone slabs, but uranium-bearing rocks can be seen in some of it. Gamma walkover data verified the presence of uranium in portions of this overburden material. The mesa also contains remnants of the unmined ore between layers of the limestone and sandstone. These ore bands are exposed along the mesa cliff face and have resulted in some deposits of uranium material through natural fracturing of the rock, unrelated to mining operations. Material not related to mining operations is not included in the remediation plans.

11.4.5 Surface Deposit

Surface deposits are visible rock piles containing sediment, pea gravel, and larger rocks that have migrated from mining waste during mining operations. It is expected that pending laboratory data will confirm that this material is superficial and confined to the top 6 inches of soil. Results of all soil sampling efforts will be included in the forthcoming sampling report.

11.4.6 Rock Versus-Soil Fines

The remains of the original uranium ore body affect the borehole data at depth (Attachment 1, Page 2). The borehole logs detected radiation from the rocks, while the core itself, consisting of smaller than pea gravel sized material, exhibited an unremarkable radiological profile.

Widespread migration of contamination has not been identified on the APE. The areas of the APE at which mining activity was known to have taken place are where the gamma walkover survey indicated elevated gamma response and those areas not known to have previously

been mined indicate a background gamma response. The contamination appears to be primarily found in the fractured limestone material. This consists of pea gravel and larger rocks. The available borehole logs and sampling data indicate that contamination is not present in the fines and sand at the APE.

If the borehole depth approached the existing mineral layers, the borehole log would indicate elevated activity at the deeper end of the hole, although the core scan and sample analysis support that the soil is not contaminated above the naturally occurring mineral bed (Attachment 1, Page 3).

11.5 Potential Receptors

The overall APE is ranchland used exclusively for cattle grazing. The surrounding area is also ranchland. The closest occupied residence is less than a mile away on private land. The APE lands may also be used for recreational purposes, specifically with the public in the State Land rocky outcropping portion.

A “receptor” in risk assessment is an organism or ecological entity, such as humans or biota, exposed to a stressor. In this case, the term “receptor” is representative of a local population and should not be considered as a specific individual. As such, results are not representative of or applicable to any particular person but are considered representative of an exposed population.

For the RB1 State Trust land portion of the APE specifically, the most representative receptor type for this parcel is the recreational receptor, who only has intermittent direct contact. Receptor exposure following reclamation will be dependent on the alternative selected.

11.6 Sources

The media considered in this report are soil/rock, settled dust, surface water, and sediment within the study area. These source media potentially contain the radionuclides of concern (ROCs) identified in the SAP, namely U-238 including progeny and Ra-226 including progeny (ENTACT, LLC, 2025b). The following is a preliminary assessment based on site observations, sampling results, and the gamma walkover.

11.6.1 Potential Release Mechanisms

Radionuclides may be released to the environment from source media within the APE by a number of processes. These processes are referred to as “release mechanisms” and are identified by assessing potential interactions between the physical environment and

radionuclide sources. Potential release mechanisms are discussed in the following subsections. Attachment 2 identifies the release mechanisms evaluated.

11.6.2 Resuspension and Relocation of Soil

Loose surface soil particles containing ROCs can be released by mechanical agitation or picked up by wind passing over areas of exposed loose soil, becoming suspended in the air for a time. Once released, particulates can become airborne and be carried by the wind.

11.6.3 Soil Erosion by Surface Water

Soil particles can be picked up by surface water runoff during precipitation events and carried to surface water bodies such as creeks. Such particles may remain suspended in natural water or may be deposited as sediment. In addition, soluble materials in the soil might be dissolved and transported downstream by the flowing water as sediment.

However, the gamma walkover survey results do not indicate any significant contamination due to erosion. Concentrations of radioactive materials as a result of sediment deposition are not found along the depressions or low areas known to be temporary waterways during rain events within the APE, or – and more importantly – along the ditches and arroyos surrounding the APE. While soil erosion is noted along the ditches and arroyos (EA Engineering, Science, and Technology, Inc., 2026) and other known temporary waterways within and near the APE, the elevated radiation areas remain localized and thus do not match the characteristics of an erosion deposition.

11.6.4 Leaching from Soil to Groundwater

Water percolating through the soil can dissolve soluble materials within a soil matrix. These dissolved materials can then be carried by water through the soil and enter the groundwater. However, groundwater appears to be deeper than 200 ft and below multiple rock layers beneath the APE (Banks Environmental Data, 2026). Additionally, the processes known to have occurred on the APE appear to have been mechanical in nature (e.g., blasting, digging, etc.) and did not include any chemical separation steps that would have concentrated or altered the solubility of the uranium compounds naturally present. As such, leaching resulting from the abandoned mine is not considered a potential source of exposure beyond whatever natural leaching from the ore bed is already occurring.

11.7 Pathways

Attachment 2 presents the conceptual exposure model depicting the media and potential exposure pathways in that scenario. The model traces common routes that environmental Naturally Occurring Radioactive Materials (NORM) or Technologically Enhanced Naturally

Occurring Radioactive Materials (TENORM) may take in the local environment and identifies potential exposure mechanisms and routes that may result.

This type of graphic illustrates the potentially complete exposure pathways considered for quantitative evaluation. Each complete exposure pathway evaluated consists of:

- a source (e.g., soil)
- an exposure mechanism (e.g., direct contact, food from local gardens)
- an exposure route (e.g., inhalation, ingestion)
- a potential receptor (e.g., resident or recreational user)

For some exposure pathways to be complete, additional elements are required, such as a release mechanism (e.g., wind, erosion) and/or a transport mechanism (e.g., root uptake). If any required element is missing, the exposure pathway under consideration is incomplete and no exposure can occur.

This report's conceptual model, depicted in Attachment 2, describes hypothetical receptor behaviors during theoretical current and future land use.

The basis for identifying complete exposure pathways from ROCs detected on the APE include the following assumptions:

- Currently, the land within the study area is partially vegetated, contains no homes or other structures, and is used primarily for cattle grazing.
- Surface water runoff within the study area is currently channeled to existing ditches and arroyos.

An exposure route describes how a ROC is delivered to the receptor. Generally, radiological exposures are divided into two types: direct external exposures and internal exposures.

Direct external radiation exposures occur when a person is irradiated by an external source. They do not require physical contact and can occur when a person is near gamma-emitting radionuclides. Increasing the distance between a radiation source and the receptor reduces the intensity of the radiation field at the point of exposure. (The magnitude of exposure is inversely related to the distance of the receptor from the source.) Direct radiation exposures can also be reduced when shielding, such as soil or water, is placed between the receptor and the source of radioactivity. Sources of direct exposure may include gamma-emitting ROCs contained in soil, settled dust, surface water, and sediment, as well as in airborne particulates borne out of disturbed soil or dust.

Internal radiation exposures occur when ROCs are introduced directly into the human body through, for example, inhalation and inadvertent or intentional ingestion of soil, crops or water. Once inside the body, these ROCs could irradiate organs and tissues. Based on their

low permeability through human skin, dermal absorption of these ROCs through the skin was not considered to be a complete exposure pathway.

Several examples of potentially complete, media-specific exposure routes to be evaluated are presented below:

- Soil: A receptor can be exposed to radioactive materials in soil or rock via direct external radiation. In addition, a receptor may come into physical contact with soil or soil particulates in air and be internally exposed to ROCs via ingestion or inhalation. Also, a receptor can indirectly consume radioactive materials in soil via root uptake by fruits and vegetables, or by consuming the flesh of an animal that consumed the potentially contaminated plant matter.
- Sediment: A receptor may come into physical contact with sediment while on the APE and be internally exposed to ROCs via ingestion. As with other media, a receptor can be exposed via direct external radiation to radioactive materials in sediment. However, the sediment may also provide shielding between ROCs and a receptor.

There may be more than one complete exposure pathway for a hypothetical receptor. An example of a receptor with the potential to be exposed via multiple pathways is a recreational receptor who infrequently spends time within the APE. Potential complete pathways to a recreational receptor may include:

- Inhalation: Resuspension of soil.
- Direct radiation: Proximity to soil, sediment, or settled dust; submersion in air or surface water during recreation.
- Ingestion: Incidental or intentional ingestion of soil, sediment, or resuspended soil.

12.0 Alternatives and Recommendations

The RB1 State Trust land parcel alternatives presented in Table 2 attached, that are determined to be practicable, are further evaluated in greater detail in this section in order to recommend the most favorable reclamation alternative. The selection process is solely for the purpose of simplifying the subsequent development and evaluation of alternatives without limiting flexibility during design and the development of the closure plan.

Alternatives are evaluated using the following criteria – effectiveness, constructability, and cost. Furthermore, the evaluation focuses on effectiveness factors and implementability at this stage, with less effort directed at the cost evaluation. The application of these criteria is discussed below:

- Effectiveness: Effectiveness is evaluated relative to other alternatives. This evaluation focuses on the ability to handle the estimated areas or volumes of contaminated sediment and meet the reclamation objectives, potential impacts to human health and the environment during the construction phase, and how proven and reliable the process is with respect to the contaminants and conditions at the APE.
- Constructability: Constructability evaluates each alternative and the administrative feasibility of implementing a reclamation strategy. Since constructability is used as an initial screen of technology types to eliminate those that are clearly ineffective or unworkable at this APE, this subsequent, more detailed evaluation of process options places greater emphasis on the technical aspects of constructability. Administrative feasibility refers to the ability to obtain permits for those components of an action, the ability to coordinate with private landowners that will be potentially impacted, the availability of treatment, storage and disposal services (including capacity), and the availability of specific equipment and technical specialists.
- Relative Cost: Cost plays a limited role in the screening of process options. Both capital and operation and maintenance (O&M) costs are considered. The cost analysis is based on engineering judgment, and each process is evaluated as to whether costs are low, moderate, or high relative to the other options within the same technology type.
- Private Property Stakeholders: The majority of the lands within the RB1 APE are private properties, owned by private landowners. Impacts based on considerations relative to this stakeholder group and the pathways available to manage challenges is a criterion evaluated during the development of the potential alternatives. The “Permission to Enter and Traverse” Right of Entry (ROE) access agreements have been secured for the Marquez and the AK1, LLC private land parcels and are filed with McKinley County, NM. The ROE agreements encompass the following general tasks in support of reclamation:
 - Enter and traverse the property with all materials and necessary equipment in order to perform reclamation work on adjacent land for the purpose of restoring, abating, controlling or preventing the adverse effects of mining practices.
 - Construction of temporary or permanent facilities on the property.
 - Grading, excavation, use of topsoil from approved borrow areas, mulching, planting of vegetative cover, placement of erosion control features.

