

# Abandoned Uranium Mine Assessment for the Becky Site (NM0244)

## FINAL REPORT

Prepared For:



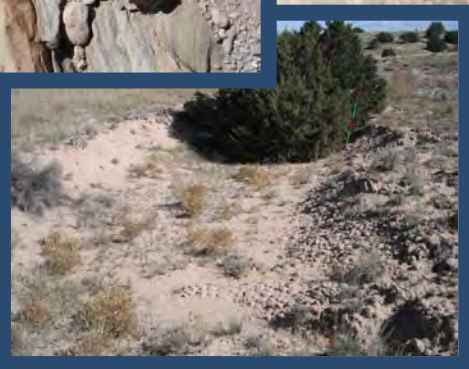
New Mexico Energy, Minerals and  
Natural Resources Department  
Wendell Chino Building  
1220 South St. Francis Drive  
Santa Fe, New Mexico 87505

Prepared By:



November 05, 2010

NM0244



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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 Becky Site (AUM Site), MMD ID: NM0244 on October 11, 2010.

### 1.1 PREVIOUSLY KNOWN INFORMATION ABOUT THE SITE

According to Anderson (1980), the AUM Site consists of several small bulldozer cuts spread out over Sections 17, 20, and 29 of Township 20 North, Range 9 East. The pits are reportedly 15 ft wide by 15 ft long, and 2 ft deep (Anderson, 1980). Workings are within sandstone, siltstone, and mudstone deposits of the Santa Fe Group (Anderson, 1980). The uranium minerals carnotite and schroeckingerite were reported to occur in this area by Anderson (1980). A sample from a pit in the northwest quarter of Section 29 contained 0.27%  $U_3O_8$  and another sample from the southwest quarter of Section 17 yielded 0.03%  $U_3O_8$  (Anderson, 1980).

According to McLemore (1983), no uranium production was reported from the northern claims and 12 tons of ore yielding 12 pounds of 0.05%  $U_3O_8$  were produced from the southern claims. A mineralized fracture zone within the Tesuque Formation of the Santa Fe Group was reported to contain 0.19-0.32%  $U_3O_8$ .

### 1.2 SITE LOCATION AND DIRECTIONS

AUM Site features were identified over a stretch of approximately 1.5 miles extending north-south along US-84/US-285 north of Pojoaque. Workings in the northern area are located on State of New Mexico Land and workings in the southern area are located on Bureau of Land Management (BLM) land. The AUM Site is in Santa Fe County and is 3 to 4.5 miles north of the pueblo of Pojoaque. Both areas may be accessed through private land. The location of the northern area was provided to INTERA by MMD. The location of the southern area was identified in the Anderson report (1980).

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 22.5 miles north. The southern area can be accessed by turning right after traveling 22.5 miles on US-84 W/US-285 N, onto a residential road. Follow this residential road approximately 0.25 miles southeast. After passing several private drives, continue 0.2 miles east onto BLM land. There is no road for this last 0.2 miles on BLM land. Site features trend north-south above and below a sandstone outcrop. To reach the northern area, follow US-84 W/US-285 N approximately 1.4 miles north from the southern area turnoff and turn right onto Sheriff Road. Go approximately 0.5 miles east to where the road ends in an arroyo. Site features are located approximately 0.3 miles northeast of here. Note that permission from the private landowner is necessary to access both areas.

### **1.3 SITE GEOLOGY**

The AUM Site is found in the Tesuque Formation which is a sedimentary unit filling most of the Espanola basin (Cavazza, 1989). The Espanola basin is an asymmetrical basin which is part of the Rio Grande Rift and is composed of alluvial sediments largely derived from the Sangre de Cristo Mountains along the eastern margin of the basin. Small, scattered sandstone uranium deposits are found locally within the Miocene Tesuque Formation of the Santa Fe Group (McLemore and Chenoweth, 1989). Uranium mineralization has likely occurred as roll front deposits associated with groundwater flow in these sediments (McLemore and Chenoweth, 1989).

### **1.4 SITE HYDROGEOLOGY**

The AUM Site is located within the Espanola subregion of the Jemez y Sangre Water Planning Region (DBS&A, 2003). Surface runoff at the AUM Site discharges northwest to the Arroyo Seco which joins the Rio Grande 3 miles to the west.

The Tesuque Formation constitutes the principal groundwater-bearing unit in the planning region and is sometimes referred to as the Tesuque Formation aquifer (DBS&A, 2003). Groundwater in this unit generally flows horizontally along bedding planes, toward the axis of the basin, east to west at the AUM Site (DBS&A, 2003). Groundwater also accumulates within shallow alluvial deposits, younger than the Santa Fe Group, below the Rio Grande and its main tributaries throughout the planning region.

### **1.5 REGIONAL TOPOGRAPHY AND TERRAIN**

The AUM Site can be found on the Espanola Quadrangle 7.5 minute United States Geological Survey topographic map at approximately 5,800 to 5,950 ft above mean sea level (please see Figure 2). The AUM Site is located in the lower Espanola valley in a region of low hills and shallow drainages west of the Sangre de Cristo Mountains. 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, three pits, two piles, and a mine road were found onsite. The features identified at the AUM Site were found in two locations; the northern area and the southern area (please see Figure 2 and 3). 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, 4b, 5a, and 5b 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

In the southern area of the AUM Site one cut (CutLn-1) and one pit (Pit-1) were found and two pits (Pit-2 and Pit-3) were found in the northern area (please see Figures 4a, 4b, 5a and 5b). The cut (CutLn-1) is a surface excavation along the side of a low hill in the southern area (see Photo 6 in Appendix A). It is approximately 5 ft high and 70 ft long and exposes loosely consolidated Santa Fe Group sediments. Pit-1 was also found in the southern area and is a bulldozer excavation into surface alluvium (see Photo 3 in Appendix A). Pit-2 and Pit-3, found in the northern area, are also excavations into surface alluvium (see Photos 7 and 8 in Appendix A). The maximum gamma radiation for these feature measured 100  $\mu\text{R/hr}$  (microroentgens per hour) at 0 ft above ground at radiation survey point Rad-7 on CutLn-1 (see Table 2).

