

AUM RECLAMATION

The NAMLRP has the authority and responsibility to reclaim uranium mines within the jurisdiction of the Navajo Nation that were left abandoned or inadequately reclaimed prior to August 3, 1977. This authority is granted under the Surface Mining Control and Reclamation Act (SMCRA) of 1977, Public Law 95-87 and the approved Navajo Reclamation Plan and Reclamation Code. The reclamation projects were designed to minimize the need for maintenance, promote landscape stability, enhance re-establishment of natural vegetation, enhance wildlife (where it is consistent with adjacent land uses), and most importantly, adequately safeguard the physical and radioactive hazards. NAMLRP is only authorized to perform reclamation activities on “tribal trust lands.” A prioritization scheme for non-coal mine sites was established by the NAMLRP. Priority 1 sites exhibit extreme physical hazards, easy access, and danger to life and property. Priority 2 and 3 sites have less physical dangers, more difficult access, and lower visitation (NAMLRP, 2000 - S07220301). AUM “Problem Areas” were identified by NAMLRP, which were used for mine feature and reclamation project identifiers (Table 1). For example, “COV127” designates the 127th inventoried mine feature in the Cove Problem Area. “NA-0307” is a reclamation project in the Cove Problem Area.

Table 1. NAMLRP Problem Areas and Associated Naming Convention Designations.

PROBLEM AREA	PROJECT RANGE	MINE FEATURE		PROBLEM AREA	PROJECT RANGE	MINE FEATURE
Cameron	NA-0100	CAM		Sanostee	NA-0600	SAN
Monument Valley	NA-0200	MON		Black Mesa	NA-0700	BLK
Cove	NA-0300	COV		Bidahochi	NA-0750	BID
Beclabito	NA-0400	BEC		Oak Springs	NA-0800	OAK
Sweetwater	NA-0500	SWT		Tse Tah	NA-0900	TSE

NAMLRP conducted inventories of non-coal mine features and established priorities during the period August 1988 through October 1990 (NAMLRP, S02230324). Problem Area inventory field logs were maintained for each mine feature included in the inventory. Field observations were recorded that included parameters such as: the date of the field visit, mine feature type, description of mine feature, dimensions, drainages, evidence of visitation, impacted area estimate, spoil volume, and accessibility. Field logs are available from NAMLRP. Mine features include uranium mine portals, rimstrips, open pits, highwalls, and radioactive waste piles with low-level radioactivity. The portals and shafts are open or partially open and located on the mesa ridges/edges and flat areas. The highwalls, or mine related cliffs, are associated with portals and rimstrips. The waste piles are usually located on the flats and on steep slopes. NAMLRP inventoried over 1,000 AUM features on the Navajo Nation.

After the prioritization process, NAMLRP initiated reclamation projects. Each reclamation project started with a description of the technical specifications, including general information about the required reclamation work, mine closure methods, earthwork requirements, incidental work (e.g., mobilization, site grading to re-establish drainage patterns, access road improvement, demobilization), site specific work scope details with maps and drawings, radiological clean-up guidelines and worker safety, and cultural and fish and wildlife resources protection.

Figure 8 is an example of one of the technical specification drawings that was developed for a planned reclamation site. These drawings are available from the NAMLRP and provide valuable information about the number and type of AUM features, acreages, and estimated waste volumes. Figure 9 shows the NAMLRP Problem Areas and Priority 1, 2, or 3 AUM features. There are four (4) reclaimed AUM features in the Eastern Agency that do not have assigned priorities.

