

Abandoned Uranium Mine Site Assessment for the Bear Canyon Group Site (NM0138)

FINAL REPORT

Prepared For:



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NM0138

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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 Bear Canyon Group Site (AUM Site), MMD ID: NM0138 on April 28, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

According to McLemore (1983), three tons of ore yielding one pound of uranium was produced from the Bear Canyon Group in 1954. The mine consisted of pits, trenches, and one adit along an east-west trending radioactive magnetite vein hosted in an alaskite intrusion (McLemore, 1983). Anderson (1980) did not visit this Site.

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is on land managed by the U. S. Department of Agriculture Forest Service, in the eastern half of Section 9, Township 8 South, Range 17 East. The Site is located in Lincoln County, approximately 11 miles northeast of the town of Lincoln. The location of this Site was provided to INTERA by MMD.

To access the AUM Site from Albuquerque, drive south on Interstate 25 for 87 miles. Take Exit 139 towards San Antonio and continue east on US-380 for 85 miles, passing through the towns of San Antonio and Carrizozo. After 85 miles, turn left on NM-246 East, in the town of Capitan. Continue on NM-246 for 30 miles, and then turn right on Forest Service Road 156. Drive 4.6 miles on the Forest Service road, then park and hike approximately one mile to the AUM Site.

1.3 SITE GEOLOGY

The AUM Site lies within the Capitan Mountains, one of the few east-west trending mountain ranges in the state. The majority of the range consists of a Tertiary-age batholith intruding the Paleozoic-age sedimentary San Andres Formation. The majority of these sediments have eroded away, leaving a core of igneous intrusives. During the last ice age, rock glaciers formed on the northern slopes of the Capitan Mountains, leaving extensive talus deposits (Julyan, 2006).

Mine features at the Site are located on a magnetite vein trending North 80° W (McLemore, 1983). The vein is hosted in alaskite, an intrusive igneous rock composed mostly of quartz and alkali feldspar. The vein is interpreted to be a hydrothermal deposit, and resembles other small iron ore deposits in the area. Most iron ore occurrences in the Capitan area (including the deposit at the AUM Site) lie within several hundred feet of the igneous-sedimentary contact (Griswold, 1964).

The magnetite vein at the AUM Site is seldom exposed at the surface. However, fragments of dark, dense iron ore are scattered throughout the Site area, especially in and near the mine workings. The ore is not itself magnetic, but it will strongly attract magnets due to its iron content (see Photo 5 in Appendix A).

1.4 SITE HYDROGEOLOGY

The surface runoff at the AUM Site discharges north to Arroyo Seco, which joins Salt Creek and eventually the Pecos River to the east. Small pools and running water were observed in streambeds onsite (see Photo 33 in Appendix A), but these streams are intermittent, particularly in the alluvium beyond the mountain front.

The AUM Site is located in the northwestern portion of the Roswell Artesian Basin, near the northern boundary of the Hondo Underground Water Basin (NMOSE, 2005). The Roswell Artesian Basin consists of both shallow alluvial aquifers and a confined, artesian aquifer contained within the Paleozoic San Andres Formation. The San Andres and Yeso Formations outcrop northeast of the AUM Site, creating a recharge area for the artesian aquifer to the east (Barroll and Shoemaker, 2003).

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the Kyle Harrison Canyon 7.5 minute United States Geological Survey topographic map at an elevation of approximately 6700 ft above mean sea level (see Figure 2). The AUM Site is located on the northern slopes of the Capitan Mountains, an east-west trending range rising to over 10,000 ft above mean sea level (Julyan, 2006). Mine features are found in a series of narrow, steep walled canyons with occasional running water.

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 pit, one open cut, one trench, three piles, and two mine roads were found onsite. GPS data was logged for the pit (Pit-1) and one mine road (Rd-2), the other features were hand digitized due to lack of satellite coverage at the AUM Site. 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

McLemore (1983) reports an 80 ft long adit at the AUM Site; however no adit was found during the current survey.

2.2 MINING AND EXPLORATION PITS AND OPEN CUTS

One open cut (CutPly-1), one trench (Trench-1), and one pit (Pit-1) were found at the AUM Site. CutPly-1 was incised into a hillslope at the bottom of a narrow canyon (see Photo 7 in Appendix A). Trench-1 lies just north of CutPly-1 and trends upslope to the west (see Photo 4 in Appendix A). Large blocks of iron ore are present in the bottom of Trench-1 (see Photo 5 in Appendix A). Pit-1 (see Photo 36 in Appendix A) is located about 1200 ft west of CutPly-1 and Trench-1. The maximum gamma radiation measurement on these features was 24 μ R/hr at 4 ft above ground at radiation survey point Rad-4 in Trench-1.

