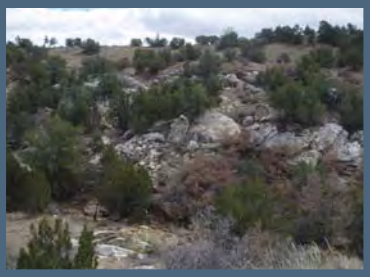
Abandoned Uranium Mine Site Assessment for the Bel Aro Site (NM0174)



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 Bel Aro Site (AUM Site), MMD ID: NM0174, on March 10, 2010.

1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

Finch (1972) reports that about 30 tons of radioactive petrified wood was extracted from the Bel Aro Mine. The mine was reportedly located in Section 24, Township 11 North, Range 28 East. However, the Atomic Energy Commission does not have a record verifying this account (Finch, 1972).

McLemore (1989) reports scattered low-grade uranium deposits in the Jurassic Morrison Formation throughout the Tucumcari area. These deposits consist of petrified wood, bones, and organic material (McLemore, 1989).

1.2 SITE LOCATION AND DIRECTIONS

The AUM Site was believed to reside on land owned by the State of New Mexico in the northern half of Section 24, Township 11 North, Range 28 East. However, the only mine feature found nearby was on the Northwest 1/4 Section 19, Township 11 North, Range 29 East on private land immediately east of Section 24, Township 11 North, Range 28 East. The Site is located in Quay County and is approximately 10 miles west of the town of Tucumcari. The location of this site was provided to INTERA by MMD.

To access the AUM Site from Albuquerque, drive east on Interstate 40 for 154 miles. Take Exit 321 towards Palomas and turn right, heading south on road QR-AY. Continue on this road until you reach a frontage road, about 0.2 miles. Turn right on this frontage road and drive 1.2 miles, then cross the interstate at the bridge. After the bridge, the road becomes QR-AZ. Continue north on QR-AZ for about 2.8 miles, first crossing the railroad tracks, then passing a ranch house, and finally crossing a large arroyo. About 400 feet after crossing the arroyo, the road will fork. Take the left fork and keep left for another 0.5 miles. The road will begin to ascend the mesa to the west, passing into state land. This is the AUM Site.

Note that permission must be obtained from the New Mexico State Land Office in order to access the Site. In addition, permission may be required from individuals leasing grazing rights from the State. The road QR-AZ passes through a ranch with a locked gate, thus permission from this ranch is also required before attempting to visit the Site.

1.3 SITE GEOLOGY

The AUM site is situated within the Tucumcari Basin, a Pennsylvanian-age structure formed by strike slip motion. The topography of this basin consists of isolated mesas and buttes consisting of Cretaceous and Jurassic strata underlain by Triassic red beds. The subsurface geology is a complex series of buried basins and uplifts (Broadhead, 2004).

The local Site geology consists of nearly flat-lying sandstones and shales of the Upper Jurassic Morrison Formation and the Cretaceous Dakota Sandstone. Near Tucumcari, the Morrison Formation consists of a lower shale, a middle mudstone with sandstone lenses, and an upper shale with cemented sandstone layers. The Morrison is considered terrestrial and is known to contain locally concentrated petrified wood deposits (Mankin, 1972). The lower Dakota Sandstone is also present at the Site, directly overlying the Morrison (Jacka and Brand, 1972).

Numerous Cretaceous clam and oyster fossils and a large fragment of petrified wood were found at radiation survey point 5 (see Photo 5 in Appendix A). Organic material was found in a road cut (see Photo 20 in Appendix A). However, the petrified wood and organic material did not have radiation levels above background.

1.4 SITE HYDROGEOLOGY

The surface runoff at the AUM Site discharges to Pajarito Creek, which drains into the Canadian River approximately 16 miles to the northeast. Permanent surface water in the area is restricted to stock tanks and certain sections of Pajarito Creek.

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. The Ogallala Aquifer is present near the AUM Site, but is not as thick in New Mexico as it is to the east. The Morrison Formation and the Dakota Sandstone can also act as an aquifer in places. The groundwater generally flows west to east in the Ogallala (DBSA, 2007).

