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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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

Scott A. McKitrick, P.G.
Senior Scientist

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.

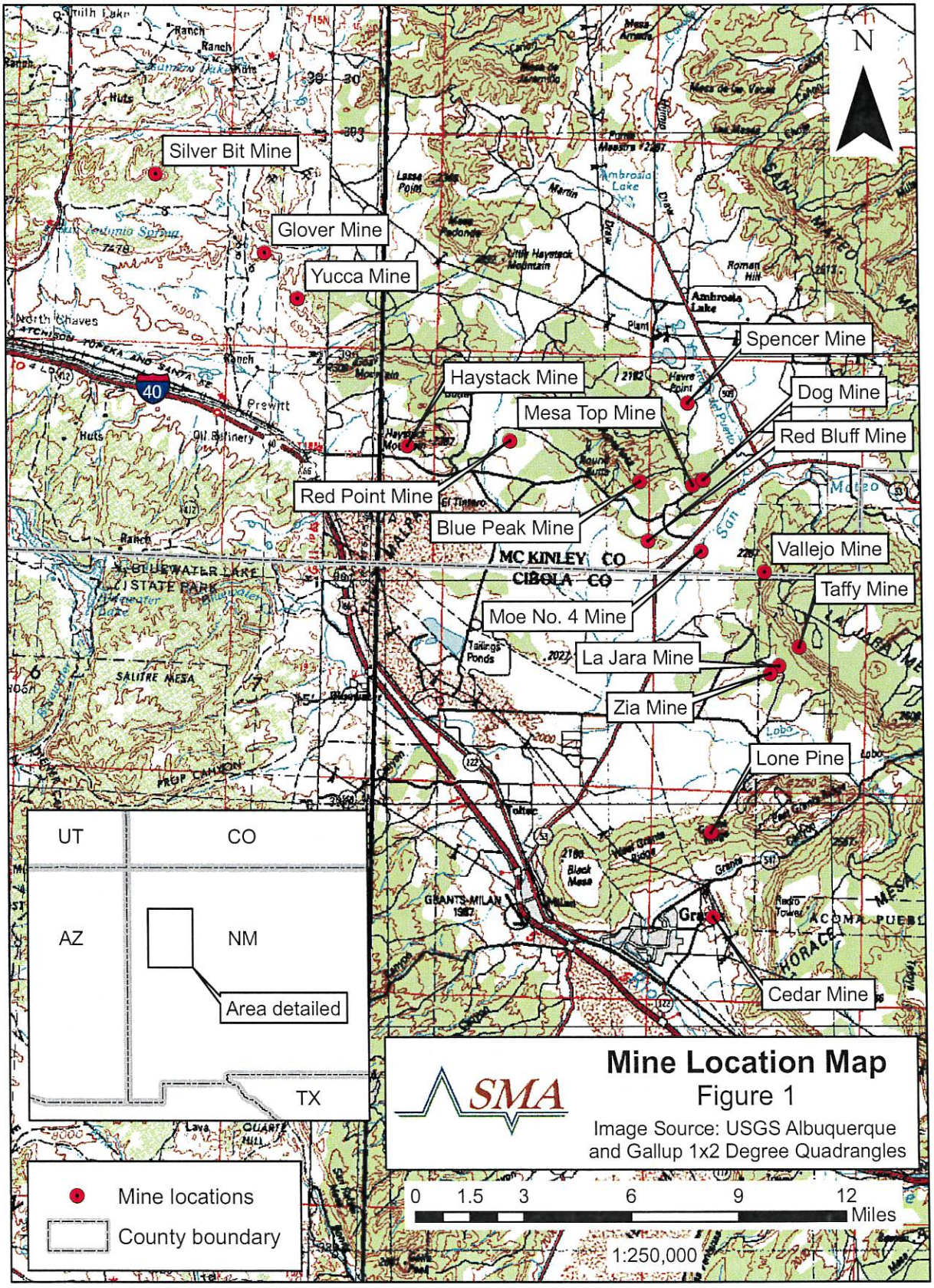
Areas of site disturbance ranged from less than one acre to tens of acres. Mine features observed included road cuts, shafts, adits, pits, ponds, and rock piles. Structures included headframes, loading structures, tanks, electrical components, steel structures, and others. Background radiation levels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