2.3 WASTE AND ORE PILES AND DISTURBANCES

Three waste piles were found onsite. PilePly-1 consisted of overburden removed from Trench-1 (see Photo 6 in Appendix A). PilePly-2 and PilePly-3 are located at the bottom of the drainage and consist of overburden and rocks (see Photos 9 and 10). The maximum gamma radiation measurement on these piles was 27 $\mu\text{R/hr}$ at 0 ft above ground at radiation survey point Rad-4 on PilePly-1.

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

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

2.5 OTHER MINE FEATURES

A faint mine road (Rd-1 and Rd-2) was found on the eastern portion of the Site (see Photo 1 in Appendix A). The road lies on the western side of a small drainage, below CutPly-1 and Trench-1. Trees, deadfalls, and rockslides have rendered this road impassable. Rd-1 was logged using the GPS, and Rd-2 was hand digitized due to a lack of satellite coverage in the canyon.

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 19 $\mu\text{R/hr}$ at 0 ft above ground and 19 $\mu\text{R/hr}$ 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 27 $\mu\text{R/hr}$ at 0 ft above ground at radiation survey point Rad-4, associated with PilePly-1. A gamma radiation measurement taken directly on magnetite (radiation survey point Rad-10, see Photo 34 in Appendix A) recorded 18 $\mu\text{R/hr}$ at 0 ft above ground.

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Cows, cow droppings, cow prints, and horse prints were seen in the area, indicating that the Site is active ranchland. Camping pullouts and fire rings are located along the access road, and a pack trail passes less than 200 ft north of mine features.

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

Evidence of cows and horses indicates that the area is active ranchland.

5.5 EVIDENCE OF WILDLIFE

A gray squirrel, hawks, mountain bluebirds, nuthatches, hummingbirds, and other small birds were noted on or near the AUM Site. A canyon wren was heard but not seen. Deer droppings were present (see Photo 31 in Appendix A). Cottontail rabbit droppings and coyote scat were also identified on or near the AUM Site.

6.0 VEGETATION

The Bear Canyon Group site is located in the Coniferous and Mixed Woodland bordering the Montane Coniferous Forest vegetation type (Dirk-Peddie, 1999). The site was affected by a forest fire in 2004.

Woody vegetation is dominated by ponderosa pine, Gambel oak, Rocky Mountain maple, alligator juniper, and fir trees. Forbs were present at the site and included different aster species and common mullein. Grass species present were Poa Sp. and an unidentified bunchgrass. There was no evidence of noxious weeds at the AUM Site.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

No evidence of erosion was observed onsite.

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.
- Barroll, Peggy and John Shoemaker, 2003. Regional Hydrology of the Roswell Artesian Basin and the Capitan Aquifer *in* Peggy S. Johnson, Lewis A. Land, L. Greer Price, and Frank Titus, eds. Water Resources of the Lower Pecos region, New Mexico: Science, Policy, and a Look to the Future. Decision Maker's Field Conference, New Mexico Bureau of Geology and Mineral Resources, pp. 23-27.
- Dick-Peddie, William A., 1999. New Mexico Vegetation: Past, Present, and Future. University of New Mexico Press.
- Griswold, George B., 1964. Mineral Resources of Lincoln County *in* Ash, Sidney R. and Leon R. Davis, eds. New Mexico Geological Society Fall Field Conference Guidebook-15: Ruidoso Country. New Mexico Geological Society, pp. 148-151.
- Julyan, Robert, 2006. The Mountains of New Mexico. University of New Mexico Press.
- 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>

TABLES

**Table 1
Site Features**

**Bear Canyon Group-NM0138
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 Photo	Notes
Access-1	Yes	Access	--	None	--	--	--	--	--	--	--	hiking trail
Access-2	No	None	--	None	--	--	--	--	--	--	--	hiking trail
Access-3	No	Access	--	Dirt Nonmaintained	--	--	--	--	--	--	--	driving route
CutPly-1	Yes	--	--	--	20	50	150	--	--	--	NM0138_007 NM0138_008	--
MiscPt-1	Yes	McLemore (1983) site location	--	--	--	--	--	--	--	--	NM0138_035	--
PilePly-1	Yes	Waste	--	Soil	20	20	40	--	--	--	NM0138_006	--
PilePly-2	Yes	Waste	--	Rock	5	30	30	--	--	--	NM0138_009	--
PilePly-3	Yes	Waste	--	Rock	4	100	150	--	--	--	NM0138_010	--
Pit-1	Yes	Exploration	--	--	2	15	15	Yes	--	--	NM0138_036	--
Rd-1	Yes	2-Track	--	Dirt Nonmaintained	--	--	--	--	--	--	--	--
Rd-2	Yes	2-Track	--	Dirt Nonmaintained	--	--	--	--	--	--	NM0138_003	--
Trench-1	Yes	--	--	--	4	20	50	--	--	--	NM0138_004 NM0138_005	--

Notes:

-- designates no information



**Table 2
Gamma Radiation Survey Results**

**Bear Canyon Group-NM0138
Abandoned Uranium Mine Assessments**

Reading ID	0 ft (μ R/hr)	4 ft (μ R/hr)	Associated Photo	Associated Feature
Rad-1	22	21	NM0138_001	--
Rad-2	23	21	--	Rd-2
Rad-3	23	24	--	Trench-1
Rad-4	27	25	--	PilePly-1
Rad-5	21	19	--	CutPly-1
Rad-6	25	24	--	PilePly-2
Rad-7	23	23	--	PilePly-3
Rad-8	20	20	--	--
Rad-9	22	21	--	--
Rad-10	18	19	NM0138_034	--
Rad-11	19	20	--	--
Rad-12	12	15	--	Pit-1
RadBack-1	19	19	--	--

Notes:

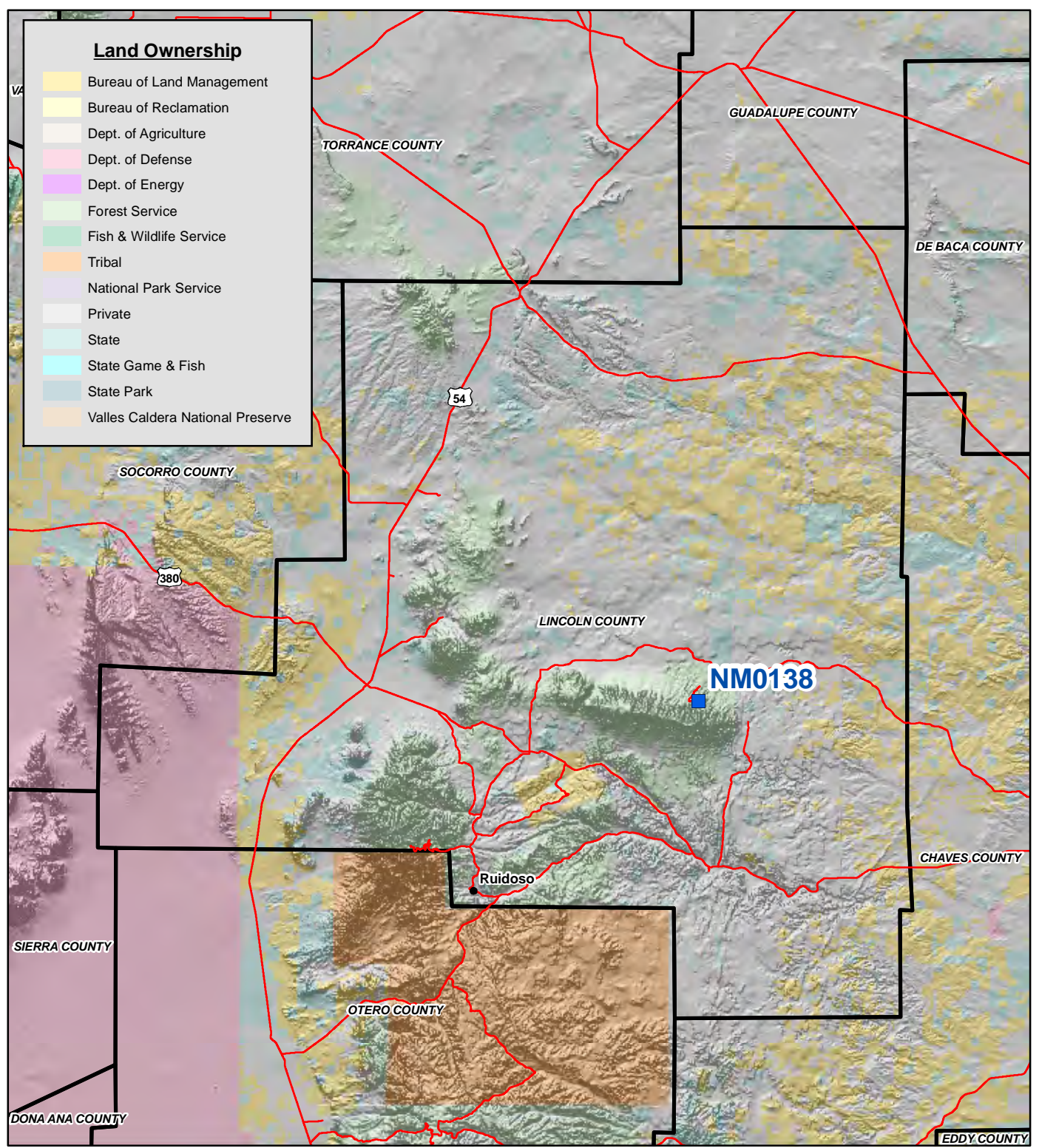
All gamma readings at this site taken by Ludlum 192 μ R/Ratemeter

