

# 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  
**Souder, Miller & Associates**  
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Albuquerque, NM 87107  
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](mailto: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



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## 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.

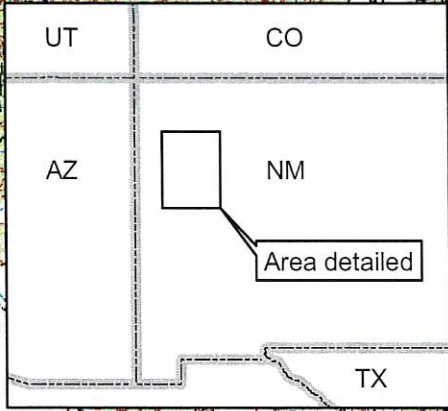
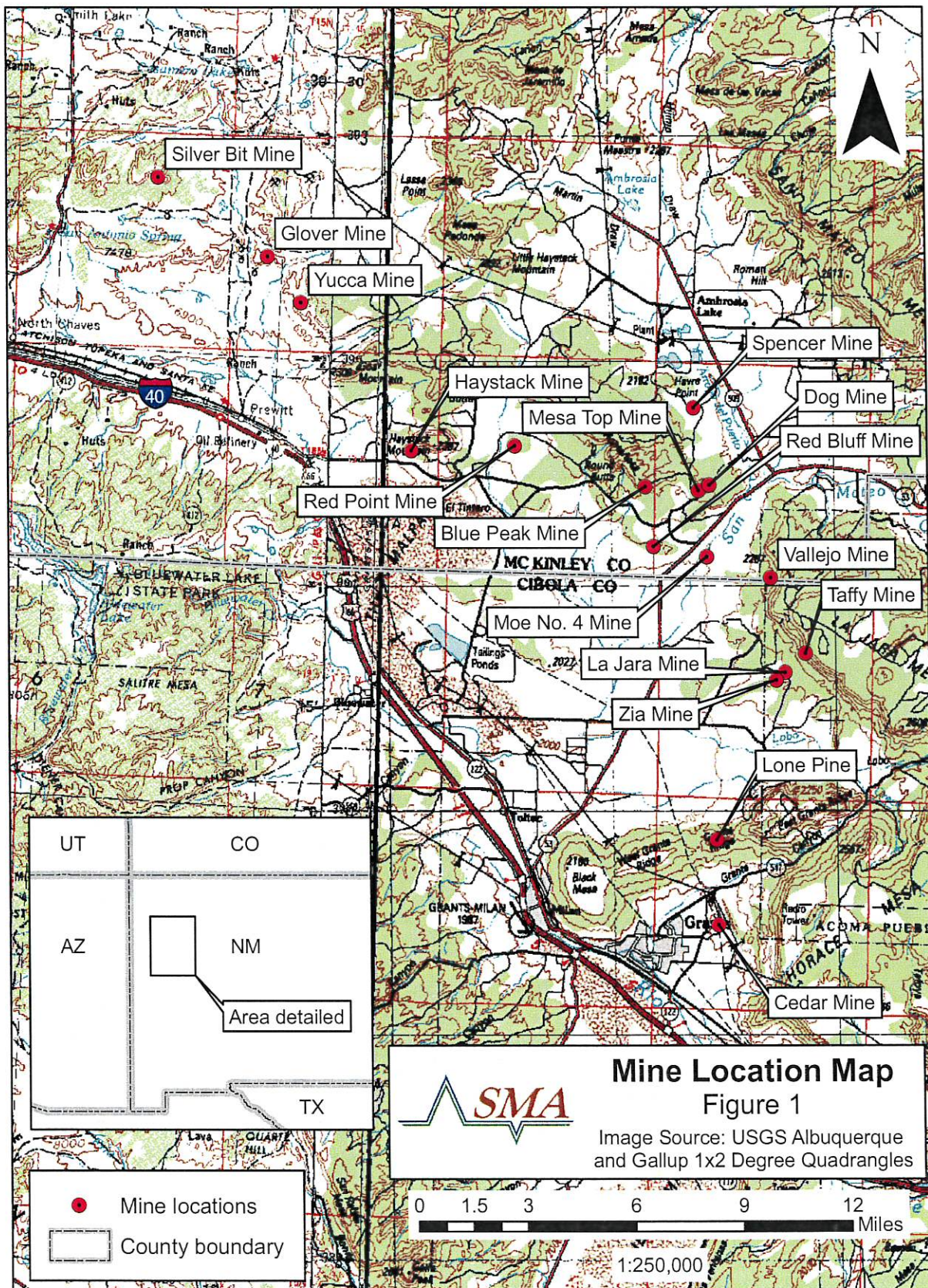
Areas of site disturbance ranged from less than one acre to tens of acres. Mine features observed included road cuts, shafts, adits, pits, ponds, and rock piles. Structures included headframes, loading structures, tanks, electrical components, steel structures, and others. Background radiation levels 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.

