

Abandoned Uranium Mine Field Survey Project

prepared for
New Mexico Energy, Minerals and Natural Resources Department
Mining and Minerals Division

July 18, 2008



prepared by
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505.299.0942



July 21, 2008

#5417514

Ms. Karen W. Garcia, Chief
Mine Reclamation Bureau
Mining and Minerals Division
New Mexico Energy, Minerals & Natural Resources Department
1220 South St. Francis Drive
Santa Fe, NM 87505

RE: Final Report - Abandoned Uranium Mine Field Survey Project

Dear Ms. Garcia:

Souder, Miller & Associates (SMA) is pleased to submit the attached report summarizing the Abandoned Uranium Mine Field Survey Project. The report has been modified in accordance with comments from your agency dated July 14 and July 16, 2008.

The complete report is being scanned, and CDs containing a pdf of the report will be forwarded to you, and put on SMA's FTP site for download. The geodatabase is enclosed on CDs. Additionally, it was placed on SMA's FTP site for download.

Souder, Miller & Associates appreciates the opportunity to complete this work. If you have questions or additional comments, please call me at the number above, on my cell at 505.220.6542, or email me at sam@soudermiller.com.

Sincerely,
SOUDER, MILLER & ASSOCIATES

A handwritten signature in blue ink, appearing to read 'Scott A. McKittrick'.

Scott A. McKittrick, P.G.
Senior Scientist

A handwritten signature in blue ink, appearing to read 'Reid S. Allan'.

Reid S. Allan, P.G.
Vice President/Principal Scientist

Encl.: Abandoned Uranium Mines Field Survey Project Report (three copies), GIS Database (one CD)

cc: Ms. Adela M. Duran, Associate Attorney, Comeau, Maldegen, Templeman & Indall, LLP, P.O. Box 669, Santa Fe, NM 87504-0699



Executive Summary

Souder, Miller & Associates (SMA) completed a field investigation of 21 abandoned uranium mine sites between January 9 and April 17, 2008 as per the contract between SMA and Comeau, Maldegen, Templeman & Indall, LLP (Comeau) dated January 16, 2008. The sites were located primarily in Cibola and McKinley Counties, with several outliers in Sandoval County and Socorro County. Site information was collected in order to allow prioritization of sites for potential reclamation activities.

Information collected included existing mine features (pits, piles, shafts, adits, structures, etc.), a radiological survey, land use (human, grazing), vegetation, soils, topography, wildlife, and hydrology information. Locations were determined using a global positioning system (GPS) survey, with field information collected on field sheets and entered into the GPS data dictionary. Digital photos of site features were collected.

Information collected during the field investigation is summarized in this report, and is also compiled in a geospatial database. These two items are the primary deliverables of the study.

Introduction

This evaluation of 21 abandoned uranium mining sites (shown in Figures 1 through 4) was conducted pursuant to the contract between SMA and Comeau, and under the oversight of the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department. Field work was completed in January through April, 2008. The goal of the mine evaluation is to provide preliminary data for MMD to rank the sites based on relative risk to human health and the environment. There are two primary deliverables for this study: this written summary report and a geospatial database of all site field data and other research.

