Abandoned Uranium Mine Assessment for the Red Head Site (NM0183)

FINAL REPORT

Prepared For:

New Mexico Energy, Minerals and
Natural Resources Department
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INTERA

November 05, 2010

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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 Red Head Site (AUM Site), MMD ID: NM0183 on October 12, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

According to Anderson (1980) workings at the site consist of drill roads and an adit. The drilling activity encompasses several hundred square feet and the adit is 5 ft high, 5 ft wide and 50 ft deep (Anderson, 1980). The adit is driven into sandstone and conglomerate of the Permian Cutler Formation (Anderson, 1980). Anderson (1980) reported that 67 tons of ore with an average grade of 0.14% U_3O_8 were mined from the site in 1954 and 1955. According to McLemore (1983) 39 tons of ore yielding 121 pounds of 0.16% U_3O_8 were produced from the site in 1955.

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is located on State of New Mexico land, in the northeast quarter of Section 8, Township 22 North, Range 3 East. The AUM Site is in southern Rio Arriba County and is approximately 1.5 miles southwest of the town of Coyote. The location of this Site was provided to INTERA by MMD.

To reach the AUM Site from Albuquerque, drive approximately 57 miles north on Interstate 25 and take exit 282 for US-84 W/US-285 N. Continue through Santa Fe and follow US-84 W/US-285 N approximately 26 miles north to Espanola. In Espanola turn left on Paseo de Onate to continue following US-84 W/US-285 N. Continue 30 miles farther to the junction of US-84 and NM-96 and turn left onto NM-96 W. Go approximately 17.1 miles and turn left onto a gravel road about 1.5 miles west of Coyote. The AUM Site features are located approximately 0.4 miles south of this turnoff. Note that permission from the private landowner is necessary to access the site.

1.3 SITE GEOLOGY

The AUM Site is located in the southern part of the Chama Basin, a shallow structural basin bounded by the Nacimiento uplift to the west, the Brazos uplift and Tusas Mountains to the east and the Jemez Mountains to the south (Smith et al., 1961). Paleozoic and Mesozoic sedimentary rocks are exposed in the vicinity of the AUM Site. Minor uraniferous sedimentary copper deposits occur locally within sandstone of the Permian Cutler Formation and the Triassic Chinle Formation (McLemore and Chenoweth, 1989).

1.4 SITE HYDROGEOLOGY

The AUM Site is located near the southern boundary of the Rio Chama watershed which covers most of the Rio Chama Water Planning Region (La Calandria Associates, Inc., 2006). Surface

runoff at the AUM Site flows west into a drainage that joins the Rio Puerco approximately 0.5 miles north. The Rio Puerco drains into the Abiquiu Reservoir approximately 9.5 miles northeast of the AUM Site.

The Permian Cutler Formation constitutes a shallow aquifer that is exposed at the surface at the AUM Site. This aquifer consists of arkosic sandstone and mudstone deposits with minor conglomerate (La Calandria Associates, Inc., 2006). Shallow groundwater at the AUM Site flows north toward the Rio Puerco.

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the Arroyo del Agua 7.5 minute United States Geological Survey topographic map at an elevation of approximately 6,800 ft above mean sea level (please see Figure 2). The AUM Site is located along the eastern side of a north-south trending canyon within the foothills at the northern end of Mesa Ojitos. Figure 3 shows an aerial photograph of the terrain surrounding the AUM Site.

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. Two drillholes, one adit and three mine roads 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

An open adit (Adit-1) was identified at the AUM Site. The adit extends east into an exposure of Permian Cutler Formation sandstone just below the contact with the overlying Triassic Chinle Formation (see Photos 5, 6, and 7 in Appendix A). The opening of the adit is approximately 5 ft tall and 4 ft wide. The depth of the adit could not be determined. Gamma radiation at the entrance to the adit measured 800 µR/hr (microroentgens per hour) at 0 ft above ground at radiation survey point Rad-7 (see Table 2).

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

No open cuts or pits were identified at the AUM Site.

2.3 WASTE AND ORE PILES AND DISTURBANCES

No waste piles or disturbances were identified at the AUM Site.

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

No mining related buildings or foundations were found at the AUM Site.

2.5 OTHER MINE FEATURES

Three mine roads (Rd-1, Rd-2 and Rd-3) were found onsite. Rd-3 is adjacent to Adit-1 and extends approximately 250 ft north of the adit. Rd-1 is located upslope to the east of Rd-3 and extends approximately 1,200 ft north-south along the eastern rim of the canyon. Rd-2 runs northwest to southeast and is located approximately 500 ft east of Adit-1 (please see Figures 4a and 4b).

