Abandoned Uranium Mine Assessment for the Marie Site (NM0257)

FINAL REPORT

Prepared For:

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1.0 INTRODUCTION

INTERA Incorporated (INTERA) has prepared this Abandoned Uranium Mine (AUM) Site Assessment Report for the Mining and Minerals Division (MMD) of the New Mexico Energy, Minerals and Natural Resources Department (EMNRD) in compliance with the Professional Service Agreement dated November 2, 2009. INTERA visited the Marie Site (AUM Site), MMD ID: NM0257 on May 6, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

According to McLemore (1983), 46 tons of ore yielding 125 pounds of uranium was produced from the Marie Prospect by Florida Minerals in 1956. Workings consisted of one open pit in the Madera Group near the contact with the Abo Formation. The uranium mineral novacekite was reported to occur at this location. The Marie Prospect was also known as the Maria #1, T.D. Campbell, Mary Ball #1, and Cibola #1-2 (McLemore, 1983). Anderson (1980) did not visit this AUM Site.

1.2 SITE LOCATION AND DIRECTIONS

The AUM is located on the Sevilleta National Wildlife Refuge, administered by the U. S. Fish and Wildlife Service. The land was originally part of the Sevilleta de la Joya Land Grant. The Site lies within Socorro County, approximately 13 miles east of the town of San Acacia. The location of this Site was provided to INTERA by MMD.

To access the AUM Site from Albuquerque, drive south on Interstate 25 for 52 miles. Take Exit 170 towards Mountainair and continue east on US-60 for 9 miles. After 9 miles, turn right onto a dirt road just east of Black Butte. Continue south on this dirt road for 7 miles. After 7 miles, turn left on a dirt road bearing southeast and drive another 6 miles. After 6 miles, park and proceed 0.25 miles west on foot to the AUM Site.

Permission must be obtained from the U. S. Fish and Wildlife Service before accessing the AUM Site.

1.3 SITE GEOLOGY

The AUM Site lies on the contact between the Pennsylvanian-age Madera Group and the Permian-age Abo Formation. The Madera Group is interpreted to be a marine limestone and the Abo Formation is believed to represent a terrestrial environment (Kues and Giles, 2004). The Madera-Abo contact in this location consists of a north-striking down-to-the-east normal fault (Rawling, 2005). The Agua Torres mine (NM0252) is found further south along the same fault.

Mineralization occurs as veins in the fault zone along the Madera-Abo contact in conjunction with silicified limestone. In addition, the yellow uranium mineral novacekite was reported to occur at the AUM Site (McLemore, 1983). Gamma-active yellow minerals that could be novacekite were observed during the present survey, but they were not specifically identified.

1.4 SITE HYDROGEOLOGY

The surface runoff at the AUM Site discharges west to Palo Duro Canyon, which joins the Rio Grande 10 miles to the west. Running water and pools were observed at Cibola Spring 1 mile south of the Site.

The AUM Site is located in central region of the Middle Rio Grande Underground Water Basin (NMOSE, 2005). A highly-transmissible aquifer, consisting of fractured Madera Group limestones, discharges at Cibola Spring to the south. It is unlikely that the nearby Abo Formation hosts significant groundwater as it consists of numerous interbedded mudstones (Rawling, 2005).

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the Sierra de la Cruz 7.5 minute United States Geological Survey topographic map at an elevation of approximately 5600 ft above mean sea level (see Figure 2). The AUM Site is located in a region of low hills and canyons southwest of the Los Pinos Mountains. The Marie mine features are located on an east-facing hillslope.

2.0 MINE FEATURES

The mine features described below are based on the features provided to INTERA by MMD in the GIS Data Dictionary (MMD, 2009). INTERA marked the locations of the AUM Site features using a Trimble Global Positioning System (GPS), and entered details about the features into the GPS using the MMD data dictionary. Five open cuts, five piles, wood boards, and an erosional feature were found onsite. Please see the Photo Log in Appendix A for photos of the AUM Site features, Table 1 for a list of the AUM Site features, and Figures 4a and 4b for the locations of the AUM Site features.

2.1 MINE SHAFTS, ADITS, AND DECLINES

No shafts, adits or declines were found at the AUM Site.

