

Abandoned Uranium Mine Site Assessment for the Little Rattler Site (NM0176)

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 Little Rattler Site (AUM Site), MMD ID: NM0176 on March 11, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

Anderson (1980) visited the Little Rattler site in 1979, finding an open cut, a small, linear pile, and an abandoned ore sorter. A few drill holes were also discovered. The mine was on private land at the fork of a tributary of the Revuelto Creek. Mine workings were in the Chinle Formation (Anderson, 1980).

Finch (1972) reported that 80 tons of ore was shipped from the Little Rattler, Windy, and Good Luck mines, all of which are located in the middle sandstone member of the Chinle Formation (Finch, 1972).

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site is on private land in the western half of Section 12, Township 11 North, Range 33 East. The Site is located in Quay County and is approximately 17 miles east-northeast of the town of Tucumcari and 7 miles northwest of the town of San Jon. The location of this site was provided to INTERA by MMD.

To access the AUM Site from Albuquerque, drive east on Interstate 40 for 192 miles. Take Exit 356 towards San Jon and turn right. Continue on this road until you reach U.S. 66. Turn right at U. S. 66 and drive west for 3 miles, paralleling Interstate 40. After 3 miles, you will see a bridge crossing the Interstate. Turn right, crossing the bridge and continuing north on Quay Road U for 5.5 miles, then turn left at Quay Road 65, passing through a wire gate onto private property. Stay on Quay Road 65 for 0.6 miles, and then turn left on a two track. After about 0.3 miles, there will be a barn and abandoned farm equipment on your right. Continue until a barbed wire fence crosses the road, and then proceed on foot to the AUM Site.

Note that permission from two private landowners is required in order to access and view the AUM Site. The access route from Quay Road 65 and the northwest quarter of Section 12 is owned by one individual, and the southwest quarter of Section 12, where the AUM Site is actually located, is owned by another individual.

1.3 SITE GEOLOGY

The AUM site is situated within a broad region of near-horizontal Jurassic and Triassic strata. The topography is typically flat, with some small canyons and valleys cut by local rivers (Spiegel, 1972).

The Site geology consists of the Upper Triassic Bull Canyon Formation overlain by Quaternary alluvium and aeolian deposits (USGS, 2003). The Bull Canyon Formation is part of the Chinle

Group, and previous literature describing the AUM Site refers to it as the “Chinle Formation.” A resistant sandstone layer in the Bull Canyon Formation creates a prominent cliff where it is exposed (see Photo 9 in Appendix A). This layer ranges from white to red in color and has well-defined crossbedding. A lower shale layer is gray-green with occasional yellow staining and sandstone lenses. Petrified wood is locally abundant in this layer at the AUM Site. Radioactive anomalies occur in limestone pebble conglomerate in the middle sandstone layer (see Photo 1 in Appendix A) and at the top of the lower shale layer (see Photo 12 in Appendix A).

1.4 SITE HYDROGEOLOGY

The surface runoff at the AUM Site discharges to Revuelto Creek, which drains into the Canadian River just east of the town of Logan. Stock tanks are present near the AUM Site, and a small canyon directly below the Site had running water. Numerous seeps and boggy areas were noted throughout the area.

The AUM Site is located in the Tucumcari Basin, defined by the New Mexico State Engineer in 1982. This basin falls between the Clayton Basin to the north, the Curry County Basin and Fort Sumner Basin to the south, the Canadian River basin to the west, and the Texas border to the east (DBSA, 2007). The Chinle Group is known to yield small amounts of water in the area. The regional groundwater movement is controlled by proximity to the Canadian River and its tributaries (Trauger, 1972). Therefore, the groundwater at the AUM Site most likely moves west toward Revuelto Creek.

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the San Jon Quadrangle 7.5 minute United States Geological Survey topographic map at an elevation of approximately 3900 feet above mean sea level (see Figure 2). The AUM Site is located on the eastern slope of the valley formed by Revuelto Creek. 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, two piles, an ore sorter, and a rock drill were found onsite. In addition, two mine roads (one including a culvert) and a barbed wire boundary fence were located nearby. Please see the Photo Log in Appendix A, Table 1 for a list of 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 was found at the AUM Site (CutPly-1). This open cut exposed gray-green shale below a sandstone caprock. The maximum gamma ray reading in this cut was 12 $\mu\text{R/hr}$ at contact.

2.3 WASTE AND ORE PILES AND DISTURBANCES

Two piles are located on the AUM Site. PilePt-1 is a small pile of soil and rock at the end of a mine road (Rd-1). The maximum gamma ray reading on this pile was 10 $\mu\text{R/hr}$ at contact. Another pile, Pileridge-1, is a linear mound paralleling CutPly-1. The maximum gamma ray reading on this pile was 40 $\mu\text{R/hr}$ at contact.

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

No mining related buildings and foundations were evident at the AUM Site.

2.5 OTHER MINE FEATURES

Two pieces of mine equipment were discovered onsite: a rock drill on the mesa to the east of CutPly-1, and an ore sorter mentioned by Anderson, 1980 (see photo "a" in the Anderson report, compare with Photo 23 in Appendix A of this report). Two mine roads, Rd-1 and Rd-2, provided access to CutPly-1 from above. A culvert was found in Rd-2.

