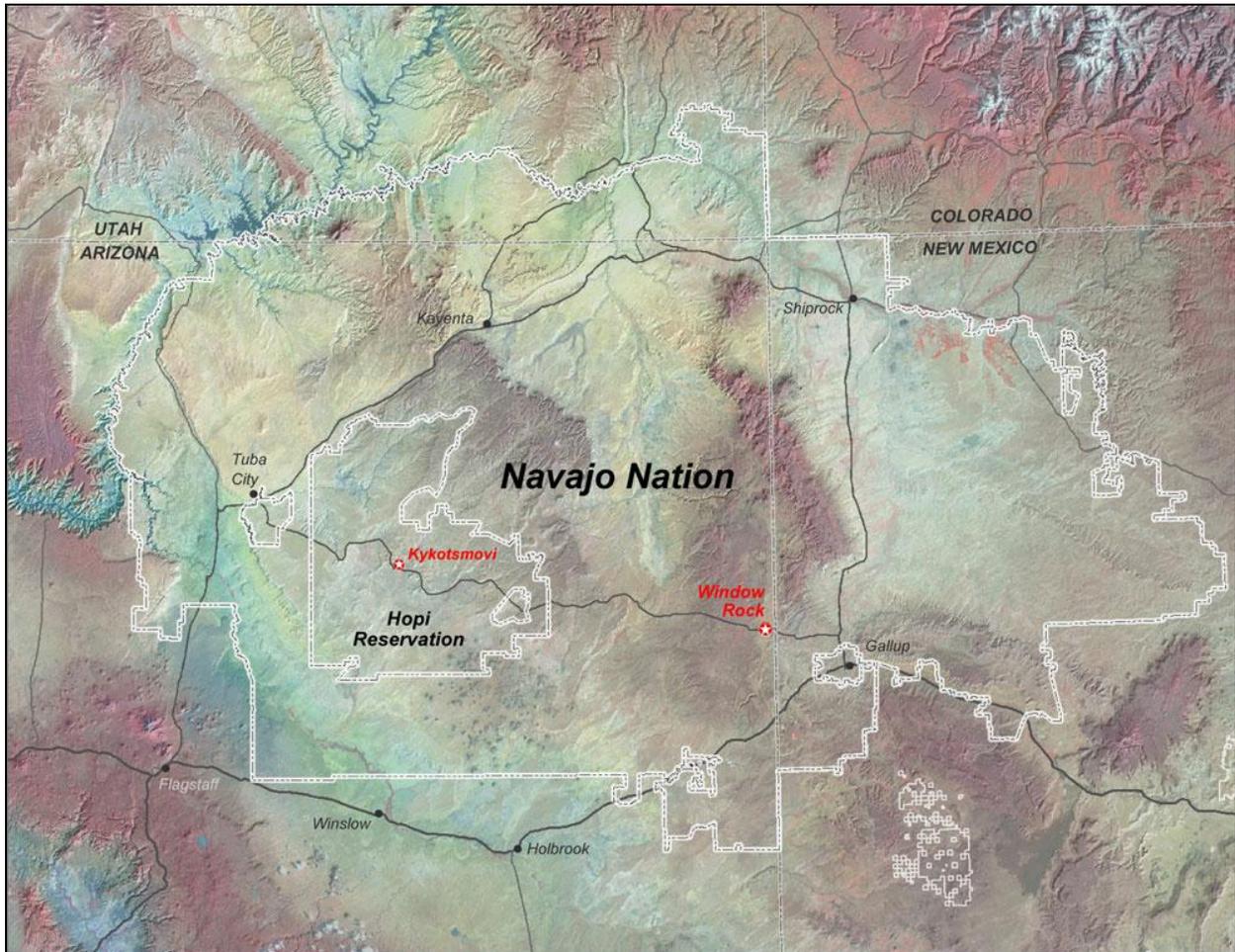


# Federal Actions to Address Impacts of Uranium Contamination in the Navajo Nation

## Five-Year Plan Summary Report



January 2013

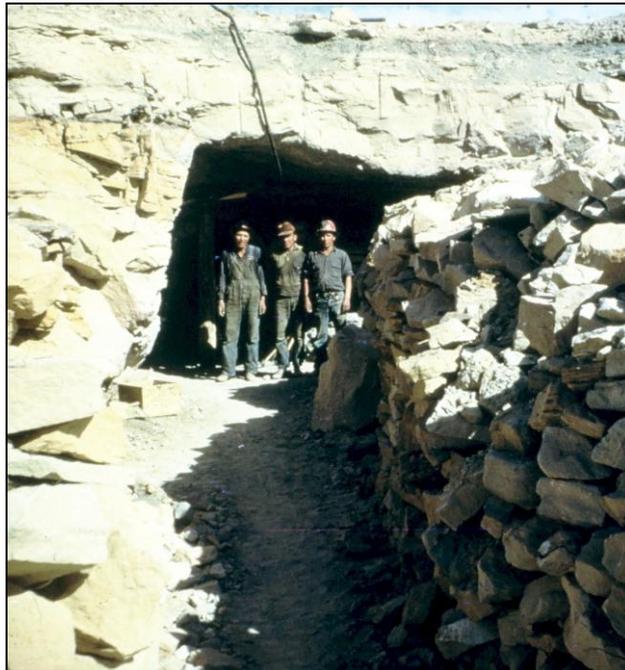
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## EXECUTIVE SUMMARY

The Navajo Nation encompasses more than 27,000 square miles, spread between three states in the Four Corners area. The unique geology of the region makes the Navajo Nation rich in uranium, a radioactive ore in high demand after the development of atomic power and weapons at the close of World War II in the 1940s. Approximately four million tons of uranium ore were extracted during mining operations within the Navajo Nation from 1944 to 1986. Many Navajo people worked the mines, often living and raising families in close proximity to the mines and mills.

Uranium mining and milling activities no longer occur on Navajo lands, but the legacy of these activities remains; including more than 500 abandoned uranium mine claims with thousands of mine features such as pits, trenches, holes, etc., and homes and drinking water sources with elevated levels of uranium, radium and other radionuclides. Uranium and other elements (selenium, arsenic, etc.) associated with mine and mill sites also occur naturally at elevated levels in rock, soil, surface water, and groundwater across the Navajo Nation and the broader Four Corners region. Health effects as a result of exposure to these elements can include lung cancer, bone cancer, and impaired kidney function.



### **Historical Uranium Mining on the Navajo Nation - King Tutt Point Mine**

In October 2007, at the request of the U.S. House Committee on Oversight and Government Reform, the United States Environmental Protection Agency (EPA), along with the Bureau of Indian Affairs (BIA), the Nuclear Regulatory Commission (NRC), the Department of Energy (DOE), and the Indian Health Service (IHS) developed a coordinated Five-Year Plan to address uranium contamination in consultation with Navajo Nation. The Five-Year Plan was the first

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coordinated approach by the agencies, and outlined a strategy for gaining a better understanding of the scope of the problem and for addressing the greatest risks first. The following objectives were developed as part of the Five-Year Plan:

1. Assessment and cleanup of contaminated structures
2. Assessment of contaminated water sources, and provision of alternative water supplies
3. Assessment of abandoned uranium mines, with detailed assessments of those most likely to pose environmental or health problems
4. Cleanup of the Northeast Church Rock mine site and additional high-priority abandoned mine sites
5. Cleanup of the Tuba City Highway 160 site
6. Cleanup of the Tuba City Dump
7. Remediation of groundwater contamination at three former mill sites
8. Case control studies of health risks faced by individuals residing near mill sites or abandoned mine sites

This report is provided in response to a letter dated October 18, 2012 from six members of Congress requesting that the EPA, BIA, NRC, DOE, and IHS provide a summary of work completed toward the goals outlined in the Five-Year Plan. The members requested that the report include:

1. The extent to which the federal agencies have been successful and effective in accomplishing the cleanup and assessment milestones established in the Five-Year Plan.
2. A description of the results of the assessment and characterization efforts, including a discussion of changes to the initial understanding of the scope of the contamination problems over the past five years.
3. A discussion on how effective the collaboration among the federal and other agencies involved has been, and any ways collaboration and information sharing could be further improved during implementation of the next Five-Year Plan.
4. A preliminary discussion of the remaining immediate and longer-term steps that need to be taken to address the uranium contamination in and around the Navajo Nation.
5. A discussion of whether past allocated resources were sufficient to accomplish the milestones outline in the Five-Year Plan and anticipated future funding needs for additional remediation and public health efforts, including a discussion of the role of non-appropriated funds, such as those from PRPs, during the first five years and for future efforts.

### **1. Progress toward milestones of the Five-Year Plan**

Significant progress was made on all eight goals of the plan as described in detail below. The agencies met the overarching goal of protecting Navajo residents from urgent risks first by addressing contaminated structures, water supplies, and mills and mines with the highest levels of radiation. There is also an improved understanding of the scope of mine-impacted and naturally occurring uranium on the reservation. Uranium mining has resulted in elevated uranium levels at over 400 locations on the Navajo Nation, which will take additional time to address. All

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agencies are committed to continue working with the Navajo Nation to understand and address the health and environmental risks and to find long-term solutions to the remaining uranium issues on Navajo lands.

**The agencies completed the following actions:**

**OBJECTIVE 1. Assessment and cleanup of contaminated structures:** The EPA and Navajo Nation EPA (NNEPA) exceeded the Plan goal of assessing 500 homes and other structures that were likely to be contaminated with radiation at elevated levels. Together, the EPA and NNEPA surveyed 878 structures and, when found to pose a health risk, the EPA demolished and rebuilt or provided financial compensation for the structures. In total, 34 structures were addressed and contaminated soil from 18 yards was removed.

**OBJECTIVE 2. Assessment of contaminated water sources, and provision of alternative water supplies:** The EPA, NNEPA, IHS, Navajo Department of Water Resources (NDWR), and the Center for Disease Control and Prevention (CDC) exceeded the Plan goal of testing 70 rural Navajo water sources for unsafe levels of radiation or radionuclides. Of the 240 unregulated water sources tested, 29 sources exceeded the drinking water standard for uranium or radionuclides. It was beyond the scope of this effort to determine whether the source of uranium and other elements was from naturally occurring sources or due to mining and milling. With the support of Navajo Nation Chapter officials, three wells were shut down. Working together, the EPA, NNEPA, the Dine Network for Environmental Health (DiNEH) Project, CDC and the University of New Mexico conducted a comprehensive public outreach campaign including meeting with Navajo Nation Chapter officials, posting warning signs regarding health risks at water sources that exceeded the drinking water standard for uranium and radionuclides, and announcements in the Navajo Times and local radio stations.

IHS, the EPA, and Housing and Urban Development (HUD) have partnered to provide \$26.7 million for 14 projects that will provide piped water to 808 homes. The Sweetwater transmission main extension also benefits 1,017 homes currently connected to piped water by improving the quality of the drinking water supply. More than \$21 million of the projects funded are substantially complete which means that construction has been completed. The EPA provided \$2.6 million to the NDWR to implement a water hauling program to serve up to 3,000 residents that live in remote areas.

**OBJECTIVE 3. Assessment of abandoned uranium mines, with detailed assessments of those most likely to pose environmental or health problems:** The EPA and NNEPA exceeded the Plan goal of conducting on-site screening evaluations of 200-250 mines by surveying 521 mine claims. The agencies also conducted more detailed assessments at 45 high priority mine areas, exceeding the Plan goal of conducting more detailed assessments at 35 mines.

**OBJECTIVE 4. Cleanup of the North East Church Rock (NECR) mine site and additional high-priority abandoned mine sites:** In 2011, the EPA issued a cleanup plan for the removal of approximately one million cubic yards of mine waste from NECR, three years after the target date established in the Five-Year Plan. The additional time was needed for extensive consultation on the cleanup plan with the Navajo Nation and nearby community. In the intervening time, the EPA and the responsible party conducted two large-scale interim cleanup actions to remove a

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total of 130,000 cubic yards of contaminated soil and addressed all known soil contamination remaining on the reservation from the adjacent NECR mine site. For the next few years, the EPA will be working closely with NRC, DOE, and the Navajo Nation to execute the cleanup plan and potential disposal of the mine waste at the UNC Church Rock Mill Site.

In addition to significant cleanup actions at the NECR Mine, the EPA and NNEPA worked together to identify mines to begin cleanup actions. These mines were selected based on radiation levels, proximity to residents, and proximity to sensitive areas such as drainage areas that could cause migration of contamination. Between 2007 and 2012, the EPA took response actions at 9 mine sites throughout the Navajo Nation. These response actions ranged from fencing and stabilization of waste to full removal. In 2011, mine cleanup was completed at Skyline Mine, in Monument Valley, Utah.

**OBJECTIVE 5. Cleanup of the Tuba City Highway 160 site:** The Highway 160 Site is located approximately four miles northeast of Tuba City, Arizona, on the north side of Highway 160. DOE met the Plan goal of characterizing the Highway 160 site. In addition, DOE transferred \$4.4 million to the NNEPA through a cooperative agreement to conduct remediation of the site. Navajo Nation started the project in June 2011; excavation and transportation of contaminated soil materials was completed on August 29, 2011. The material was shipped to the DOE Grand Junction Disposal Site. Backfill of the Highway 160 site was completed in October 2011 and a completion report was developed. DOE performed site characterization and also provided oversight and independent verification of the remediation. At DOE's request, NRC reviewed the completion report and agreed that the site met the 40 CFR 192 cleanup standards. DOE work on remediating two structures is expected to be completed during the next five years.

**OBJECTIVE 6. Cleanup of the Tuba City Dump:** The agencies made substantial progress but did not meet the schedule established for assessment and cleanup of the Tuba City dump. Additional work and time were required due to the complex nature of site hydrology and geology. The BIA accomplished several interim actions in 2009 and 2010, including: fencing the perimeter of the dump site using funds from IHS, quarterly groundwater monitoring, wellhead protection studies to evaluate methods for protecting water supply wells, and investigation of the potential source of elevated uranium in groundwater at the dump site. All work was accomplished in consultation with the Navajo Nation and Hopi Tribe.