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

Five open cuts were found at the AUM Site. Four of the open cuts (CutPly-1, CutPly-2, CutPly-3, and CutPly-5) were shallow excavations into hillside alluvium with little exposed bedrock (see Photos 1, 3, 4, and 11 in Appendix A). CutPly-4 exposes Madera Group bedrock (see Photo 7) and may be the pit mentioned in McLemore (1983). The maximum gamma radiation measurement on these features was 150 µR/hr at 0 ft above ground at radiation survey point Rad-5 in CutPly-3.

2.3 WASTE AND ORE PILES AND DISTURBANCES

Five waste piles were found onsite. Three of the piles (PilePly-1, PilePly-2, and PilePly-3) were broad, low mounds of soil and rock (see Photos 2, 5, and 6 in Appendix A). The other two piles (PilePly-4 and PilePly-5) were isolated conical mounds (see Photos 4 and 5 in Appendix A). The

maximum gamma radiation measurement on these features was 1000 µR/hr at 0 ft above ground at radiation survey point Rad-9 on PilePly-4.

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

Scattered wooden boards (StrucPly-1, see Photo 12 in Appendix A) were found onsite.

2.5 OTHER MINE FEATURES

A drainage (ErosPt-1) runs south to north just east of the mine features (see Photo 9 in Appendix A). This drainage is eroding some material from nearby waste piles.

2.6 BOREHOLES

No boreholes were found at the AUM Site.

2.7 RECLAMATION ACTIVITIES

No reclamation activities were identified onsite.

3.0 ARCHEOLOGICAL SITES

No apparent archeological sites were identified at or near this AUM Site.

4.0 SITE GAMMA RADIATION READINGS

One background gamma radiation reading was taken near the AUM Site, recording 10 µR/hr at 0 ft above ground and 10 µR/hr at 4 ft above ground. Please see Table 2 for all of the gamma radiation readings taken at the AUM Site and Figures 4a and 4b for the locations of the radiation readings.

The maximum gamma radiation measured onsite was 1000 µR/hr at 0 ft above ground at radiation survey point Rad-9 on PilePly-4. A gamma radiation measurement taken on PilePly-5 (radiation survey point Rad-10) recorded 350 µR/hr at 0 ft above ground.

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Human presence in the Sevilleta National Wildlife Refuge is limited to research activity.

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

No structures were sighted within a mile of the AUM Site.

5.3 NEARBY DOMESTIC WELLS

No wells, domestic or otherwise, lie within a mile of the AUM Site.

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

Grazing and agriculture is not allowed on the Sevilleta National Wildlife Refuge, but wild horse droppings were found near the AUM Site.

5.5 EVIDENCE OF WILDLIFE

Wild horse droppings were noted near the AUM Site. A horned lizard, other lizards, and small birds were seen on or near the Site. A rattlesnake was seen while driving to the Site.

6.0 VEGETATION

The AUM site is located in the Juniper Savanna Ecotone. Woody species at the site include one-seed juniper, pinyon pine, littleleaf sumac, mesquite, and rubber rabbitbrush. Sand verbena, desert globemallow, Indian paintbrush, chihuahuan flax, multiple species of primrose, and feathered dalia were also present. Alkali and giant sacaton as well as blue and black grama were the grasses identified at the AUM Site. There was no evidence of noxious weeds at the AUM Site.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

A gully is forming to the east of the mine features (see Photo 9 in Appendix A). Material from waste piles is being eroded into this gully.

7.2 ENVIRONMENTAL IMPACTS

There is no evidence of soil staining from chemicals potentially brought to the AUM Site.

8.0 REFERENCES

Dick–Peddie, William A, 1999. New Mexico Vegetation: Past, Present, and Future. University of New Mexico Press.

Kues, Barry S. and Giles, Katherine A., 2004. The Late Paleozoic Ancestral Rocky Mountains System in New Mexico in Mack, Greg H. and Giles, Katherine A., eds., The Geology of New Mexico, A Geologic History. New Mexico Geological Society, p. 95-136.

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McLemore, Virginia T., 1983. Uranium and Thorium Occurrences in New Mexico: Geology, Production, and Resources, with Selected Bibliography. New Mexico Bureau of Mines and Mineral Resources Open File Report 183.

Mining and Minerals Division (MMD), 2009. Mine Feature Data Dictionary.