2.6 BOREHOLES

Both the Anderson Report and the private landowner reported boreholes near the AUM Site, but no boreholes were found during the present survey.

2.7 RECLAMATION ACTIVITIES

No apparent reclamation activities have taken place 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 at the AUM Site, recording 6 $\mu\text{R/hr}$ at contact and 6 $\mu\text{R/hr}$ 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 reading for the AUM Site was 110 $\mu\text{R/hr}$ at contact at radiation survey point Rad-4. This reading was taken on yellow staining in a gray-green shale layer in the Bull Canyon Formation (see Photo 12 in Appendix A).

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

Fences, stock tanks, and the presence of cows indicate that the Site is active ranchland.

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

A barn or work shed is located about 0.4 miles northeast of the mine features. The nearest house is about a mile east-northeast of the Site.

5.3 NEARBY DOMESTIC WELLS

One domestic well and four irrigation wells are located within a mile of the site. The domestic well, designated TU 01030, was drilled in 1990 and is 50 feet deep. Depth to water was not reported. The four irrigation wells are designated SD 06326, SD 06327, TU 01347, and TU 01346.

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

Cows, cow trails, and cow droppings were noted in the area. Agricultural fields are present above the AUM Site, about 0.4 miles to the east.

5.5 EVIDENCE OF WILDLIFE

A great horned owl was seen onsite. Swallow nests were present under overhanging cliffs (see Photo 9 in Appendix A).

6.0 VEGETATION

The Little Rattler AUM Site is located in the Plains-Mesa Grassland vegetation type. Woody species include salt cedar, tree cholla, prickly pear, Christmas cholla, snakeweed, soapwood yucca, chamisa, and skunkbush sumac. Observed grass species included a species of dropseed (*Sporobolus* Sp.). No forbs were found at the site, and there was no evidence of herbaceous noxious weeds onsite. Salt cedar was present.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

A mine road (Rd-2) is being undermined by runoff spilling from a culvert (MiscPt-1).

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.
- Daniel B. Stephens & Associates, Inc (DBSA), 2007. Northeast New Mexico Regional Water Plan. Prepared for the City of Tucumcari and the Northeast New Mexico Regional Water Planning Steering Committee.
- Finch, Warren I., 1972. Uranium in Eastern New Mexico: New Mexico Geological Society, Guidebook to the 23rd Field Conference.
- 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.shapfile. OSE Waters Database.
- Scholle, Peter A., 2003. Geologic Map of New Mexico, 1:500,000: New Mexico Bureau of Geology and Mineral Resources.
- Spiegel, Zane, 1972. Problems of the Triassic Stratigraphy in the Canadian River Basin, Quay, San Miguel, and Guadalupe Counties, New Mexico: New Mexico Geological Society, Guidebook to the 23rd Field Conference.
- Trauger, F. D., 1972. Ground Water in East-Central New Mexico: New Mexico Geological Society, Guidebook to the 23rd Field Conference.

TABLES

**Table 1
Site Features**

**Little Rattler-NM0176
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 Road	--	--	--	--	--	--	--	--	--	--
CutPly-1	Yes	Open Cut	--	--	30	50	200	Yes	No	None	NM0176_018 NM0176_019 NM0176_020	--
Equip-1	Yes	Rock Drill	--	--	--	--	--	--	--	--	NM0176_003 NM0176_004 NM0176_005 NM0176_006 NM0176_007 NM0176_008	--
Equip-2	Yes	Ore Sorter	--	--	--	--	--	--	--	--	NM0176_010 NM0176_011	--
Fenc-1	Yes	Boundary Fence	--	Barbwire	--	--	--	--	--	--	--	--
MiscPt-1	Yes	Culvert	--	--	--	--	--	--	--	--	NM0176_024	under rd-2
PilePt-1	Yes	Pile	--	Waste	3	4	6	--	--	--	NM0176_013	--
Pileridge-1	Yes	Pile	--	Waste	4	20	180	--	--	--	NM0176_015 NM0176_016 NM0176_017	--
Rd-1	Yes	Mine Road	--	--	--	--	--	--	--	--	--	--
Rd-2	Yes	Mine Road	--	--	--	--	--	--	--	--	NM0176_024	--

Notes:

-- designates no information



**Little Rattler-NM0176
Abandoned Uranium Mine Assessments**

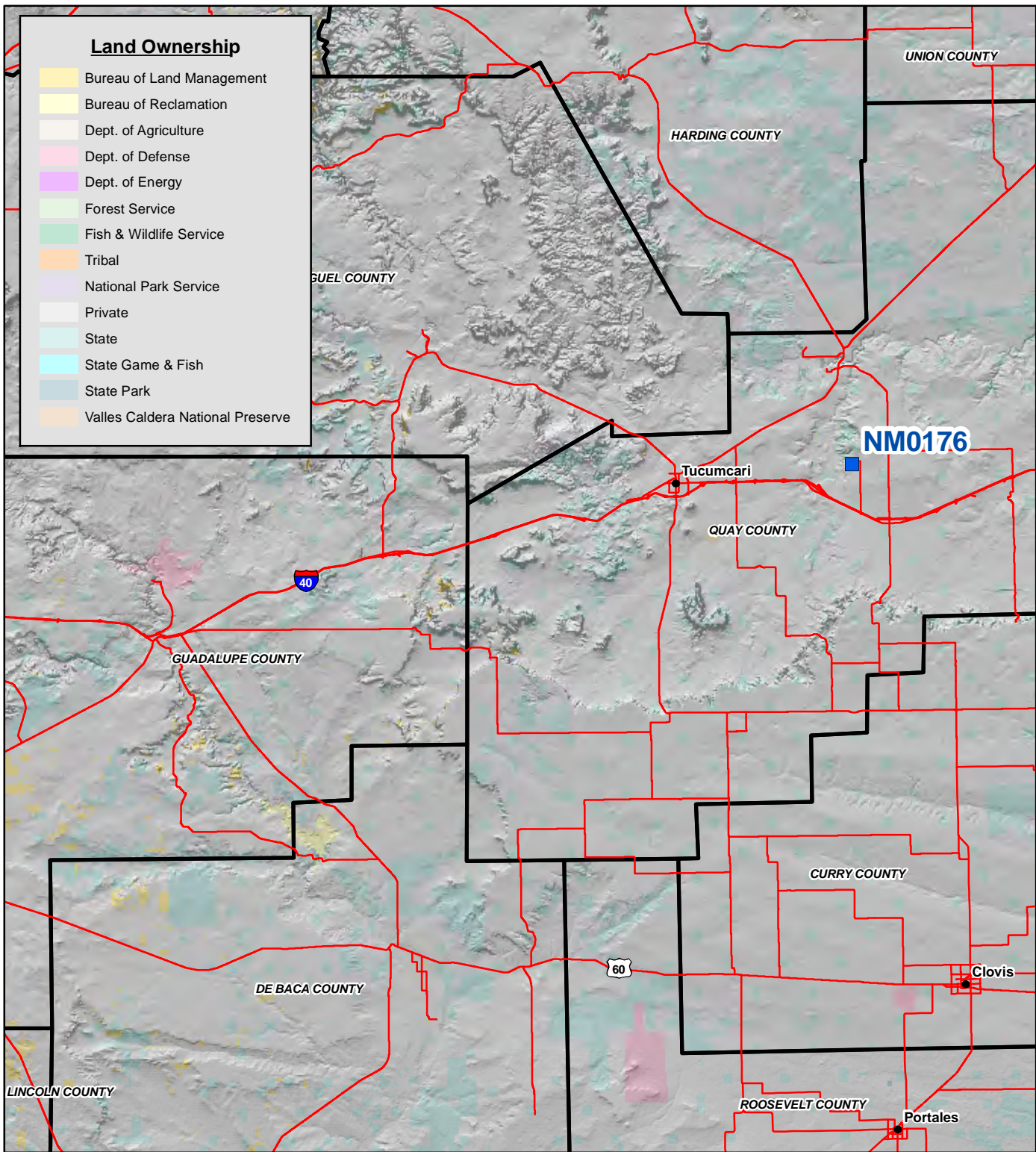
Reading ID	Associated Features	Reading at 0ft Above Ground (μR/hr)	Reading at 4ft Above Ground (μR/hr)	Associated Photos
Rad-1	--	27	17	NM0176_001
Rad-2	--	70	18	--
Rad-3	Equip-2	15	10	--
Rad-4	--	110	41	NM0176_012
Rad-5	PilePt-1	10	10	--
Rad-6	Pileridge-1	30	22	--
Rad-7	Pileridge-1	40	24	--
Rad-8	CutPly-1	10	11	--
Rad-9	CutPly-1	12	11	--
Rad-10	--	40	20	NM0176_021 NM0176_022
Rad-11	Equip-1	5	7	--
Rad-12	--	6	7	--
Rad-13	--	5	5	--
RadBack-1	--	6	6	--

Notes:

All gamma readings at this site taken by Ludlum 192 μR/Ratemeter
 μR/hr=microroetgens per hour
 -- designates no information



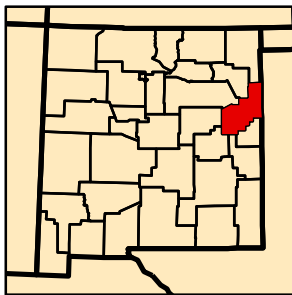
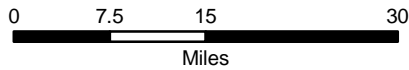
FIGURES



Land Ownership

Yellow	Bureau of Land Management
Light Yellow	Bureau of Reclamation
Light Orange	Dept. of Agriculture
Pink	Dept. of Defense
Purple	Dept. of Energy
Light Green	Forest Service
Green	Fish & Wildlife Service
Orange	Tribal
Light Purple	National Park Service
White	Private
Light Blue	State
Cyan	State Game & Fish
Blue	State Park
Light Orange	Valles Caldera National Preserve