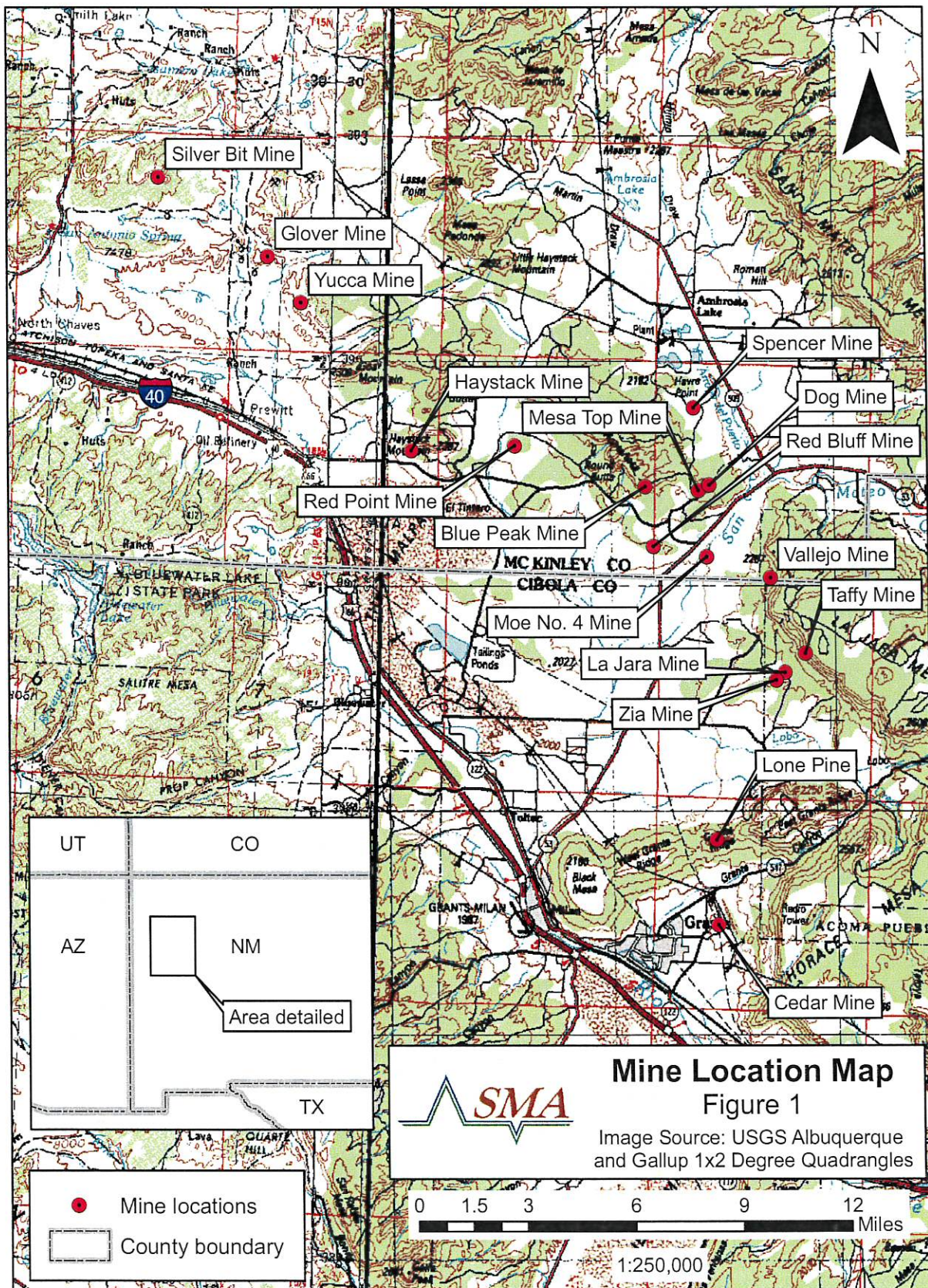
Areas of site disturbance ranged from less than one acre to tens of acres. Mine features observed included road cuts, shafts, adits, pits, ponds, and rock piles. Structures included headframes, loading structures, tanks, electrical components, steel structures, and others. Background radiation levels were generally between 10 and 20 $\mu\text{R}/\text{hour}$, with impacted readings as high as 1,800 $\mu\text{R}/\text{hour}$.

Scope of Services

SMA's scope of services included the following:

Health and Safety Plan

Prior to the commencement of field work, a field task-specific health and safety plan (HASP) was developed in accordance with applicable requirements (OSHA), the SMA Health and Safety program, and any applicable Agency safety requirements. A copy of the HASP is included in Appendix 1 to this report.