μ R/hr=microroetgens per hour

-- designates no information



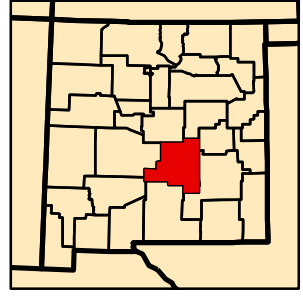
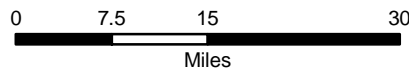
FIGURES



Land Ownership

- Bureau of Land Management
- Bureau of Reclamation
- Dept. of Agriculture
- Dept. of Defense
- Dept. of Energy
- Forest Service
- Fish & Wildlife Service
- Tribal
- National Park Service
- Private
- State
- State Game & Fish
- State Park
- Valles Caldera National Preserve

Map Source(s):
Ownership - BLM, 2008

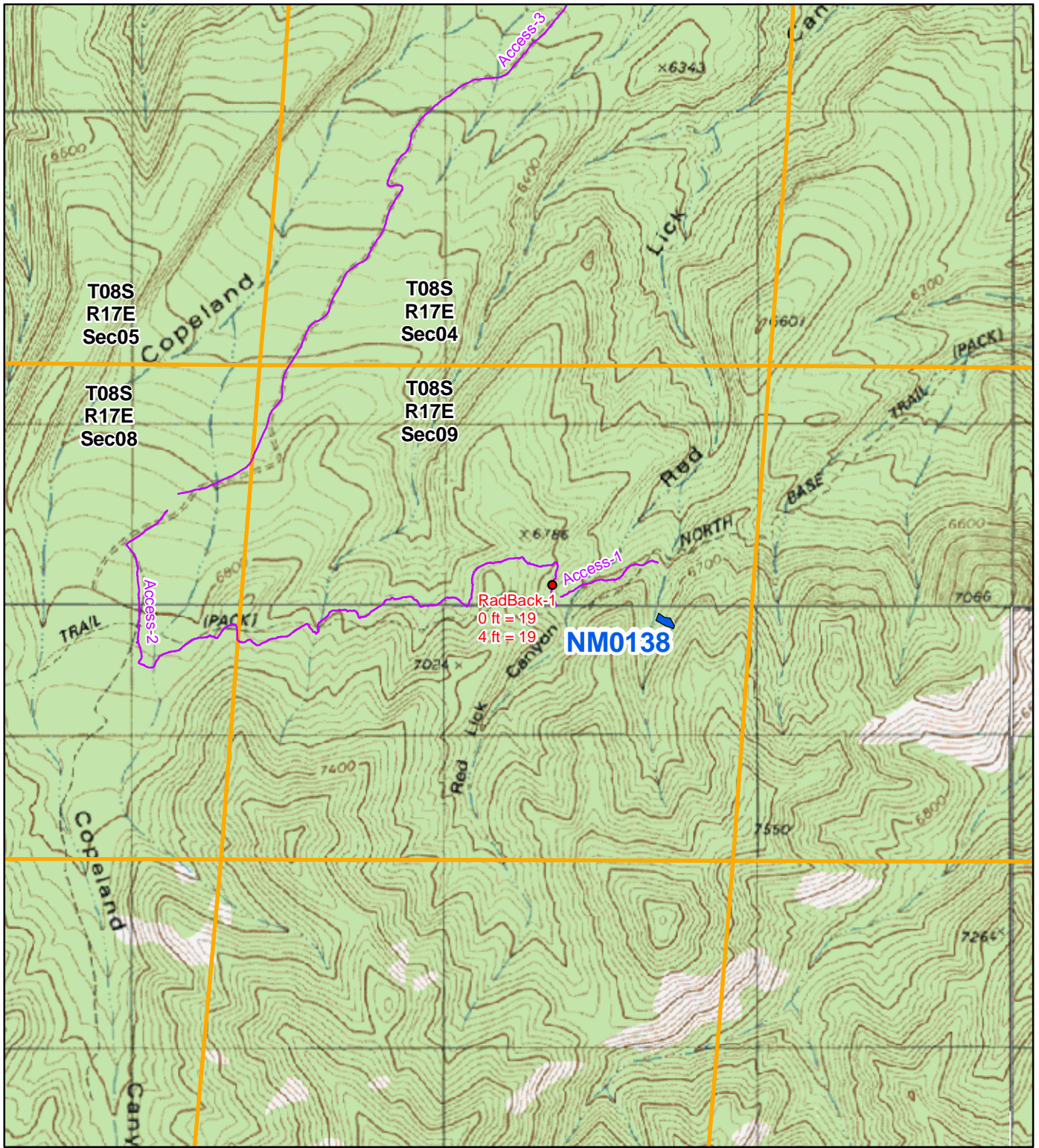


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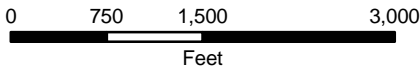
- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0138-Bear Canyon Group
Abandoned Uranium
Mine Assessment