Map Source(s):
Ownership - BLM, 2007

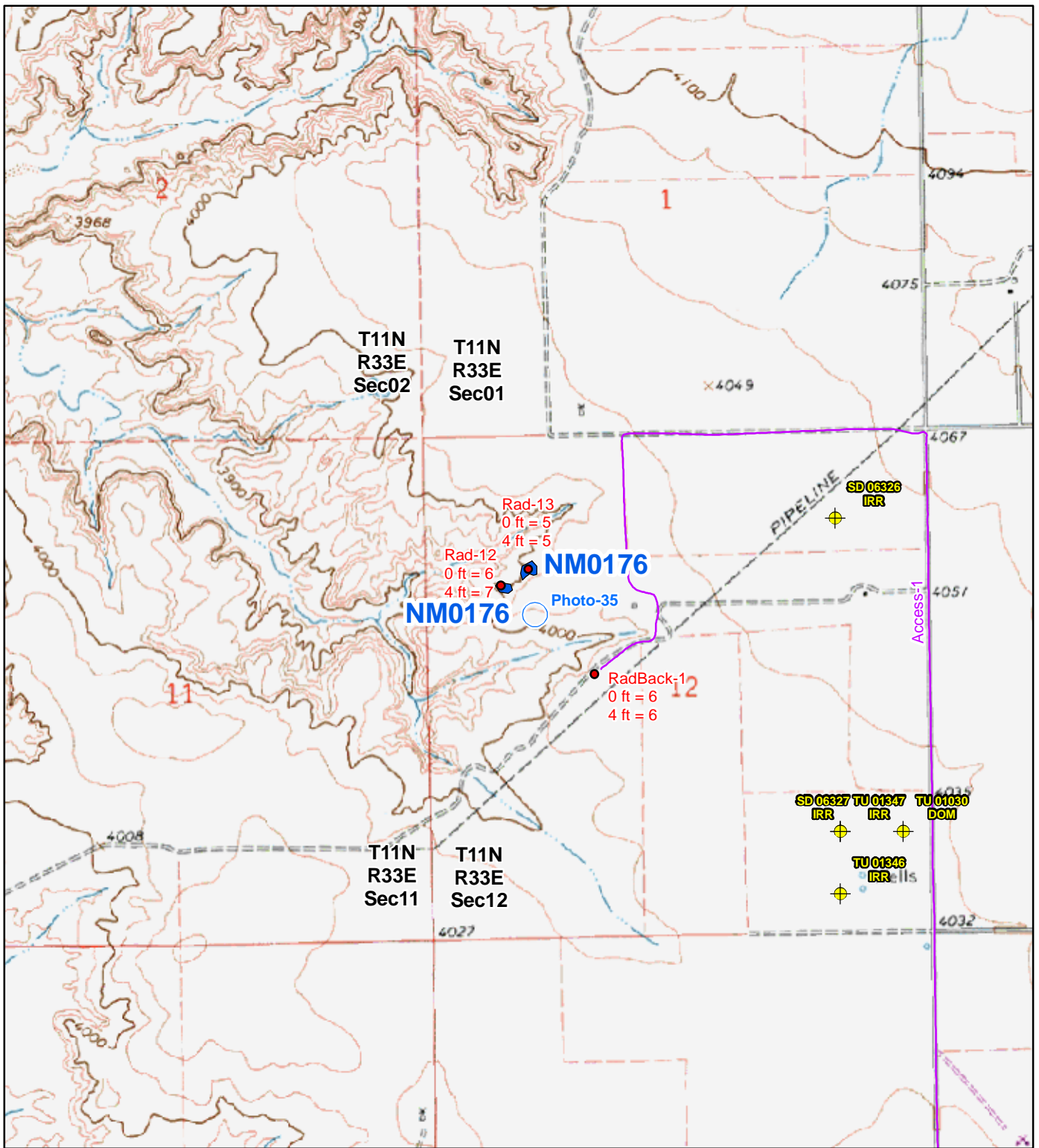


Legend

Blue square	AUM Location
Red line	Road
Black outline	County Boundary

Figure 1
Site Location Map
NM0176-Little Rattler
Abandoned Uranium
Mine Assessment





Map Source(s):
 U.S. Geological Survey 7.5-Minute
 Topographic Map
 -San Jon NW, 1982