The Remedial Investigation/Feasibility Study (RI/FS) will provide the scientific basis for remediation of the groundwater contamination. In September of 2010 EPA and BIA signed an Administrative Order on Consent (AOC) for EPA oversight of BIA work on the RI/FS. BIA, the EPA, and the Navajo and Hopi Tribes meet regularly either by conference call or in person to review progress of the RI/FS and determine the necessary path forward. By the end of 2012, BIA had spent more than \$7.6 million on the Tuba City Dump project

**OBJECTIVE 7. Remediation of groundwater contamination at three (of the four) former mill sites:** Four uranium milling sites (Shiprock, NM; Tuba City, AZ; Monument Valley, AZ; and Mexican Hat, UT) are located within the Navajo Nation's lands. DOE's Office of Legacy Management met the Plan goal of continuing maintenance of existing groundwater treatment activities at the three inactive uranium milling sites and long-term surveillance and maintenance at four inactive milling sites, all of which have been remediated by DOE Environmental

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Management with NRC concurrence. DOE will continue to monitor the disposal cells to ensure they remain effective in protecting human health and the environment. NRC will continue to conduct oversight activities for the general license DOE holds for the sites. DOE will continue to fund the Cooperative Agreement with the Navajo Nation for activities conducted at these sites.

**OBJECTIVE 8. Case control studies of health risks faced by individuals residing near mill sites or abandoned mine sites:** IHS and the Agency for Toxic Substances and Disease Registry (ATSDR) met the Plan goals, including diagnosing and treating known health conditions in eligible Indians, supporting a university-led Navajo Uranium Assessment and Kidney Health Project, reviewing existing databases to develop plans for improved cancer case surveillance, reviewing water contamination data for potential future health studies, and developing plans to assess the prevalence of cancer and other health conditions for populations near mine and inactive mill sites.

In 2010, IHS created the Community Uranium Exposure Journey to Healing program and has since conducted 22 community-based medical screening events. During these events 699 individuals presented themselves for examinations, and 578 of these individuals self-identified current or past non-occupational exposure to uranium.

Particular activities have included the following: training provided in 2009-10 by the CDC and ATSDR to Navajo Area IHS (NAIHS) and Navajo Nation hospital and clinic staff on uranium exposure, creation by IHS in 2010 of the community-based medical screening program Community Uranium Exposure Journey to Healing, the National Institutes of Health (NIH) grant to the University of New Mexico for the Navajo Uranium Assessment and Kidney Health Project, and ATSDR's 2010 cooperative research agreement with the University of New Mexico for a prospective birth cohort study of environmental uranium exposure in Navajo Nation.

## **2. Results of assessment and characterization efforts.**

Based on the information described above, the agencies have gained a good understanding of the scope of potential exposure to uranium contamination on the Navajo Nation and can better prioritize the work that remains to be done.

For Navajo Nation uranium mine claim screening, the EPA considered contamination greater than twice the naturally occurring levels (background levels) to be evidence of an observed hazardous release that may require further investigation under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA; 42 U.S.C. §9601, et seq.). Of the total mine claims screened, 71 mine claims show levels of gamma radiation at less than 2 times background levels. These areas should pose little or no current threat to residents.

Of the total mine claims screened, 177 mine claims show gamma radiation levels above two times but below 10 times background levels. Long-term exposure to soils at these mines should be avoided. Residents should not build homes, corrals or other structures, and should not gather building materials from these sites. The EPA and NNEPA have initiated outreach to residents in these areas to provide warning of these conditions, and this work will continue beyond the Five-Year Plan period.

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Two hundred twenty six (226) mine claims show gamma radiation levels higher than 10 times background levels. Residents should stay away from these areas. Cleanup actions have been initiated at those mines posing the highest risks, and additional actions will be necessary. Along with outreach to residents, short-term actions such as fencing, signage, or stabilization are being taken where needed.

Proximity of mines to homes is an important factor in determining risk to residents. Seventy (70) mine claims exceeding two times background levels of radiation are located within a quarter mile of a potentially inhabited structure; 36 of these mine claims have levels of radiation over 10 times background.

### **3. Collaboration among federal and other agencies.**

Significant and active agency collaboration between federal, tribal, and academic partners was a key part of achieving success during the five-year period. Multiple agencies worked together on nearly every aspect of the Plan, including assessment and cleanup of contaminated structures, water supplies, mines, mill sites, the Tuba City Highway 160 site, and the Tuba City Dump. Agencies shared financial resources, including over \$26.7 million provided by IHS, the EPA, and HUD for drinking water projects. Agencies have also begun innovative efforts to integrate community health screening events with mine cleanup actions to address both environmental and human health questions by community members. Finally, a Pre-Design Steering Committee comprised of staff from EPA, the New Mexico Environment Department, the Navajo Nation, DOE and the NRC was formed in 2011 and meets quarterly to resolve technical, regulatory, and policy issues for disposal of mine waste and for enhancing the tailings cell pre-design for the UNC Church Rock Mill Site.

Beginning in 2008, four Multi-Agency Uranium Stakeholder Workshops were held on the Navajo Nation. The intent of the workshops was to bring Navajo residents together to hear about the work going on to address contamination and more importantly to hear from them about their greatest concerns. Each of these workshops were attended by community members and stakeholders and provided valuable opportunities for residents to impact the decisions about how best to address contamination on the Navajo Nation. A 5<sup>th</sup> workshop is planned for April 2013 in Gallup, New Mexico. The primary focus of this upcoming workshop will be to solicit input on future plans.

During the upcoming years, collaboration and information sharing could be further improved by conducting additional multi-agency outreach events in communities impacted by uranium mines. These events would provide increased opportunity for community members and agencies to discuss both health and environmental questions and to develop effective solutions for reducing exposure to contaminants.

### **4. Remaining immediate and longer-term steps to address uranium contamination.**

Each agency has identified immediate and longer-term steps to address uranium contamination in and around the Navajo Nation. Significant areas of focus will include cleanup of additional mine sites that pose a threat to human health and the environment, assessment of additional structures and water supplies in response to new information and community concerns, development,

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completion and implementation of cleanup plans for the NECR mine and Tuba City dump, and completion of the prospective birth cohort study.

Challenges include the identification of suitable disposal sites for mine waste and resources for cleanup of mines lacking viable potentially responsible parties (PRPs). In May 2012, the Navajo Nation issued an executive order creating a Uranium Task Force. The Task Force is comprised of officials from four Navajo agencies and ultimately will create a uranium commission. One goal of the commission will be to explore options for safe disposal of uranium waste. The EPA will support Navajo Nation in this effort as requested. The agencies will consult with the Navajo Nation and will seek community input on work needed as future plans are developed between January 2013 and July 2013.

**5. Resource availability and needs.**

The agencies largely accomplished the stated goals of the Five-Year Plan within available resources supplemented by responsible parties. In total, the agencies expended close to \$110 million for work associated with the Five-Year Plan and responsible parties contributed an estimated \$17 million for mine cleanup actions during this time frame.

Each agency has begun the process of identifying additional work and resources that will be needed after 2012, although significant uncertainty remains in some areas. Identification of PRPs for abandoned mines on the Navajo Nation is essential in order to provide additional resources to conduct further investigations and clean up at mines. To date, the EPA has identified and notified potentially responsible parties for 74 mine claims.



## **OBJECTIVE 1. Assessment and Cleanup of Contaminated Structures**

Uranium mining or milling waste was occasionally used as sand for aggregate (foundations and stucco) and stones incorporated into the walls and floors of structures, including homes.

Structures may also be contaminated by the presence of mined or naturally-occurring radioactive materials in outside dust and soil brought into homes on shoes and clothing. Also, native soil and bedrock with elevated uranium concentrations can contribute to elevated radiation readings in and around structures. If contaminated structures are occupied, there is a risk to inhabitants from alpha radiation (e.g. radon gas) which is a potent lung carcinogen as well as gamma radiation.

In 1978 Congress passed the Uranium Mill Tailings Radiation Control Act (UMTRCA; 42 U.S.C. §7901, et seq.) to address the environmental contamination from decades of uranium ore processing at uranium milling sites mostly throughout the western United States. UMTRCA mandated remedial action for over 5,000 “vicinity properties” that contained contamination exceeding EPA Standards when contamination came from the former uranium milling site. In addition to conducting remedial action on the milling sites, DOE also remediated contaminated soils on properties surrounding and in the vicinity of the milling sites, as a part of the Vicinity Properties Program (VPP). DOE conducted investigations for contaminated properties through aerial surveys, mobile scans, and advertising. DOE’s investigations were targeted based on results of mobile scans conducted by EPA and the Atomic Energy Commission in 1971 on over 1000 properties on the Navajo Reservation. Participation in the VPP was voluntary, and DOE conducted a radiological survey upon request. DOE performed detailed surveys on 87 properties, found 31 of those properties to exceed standards, and remediated those properties for a total cost of \$3.5 million.

At the request of the Navajo Nation, in August 2007, the EPA Superfund Program compiled a Comprehensive Database and Atlas which identified all known abandoned uranium mines on the Navajo Nation, including information about the proximity of the mine to water sources and structures, and the mine production history and volume estimates. This information was then used to target the structures and yards needing further evaluation. As part of the Five-Year Plan, the EPA, working with the Navajo Nation, assessed radiation levels and cleaned up, where appropriate, residential yards and homes.

### *Five-Year Plan Goal<sup>1</sup>*

“In coordination with the Navajo Nation, EPA will assess up to 500 structures on their land that are likely to be contaminated with radiation at elevated levels. Where contaminated structures are found that pose a health risk to current or future occupants, EPA will take appropriate response actions using its Superfund authority. Actions may include demolition of a structure or a portion of a structure, construction of a replacement structure, or other actions to protect current and future residents from exposure to elevated levels of radiation”.

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<sup>1</sup> As defined in “Health and Environmental Impact of Uranium Mining in the Navajo Nation Five-Year Plan”, 2008

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*Summary of Actions*

The EPA and NNEPA agreed to assess homes in each mining region of the Navajo Nation, including homes within 0.25 miles of an abandoned uranium mine. Many of the home sites surveyed often had more than one structure, including homes, storage units, hogans, and other various structures. The EPA and NNEPA surveyed a total of 878 structures using an initial screening process. The purpose of the initial screening was to identify whether homes were contaminated or potentially contaminated with radioactive materials. After the first year of capacity building with the EPA, NNEPA Superfund Program was enabled to perform initial screens for the next four years. NNEPA surveyed 763 structures and referred 527 structures to the EPA for further analysis. The EPA's analysis involved using more sensitive equipment to determine whether contamination or potential contamination resulted in unacceptable exposure to residents. Structures then targeted for remediation contained materials from abandoned uranium mines that posed a potential health risk to current and future occupants. Results of the EPA's analysis determined the best action for remediation of the structure, and if necessary the surrounding yard. To date, the EPA has found that 43 structures and 18 residential yards pose a health risk requiring remediation.

The EPA has addressed 34 structures and 18 residential yards, with remediation ranging from demolition of an entire structure to removal of layers of soil elevated levels of uranium or other radionuclides. Cash settlements occurred in situations where there were multiple family members who could not split up a home or the home was presently unused. Temporary housing was provided by the EPA during the remediation process.

*Summary of Results*

The surveys and remedial actions were performed in a geographically-based phased approach. Surveys and remedial activities for Phases I, II, and III are complete; Phases I, II and III included the following areas on the Navajo Nation: Church Rock, Baca-Haystack, Red Valley, Cove, Teec Nos Pos, Cane Valley and Tuba City as shown on Figure 1. Surveys for Phase IV are complete and remedial activities are underway; Phase IV survey areas included Tuba City, Cameron, and Bodaway/Gap. Surveys for Phase V occurred during Fall/Winter 2012; Phase V survey areas include Indian Wells, Blue gap, Tselani, Chinle, Chilchinbeto, Black Mesa, Oljato, and Dennehotso.

The completed survey results are summarized below in Table 1 and shown on Figure 1.

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**Table 1. Navajo Nation Contaminated Structure Assessments**

Actions	Total
Total Structures Surveyed (by the EPA and NNEPA)	878
Structures Confirmed Contaminated to Date	43
Structures and/or Residential Yards Remediated by the EPA	52
Structures and/or Residential Yards Pending Remediation by the EPA	9



**Structure Near Mine Site**

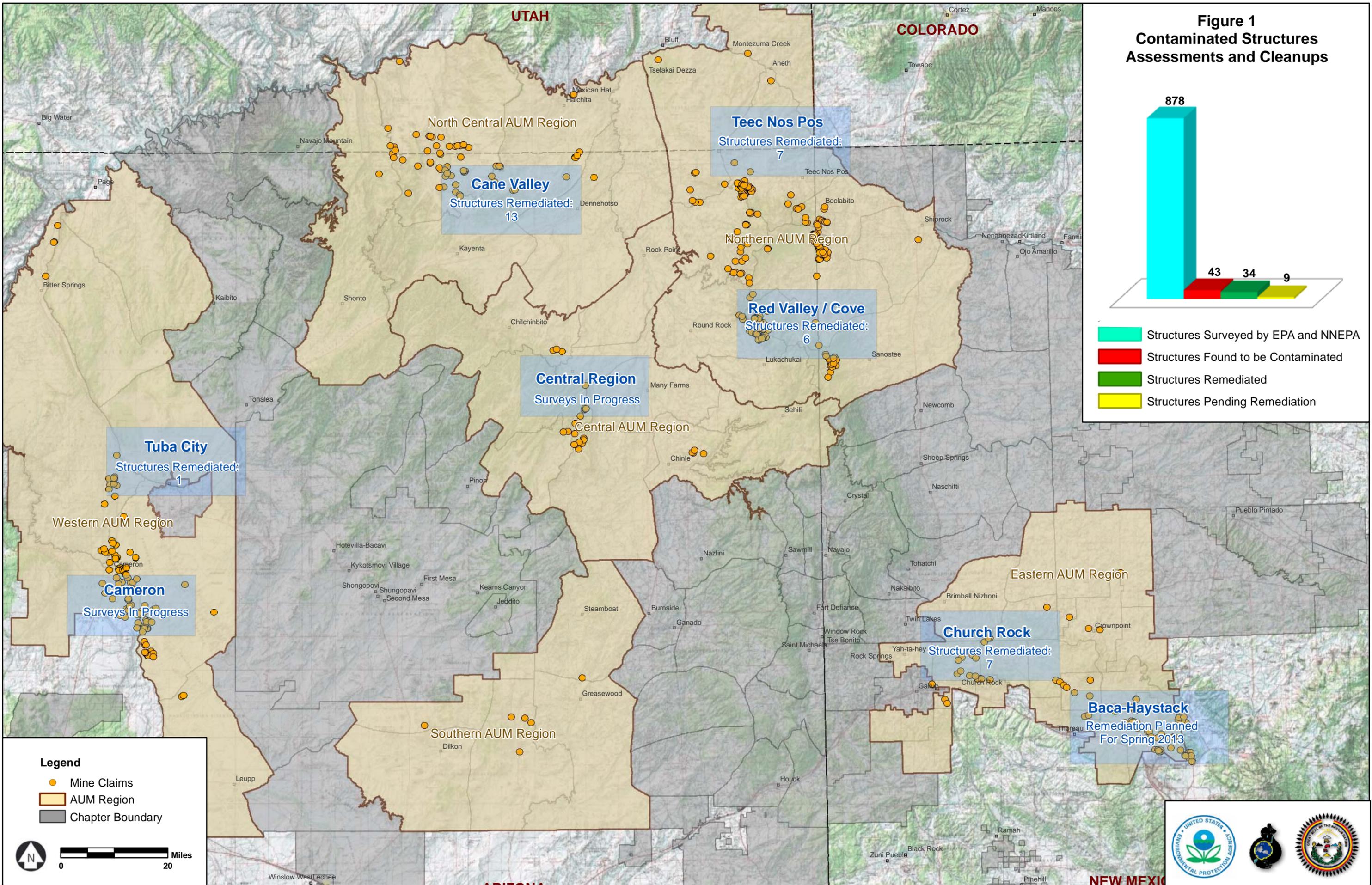
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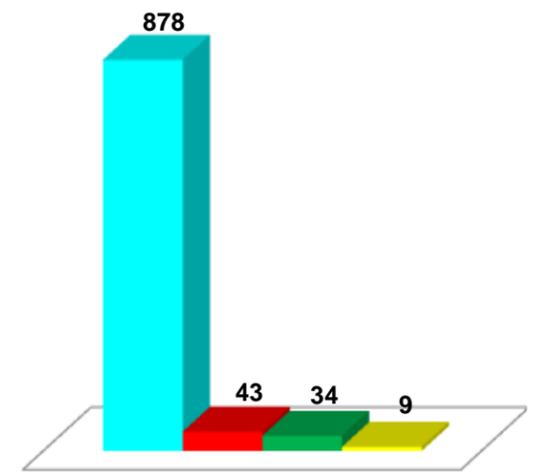
**Structure Demolition**