1.5 REGIONAL TOPOGRAPHY AND TERRAIN

The AUM Site is found on the Cow Canyon Quadrangle 7.5 minute United States Geological Survey topographic map at an elevation of approximately 4400 feet above mean sea level (see Figure 2). The AUM Site is located on the Pablo Montoya Mesa southwest of Tucumcari. The mesa is approximately 15-20 miles long and 6 miles across. It is one of many mesas in the area capped by Cretaceous and Jurassic strata (Broadhead, 2004). 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 road were found onsite. In addition, a possible equipment staging area was seen on private land just offsite. 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 carbonaceous material in a shale layer of the Morrison Formation, but no anomalous radiation was detected.

2.3 WASTE AND ORE PILES AND DISTURBANCES

No waste piles, ore piles, or disturbances were found at the AUM Site.

2.4 MINING RELATED BUILDINGS AND FOUNDATIONS

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

2.5 OTHER MINE FEATURES

A dirt pad was seen on private land about 150 feet east of CutPly-1.

2.6 BOREHOLES

No boreholes were evident at the AUM Site.

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 9 µR/hr at contact and 9 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 reading for the AUM Site was 13 µR/hr at contact at radiation survey point Rad-9. This reading was taken inside an open cut (CutPly-1). A radiation survey point was also taken on a boulder of petrified wood, reporting 9 µR/hr at contact (Rad-5, see Photo 5 in Appendix A).

5.0 CURRENT LAND USES

5.1 HUMAN ACTIVITY AND RECREATIONAL SITE USE

A well maintained road passes through the Site, and nearby stock tanks and evidence of cows suggest the area is active ranchland.

5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES

No structures were noted on or near the AUM Site.

5.3 NEARBY DOMESTIC WELLS

No domestic wells are located within a mile of the Site. Three stock wells, TU 00880, TU 00879, and TU 00129, are located within a mile of the Site.

5.4 EVIDENCE OF GRAZING OR AGRICULTURE

Cow droppings were noted in the area.

5.5 EVIDENCE OF WILDLIFE

A blue jay, a raven, and a herd of deer were seen while onsite. Coyote and deer scat were present.

6.0 VEGETATION

The Bel-Aro site is located in the Juniper Savanna (Ecotone) vegetation type. Dominant woody species include one-seed juniper and various cacti, including cholla and prickly pear, and snakeweed. No forbs were observed at the site. Grasses include beargrass (*Nolina* Sp.) and grama grass (*Bouteloua* Spp.) species. There was no evidence of noxious weeds at the site.

7.0 POTENTIAL OFFSITE IMPACTS

7.1 EROSION

Some gullying associated with an old stock tank was found about 300 ft northwest of CutPly-1.

7.2 ENVIRONMENTAL IMPACTS

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

8.0 REFERENCES

Broadhead, Ronald F, 2004. Petroleum Geology of the Tucumcari Basin-Overview and Recent Exploratory Activity. New Mexico Geology, Vol. 26, No. 3.

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.

Jacka, A. D. and Brand, John P., 1972. An Analysis of the Dakota Sandstone in the Vicinity of Las Vegas, New Mexico and Eastward to the Canadian River Valley: New Mexico Geological Society, Guidebook to the 23rd Field Conference.

Mankin, Charles J., 1972. Jurassic Strata in Northeastern New Mexico: New Mexico Geological Society, Guidebook to the 23rd Field Conference.

McLemore, V. T., and Chenoweth, W. C., 1989, Uranium resources in New Mexico: New Mexico Bureau of Mines and Mineral Resources, Resource Map 18, 37 pp

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.