Silver Bit Mine

Glover Mine

Yucca Mine

Haystack Mine

Mesa Top Mine

Red Point Mine

Blue Peak Mine

Spencer Mine

Dog Mine

Red Bluff Mine

Vallejo Mine

Taffy Mine

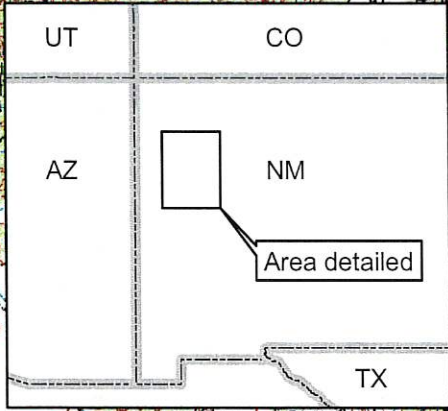
Moe No. 4 Mine

La Jara Mine

Zia Mine

Lone Pine

Cedar Mine

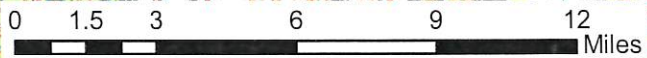


- Mine locations
- County boundary

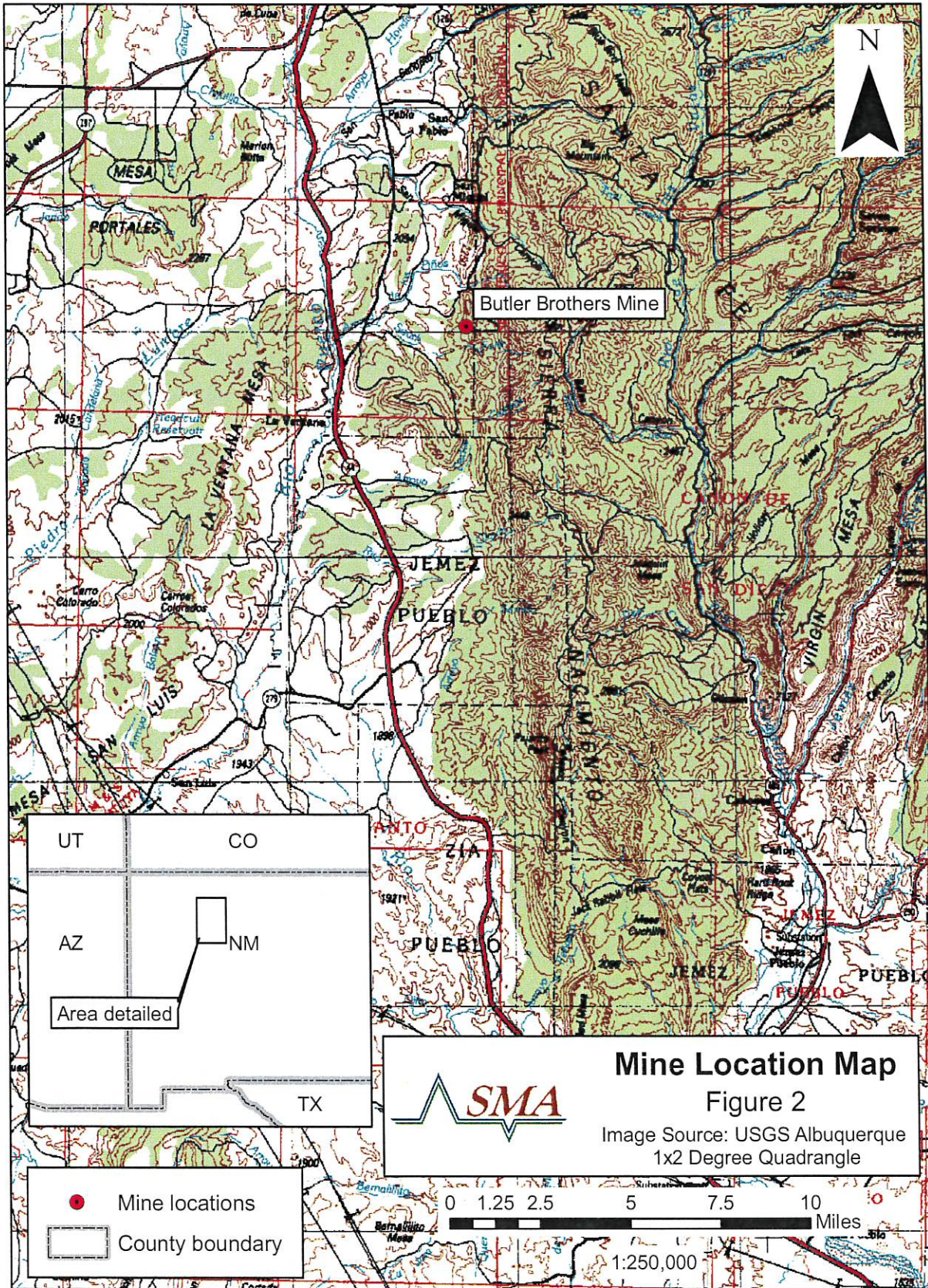


Mine Location Map Figure 1

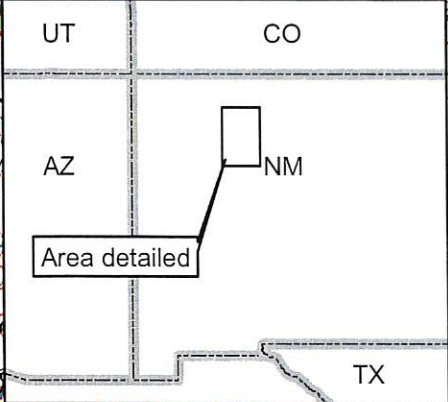
Image Source: USGS Albuquerque and Gallup 1x2 Degree Quadrangles