Scope of Services

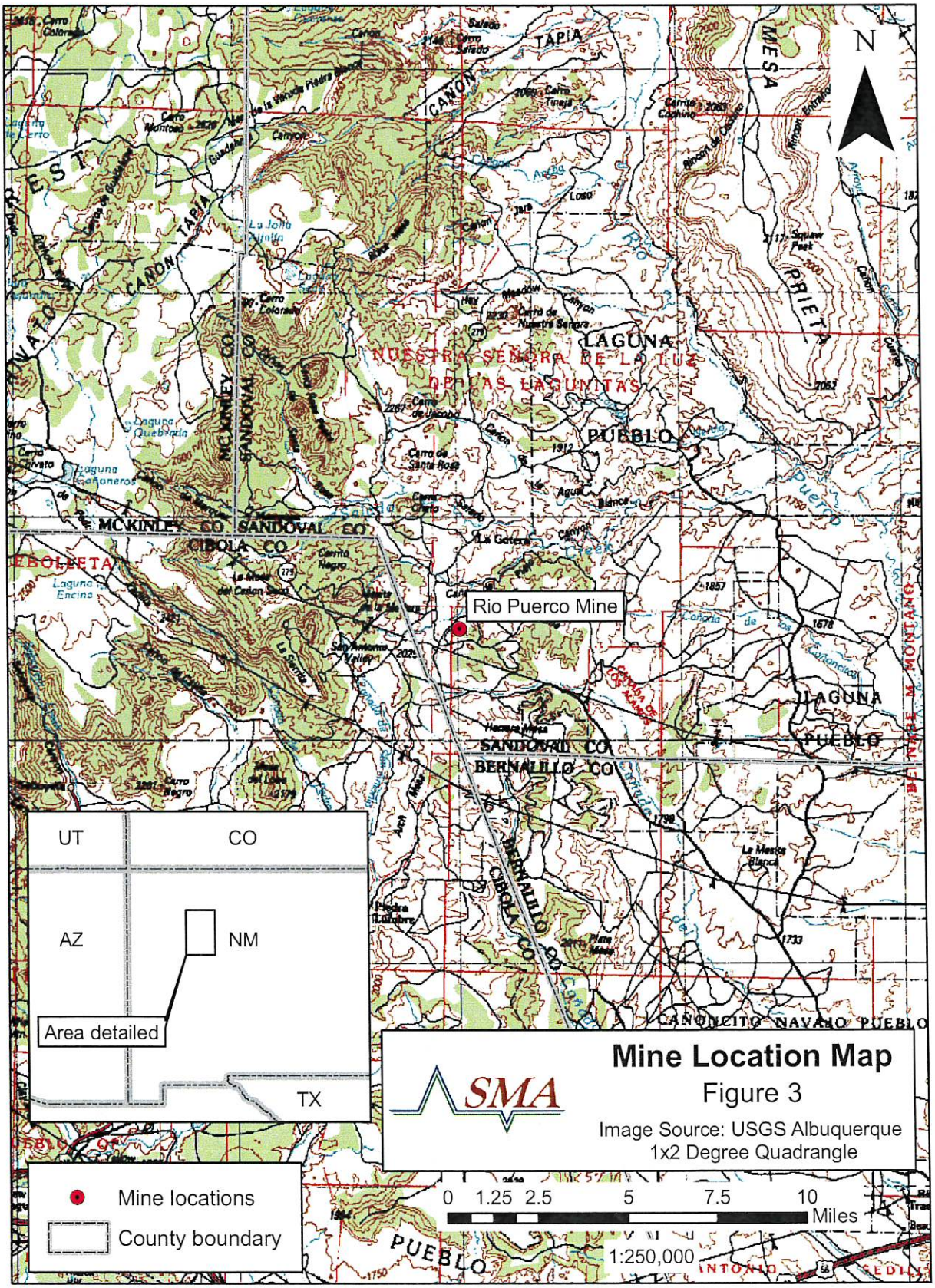
SMA's scope of services included the following:

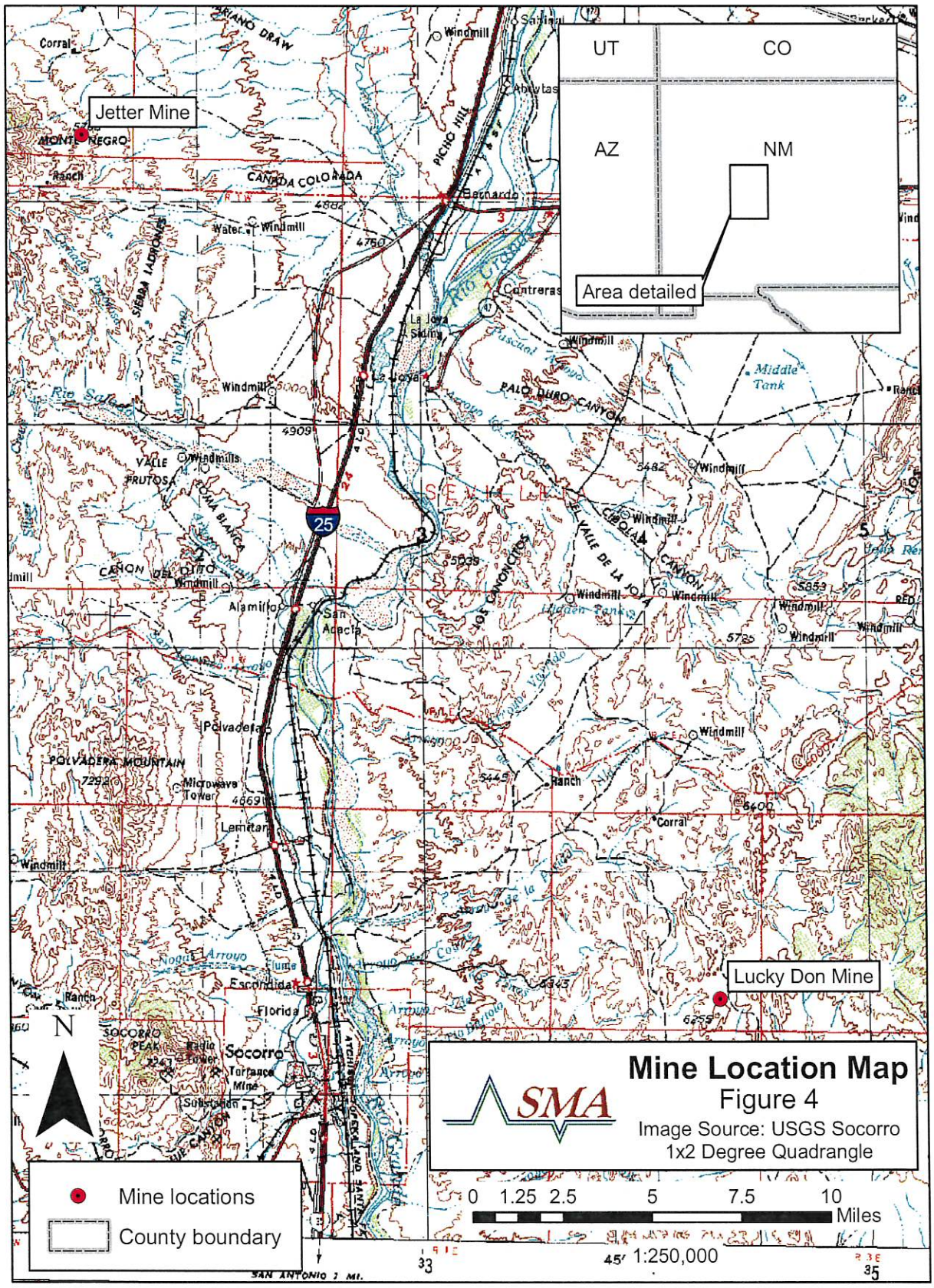
Health and Safety Plan

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
Spencer Mine
Haystack Mine
Dog Mine
Mesa Top Mine
Red Bluff Mine
Red Point Mine
Blue Peak Mine
Vallejo Mine
Taffy Mine
Moe No. 4 Mine
La Jara Mine
Zia Mine
Lone Pine
Cedar Mine
MC KINLEY CO
CIBOLA CO
N
UT
CO
AZ
NM
TX
Area detailed
Mine locations
County boundary
SMA
Mine Location Map
Figure 1
Image Source: USGS Albuquerque and Gallup 1x2 Degree Quadrangles
0 1.5 3 6 9 12
Miles
1:250,000