TABLES

Table 1
Site Features

Bel Aro-NM0174
Abandoned Uranium Mine Assessments

Feature Name	On Site?	Feature Type	Associated Feature	Material	Activity	Height or Depth (ft)	Width or Diameter (ft)	Length (ft)	Open	Collapsed	Closure Type	Associated Photos	Notes
Access-1	Yes	Access Road	--	Dirt	--	--	--	--	--	--	--	--	--
CutPly-1	Yes	Open Cut	--	--	--	15	15	100	Yes	--	--	NM0174_015 NM0174_016 NM0174_017 NM0174_018 NM0174_019	--

Notes:
-- designates no information

Table 2
Gamma Radiation Survey Results

Bel Aro-NM0174
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	--	5	7	--
Rad-2	--	7	7	NM0174_001
Rad-3	--	4	5	--
Rad-4	--	4	5	--
Rad-5	--	9	8	NM0174_005
Rad-6	--	12	9	--
Rad-7	--	6	6	--
Rad-8	--	12	9	--
Rad-9	CutPly-1	13	10	--
Rad-10	CutPly-1	7	8	--
RadBack-1	--	9	9	--

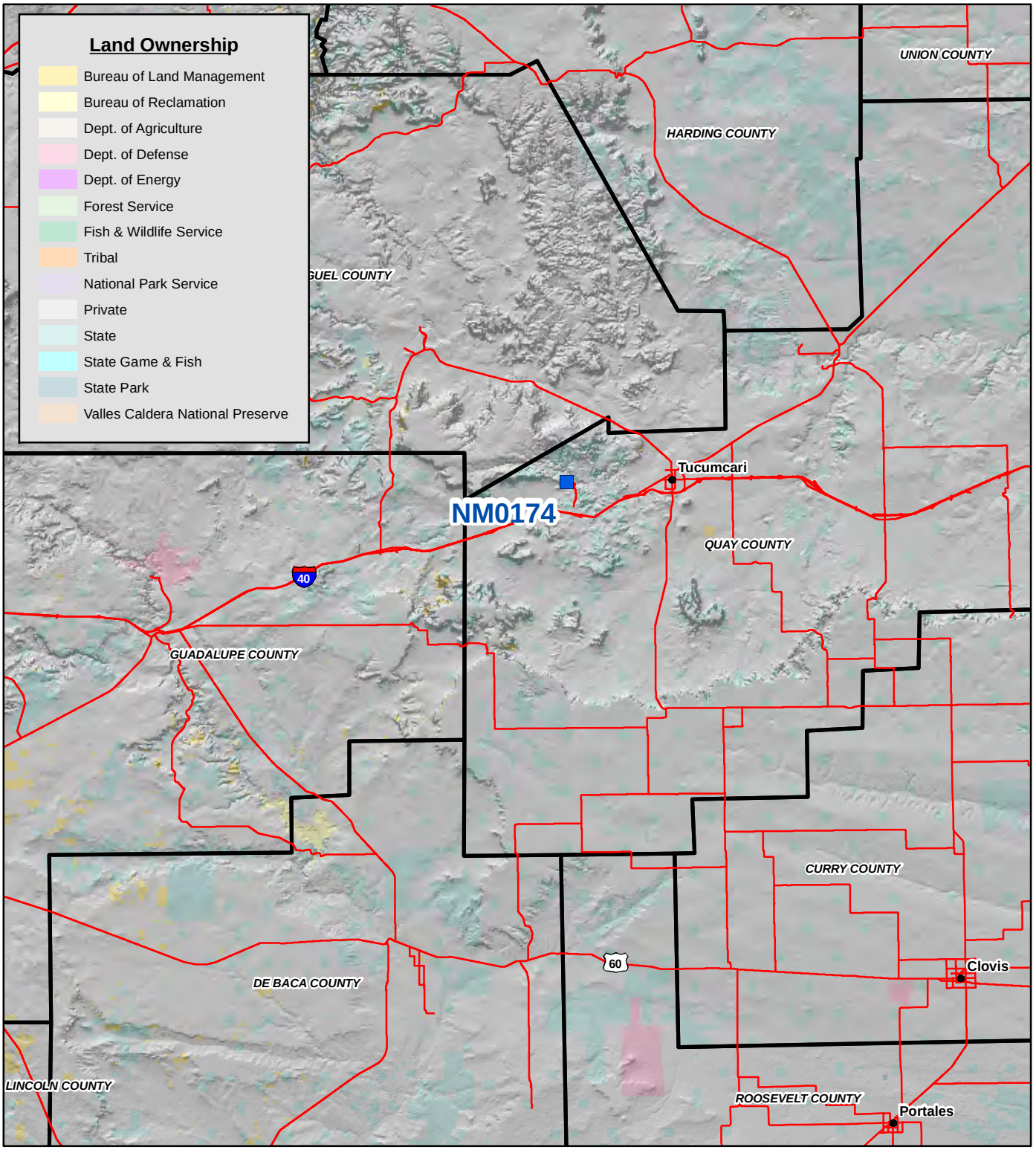
Notes:

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

µR/hr=microroetgens per hour

-- designates no information

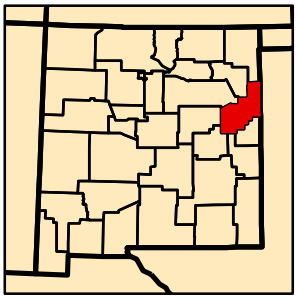
FIGURES



Map Source(s):
Ownership - BLM, 2007

0 7.5 15 30
Miles

NORTH



Legend

- AUM Location
- Road
- County Boundary

Figure 1
Site Location Map
NM0174-Bel Aro
Abandoned Uranium Mine Assessment

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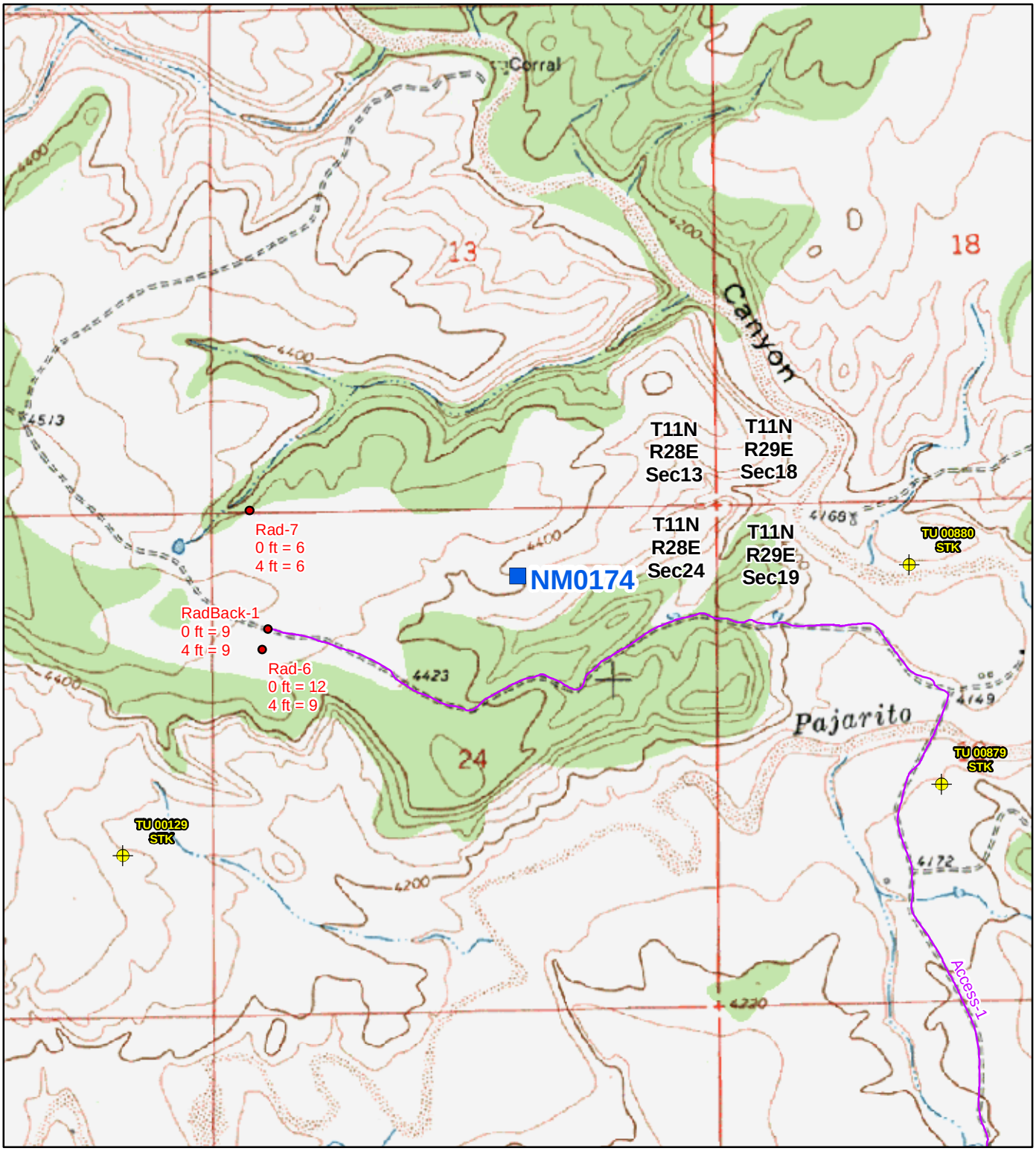