## 2.3 WASTE AND ORE PILES AND DISTURBANCES

Two waste piles were found onsite; one in the southern area and one in the northern area (see Figures 4a, 4b, 5a, and 5b). PilePly-1, in the southern area, and PilePly-2, in the northern area, are waste piles composed of soil excavated from Pit-1 and Pit-3, respectively. Both piles are approximately 3 ft tall, 10 ft wide and 20 ft long (see Photos 2 and 9 in Appendix A). The maximum gamma radiation measurement on these features was 44  $\mu\text{R/hr}$  at 0 ft above ground at radiation survey point Rad-10 on PilePly-2 in the northern area.

## 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 found onsite. This road is located in the northern area of the AUM Site and extends northwest to southeast (see Figure 4a).

## 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 13  $\mu\text{R/hr}$  at 0 ft above ground and 12  $\mu\text{R/hr}$  at 4 ft above ground. Please see Table 2 for all of the gamma

radiation readings taken at the AUM Site and Figures 4a, 4b, 5a and 5b for the locations of the radiation readings.

The maximum gamma radiation measured onsite was 440  $\mu\text{R/hr}$  at 0 ft above ground on a sandstone outcrop at radiation survey point Rad-6 in the southern area. In the northern area a gamma radiation measurement taken on an outcrop at radiation survey point Rad-12 recorded 250  $\mu\text{R/hr}$  at 0 ft above ground.

## **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.

### **5.2 NEARBY RESIDENTIAL, COMMERCIAL AND INDUSTRIAL STRUCTURES**

Several residential neighborhoods are located within a mile west of both AUM Site areas along US-84/US-285 between Pojoaque and Espanola.

### **5.3 NEARBY DOMESTIC WELLS**

Fifteen domestic wells and eight nondomestic wells lie within 1 mile of the AUM Site features. These domestic wells were drilled from 1981 to 2010 and range in depth from 110 to 275 feet below ground surface with a depth to water of 8 to 96 feet below ground surface (NMOSE, 2010). Please see Figures 2 and 3 for the locations of the domestic and nondomestic wells.

### **5.4 EVIDENCE OF GRAZING OR AGRICULTURE**

Cow droppings, cow tracks, fences, and horses observed near the AUM Site indicate that the land is used for grazing.

### **5.5 EVIDENCE OF WILDLIFE**

Crows and rabbit droppings were noted near the AUM Site.

## **6.0 VEGETATION**

The Becky site is located in the Desert Grassland (Ecotone) vegetation type (Dick-Peddie, 1999). The dominant woody species include Perry's rabbitbrush and fourwing saltbush. The dominant forb species at the AUM Site is barbwire Russian thistle. Grasses species include needlegrass and Indian ricegrass. There was no evidence of noxious weeds at the AUM Site.

## 7.0 POTENTIAL OFFSITE IMPACTS

### 7.1 EROSION

No evidence of mine related 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.

Cavazza, William, 1989. Sedimentation Pattern of a Rift-filling Unit, Tesuque Formation (Miocene), Espanola Basin, Rio Grande Rift, New Mexico. *Journal of Sedimentary Research* v. 59.

Daniel B. Stephens and Associates, Inc. (DBS&A), 2003. Jemez y Sangre Regional Water Plan. Prepared for Jemez y Sangre Water Planning Council.

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

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 Resources 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), 2010. Wells and Surface Diversions in New Mexico. *POD\_WATERS\_june2010.shp*. OSE Waters Database.

## TABLES

**Table 1  
Site Features  
Becky-NM0244  
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	Yes	Access	--	--	--	--	--	--	--	--	--	arroyo
Access-2	No	Dirt	--	Dirt Maintained	--	--	--	--	--	--	--	--
CutLn-1	Yes	--	--	--	5	5	70	--	--	--	NM0244_006	--
PilePly-1	Yes	Waste	--	Soil	3	10	20	--	--	--	NM0244_002	--
PilePly-2	Yes	Waste	--	Soil	3	10	20	--	--	--	NM0244_009	--
Pit-1	Yes	Exploration	--	--	4	15	35	Yes	--	--	NM0244_003	bulldozer cut
Pit-2	Yes	Exploration	--	--	4	30	40	Yes	--	--	NM0244_007	--
Pit-3	Yes	Exploration	--	--	2	10	30	Yes	--	--	NM0244_008	bulldozer cut
Rd-1	Yes	Dirt	--	Dirt Nonmaintained	--	--	--	--	--	--	--	--