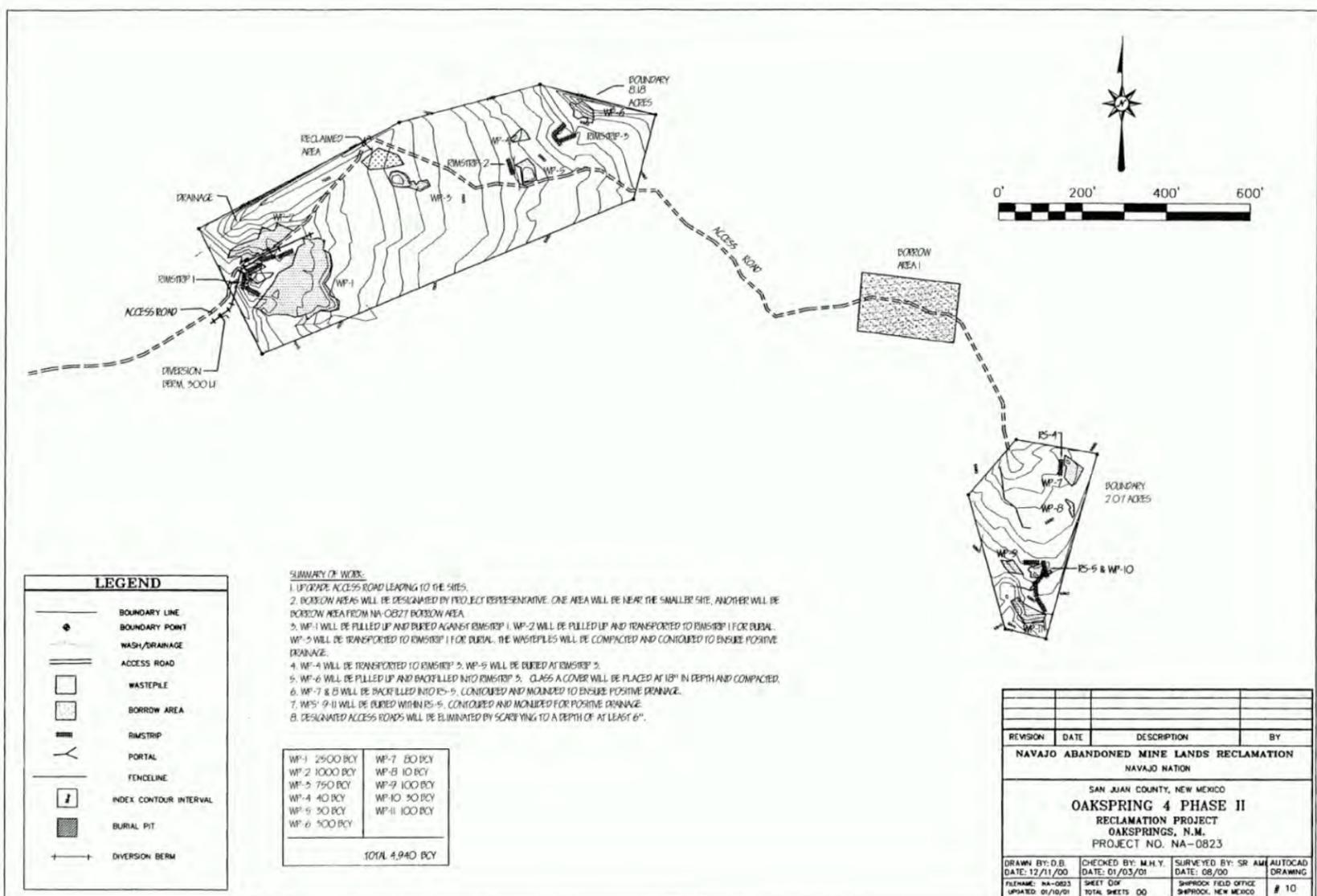
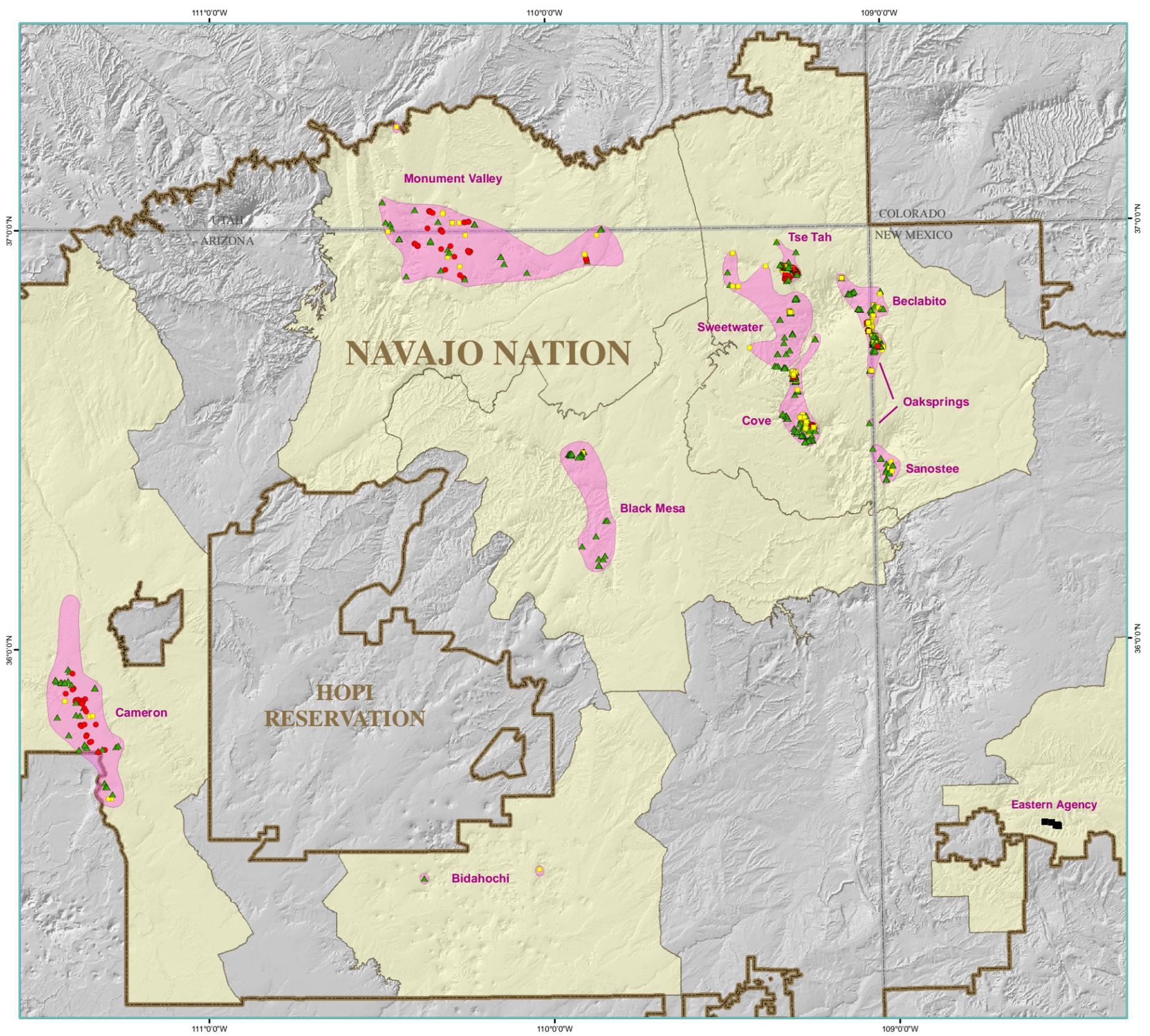
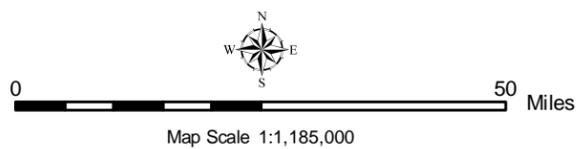