Map Source(s):
U.S. Geological Survey 7.5-Minute
Topographic Map
-Cow Canyon, 1968

0 750 1,500 3,000
Feet

NORTH

Legend

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

Figure 2
Topographic Map
NM0174-Bel Aro
Abandoned Uranium
Mine Assessment

INTERA

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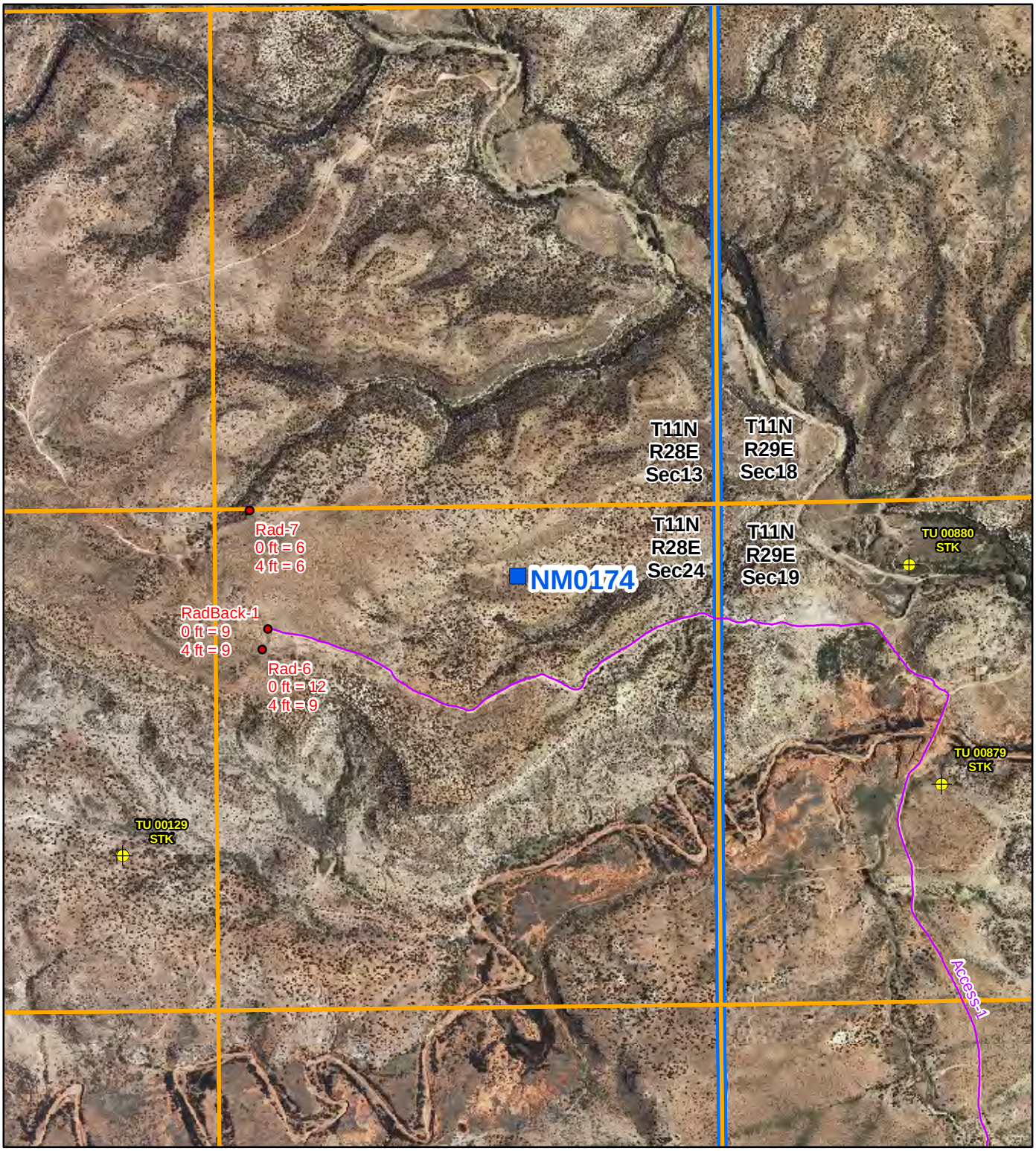