**Notes:**  
-- designates no information



**Table 2**  
**Gamma Radiation Survey Results**

**Becky-NM0244**  
**Abandoned Uranium Mine Assessments**

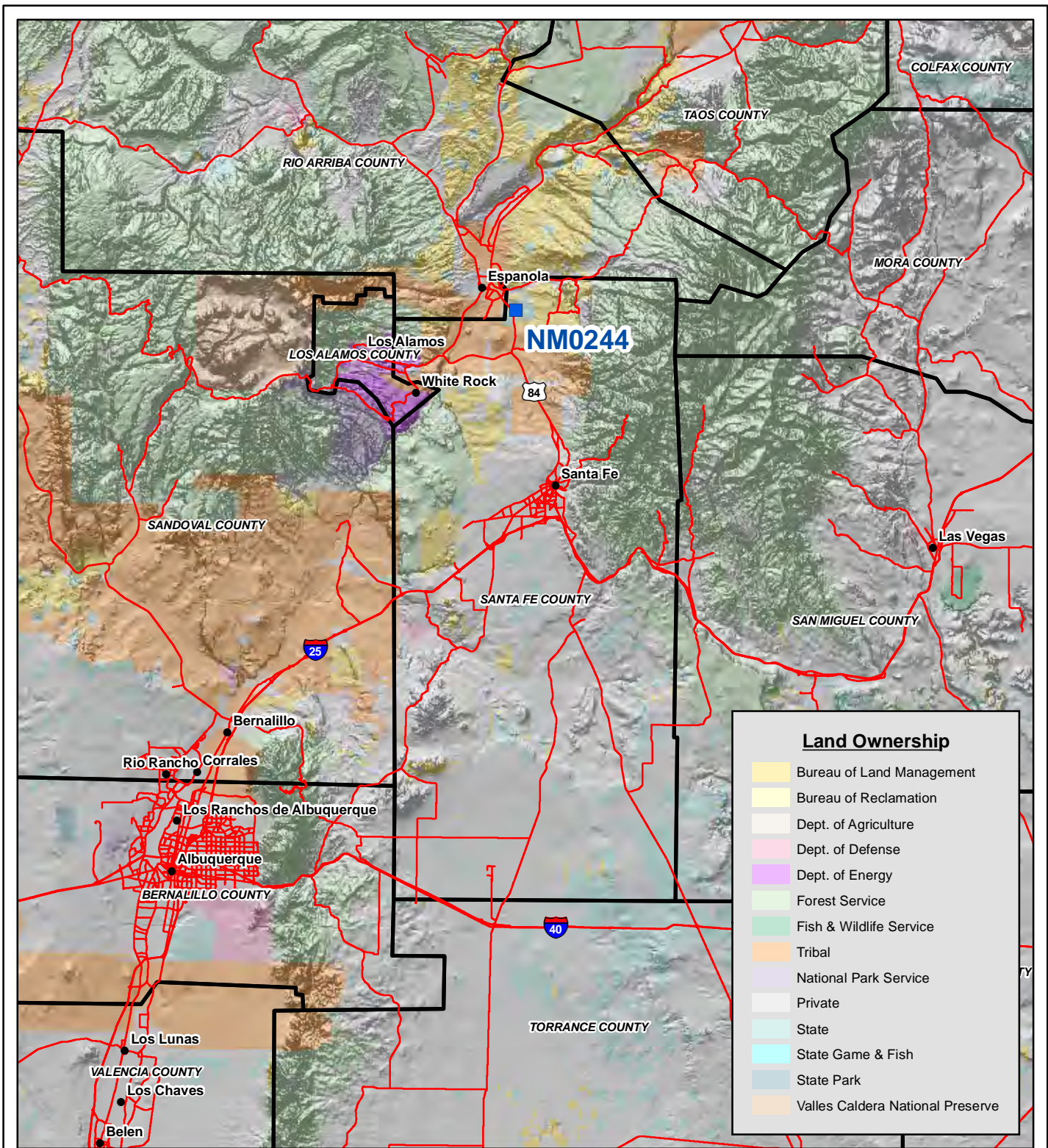
Reading ID	Associated Features	0 ft ( $\mu\text{R/hr}$ )	4 ft ( $\mu\text{R/hr}$ )	Associated Photos
Rad-1	--	15	14	--
Rad-2	--	16	14	--
Rad-3	--	15	15	--
Rad-4	pileply-1	19	18	--
Rad-5	pit-1	17	17	--
Rad-6	--	440	70	NM0244_004 NM0244_005
Rad-7	cutln-1	100	43	--
Rad-8	pit-2	41	31	--
Rad-9	pit-3	32	25	--
Rad-10	pileply-2	44	28	--
Rad-11	--	70	36	--
Rad-12	--	250	22	NM0244_010
RadBack-1	--	13	12	--

**Notes:**

All gamma readings at this site taken by Ludlum 192  $\mu\text{R}$ /Ratemeter  
 $\mu\text{R/hr}$ =microroetgens per hour  
 -- designates no information



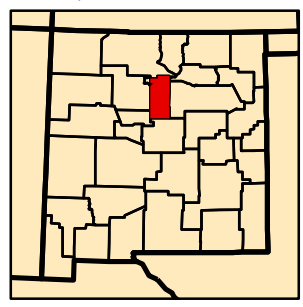
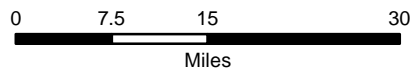
## FIGURES