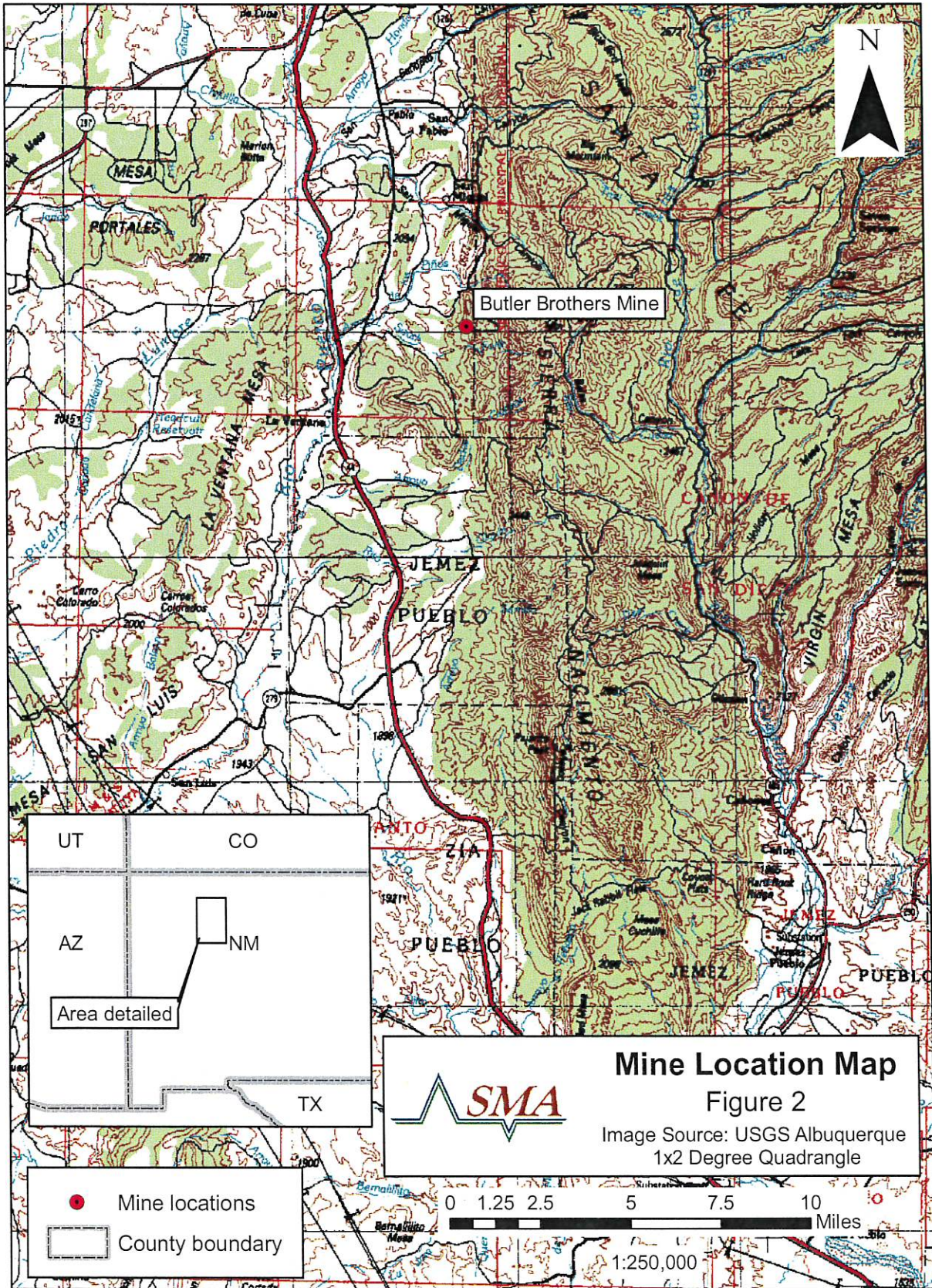


**Mine Location Map**  
 Figure 1  
 Image Source: USGS Albuquerque and Gallup 1x2 Degree Quadrangles

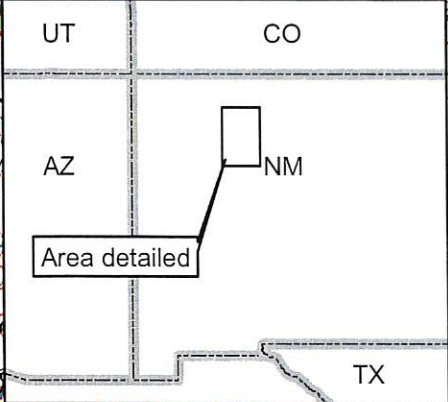
- Mine locations
- County boundary