2.6 BOREHOLES

Two drillholes (Drill-1 and Drill-2) were found onsite. Drill-1 contains a 2 inch diameter metal pipe extending approximately 2 ft above the ground surface and located along Rd-1(see Photo 2 in Appendix A). Drill-2 was found approximately 250 ft northeast of Adit-1. It has a diameter of approximately 3 inches and also contains a metal pipe extending approximately 0.5 ft above the ground surface (see Photo 3 in Appendix A). The depth of the drillings could not be determined.

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 16 µR/hr at 0 ft above ground and 15 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 800 µR/hr at 0 ft above ground at radiation survey point Rad-7 at Adit-1. A second gamma radiation measurement taken near Adit-1 (radiation survey point Rad-8) recorded 180 µR/hr at 0 ft above ground and a measurement taken along Rd-3 recorded 130 µR/hr at 0 ft above ground (radiation survey point Rad-10).

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Human activity at the AUM Site and in the surrounding area included grazing and domestic dwellings within a 1 mile radius of the site (please see Figure 3).

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

Three private residences are located approximately 800 ft north of the AUM Site along the gravel road that leads to the area from NM-96. Several more residential structures are located within one mile northwest of the AUM Site along NM-96 (please see Figure 3).

5.3 NEARBY DOMESTIC WELLS

Five domestic wells lie within 1 mile of the AUM Site. These domestic wells were drilled from 1993 to 2007 and range in depth from 80 to 340 feet below ground surface with a depth to water of 18 to 25 feet below ground surface (NMOSE, 2008). Please see Figures 2 and 3 for the locations of the domestic wells.

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

Cow droppings, cow tracks, and fences observed near the AUM Site indicate that the land is used for cattle grazing. West of the AUM Site are agricultural fields along the Rio Puerco. Much of the land along NM-96 within one mile of the site is used for grazing and agriculture.

5.5 EVIDENCE OF WILDLIFE

Ravens, rabbits, a lizard, and deer droppings were seen at the AUM Site.

6.0 VEGETATION

The Red Head, Coyote Hill and Midcontinent sites are located in the Coniferous and Mixed Woodland vegetation type (Dick-Peddie, 1999). The vegetation photographs and samples collected are representative of these three sites (please see Photos 9 – 14 in Appendix A). Woody vegetation is dominated by pinyon pine, Utah juniper, rabbitbrush, and ephedra species. The grass species included blue grama and slender wheatgrass. Forb species are limited to barbwire Russian thistle and little hogweed. No noxious weeds were observed at the AUM Site.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

No evidence of mine related erosion was observed on site.

7.2 ENVIRONMENTAL IMPACTS

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

8.0 REFERENCES

Anderson, Orin J., 1980. Abandoned or Inactive Uranium Mines in New Mexico. New Mexico Bureau of Mines and Mineral Resources Open File Report 148.

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

La Calandria Associates, Inc., 2006. Rio Chama Regional Water Plan. Prepared for Rio de Chama Acequias Association and Rio Arriba County.

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

McLemore, Virginia T., and William L. Chenoweth, 1989. Uranium Resources in New Mexico. Socorro: New Mexico Bureau of Mines & Mineral Resources.

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

New Mexico Office of the State Engineer (NMOSE), 2008. Wells and Surface Diversions in New Mexico. WATERS_PODS_may08.shapefile. OSE Waters Database.

Smith, Clay T., Antonius J. Budding and Charles W. Pitrat, 1961. Geology of the Southeastern Part of the Chama Basin. Socorro: New Mexico Bureau of Mines & Mineral Resources Bulletin 75.

TABLES

Table 1
Site Features

Red Head-NM0183
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	No	Access	--	--	--	--	--	--	--	--	--	hiking
Access-2	No	Dirt	--	Dirt Maintained	--	--	--	--	--	--	--	--
Adit-1	Yes	--	--	--	5	4	--	Yes	No	--	NM0183_005 NM0183_006 NM0183_007	--
Drill-1	Yes	--	--	--	--	0.17	--	--	--	--	NM0183_002	--
Drill-2	Yes	--	--	--	--	0.25	--	--	--	--	NM0183_003	--
Rd-1	Yes	Dirt	--	Dirt Nonmaintained	--	--	--	--	--	--	NM0183_001	--
Rd-2	Yes	Dirt	--	Dirt Nonmaintained	--	--	--	--	--	--	NM0183_004	--
Rd-3	Yes	Dirt	--	Dirt Nonmaintained	--	--	--	--	--	--	NM0183_008	--

Notes:

-- designates no information

Table 2
Gamma Radiation Survey Results

Red Head-NM0183
Abandoned Uranium Mine Assessments

Reading ID	Associated Features	0 ft (µR/hr)	4 ft (µR/hr)	Associated Photos
Rad-1	rd-1	70	33	--
Rad-2	drill-1	13	13	--
Rad-3	drill-2	12	12	--
Rad-4	rd-2	17	15	--
Rad-5	--	10	11	--
Rad-6	--	12	12	--
Rad-7	adit-1	800	220	--
Rad-8	adit-1	180	110	--
Rad-9	rd-3	20	19	--
Rad-10	rd-3	130	70	--
RadBack-1	--	16	15	--

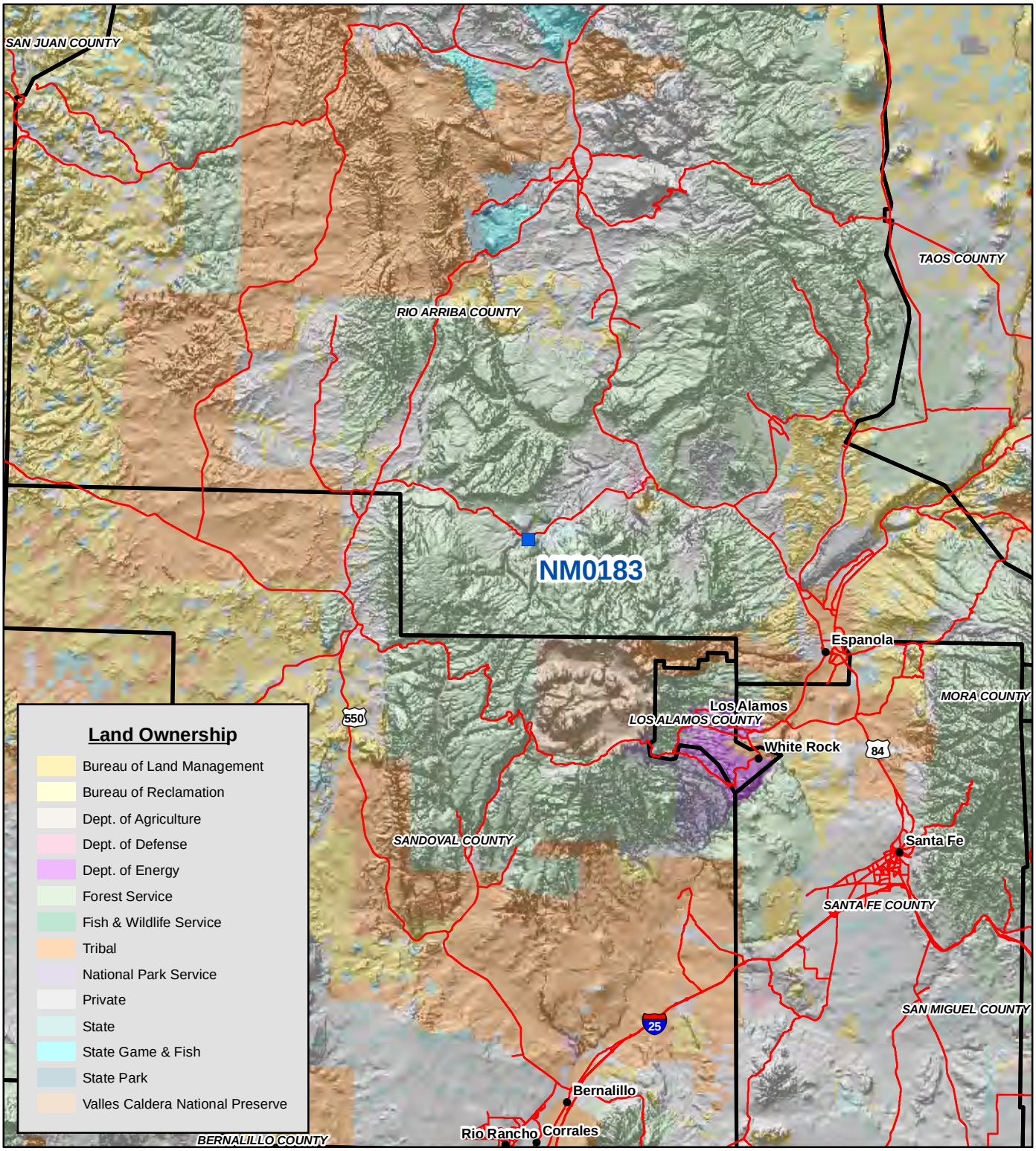
Notes:

All gamma readings at this site taken by Ludlum 192 µR/Ratemeter

µR/hr=microroetgens per hour

-- designates no information

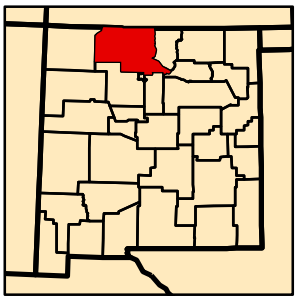
FIGURES



Map Source(s):
Ownership - BLM, 2008

0 7.5 15 30
Miles

NORTH



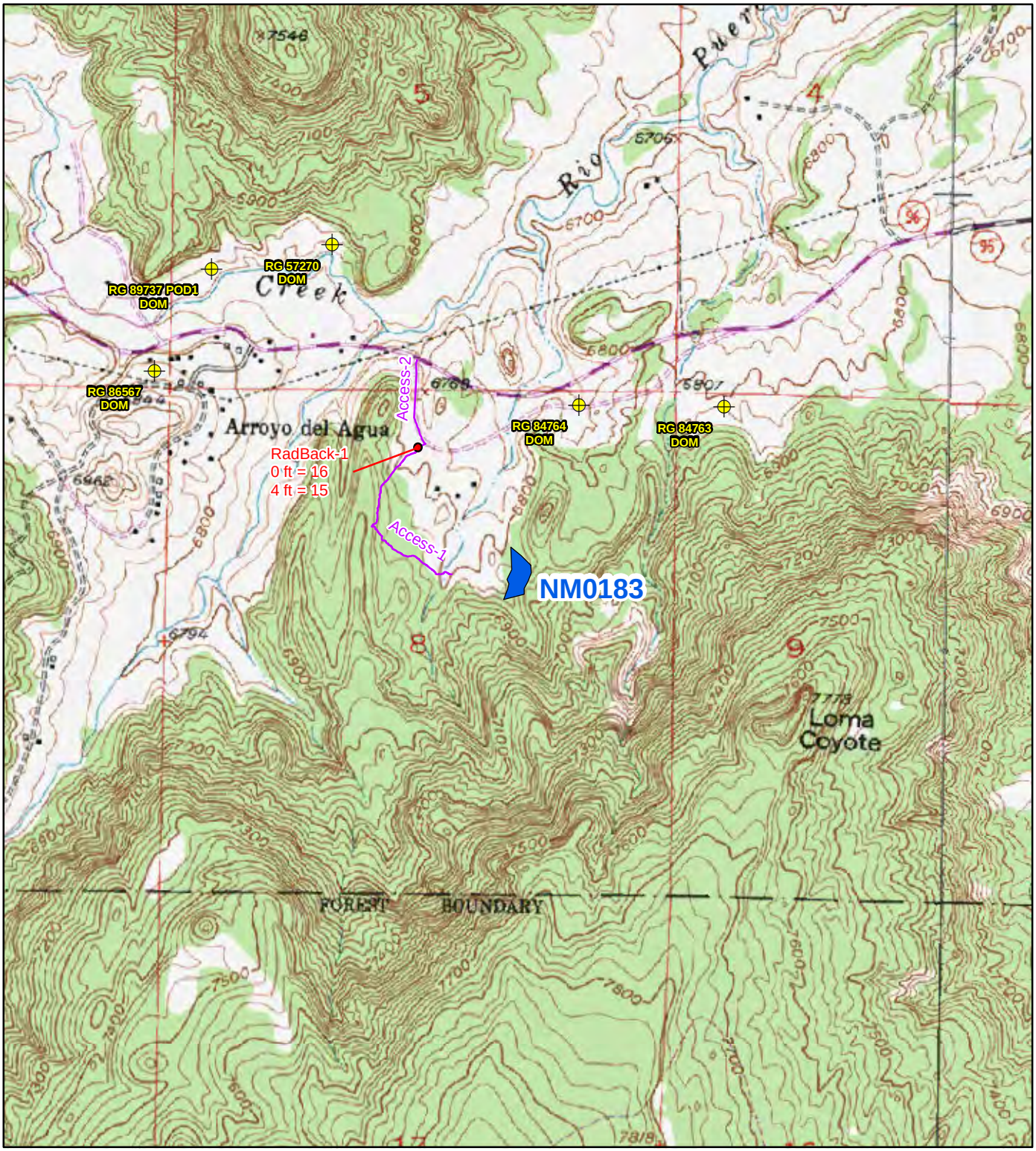
Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0183-Red Head
Abandoned Uranium Mine Assessment

INTERA

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0183-Red_Head\GIS\Maps\Site_Map_RedHead_CP.mxd 10/18/2010



Map Source(s):
U.S. Geological Survey 7.5-Minute
Topographic Map
-Arroyo Del Agua, 1979
-Youngsville, 1979

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Well Within 1 Mile of Site
- Access Route
- AUM Location Boundary (MMD Provided)