- Mechanically or manually backfilling physical openings with surrounding waste material, filling openings with polyurethane foam plugs or building wildlife compatible structural barriers that restrict human access including locking gates, mesh netting and cupolas.
- Subsurface exploratory drilling and installation of monitoring wells.
- Any other necessary or expedient work deemed necessary to protect health, safety and general welfare of the landowner and public.

12.1 Alternative #1: No Further Action

The RB1 State Trust land parcel Alternative #1, No Further Action (NFA), reflects the current RB1 APE – State Trust land parcel conditions, as described in the BA/BE (Sundance Consultants, LLC, 2025) and Class III Cultural Resource Inventory (Resi Solutions, 2025) reports, and serves as a baseline against which the performance of other alternatives will be compared. Under this NFA alternative, the surface mine features, e.g., waste rock piles, will remain in-place. There is no cost associated with this alternative.

This alternative will not satisfy any of the three ROs for the RB1 State Trust land parcel.

12.2 Alternative #2: Off-Site Milling

The RB1 State Trust land parcel Alternative #2, consists of removal of waste rock piles, loading of the impacted material into on-road trucks, and off-site transport for milling at a licensed off-site facility. The milling process would extract uranium from the waste rock for sale in the exchange markets.

To be considered as a feedstock, material must contain “recoverable” amounts of uranium. The preferred feedstock for the mill is material greater than 0.05% U, but they can process material down to 0.005%. In addition to license amendment fees, to add an additional feedstock supplier to their license, low grade material will also incur processing fees since the cost of processing exceeds the value of the recoverable uranium.

The RB1 State Trust land parcel contains a mix of primarily slabs of limestone and sandstone, with additional rocks consisting of low-grade ore. Uranium concentrations are estimated based on historical data, current off-site laboratory data, and field XRF analysis. The calculated grade and tonnage for the radiologically elevated waste rock in this section was estimated at 1545.6 tons at a grade of 0.00001% and 134.4 tons at a grade of 0.05% for an overall grade of 0.004%. The remainder of the APE contains primarily a mix of sand and pea gravel found in the large piles, along with the slabs of limestone, sandstone and ore found around at the rocky pit areas. The calculated grade and tonnage for the radiologically

impacted material in the State Trust land parcel was estimated at 2,182 tons at a grade of 0.0001% and 368 tons at a grade of 0.02% for an overall grade of 0.003%. These concentrations are too low to cover processing costs, which will increase milling/processing costs and incur a processing fee from the mill.

For the facility to process the waste rock, a license amendment for each mine must be applied for, which adds to the cost and approval time. Based on conversations with the facility, it would take at least six months to amend the license, which is outside the project's time horizon.

The facility is located approximately 250 miles from the APE, in Blanding, Utah. On-road trucks would need to traverse the AK1, LLC. and Marquez private land parcels when accessing the RB1 State Trust land parcel from County Road 23. The existing ROEs are anticipated to cover the activities within this alternative, mitigating the anticipated challenges associated with private property and landowner coordination.

Additionally, the primary route traverses the Navajo Nation Off-Reservation Trust Land. This may require special permits, delays and added costs. The cost for this alternative has yet to be estimated, but it is anticipated that the costs will exceed those for transportation and disposal.

Moreover, based on a review with EMNRD, a Mining Act Reclamation permit would be required if the waste rock is rendered for milling operations. The timing for obtaining the permit is outside the current fiscal 2026 schedule; therefore, no further consideration will be given to this alternative.

Alternative #2 would satisfy RO1, RO2 and RO3 for the RB1 State Trust land parcel.

12.3 Alternative #3: Off-Site Disposal

The RB1 State Trust land parcel Alternative #3 consists of off-site disposal of the impacted waste. This alternative offers a second option for the removal of the 2,550 tons (1,700 CY) of waste rock from the RB1 State Trust land parcel. Off-site disposal facility acceptance criteria will play an essential role in handling the waste rock. Still, it is believed that sufficient data are available to process the necessary waste profiles for the ultimate facility acceptance of the waste rock.

The disposal facility is located approximately 500 miles from the APE in Deer Trail, Colorado. The cost for this alternative is estimated at \$2,000,000 for the RB1 State Trust land parcel waste rock.

The existing ROEs are anticipated to cover the activities within this alternative, mitigating the anticipated challenges associated with private property and landowner coordination.

Alternative #3 would satisfy RO1, RO2 and RO3 for the RB1 State Trust land parcel.

Currently, this alternative is the only alternative that can be completed within the fiscal 2026 schedule. As such, this is ENTACT's preferred alternative based on cost and schedule.

12.4 Alternative #4: Burial on State Trust Lands

The RB1 State Trust land parcel Alternative #4 includes removing approximately 1,700 CY of surface waste rock from the RB1 State Trust land parcel and consolidating the waste into a newly constructed approximate 0.4-acre on-site repository within the State Trust land parcel of the APE. The selected repository area is atop the mesa at its southern tip. The repository will be underlain with aggregate to separate the MARSSIM Class 1 material from the mesa surface. The overlying cap will be constructed of 2 feet of impervious clay and armored with 1-foot of 4 to 8-inch riprap. Long-term O&M costs are expected and would be the responsibility of the NMSLO. The cost for this alternative is estimated at \$1,200,000 for the RB1 mesa repository.

The existing ROEs are anticipated to cover the activities within this alternative, mitigating the anticipated challenges associated with private property and landowner coordination.

Alternative #4 would satisfy RO1, RO2 and RO3 for the RB1 State Trust land parcel.

12.5 Alternative #5: Burial on Private Land

The RB1 State Trust land parcel Alternative #5 is subdivided into two alternatives. The first considers a newly constructed repository (5A) on the Marquez private land parcel, and the second considers the use of the three open pits that make up the Roundy Strip Mines (5B), also on the Marquez private land parcel. These alternatives include combining approximately 1,700 CY of waste rock from the State Trust land parcel with 36,300 CY of waste rock from the Roundy Mines and the Haystack Mine on private property land parcels. The expected cost for these alternatives are estimated at \$900,000.

The Marquez and AK1, LLC private land parcel (Roundy and Haystack Mines) waste rock removal and consolidation, as well as preparation or construction of the repository(ies), import of backfill, capping and final grading design are excluded from the scope of this alternative as presented, and would be managed by NMED under a separate contract.

The State Trust land parcel waste rock will be transported across the AK1, LLC. and Marquez private land parcels. The State Trust land waste rock will be deposited and potentially comingled with private land waste rock in cells for final placement on the Marquez private land parcel. The existing ROEs do not cover the activities within this alternative, introducing

anticipated challenges associated with private property and landowner coordination, including unquantified compensation measures that may impact cost and schedule, jeopardizing project implementation feasibility.

Additionally, these two alternatives, though less expensive than Alternative #3, cannot be completed during this fiscal year. At the time of publication of this document, ENTACT has not been provided with a clear regulatory pathway that allows for the construction of the repositories and is awaiting clarification from the state on how it wants to proceed.

Alternatives #5A and #5B would have the ability to satisfy RO1, RO2 and RO3 for the RB1 State Trust land parcel only when combined with the remaining APE reclamation measures.

12.5.1 Alternative #5A: Consolidation of APE Waste Rock into a Newly Constructed On-Site Repository

This alternative includes consolidating Red Bluff No. 1, Roundy Shaft, Round Manol Strip, and Haystack Section 31 Mine waste rock piles, requiring the consolidation of State Trust land waste rock with the Marquez and AK1, LLC. private land parcel waste rock from the Roundy and Haystack Mines (est. 36,300 CY of material), and the construction of an approximately 5-acre on-site repository on the Marquez private property (T13N R9W Section 30).

The cost for removing the surface waste rock and transferring the waste rock to the newly constructed repository is estimated at \$900,000.

This alternative will require the State Trust land parcel waste rock to be transported across the AK1, LLC. private land parcel and deposited for final disposal on the Marquez private land parcel. This alternative may potentially introduce further impediments relative to private landowner permission for placement of State trust land waste rock on private property. Compensation in an unknown amount may be requested by the private property landowner(s).

The Marquez and AK1, LLC private land parcel (Roundy and Haystack Mines) waste rock removal and consolidation, as well as construction of the repository(ies), import and placement of backfill in open pits, capping and final grading, are excluded from the scope of this alternative as presented, and would be managed by the NMED under a separate contract.

The Marquez and AK1, LLC private land parcel (Roundy and Haystack Mines) waste rock removal and consolidation, as well as preparation or construction of the repository(ies),

import of backfill, capping and final grading design are excluded from the scope of this alternative as presented, would be managed by NMED under a separate contract.

Additionally, if the Marquez private land parcel reclamation plans, landowner compensation and regulatory framework is not finalized prior to the execution of this Alternative, the material would either need to be stockpiled for double handling of materials later or delayed pending approval of the Marquez private land parcel authorization for reclamation to proceed. As a result, this alternative would not meet RO1, RO2 or RO3.

12.5.2 Alternative #5B: Consolidation of APE Waste Rock into Existing Strip Mines Used as an On-Site Repository

This alternative includes consolidating Red Bluff No. 1 State Trust land waste rock with the Marquez and AK1, LLC. private land parcel waste rock from the Roundy and Haystack Mines (est. 36,300 CY of material) and the use of the existing Roundy Manol open pits on the Marquez private land parcel (T13N R9W Section 30) as on-site repositories.