0 1.5 3 6 9 12 Miles

1:250,000



Butler Brothers Mine

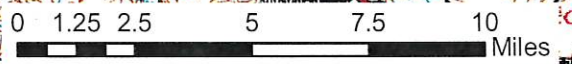


**Mine Location Map**

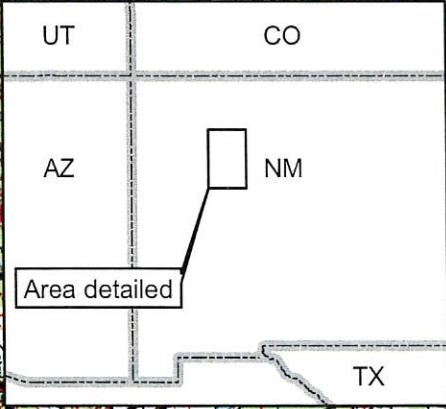
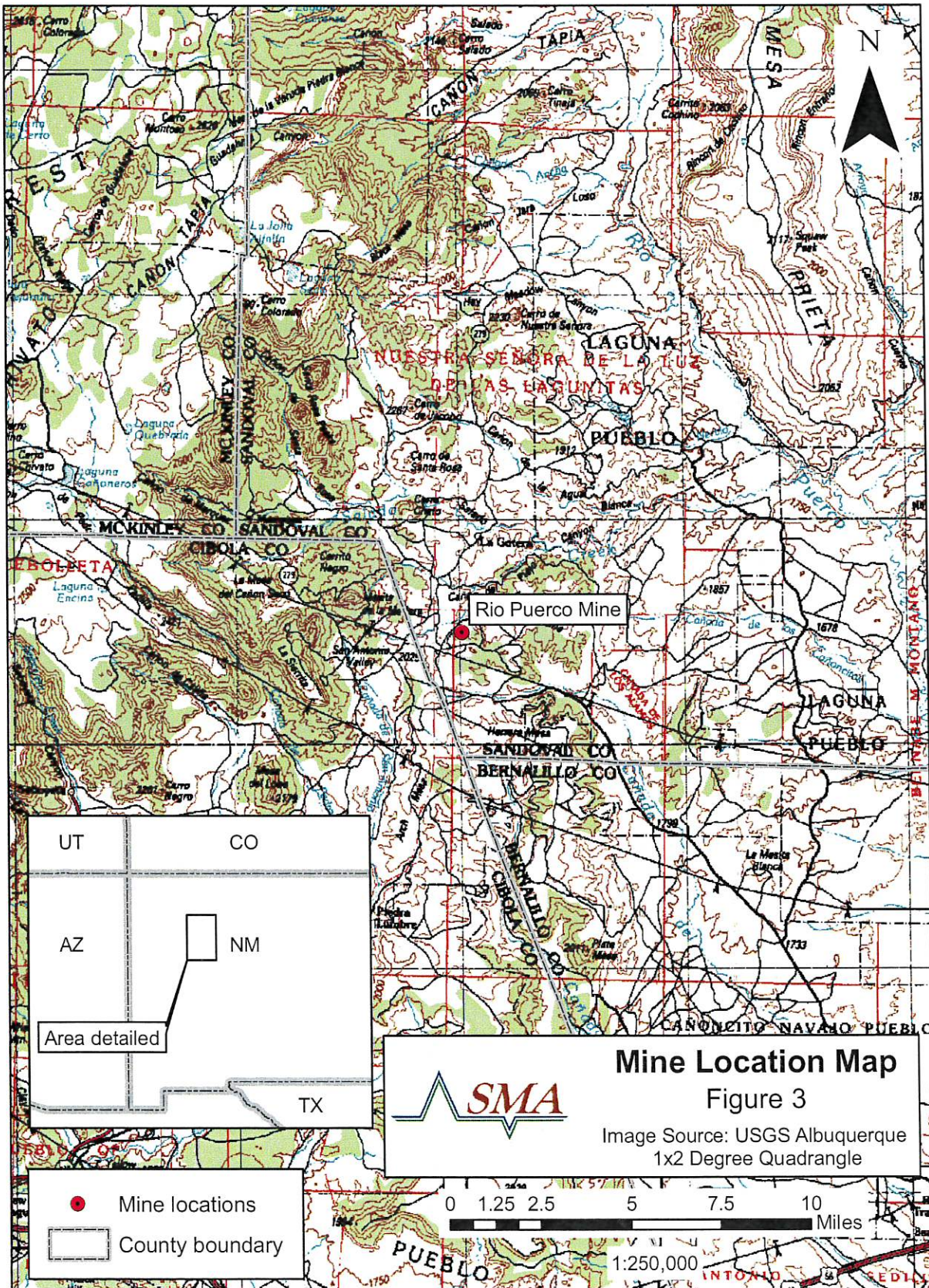
Figure 2