Map Source(s):
 U.S. Geological Survey 7.5-Minute
 Topographic Map
 -Arabela, 1981
 -Arroyo Serrano West, 1981
 -Capitan Peak, 1981
 -Kyle Harrison Canyon, 1981



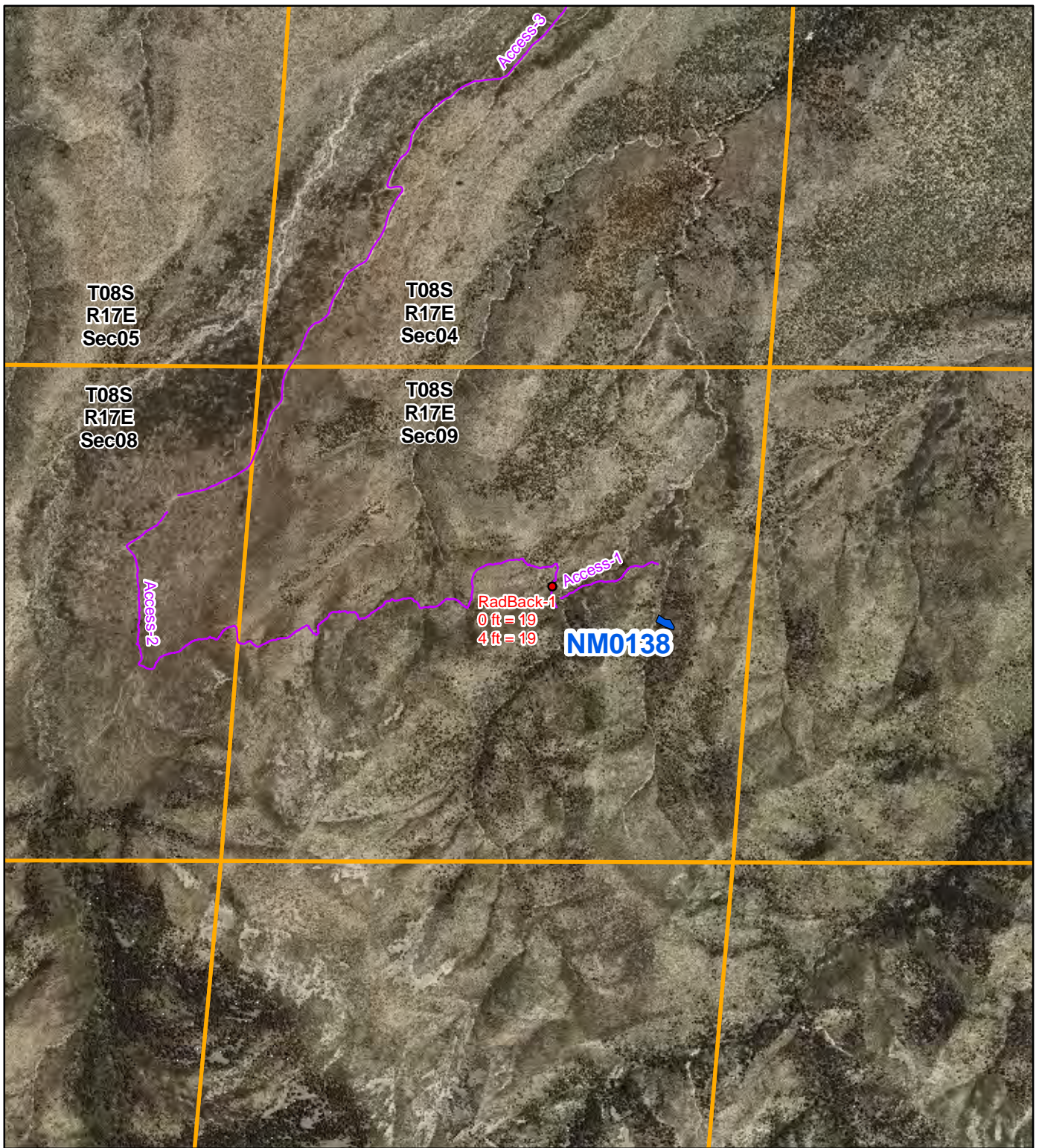
Note:
 There are no wells within 1 mile of the Site.