Figure 8. Example of an NAMLRP AUM Reclamation Project Site Technical Specification Drawing.



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**NAMLRP RECLAMATION PROBLEM AREAS
WITH AUM FEATURES BY PRIORITY**



Legend

- PRIORITY
- 1 = Highest Priority
 - 2 = Medium Priority
 - ▲ 3 = Lowest Priority
 - Unknown Priority
- NAMLRP Problem Areas
- AUM Regions

Sources

Problem area boundaries and Priority 1, 2, and 3 sites for the Navajo Nation were developed by the Navajo Abandoned Mine Lands Reclamation Program (NAMLRP). Priority 1 and 2 category sites meet criteria that concern the protection of public health and safety. Priority 3 sites meet conditions that concern environmental degradation.

Filenames:
DB/AUM/NN_AUM_Problem_Areas.shp
DB/AUM/NN_AUM_Pt_Features.shp.



NAMLRP reclamation site NA-0804 at Lookout Point Incline Mine. This photo shows a loader hauling Class A cover and a bulldozer placing it on a reclaimed waste pile. Photo courtesy NAMLRP.

Figure 9. NAMLRP Reclamation Problem Areas with Prioritized AUM Features.

AUM RECLAMATION (continued)

Site evaluation and design of reclamation projects typically involved characterization of the mine feature(s) and associated waste piles at the site. Preliminary radiometric readings were taken at mine feature locations (e.g., rimstrips, adits, pits, etc.) during the site inventories and were recorded in field logs. Prior to beginning significant reclamation activities, gamma radiation surveys were conducted. General maps were prepared for the mine site vicinity including: the mine, waste piles, protore piles, structures, and surface water drainage (NAMLRP, S05110504). Field logs and ground gamma radiation surveys are available from the NAMLRP.

During reclamation, portals and shafts were generally closed by either backfilling, by polyurethane foam (PUF) plugs, or cinderblock bulk heads (Figure 10). The rimstrips and open pits were backfilled with a combination of mine waste piles (Class B and C) and Class A cover. The waste piles were used to backfill the portals and rimstrips to a certain point, then any excess was excavated out, hauled to designated areas, placed in burial pits, and then covered with a minimum 18 inches thick compacted Class A cover (NAMLRP, 2000 - S02230328). Generally a buffer zone of clean material is placed at the bottom of the waste disposal area, then the highest levels of radioactive materials are placed on top of the buffer zone material, and the less radioactive materials are subsequently placed over them. Topsoil or non-radioactive materials (Class A) from the surrounding area are used as cover material. All radioactive waste disposal areas are located away from surface and ground water in order to prevent contamination to the local hydrology. Generally the reclaimed sites are revegetated using a suitable native seed mix (OSM, 1998 - S07220302). Work that was performed at each reclamation site included:



Figure 10. Polyurethane Foam (PUF) Closure on an Open Portal. Photo courtesy NAMLRP.

- Improve access roads for reclamation work
- Stabilize mine openings before closure
- Backfill or excavate any radiological “hot spots”
- Eliminate the mine feature and any related physical hazards
- Regrade all disturbed areas to ensure positive drainage around and off the reclaimed areas
- Roughen reclaimed surfaces
- Eliminate access roads at completion of reclamation.