Image Source: USGS Albuquerque  
1x2 Degree Quadrangle

- Mine locations
- ▭ County boundary



1:250,000

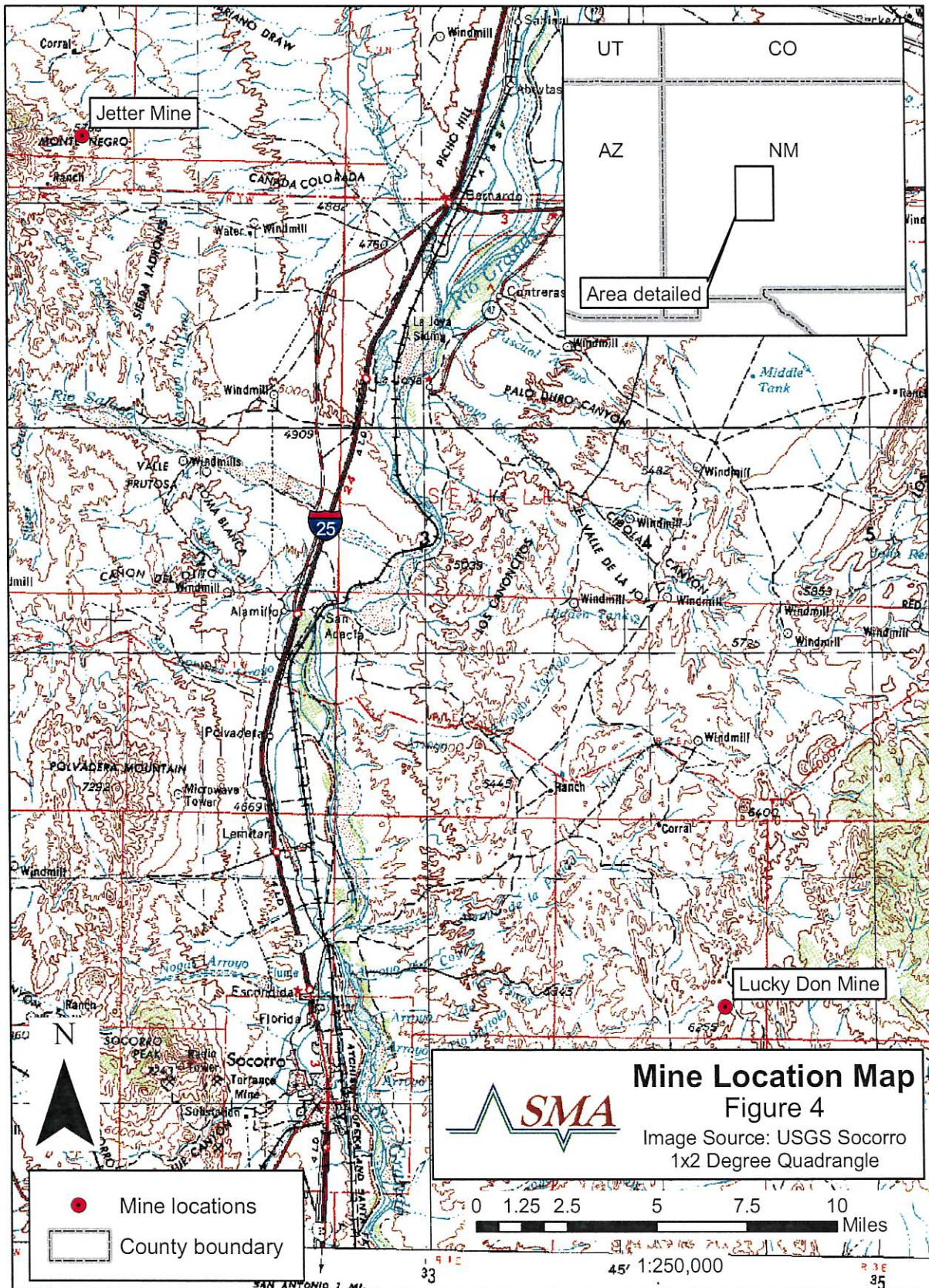


**Mine Location Map**  
**Figure 3**  
 Image Source: USGS Albuquerque  
 1x2 Degree Quadrangle

- Mine locations
- - - County boundary

0 1.25 2.5 5 7.5 10 Miles

1:250,000



Jetter Mine

Lucky Don Mine

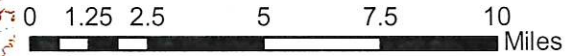


- Mine locations
- County boundary

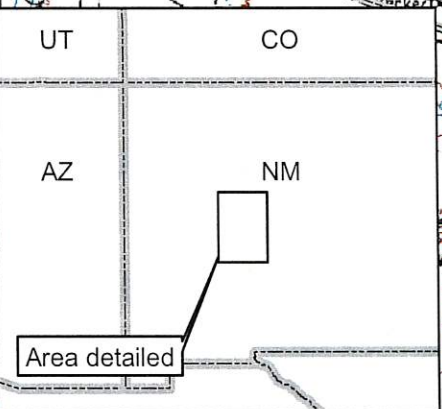


**Mine Location Map**  
Figure 4

Image Source: USGS Socorro  
1x2 Degree Quadrangle



0 1.25 2.5 5 7.5 10 Miles  
1:250,000



Area detailed

SAN ANTONIO 3 MI.

33

35



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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.



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## **Moe No. 4 Mine**

**1. Location/Land Status:** The Moe No.4 Mine is located on land owned by the New Mexico State Land Office within Section 32, T13N, R9W on the USGS Dos Lomas quadrangle (35.313011N, 107.813102W) and is surrounded by private properties. Physical access to the mine can be gained by traveling north 12 miles from Milan, NM on NM 605. The Moe No. 4 mine is to the east of the highway and visible from the road. Legal access was graciously provided by Mr. Robert Schmitt of 57 NM 509, Grants, NM 87020; phone: (505) 287-2260.