Map Source(s):
U.S. Geological Survey 7.5-Minute
DOQQ County Mosaic
-Quay County, 2009

0 750 1,500 3,000
Feet

NORTH

Legend

- Radiation Readings (µR/hr)
- Well Within 1 Mile of Site
- AUM Location
- Access Route
- Section Boundary
- Township/Range Boundary

Figure 3
Aerial Photo
NM0174-Bel Aro
Abandoned Uranium Mine Assessment

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Legend

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

Surface Ownership

- State
- Private

0 100 200 400

Feet

NORTH

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

Figure 4a
Site Map on
Aerial Photo
NM0174-Bel Aro
Abandoned Uranium
Mine Assessment

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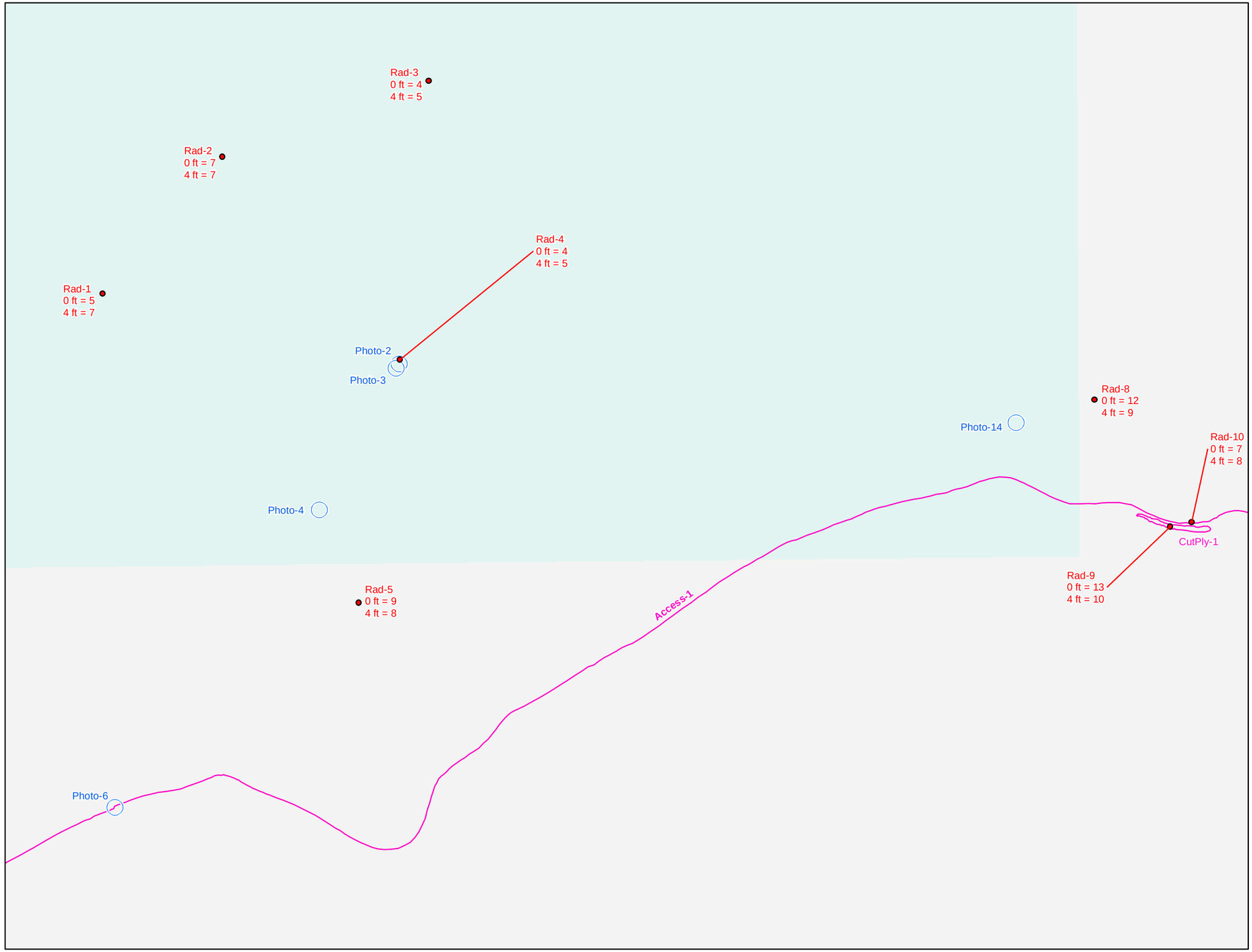