**Rebuilt Structure**



**Figure 1**  
**Contaminated Structures**  
**Assessments and Cleanups**



- Structures Surveyed by EPA and NNEPA
- Structures Found to be Contaminated
- Structures Remediated
- Structures Pending Remediation

- Legend**
- Mine Claims
  - AUM Region
  - Chapter Boundary



## **OBJECTIVE 2. Assessment of Contaminated Water Sources and Provision of Alternative Water Supplies**

Nearly 30% of the Navajo population obtains drinking water from unregulated sources, such as livestock wells, springs, private wells, or watering points. Navajo Nation policy prohibits the use of these unregulated sources for human consumption, but the practice continues due to lack of suitable water sources in the more remote areas. Many unregulated sources contain naturally occurring levels of uranium, arsenic, and other elements. The use of unregulated water sources represents the greatest public health risk associated with drinking water for the Navajo Nation. Regulated public water supplies are currently monitored by NNEPA, and levels of uranium and other radionuclides are within safe drinking water standards.

### *Five-Year Plan Goal*

“In spring 2008, the EPA will test up to 70 rural Navajo water sources such as livestock wells, windmills, artesian wells and springs to determine if they contain safe levels of radiation or radionuclides. The EPA will work with the Navajo Nation, the IHS, and other agencies to provide the results to the affected communities and develop plans to ensure access to clean and safe water for drinking. The EPA will use Superfund authority to take appropriate action at water sources contaminated by mine waste and found to be endangering human health”.

### *Summary of Actions*

The EPA, NNEPA, IHS, NDWR, and the CDC tested 240 unregulated water sources for elevated uranium or radionuclides. The exact number of unregulated sources is unknown, but estimated to be in the low thousands. Water sources were prioritized for sampling based on proximity to abandoned uranium mines, existing information indicating potential contamination, or other known uses. Regulated water sources were not sampled because these sources are routinely monitored in accordance with the requirements of the Safe Drinking Water Act.

### *Summary of Results*

Of the 240 unregulated water sources tested, 29 sources exceeded drinking water standards for uranium or radionuclides. Durable signs were posted at these contaminated water sources warning individuals of the health risks associated with hauling water with elevated radionuclides and other minerals. With the support of Navajo Nation Chapter officials, three contaminated wells were shut down. It was beyond the scope of this effort to determine whether the source of uranium and other radionuclides was from naturally occurring sources or due to mining and milling. Working together, NNEPA, the EPA, the DiNEH Project, CDC and the University of New Mexico conducted a comprehensive public outreach campaign regarding these wells. Outreach included meeting with officials of affected Navajo Nation chapters, the posting of yellow warning signs, and the publication of outreach flyers in the Navajo Times. In addition, NNEPA, the University of New Mexico, the DiNEH Project and the CDC aired radio announcements warning residents about the dangers of using livestock water sources. NNEPA and the EPA issued a joint press release informing residents that only regulated water sources are safe to drink because they are regularly sampled by the Navajo Tribal Utility Authority and they meet the Safe Drinking Water Act standards.

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The NAIHS Office of Environmental Health, the Navajo Nation and the EPA collaborated to identify homes within a 10 mile radius of abandoned mines or stock wells known to have high levels of uranium. From this list, 13 water/sewer infrastructure projects were targeted for funding from 2009-2012 in Arizona and New Mexico plus a Black Falls, Arizona, pilot project which was completed in 2010. The pilot project funded by EPA provided NAIHS designed solar powered cistern pump water delivery to six family homes instead of the more conventional designs of gravity fed and electrical powered cistern pumps. To date there have not been any reports of failures for the solar powered systems.

IHS, the EPA, and HUD have partnered to provide \$26.7 million for 14 projects that will provide piped water to 808 homes. The Sweetwater transmission main extension also benefits 1,017 homes currently connected to piped water by improving the quality of their drinking water supply. The EPA provided \$2.6 million to the NDWR to implement a water hauling program to serve up to 3,000 residents that live in remote areas. NDWR delivered the first loads of water in April 2011, and is working with 328 residents in 40 Navajo Nation chapters. Four trucks are currently delivering water. The EPA worked with the Navajo Tribal Utility Authority to fund the construction of new regulated watering points in several Navajo Nation chapters, including Baca, Red Mesa and Coalmine Mesa Chapters. NNEPA also developed safe water hauling guidelines which are posted on their website: [www.navajopublicwater.org](http://www.navajopublicwater.org). NNEPA sponsors workshops for the Community Health Representatives (CHRs) who are within the Navajo Nation Division of Health (NNDOH). These workshops help the CHRs recognize potential health risks and identify for medical referral any individuals who exhibit health problems that may be caused by environmental sources, including drinking water from unregulated sources or living near an abandoned uranium mine site. These workshops are well received and the CHRs, who are often the first to provide outreach when they visit people at their homes, can now provide better assistance.

The water sources that exceeded drinking water standards and improvement projects are detailed in Tables 2 and 3, and shown on Figure 2.

*Limitations*

- Navajo Nation Chapters are reluctant to close contaminated wells because funds to replace these wells are very limited. Some wells were disabled only to be reconnected by residents for livestock use.

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**Table 2. Navajo Nation Unregulated Water Sources**  
**Twenty-nine of the 240 sources sampled contained constituents above drinking water standards, as summarized below.**

Water Source	Navajo Nation Chapter	Uranium (µg/L) MCL 30 µg/L	Gross Alpha (pCi/L) No MCL	Radium 226+228 (pCi) MCL 5 pCi	Arsenic (µg/L) MCL 10 µg/L	Lead (µg/L) 15 µg/L action level	Selenium (µg/L) MCL 50 µg/L
Badger Springs	Cameron	39			31		
3A-155 Tohatchi Spring	Cameron	120			40		
3A-PHS-32 Paddock Well	Cameron	55			25		
16-4-10 Lime Ridge	Church Rock	260	108	9.6			
16K-336	Church Rock			5.78	11		
Becenti Trail Spring	Church Rock	110					
17M-99	Cornfields	100					
12-7-12 Ellison Well	Cove	61					
8A-180	Dennehotso	31					
8A-179	Dennehotso	46					
17M-66	Ganado	31			18		
17T-559	Greasewood	78					
17-8 Snake Well	Greasewood	32			20		
16B-38 Paddy Martinez	Haystack	54					
16T-521 Platero	Haystack	63	20.6		55		
17H-146	Indian Wells	69			51		
Pigeon Springs	Iyanbito	88.5					
5M-74 Box Springs	Leupp	35					
10T-241A	Many Farms	44					
Monument Pass	Oljato	39	16.37		11		
8K-433	Oljato	130		9.57	11		
17T-519	Steamboat			8.19			
17T-545	Steamboat	32.85			26.8		

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**Table 2 – Continued**

Water Source	Chapter	Uranium (µg/L) MCL 30 µg/L	Gross Alpha (pCi/L) No MCL	Radium 226+228 (pCi) MCL 5 pCi	Arsenic (µg/L) MCL 10 µg/L	Lead (µg/L) 15 µg/L action level	Selenium (µg/L) MCL 50 µg/L
9Y-12	Red Mesa / Mexican Water	700				68	140
9Y-32	Red Mesa	51			21		
16T-519 Largo Corral	Smith Lake	34			32		
9T-550	Sweetwater	31	18.93	6.21			
9T-586	Sweetwater		22.43				
10R-51B	Tselani / Cottonwood	31					

Note that the water sources cited were not sampled from Public Water Supply Systems. The MCLs were used for comparison purposes only. The results are not definitive with respect to attribution from mining versus naturally occurring sources.

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**Table 3. Navajo Nation Water Infrastructure Projects**

Project	Project Completion Status	Homes Served
Monument Valley waterline extension	6/12 substantially complete	128
Black Falls waterline extension and watering point	9/10 complete	18
Dennehotso new water system	6/12 substantially complete	107
Sweetwater transmission main extension	6/12 substantially complete	1,109
Pinedale scattered sites	3/12 complete	5
Church Rock scattered sites	1/12 complete	4
Haystack scattered sites	6/12 construction started	6
Mariano Lake North waterline extension	6/12 complete	62
Leupp / Grand Falls Test Well	Planning/design underway	Unknown
Red Mesa Water Hauling point	6/12 complete	Unknown
Mexican Water Walker Creek Extension	Planning/design underway	38
Thoreau scattered extension	Planning/design underway	9
Peretti Canyon	Planning/design underway	11
Water Hauling	Water hauling began 4/11. 328 homes in 40 chapters are being served.	328
<b>Total</b>		<b>1825 homes served (808 homes served with piped water for the first time)</b>

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**Contaminated Water Sources**



**Water Hauling**

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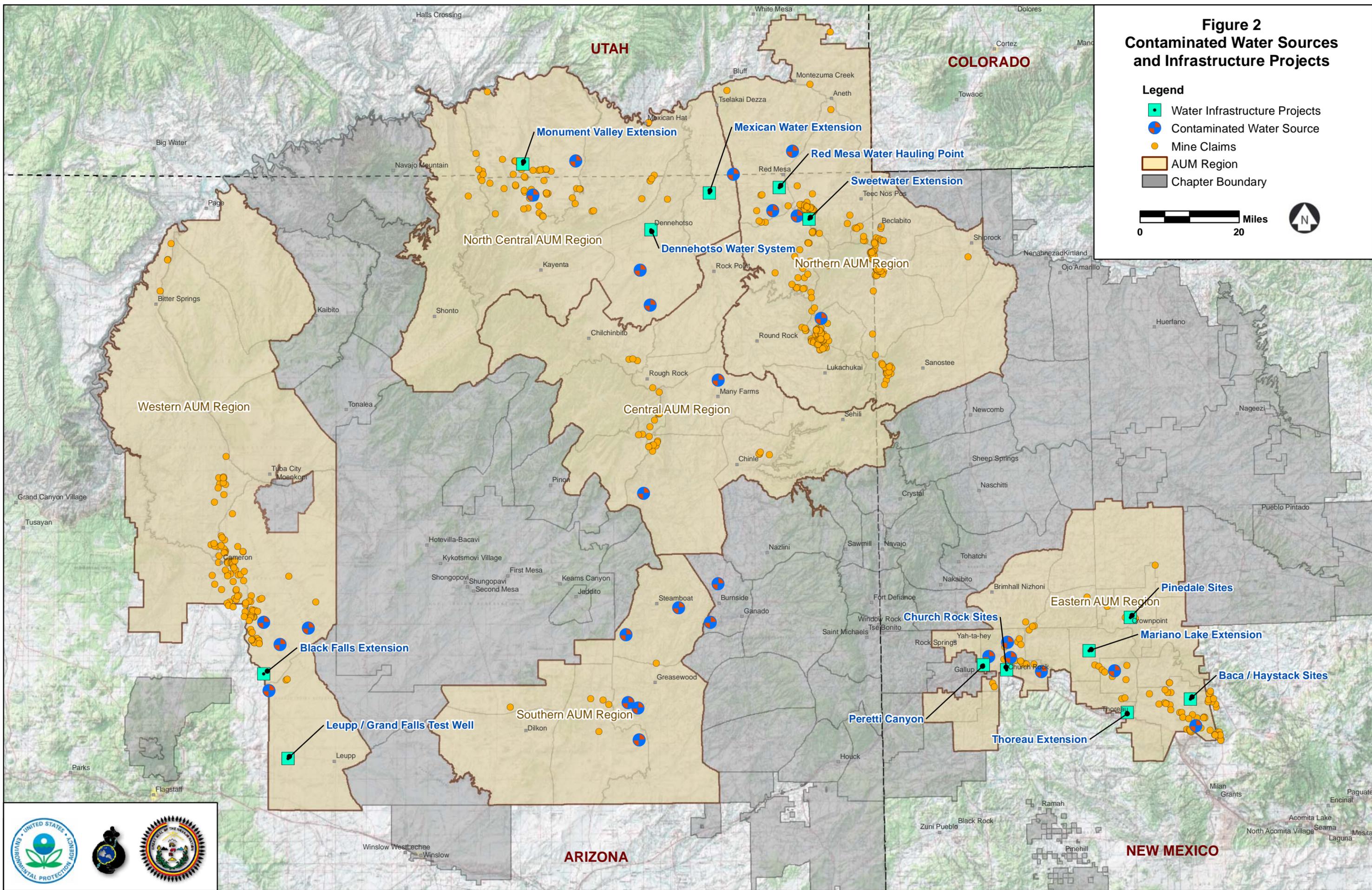


**New Infrastructure Construction**

**Figure 2**  
**Contaminated Water Sources**  
**and Infrastructure Projects**

**Legend**

-  Water Infrastructure Projects
-  Contaminated Water Source
-  Mine Claims
-  AUM Region
-  Chapter Boundary



**OBJECTIVE 3. Assessment of Abandoned Uranium Mines, with Detailed Assessments of Those Most Likely to Pose Environmental or Health Problems**

Prior to 2007 the EPA identified approximately 1,100 mine features (portals, prospects, rim strips, pits, vertical shafts or waste piles) at 520 discrete abandoned mine claims throughout the Navajo Nation. Based on this information, the EPA compiled a Comprehensive Database and Atlas which provides detailed maps, photos and other relevant data about these mine claims. The Atlas is available at <http://www.epa.gov/region9/superfund/navajo-nation>.