**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-Gray]	State Park
[Light Orange]	Valles Caldera National Preserve

Map Source(s):  
Ownership - BLM, 2008

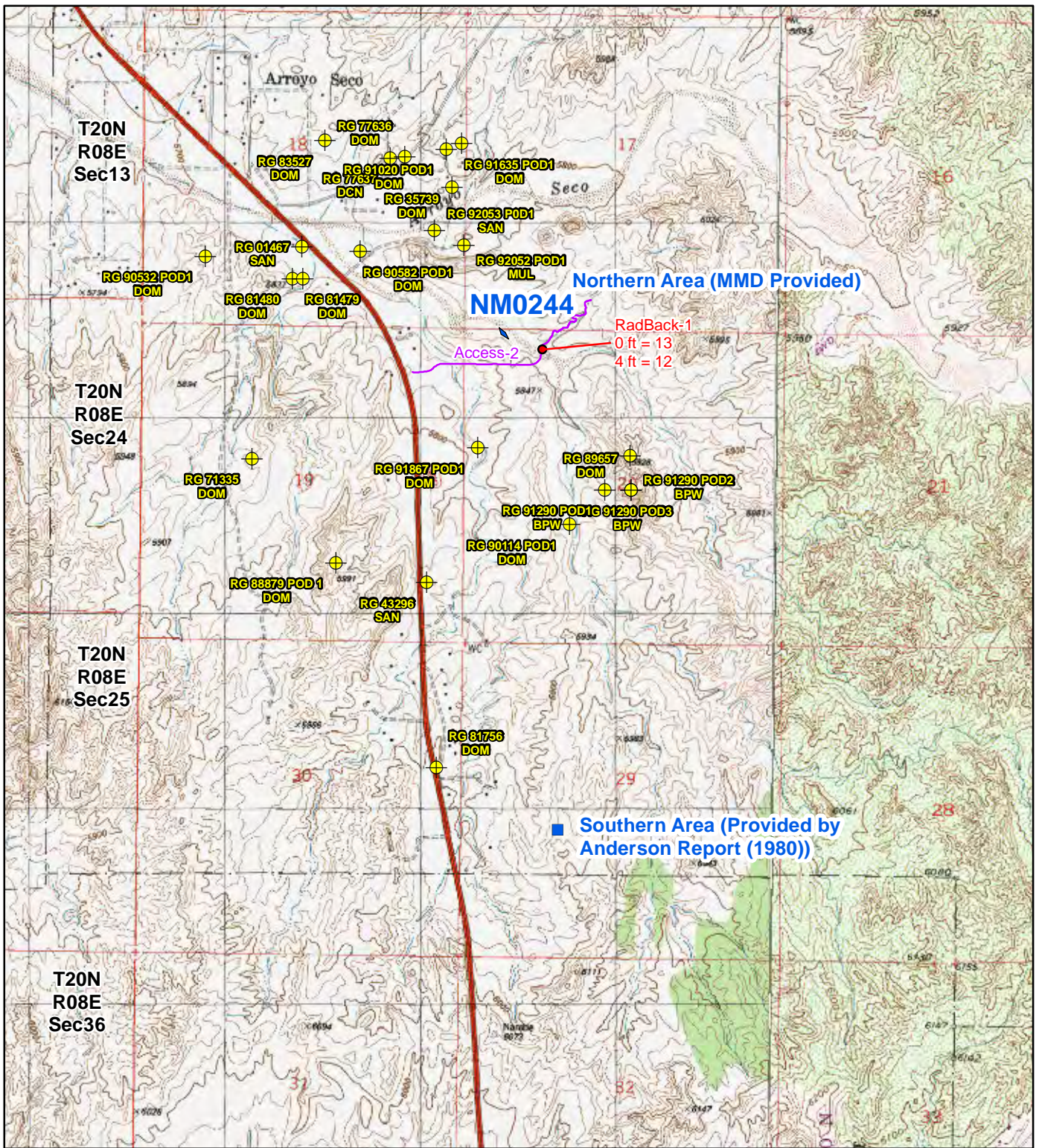


**Legend**

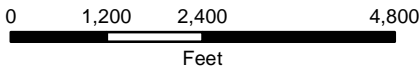
[Blue Square]	AUM Location
[Red Line]	Road
[Black Outline]	County Boundary

**Figure 1**  
**Site Location Map**  
**NM0244-Becky**  
Abandoned Uranium  
Mine Assessment





Map Source(s):  
 U.S. Geological Survey 7.5-Minute  
 Topographic Map  
 -Cundiyo, 1993  
 -Espanola, 1984

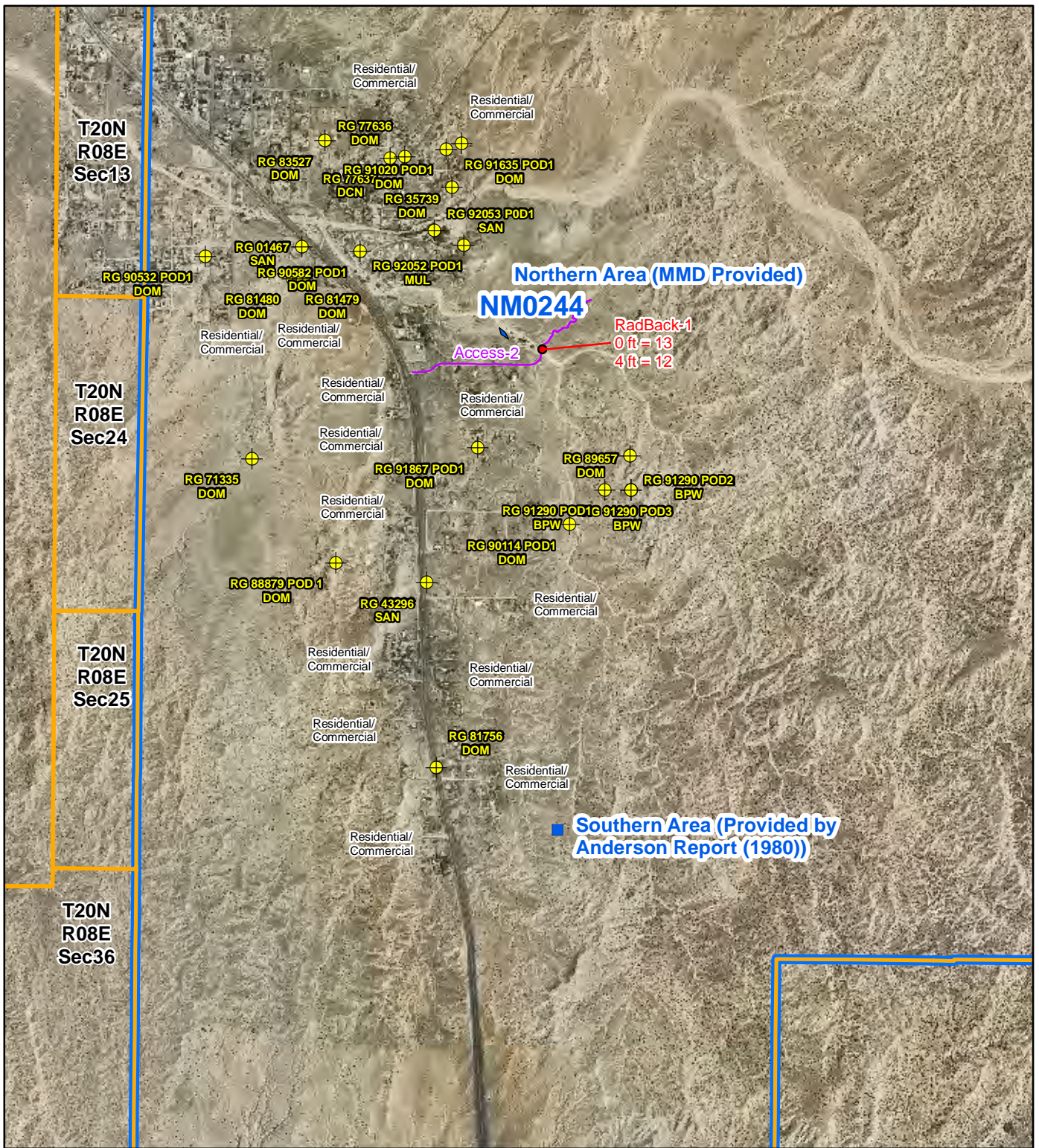


**Legend**

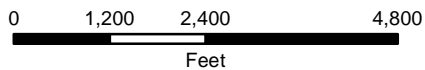
- Radiation Readings (μR/hr)
- Center of Southern Site Area
- ⊕ Well Within 1 Mile of Site
- Access Route
- AUM Location Boundary (MMD Provided)