Figure 2
Topographic Map
NM0183-Red Head
Abandoned Uranium
Mine Assessment

INTERA

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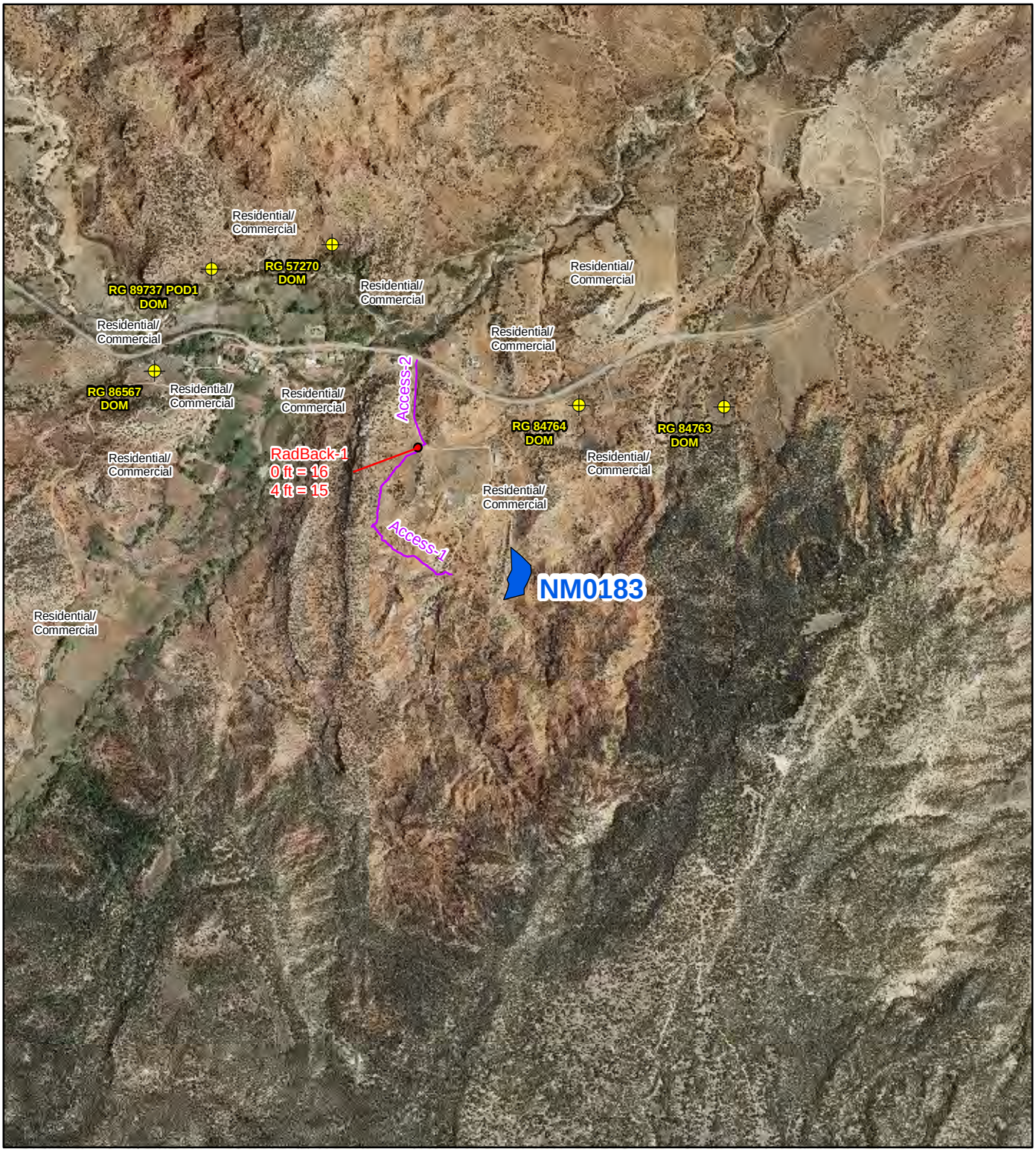

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-Rio Arriba County, 2009

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Well Within 1 Mile of Site
- Access Route
- AUM Location Boundary (MMD Provided)

Figure 3
Aerial Photo
NM0183-Red Head
Abandoned Uranium
Mine Assessment

INTERA

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0183-Red_Head\GIS\Maps\Aerial_Map_RedHead_CP.mxd 10/21/2010

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

0 60 120 240
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Adit
- Drill Hole
- Photo Location
- Mine Road
- Access Route

Figure 4a
Site Map on
Aerial Photo
NM0183-Red Head
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0183-Red_Head\GIS\Maps\CloseUpAerial_Map_RedHead_CP.mxd 10/18/2010