**2. Human Activity:** No evidence of human activity was noted.

**3. Radiological Survey:** Radiological survey results were as follows: ground surface maximum of 1,100  $\mu$ R/hour and minimum of 12  $\mu$ R/hour. Four-foot elevation maximum was 1,000  $\mu$ R/hour and minimum was 14  $\mu$ R/hour. The ground surface at the headframe displayed readings of 1,100  $\mu$ R/hour. Background radiation level is approximately 15  $\mu$ R/hour.

**4. Mine Disturbance:** Moe No. 4 is a small underground mine situated on approximately 3 acres which immediately adjoins an arroyo (ephemeral stream). The mine consists of a 30-degree decline striking north into a collapsed working of approximately 10,000 square-feet by 12 feet deep. The site includes approximately 45 small rock piles having an estimated total volume of approximately 400 cubic-yards.

There is a foundation, loading dock and tank located approximately 2,000 feet from the site, where the access road leaves NM 605.

**5. Plant Community:** The surrounding area is characteristic chaparral: 40% grasses, 5% bare ground, 10% scrub, 40% forbs, and 5% bare.

**6. Soils:** Soils at the site are Penistaja-Tintero complex, with 1 to 10 percent slopes, 0 to 3 inches sandy loam, 3 to 19 inches sandy clay loam.

**7. Wildlife:** There were numerous signs of rabbit and coyote observed on site, but no other wildlife or sign was observed.