**Figure 2**  
**Topographic Map**  
**NM0244-Becky**  
 Abandoned Uranium  
 Mine Assessment





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



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

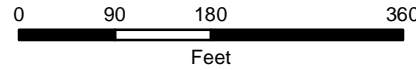


**Figure 3**  
**Aerial Photo**  
**NM0244-Becky**  
 Abandoned Uranium  
 Mine Assessment



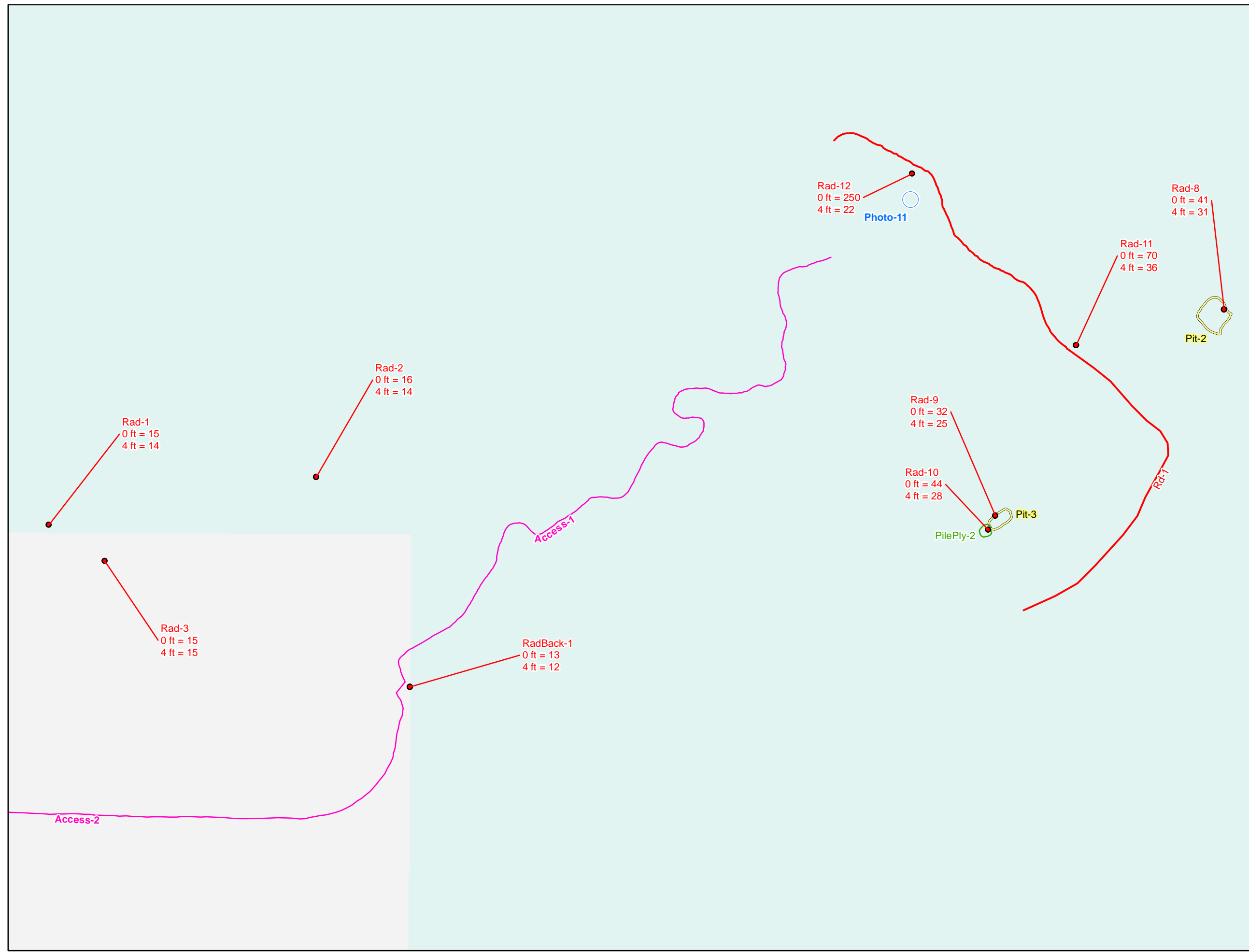
**Legend**

- Radiation Readings (µR/hr)
- Photo Location
- Access Route
- Mine Road
- Pile Boundary
- Pit Boundary



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

**Figure 4a**  
**Site Map on**  
**Aerial Photo**  
**NM0244-Becky**  
**Northern Area**  
 Abandoned Uranium  
 Mine Assessment

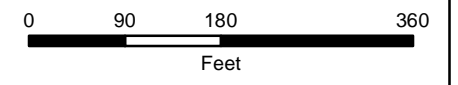


**Legend**

- Radiation Readings (µR/hr)
- Photo Location
- Access Route
- Mine Road
- Pile Boundary
- Pit Boundary

**Surface Ownership**

- Private
- State

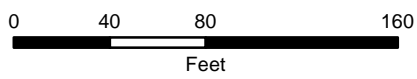


Map Source(s):  
Ownership - BLM, 2008

**Figure 4b**  
**Site Map with**  
**Surface Ownership**  
**NM0244-Becky**  
**Northern Area**  
 Abandoned Uranium  
 Mine Assessment