Rad-6
0 ft = 12
4 ft = 12

Rad-8
0 ft = 180
4 ft = 110

Access-1

Rad-3
0 ft = 12
4 ft = 12

Rad-7
0 ft = 800
4 ft = 220

Rd-3

Drill-2

Rad-10
0 ft = 130
4 ft = 70

Drill-1

Adit-1

Photo-8

Rd-2

Rad-5
0 ft = 10
4 ft = 11

Rad-4
0 ft = 17
4 ft = 15

Rad-9
0 ft = 20
4 ft = 19

Rad-2
0 ft = 13
4 ft = 13

Rd-1

Rad-1
0 ft = 70
4 ft = 33

Map Source(s):
Ownership - BLM, 2008

0 60 120 240
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Adit
- Drill Hole
- Photo Location
- Mine Road
- Access Route

Surface Ownership

- State

Figure 4b
Site Map with
Surface Ownership
NM0183-Red Head
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0183-Red_Head\GIS\Maps\CloseUpOwnership_Map_RedHead_CP.mxd 10/18/2010

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 north at Rd-1.

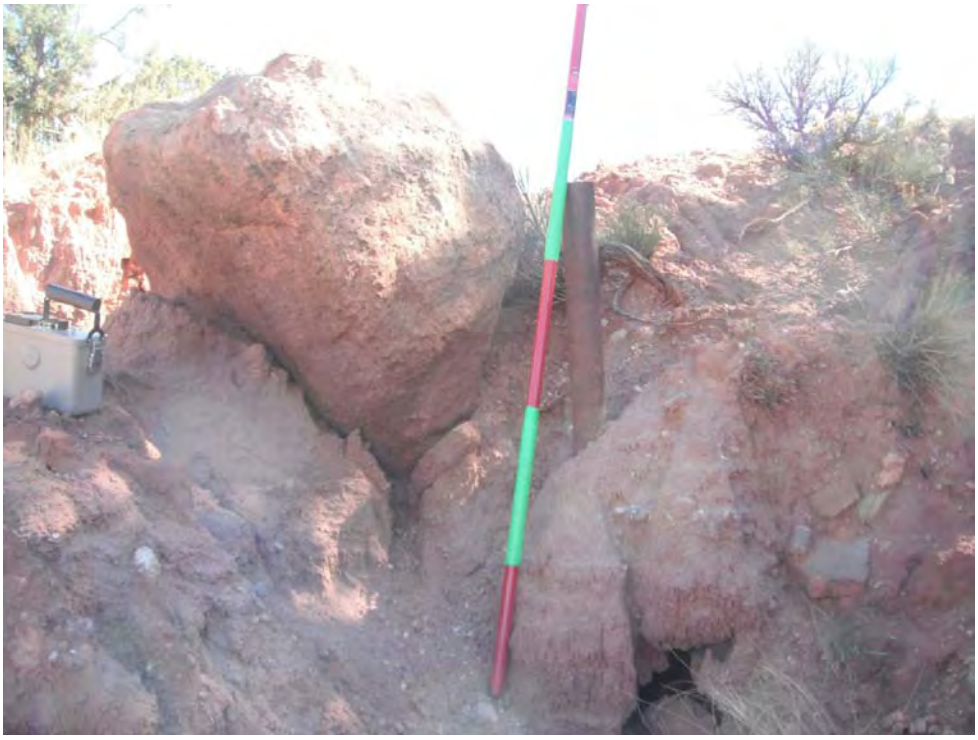

Photo 2-Looking east at Drill-1.