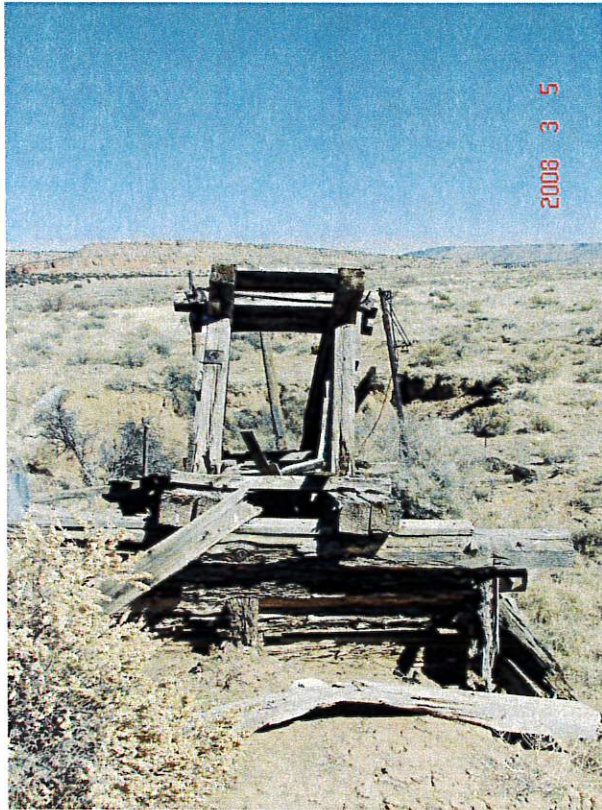
**8. Land Use:** The land use is light to moderate grazing.

**9. Off-Site Impacts:** No off-site impacts were noted.

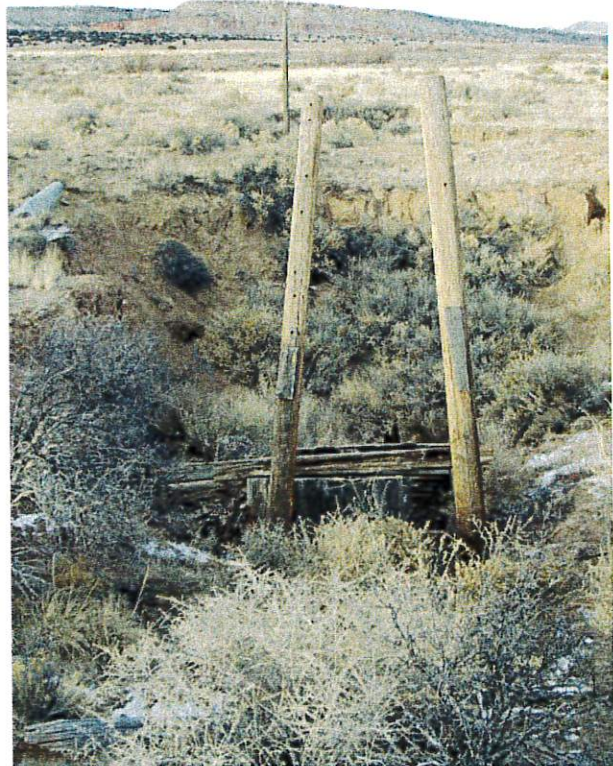
**10. Topographic Features:** The site is flat, and bounded on the northwest by an arroyo. The site displays no notable erosional features.

**11. Hydrogeology:** Based on a review of the NMOSE iWaters database, there is one well record within a one mile search radius. It is located approximately 800 feet to the north of the site, with a recorded depth to water of 30 ft.

The nearest surface water drainage feature is adjacent to the site to the northwest.