The Navajo Abandoned Mine Lands Program (AML) used Surface Mining Control Reclamation Act (SMCRA; 30 U.S.C. §1234, et seq.) funds to address an estimated 90% of the surface hazards posed by these abandoned uranium mines (AUMs). Some of the mines continue to release contaminants into the environment and will require further cleanup or future O&M. The AML work included reclamation of 913 abandoned uranium mine features identified. This information is available at [http://www.aml.navajo-nsn.gov/AML\\_Files/AMLAccomplishmentsPage.html](http://www.aml.navajo-nsn.gov/AML_Files/AMLAccomplishmentsPage.html).

*Five-Year Plan Goal*

“EPA and the Navajo Nation will work together to conduct a tiered assessment of abandoned mines, with more detailed assessments of those most likely to pose environmental or health problems. In 2007, EPA completed a geographic information system inventory and risk-ranking of the 520 known mines. In 2008, EPA will use this list and consult with the Navajo Nation to identify the highest-priority 200-250 mines for further evaluation. EPA expects to conduct on-site screening evaluations of these mine sites, at the rate of up to 50 per year through 2012. EPA also expects to conduct more detailed assessments of up to 35 of the highest priority mines by 2012, at the rate of approximately seven sites each year.”

*Mine Assessments*

*Summary of Actions*

While the plan called for 250 mines to be evaluated, the EPA determined that all mine claims should be surveyed. Three additional mine claims were identified and a total of 521 mine claims were assessed from October 2008 until November 2011. The EPA conducted on-the-ground gamma radiation screens at all accessible identified mine claims. A total of 474 mine claims were scanned for gamma radiation. Forty-seven of the mine claims were not scanned for gamma radiation due to access issues. Note that often several mines are located within a mine claim. A mine site screen report was completed for each mine claim. The report includes a summary of the field observations, a review of the database information, site photographs, and figures showing the gamma radiation measurements throughout each site. The screening reports along with data from the Atlas are being used to help determine which sites have the greatest potential to impact surrounding communities. The reports were used to determine which sites should be further evaluated for listing on the National Priorities List or if they should be referred to the EPA’s emergency response program. The screening reports are available at <http://www.epa.gov/region9/superfund/navajo-nation/>.

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For each of the mines, radiation readings were recorded with combination detector/GPS units. Following the field survey, the data was integrated into the Geographic Information System to be used for mapping and evaluation. Specific mine features, such as portals, rim strips, pits, and waste rock piles, were recorded into the field observation notes as well as collected as GPS waypoints. In addition, any observed structures, potential drinking water sources, and surface water drainages were identified and recorded. Site photographs were also taken at each mine. As part of scanning the mine claim, the EPA collected off-site gamma readings for each mine in order to evaluate the results against naturally occurring gamma radiation levels in the vicinity.

Extensive coordination was conducted with Navajo tribal officials, Navajo community members, state agencies, and private land owners. Prior to the site visits, meetings were held with local officials and residents at various Navajo Nation Chapter Houses to discuss site access issues. Site access meetings were held with State officials from the New Mexico Energy, Minerals, and Natural Resources Department, Mining and Minerals Division and the New Mexico Environment Department. Local property owners and ranchers were also consulted with in order to gain access to several of the sites.

Based on results of the screening reports, more detailed assessments were completed at 45 mines. The assessments evaluated exposure factors in order to determine whether any of the mines could be eligible for potential listing on the National Priorities List or if they should be referred to the EPA's emergency response program for an immediate action. In July 2008, Preliminary Assessments were completed at several of the mines which had been previously investigated and entered into the EPA's Comprehensive Environmental Response, Compensation, and Liability Information System database and required further evaluation using the Hazard Ranking System. A Site Inspection was completed for the King Tutt Mesa Aggregated Site, which is a mining complex of more than 30 mines. The EPA is currently working on two additional Preliminary Assessments; one for the Section 9 Lease located near Cameron, AZ and an updated assessment for the Mesa I Mines and Cove Wash areas based on new information provided from the screening data. The detailed assessments are summarized below in Table 4. Two of the mine claim areas are currently undergoing cleanup actions as described in the next section.

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**Table 4. Detailed Mine Assessments**

<b>Mine Claim</b>	<b>Region</b>	<b>Assessment Action</b>	<b>Current Status</b>
Billy The Kid Mine	Eastern	Preliminary Assessment	Assessment completed in 2008; not eligible for listing
Cove Transfer Station	Northern	Preliminary Assessment	Referred to Response Program; cleanup in progress
Mariano Lake	Eastern	Preliminary Assessment	Referred to Response Program; cleanup in progress
Moonlight Mine	North Central	Preliminary Assessment	Assessment completed in 2008; not eligible for listing
King Tutt Mesa Mines	Northern	Reassessment	High priority mines to be re-evaluated in 2013
Section 9 Lease	Western	Preliminary Assessment	Assessment in progress
Mesa Mines/Cove Wash	Northern	Preliminary Assessment	Updated assessment in progress

*Summary of Results*

Based on the information described above, the EPA has a good understanding of the scope of potential exposure issues related to uranium mining on the Navajo Nation. Health effects as a result of chronic uranium exposure via contaminated soil include lung cancer, bone cancer and impaired kidney functions.

Of the total mine claims screened, 71 mine claims show levels of gamma radiation at less than 2 times background levels. Areas with levels that are at or below 2 times background levels should pose little or no current threat to residents.

For mine claim screening, the EPA generally considered contamination (including radiation levels) greater than twice the naturally occurring levels (background levels) to be evidence of an observed hazardous release that may require further investigation under CERCLA.

Of the total mine claims screened, 403 mine claims show gamma radiation levels above 2 times background levels. Long-term exposure to soils at these mines should be avoided. Residents should not build homes, corrals or other structures, and should not gather building materials from these sites.

Of the 403 mine claims showing gamma radiation levels above 2 times background levels, 226 mine claims show gamma radiation levels higher than 10 times background levels. Residents should stay away from these areas. The EPA and Navajo EPA have begun working closely with Navajo Nation Chapters to warn them of areas with elevated levels and are working together with residents to determine whether warning signs and/or fencing would be appropriate to keep people away from these areas.

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Of the total mine claims screened, 70 mine claims show levels of radiation greater than 2 times background and are located within .25 mile of a potentially inhabited structure; 36 of which have levels of radiation over 10 times background.

The EPA and NNEPA have been using the screening information described above along with results from the Atlas to determine where to allocate resources first; beginning with mines that are near structures. EPA is conducting CERCLA response actions at 9 of the 36 mine claims that have levels of radiation more than 10 times background levels and are within 0.25 miles of structures. As future plans are developed, information from the mine claim screening will be used to prioritize work.

Figure 3 shows where the mines with elevated levels of radiation are located.

Figure 4 shows mines with elevated levels of radiation that are within a 0.25 mile radius of potentially inhabited structures.

*Limitations*

Forty-seven mines were not accessible, and therefore gamma radiation measurements and field observations were not collected. However reports for these mines were written and provide as much information as could be gathered from the Atlas and visual observation.

DOE will continue to work with the EPA to provide information on the results of historical vicinity property surveys and abandoned mine properties to determine the extent of other contaminated properties on Navajo Nation lands.

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**AUM Screening**

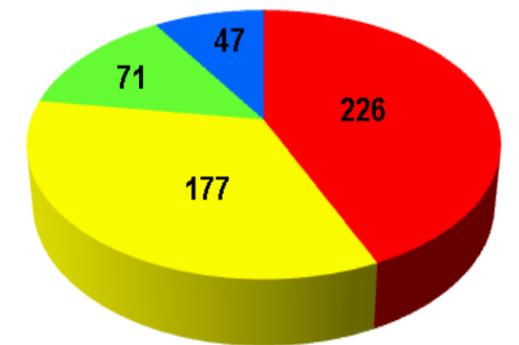
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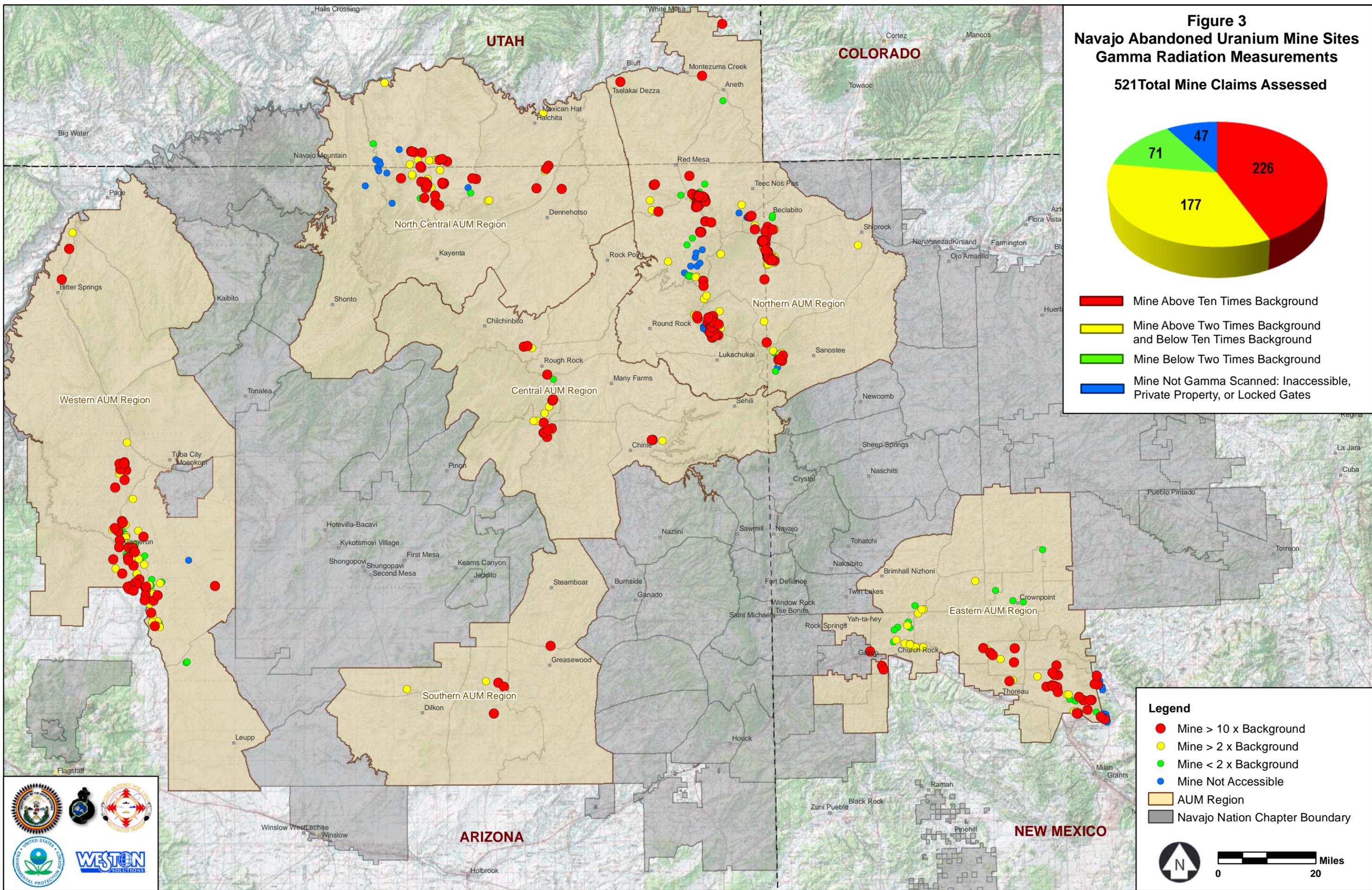
**AUM Screening**