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

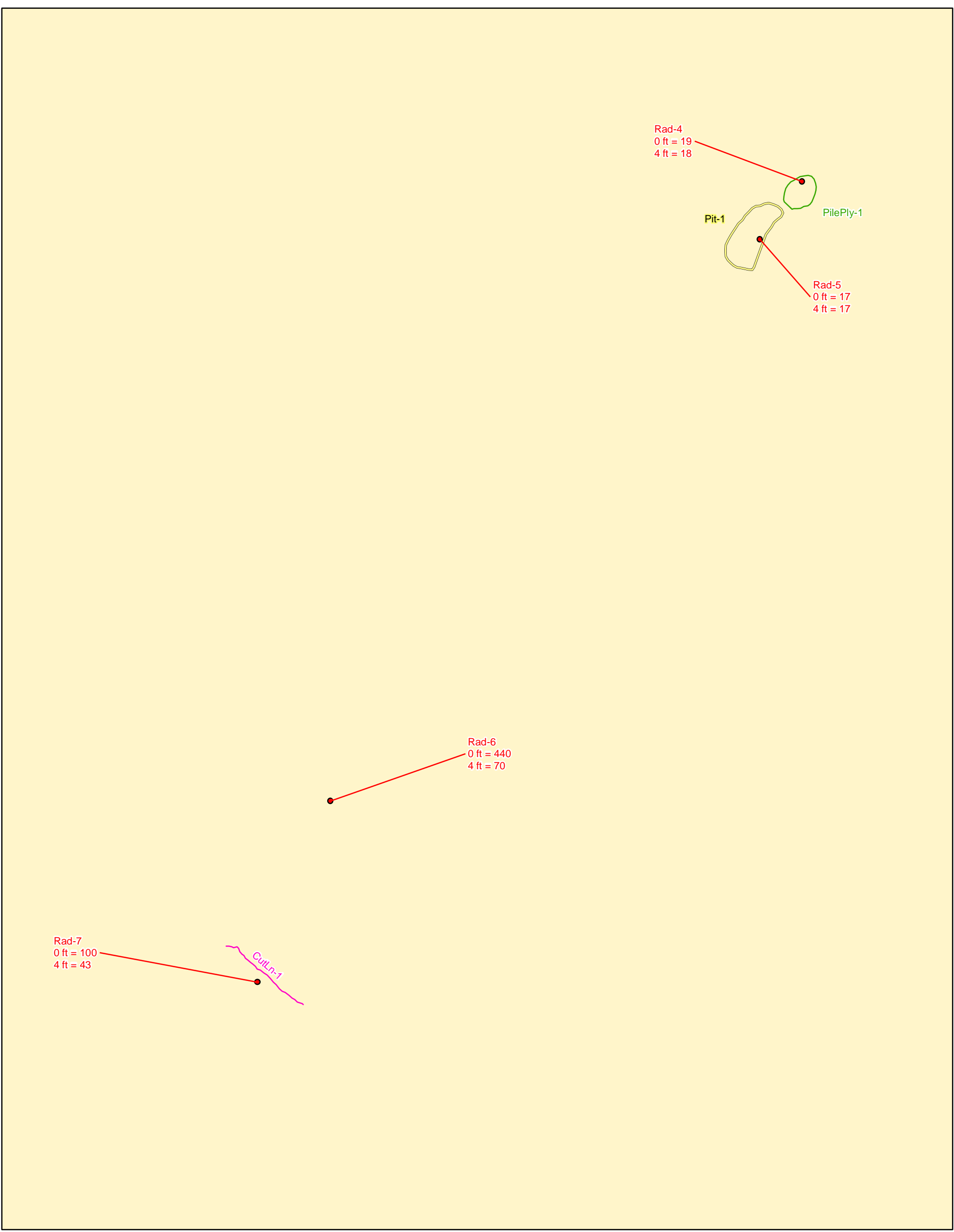


**Legend**

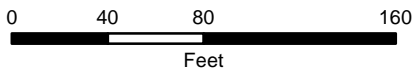
- Radiation Readings ( $\mu\text{R/hr}$ )
- Open Cut
- Pile Boundary
- Pit Boundary

**Figure 5a**  
**Site Map on**  
**Aerial Photo**  
**NM0244-Becky**  
**Southern Area**  
 Abandoned Uranium  
 Mine Assessment





Map Source(s):  
Ownership - BLM, 2008



**Legend**

- Radiation Readings (µR/hr)
- Open Cut
- Pile Boundary
- Pit Boundary

**Surface Ownership**

- Bureau of Land Management

**Figure 5b**  
**Site Map with**  
**Surface Ownership**  
**NM0244-Becky**  
**Southern Area**  
 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 north at MMD polygon location.

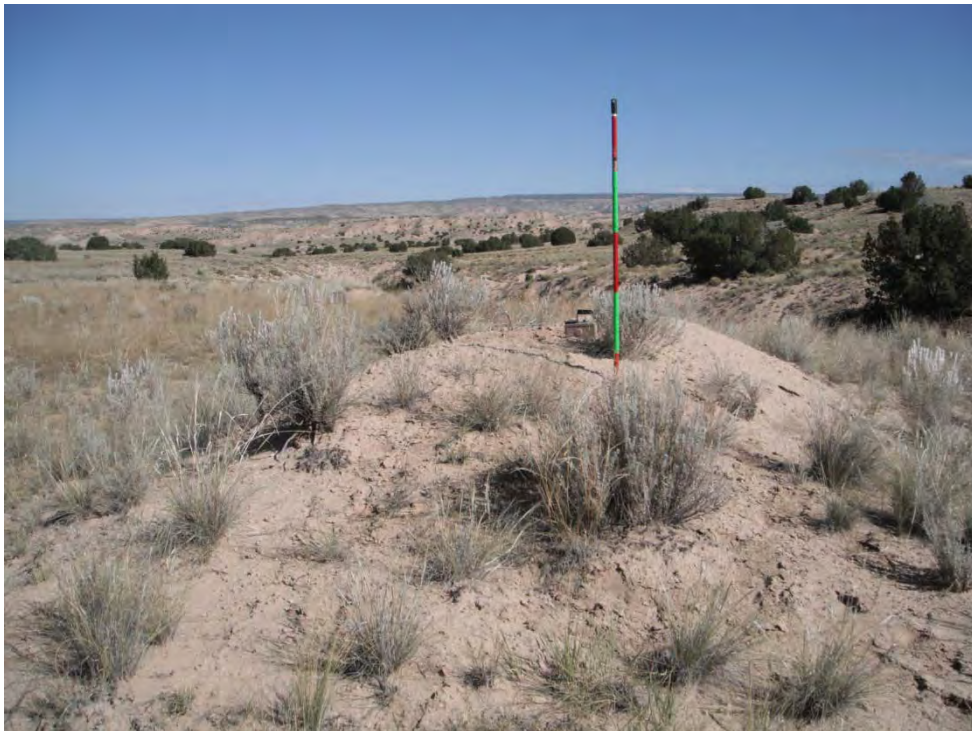


Photo 2-Looking north at PilePly-1.