N
Butler Brothers Mine
MESA
PORTALES
JEMEZ
PUEBLO
SAN LUIS
LA VENTANA MESA
CANON DE SAN DIEGO
VALLE GRANDE
ANTO
ZIA
UT
CO
AZ
NM
TX
Area detailed
Mine locations
County boundary
SMA
Mine Location Map
Figure 2
Image Source: USGS Albuquerque
1x2 Degree Quadrangle
0 1.25 2.5 5 7.5 10
Miles
1:250,000


N
Rio Puerco Mine
MCKINLEY CO
SANDOVAL CO
CIBOLA CO
BERNALILLO CO
LAGUNA PUEBLO
NUESTRA SEÑORA DE LA LUZ DE LAS LAGUNITAS
UT
CO
AZ
NM
TX
Area detailed
Mine locations
County boundary
0 1.25 2.5 5 7.5 10
Miles
1:250,000
SMA
Mine Location Map
Figure 3
Image Source: USGS Albuquerque
1x2 Degree Quadrangle


Jetter Mine
Lucky Don Mine
UT
CO
AZ
NM
Area detailed
Mine locations
County boundary
N
0 1.25 2.5 5 7.5 10
Miles
1:250,000
SMA
Mine Location Map
Figure 4
Image Source: USGS Socorro
1x2 Degree Quadrangle

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 µR/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.

Spencer Mine

1. Location/Land Status: The Spencer Mine is located on BLM land within Section 8, T13N, R9W on the USGS Dos Lomas quadrangle (35.372637N, 107.819975W), approximately 15 miles north of Grants, NM. It is approximately three-quarters of a mile south of the BHP-Billiton Ambrosia Lake millsite. Physical access to the mine can be gained by traveling north 14 miles on NM 605, then west 3 miles on Ambrosia Lake Road, park at the gate on south side of road and travel on foot 0.5 miles south to the mine site. Legal access to the mine 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 320 µR/hour and minimum of 20 µR/hour. Four-foot elevation maximum was 280 µR/hour and minimum was 20 µR/hour. Background radiation level is approximately 20 µR/hour.

4. Mine Disturbance: The mine consists of collapsed underground workings of approximately 100 by 160 ft. by 8 ft. deep with a large iron head frame fallen into the pit. The area around the collapsed workings is strewn with about 20 rock piles with a total volume of approximately 200 cubic yards. There is a fence enclosing the collapsed workings which has been compromised by further collapse. Equipment at the site includes a utility pole at the north side of the site, and a telephone junction box on the southern portion of the site.

5. Plant Community: The area surrounding the mine is characteristic chaparral. The vegetation on the mine site is 5% bare ground, 5% grass, 20% woody scrub, and 70% forbs.

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: A single raptor was noted at the site.

8. Land Use: The land use of the area is light to moderate grazing.

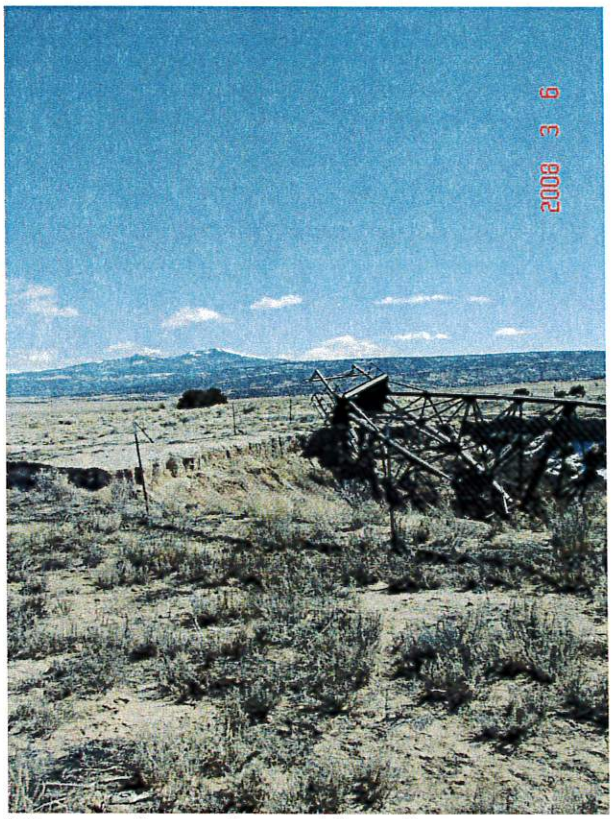
9. Off-Site Impacts: No off-site impacts were noted, however, an arroyo flanked by piles cuts across the site. Radiation levels of 60 µR/hour at both surface and four foot elevation were noted in this feature.

10. Topographic Features: The site is flat-lying, with an arroyo to the east.

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 with a recorded depth to water is

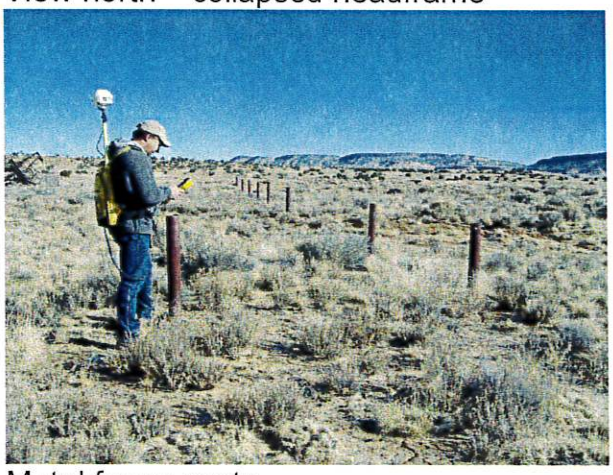
approximately 2.8 miles to the southeast, with a depth to water of 80 ft. Numerous groundwater monitoring wells are associated with the Ambrosia Lake Mill to the north and east of the site.