**Figure 3**  
**Navajo Abandoned Uranium Mine Sites**  
**Gamma Radiation Measurements**

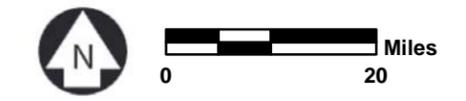
**521 Total Mine Claims Assessed**

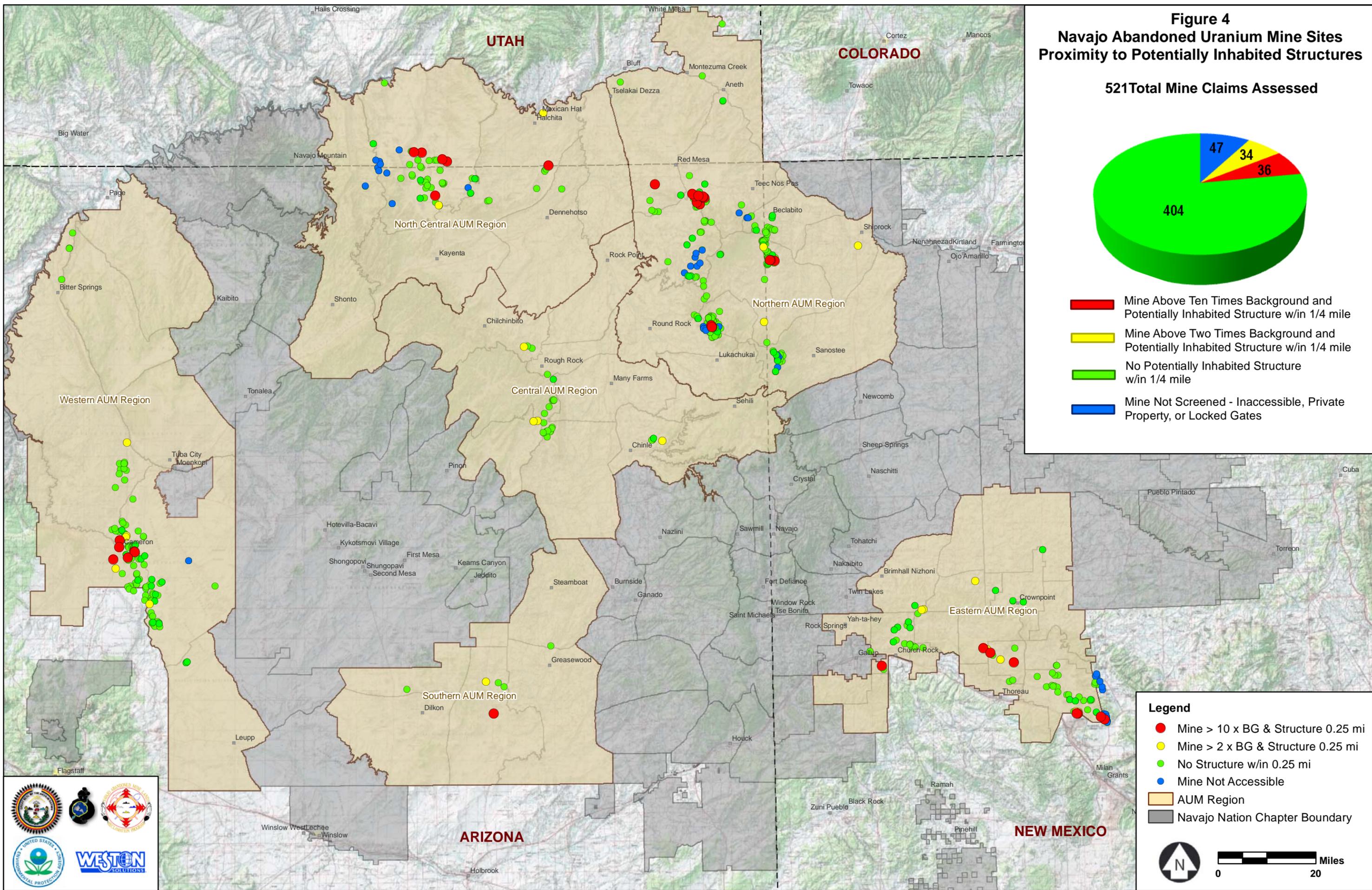


- Mine Above Ten Times Background
- Mine Above Two Times Background and Below Ten Times Background
- Mine Below Two Times Background
- Mine Not Gamma Scanned: Inaccessible, Private Property, or Locked Gates



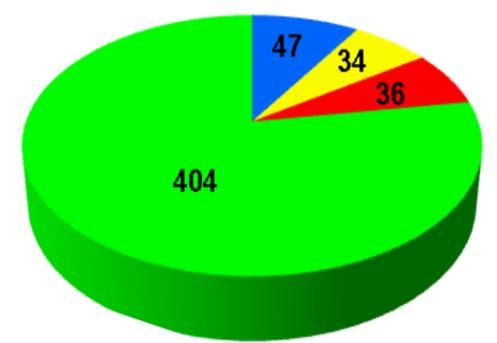
- Legend**
- Mine > 10 x Background
  - Mine > 2 x Background
  - Mine < 2 x Background
  - Mine Not Accessible
  - AUM Region
  - Navajo Nation Chapter Boundary





**Figure 4**  
**Navajo Abandoned Uranium Mine Sites**  
**Proximity to Potentially Inhabited Structures**

**521 Total Mine Claims Assessed**



- Mine Above Ten Times Background and Potentially Inhabited Structure w/in 1/4 mile
- Mine Above Two Times Background and Potentially Inhabited Structure w/in 1/4 mile
- No Potentially Inhabited Structure w/in 1/4 mile
- Mine Not Screened - Inaccessible, Private Property, or Locked Gates

- Legend**
- Mine > 10 x BG & Structure 0.25 mi
  - Mine > 2 x BG & Structure 0.25 mi
  - No Structure w/in 0.25 mi
  - Mine Not Accessible
  - AUM Region
  - Navajo Nation Chapter Boundary



## **OBJECTIVE 4. Cleanup of NECR Mine Site and additional High-Priority Abandoned Mine Sites**

### **Cleanup of NECR Mine**

Located north of Gallup, New Mexico and on Navajo Nation land, the NECR mine is the highest priority mine site cleanup for the Navajo Nation and the EPA. NECR was formerly operated by the United Nuclear Corporation/General Electric (UNC/GE).

#### *Five-Year Plan Goal*

“The Northeast Church Rock Mine located near Gallup, New Mexico, is the highest priority cleanup on EPA’s AUM ranking list. EPA will determine the soil remedy in 2008 and plans to require United Nuclear Corporation, now a subsidiary of GE, to perform a comprehensive Superfund removal action for cleanup of soils on the balance of the site. Cleanup is expected to take up to three years. Costs are expected to be provided by the responsible party.”

#### *Summary of Actions*

The EPA issued a cleanup plan for the removal of approximately one million cubic yards of mine waste from NECR, and continued to conduct removal actions to address soil contamination at the site and throughout the surrounding community.

The cleanup plan uses one of the most stringent uranium mine cleanup standards in the country, and details the intent of sending waste containing high levels of radium or uranium off-site for reprocessing or approved disposal, adding a cap and liner system for the mine waste to potentially be disposed of at the UNC Church Rock Mill Site to ensure that the mine waste does not affect people and the environment. The NECR mine is located on Navajo Nation Trust land and the UNC Church Rock Mill Site is located on fee land held by UNC and is regulated and licensed by the NRC. UNC is now an indirect subsidiary of General Electric Corporation (GE). The plan provides for unlimited surface use of the mine site after cleanup, voluntary housing options during the cleanup for community members living near the mine, and job training and employment during the cleanup.

EPA, DOE, NRC, State of New Mexico, and Navajo Nation have been working closely on the cleanup plan for the NECR Mine Site. The mine site is being remediated by UNC/GE under the CERCLA. Implementation of the cleanup plan is contingent upon the EPA’s Record of Decision for the UNC Church Rock Mill Site anticipated by March 2013 and license amendment approval from the NRC anticipated in 2016. The cleanup action calls for the mine waste contaminated material to be placed in a new disposal cell to be built on top of the existing Church Rock uranium mill tailings disposal cell. The design of the disposal cell and placement of the mine waste at the UNC Church Rock Mill Site would require NRC approval of a license amendment request from the site owner. DOE has reviewed the EPA’s proposed plan and has provided detailed comments on the approach for mine waste disposal. If the mine waste is co-located with the mill tailings at the UNC Church Rock Mill Site, after GE/UNC completes remediation and NRC approves termination of the current licensee’s radioactive materials license, DOE likely will conduct long-term surveillance and maintenance (LTS&M) for the site under UMTRCA.

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DOE will continue to work with the Navajo Nation regarding the reclamation and transfer of this site for long term management to ensure protection of human health and the environment.

During the five year planning period, the EPA direct and indirect oversight costs have exceeded \$4 million which include labor, contractor support, and the cost of temporary housing for residents during removal actions. GE has reimbursed the EPA for past costs. In addition, the cost to GE has exceeded \$6 million for interim removal actions as well as progress on the long-term action. GE/UNC entered into an agreement with the United States (DOE/DOI) to reimburse GE/UNC for approximately one-third of NECR-related costs.

*Summary of Results*

In 2009, the EPA cleaned up more than 100,000 cubic yards of contaminated soil on the Navajo Nation around the NECR Mine. The waste was consolidated on the existing mine waste pile which was also re-graded and covered to prevent further migration of waste before the final cleanup of the mine site. In 2011, an additional area of contaminated soil outside the NECR fence line on the reservation was discovered. A fence was installed around the area immediately to control access and exposure. Beginning in October 2012, GE under the EPA's oversight, removed approximately 30,000 cubic yards of contaminated soil. This soil was moved to the existing waste pile at NECR and covered with clean soil. During the same time period, 15,000 cubic yards of contaminated soil was removed by Rio Algom (the responsible party for Quivira mine) from a drainage area adjacent to NECR and placed on the waste pile currently located at Quivira mine. Seventy residents were temporarily relocated during these actions. All interim cleanup actions were completed, and residents returned to their homes on November 17, 2012.

A site plan map of the NECR cleanup is shown on Figure 5. Factsheets, action memos (cleanup decisions), technical documents, enforcement documents, public comment documents, and administrative records can be accessed at [www.epa.gov/region09/NECR](http://www.epa.gov/region09/NECR).

*Limitations*

- Implementation of the cleanup plan is contingent upon the EPA's Record of Decision for the UNC Church Rock Mill Site anticipated by March 2013, and license amendment approval from the NRC, anticipated in 2016.

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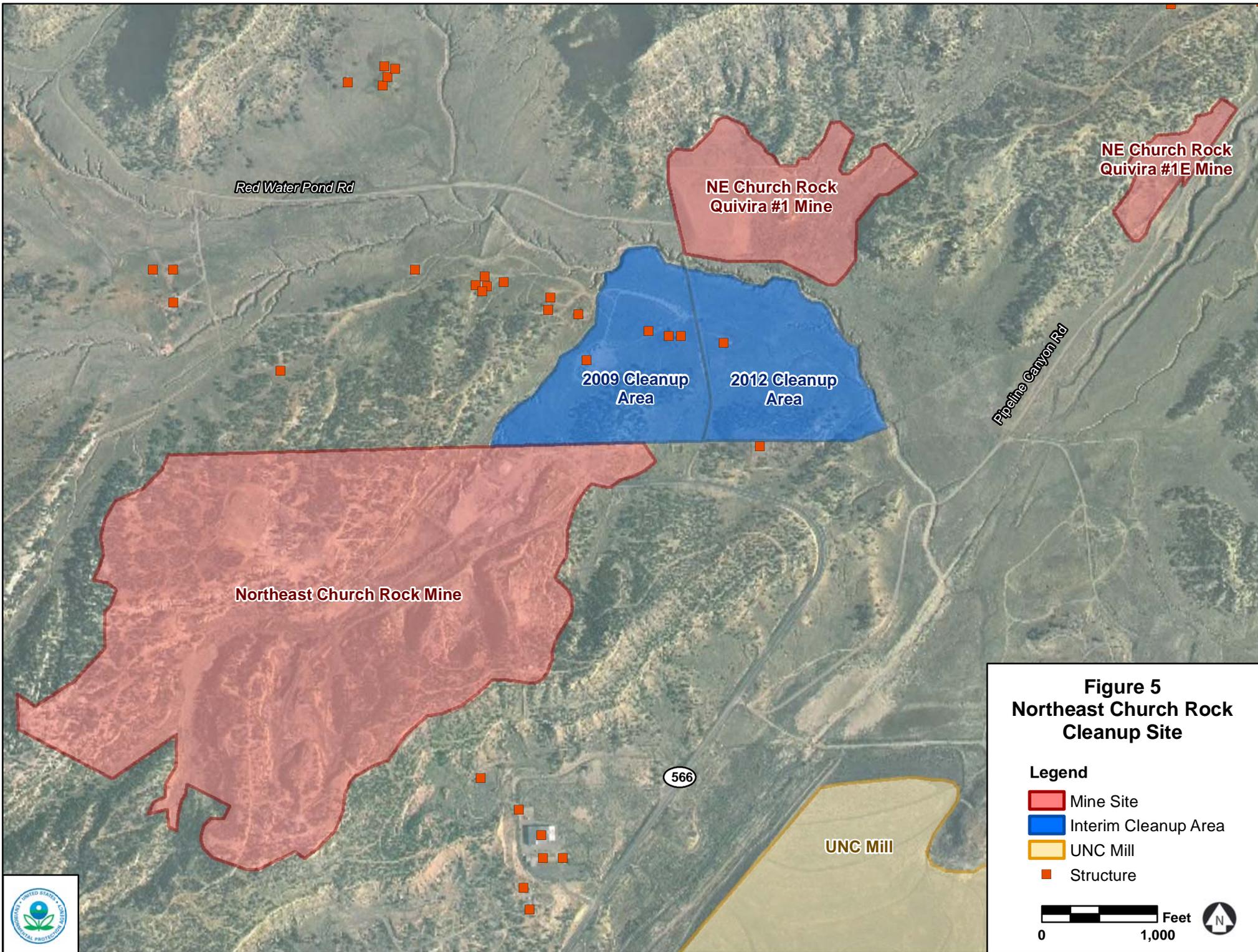
**Cleanup of remaining contaminated soil  
outside the NECR fence line, completed November 2012.**



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**Cleanup of NECR Mine**



**Figure 5**  
**Northeast Church Rock**  
**Cleanup Site**

**Legend**

- Mine Site
- Interim Cleanup Area
- UNC Mill
- Structure

0 1,000 Feet

N



## Cleanup of Additional High Priority Mines

### *Summary of Actions*

In addition to significant cleanup actions at the highest priority mine site, NECR Mine, the EPA and NNEPA worked together to identify mines at which to begin physical response actions. These mines were selected based on radiation levels, proximity to residents, and proximity to sensitive areas such as drainage areas that could cause migration of contamination.

### *Summary of Results*

Between 2007 and 2012, the EPA began response actions at 9 mine areas throughout the Navajo Nation. In 2011, the first full mine cleanup was completed at Skyline Mine, in the North Central Region. Cleanup of Skyline mine included moving 25,000 cubic yards of radioactive mine waste to a repository near the abandoned Skyline Mine. The repository, a shallow pit, was sealed with high-density polyethylene (HDPE), then covered with local soil and rock. In addition, cleanups are underway at mines in the Eastern and Northern Regions of Navajo Nation.

The status of response actions at mines is summarized below in Table 5 and locations of these mine areas are shown on Figure 6.