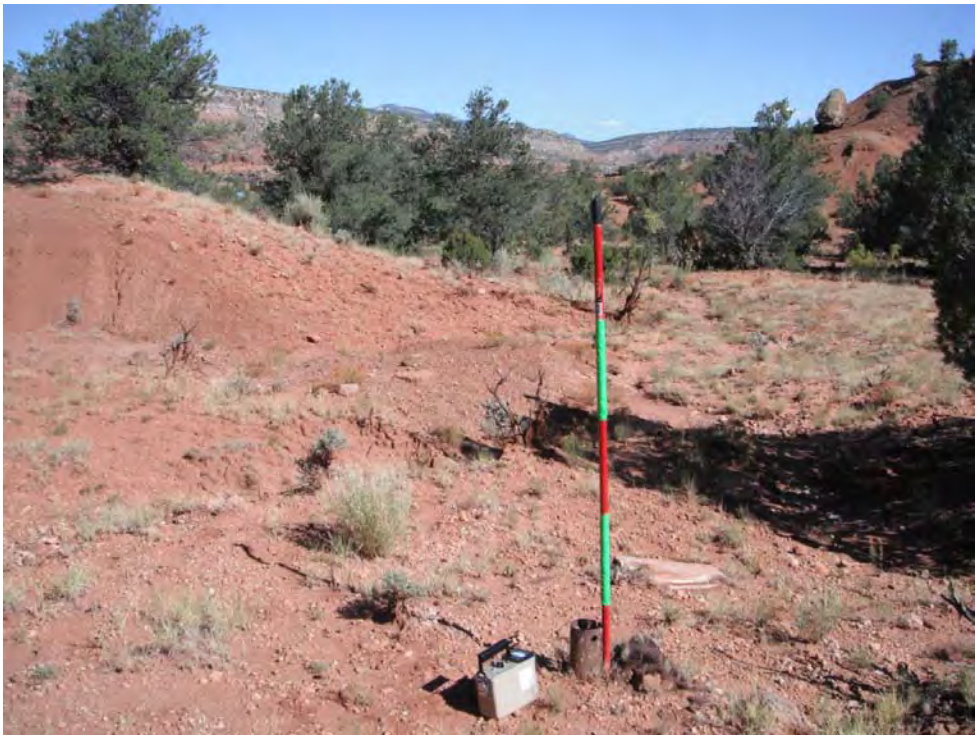

Photo 3-Looking north at Drill-2.

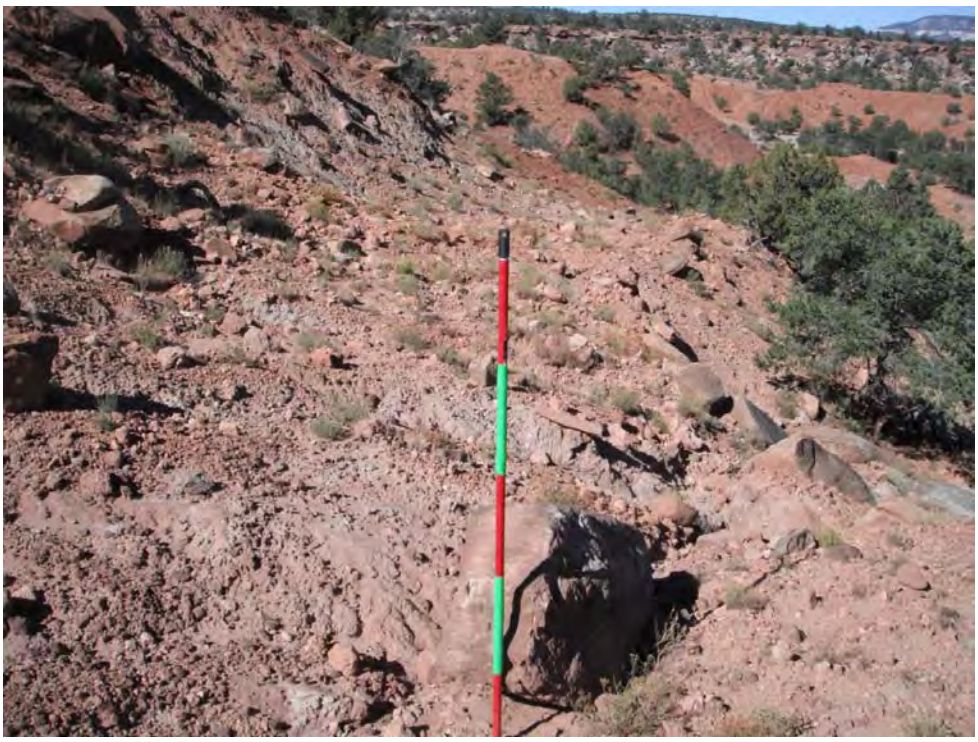

Photo 4-Looking west at Rd-2.

Photo 5-Looking east at Adit-1.

Photo 6-Looking east at wall of Adit-1.

Photo 7-Looking northeast at Adit-1, replicating Anderson photo B.

Photo 8-Looking north at Rd-3, replicating Anderson photo A.

Photo 9-Vegetation representative of the AUM Site.

Photo 10-Vegetation representative of the AUM Site.

Photo 11-Vegetation representative of the AUM Site.

Photo 12-Vegetation representative of the AUM Site.