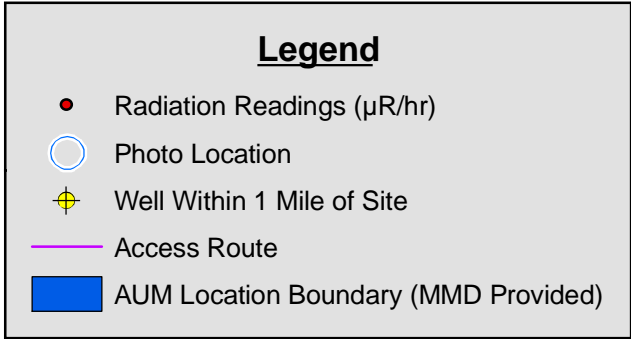
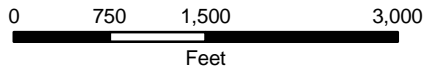
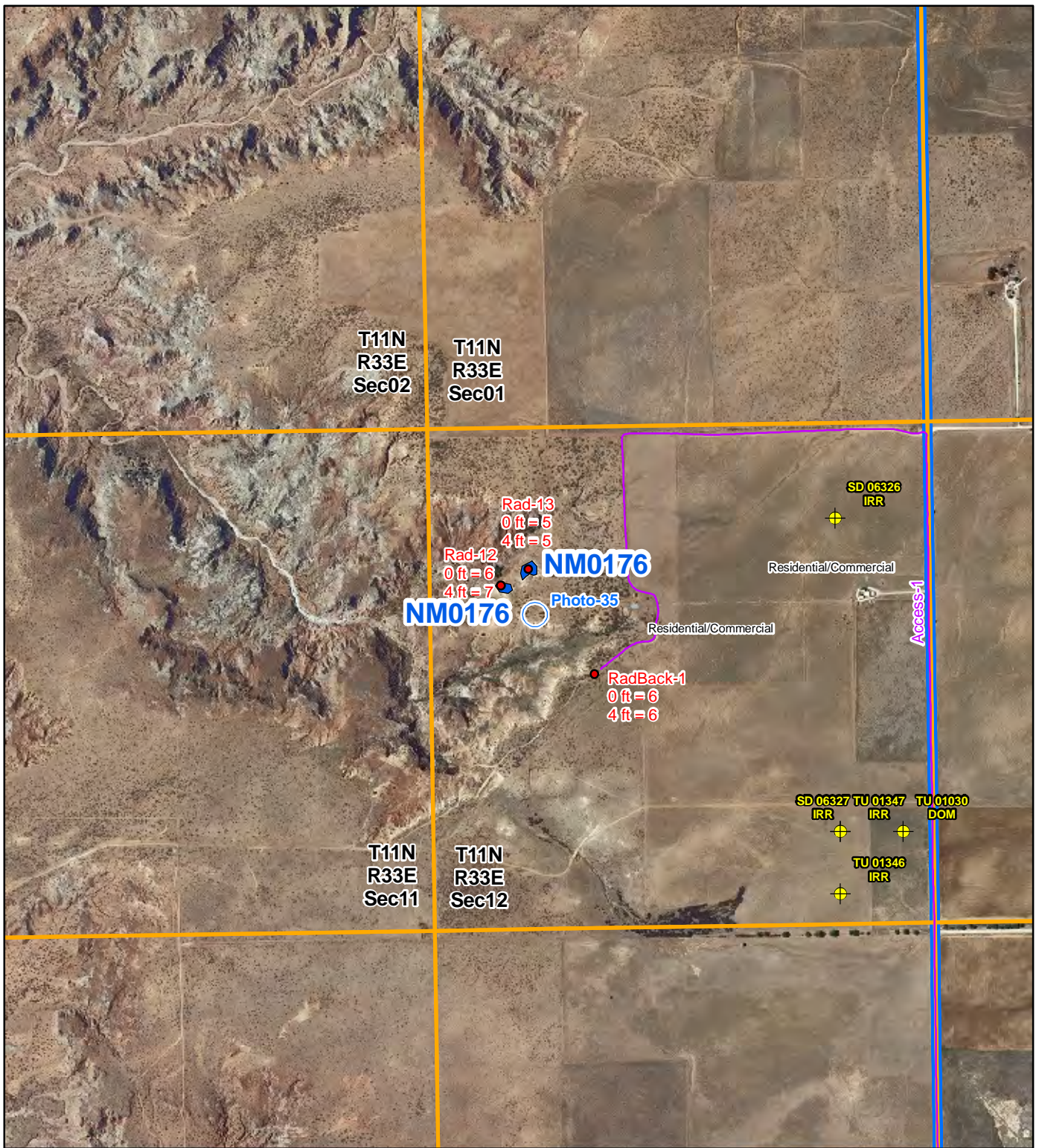
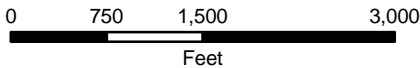


Figure 2
Topographic Map
NM0176-Little Rattler
 Abandoned Uranium
 Mine Assessment





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



Legend			
●	Radiation Readings ($\mu\text{R/hr}$)	 	AUM Location Boundary (MMD Provided)
 	Photo Location	 	Section Boundary
⊕	Well Within 1 Mile of Site	 	Township/Range Boundary
—	Access Route		