**Cleanup of Skyline Mine**

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**Table 5. EPA Response Actions**

<b>Mine Site</b>	<b>Region</b>	<b>Action</b>	<b>Status</b>
NECR mine	Eastern	Cleanup	Third interim action occurred Oct/Nov 2012. Cleanup to occur 2016-2020. <a href="http://www.epa.gov/region9/necr">www.epa.gov/region9/necr</a>
Mariano Lake Mine	Eastern	Investigation/Cleanup	Urgent actions have been taken. Investigation ongoing. Evaluation of cleanup options to begin in 2013.
Quivira Mine	Eastern	Investigation/Cleanup	Second interim action occurred Oct/Nov 2012. Cleanup to occur 2016-2020. <a href="http://www.epaosc.org/Quivira_Mine">www.epaosc.org/Quivira_Mine</a>
Skyline Mine	North Central	Cleanup	Clean up completed October 2011; total cost of \$8 million. <a href="http://www.epaosc.org/SkylineAUM">www.epaosc.org/SkylineAUM</a>
Cove Transfer Stations	Northern	Cleanup	Investigation complete. Urgent actions occurred October 2012. <a href="http://www.epaosc.org/CoveTransferStations">www.epaosc.org/CoveTransferStations</a>
Sections 32 and 33	Eastern	Cleanup	Investigation complete. Urgent actions occurred Oct/Nov 2012. <a href="http://www.epaosc.org/Section32_33AUM">www.epaosc.org/Section32_33AUM</a>
Ruby Mines 1-4	Eastern	Negotiations with PRP	Starting negotiations with PRP. Urgent actions occurred Oct 2012.
20 Mine Claims in Cameron Area	Western	Negotiations with PRP	Starting negotiations with PRP. Site visits conducted Sept/Nov 2012.

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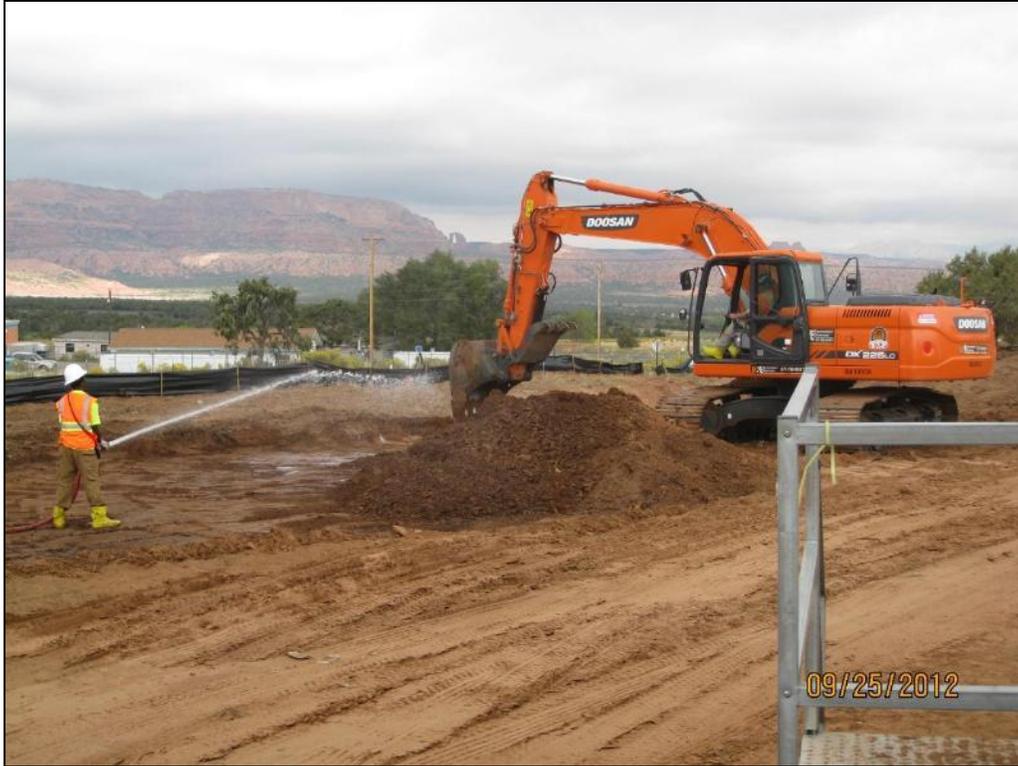


**Cleanup at Section 32/33**



**Repository Cell at Skyline Mine**

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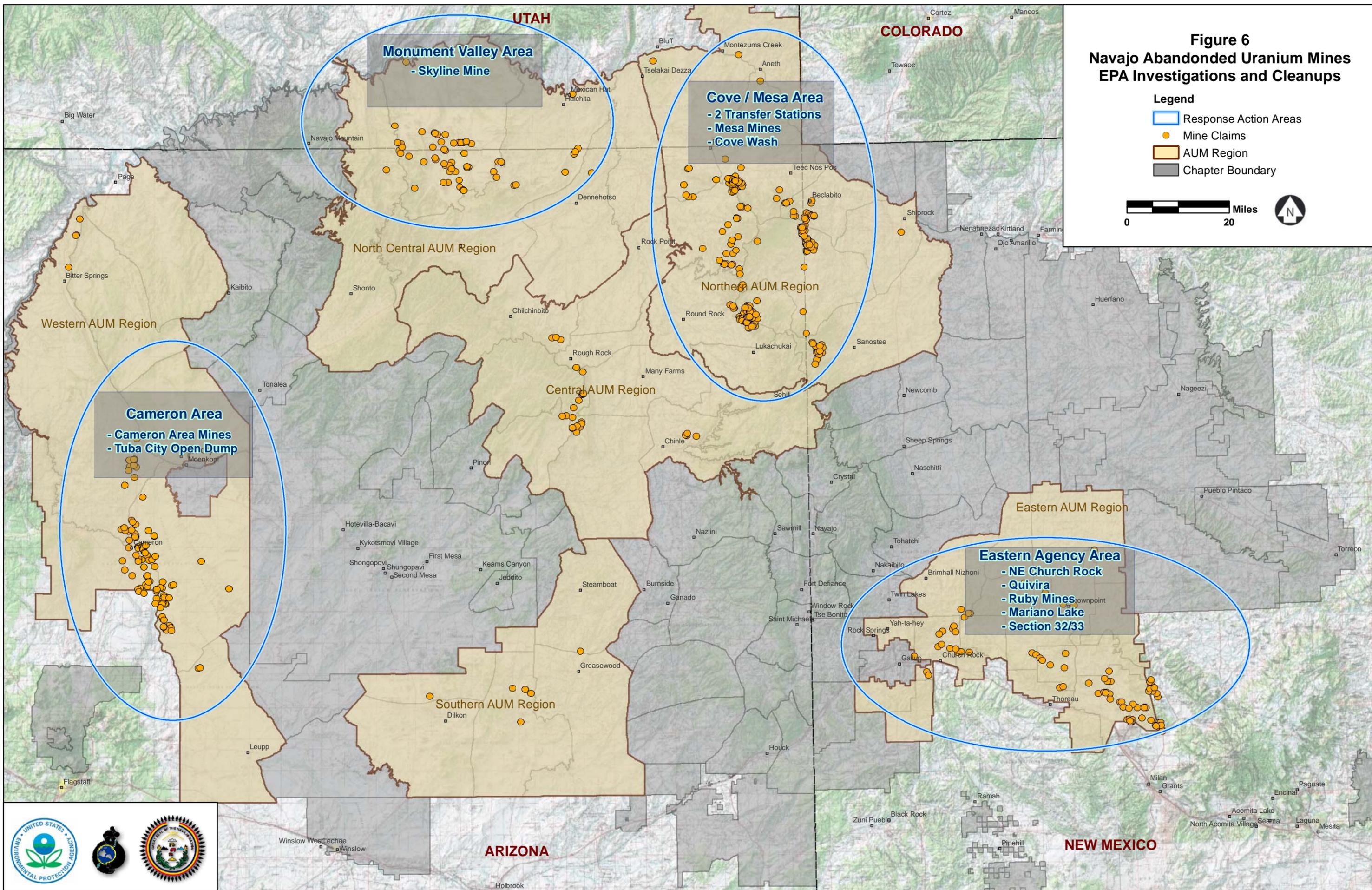


**Cleanup at Cove Transfer Station**



**Repository Cell at Section 32/33**

**Figure 6**  
**Navajo Abandoned Uranium Mines**  
**EPA Investigations and Cleanups**



**Legend**

- Response Action Areas
- Mine Claims
- AUM Region
- Chapter Boundary



## **Identification of Potentially Responsible Parties and Enforcement**

Identification of Potentially Responsible Parties (PRP) for abandoned mines on the Navajo Nation is essential in order to provide additional resources to conduct further investigations and clean up at mines.

### *Five-Year Plan Goal*

“High-priority mines will be candidates for Superfund enforcement. The EPA will continue to pursue an enforcement-first policy, and will conduct a general search for Potentially Responsible Parties at all of the mines. The EPA plans to issue information request letters to several major viable corporations (potentially responsible parties) who owned or operated multiple mines by 2008, and the EPA will continue to assist Navajo Department of Justice with Navajo-lead enforcement actions”.

### *Summary of Actions*

In 2008 the EPA sent CERCLA 104(e) letters requesting information about potential liability to 10 companies that had been previously identified as having mined uranium on the Navajo Nation. The EPA used the information provided to identify PRPs for mines posing the highest risks. Prior to initiating extensive research, the EPA and NNEPA worked together to identify mines that both agencies agreed pose the greatest risk to human health and the environment.

### *Summary of Results*

To date, the following mines are being addressed by the EPA and NNEPA and are being paid for by responsible parties who have signed cleanup orders with the EPA:

- NECR Mine;
  - Responsible Parties: United Nuclear Corp, General Electric
- Mariano Lake Mine;
  - Responsible Party: Chevron USA, Inc.
- Quivira Mine;
  - Responsible Party: Rio Algom Mining LLC. Note that Rio Algom purchased and operated Quivira mine from the predecessor to Tronox Corporation (Kerr McGee Corp). The EPA has signed an agreement with Rio Algom to investigate and cleanup contamination associated with Quivira mine.

The EPA is paying for the cleanup of Sections 32 and 33 and the Cove Transfer Stations with funds received via the federal bankruptcy of Tronox Inc. as a successor to Kerr-McGee and will prioritize the use of any remaining bankruptcy funds at 49 other Kerr-McGee mine claim sites.

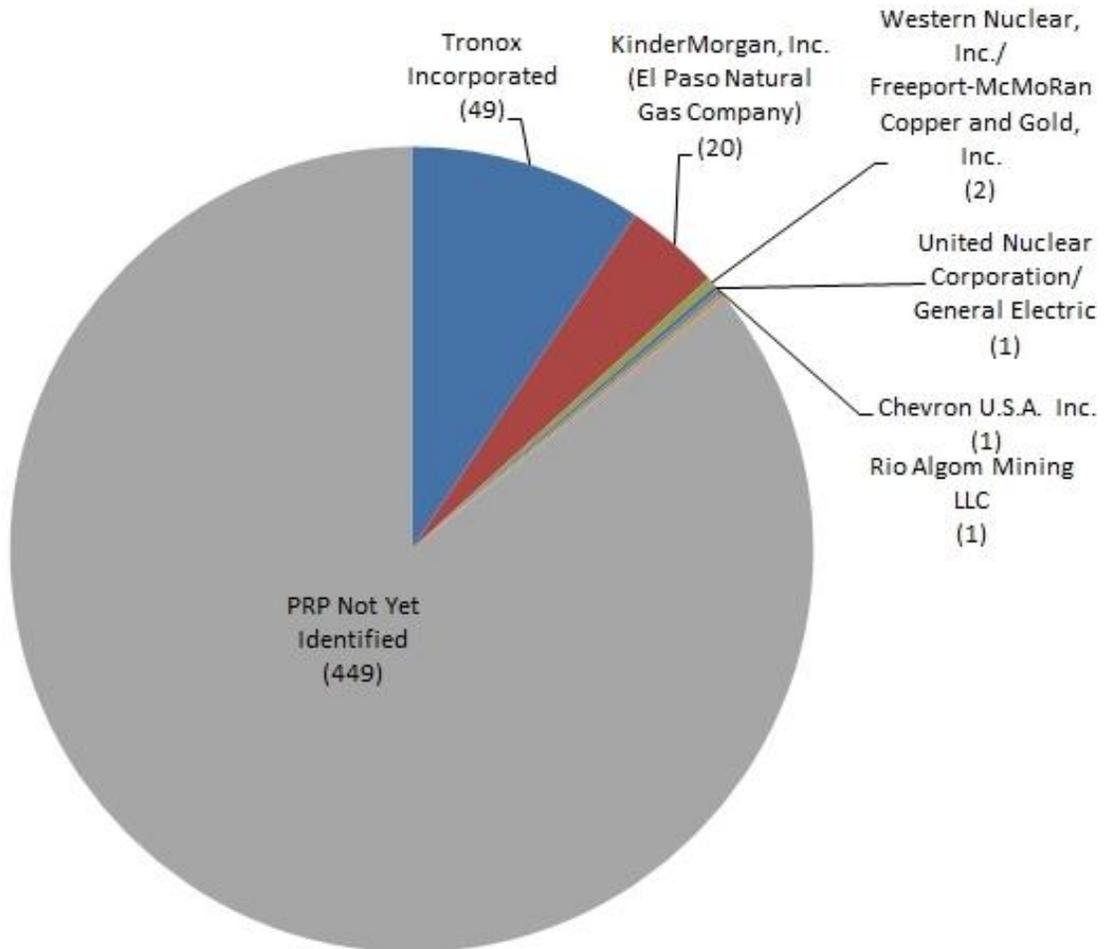
In addition to the above referenced parties, the EPA has identified and sent liability notices to two companies regarding their liability at 24 mines. The EPA is in negotiations with Freeport McMoRan Company to investigate and clean up the Ruby Mines 1, 2, 3, and 4, which are located in the Eastern Agency. The EPA is also in negotiations with Kinder Morgan, formerly El Paso Natural Gas, to investigate and cleanup 20 mine claims located near Cameron, AZ.

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The PRPs that have been notified of their liability are summarized in Table 6.

**Table 6. Identified PRPs**

Potentially Responsible Party	No. Mine Claims
Tronox Incorporated	49
KinderMorgan, Inc. (El Paso Natural Gas Company)	20
Western Nuclear, Inc. / Freeport-McMoRan Copper and Gold, Inc.	2
United Nuclear Corporation /General Electric	1
Chevron U.S.A. Inc.	1
Rio Algom Mining LLC	1
Total Number of Mine Claims with Identified PRP	74



## **OBJECTIVE 5. Cleanup of the Tuba City Highway 160 Site**

The Highway 160 Site is located approximately four miles northeast of Tuba City, Arizona, on the north side of Highway 160. DOE maintains a disposal cell and operates a groundwater treatment system on the south side of Highway 160 (the Tuba City Disposal Site). In the 1980s and 1990s, DOE conducted characterization and remediation of the former uranium mill site (south of Highway 160) under UMTRCA. Previous surveys conducted by DOE on the north side of Highway 160 indicated no contamination in this area. The 16-acre property is vacant land, but there are 14 residential structures within one mile of the site.