Headframe, view to north



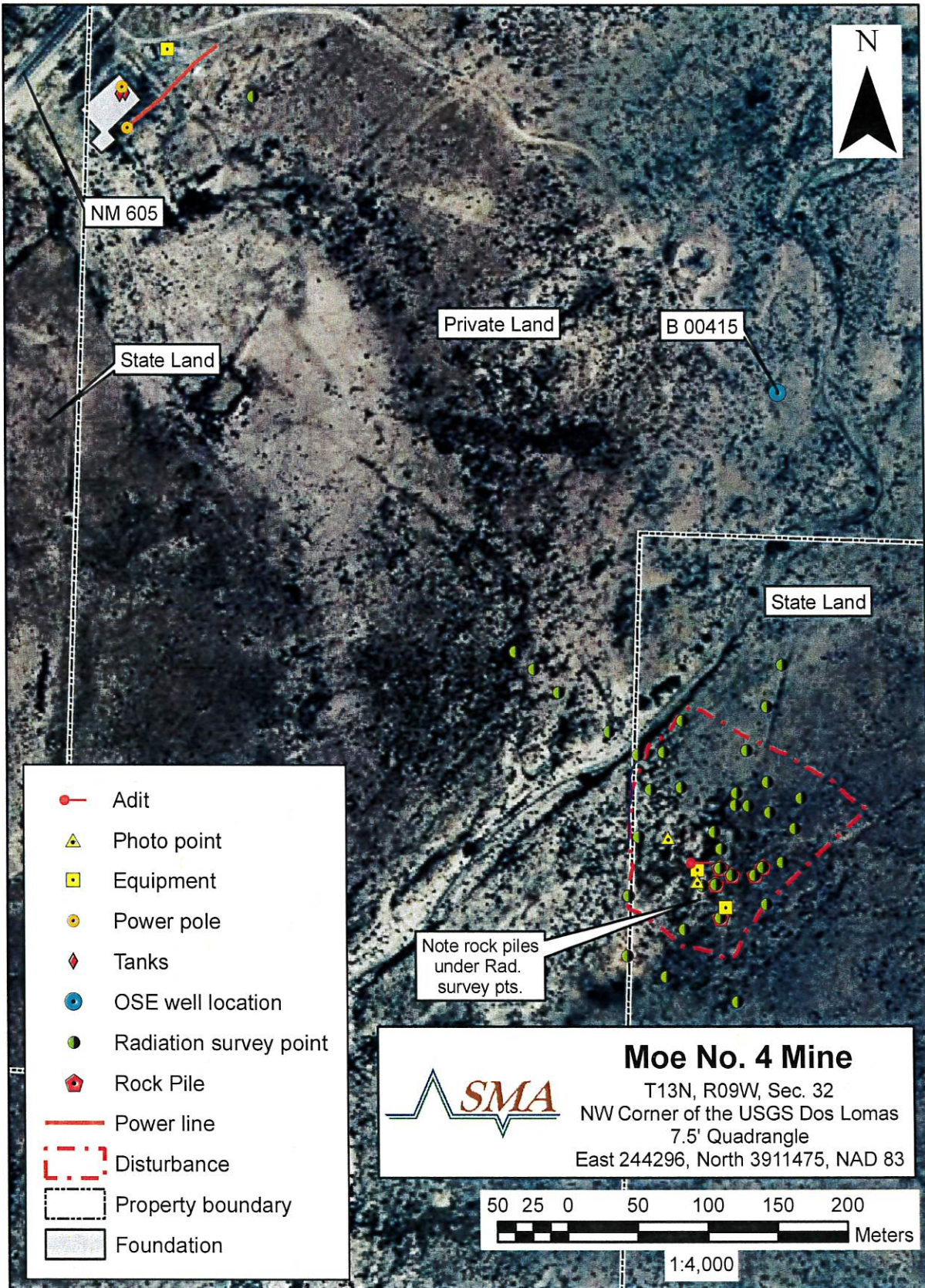
Decline (adj. to headframe), view to north



Decline, view to south



Rock piles, view to northeast



AUM Field Survey Data Sheet

Site Vallejo

Page      of       
*(Moe No. 4)*

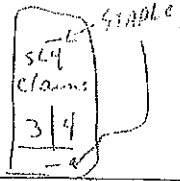
Date <i>01/23/08</i>	Time On-Site <i>1015 hrs.</i>	Time Off-Site	By <i>B. MEKFE</i> <i>B. BALDWIN</i>
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Weather Conditions: *Sunny, wind 0 mph, cloudless sky  $\approx$  40°F*

Disturbances	GPS#	Description	Dim/Area/Volume	Photo #'s
Shafts				<i>#1</i>
Adits				
Pits				
Waste Rock Dumps				
Tailings				
Trenches				
Roads <i>Access</i>		<i>Suspected road - unsure</i>	<i>2-Track</i>	
Erosional Features		<i>2-Track from SR605 to 1/4 mile of site - landowner locked gate</i>	<i>2-TRACK</i>	
Structures / Equipment	GPS#	Description	Dimensions	Photo #
Buildings				
Headframes				

AUM Field Survey Data Sheet

Site V

Equipment <small>None on-site</small> Lumber about N/A - 4x4's		No visible, viable structures		
<b>Soils</b>	GPS#	Description	Extent	Photo #
Sandy-Loam		Surrounding sandstone Cliffs - redish-brown.	Predominant	
<b>Vegetation</b>	GPS#	Description	Extent	Photo #
<ul style="list-style-type: none"> <li>- P-S Forest</li> <li>- Blue gramma</li> <li>- Senecio</li> <li>- Snake weed</li> <li>- 4-ling Salt brush</li> </ul>		200-300 lbs/acre gramma production. Predom. Juniper (one seed) some piñon. Spacing is sparse	Some P-S mortality but seems to be natural. Grass prod. high compared to adjacent areas	
<b>Wildlife</b>	GPS#	Description		Photo #
<ul style="list-style-type: none"> <li>- Fox rabbit, Coyote tracks,</li> <li>- Cottontail rabbit, deer tracks in</li> <li>- snow patch, mouse rodents</li> </ul>				
<b>Human Activity</b> <small>(non-mining, w/in 0.5 mi of site)</small>	GPS#	Description	Extent	Photo #
Bob schmidt land lease.  N/A  According to Spadsh is SLD He said he SFS.				
<b>Land Use</b> <small>(grazing, agricultural, roads, etc., w/in 0.5 mi of site)</small>	GPS#	Description	Extent	Photo #
Grazing - Evidence of cattle tracks/feces.				
<b>Nearby Residences / Wells</b> <small>(w/in 0.5 mi of site)</small>	GPS#	Description	Distance to Site	Photo #
Chain marker (1 mile) w/ metal tag.  N/A				
<b>Topographic Features</b> <small>(roads, water courses, etc.)</small>	GPS#	Description		Photo #