Figure 3
Aerial Photo
NM0176-Little Rattler
 Abandoned Uranium
 Mine Assessment



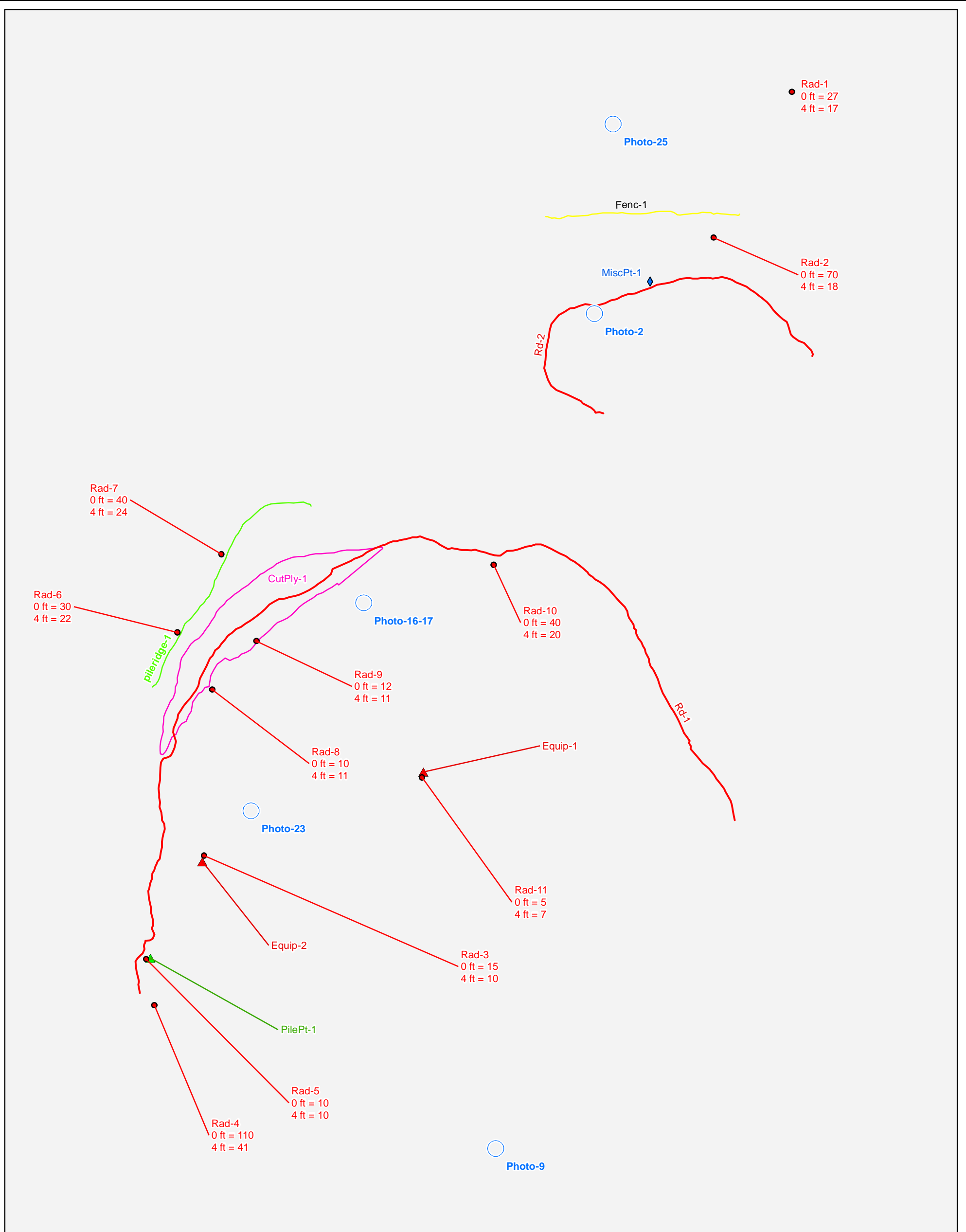


Map Source(s):
 U.S. Geological Survey 7.5-Minute
 DOQQ County Mosaic
 -Quay County, 2009

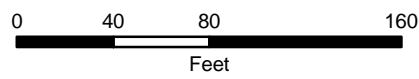


Legend	
●	Radiation Readings ($\mu\text{R/hr}$)
○	Photo Location
▲	Pile Location
▲	Equipment Location
◆	Miscellaneous Feature
—	Fence
—	Pile Ridge
—	Mine Road
—	Open Cut Boundary

Figure 4a
Site Map on
Aerial Photo
NM0176-Little Rattler
 Abandoned Uranium
 Mine Assessment



Map Source(s):
Ownership - BLM, 2008



Legend	
●	Radiation Readings (μ R/hr)
○	Photo Location
▲	Pile Location
▲	Equipment Location
◆	Miscellaneous Feature
—	Fence
—	Pile Ridge
—	Mine Road
□	Open Cut Boundary
Surface Ownership	
□	Private

Figure 4b
Site Map with
Surface Ownership
NM0176-Little Rattler
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.