### *Five Year Plan Goal*

“Characterize the Highway 160 Site: DOE will work with BIA, USGS, EPA, the Navajo Nation, and El Paso Natural Gas (EPNG), as appropriate, to understand the best approach for characterization and any required cleanup based on characterization of the site.

There are currently three authorized courses of action related to additional characterization and remediation of the Highway 160 site: (1) EPA cleanup of the site as a Superfund removal action; (2) continued action by EPNG; (3) some combination of the two approaches.

If EPA determines that an Imminent and Substantial Endangerment exists at this site, EPA can use Superfund enforcement authority to require the potentially responsible parties to conduct a response action. DOE will cooperate with that effort, as requested by the parties as appropriate. If El Paso Natural Gas works to affect a cleanup of this site, DOE will work with them to consider disposal of the contaminated materials at the DOE facility near Grand Junction.

DOE has provided support to the preparation of a cost estimate for the remaining cleanup work based on the EPNG characterization report. The cost estimate would require additional characterization data that provides information on the chemical species and the depth of the contamination. Based on existing site knowledge, DOE estimates it would take several years to complete the work at the Highway 160 site”.

### *Summary of Actions*

The Navajo Nation through a cooperative agreement with DOE conducted the remediation of the Highway 160 site. DOE performed the characterization and also provided oversight and independent verification of the remediation.

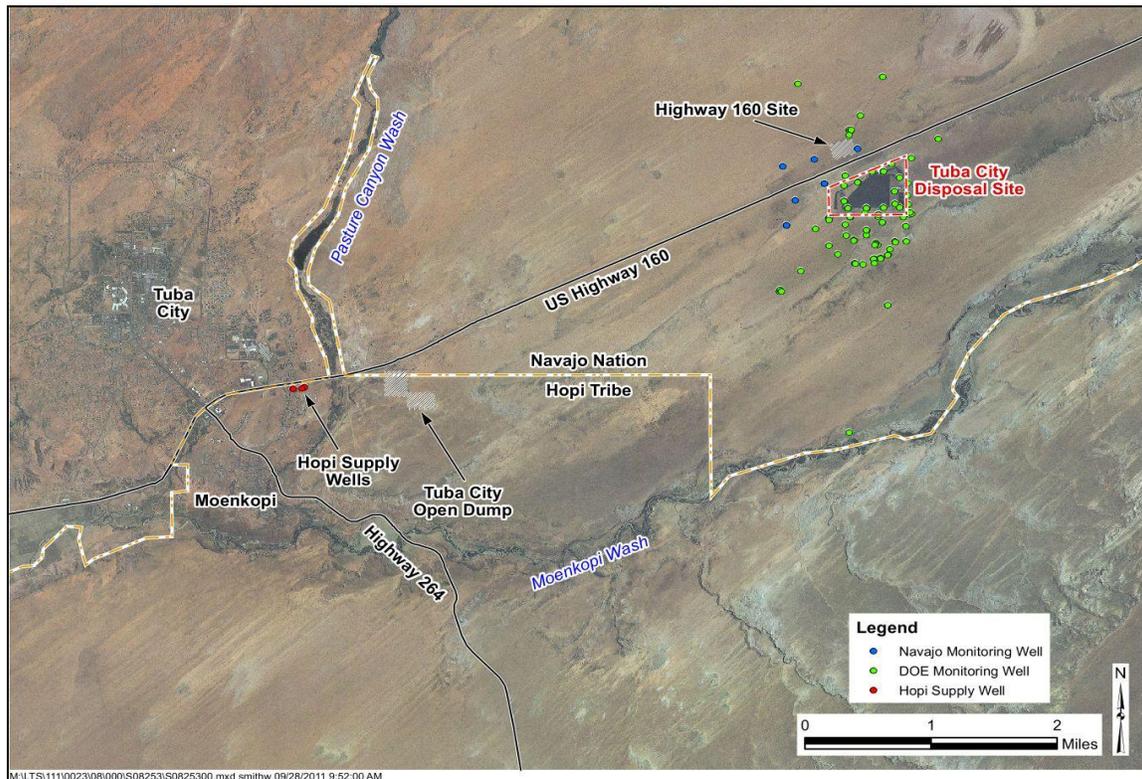
Because the characterization concluded the radioactive waste originated from the former mill site, it could be classified as residual radioactive material (RRM) and therefore could be disposed of at the Grand Junction Colorado Disposal Cell (GJDS) which is an UMTRCA disposal site. Congress authorized DOE to keep the GJDS open to receive RRM from properties discovered after DOE’s authority to remediate RRM expired in 1998. DOE only opens the cell as needed to accommodate cleanups such as the Highway 160 site. DOE worked with the Navajo Nation to keep the cell open during the period of site remediation and RRM shipment.

DOE also worked with the Navajo Nation to install wells to reevaluate the extent of groundwater contamination in the area of the Highway 160 Site and the Tuba City UMTRCA Disposal Cell;

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no contamination was found. Data from these wells also demonstrates that contamination is not migrating from the Tuba City Disposal Cell to the Tuba City Open Dump. Some of these wells were transferred into DOE's long-term surveillance network and continue to be sampled on a regular basis.

The entire Highway 160 project took less than one year from initial field characterization to completing remediation of the soil contamination. At DOE's request, the NRC reviewed the project completion report documenting the site cleanup and agreed that the site met the 40 CFR 192 cleanup standards. DOE is working with EPA and the Navajo Nation to use remaining funding from the project to remediate two structures that will be completed during the next five year plan.



**Highway 160 Site**

## **OBJECTIVE 6. Cleanup of the Tuba City Dump**

The Tuba City Dump (TCD) was used for more than 50 years as an open, uncontrolled dump receiving solid waste from local Navajo and Hopi communities. The BIA serviced the TCD by periodically covering trash and burying waste with available soil. Information on the type of waste disposed of at the TCD is limited because the site was unmanned and unsecured. The TCD occupies land on both the Hopi Reservation and the Navajo Nation Reservation. The BIA, along with the EPA, and the IHS, are working collaboratively with the Hopi Tribe and Navajo Nation to address environmental concerns at the site. The contaminants of concern (COC) include persistent elevated levels of uranium, vanadium, radium 226/228, gross alpha and beta activity, metals, selenium, chlorides, nitrates, sulfates and arsenic in the shallow groundwater sources at the site. Deeper groundwater and nearby drinking water supply wells have not exhibited elevated levels of these constituents. The TCD was closed by BIA in August 1997 thereby prohibiting any further use of the site as a dump. It had been the only dump site available to the Navajo and Hopi communities of Tuba City and the Upper and Lower Hopi Villages of Moenkopi prior to that time.

### *Five Year Plan Goal*

“The five federal agencies will work together with the Navajo and Hopi tribes in early 2008 to assess whether interim actions are needed prior to selection of a final remedy for the site. By August 2008, the Bureau of Indian Affairs plans to complete an assessment of the need and feasibility of conducting an interim measure to prevent contamination of nearby Hopi water supplies. If an imminent threat to water supplies is identified, the agencies will determine the most appropriate authorities to achieve an interim remedy. These authorities might include a Superfund response or enforcement action.”

### *Summary of Actions*

Since 1999, the BIA has been conducting assessment activities of uranium and other COCs in groundwater, springs, contaminant migration pathways, sources, and receptors for the purpose of formulating a final closure plan for the TCD. The Hopi Tribe has concerns because the springs in the area are used by the Tribe for religious and ceremonial purposes. Groundwater monitoring data suggests that COCs in groundwater may extend to the west and southwest of the site. Groundwater sampling and analyses in the TCD as well as up-gradient and down-gradient indicate shallow groundwater COCs may not be limited to the TCD site. Both tribes have consistently requested “clean closure” (removal of all waste).

BIA and the EPA have worked with the Hopi Tribe and the Navajo Nation for the last five years to resolve the problems at the TCD. In 2008, the BIA performed an interim action study prior to the CERCLA RI/FS process, to determine the movement of COCs in both deep and shallow groundwater to assess any imminent threat to drinking water supply wells, irrigation water, springs and seeps. As a result no imminent threat was found to the drinking water supply wells. However, other actions were recommended in the Interim Action Report (IAR) to safeguard human health and the environment in and around the dump. The IAR recommendations included:

1. Fencing the perimeter of the old cell to prevent direct contact with exposed waste;

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2. Quarterly Monitoring of deep and shallow groundwater and spring water to confirm the findings and conclusions of the IAR;
3. Wellhead protection studies to evaluate methods for protecting water supply wells from shallow ground water intrusion;
4. Source investigations for uranium and other COCs around a “hot spot” known as monitoring well 07 (MW-07) which exhibited elevated levels of contamination.

In response to the report, in 2009 the BIA proceeded to implement all IAR recommended interim action measures. The landfill was fenced off to prevent the possibility of exposure of humans to possible COCs in the soils. NAIHS contributed \$80,000 to the BIA to allow the BIA to complete the fencing. BIA funded an investigation by EPA to locate the source of uranium and other COCs in or around MW-07. Two sentinel wells were installed between the dump and the Hopi drinking water source to provide early detection in the event that the COCs started migrating toward the water supply wells. Quarterly groundwater monitoring and the wellhead protection study were contracted with the Hopi Tribe to aid in the evaluation of measures to be taken to protect the groundwater.

The EPA performed a limited waste characterization and “Hot Spot” investigation around MW-07 where uranium levels were highest. The operation was completed in five phases.

1. non-intrusive surface and down hole gamma spectroscopy surveys
2. direct push borings, core samples and analysis
3. five test pits excavated at locations to attempt to locate a uranium source
4. 8 hollow stem auger boring sites identified during phase 1 through 3 to indicate elevated uranium and for ground water flow direction and volume information
5. groundwater sampling, aquifer testing and slug testing to evaluate groundwater flow direction and water quality data

The investigation resulted in shallow groundwater COCs detected above applicable maximum contaminant levels within a fifteen foot area in the vicinity of well MW-07. Another monitoring well was created with even higher uranium readings adjacent to MW-07. The investigation did not determine the source of elevated uranium in groundwater. Additional evaluation will be conducted during the ongoing Remedial Investigation. This report is expected to be completed in 2013.

In 2010 the RI/FS Work Plan and all accompanying work plan documents such as the Sampling and Analysis Plan, Quality Assurance Project Plan and the Health and Safety Plan were written resulting in an approved RI/FS workplan. The core samples taken by the EPA during the Hot Spot investigation were stored by USGS and analyzed in 2010. The results of the analysis were inconclusive and failed to confirm the source of elevated levels of uranium contamination, although the isotopic signature of the MW-07 investigation was not consistent with the isotopic signature of mill waste or mine tailings. EPA and BIA entered into an Administrative Order on Consent (AOC) for EPA oversight of BIA work on the RI/FS.

Work on the ground water monitoring and supply well testing continued in 2011 and the RI/FS workplan was revised. Field studies such as the vegetation inventories began in 2011. Groundwater monitoring continued along with drinking water well testing.

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In 2012, radiological and soil vapor surveys began. The final RI/FS work plan field investigations and data collection began along with soil borings and the hydro geologic investigations. The soil boring and hydrogeology investigations and analysis were scheduled for completion by February of 2013. However, the Continuous Multi-channel Tubing wells were delayed resulting in a delay in the data analysis phase. The RI/FS report is still on track to be completed by the end of calendar year 2013. Reviews of the draft report will be available to stakeholders prior to the release of the final report.

*Future Plans*

The agencies will continue to work together following directions outlined in the AOC agreement. The BIA will continue to consult with the Hopi Tribe and Navajo Nation in its decisions. The timelines are set as indicated below. All time frames are subject to adjustments dictated by the RI/FS and culminating in the ROD.

Task 1: The BIA is scheduled to submit the remedial investigation report by December of 2013 with the feasibility study report submitted in January of 2014. This will include soil sampling and analysis, data validation and continued groundwater sampling.

Task 2: EPA is slated to issue the ROD for the TCD in 2014. The ROD is the instrument EPA will use to determine the course of action for the cleanup/remediation process at the TCD. Stakeholder meetings on the ROD will be held prior to a final decision.

Task 3: The Remedial Design/Remedial Action Plan should be completed in 2015 and Closure should begin in 2015 or 2016 depending on the remedial actions decided upon. Closure timelines for the remediation will also be dependent upon the type of work required under the ROD.

Task 4: The length of time for the groundwater remediation, as well as cleanup and final closure activities, cannot be reasonably estimated at this time and will depend upon the remedial actions required in the ROD. Groundwater monitoring is planned to continue throughout the completion of the closure with the duration of monitoring also determined by the ROD.

**OBJECTIVE 7. Remediation of Groundwater Contamination at Three Former Milling Sites**

DOE’s Office of Legacy Management is responsible for long-term care of 26 UMTRCA sites in ten states (Figure 7). Four former uranium milling sites (Shiprock, NM; Tuba City, AZ; Monument Valley, AZ; and Mexican Hat, UT) are located within Navajo Nation lands (see Figure 8). These sites are under the general license issued by the NRC pursuant 10 CFR 40.27.

DOE met the Five-Year Plan goal of continuing maintenance of existing groundwater treatment activities at the three inactive uranium milling sites and long-term surveillance and maintenance at three disposal cells located on the former milling sites, all of which have been remediated by DOE. DOE will continue to monitor the disposal cells and the NRC will continue its oversight of DOE to ensure the disposal cells remain protective of human health and the environment. DOE’s LTS&M and the NRC’s oversight responsibilities will continue for the foreseeable future.



**Figure 7: UMTRCA Sites managed by DOE**

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**Figure 8: Location of UMTRCA Sites on Navajo Nation**

In 1983, DOE and the Navajo Nation entered into a cooperative agreement to facilitate the surface remedial action of the Shiprock, Monument Valley, Tuba City, and Mexican Hat sites. Funds provided by DOE to the Navajo Nation for the agreement were directed to the Navajo Nation's Division of Natural Resources. The National Environmental Policy Act (NEPA) compliance documentation (which includes the Environmental Assessments as well as the Remedial Action Plans) was developed with the participation of the Navajo Nation. The characterization of surface and subsurface radiological contamination involved a phased approach that included an aerial assessment, a mobile scan, and on-site sampling to delineate the extent of contamination according to specific removal criteria set by the EPA. Over \$140 million was spent on the surface remediation of the four uranium mill processing sites and construction of three disposal cells. That agreement expired in 1998 along with the surface cleanup authority, and a new cooperative agreement was initiated for groundwater cleanup that remains in place. The cooperative agreement for groundwater was recently extended for another five years through March 2017. However, DOE will continue groundwater monitoring and/or remediation activities until the sites are in compliance with the EPA standards.