The cost for removing the RB1 State Trust land parcel surface waste rock and transferring it to the existing open pits for consolidation into the pit as a repository(ies) is estimated at \$900,000.

This alternative will require the State Trust land parcel waste rock to be transported across the AK1, LLC. private land parcel and deposited for final disposal on the Marquez private land parcel. This alternative may potentially introduce further impediments relative to private landowner permission for placement of State Trust land waste rock on private property. Compensation in an unknown amount may be requested by the private property landowner(s).

The Marquez and AK1, LLC private land parcel (Roundy and Haystack Mines) waste rock removal and consolidation, as well as preparation of the repository(ies), import of backfill, capping and final grading design are excluded from the scope of this alternative as presented, and would be managed by NMED under a separate contract.

Additionally, if the Marquez private land parcel reclamation plans, landowner compensation and regulatory framework is not finalized prior to the execution of this Alternative, the material would either need to be stockpiled for double handling of materials later or delayed pending approval of the Marquez private land parcel authorization for reclamation to proceed. As a result, this alternative would not meet RO1, RO2 or RO3. This is the alternative preferred by EMNRD but will not meet the schedule constraints.

12.6 Alternative Recommendations

The following ranking is presented in from the most favorable to the least favorable when considering the pros and cons presented in Table 2 – Alternative Comparative Analysis and Ranking, attached, with heavier weighting on achieving ROs, overall cost, estimated schedule, and long-term responsibility:

1. Alternative #3: Off-Site Disposal
2. Alternative #4: Burial on State Trust Land Parcel
3. Alternative #5: Burial on Private Land
4. Alternative #2: Off-Site Milling
5. Alternative #1: No Action

Based on the information presented within this Report, ENTACT recommends Alternative #3: Off-Site Disposal for the RB1 State Trust land parcel. This would include the following scope:

- Removal of 1,700 CY of surface waste rock from the Red Bluff No.1 State Trust land parcel only.
- Transportation and disposal of approximately 2,550 tons of impacted waste rock to the Clean Harbors Deer Trail Facility (CHDTF) disposal facility.
- Restoration of the State Trust land parcel to meet those conditions as stipulated by and approved by NMED and/or NMSLO.

13.0 Closure Plan

A Closure Plan for the RB1 State Trust land parcel will be prepared by ENTACT, consistent with NMED and NMSLO recommendations to meet the requirements of Stage 3 from the Red Bluff No. 1 AUM Cleanup Initiative contract, and follow the 2016 *Joint Guidance for the Cleanup and Reclamation of Existing Uranium Mining Operations in New Mexico*¹ and consider the *Guidance for Meeting Radiation Criteria Levels and Reclamation at New Uranium Mining Operations*². The Closure Plan for the RB1 State Trust land parcel will be developed following the selection of the reclamation alternative and will include the following elements:

- Site Background
- Site Assessment and Investigation Summary
- Radiological Monitoring

¹ (EMNRD MMD and NMED, 2016)

² (Mining and Minerals Division (MMD), New Mexico Energy, Minerals and Natural Resources Department., March 2016)

- Reclamation Guidelines and Objectives
- Reclamation Design Components
- Climate Change Assessment
- Estimated Budget and Schedule
- Current and Future Land Use
- Quality Assurance/Quality Control
- Long Term Monitoring

In addition to the Closure Plan, the Final Reclamation Design Drawings and Statement of Work/Specifications, signed and stamped by Mark A. Fleri, NM P.E. of ENTACT, will be submitted separately during the design and planning phase for review and NM approval. The final design package will be present the basis for the design, which will include:

- Volumes, location, and thickness of radiologically elevated waste rock
- Volumes of imported materials, clay, common fill, and aggregates
- Design of the repositories and final cover construction detail
 - Geotechnical analysis and suitability of cover material
 - Estimated thickness and types of cover material to be installed
 - Stormwater management design and final stabilization measures, e.g., armoring, seed mix, other erosion control measures, etc.

Upon acceptance of the RB1 State Trust land parcel Closure Plan and final design, ENTACT will develop Stage 3 -Reclamation deliverables prior to mobilization:

- A detailed project schedule in Gantt chart format with project milestones. The baseline schedule will exhibit planned task durations, sequencing and overlapping.
- A project submittal register to log and track project deliverables and reviews/approvals.
- A Reclamation Work Plan to describe the reclamation construction means and methods to successfully complete the project to achieve closure. The work plan will include the restoration and revegetation plan.
- A site-specific Health and Safety Plan for construction activities.
- A Stormwater Pollution Prevention Plan.

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APPENDICES

TABLES

Table 1 - Haystack Mine Locations

Google ID	Name/Location	Description/Aliases	McLemore 2002 Mine_ID	LATITUDE_DECIMAL	LONGITUDE_DECIMAL	SOURCE
NMED_H-S31	Haystack Section 31	Santa Fe Railroad, Henri Dole, Section 31	NMMK0273	Not Available	Not Available	NMED Dashboard
M2002_S31NQW	Section 31 NWQ	N/A	NMMK0238	35.316042	-107.837644	McLemore 2002
M2002_S31S	Section 31 Strip	N/A	NMMK0240	35.31719	-107.822279	McLemore 2002
M2002_USFRR	unknown	Santa Fe Railroad	NMMK0272	35.316396	-107.835732	McLemore 2002
M2002_USFRR-HD	unknown	Santa Fe Railroad, Henri Dole	NMMK0273	35.318844	-107.835315	McLemore 2002
M1983_H-S31	Haystack Section 31	Unknown Quarry (Santa Fe Railroad, Henri Dole)	N/A	35.316667	-107.8250	McLemore 1983
M1983_S31S	Section 31 Strip	N/A	N/A	35.316389	-107.8375	McLemore 1983
M1983_S31NQW	Section 31 NWQ	N/A	N/A	35.316389	-107.833333	McLemore 1983
I2010_Pit1	N1/2 Sec 31	Haystack Section 31 Mine, Pit 1	N/A	35.317114	-107.822494	Intera 2010 - Approx. location based on Figure 4a
I2010_Pit2	N1/2 Sec 31	Haystack Section 31 Mine, Pit 2	N/A	35.315897	-107.826106	Intera 2010 - Approx. location based on Figure 4a
I2010_Pit3	N1/2 Sec 31	Haystack Section 31 Mine, Pit 3	N/A	35.317267	-107.829433	Intera 2010 - Approx. location based on Figure 4a
I2010_Trench1&2	N1/2 Sec 31	Haystack Section 31 Mine, Trench 1 & 2	N/A	35.316544	-107.832814	Intera 2010 - Approx. location based on Figure 4a

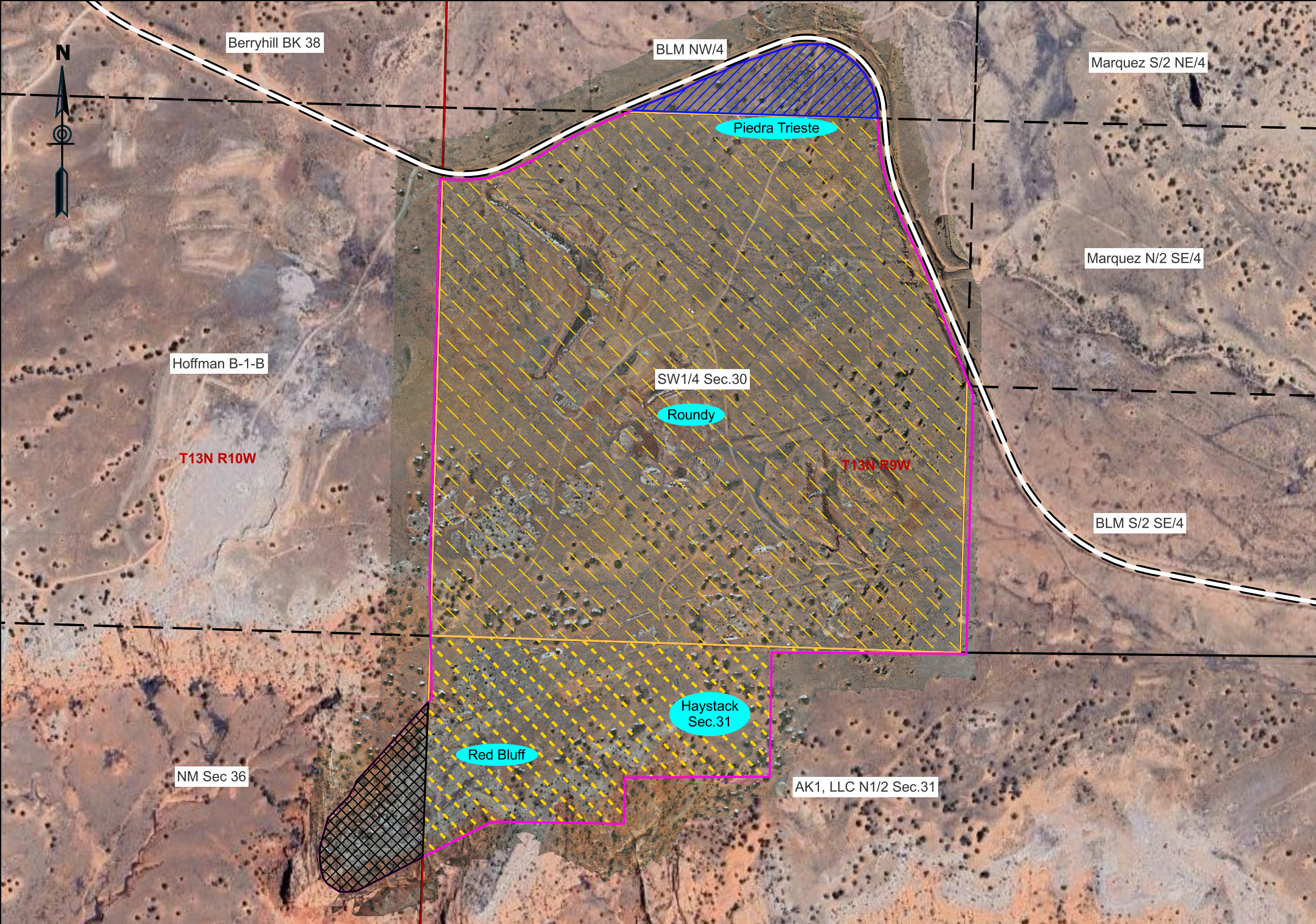
Abbreviations:

S31NQW	Section 31 NWQ
S31S	Section 31 Strip
USFRR	Unknown Santa Fe Railroad
USFRR-HD	Unknown Santa Fe Railroad - Henri Dole
H-S31	Haystack Section 31
M2002	McLemore OFR-146 Database, 2002
M1983	McLemore OFR-183, 1983
I2010	Intera Report, 2010

Alternative Comparative Analysis and Ranking for Red Bluff No 1 State Land Only

Alternatives	Design Elements	Design		Constructability		Construction Costs	O&M Costs	Agency Acceptance	
		Pros	Cons	Pros	Cons			Pros	Cons
Alternative #1: No Action	No design required	1. No design required		1. No construction disturbance		1. no cost	1. no cost		1. Does not manage Public Health 2. Does not manage surface water risk 3. Does not manage groundwater risk 4. Does not manage infiltration 5. Materials remain on State Land 6. Public Perception
Alternative #2: Off Site Milling	Excavation and Removal of materials (cy): 18,000 Analysis and profiling of materials for Milling acceptance Water Well Design and Installation Import of fill to close Strip mines Erosion Control Features Transportation of Materials (tons): 30,000 Marssim Clearance Restoration	1. Minimal design effort 2. Designed to address surface water risk 4. Designed to address groundwater risk 5. Designed to address public health risk.	1. Effort of analysis and profiling of waste rock materials 2. Cost of analysis and permitting 3. Time frame exceeds the scheduled project horizon 4. Public perception	1. Excavation Volume: 1700 cy 2. Shallow excavation cuts 3. Minimal impact to land area. 4. Safety risk is considered minimal based on construction methods used. 5. Environmental risk is considered minimal based on construction methods used.	1. Trucking Logistics 2. Transportation through Tribal Lands 3. Potential Emissions	Highest	1. No Long-Term O&M Monitoring	1. Materials removed from State Land 2. Manages Public Health 3. Manages surface water risk 4. Manages groundwater risk 4. Manages infiltration 6. Land can be leased/used	1. Public perception 2. Will require a Mining Act Reclamation permit
Alternative #3: Off-Site Disposal	Excavation and Removal of materials (cy): 18,000 Analysis and profiling of materials for disposal acceptance Water Well Design and Installation Import of fill for the on-site repository Erosion Control Features Transportation of Materials (tons): 30,000 MARSSIM Clearance Restoration	1. Minimal design effort 2. Designed to address surface water risk 4. Designed to address groundwater risk 5. Designed to address public health risk.		1. Excavation Volume: 1700 cy 2. Shallow excavation cuts 3. Minimal impact to land area. 4. Safety risk is considered minimal based on construction methods used. 5. Environmental risk is considered minimal based on construction methods used.	1. Trucking Logistics 2. Potential Emissions	\$2,000,000	1. No Long-Term O&M Monitoring	1. Materials removed from State Land 2. Manages Public Health 3. Manages surface water risk 4. Manages groundwater risk 4. Manages infiltration 6. Land can be leased/used	1. Public perception
Alternative #4: Red Bluff No.1- Burial on State Lands	Excavation and Removal of materials (cy): 638 Design Repository on State Land Import of fill for the on-site repository Erosion Control Features MARSSIM Clearance Restoration	1. Moderate design effort 2. Designed to address surface water risk 4. Designed to address groundwater risk 5. Designed to address public health risk.	1. Suitable location for repository 2. Additional design work 3. Requires the design of multiple repositories	1. Excavation Volume: 1700 cy 2. No off-site transportation 3. Safety risk is considered minimal based on the construction methods used. 4. Environmental risk is considered minimal based on the construction methods used.	1. Shallow bedrock preventing the siting of the repository. 2. Additional construction effort	\$1,200,000	1. Long-Term O&M Monitoring	1. Materials removed from State Land 2. Manages Public Health 3. Manages surface water risk 4. Manages groundwater risk 4. Manages infiltration 6. Land can be leased/used	1. Materials remain on State Lands 2. Regulatory framework for repository uncertain 3. Time frame to resolve framework not aligned with the current fiscal schedule
Alternative #5: Red Bluff No.1- Burial on Private Land	Excavation and Removal of materials (cy): 638 Design of Repository/Use of Strip mine Water Well Design and Installation Import of fill to close Strip mines Erosion Control Features MARSSIM Clearance Restoration	1. Moderate design effort 2. Allows for a single repository design 3. Allows for consolidation of all mine materials 4. Designed to address surface water risk 5. Designed to address groundwater risk 6. Designed to address public health risk.	1. Assess suitable location for repository 2. Destruction of Range Land 3. Public perception 4. Owner perception	1. Excavation Volume: 1700 cy 2. Consolidation of all materials into selected repositories 3. No off-site transportation 4. Safety risk is considered minimal based on the construction methods used. 5. Environmental risk is considered minimal based on the construction methods used.	1. Construction of New Repository 2. Significant materials to import to close strip mines 3. Destruction of Range Land 4. Owner Consent status is unknown	Repository Construction included under separate contract	1. No Long-Term O&M Monitoring for SLO	1. Materials removed from State Land 2. Manages Public Health 3. Manages surface water risk 4. Manages groundwater risk 4. Manages infiltration 6. Land can be leased/used	1. Regulatory framework for repository uncertain 2. Time frame to resolve framework not aligned with the current fiscal schedule.
Alternative #5a: Consolidation of Red Bluff No. 1, Roundy Shaft, and Roundy Manol Strip into <u>newly constructed</u> On-Site Repository	Excavation and Removal of materials (cy): 18,000 Design of Repository Water Well Design and Installation Import of fill to close Strip mines Erosion Control Features MARSSIM Clearance Restoration	1. Moderate design effort 2. Allows for a single repository design 3. Allows for consolidation of all mine materials 4. Designed to address surface water risk 5. Designed to address groundwater risk 6. Designed to address public health risk.	1. Assess suitable location for repository 2. Destruction of Range Land 3. Public perception 4. Owner perception	1. Excavation Volume: 1700 cy 2. Consolidation of all materials into selected repositories 3. No off-site transportation 4. Safety risk is considered minimal based on the construction methods used. 5. Environmental risk is considered minimal based on the construction methods used.	1. Construction of New Repository 2. Significant materials to import to close strip mines 3. Destruction of Range Land 4. Owner Consent status is unknown	\$900,000	1. No Long-Term O&M Monitoring for SLO	1. Materials removed from State Land 2. Manages Public Health 3. Manages surface water risk 4. Manages groundwater risk 4. Manages infiltration 6. Land can be leased/used	1. Regulatory framework for repository uncertain 2. Time frame to resolve framework not aligned with the current fiscal schedule.
Alternative #5b: Consolidation of Red Bluff No. 1, Roundy Shaft, and Roundy Manol Strip into existing strip mines used as On-Site Repository	Excavation and Removal of materials (cy): 18,000 Assessment of strip mines to accept waste rock piles Water Well Design and Installation Import of fill to close Strip mines Erosion Control Features MARSSIM Clearance Restoration	1. Moderate design effort 2. Use of Strip Mine as a repository 3. Owner acceptance 4. minimizes the import of materials for strip mine closure 5. Designed to address surface water risk 6. Designed to address groundwater risk 7. Designed to address public health risk.		1. Excavation Volume: 1700 cy 2. Consolidation of all materials into selected repositories 3. No off-site Transportation 4. Use of existing strip mines 5. Closure of select strip mine excavations 6. Safety risk is considered minimal based on the construction methods used. 7. Environmental risk is considered minimal based on the construction methods used. 8. Minimizes import of materials for strip mine closure	1. Construction of New Repository 2. Significant materials to import to close strip mines 3. Destruction of Range Land 4. Owner Consent status is unknown	\$900,000	1. No Long-Term O&M Monitoring for SLO	1. Materials removed from State Land 2. Manages Public Health 3. Manages surface water risk 4. Manages groundwater risk 4. Manages infiltration 6. Land can be leased/used	1. Regulatory framework for repository uncertain 2. Time frame to resolve framework not aligned with the current fiscal schedule.

FIGURES



LEGEND

Roads
County Rd 23

AREA DESIGNATIONS
NM State Land
BLM land
Area of Potential Effect - NMED
Private Land - Marquez
Private Land - AK1, LLC

Mine Regions
MineRegions

PropertyLines
Land Status - NMSLO
AndersonEngineeringSurvey_12-3-25
2026 UAS_2cm Ortho Imaging
Google Earth