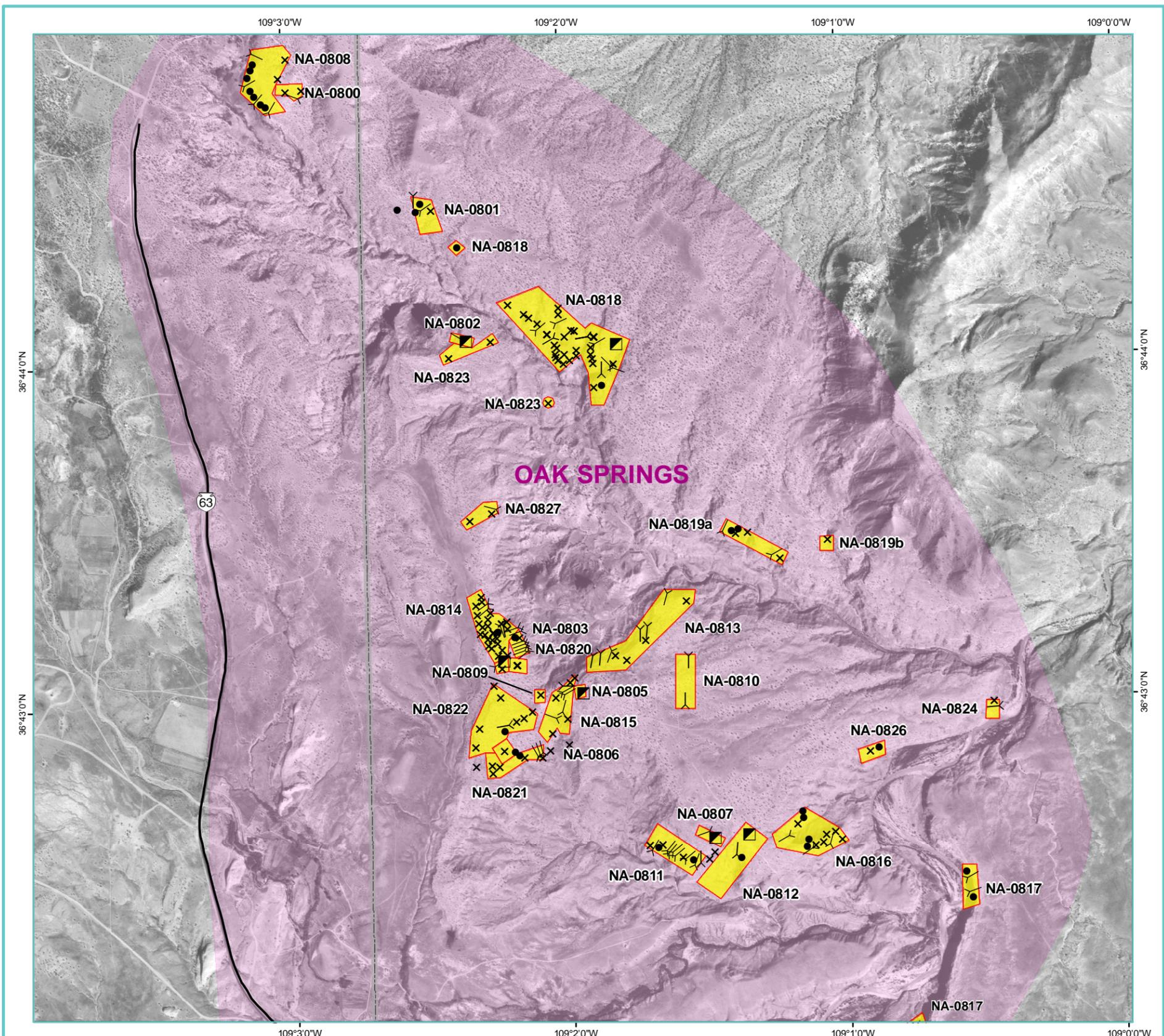
Reclamation projects for all high Priority-1 and Priority-2 AUM projects have been completed. There are 166 identified unreclaimed AUM mine features with environmental problems remaining, as shown in Table 2. The environmental problems are related to uranium mine waste that remains within the AML sites. These sites are located in the high mesas and/or mountainous regions making access to these sites difficult. The NAMLRP has been recognized through OSM’s award programs for excellence in reclamation by receiving both National and regional awards (NAMLRP, 2007- S05190702).

Table 2. NAMLRP Reclamation Accomplishments by Problem Area (after NAMLRP, 2007 - S05190702)

AML PROBLEM AREAS	TOTAL # PROJECT SITES (NA-0XXX)	TOTAL # MINE FEATURES	TOTAL # RECLAIMED MINE FEATURES	# PHASES	# UNRECLAIMED MINE FEATURES	COMMENTS
Beclabito	29	90	81	4	18	OSM Award
Bidahochi	2	2	2	1	0	
Black Mesa	17	29	22	3	5	
Cameron	75	103	68	6		
Cove	58	231	202	4	84	OSM Award
Eastern Agency	3	15	14	1	4	
Monument Valley	53	82	67	4	14	OSM Award
Oak Springs	36	238	233	4	9	
Sanostee	8	19	8	1	2	
Sweetwater	27	48	42	2	13	
TseTah	37	179	178	3	17	
TOTALS	344	1036	917		166	

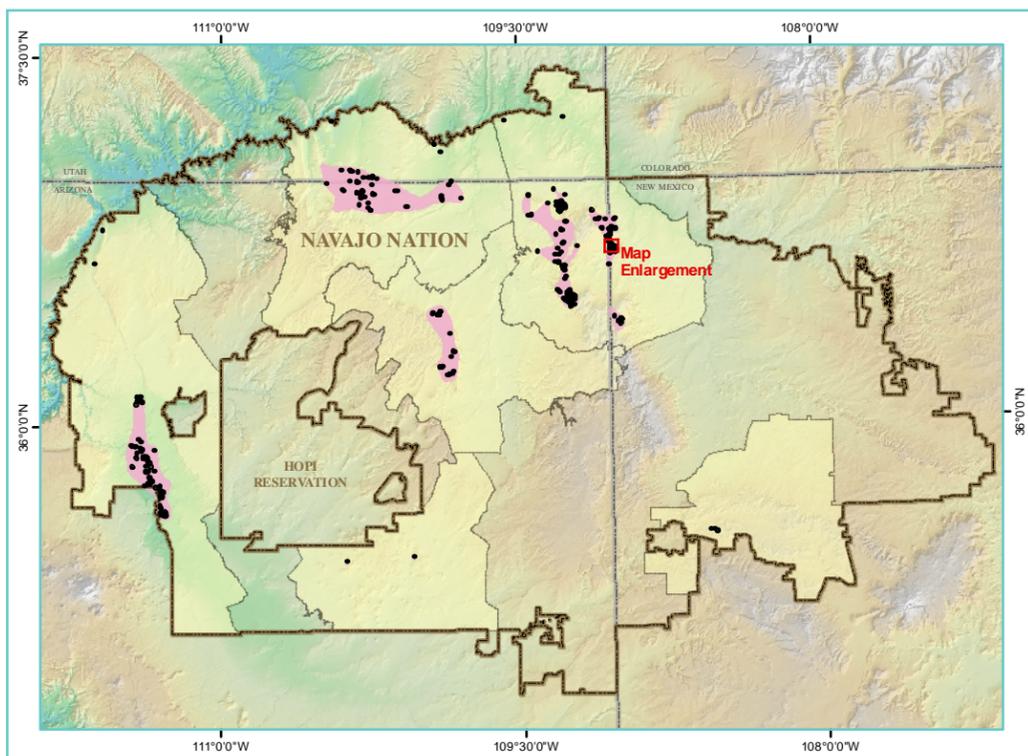
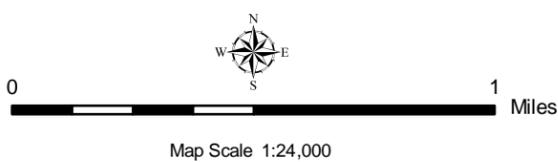
Figure 11 shows an enlarged portion of the Oak Springs Problem Area. The inset map shows locations of the NAMLRP Problem Areas and AUM features across the Navajo Nation. NAMLRP GIS datasets are provided on the GIS Data DVD (DB/AUM) as follows: (NN_AUM_Problem_Areas.shp); (NN_AUM_Project_Sites.shp); and (NN_AUM_Pt_Features.shp).

Figure 12 shows mine features according to reclamation status. Circles represent reclaimed mine features, squares depict unreclaimed mine features, and triangles represent locations of mine features where the reclamation status is not known. Most of these unknown features occur in the Eastern AUM Region. Red symbols indicate that there are unreclaimed waste piles nearby. Green symbols indicate AUMs that were not inventoried for the presence of unreclaimed waste piles. Blue symbols have no unreclaimed waste piles associated with the AUM.