New Mexico Office of the State Engineer (NMOSE), 2005. Declared Underground Water Basins in New Mexico. Accessed April 30, 2010. <http://www.ose.state.nm.us/PDF/Maps/Decl_gw_basins_PLSS_Lines.pdf>

Rawling, Geoffrey C., 2005. Geology and Hydrologic Setting of Springs and Seeps on the Sevilleta National Wildlife Refuge. New Mexico Bureau of Mines and Mineral Resources Open File Report 495.

TABLES

Table 1
Site Features

Marie-NM0257
Abandoned Uranium Mine Assessments

Feature Name	On Site?	Feature Type	Associated Feature	Material	Height or Depth (ft)	Width or Diameter (ft)	Length (ft)	Open	Collapsed	Closure Type	Associated Photos	Notes
Access-1	Yes	Access	--	--	--	--	--	--	--	--	--	walking to truck
CutPly-1	Yes	--	--	--	5	20	75	--	--	--	NM0257_001	--
CutPly-2	Yes	--	--	--	5	15	15	--	--	--	NM0257_003	--
CutPly-3	Yes	--	--	--	3	18	60	--	--	--	NM0257_004	--
CutPly-4	Yes	--	--	--	15	40	75	--	--	--	NM0257_007	--
CutPly-5	Yes	--	--	--	3	18	60	--	--	--	NM0257_011	--
ErosPt-1	Yes	Water Eroded	--	--	5	20	40	--	--	--	NM0257_009	--
PilePly-1	Yes	Waste	--	Soil	4	30	54	--	--	--	NM0257_002	--
PilePly-2	Yes	Waste	--	Soil	3	6	40	--	--	--	NM0257_005	--
PilePly-3	Yes	Waste	--	Soil	8	60	60	--	--	--	NM0257_006	--
PilePly-4	Yes	Waste	--	Soil	5	15	15	--	--	--	NM0257_008	--
PilePly-5	Yes	Waste	--	Rock	6	15	18	--	--	--	NM0257_010	--
StrucPly-1	Yes	Shed	--	Wood	0	15	15	--	--	--	NM0257_012	--

Notes:
-- designates no information

Table 2
Gamma Radiation Survey Results

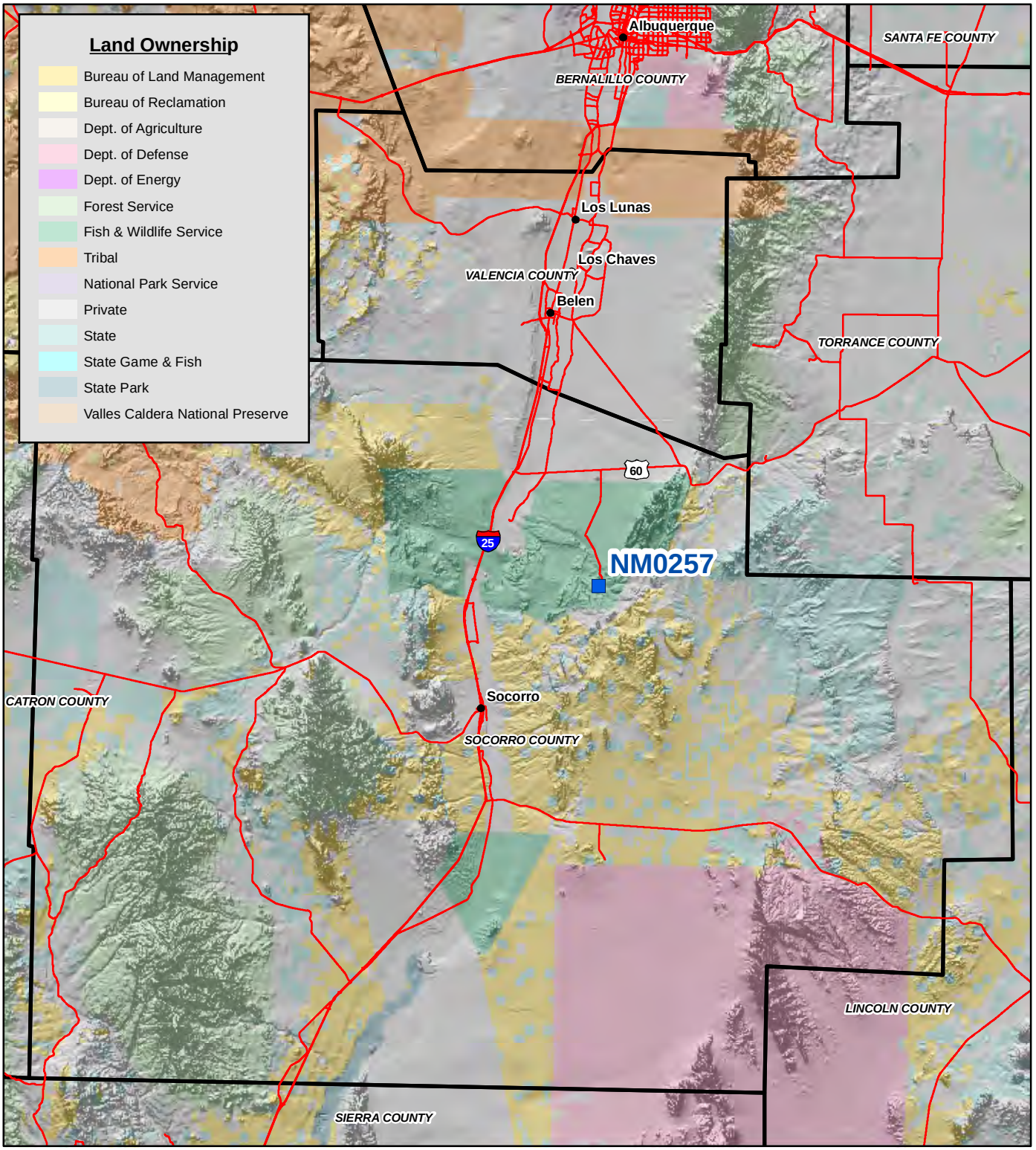
Marie-NM0257
Abandoned Uranium Mine Assessments