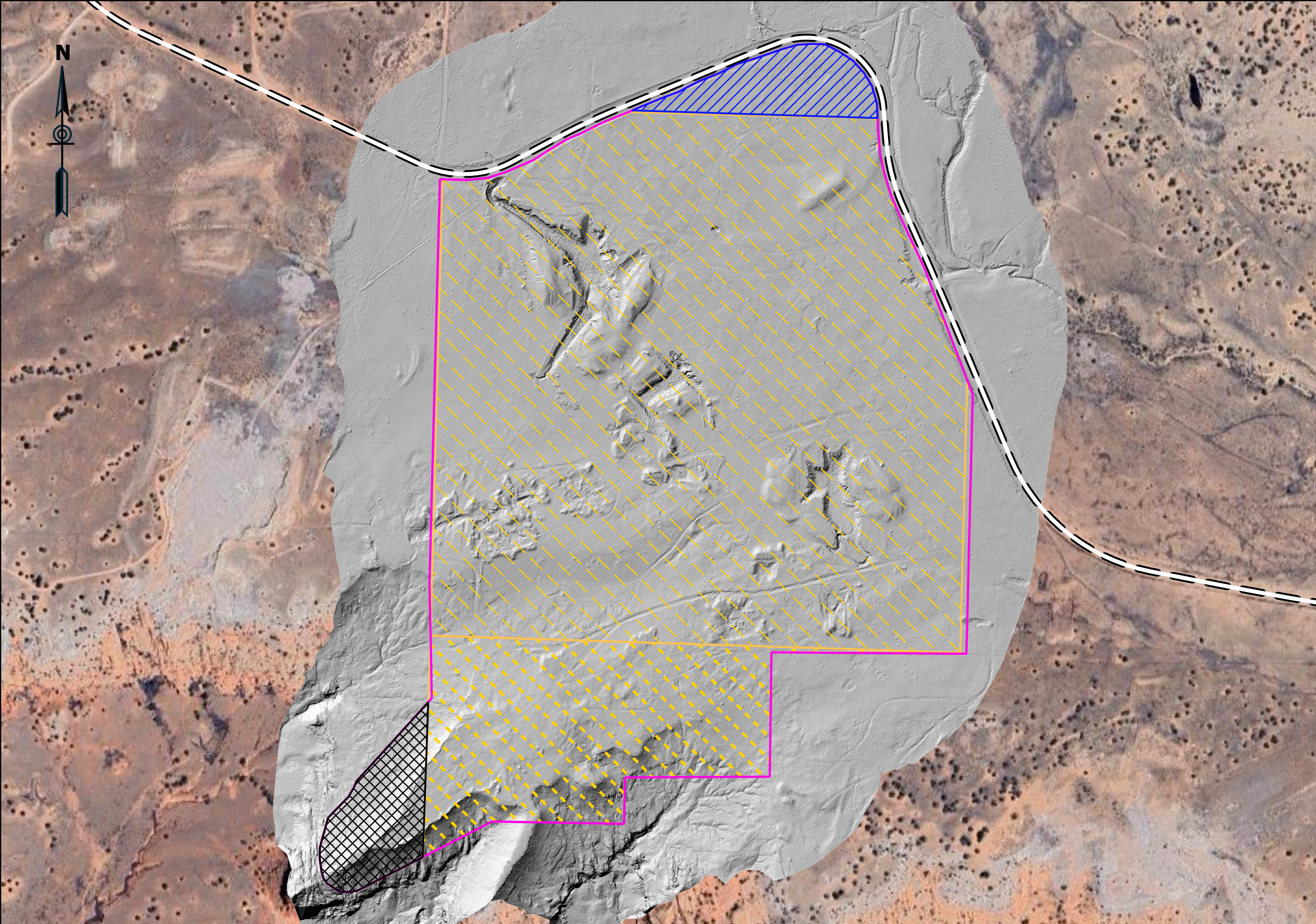
NOTES:
*PLSS is NM PM23 T13N
*Mine boundaries are approximate and for discussion purposes only.

SOURCES:
2026 Google Aerial Imaging
2026 UAS Aerial Imaging
NMED & EMNRD - APE
2025 Anderson Engineering Survey

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION	

PREPARED FOR:

DRAWING NAME Figure 1 - Property Lines, Mine Regions, and Area of Potential Effect					
PROJECT NAME & LOCATION Red Bluff No.1 & Roundy McKinley County, NM					
DRAWN BY	E. Fruchtnicht	APPROVED BY		DRAWING NO.	
DATE	03/19/2026	DATE		PROJECT NO.	E9462



LEGEND

Roads

County Rd 23

AREA DESIGNATIONS

NM State Land

BLM land

Area of Potential Effect - NMED

Private Land - Marquez

Private Land - AK1, LLC

Elevation

DroneLidar

DEM2_hillshade

Google Earth

SOURCES:

2026 Google Aerial Imaging

2026 UAS LiDAR Imaging

NMED & EMNRD - APE



0 500 1,000 ft

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION



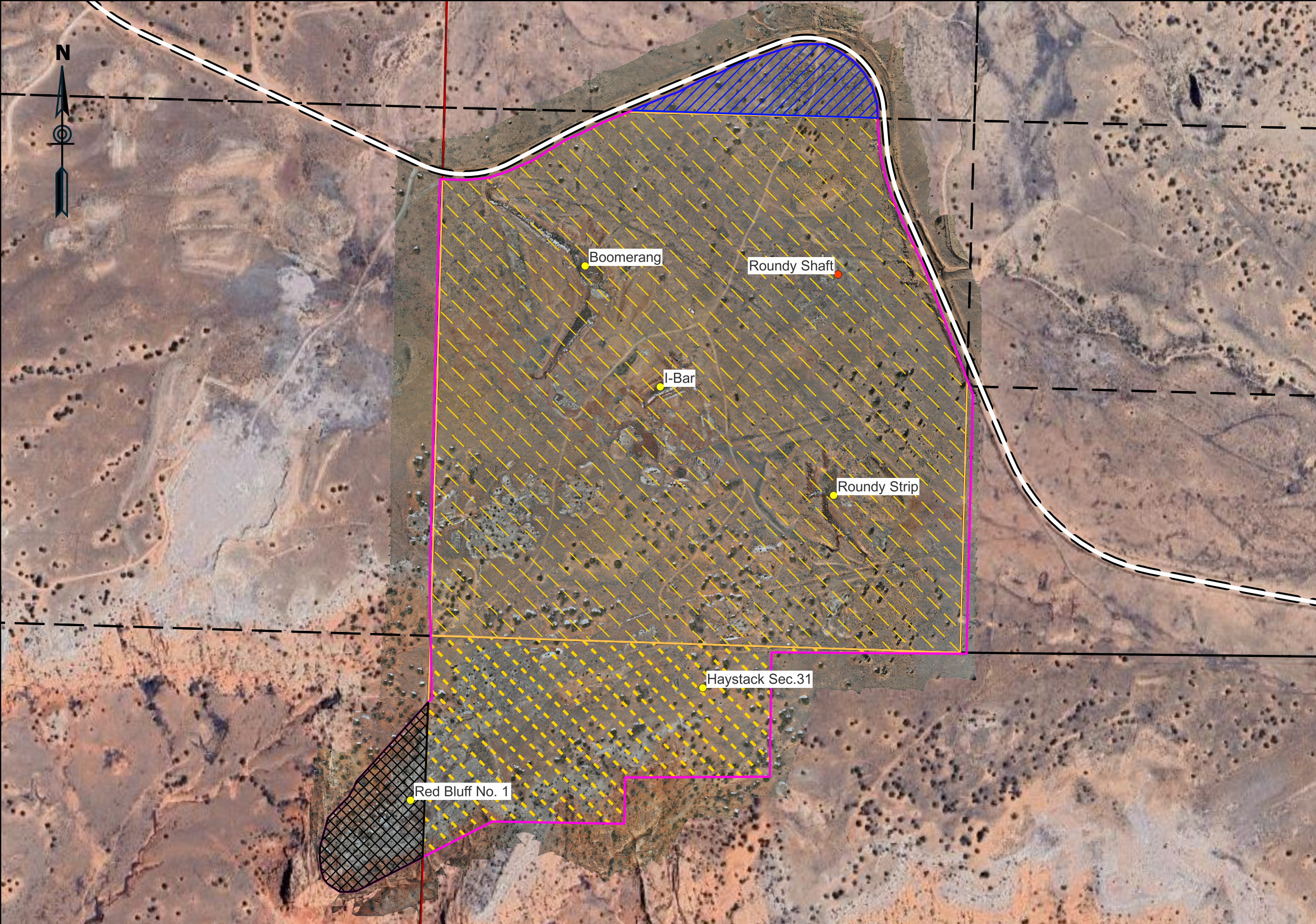
PREPARED FOR:



DRAWING NAME Figure 2 - Site Topographical Hillshade and Area of Potential Effect

PROJECT NAME & LOCATION Red Bluff No.1 & Roundy
McKinley County, NM

DRAWN BY	E. Fruchtnicht	APPROVED BY		DRAWING NO.	
DATE	03/19/2026	DATE		PROJECT NO.	E9462



LEGEND

Roads

County Rd 23

AREA DESIGNATIONS

Labels

Shaft Mines

Strip/Pit Mines

NM State Land

BLM land

Area of Potential Effect - NMED

Private Land - Marquez

Private Land - AK1, LLC

PropertyLines

Land Status - NMSLO

AndersonEngineeringSurvey_12-3-25

2026 UAS_2cm Ortho Imaging

Google Earth

NOTES:

*PLSS is NM PM23 T13N

SOURCES:

2026 Google Aerial Imaging

2026 UAS Aerial Imaging

NMED & EMNRD - APE

2025 Anderson Engineering Survey



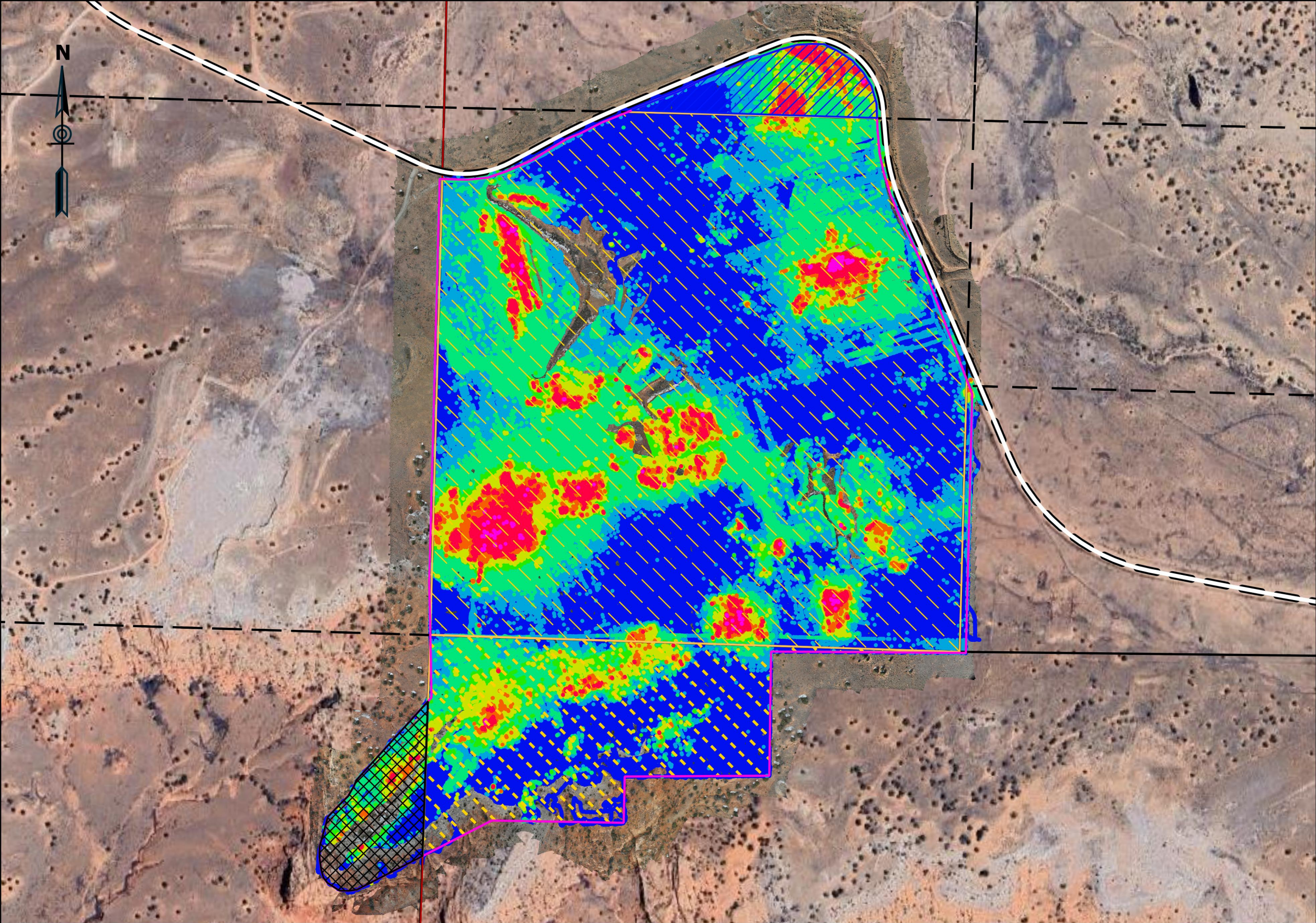
REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION



PREPARED FOR:



DRAWING NAME Figure 3 - Mine and Feature Locations within the Area of Potential Effect					
PROJECT NAME & LOCATION Red Bluff No.1 & Roundy McKinley County, NM					
DRAWN BY	E. Fruchtnicht	APPROVED BY		DRAWING NO.	
DATE	03/19/2026	DATE		PROJECT NO.	E9462



LEGEND

Roads

County Rd 23

AREA DESIGNATIONS

NM State Land

BLM land

Area of Potential Effect - NMED

Private Land - Marquez

Private Land - AK1, LLC

PropertyLines

Land Status - NMSLO

AndersonEngineeringSurvey_12-3-25

Phase 1 Walkover

sensor_20251008 - CPM

0 - 17000

17000 - 20000

20000 - 33000

33000 - 42000

42000 - 92000

92000 - 170000

170000 - 520000

520000 - 1378140

2026 UAS_2cm Ortho Imaging

Google Earth

NOTES:

*PLSS is NM PM23 T13N

SOURCES:

2025 ENTACT Gamma Walkover Survey

2026 Google Aerial Imaging

2026 UAS Aerial Imaging

NMED & EMNRD - APE

2025 Anderson Engineering Survey



0 500 1,000 ft

REV	DATE	BY	CHK'D	APR'VD	DESCRIPTION



PREPARED FOR:

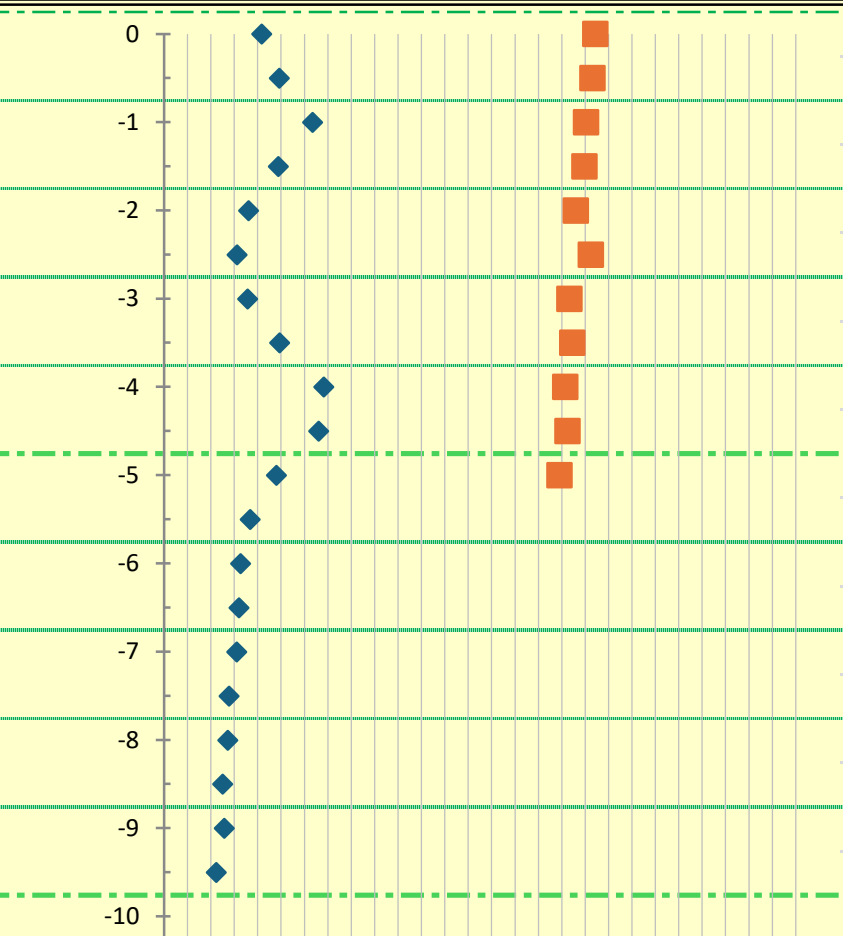


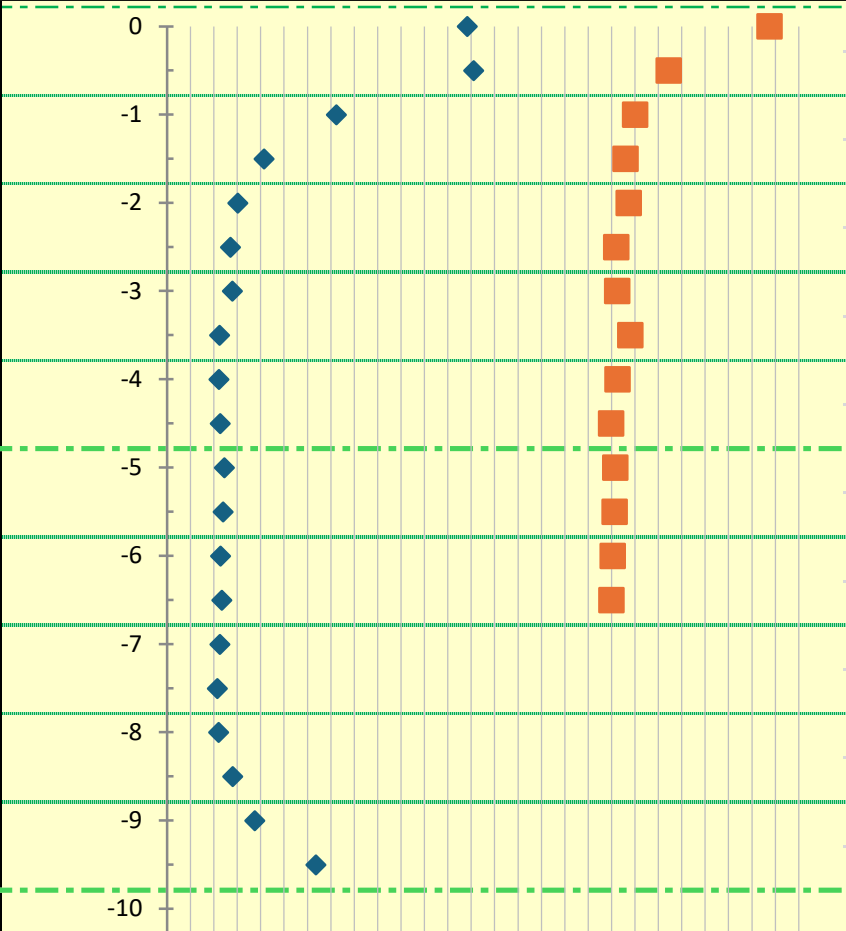
DRAWING NAME Figure 4 - 2025 ENTACT Gamma Walkover Survey