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Butler Brothers Mine

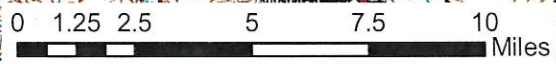


Mine Location Map

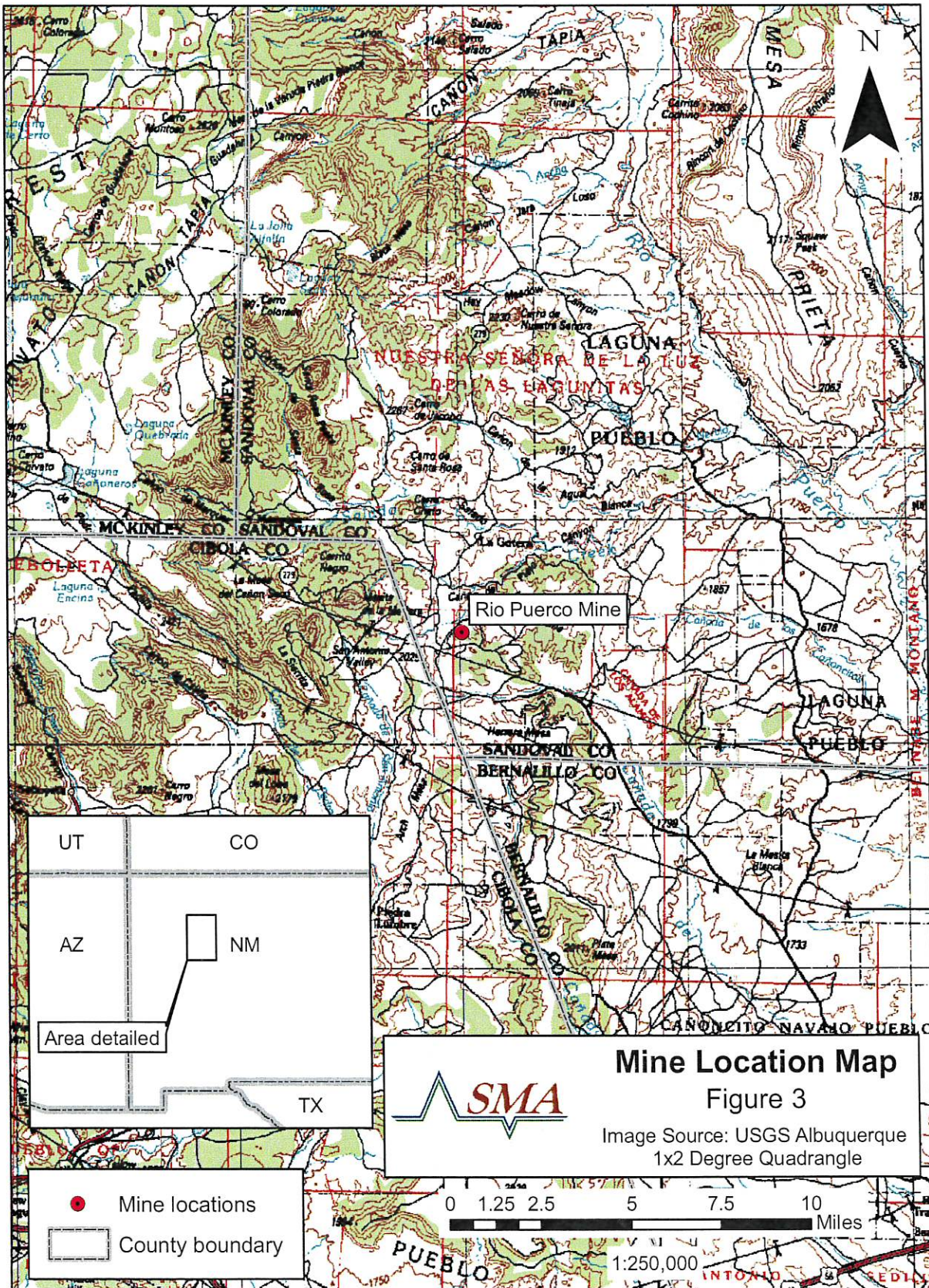
Figure 2

Image Source: USGS Albuquerque
1x2 Degree Quadrangle

- Mine locations
- County boundary



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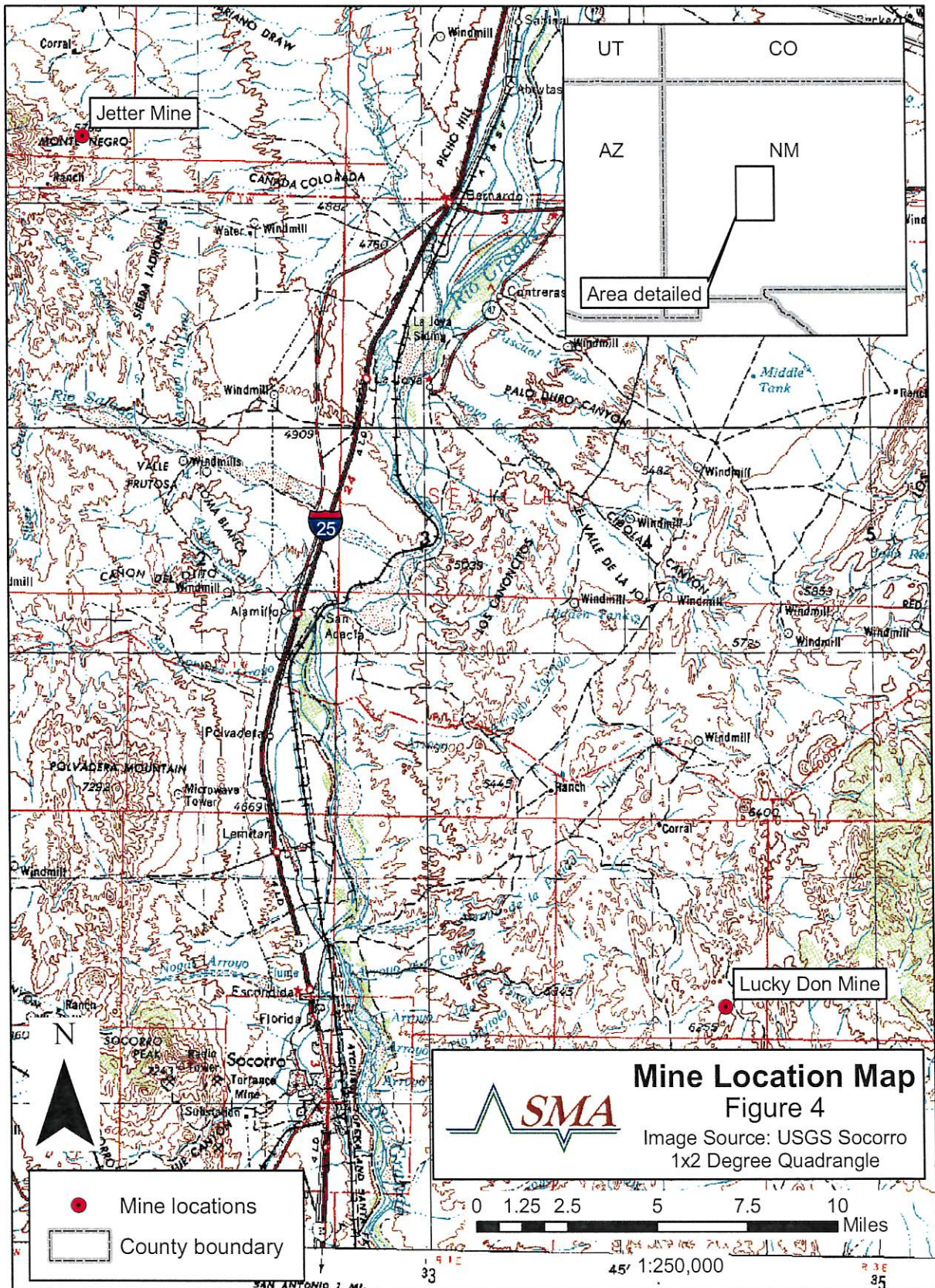


Mine Location Map
 Figure 3
 Image Source: USGS Albuquerque
 1x2 Degree Quadrangle

- Mine locations
- ▭ County boundary

0 1.25 2.5 5 7.5 10 Miles

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Agency Notification

SMA notified, where appropriate, State and Federal land management agencies prior to field visits to allow Agency staff to accompany SMA staff. SMA was able to give at least a two business days (48 hour) notice.

Field Inspections and Data Collection

SMA developed and submitted a standardized data collection form prior to the start of the field work activities. Copies of the completed data collection forms are included in with each site summary. Field data locations were collected using a Trimble GPS Pathfinder Pro XRS receiver with sub-meter accuracy and data logging capability. Radiological survey information was collected using a state-of-the-art Ludlum Model 19 Micro-R meter.

Data Collection Reporting

A total of 21 sites were evaluated. Two sites that were originally requested by MMD were not evaluated. The United Western site was determined to be on private land, and is therefore not included in the written summaries. The Westwater site was not evaluated due to lack of access to the site.

Written site summaries have been compiled and are included in this report. The site summaries include all data collected, as well as representative photos and site maps, and copies of field notes.

Data collected has been entered into a geospatial database compatible with ESRI ArcGIS, including attribute tables for all collected data and georeferenced digital photos. An electronic copy of the database has been submitted under separate cover.

Field Data Collection Methodology

SMA field staff collected the following information during field survey activities:

- 1) GPS survey of the entire site including:
 - a. rock piles (type of rock, i.e. waste rock, ore stockpile, etc. not delineated)
 - b. mine features
 - c. adits
 - d. shafts
 - e. buildings
 - f. perimeter of disturbed area
 - g. perimeter of rock piles
 - h. buildings

SMA used a Trimble GPS Pathfinder Pro XRS receiver to locate and record data points.