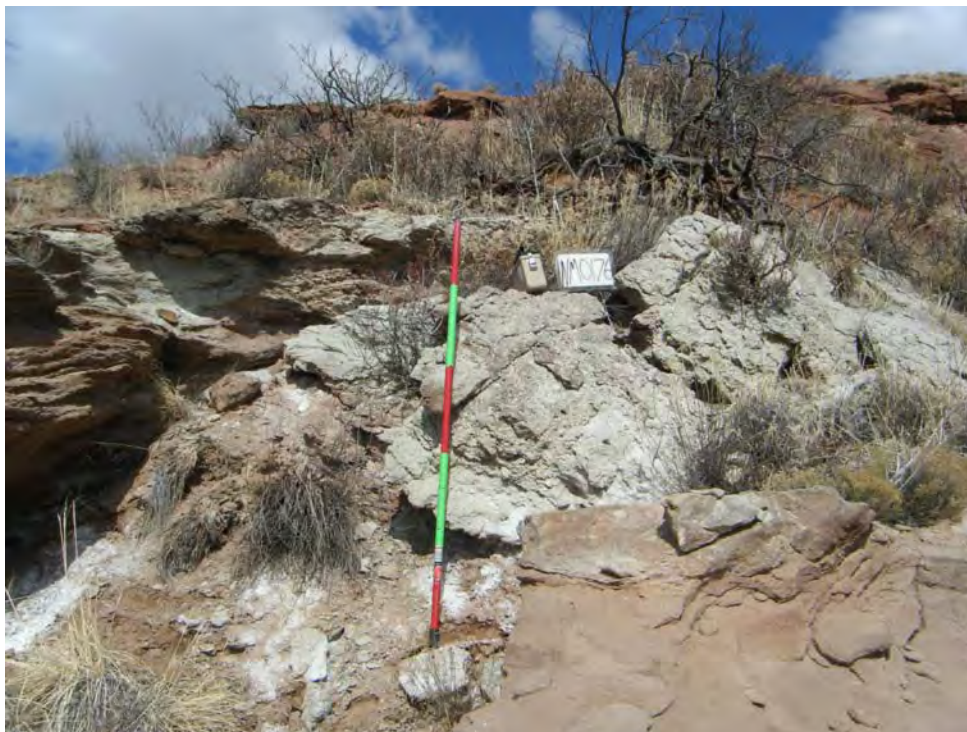


Photo 1-Site photo and gamma radiation survey point Rad-2, looking north.



Photo 2-A shale layer in the Bull Canyon Formation, looking southeast. The scintillometer is resting on a piece of petrified wood.

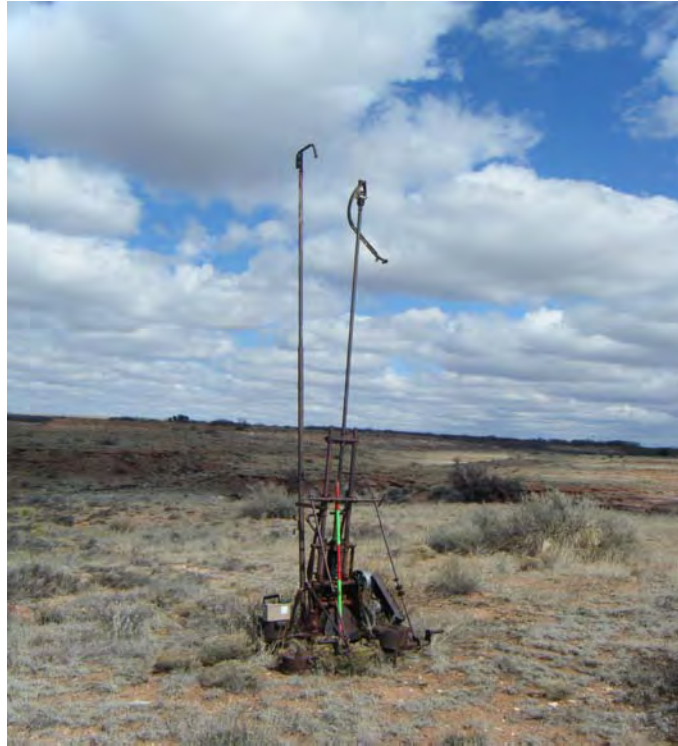


Photo 3-A rock drill found onsite (Equip-1).



Photo 8-Closeup of serial number on rock drill (Equip-1).



Photo 9-Swallow nests, looking southeast.



Photo 10-An ore sorter (according to Anderson, 1980) found onsite (Equip-2).



Photo 11-Ore sorter (Equip-2), looking northwest.



Photo 12-Gamma radiation survey point Rad-4, looking northeast.



Photo 13-Looking north at PilePt-1.



Photo 14-Looking north up Rd-1. The ore sorter (Equip-2) is off the photo to the right.



Photo 15-Looking north at Pileridge-1.



Photo 16-Looking southwest at Pileridge-1.



Photo 17-Looking northwest at Pileridge-1, replicating Anderson Report photo "b".



Photo 18-Looking southwest at CutPly-1.



Photo 19-Looking southeast at CutPly-1.



Photo 20-Looking east at CutPly-1.



Photo 21-Gamma radiation survey point Rad-10, looking south.



Photo 22-Closeup of gamma radiation survey point Rad-10. The pen is resting on a piece of petrified wood.



Photo 23-Looking down and to the south at ore sorter (Equip-2) from above, replicating Anderson Report photo "a".