PROJECT NAME & LOCATION Red Bluff No.1 & Roundy McKinley County, NM

DRAWN BY	E. Fruchtnicht	APPROVED BY		DRAWING NO.	
DATE	03/19/2026	DATE		PROJECT NO.	E9462

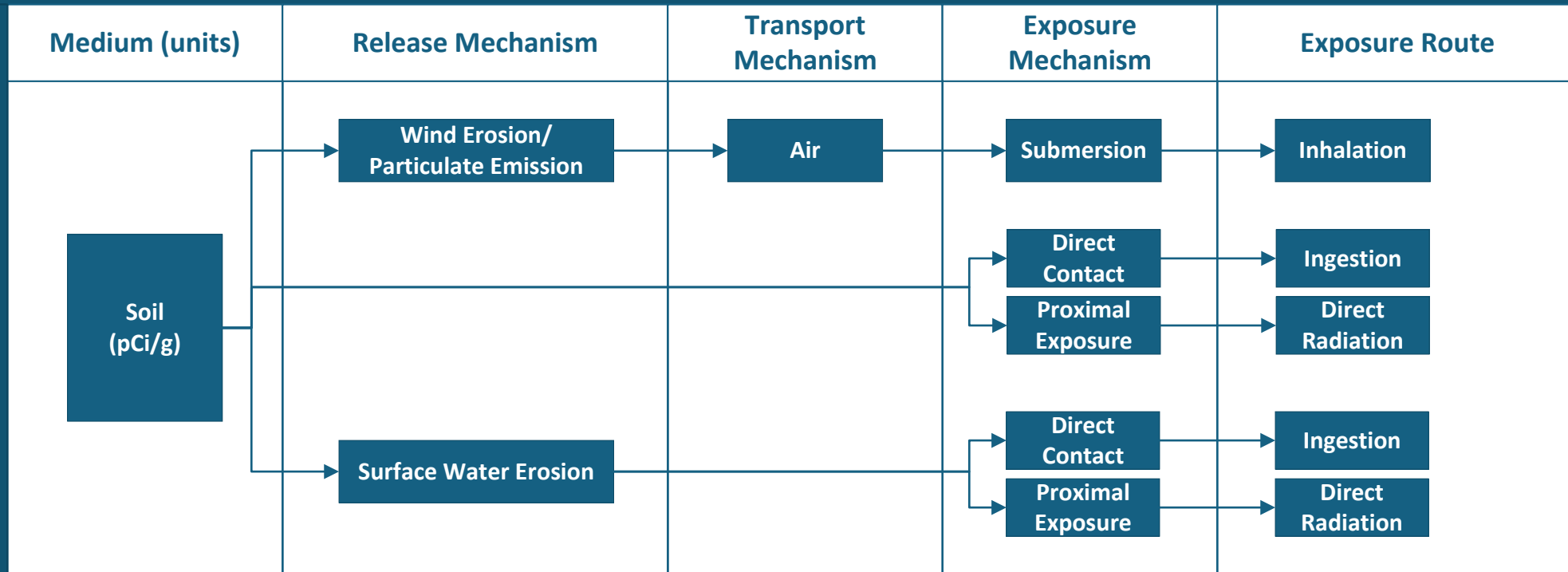
ATTACHMENTS

Borehole Log		Downhole Radiological Profile	Core Scan	Sample	
Depth (feet)	1"Nal Resp. (cpm)		3" Nal Response (cpm)	Collected	Shipped
Surface	8350		36883	X	X
-0.5	9860		36625		
-1	12691		36091		
-1.5	9773		35948		
-2	7235		35210		
-2.5	6250		36501	X	X
-3	7155		34650		
-3.5	9876		34898		
-4	13645		34305		
-4.5	13218		34507		
-5	9612		33804		
-5.5	7363				
-6	6534				
-6.5	6391				
-7	6203				
-7.5	5560				
-8	5445				
-8.5	5017				
-9	5142				
-9.5	4470				
-10					

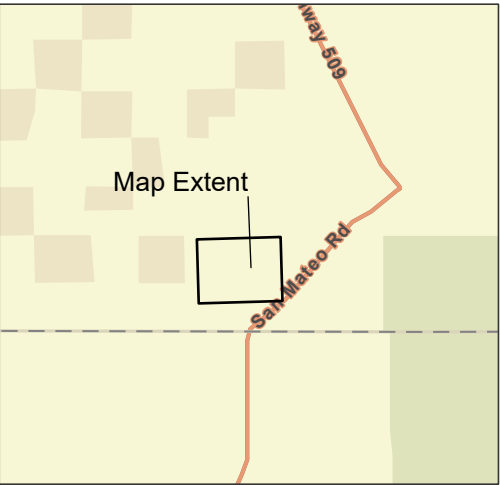
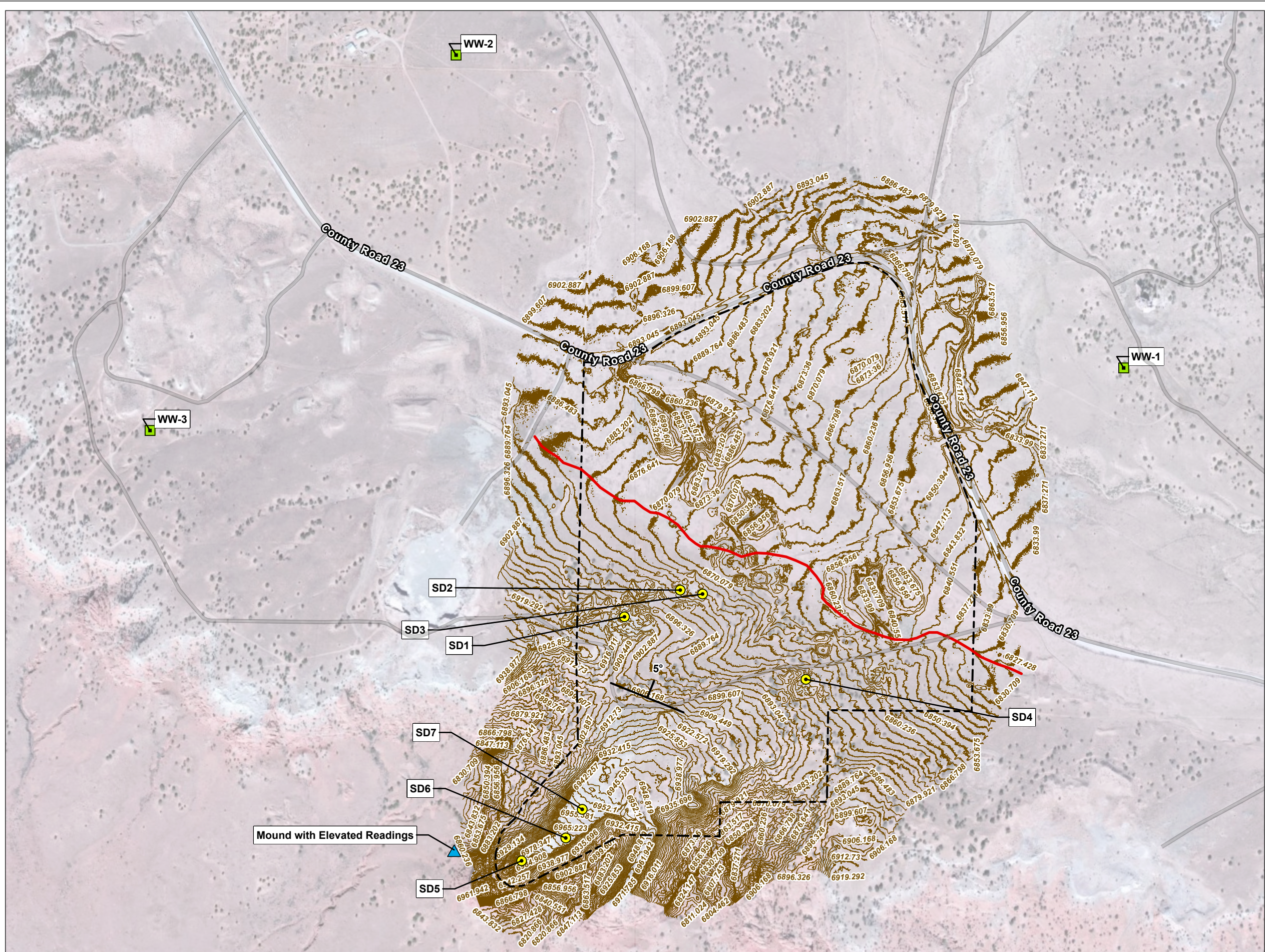
Borehole Log		Downhole Radiological Profile	Core Scan 3" NaI Response (cpm)	Sample	
Depth (feet)	1"NaI Resp. (cpm)			Collected	Shipped
Surface	25658		51514		
-0.5	26197		42886		
-1	14461		40014	X	X
-1.5	8295		39213		
-2	6037		39480		
-2.5	5416		38411	X	X
-3	5592		38491		
-3.5	4482		39606		
-4	4434		38534		
-4.5	4544		37964		
-5	4887		38333		
-5.5	4801		38281		
-6	4559		38120		
-6.5	4689		38000		
-7	4512				
-7.5	4288				
-8	4417				
-8.5	5604				
-9	7486				
-9.5	12731				
-10					

Borehole Log		Downhole Radiological Profile	Core Scan	Sample	
Depth (feet)	1"NaI Resp. (cpm)		3" NaI Response (net cpm)	Collected	Shipped
Surface	18434	0	2892	X	X
-0.5	17423		2443	X	X
-1	9829	-1	3004	X	X
-1.5	7620		4709		
-2	6933	-2	3005		
-2.5	6102		2596		
-3	6418	-3	2437		
-3.5	6210		2378		
-4	5457	-4			
-4.5	4721				
-5	4746	-5			
-5.5					
-6		-6			
-6.5					
-7		-7			
-7.5					
-8		-8			
-8.5					
-9		-9			
-9.5					
-10		-10			

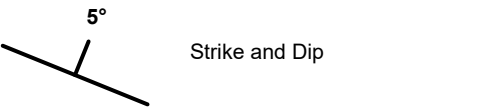
Exposure Conceptual Model



APPENDICES



- Legend**
- Domestic Well
 - Strike and Dip Measurement Taken on Todilto Limestone
 - Mound with Elevated Readings
 - Todilto Limestone Dips Below Valley Alluvium
 - Site Boundary
 - UpdatedDEM2_Contour_ft_Output