Legend

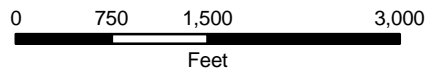
- Radiation Readings ($\mu\text{R/hr}$)
- Access Route
- AUM Location Boundary (MMD Provided)
- Section Boundary

Figure 2
Topographic Map
NM0138-Bear Canyon Group
 Abandoned Uranium
 Mine Assessment





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



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

Legend

- Radiation Readings ($\mu\text{R/hr}$)
- Access Route
- ▭ AUM Location Boundary (MMD Provided)
- Section Boundary

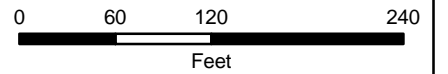
Figure 3
Aerial Photo
NM0138-Bear Canyon Group
 Abandoned Uranium
 Mine Assessment





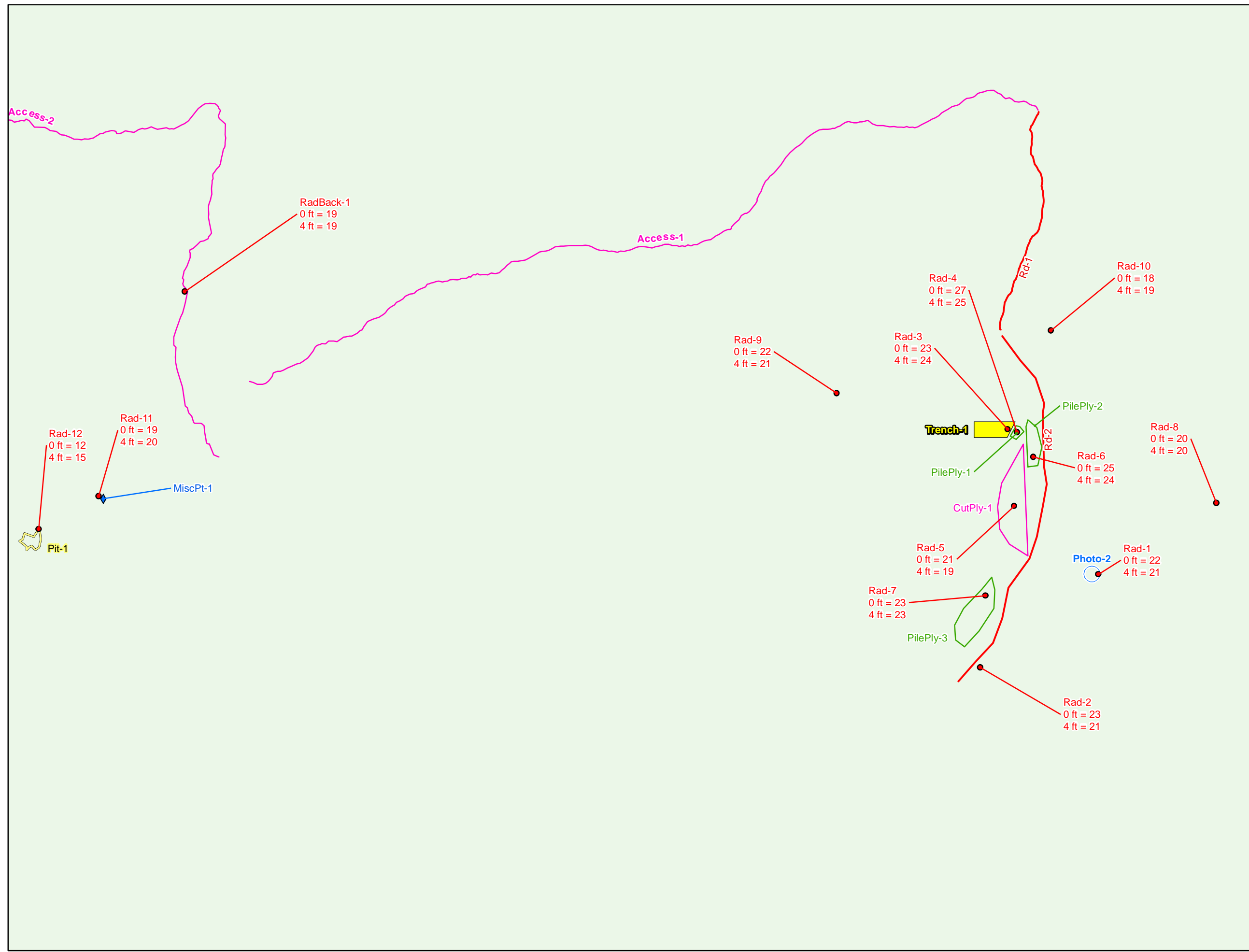
Legend

- Radiation Readings (µR/hr)
- Photo Location
- ◆ Miscellaneous Feature
- Access Route
- Mine Road
- Open Cut Boundary
- Pile Boundary
- Pit Boundary
- Trench



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

Figure 4a
 Site Map on
 Aerial Photo
 NM0138-Bear
 Canyon Group
 Abandoned Uranium
 Mine Assessment

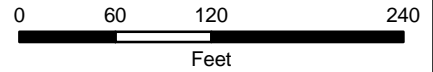


Legend

- Radiation Readings (µR/hr)
- Photo Location
- ◆ Miscellaneous Feature
- Access Route
- Mine Road
- Open Cut Boundary
- Pile Boundary
- Pit Boundary
- Trench

Surface Ownership

- Forest Service



Map Source(s):
Ownership - BLM, 2008

Figure 4b
Site Map with
Surface Ownership
NM0138-Bear
Canyon Group
 Abandoned Uranium
 Mine Assessment

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 south at radiation survey point Rad-1, at the center of the MMD-provided shapefile.