Large pings off cliff faces - seems to be natural washed features due to steep terrain of surrounding cliffs. Some patchy snow on N. face slopes and in canyon bottom. High areas of rilling on steep slopes. Appears to be naturally reclaimed - Advise no further action.

Mine I.D.: Loc # 4 + Valleso Plant Community Data

Date/Time: 01/23/08  
Weather: Sunny, Wind 0 mph, approx 40°F  
Observer: BCM

Current Plant Community:

Photo# P-5 Forest - open (Both)  
Valleso = Canyon lands type 10% tree, 50% bare ground, 30% Forb/shrub, 10% grasses  
Loc # 4 = light, open P-5 (sparse) - more grasslands. 40% grass, 40% Forb, 10% shrub, 5% tree, 5% bare ground

Other Species Present:

Photo # Pinon, One Seed juniper, Spineless horsebrush, Sand Sage, Winterfat (Sporobolus spp.?)  
blue gramma, Snakeweed

T&E Present: Y/N?

If yes, species? NO  
Photo #

Noxious Weeds: Y/N?

If yes, species? NO  
Photo #

Bare Spots? Y/N?

Number of spots/size YES, Normal  
Photo #

Standing Dead? Y/N?

If yes, species? ~~NO~~ None Unusual  
Photo #

Photo Point GPS Coord.

Photo #/Direction

Additional Notes:

Use back if necessary

AUM Field Survey Data Sheet

Site Moe #4

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AUM Field Survey Data Sheet

Site Moe #4

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
01	Rad. survey W to E	24	22
02	"	25	23
03	"	22	22
04	"	22	22
05	"	16	11
06	"	19	18
07	"	19	18
08	"	19	18
09	Rad. survey N to S	15	14
10	"	17	14
11	"	17	13
12	"	22	20

## AUM Field Survey Data Sheet

Site Moe #4 + Vallejo

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## AUM Field Survey Data Sheet

Site Moe #4

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
13	"	25	23
14	Adit (decline) <sup>working covered-in</sup>	—	—
15	headframe	1100	1000
16	tailings @ headframe	1,100	1,000
17	wastepile (overburden) <sup>1.5m(h)</sup> <sup>4m(b)</sup>	32	30
18	tailings 1m(h) x 3m(b)	360	300
19	tailings/overburden 1m(h) x 3m(b)	50	50
20	tailings 1m(h) x 3m(b)	120	60
21	" "	600	600
22	" "	600	600
23	Loading ramp @ highway	60	32

AUM Field Survey Data Sheet

Site AUM - Moe No. 4 2008-3-5

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
	photo ✓		
Arc 0	Power drop to former structure	-	-
Arc 1	Power line	-	-
Arc 2	Power line as line file	-	-
G0	Waste pile ~ 1m <sup>3</sup>	320	90
G0	Rad. survey baseline pt. ✓	12	14
G1	" "	16	14
G2	" "	20	16
G3	" "	22	20
G4	" "	42	30
G5	" " ✓	800	600
G6	" " ✓	32	30
G7	" "	70	110
G8	" "	42	60
G9	" "	22	22
G10	" "	18	14
G11	" " ✓	14	14

AUM Field Survey Data Sheet

Site AUM - Mol No. 4 2008-3-5

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G12	rad survey ✓	18	14
G13	"	18	14
G14	"	22	20
G15	"	140	70
G16	"	20	18
G17	" ✓	18	16
PHOTO-0	headframe looking <sup>N</sup> into collapsed workings		
PHOTO-1	looking E into collapsed workings		
FENCE 0	S to N barbed fence meandering along arroyo		
PHOTO 2	Vegetative survey 40% bare, 30% grass, 20% scrub, 10% forbs		