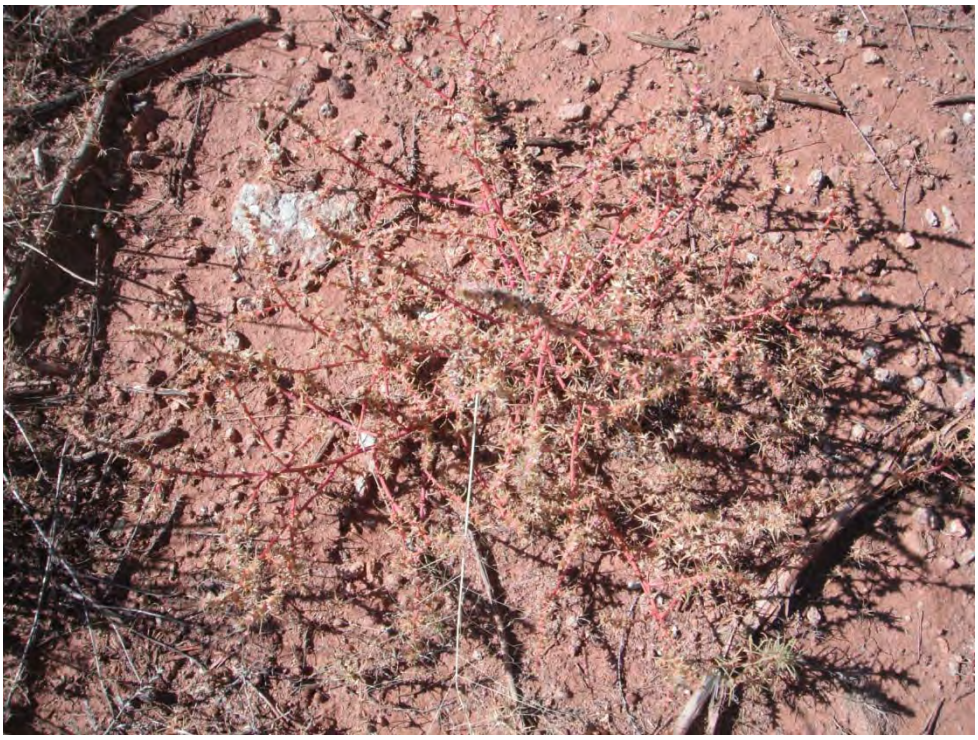

Photo 13-Vegetation representative of the AUM Site.

Photo 14-Vegetation representative of the AUM Site.

APPENDIX B

FIELD NOTES

Site Name: NM0183, Red Head

Objective: Site Assessment

Personnel: Annelia Tinklenberg
Alex Resovsky

Equipment: Rental truck, Trimbel GeoXM (SN: 4948447 27, 2008 Series), Ludlum 192 (SN: 234149), Fuji film digital camera (No. OTB31259), backup Garmin GPS, cell phone amplifier, field laptop.

830 Leaving Espanola for AUM sites.

1000 At Landowners gate, hike to site

1030 Looking for features, no visible features at Polygon

MineRd-1 - extending north-south up the canyon

Rad-1 - along MineRd-1; 0m - 70 uR/h; 1m - 33 uR/h

Photo-1 - looking ~~south~~ north ACT along MineRd-1

Drill-1 - 2" diameter metal pipe, along mineRd-1

Photo-2 - looking east at Drill-1

Rad-2 - Drill-1; 0m - 13 uR/h; 1m - 13 uR/h

Drill-2 - 3" diameter metal pipe

Photo-3 - looking north at Drill-2

Rad 3 - Drill-2; 0m - 12 uR/h; 1m - 12 uR/h

MineRd-2 - extending east-west

Photo 4 - looking west at MineRd-2

Rad 4 - MineRd-2; 0m - 17 uR/h; 1m - 15 uR/h

Rad 5 - south end of polygon; 0m - 10 uR/h; 1m - 11 uR/h - no visible mine features

Rad 6 - north end of polygon; 0m - 12 uR/h; 1m - 12 uR/h - no visible mine features

Adit-1 - 5' tall, 4' wide, unknown - filling in with sand and mud

Photo 5 - looking east at Adit 1

Rad 7 - Adit-1; 0m - 800 uR/h; 1m - 220 uR/h - entrance to adit

Rad 8 - Adit-1 rock outcrop; 0m - 180 uR/h; 1m - 110 uR/h

Photo 6 - Adit-1, looking at Adit wall, east

Photo 7 - Adit-1, looking northeast at Adit-1, replicating Anderson Photo b.

Rad 9 - mineRd-3 - 0m - 20 uR/h; 1m - 19 uR/h

Rad 10 - west of mineRd 3 and Adit-1; 0m - 130 uR/h; 1m - 70 uR/h

MineRd-3 - extends north-south along canyon below MineRd-1, runs in front of Adit-1

Photo 8 - MineRd 3 looking north, replicating Anderson Photo a

AccessRd-1 - to mine site

Background Rad - 0m - 16 uR/h; 1m - 15 uR/h

R. ACT Vegetation, Soils, Wildlife, Rocks, and Human Activities same as NM0180.

Soils: Red - purple silty sand, highly erodable

Rocks: Red - purple Cutler Formation, sandstone

Wildlife: Rabbits, deer droppings, lizard, Ravens

Human Activities: Grazing - fences, cowprints and droppings. Domestic dwellings within a mile.