Reading ID	Associated Features	0 ft (µR/hr)	4 ft (µR/hr)	Associated Photos
Rad-1	CutPly-1	12	13	--
Rad-2	CutPly-2	33	32	--
Rad-3	PilePly-1	80	33	--
Rad-4	PilePly-2	120	90	--
Rad-5	CutPly-3	150	90	--
Rad-6	PilePly-2	140	80	--
Rad-7	PilePly-3	170	100	--
Rad-8	CutPly-4	110	60	--
Rad-9	PilePly-4	1000	340	--
Rad-10	PilePly-5	350	230	--
Rad-11	CutPly-5	15	14	--
RadBack-1	Access-1	10	10	--

Notes:

All gamma readings at this site taken by Ludlum 192 µR/Ratemeter
µR/hr=microroetgens per hour

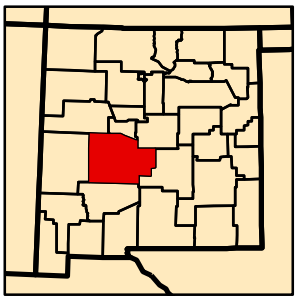
FIGURES



Map Source(s):
Ownership - BLM, 2008

0 7.5 15 30
Miles

NORTH



Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0257-Marie
Abandoned Uranium Mine Assessment