The extent of disturbance was not delineated at each mine. Numerous mines were made up of cuts into the side of mesas, thus disturbance was limited and topography

did not allow field staff to walk the disturbance perimeter. The determination of the extent of the disturbance area at some mines was extremely subjective, and therefore not recorded.

- 2) Human activity: SMA documented any noted human activity, including vehicle tracks, paths, trash, etc. Additionally, SMA documented the nearest residence within a one mile search radius either in the field or through aerial photo review.
- 3) Photo documentation: Site photographs were collected using a digital camera. Characteristic photos are included in the site summaries. All photos obtained are included in the geospatial database.
- 4) Radiological survey: SMA used a Ludlum Model 19 Micro-R meter for radiological data collection. This meter is appropriate for the reconnaissance-level survey conducted, with a total range of 0-5,000 $\mu\text{R/hr}$.

Where possible, SMA conducted the radiological survey on a regular grid. Several sites had topography which did not allow survey on a grid (specifically, sites which were cut into hillsides, that were too steep to access, or included steep-sided pits). These sites included Blue Peak, Haystack, Lone Pine, Lucky Don, Silver Bit, and Taffy.

The initial step of the radiological survey at each site was to run two perpendicular lines of preliminary collection points across the widest portion of each site. Based on radiological readings collected, SMA then determined if the grid covered all areas of elevated radiological readings, and the appropriate grid spacing. The remainder of the grid was then surveyed. Radiological measurements were collected at each point at ground level and 4 feet from ground level. Where steep slopes did not allow access, field personnel collected readings where possible.

"Background" radiation is generally considered by MMD to be the naturally occurring conditions, which have not been impacted by mining activities. At the sites, background radiation levels were collected in locations outside of obvious disturbance, or on the margin of disturbed areas in an up-wind direction. SMA did not conduct a statistical review of radiation data to confirm background values.

- 5) Vegetation at the site was described and included the following information:
 - a. General life form description of vegetation, for example, if woody species, grasses, forbs, if native, exotic or weedy species. Percent coverage was estimated based on visual observation.
 - b. Evidence of vegetation die off
 - c. Evidence of grazing
- 6) Soils: Soil descriptions were collected using the applicable USDA Soil Survey and field evaluation where necessary.



- 7) Wildlife: Description of sighted or evidence of wildlife within the mine sites was collected and is included in the written summary and geospatial database.
- 8) Land use information collected included the following items:
 - a. Grazing, cattle, sheep, etc
 - b. Agricultural areas in proximity
 - c. Identification of roads, corrals, or fences and evidence of use
- 9) Topographic features: Items noted were roads, water courses, terrain, and significant topographic features in the immediate area.
- 10) Hydrogeologic information: SMA conducted a search of the New Mexico Office of the State Engineer iWaters database for well records within a one-mile search radius of each site. Descriptions of well locations and depths to water are compiled in the written report. The geospatial database includes the iWaters database information.

Site Summaries

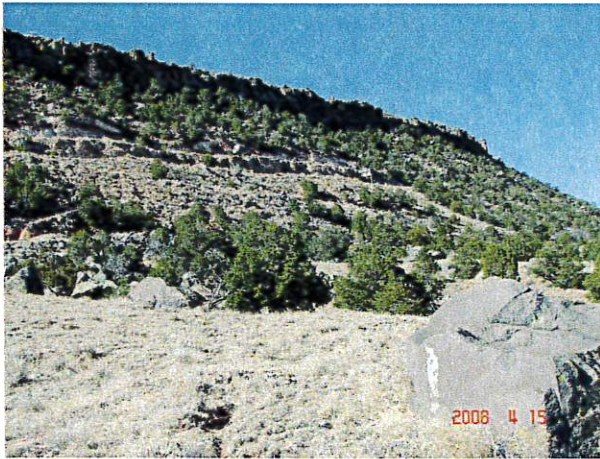
Site summaries, including site maps depicting features, and field notes, are included here.