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NAMLRP RECLAMATION PROJECT SITES AND AUM FEATURES IN THE OAK SPRINGS PROBLEM AREA



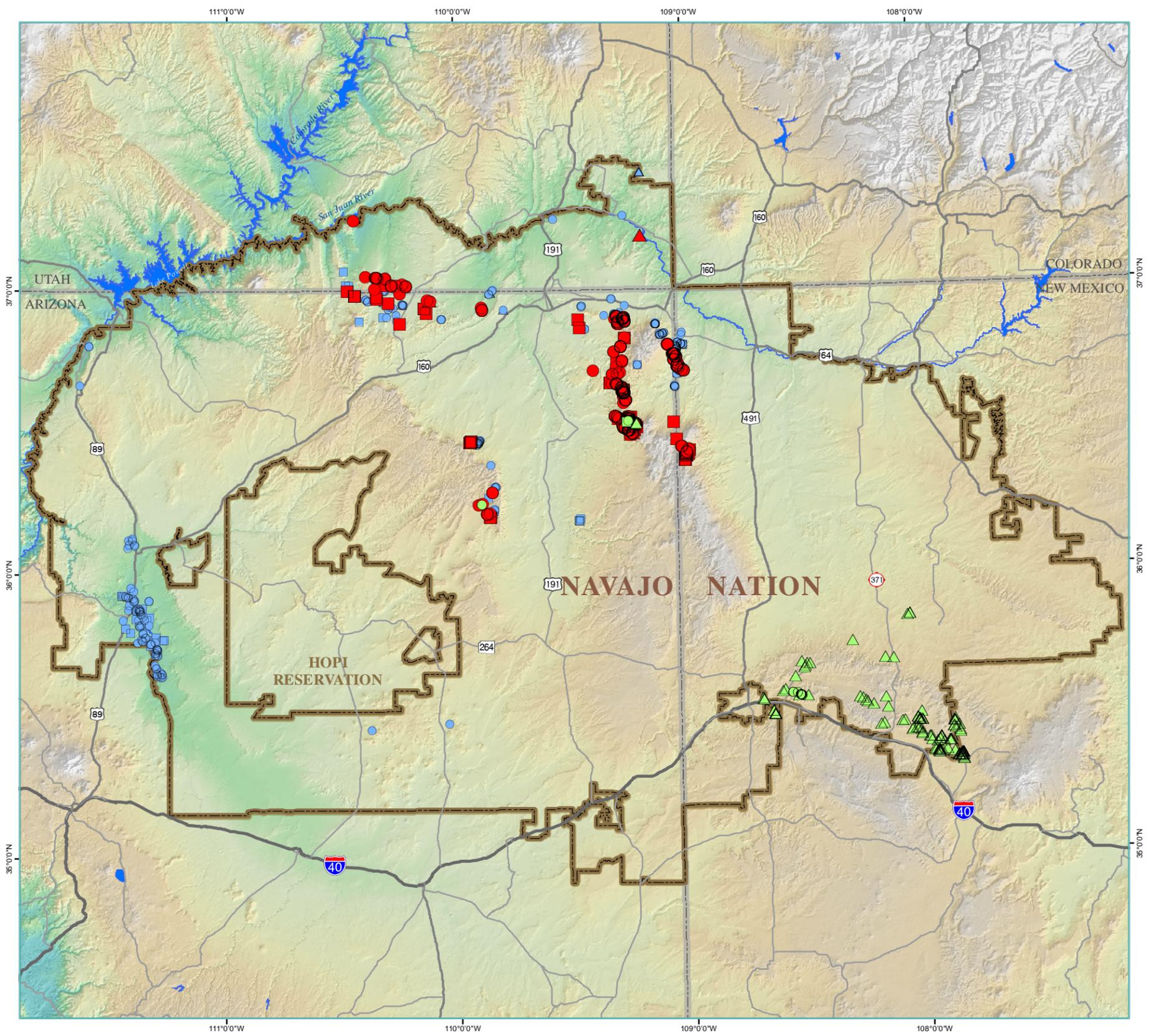
- Legend
- AUM FEATURE
- Portal
 - Prospect
 - × Rimstrip / Pit
 - ▣ Vertical
- NAMLRP Project Site (Yellow box)
- NAMLRP Problem Area (Purple box)