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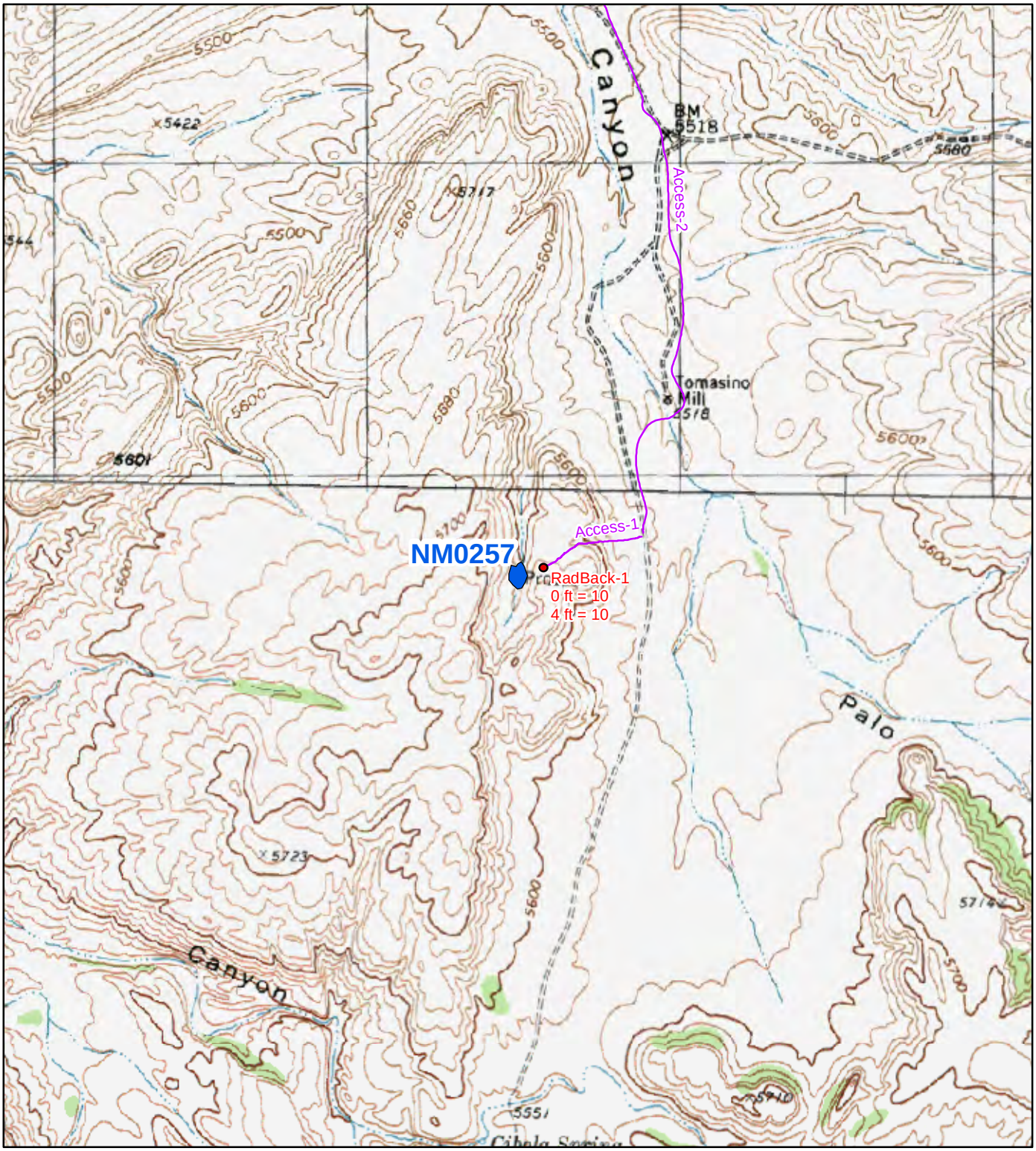

Map Source(s):
U.S. Geological Survey 7.5-Minute
Topographic Map
-Becker SW, 1952
-Sierra De La Cruz, 1972

0 750 1,500 3,000
Feet

NORTH

Note:
There are no wells within 1 mile of the Site.

Legend

- Radiation Readings (µR/hr)
- Access Route
- AUM Location Boundary (MMD Provided)

Figure 2
Topographic Map
NM0257-Marie
Abandoned Uranium
Mine Assessment

INTERA

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0257_Marie\GIS\Maps\Topo_Map_Marie_CP.mxd 05/07/2010

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosiac
-Socorro County, 2009

0 750 1,500 3,000
Feet

NORTH

Note:
There are no wells within 1 mile of the Site.

Legend

- Radiation Readings (µR/hr)
- Access Route
- AUM Location Boundary (MMD Provided)

Figure 3
Aerial Photo
NM0257-Marie
Abandoned Uranium Mine Assessment

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Legend

- Radiation Readings (µR/hr)
- Erosion Location
- Photo Location
- Access Route
- Open Cut Boundary
- Pile Boundary
- Structure Boundary