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

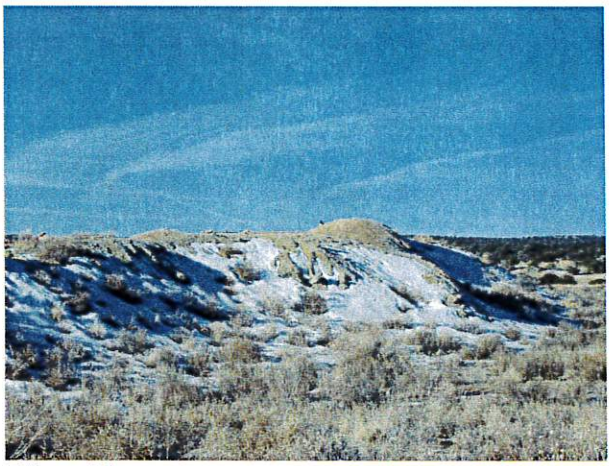


View north – collapsed headframe


Pit with headframe

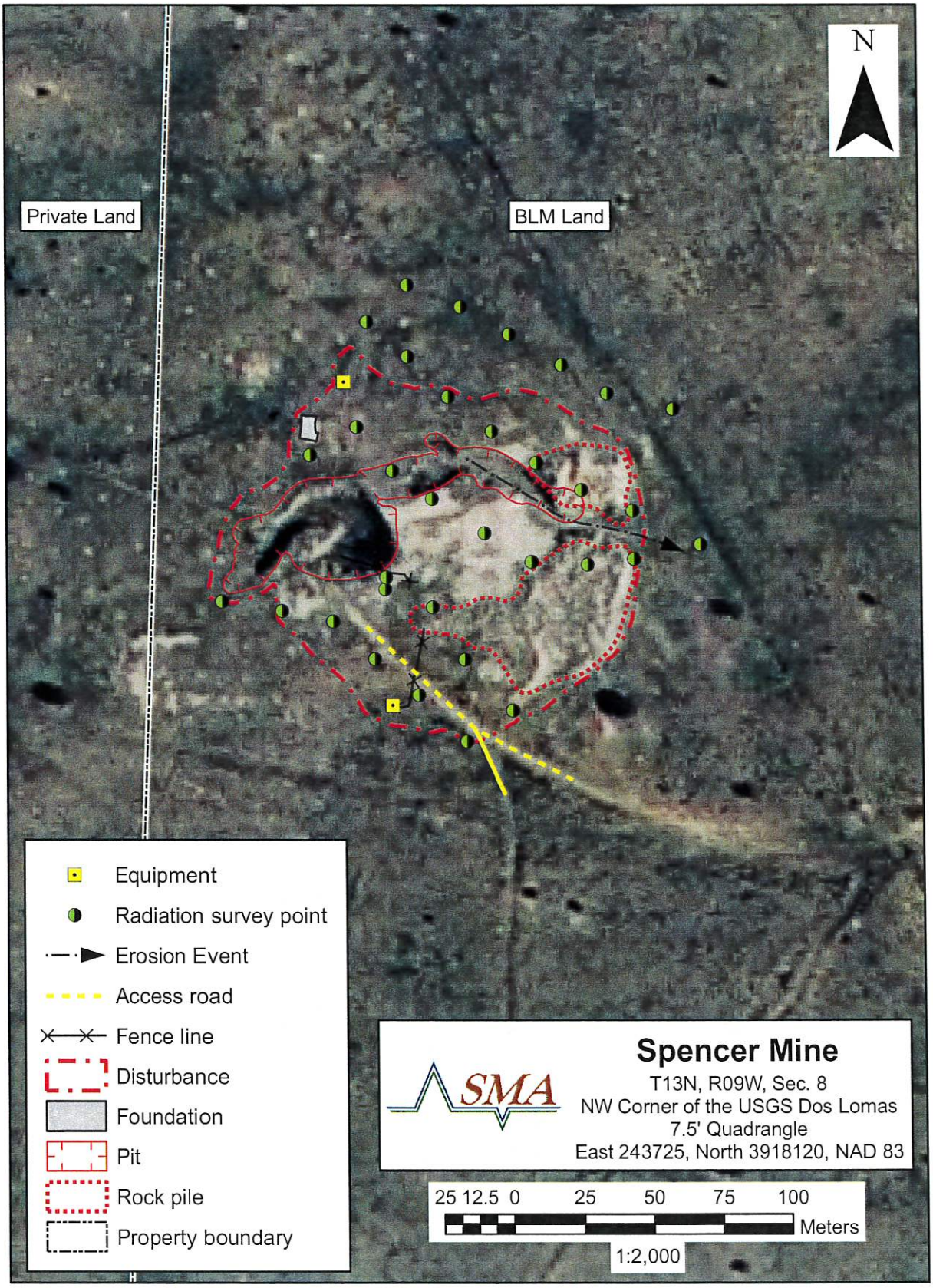

Metal fence posts


View to west, arroyo cutting site, adj. piles



Pile with raptor

Pad, arroyo, erosion through site


N
Private Land
BLM Land
Equipment
Radiation survey point
Erosion Event
Access road
Fence line
Disturbance
Foundation
Pit
Rock pile
Property boundary
SMA
Spencer Mine
T13N, R09W, Sec. 8
NW Corner of the USGS Dos Lomas
7.5' Quadrangle
East 243725, North 3918120, NAD 83
25 12.5 0 25 50 75 100
Meters
1:2,000