Sources

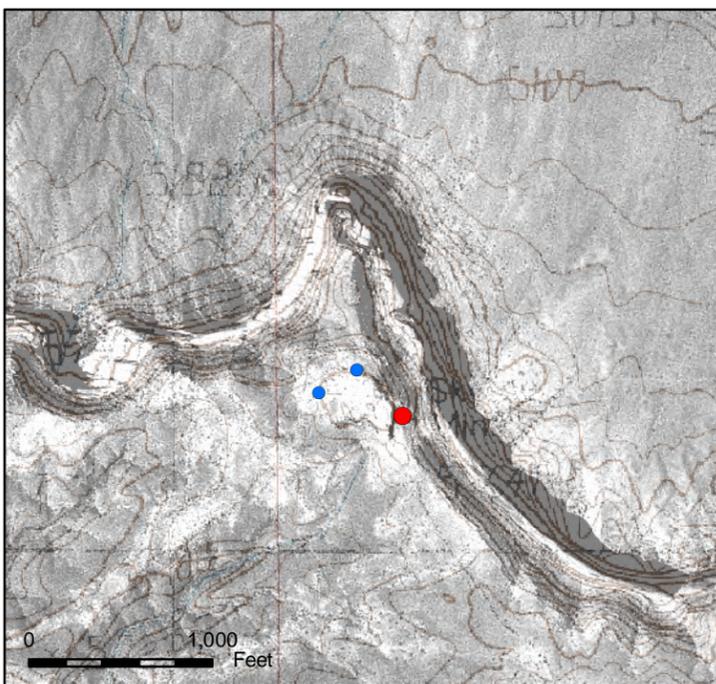
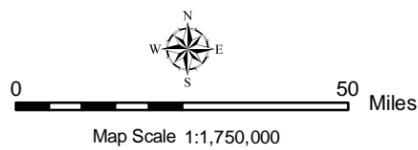
Reclamation project site boundaries and AUM feature locations are from the Navajo Abandoned Mine Lands Reclamation Program.

Filenames:
 DB/AUM/NN_AUM_Problem_Areas.shp
 DB/AUM/NN_AUM_Project_Sites.shp and
 DB/AUM/NN_AUM_Pt_Features.shp.

Figure 11. NAMLRP Reclamation Project Sites and AUM Features in the Oak Springs Problem Area.



**ABANDONED URANIUM MINES AND THE NAVAJO NATION
 NAMLRP MINE FEATURE RECLAMATION STATUS AND
 UNMAPPED ASSOCIATED WASTE PILES**



The above inset shows three mine features mapped at the Skyline mine. The reclaimed mine feature (in red) is on the margin of a cliff and has an unmapped associated waste pile. The reclaimed mine features (in blue) on top of the flat mesa do not have unmapped associated waste piles.

- Legend
- NAMLRP MINE FEATURES**
- RECLAIMED FEATURE**
- Unreclaimed Waste Piles Present
 - Presence of Unreclaimed Waste Piles Unknown
 - No Unreclaimed Waste Piles
- FEATURE RECLAMATION STATUS UNKNOWN**
- ▲ Unreclaimed Waste Piles Present
 - ▲ Presence of Unreclaimed Waste Piles Unknown
 - ▲ No Unreclaimed Waste Piles
- UNRECLAIMED FEATURE**
- Unreclaimed Waste Piles Present
 - Presence of Unreclaimed Waste Piles Unknown
 - No Unreclaimed Waste Piles

Sources

Reclaimed mine feature locations and status are from the Navajo Abandoned Mine Lands Reclamation Program. The presence of waste piles was determined by NAMLRP and TerraSpectra Geomatics.

Filenames: DB/AUM/NN_AUM_Pt_Features.shp

Figure 12. NAMLRP AUM Feature Reclamation Status and Presence of Unreclaimed Waste Piles.