Photo 3-Looking north at Pit-1.



Photo 4-Closeup of rocks at Rad-6.

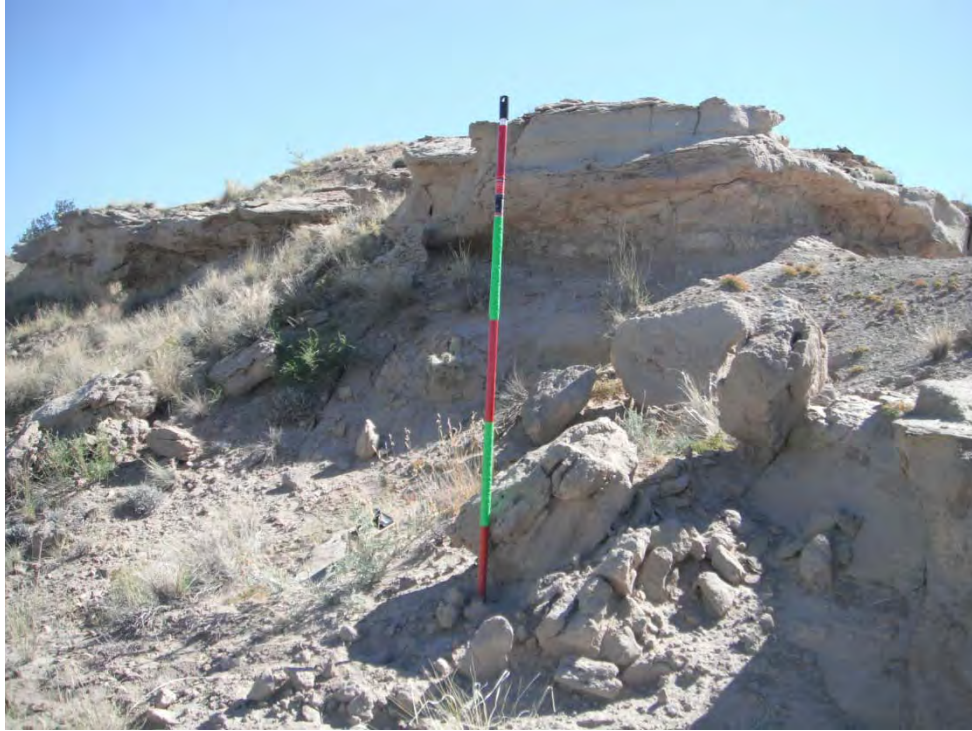


Photo 5-At Rad-6, looking north.



Photo 6-Looking north at CutLn-1.



Photo 7-Looking north at Pit-2.



Photo 8-Looking west at Pit-3.



Photo 9-Looking north at PilePly-2.



Photo 10-Closeup of rocks at Rad-12.



Photo 11-Site location photo looking north, replicating Anderson photo B.



Photo 12- Vegetation at AUM Site.



Photo 13- Vegetation at AUM Site.



Photo 14-Vegetation at AUM Site.



Photo 15-Vegetation at AUM Site.

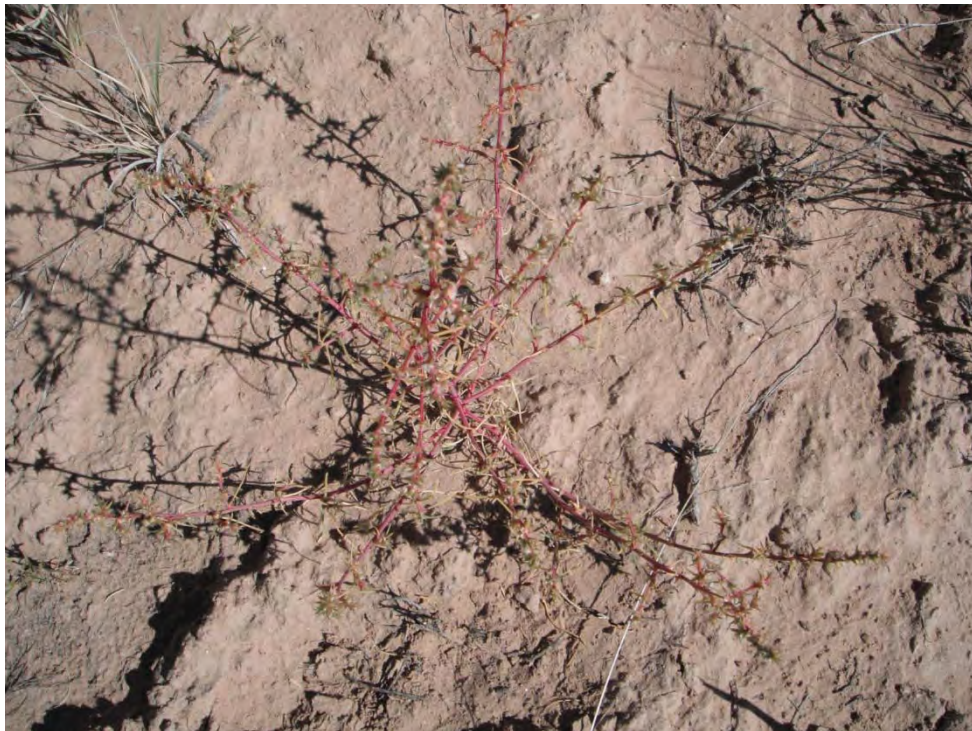


Photo 16-Vegetation at AUM Site.

**APPENDIX B**  
**FIELD NOTES**

75. 10/11/10 ACT Abandoned Uranium Mines

Site Name: NMO244, Becky

Objective: Site Assessment

Personnel: Annelia Tinklenberg  
Alex Resovsky

Equipment: Rental truck, Trimble GeoXM (SN: 494841727, 2008 Series), Ludlum 192 (SN: 234149), Fuji film digital camera (No. OTB31259), backup Garmin GPS, cell phone amplifier, field laptop.