Photo 24-A culvert (MiscPt-1) in mine road Rd-2.



Photo 25-Site photo, looking south.



Photo 32-AUM Site vegetation.



Photo 35-Site photo, looking south.

APPENDIX B
FIELD NOTES

3/11/10 AEA Abandoned Uranium Mines

Site Name: ~~NMD175 - God Luck~~^{AEA}
NMD176 - Little Rattler

Objective: Side Assessment

Personnel: Arny Andrews
Danny Bowman

Equipment: Rental truck, Trimbel Geo XM
(SN: 494842271, 2008 Series), Ludlum 192
(SN: 234149), Fuji Film digital camera,
(No. 80839493), backup Garmin GPS,
cell phone amplifier, field laptop

630 left hotel for site NMD175

Currently snowing and windy

Roads close to site have gates, and
are not public county roads, as ~~we~~ believed

Contacted Ted Rush, private landowner
who's land we would need to drive
through, as well as Wade Whitson,
who has the surface lease of the
state land, and the ownership of private
land around the state land. Both
said they would give us access (Wade
would also need to contact his boss) but
the weather could be a problem today

3/11/10 AEA Abandoned Uranium Mines

930 decided to try contacting the land owner of the private site (also in the Tucumcari area) by knocking on doors in the area.

1050 Obtained permission from F.J. Smith, Jr. to access his land + look for abandoned uranium mine features. He believes they may be just south of his property though. Obtained permission from Dennis Kerr also.

1125 Packed up + heading toward the MMD shape file for NMO176 - Little Rattles.

RadBack 1 - $0m = 6 \mu R/hr$; $1m = 6 \mu R/hr$

Rad 1 - $0m = 27 \mu R/hr$; $1m = 17 \mu R/hr$ AEA
Photo 1 - slightly radioactive rock, looking ~~SW~~ N

Rad 2 - $0m = 70 \mu R/hr$; $1m = 18 \mu R/hr$
Photo 2 - petrified wood, looking SE

Equip 1 - Rock drill

Photo 3 - rock drill, looking NE

Photo 4 - " " S

Photo 5 - " " NE

Photo 6 - " " down

Photos 7+8 - rock drill label

Saw a great horned owl

Photo 9 - swallow nests in rock, looking SE

3/11/10 AEA Abandoned Uranium Mines

Photo 10 - ore sorter, looking E

Equip 2 - ore sorter

Rad 3 - $0m = 15 \mu R/hr$; $1m = 10 \mu R/hr$

Photo 11 - ore sorter, looking NW

Rad 4 - $0m = 110 \mu R/hr$; $1m = 41 \mu R/hr$

Photo 12 - Rad 4, looking NE

Pilept 1 - in the middle of a mine road
3 ft high, 4 ft x 6 ft

Photo 13 - pilept 1 ~~looking N~~ ^{NE} looking N
up mine road

Rad 5 - $0m = 10 \mu R/hr$; $1m = 10 \mu R/hr$

Rd 1 - runs N-S, 10 ft wide

Photo 14 - rd 1, looking N; ore sorter is off the photo to the right

Pile Ridge 1 - runs NE-SW, parallel to cut:
4 ft high, 15-20 ft wide

Photo 15 - pile ridge 1

Rad 6 - $0m = 32 \mu R/hr$; $1m = 22 \mu R/hr$

Rad 7 - $0m = 40 \mu R/hr$; $1m = 24 \mu R/hr$

Photos 16+17 - Attempting to replicate Anderson report, looking SW

Cutply 1 - cut that is parallel to pile ridge 1
50 ft wide, 30 ft high ^{NE}

Photo 18 - cutply 1 looking SW

Photo 19 - cutply looking SE ^{NE}

Photo 20 - cutply looking E

3/11/10 AEA Abandoned Uranium Mines

Rad 8 - 0m = 10 μ R/hr; 1m = 11 μ R/hr
Rad 9 - 0m = 12 μ R/hr; 1m = 11 μ R/hr

Rad 10 - 0m = 40 μ R/hr; 1m = 20 μ R/hr
Photo 21 - rad 10, looking S
Photo 22 - rad 10 close up

Rad 11 - at rock drill - 0m = 5 μ R/hr; 2m = 1m

Photo 23 - Replicating Anderson report
photo looking down on ore
sorter, looking S

Rd 2 - 10 ft wide, probably used to
connect to Rd 1

Miscpt 1 - culvert in Rd 2

Photo 24 - Rd 2 + culvert, looking W

Fence 1 - close to the boundary between
the NW 1/4 + the SW 1/4 of Section 12

Photo 25 - Site photo looking S

Rad 12 - at MMD polygon (erosion feature)
0m = 6 μ R/hr; 1m = 7 μ R/hr

Rad 13 - other MMD polygon (another natural erosion
feature) - 0m = 5 μ R/hr; 1m = 5 μ R/hr

Photo 26 - 34 - vegetation

Photo 35 - Site photo looking S

3/11/10 AEA

Abandoned Uranium Mines

1600 Back at truck, packing up and
leaving site.