Photo 2-Site photo from above, looking northwest.



Photo 3-Looking south at Rd-1.



Photo 4-Looking west into Trench-1.



Photo 5-Iron ore exposed in Trench-1. Note magnet sticking to rock in upper right corner of photo.



Photo 6-Looking west at PilePly-1.



Photo 7-Looking southwest at CutPly-1.



Photo 8-Site photo, looking north.



Photo 9-Looking north at PilePly-2.



Photo 10-Looking south at PilePly-3.



Photo 30-AUM Site vegetation.



Photo 31-Deer scat found at the AUM Site.



Photo 33-A spring found downstream from the AUM Site.



Photo 34- Outcrop onsite (radiation survey point Rad-10, 19 μ R/hr at 4 ft above ground). Outcrop will attract magnets.

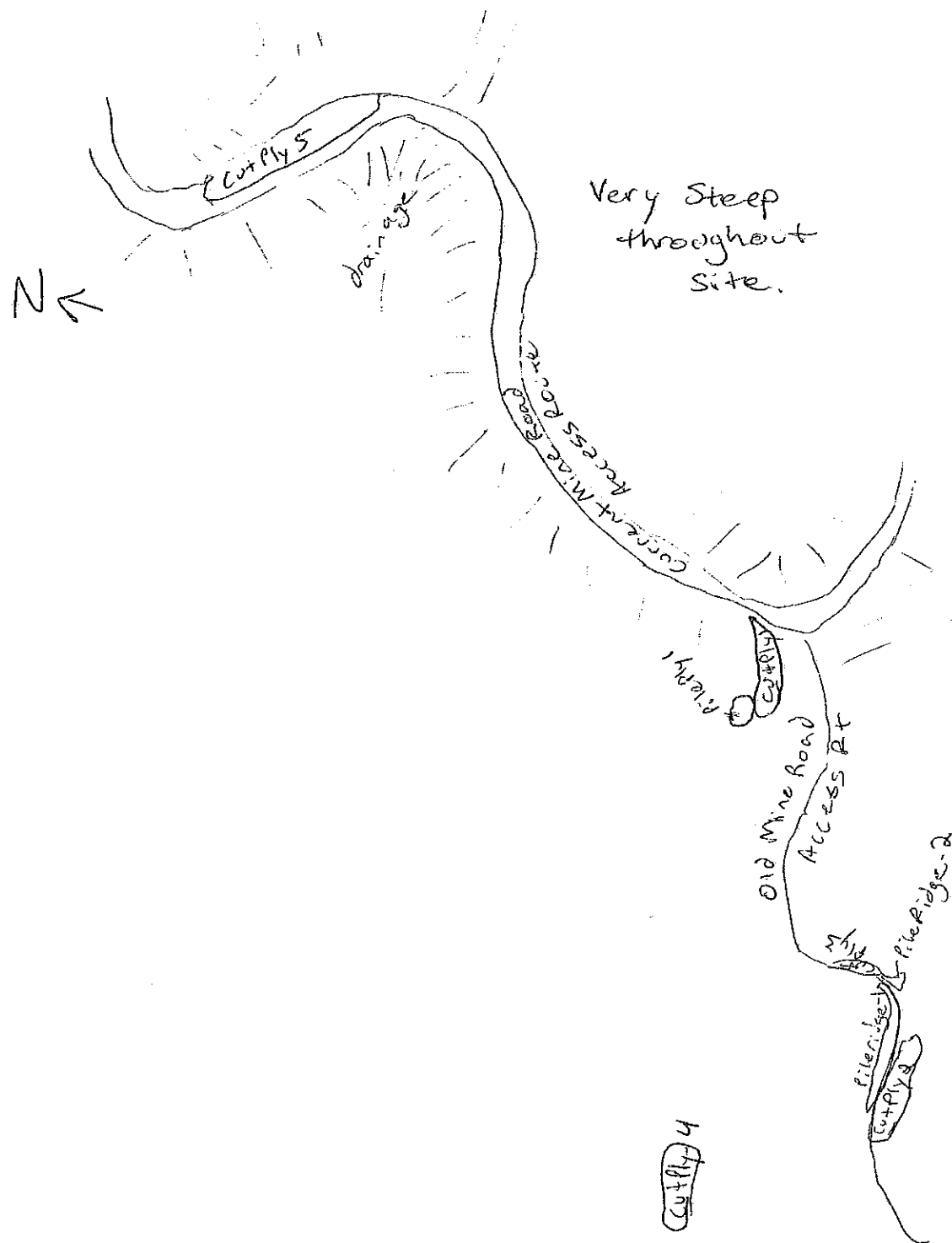


Photo 35-Location (MiscPt-1) of Site coordinates in McLemore (1983).