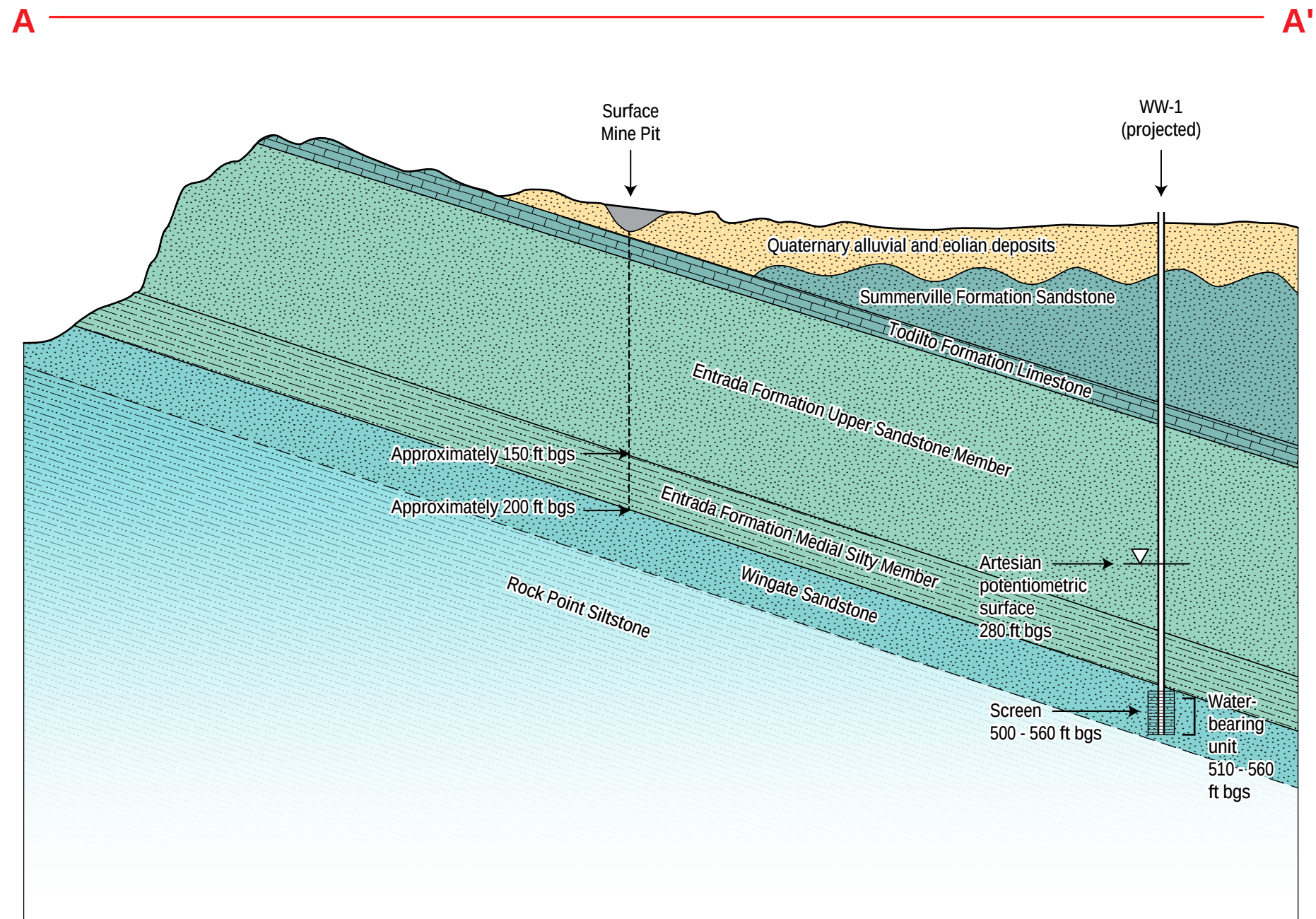


Date Saved: 3/22/2026
Projection: WGS 1984 UTM Zone 13N
Scale: 1:7,800

Data Sources: ESRI

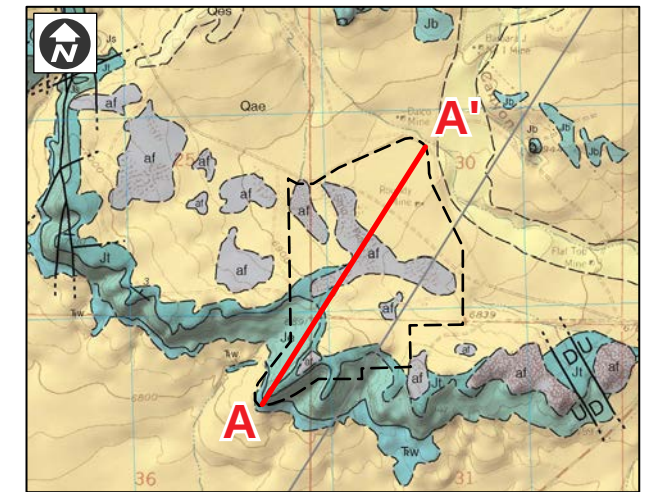
**Red Bluff No. 1 and Roundy
Abandoned Uranium Mines
McKinley County, New Mexico**

Site Features Map



NOT TO SCALE

Note:
ft bgs = feet below ground surface



Unit Descriptions

af	Disturbed and/or artificial fill – Areas affected by human disturbances, mapped where deposits or extractions are really extensive.
Qae	Eolian and alluvial deposits (Upper Pleistocene-Holocene) - Reddish-brown eolian sand and loessic silt locally reworked by alluvial processes. Deposits are stabilized by vegetation in most areas. Includes discontinuous eolian veneers on stable upland surfaces. 0-10 m thick
Jt	Todilto Formation, Luciano Mesa Member (Callovian) – Olive-gray to pale-yellow, thin- to thick-bedded limestone deposited in a lacustrine or saline environment. About 10 m thick. Gypsum of the Tonque Arroyo Member is not present in the quadrangle.
Je	Entrada Sandstone (Callovian) – Light-brown, cross-bedded eolian sandstone and reddish brown, tabular-bedded siltstone. About 50 m thick. Includes units Jem and Jeu of Thaden et al. (1967).
TW	Wingate Sandstone (Rhaetian?) – Reddish-brown, cross-bedded eolian sandstone. About 30 m thick.

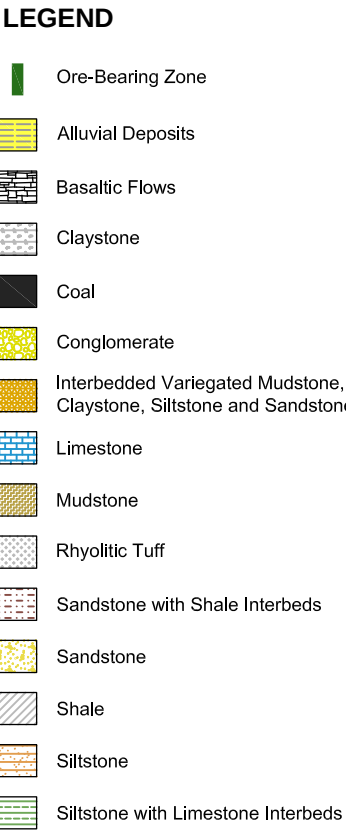
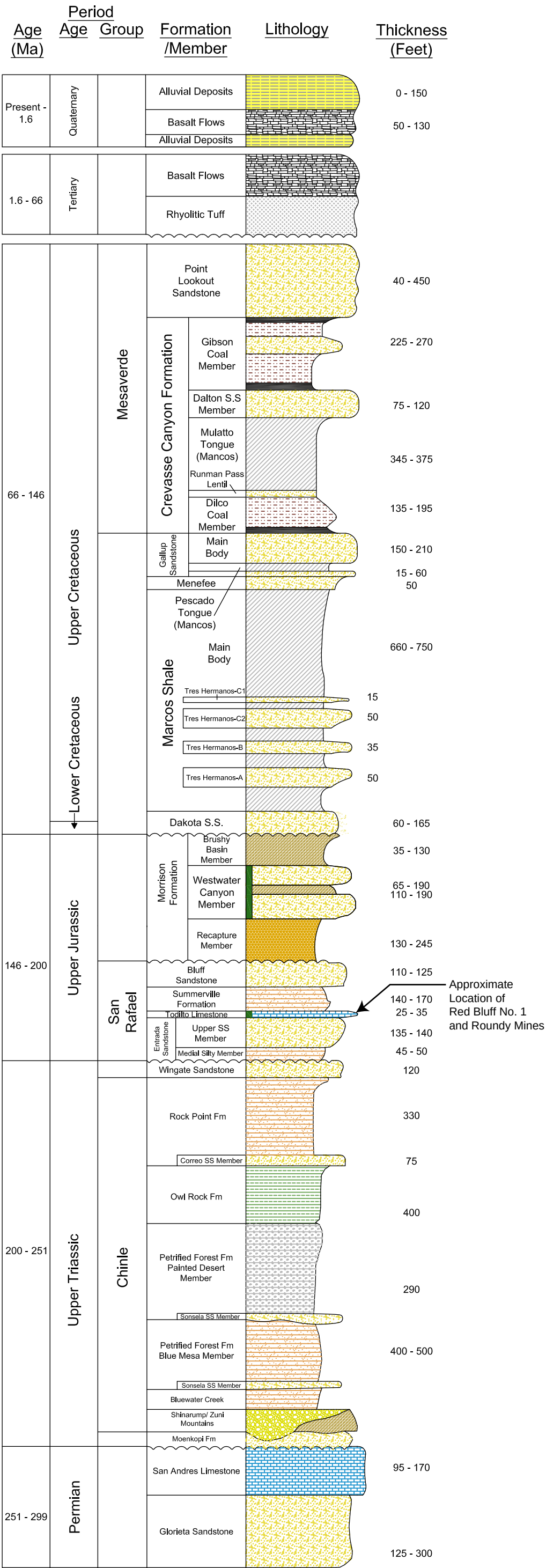
Data Sources: USGS

Red Bluff No. 1 and Roundy Abandoned Uranium Mines McKinley County, New Mexico

Geology of Red Bluff No. 1 Mine Site

Figure 2





Reference:
Phase 2 Ground-Water
Investigation Report for the
San Mateo Creek Basin
Legacy Uranium Mines Site,
Cibola and McKinley Counties,
New Mexico (EPA 2018)

Red Bluff No. 1 and Roundy
Abandoned Uranium Mines
McKinley County, New Mexico

Stratigraphic Column

Figure 3