Lone Pine Mine

- 1. Location/Land Status:** The Lone Pine Mine is located on BLM land within Section 8, T11N, R9W on the USGS Grants quadrangle, some 3 miles north of Grants, NM. Physical access to the mine can be gained by traveling 8 miles east from Grants on Lobo Canyon Road, northwest approximately 2.5 miles on USFS 450, then 1 mile southwest on an undesignated access road to the end of the road, and overland via foot to the mine site. Conditions on USFS 450 can be dangerous (snow or mud), therefore SMA recommends checking with Chuck Hagerman at the USFS station in Grants before traveling this area.
- 2. Human Activity:** No evidence of human activity beyond historical mining was noted.
- 3. Radiological Survey:** Radiological survey results were as follows: ground surface maximum of 70 μ R/hour and minimum of 9 μ R/hour. Four-foot elevation maximum was 23 μ R/hour and minimum was 8 μ R/hour. Background radiation levels are approximately 10 μ R/hour.
- 4. Mine Disturbance:** The mine consists of two lateral cuts of an estimated 2 acres into the northern side of Grants Ridge. The upper cut has a wooden load-out structure which served the lower cut. The loadout structure is approximately 15 ft. square by 25 feet tall. The mine is only revealed as separate from the various road cuts by the presence of the load-out structure. Erosion has obscured any remains of an access road.
- 5. Plant Community:** The area surrounding the mine is typical pinon/juniper scrub. The vegetation on site consists of the following: 40% grass, 10% woody scrub, 30% forbs, 5% trees, and the remainder bare earth.
- 6. Soils:** Site soils are Rock outcrop-Vessilla-Mion complex, 3 to 55 percent slopes, 0 to 2 inches sandy loam, 2 to 11 inches silty clay, 11 to 19 inches bedrock.
- 7. Wildlife:** There were numerous signs of wildlife on the site including the direct observation of a raptor, deer (4), and coyote (audible).
- 8. Land Use:** Land use at the mine includes light grazing off-site (none noted on-site).
- 9. Off-Site Impacts:** No off-site impacts were noted.
- 10. Topographic Features:** The site is cut into the side of a mesa. Erosion of the cut and access roads is present.
- 11. Hydrogeology:** Based on a review of the NMOSE iWaters database, there are no well records within a one mile search radius. The nearest well to the site with a recorded depth to water is approximately 1.3 miles to the east, with a depth to water of 115 feet.

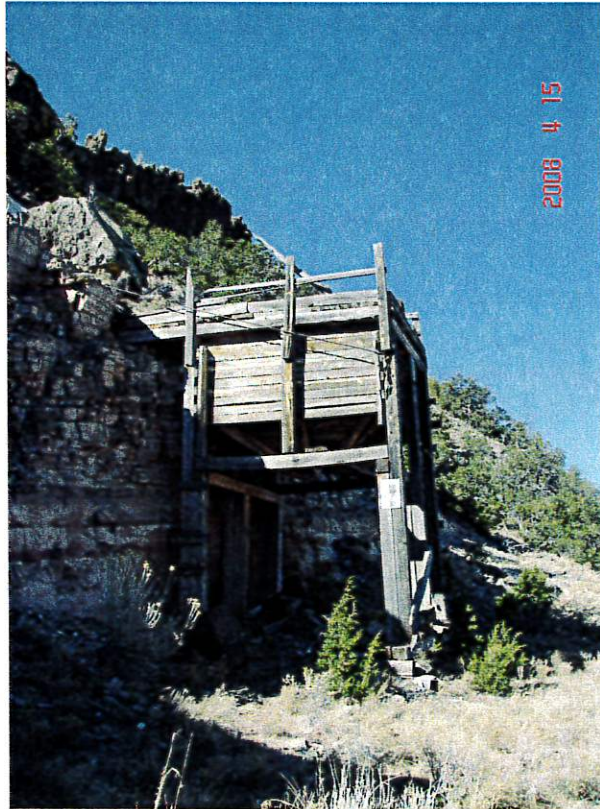
The nearest surface water drainage feature is approximately 0.2 miles north of the site.