0 40 80 160

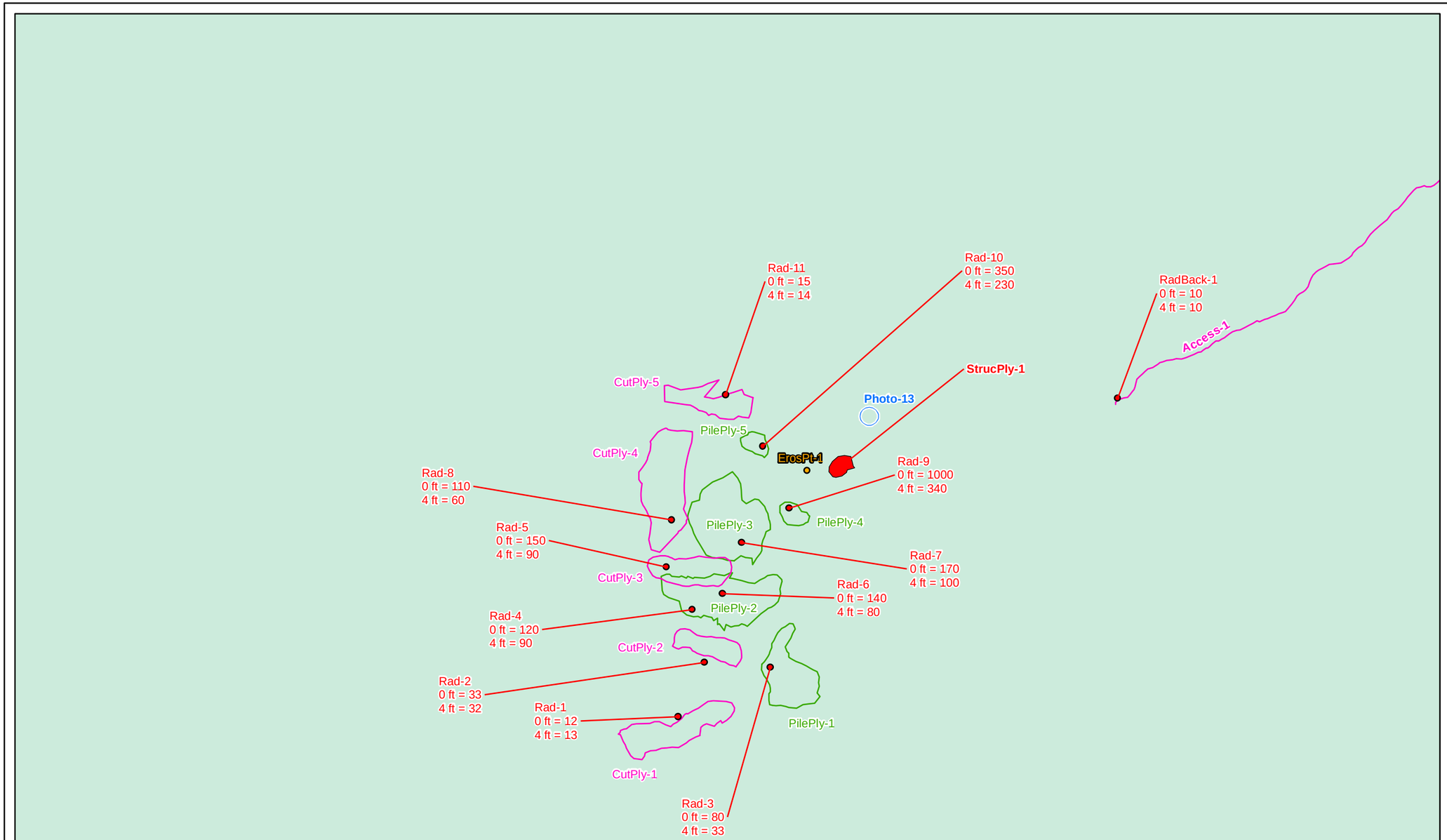
Feet

NORTH

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-Socorro County, 2009

Figure 4a
Site Map on
Aerial Photo
NM0257-Marie
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0257_Marie\GIS\Maps\CloseupAerial_Map_Marie_CP.mxd 05/07/2010



Legend

- Radiation Readings (µR/hr)
- Erosion Location
- Photo Location
- Access Route
- Open Cut Boundary
- Pile Boundary
- Structure Boundary

Surface Ownership

- Fish & Wildlife Service

0 40 80 160

Feet

NORTH

Map Source(s):
Ownership - BLM, 2008

Figure 4b
Site Map with
Surface Ownership
NM0257-Marie
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0257_Marie\GIS\Maps\CloseupOwnership_Map_Marie_CP.mxd 05/07/2010

APPENDIX A

PHOTO LOG

Note: Gaps in the numbering sequence of the photos is the result of removing photos not suitable for the report. A full set of photos is provided in the electronic deliverable.