Photo 36-Looking south at Pit-1.

APPENDIX B
FIELD NOTES



Site Name: NM0138, Bear Canyon Group

Objective: Site Assessment

Personnel: Annelia Tinklenberg
Danny Bowman

Equipment: Rental truck, Trimble Geo XM (SN: 994844727, 2008 Series), Ludlum 192 (SN: 234119), Fuji film digital camera (No. 80839493), backup Garmin GPS, cell phone amplifier, field laptop

6:20 Left Albuquerque for Site

10:20 On FS 163 road to site, downed tree is blocking the access road, start hiking

11:30 At shapefile polygon provided by MMS.

Rad 1 - shapefile; 0m - 22 uR/h; 1m - 21 uR/h

Photo 1 - Rad 1 - MMS provided shapefile looking south

Photo 2 - site photo from above looking northwest

Rd-1 - Non-maintained mine road, not GPS'd, not enough satellites with precision at lowest setting, below MMS shapefile

Rad-2 - Rd-1, southern end; 0m - 23 uR/h; 1m - 21 uR/h

Trench-1; 4' deep; 20' wide; 50' long; cut into hillslope; trending west

Photo 4 - looking west into Trench-1

Rad 3 - Trench-1; 0m - 23 uR/h; 1m - 24 uR/h

Photo 5 - magnetite rock, exposed in Trench-1

Pileply-1 - 20' high; 20' wide; 40' long; Pile at entrance to Trench-1

Photo 6 - looking south at Pileply-1

Rad 4 - Pileply-1; 0m - 27 uR/h; 1m - 25 uR/h

15 4/28/10 ACT Abandoned Uranium Mines

cutPly-1 - 20' high; 50' wide; 150' long; south of trench-1
Photo 7 - looking west at cutPly-1
Rad 5 - cutPly-1 (northern end); Om - 21 uR/h; 1m - 19 uR/h

Photo 8 - site name looking north

PilePly-2 - 5' high; 30' wide, 30' long

Photo 9 - looking north at PilePly 2
Rad 6 - PilePly-2; Om - 25 uR/h; 1m - 24 uR/h

PilePly-3 - 4' high; 100' wide; 150' long; south of cutPly-1

Photo 10 - looking south at PilePly 3
Rad 7 - PilePly 3; Om - 23 uR/h; 1m - 23 uR/h

Rad 8 - east of features; Om - 20 uR/h; ^{ALT} 1m - 20 uR/h

Photos 11-26 - Vegetation

Rad 9 - west of features, following magnetite vein
Om - 22 uR/h; 1m - 21 uR/h

Photos 27-30 - Vegetation

Photo 31 - Scat

Photo 32 - Vegetation, Alligator Juniper

Photo 33 - Spring; along mine road to site

Photo 34 - Magnetite ^{ACT} near spring; outcrop or boulder

Rad 10 - Photo 34 - Om - 18 uR/h; 1m - 19 uR/h

MiscPt-1 - Mclemore lat/long position; no features

Photo 35 - MiscPt-1 looking west

Rad 11 - MiscPt-1; Om - 19 uR/h; 1m - 20 uR/h

Access - 1 - trail from MMD shapefile to Mclemore point

Access - 2 - trail from Mclemore point to FS 163

Access - 3 - FS 163

1400 ~~Leaving Site~~ Found Pit near Mclemore Point

4/28/10 ACT Abandoned Uranium Mines

16

Pit-1 - 2' deep; 15' wide, 15' long

Photo 36 - looking south at Pit-1

Rad 12 - Pit-1; Om - 12 uR/h; 1m - 14 uR/h

Rad back - Om - 19 uR/h; 1m - 19 uR/h

1430 - Hiked around looking for more features; pits, trenches and an adit. Did not find any. Very little ore as well

1435 Leaving for truck

1515 Pack up the truck to drive back to Albuquerque.

Soil: Rocky, thin, sandy soils. Tan to grey, locally dark humus in drainage areas.

Rocks: Tan-pink-white quartz-feldspar granite, Alaskite. Iron rich black-red magnetite-hematite locally.

Human Activities: Cows and evidence of cows (fences, cattle guards, droppings, etc) indicate grazing. Recreational use: camping pullouts with fire rings. Fire suppression work.

Note* A fire burned a large portion of the trees in the Capitan Mountains in 2004.

Wildlife: Gray squirrel, hawks, mountain bluebird, nuthatch, other small birds. Deer and cottontail droppings. Coyote scat. Ponderosa pine forest.