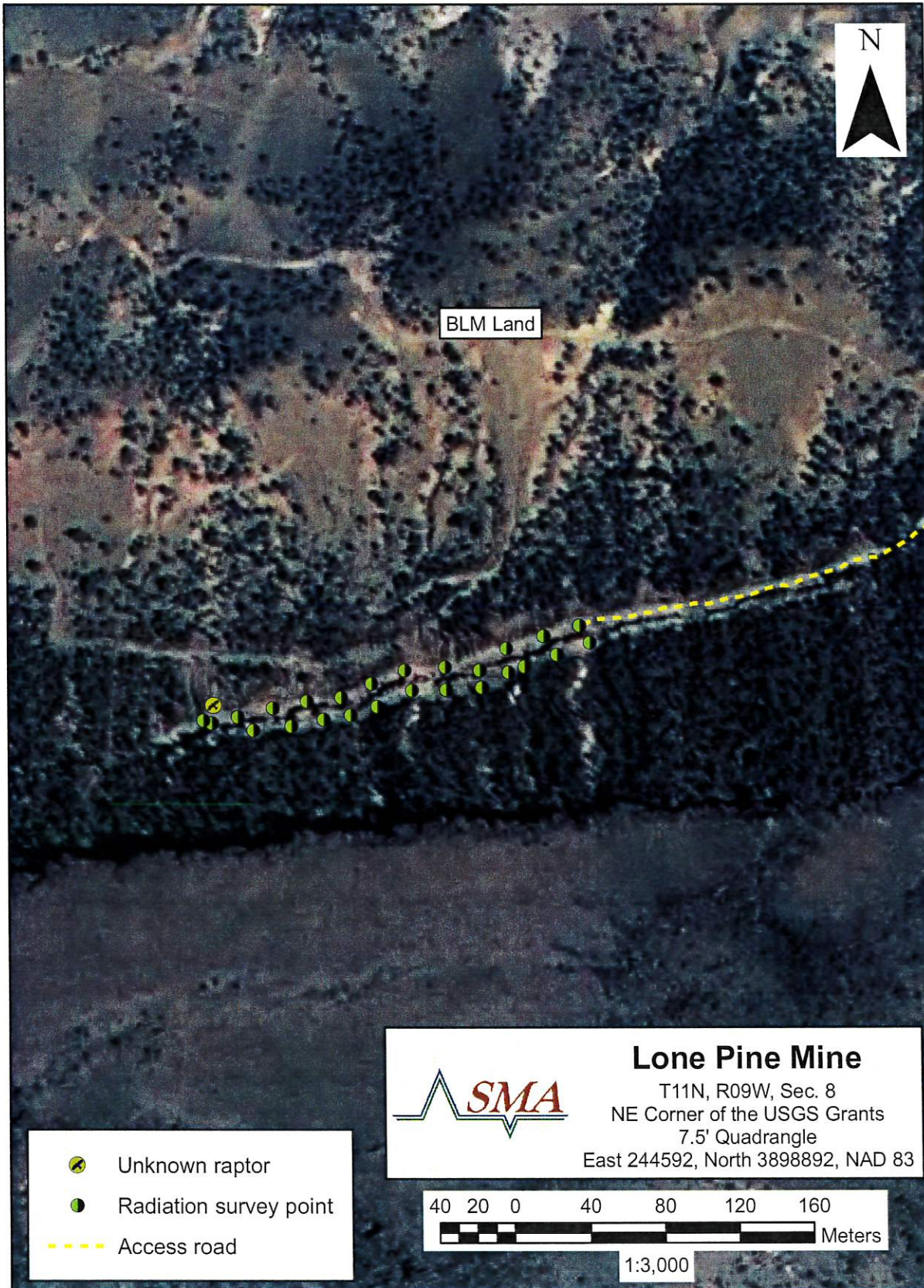
View south to mine






View south to mine



Mine load-out

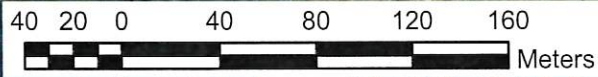


-  Unknown raptor
-  Radiation survey point
-  Access road



Lone Pine Mine

T11N, R09W, Sec. 8
NE Corner of the USGS Grants
7.5' Quadrangle
East 244592, North 3898892, NAD 83



1:3,000

AUM Field Survey Data Sheet

Site Love Pipe

Date 4/15/08	Time On-Site	Time Off-Site	By Baldwin Mertz	
Weather Conditions:				
Disturbances	GPS#	Description	Dim/Area/Volume	Photo #'s
Shafts				
Adits				
Pits				
Waste Rock Dumps				
Tailings				
Trenches				
Roads		Dirt - not maintained - 2 cuts		
Erosional Features		- cuts + access road eroded		
Structures / Equipment	GPS#	Description	Dimensions	Photo #
Buildings	GØ	loadout	15'x15'x25'	✓
Headframes				

AUM Field Survey Data Sheet

Site Love Pine

Equipment				
Soils	GPS#	Description	Extent	Photo #
Vegetation	GPS#	Description	Extent	Photo #
		40% grass 30% forbs 10% shrubs 5% trees 15% bare		
Wildlife	GPS#	Description		Photo #
		- possible buteo (captor)		
Human Activity (non-mining, w/in 0.5 mi of site)	GPS#	Description	Extent	Photo #
Land Use (grazing, agricultural, roads, etc., w/in 0.5 mi of site)	GPS#	Description	Extent	Photo #
		light grazing off-site		
Nearby Residences / Wells (w/in 0.5 mi of site)	GPS#	Description	Distance to Site	Photo #
Topographic Features (roads, water courses, etc.)	GPS#	Description		Photo #

AUM Field Survey Data Sheet

Site Line line 2008-4-15

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G0	Rad. survey (loadout ✓) ✓-photo	14	16
G1	"	10	10
G2	"	10	10
G3	"	10	10
G4	"	10	10
G5	"	12	10
G6	"	13	10
G7	"	10	10
G8	"	10	10
G9	"	13	11
G10	"	12	12
G11	"	12	12
G12	"	10	10
G13	"	70	23
G14	"	10	10