Legend

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

Surface Ownership

- State
- Private

0 100 200 400
Feet

NORTH

Map Source(s):
Ownership - BLM, 2008

Figure 4b
Site Map with Surface Ownership
NM0174-Bel Aro
Abandoned Uranium Mine Assessment

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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.

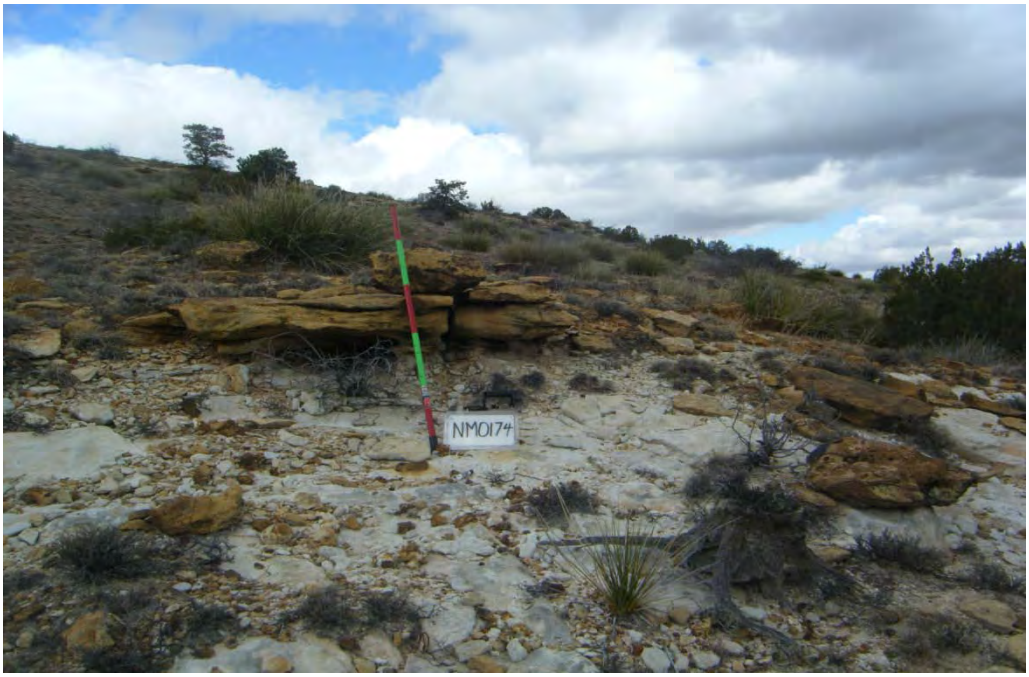

Photo 1-Site photo and radiation survey point (Rad-1), looking northeast.