AUM Field Survey Data Sheet **Site** SPENCER

Date	Time On-Site	Time Off-Site	By
2/13/08	8:30	9:51	Tami Ross + Brian Mertz

Weather Conditions: Clear, cool, sunny ground frozen some snow patches

Disturbances	GPS#	Description	Dim/Area/Volume	Photo #'s
Shafts	8 shot with 50' offset for safety	hole, filled in w/ brush, skeletons (animals)	20'	21
Adits				
Pits	2	pit to shaft: extensive erosion evident/present		2-10
Waste Rock Dumps	7 11	large waste pile waste pile	8'H / 12'H	14,15,16 22
Tailings N/A				
Trenches N/A				
Roads	9	SERVICE ROAD		
Erosional Features	10	arroyo thru waste piles towards shaft		17-20

Structures / Equipment	GPS#	Description	Dimensions	Photo #
Buildings	12	foundation	15'x30'	23
Headframes	4	GPS shot w/ 40' offset for safety; collapsed	60' long	11

AUM Field Survey Data Sheet Site SPENCER

Equipment	5 6 13	telephone junction box metal posts utility pole		12 13 OK
Soils	GPS#	Description	Extent	Photo #
265 - Uranium Mined Land 205 - Penistaja-Tintero Complex				
Vegetation	GPS#	Description	Extent	Photo #
See Attachment				
Wildlife	GPS#	Description		Photo #
		Red TAIL HAWK on nearby tree Deer pellets (1 pile) Large amount of coyote sign		1
Human Activity (non-mining, w/in 0.5 mi of site)	GPS#	Description	Extent	Photo #
		☒ None KNOWN		
Land Use (grazing, agricultural, roads, etc., w/in 0.5 mi of site)	GPS#	Description	Extent	Photo #
		Grazing - Heavy		
Nearby Residences / Wells (w/in 0.5 mi of site)	GPS#	Description	Distance to Site	Photo #
		N/A		
Topographic Features (roads, water courses, etc.)	GPS#	Description		Photo #

AUM Field Survey Data Sheet Site SPENCER

AUM Field Survey Data Sheet Site Spencer

Radiological Survey SPENCER

GPS#	Description	Reading Surface	Reading 4 feet
OFF SITE	BACKGROUND	50 scale 28uR/hr	28uR/hr
3	east side of shaft/headframe (45 shot w/ offset of 30' for safety reasons per HASP	500 scale 20uR/hr	500 scale 22uR/hr
6	radiation not shot directly for safety Max surface readings on 500 scale @ 30uR/hr		
10	erosional feature from shaft - thru waste piles (polyline	250 scale 22uR/hr	20uR/hr

Mine I.D.: Spencer

Plant Community Data

Date/Time: 02/13/08
Weather: Sunny
Observer: BCM

Current Plant Community:
Photo# open savanah - PJ Forest located appx 1/4 mile off site
70% Forb, 20% shrub, 5% grass, 5% bare spot one juniper (one seed) just

Other Species Present:
Photo # Blue gramma, Shakeweed, Four wing saltbush, ~~[illegible]~~ sand sage, WINTERFAT
Spineless horsebrush, Galleta(?)

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, occassional
Photo #

Standing Dead? Y/N?
If yes, species? NO
Photo #

Photo Point GPS Coord.
Photo #/Direction

Additional Notes:
Use back if necessary

AUM Field Survey Data Sheet Site AUM Spencer 2008-3-16

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G0	Rad. survey ✓	39	42
G1	" "	50	50
G2	"	44	40
G3	"	32	30
G4	"	24	24
G5	" ✓	20	20
G6	" ✓	30	30
G7	"	32	30
G8	"	48	50
G9	"	160	140
G10	"	100	100
G11	"	80	80
G12	" ✓	70	60
G13	" ✓	140	140
G14	"	150	130

B. Schmidt
287 - 2277

AUM Field Survey Data Sheet Site AUM - Spencer 2008-3-6

Radiological Survey			
GPS#	Description	Reading Surface	Reading 4 feet
G15	Rad. survey	150	150
G16	"	320	280
G17	"	300	280
G18	"	30	30
G19	" ✓	32	30
G20	" ✓	36	30
G21	"	230	220
G22	"	80	70
G23	"	44	44
G24	" ✓	44	50
G25	" ✓	42	40
G26	"	24	25
G27	"	32	~~50~~ 40
G28	"	100	100
G29	"	170	140
G30	" ✓	28	
[illegible] 0	" ✓	60	60