Photo 1-Looking west at CutPly-1.

Photo 2-Looking west at PilePly-1.

Photo 3-Looking west at CutPly-2.

Photo 4-Looking west at CutPly-3.

Photo 5-Looking southwest at PilePly-2.

Photo 6-Looking north at PilePly-3.

Photo 7-Looking west at CutPly-4.

Photo 8-Looking southeast at PilePly-4.

Photo 9-Looking south at a gully (ErosPt-1).

Photo 10-Looking north at PilePly-5.

Photo 11-Looking west at CutPly-5.

Photo 12-Looking south at wooden planks (StrucPly-1).

Photo 13-Site photo, looking west.

APPENDIX B

FIELD NOTES

5/6/10 At Abandoned Uranium Mines

Site Name: NM0257, Marie

Objective: Site Assessment

Personnel: Danny Bowman
Annelia Tinklenberg

Equipment: Rental truck, Trimbel GeoXM (SN: 4948447 27, 2008 Series), Ludlum 192 (SN: 234149), Fujifilm digital camera (No. 80839493), backup Garmin GPS, cell phone amplifier, field laptop

1300 At AUM site.

CutPly1 - 5' high; 20' wide; 75' long
Photo1 - CutPly-1 looking west
Rad1 - CutPly-1; 0m - 12 ~~MR~~/h; 1m - 13 uR/h

Rad2 - between CutPly1 and CutPly2; 0m - 33uR/h; 1m - 32uR/h

PilePly-1 - 4' high, 30' wide, 44' long
Photo 2 - PilePly-1; ~~On~~ At looking ~~east~~ At west
Rad ~~3~~ - PilePly-1; 0m - 80 uR/h; 1m - 33 uR/h

CutPly2 - 5' deep; 15' wide, 50' long
Photo3 - CutPly2 looking ~~east~~ At west
Rad 4 - CutPly2; 0m - 120uR/h; 1m - 90 uR/h

CutPly3 - 3' deep, 18' wide; 60' long
Photo 4 - CutPly3 looking ~~east~~ At west
Rad 5 - CutPly3; 0m - 150 uR/h; 1m - 90 uR/h

PilePly2 - 3' high; 6' wide; 40' long
Photo 5 - PilePly2 looking southwest
Rad 6 - PilePly2; 0m - 140uR/h; 1m - 80 uR/h

PilePly 3 - 8' high; 60' wide; 60' long
Photo 6 - PilePly3 looking north
Rad 7 - PilePly 3; Om-120 uR/h; 1m-100 uR/h

CutPly 4 - 15' deep; 40' wide; 75' long
Photo 7 - CutPly 4 looking west
Rad 8 - CutPly-4; Om-110 uR/h; 1m-60 uR/h

PilePly 4 - 5' high; 15' wide, 15' long
Photo 8 - PilePly-4 looking southeast
Rad 9 - PilePly 4; Om-1000 uR/h; 1m-340 uR/h

ErosPt-1 - headcut in the drainage; 5' deep, 20' wide, 40' long
Photo 9 - looking south at ErosPt-1

PilePly 5 - 6' high; 15' wide; 18' long
Photo 10 - PilePly 5 looking north
Rad 10 - PilePly 5; Om-350 uR/h; 1m-230 uR/h

CutPly 5 - 3' deep; 18' wide; ~~40'~~ ALT long 60'
Photo 11 - CutPly 5 looking west
Rad 11 - CutPly 5; Om-15 uR/h; 1m-14 uR/h

StructPly-1 - 15' x 15', timber
Photo 12 - StructPly-1 looking south

Photo 13 - Site Name looking west

Rad Background - Om-10 uR/h; 1m-10 uR/h

AccessRd-1 - Back to Road

1445 - Back at truck

Soils: Light tan sandy to silty.
Rocks: Gray - tan Madera Limestone and red Abo sandstone
Human Activities: Current use is limited to Sevilleta Refuge research. Past use included grazing and mining. Evidence of grazing was an old windmill and corral.

Wildlife: Horny toad lizard, other small lizards, rabbit droppings. Small birds, rattlesnake.