800 Measured Ludlum scintillometer against  $^{137}\text{Cs}$  source = 270  $\mu\text{R/h}$  at contact.

HASP

830 Leaving Albuquerque for site

1000 At location south of Espanola on NM-285 to meet landowner

1030 AUM Polygon location - no visible mine features, in Arroyo Seco

Rad-1 - Om-15  $\mu\text{R/h}$ ; 1m-14  $\mu\text{R/h}$  - no visible features

Photo 1 - photo of site looking north

Rad 2 - Om-16  $\mu\text{R/h}$ ; 1m-14  $\mu\text{R/h}$  - no visible features

Rad 3 - Om-15  $\mu\text{R/h}$ ; 1m-15  $\mu\text{R/h}$  - no visible features

1130 - Going south to other features.  
PilePly-1 - 3' tall, 10' wide, 20' long, 30"

Photo 2 - PilePly-1 looking north

Rad 4 - PilePly-1, Om-19  $\mu\text{R/h}$ ; 1m-18  $\mu\text{R/h}$

Pit-1 - 4' deep, 15' wide, 35' long; bulldozer cut, no exposed bedrock

Photo 3 - Pit-1 looking north

Rad 5 - Pit-1; Om-17  $\mu\text{R/h}$ ; 1m-17  $\mu\text{R/h}$

10/11/10 ACT Abandoned Uranium Mines

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Rad 6 - cliff wall; Om-49  $\mu\text{R/h}$ ; 1m-70  $\mu\text{R/h}$ ; sandstone

Photo 4 - contact of Rad 6

Photo 5 - cliff wall at Rad 6 looking north

CutIn-1 - old cut, 5' high, 70' long, 5' wide

Photo 6 - CutIn-1 looking north

Rad 7 - CutIn-1; Om-100  $\mu\text{R/h}$ ; 1m-43  $\mu\text{R/h}$

1230 - Returning to northern area to look for features

Pit-2 - 4' deep, 30' wide, 40' long

Photo 7 - Pit-2 looking north

Rad 8 - Pit-2; Om-41  $\mu\text{R/h}$ ; 1m-31  $\mu\text{R/h}$

Pit 3 - 2' deep, 30' long, 10' wide; bulldozer cut

Photo 8 - Pit 3 looking west

Rad 9 - Pit 3; Om-32  $\mu\text{R/h}$ ; 1m-25  $\mu\text{R/h}$

PilePly-2 - 3' tall, 10' wide, 20' long associated with Pit 3

Photo 9 - PilePly-2 looking north

Rad 10 - PilePly-2; Om-44  $\mu\text{R/h}$ ; 1m-28  $\mu\text{R/h}$

Rad 11 - sandstone outcrop; Om-70  $\mu\text{R/h}$ ; 1m-36  $\mu\text{R/h}$

Rad 12 - outcrop in arroyo; Om-250  $\mu\text{R/h}$ ; 1m-22  $\mu\text{R/h}$

Photo 10 - Rad 12

Photo Pt. 1 - Photo 11 - site 10 location looking north, replicating

Anderson Photo 6  
Background Rad - Om-13  $\mu\text{R/h}$ ; 1m-12  $\mu\text{R/h}$

Photos 12-16 - Vegetation

Mine Rd-1 - along north side of features

Access-1 - through arroyo

Access-2 - road on private land to arroyo to features

Rad-1 through Rad 3, at AUM polygon and Pit-2 through Photo Pt. 1 (all northern features).

Features PilePly-1 through Rad 7 (CutIn-1) are all of the southern features approximately 2 miles south of the northern features.

After finding no visible mine features at the AUM polygon the landowner took us to some features he knew about;

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but they did not appear to be the same as the features described in the Anderson report. We returned to the northern location and hiked around a lot more and found what appears to be described in the Anderson report.

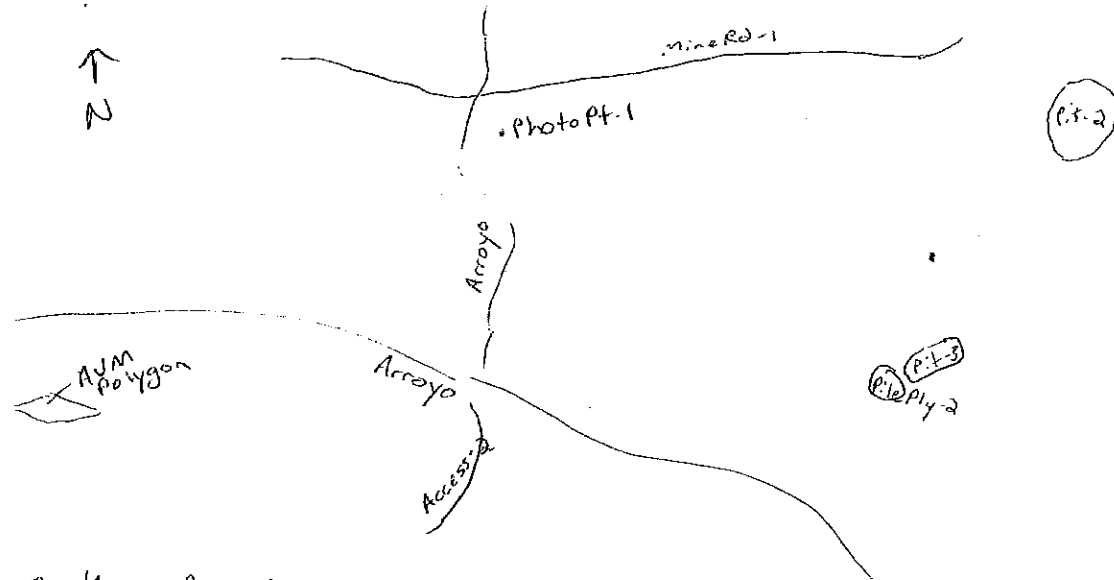
Soils: light tan, sandy soils.

Rocks: Tan to red sandstone with nodules.

Wildlife: Rabbit droppings, crows.

Human Activities: Horses and cattle grazing. Fences, cow prints and droppings. Domestic dwellings within 1 mile of both sites.

Northern Area:



Southern Area:

