Abandoned Uranium Mine Assessment for the Coyote Hill Site (NM0180)

FINAL REPORT

Prepared For:

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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 Coyote Hill Site (AUM Site), MMD ID: NM0180 on October 12, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

According to McLemore (1983), workings at the site consist of a 200 ft long open cut within the Permian Cutler Formation sandstone. In 1954, 28 tons of ore yielding 56 pounds of 0.10% U_3O_8 were mined from the site (McLemore, 1983). Mineralization occurs along the base of a channelized conglomeratic sandstone deposit (McLemore, 1983).

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is located on State of New Mexico land, in the northwest 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 is located approximately 0.2 miles southwest of this turnoff and may be accessed on foot by hiking west from the gravel road over a low hill. Note that permission is necessary from the private landowner to access the site.

1.3 SITE GEOLOGY

The AUM Site is located along the southern rim 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). The AUM Site is located along a drainage that joins the Rio Puerco approximately 500 ft to the northwest. The Rio Puerco drains into the Abiquiu Reservoir approximately 9.3 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 slope a north-south trending drainage 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. One open cut and one mine road 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

One open cut (CutLn-1) was identified at the AUM Site. This feature is a 20 ft-high, 250 ft-long bench cut that exposes the Permian and Triassic sediments forming the hillside. The bench of the cut is approximately 25 ft wide (see Photos 1, 3, 4 and 5 in Appendix A). Several gamma radiation measurements were taken along the surface of the cut but none of the readings varied significantly above background level. The maximum gamma radiation measurement along CutLn-1 was 38 µR/hr (microroentgens per hour) at 0 ft above ground at radiation survey point Rad-2 (see Table 2).

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

One mine road (Rd-1) was identified onsite. Rd-1 is a ramp that leads north from the north end of the bench into the drainage below (see Figures 4a and 4b).

2.6 BOREHOLES

No boreholes were found at the AUM Site.

2.7 RECLAMATION ACTIVITIES

No reclamation activities were identified at the AUM Site.

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 14 µR/hr at 0 ft above ground and 14 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 gamma radiation readings at the AUM Site did not vary significantly above background levels. The highest radiation reading was at Rad-2, where 38 µR/hr was recorded along the contact between a reddish-brown shale layer and overlying coarse-grained sandstone. Please see Table 2 for details.

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 0.25 miles southeast of the AUM Site along the gravel road that leads to the area from NM-96. Several other homes and farms are located within 0.25 miles to the north and 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 prints, and fences observed near the AUM Site indicate that the land is used for cattle grazing. The land along the Rio Puerco west of the AUM Site is used for agriculture. 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, lizards, rabbits, and deer droppings were seen at the AUM Site.

6.0 VEGETATION

The Coyote Hill, Red Head, 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 7 – 12 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

Coyote Hill-NM0180
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	--	Dirt Nonmaintained	--	--	--	--	--	--	--	--
Access-2	No	Dirt	--	Dirt Maintained	--	--	--	--	--	--	--	--
CutLn-1	Yes	--	--	--	20	25	250	--	--	--	NM0180_001 NM0180_003 NM0180_004 NM0180_005	--
Rd-1	Yes	Dirt	--	Dirt Nonmaintained	--	--	--	--	--	--	NM0180_006	--

Notes:

-- designates no information

Table 2
Gamma Radiation Survey Results

Coyote Hill-NM0180
Abandoned Uranium Mine Assessments

Reading ID	Associated Features	0 ft (µR/hr)	4 ft (µR/hr)	Associated Photos
Rad-1	cutln-1	21	19	--
Rad-2	cutln-1	38	23	NM0180_002.jpg
Rad-3	--	16	15	--
Rad-4	cutln-1	22	18	--
Rad-5	cutln-1	21	19	--
Rad-6	cutln 1	15	14	--
Rad-7	cutln 1	25	17	--
Rad-8	--	27	23	--
Rad-9	cutln 1	21	17	--
Rad-10	cutln 1	20	18	--
Rad-11	rd-1	15	14	--
RadBack-1	--	14	14	--

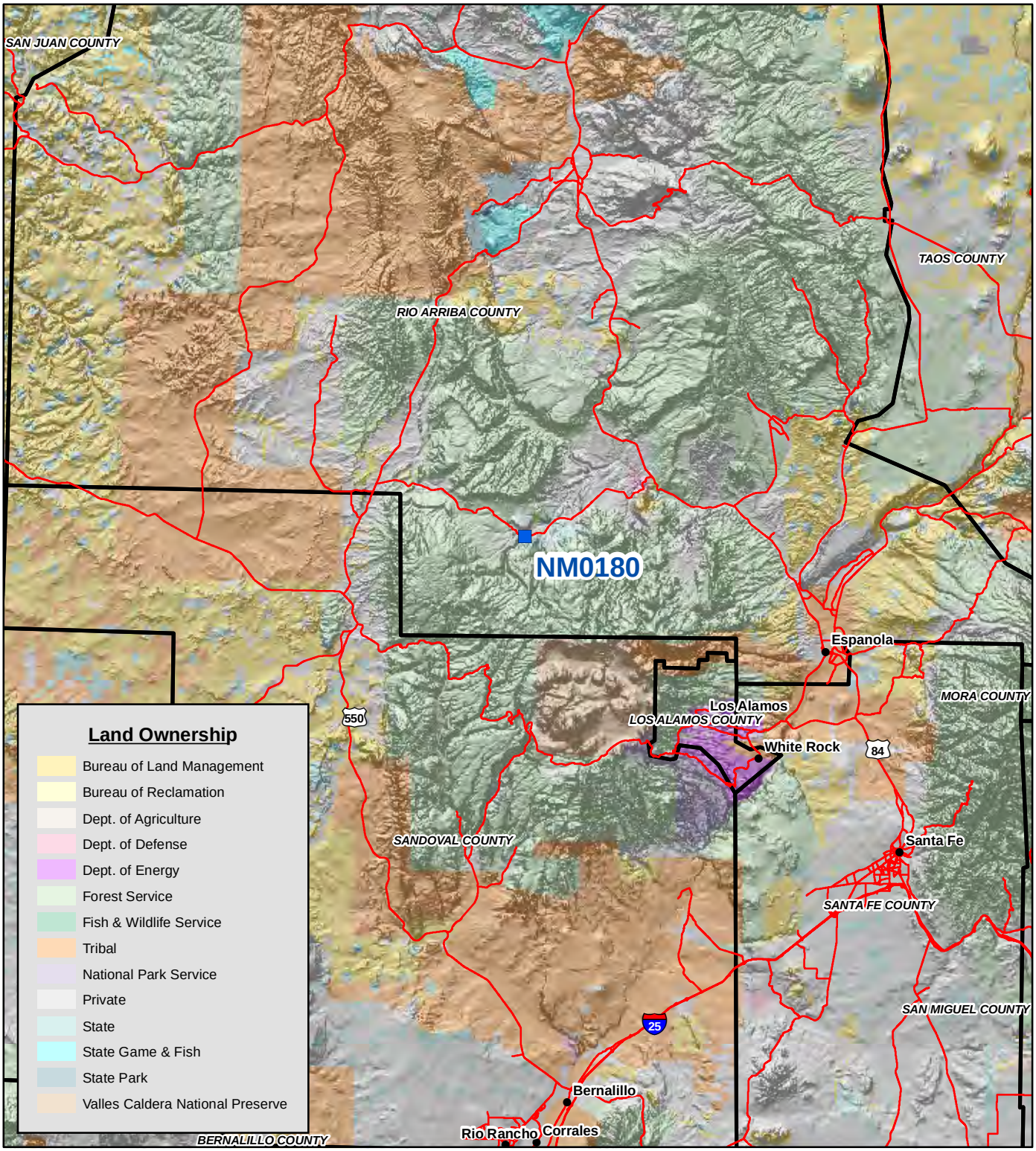
Notes:

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

µR/hr=microroetgens per hour

-- designates no information

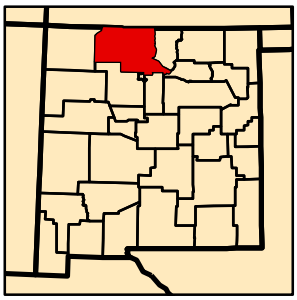
FIGURES



Map Source(s):
Ownership - BLM, 2008

0 7.5 15 30
Miles

NORTH

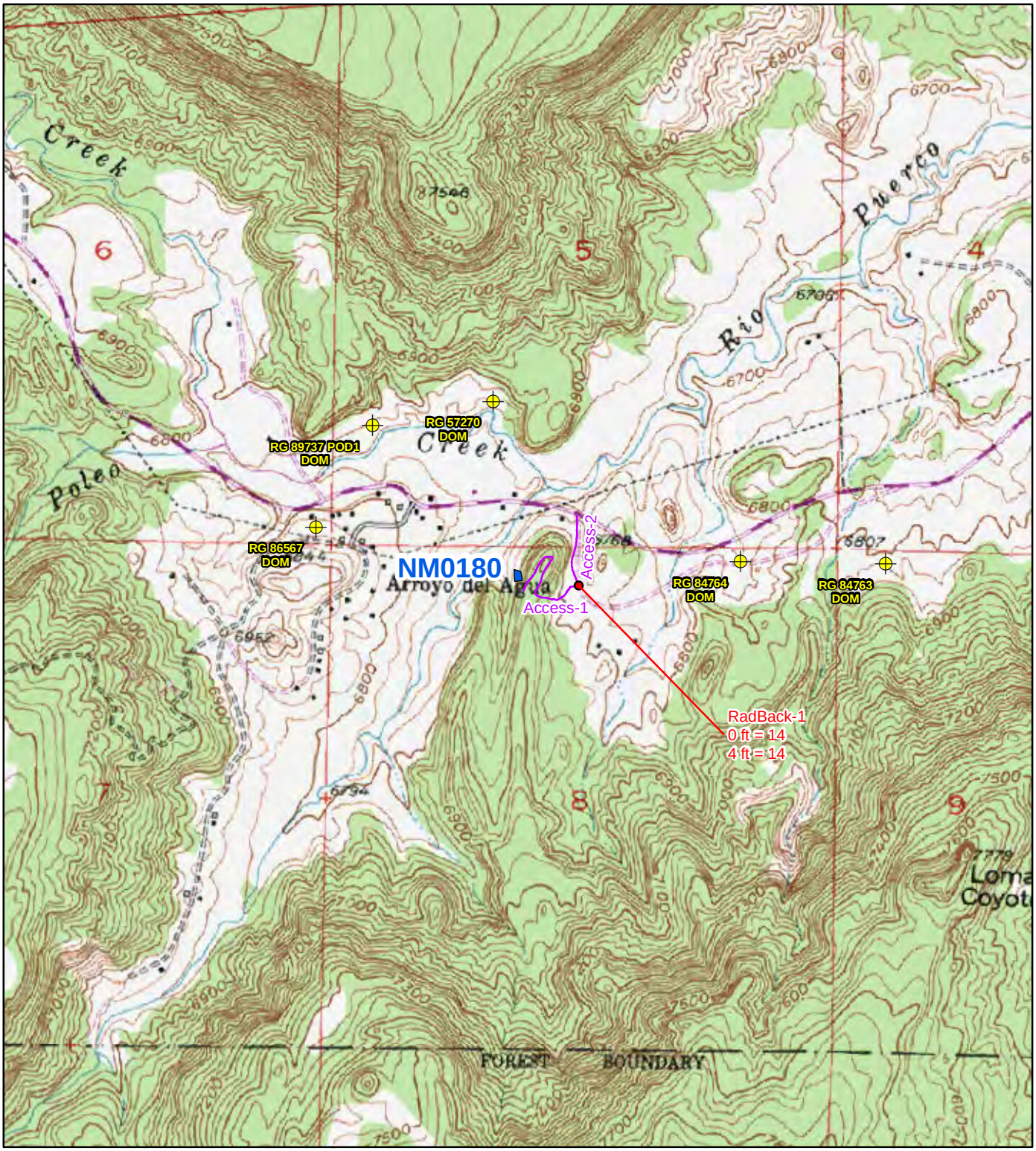


Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0180-Coyote Hill
Abandoned Uranium Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0180-Coyote_Hill\GIS\Maps\Site_Map_CoyoteHill_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
NM0180-Coyote Hill
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
NM0180-Coyote Hill
Abandoned Uranium
Mine Assessment

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

0 40 80 160
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Photo Location
- Open Cut
- Mine Road
- Access Route

Figure 4a
Site Map on
Aerial Photo
NM0180-Coyote Hill
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0180-Coyote_Hill\GIS\Maps\CloseUpAerial_Map_CoyoteHill_CP.mxd 10/18/2010

Rad-11
0 ft = 15
4 ft = 14

Rad-10
0 ft = 20
4 ft = 18

Rad-7
0 ft = 25
4 ft = 17

Rad-6
0 ft = 15
4 ft = 14

Rad-8
0 ft = 27
4 ft = 23

Rad-9
0 ft = 21
4 ft = 17

Rad-3
0 ft = 16
4 ft = 15

Rad-5
0 ft = 21
4 ft = 19

Rad-4
0 ft = 22
4 ft = 18

Rad-2
0 ft = 38
4 ft = 23

Rad-1
0 ft = 21
4 ft = 19

Rd-1

CutLn-1

Photo-3

Access-1

Map Source(s):
Ownership - BLM, 2008

0 40 80 160
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Photo Location
- Open Cut
- Mine Road
- Access Route

Surface Ownership

- Private

Figure 4b
Site Map with
Surface Ownership
NM0180-Coyote Hill
Abandoned Uranium
Mine Assessment

File: S:\Projects\EMMD-001_Abandoned Uranium Mine Assessment\Sites\NM0180-Coyote_Hill\GIS\Maps\CloseUpOwnership_Map_CoyoteHill_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 northern end of CutLn-1.

Photo 2-Looking east, closeup of contact at Rad-2.

Photo 3-Site location photo, looking north at CutLn-1.

Photo 4-Looking southeast at CutLn-1.

Photo 5-Looking east at CutLn-1.

Photo 6-Looking north at Rd-1.

Photo 7- Vegetation representative of the AUM Site.

Photo 8- Vegetation representative of the AUM Site.

Photo 9-Vegetation representative of the AUM Site.

Photo 10-Vegetation representative of the AUM Site.

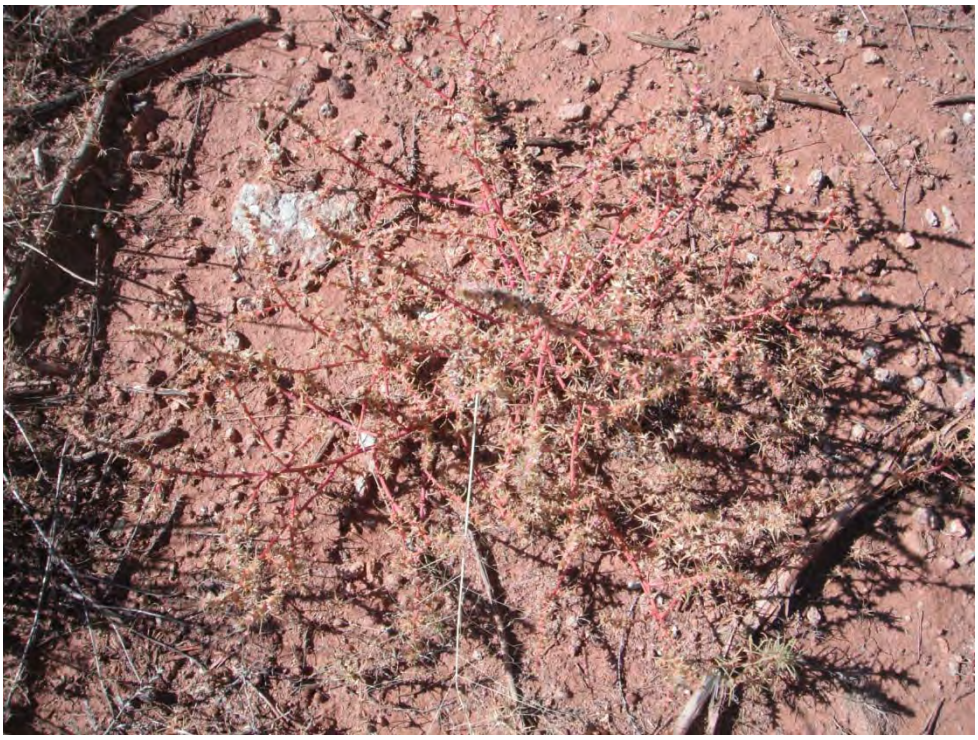

Photo 11-Vegetation representative of the AUM Site.

Photo 12-Vegetation representative of the AUM Site.

APPENDIX B

FIELD NOTES

Site Name: NM0180, Coyote Hill

Objective: Site Assessment

Personnel: Annelia Tinklenberg
Alex Resovsky

Equipment: Rental truck, Trimble GeoXM (SN: 4948447 27, 2008 Series), Ludlum 192 (SN: 234149), Fuji Film digital camera (No. 0TB31259), backup Garmin GPS, cell phone amplifier, ALT field laptop

1200 Leaving truck for site.

1230 At AUM Polygon

Cut In-1 - 20', 25' wide, 250' long

Rad-1 - Cut In-1; 0m - 21 uR/h; 1m - 19 uR/h

Photo-1 - north end of cut in-1 looking north

Rad 2 - cut in-1, contact between Permian Cutler and overlying sandstone; 0m - 38 uR/h; 1m - 23 uR/h

Photo-2 - Rad2 close up of contact looking east

Photo 3 - Site ID location looking north at ~~Cut In-1~~ ALT

Rad 3 - ~~Cut In-1~~ ALT; 0m - 16 uR/h; 1m - 15 uR/h

Photo 4 - Cut In-1 looking southeast

Photo 5 - Cut In-1 looking east

Rad 4 - cut in-1; 0m - 22 uR/h; 1m - 18 uR/h

Rad 5 - Cut In-1; 0m - 21 uR/h; 1m - 19 uR/h

Rad 6 - Cut In-1; 0m - 15 uR/h; 1m - 14 uR/h

Rad 7 - Cut In-1 - 0m - 25 uR/h; 1m - 17 uR/h

Rad 8 - ~~Cut In-1~~ ALT; 0m - 27 uR/h; 1m - 23 uR/h

Rad 9 - Cut In-1; 0m - 21 uR/h; 1m - 17 uR/h

Rad 10 - Cut In-1; 0m - 20 uR/h; 1m - 18 uR/h

Mine Rd-1 - extends north to private property

Photo 6 - Mine Rd-1 looking north

Rad 11 - mine Rd-1; 0m - 15 uR/h; 1m - 14 uR/h

Access Rd-1 - Hike out

Access Rd-2 - Gravel Road to NM 96

Background Rad - 0m - 14; 1m - 14 uR/h

Photos 9 - 14 - Vegetation (not in order due to vegetation collection for NM0180 and NM0183 combined).

Soils: Light tan to red-purple sand.

Rocks: Light tan conglomerate sandstone; red-purple Cutler Formation sandstone

Wildlife: Rabbit, ravens, lizards, deer droppings.

Human Activities: Grazing - fences cow droppings and prints. Agriculture fields within 1 mile to the west. Domestic dwellings within 1 mile ~~south~~ North of the site. ALT