Photo 2-Site photo, looking east.

Photo 3-Site photo, looking southwest.

Photo 4-Looking south at an outcrop of white, crossbedded sandstone.

Photo 5-A piece of petrified wood at radiation survey point 5 (Rad-5).

Photo 6-Site photo, looking north.

Photo 7-Site vegetation.

Photo 14-Site photo, looking northwest.

Photo 15-Looking east at CutPly-1. The road Access-1 is visible in the foreground.

Photo 16-Another view, looking east at CutPly-1. The road Access-1 is visible in the foreground.

Photo 17-Looking west at CutPly-1. The road Access-1 is visible in the foreground.

Photo 18-Another view, looking west at CutPly-1. The road Access-1 is visible in the foreground.

Photo 19-A possible staging area west of CutPly-1. Photo is looking northeast.

Photo 20-Shale and fossilized organic matter in CutPly-1.

APPENDIX B

FIELD NOTES

3/10/10 AEH Abandoned Uranium Mines

Site Name: NM0174 - Bel Ayre

Objective: Site Assessment

Personnel: Amy Andrews
Danny Bowman

Equipment: Rental truck, Trimbel Geo XM (SN: 4948447271 2008 series), Ludlum 192 (SN: 234149), Fuji Film digital camera (No. 80839493), backup Garmin GPS, cell phone amplifier, field laptop

800 Left office for site

1100 Arrived at site, packing up to walk to shapefile location. put waypoints in GPS for edges of State Land.

Rad 1 - at MMD polygon - AEH 0m = 5uR/hr; 1m = 7uR/hr

Rad 2 - 0m = 7uR/hr ; 1m = 7uR/hr
Photo 1 - believed to be Dakota SS, Rad 1 looking NE

Rad 3 - 0m = 4uR/hr ; 1m = 5uR/hr

Rad 4 - 0m = 4uR/hr ; 1m = 5uR/hr

Photo 2 - Site photo, looking E
Photo 3 - Site photo, looking SW

Photo 4 - white rock outcrop, looking S

Deer tracks + scat present

White Rock is fine grain, well sorted, very little matrix, rounded

Rad 5 - 0m = 9uR/hr ; 1m = 8 uR/hr
Photo 5 - Rad 5, looking SE
petrified wood

herd of 6 deer ran by

Rad 6 - 0m = 12uR/hr ; 1m = 9 uR/hr

Rad Back = 9uR/hr ; 1m = 9 uR/hr

Rad 7 : 0m = 6uR/hr ; 1m = 6uR/hr

Lots of evidence of cattle grazing and human activity (log cutting)

Photo 6 - Site Photo looking N

Rad 8 - 0m = 12uR/hr ; 1m = 9uR/hr

3/10/10 AEA Abandoned Uranium Mines

Photos 7-13 AEA vegetation
Photo 14 - site photo looking NW

cutply1 - cut is currently a road that goes through northern half of Section 24.

Rad 9 - 0m = 13uR/hr ; 1m = 10uR/hr
AEA
Photo 15+16 - cutply1, looking E

Rad 10 - 0m = 7uR/hr ; 1m = 8 uR/hr

Photos 17+18 - cutply1, looking W

Photo 19 - Staging area to the West of cutply1, looking NE, but is in wrong Section, so probably not part of the mine

We suspect that cutply1 may have originally been the mine prospect, and that they removed all economic material already McLemore refers to "fossilized logs" as the ore material, small pieces of fossilized wood are noted inside the cut.

Photo 20 - fossilized wood in cutply1

3/10/10 AEH Abandoned Uranium Mines

1515 packing up truck + leaving site

1535 came to locked gate, had to call the landowner to get out.