DOE funds maintenance of groundwater remediation activities and LTS&M at the four Navajo Nation sites for a cost over \$4 million dollars annually. The only UMTRCA sites with active remediation systems are located on Navajo Nation: Shiprock and Tuba City (Figure 9).

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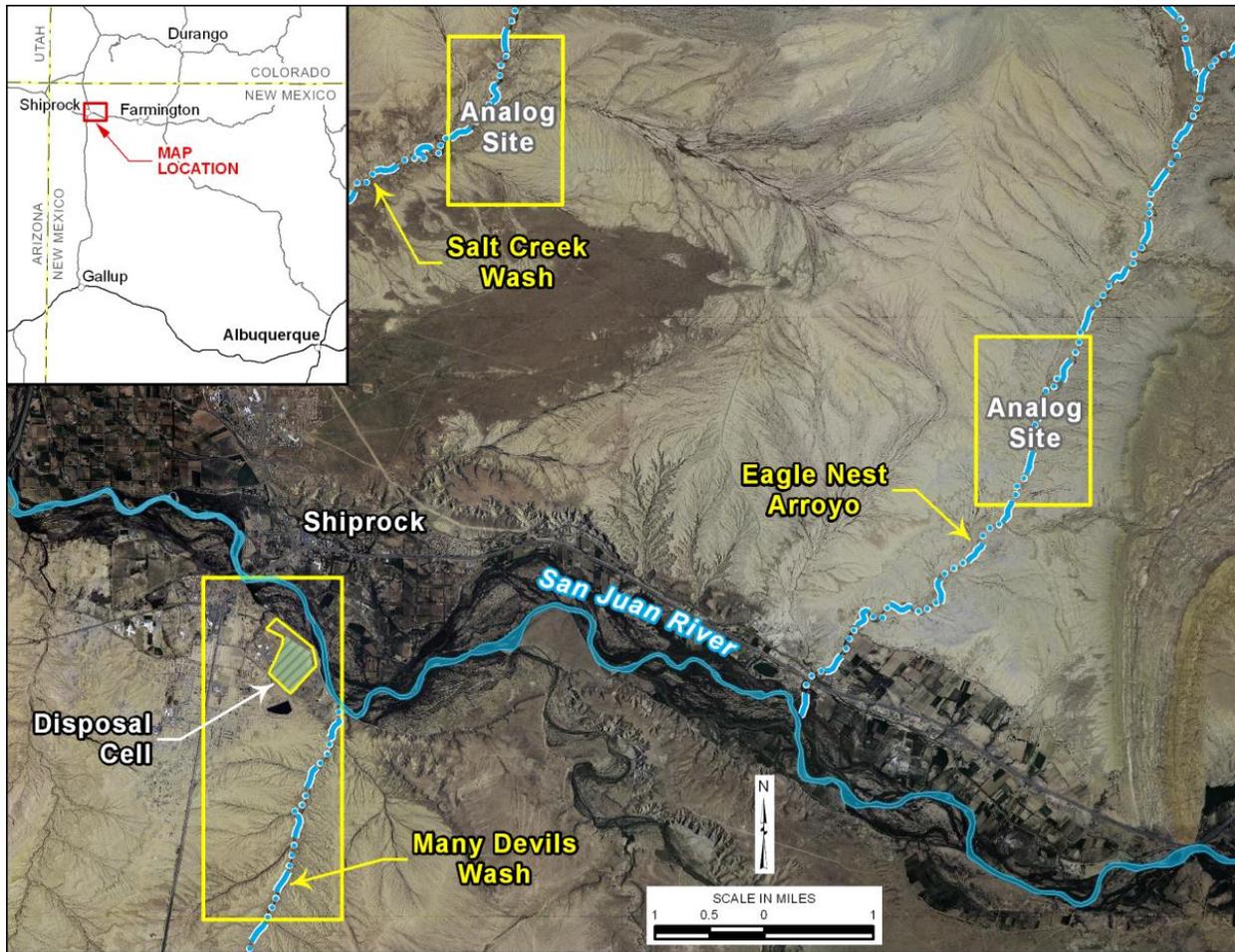


**Figure 9: Solar panels at the Tuba City Disposal Cell**

The groundwater compliance strategies are reviewed annually with the Navajo Nation and the NRC to track progress towards cleanup standards in the groundwater plumes. DOE will continue to work with the Navajo Nation to complete the groundwater remediation responsibilities.

Also, DOE is continuing studies of the sources of constituents in Many Devils Wash near the Shiprock New Mexico Disposal Cell and Processing Site. This work is part of a broader effort by DOE to understand sources of naturally occurring contaminants in the region. For example, at Many Devils Wash, DOE has published several reports that together provide strong evidence that some constituents (e.g. uranium, selenium, nitrate, and sulfate) in the wash are naturally occurring and not a result of ore processing. DOE's studies have shown that these constituents are found naturally in the Mancos Shale, a Cretaceous marine deposit widely occurring in the southwestern United States. The studies included sites with no known uranium mining or milling, and therefore, the elevated levels of uranium, selenium, nitrate and sulfate were not due to uranium extraction processes. These sites are termed "analog sites" on Figure 10.

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**Figure 10: Satellite photograph showing two sites not associated with uranium mining or milling used to compare with ground water from Many Devils Wash.**

Links to DOE's reports are provided:

- *Application of Environmental Isotopes to the Evaluation of the Origin of Contamination in a Desert Arroyo: Many Devils Wash, Shiprock, New Mexico*, can be found at <http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=9505&libID=9611>.
- *Naturally Occurring Contaminants from the Mancos Shale*, can be found at <http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7924&libID=8030> , and
- *Geology and Groundwater Investigation Many Devils Wash, Shiprock Site, New Mexico*, can be found at <http://www.lm.doe.gov/WorkArea/linkit.aspx?LinkIdentifier=id&ItemID=7743&libID=7850> .

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*Five-Year Plan Goal*

“Remediate Groundwater at the Inactive Uranium Milling Sites: DOE’s Office of Legacy Management will continue maintenance of existing groundwater treatment activities at the three inactive uranium ore processing sites and long-term surveillance and maintenance at four inactive milling sites, all of which have been remediated by DOE Environmental Management throughout the 5-year period of this plan. Site surveillance and maintenance costs is estimated at \$4,940,000 in 2008 and \$3,178,000 in 2009”.

*Summary of Actions*

DOE’s Office of Legacy Management, in consultation with the Navajo Nation, and with NRC’s regulatory oversight, has been addressing groundwater contamination at the four sites. Note that at the Mexican Hat, Arizona site, groundwater contamination is confined and the hydraulic conditions prevent the future use of any groundwater within the area; therefore, DOE and the Navajo Nation have agreed that no further remedial action is warranted at the site. As required by UMTRCA, DOE has worked closely with the Navajo Nation Division of Natural Resources, and with other federal and state agencies in the cleanup of uranium milling sites.

*Milling Site Action Plan:*

- DOE will continue to monitor the three disposal cells to ensure they remain effective in protecting human health and the environment.
- DOE funds maintenance of groundwater remediation activities and LTS&M at the four Navajo Nation sites at a cost of about \$4 million dollars annually<sup>2</sup>. The groundwater compliance strategies are reviewed annually with the Navajo Nation and the NRC to track progress towards cleanup standards in the groundwater plumes. DOE will continue to work with the Navajo Nation using the currently approved plans to complete our groundwater remediation responsibilities.
- DOE will continue to fund the Navajo Nation, under the Cooperative Agreement, to assure they have the resources to review and participate in DOE’s activities as we continue these long term actions.
- DOE will continue its evaluation of naturally occurring groundwater constituents, such as those at Many Devils Wash, which may have been erroneously attributed to uranium milling. If such evidence continues to be supported by research results from DOE and other agencies, DOE may reevaluate the need for some water treatment efforts at mill tailing sites on the Navajo Nation.

DOE continues to collaborate with the other federal agencies and the Navajo Nation on issues on the four Navajo sites. DOE activities have included:

- Attending annual meetings and working with other stakeholders (DOE, EPA, IHS, BIA, DOI, NRC, ATSDR, Navajo and Hopi Tribes, and the public) on uranium contamination issues and updates on each of the federal agency’s progress (November 2011 and March 2012); Holding quarterly meetings with the Navajo Nation to discuss groundwater data and strategies;

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<sup>2</sup> For comparison, DOE spends an average of \$200,000 per year per site on its other UMTRCA sites.

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- Meeting with stakeholders in Shiprock in March 2012 to discuss DOE Legacy Management program's LTS&M activities at the Shiprock site and to address concerns raised by members of the community;
- Meeting with Navajo Nation and the United States Geological Survey (USGS) in September 2012 to discuss LM's geochemistry studies performed on the groundwater at the Shiprock site and to discuss USGS's future plans for groundwater studies at the site;
- Working closely with NNEPA staff on supporting the remediation of the Highway 160 site, providing technical assistance throughout the remediation, and operating the Grand Junction Disposal Site to receive the contaminated material;
- Providing groundwater monitoring data, annual treatment system performance reports, and annual site inspection reports on LM website so it is available to the public; and
- Supporting summer internships for Navajo Nation students at the DOE Grand Junction Office to help build additional tribal capacity in environmental fields.

The NRC's regulatory program is based on UMTRCA and governs the management and remediation of legacy mill sites by the DOE and the licensing of new uranium recovery facilities that are owned by private entities. The four Navajo Nation legacy sites addressed under Title I of UMTRCA are under the general license issued by the NRC pursuant to 10 CFR 40.27 with DOE as the general licensee. The purpose of the general license is to ensure that the tailings disposal sites are cared for in a manner that protects public health and safety and the environment once the remedial actions are completed. The NRC oversees DOE activities (as the licensee) at these sites and concurs in remedial action plans, reviews and comments on DOE environmental and performance reports, and conducts DOE inspection activity oversight.

During the 1980s after the issuance of UMTRCA, the NRC implemented many regulatory improvements to avoid the problems from uranium milling operations conducted in the 1950s and 1960s. Some of these are:

- Implementation of below grade disposal of mill tailings;
- Use of liners for tailings impoundments to prevent groundwater contamination;
- Installation of groundwater monitoring wells to monitor potential groundwater contamination;
- Financial surety requirements to reduce the risk of problems caused by a licensee's bankruptcy; and,
- Reclamation and decommissioning requirements.

The NRC's uranium recovery program regulatory framework is designed to adequately protect public health and safety and the environment. Currently there are no new sites planned on the Navajo Nation. One site, the Hydro Resources, Inc. (HRI) facility, is in Crownpoint, NM, near the Navajo Reservation and in the Church Rock area adjacent to Indian Trust Lands. The Church Rock mill site is adjacent to the Navajo Reservation.

At the request of the Navajo Nation, NRC staff has begun Government-to-Government meetings with the Navajo Nation regarding the HRI site. The NRC is committed to keeping the Navajo Nation informed of all meetings with applicants for uranium recovery sites at or near Navajo land so that they may participate in the meetings.

## **OBJECTIVE 8. Case Control Studies of Health Risks Faced by Individuals Residing Near Mill Sites or Abandoned Mine Sites**

Through Congressional authorization, several efforts were undertaken in the past to compensate uranium mine and mill workers and Navajo Nation residents for radiation exposure.

### **Radiation Exposure Compensation Act (RECA)**

The U.S. conducted nearly 200 atmospheric nuclear weapons development tests from 1945 to 1962. Essential to the development of nuclear weapons was uranium mining and processing, which was carried out by tens of thousands of workers. Congress passed the RECA (42 U.S.C. note §2210) in 1990 to provide partial restitution to individuals who developed serious illnesses after exposure to radiation released during atmospheric nuclear testing or following employment in the uranium industry. Residents from the Four Corners region of Utah, Colorado, Arizona, and New Mexico, have filed the majority of claims. Approximately 10% of all claimants are members of one of several Native American tribes. The Navajo Nation maintains one office which assists potential claimants through the Office of Navajo Uranium Workers program. The RECA program is administered by the Department of Justice. RECA provides for payments of \$100,000 for uranium miners, millers, and ore transporters, \$75,000 for individuals who participated onsite during atmospheric nuclear weapons testing, and \$50,000 for individuals who lived or worked downwind of the atmospheric tests. The federal government has approved over 26,000 claims and awarded over \$1.7 billion under the RECA (as of 1/02/2013).

### **Energy Employees Occupational Illness Compensation Program Act (EEOICPA)**

EEOICPA (codified at 42 U.S.C. §§7384d-7384g) was enacted by Congress in 2000 to provide lump-sum compensation and health benefits to eligible (DOE) nuclear weapons workers (including employees, former employees, contractors and subcontractors) and lump-sum compensation to certain survivors if the worker is deceased. The EEOICPA program is now administered by the Department of Labor (DOL), with cooperation from DOE and HHS.

The DOL is supported in its role by the DOE Office of Health, Safety and Security, and the Department of Justice. Part E of the Act also covered exposure to toxic substances, which included not just radiation, but chemicals, solvents, acids and metals. To date the federal government has paid workers and certain survivors over \$8.8 billion.

For covered employees, a maximum of \$400,000 of compensation has been made available to employees with covered illnesses related to the production of weapons related materials, recently including uranium mill cleanup contractor employees such as those involved with the four former uranium processing sites in the Navajo Nation.

### **Indian Health Service treatment, public health, and research activities**

#### *Five-Year Plan Goal*

“The Indian Health Service will continue to diagnose and treat known health conditions in eligible Indians, and also support a university-led Navajo Uranium Assessment and Kidney

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Health Project in 2008. IHS will also review existing databases to develop plans for improved cancer case surveillance, review water contamination data for potential future health studies, and develop plans to assess the prevalence of cancer and other health conditions for populations near AUM and inactive mill sites. Cost estimates for this objective are unavailable, but are projected to be achievable within current and projected agency appropriations.”

*Summary of Actions*

IHS, within the Department of Health and Human Services (HHS), is an Agency partner contributing over the years to the Navajo Uranium Five-Year Plan. NAIHS, located in Window Rock, Arizona, is one of 12 service areas of IHS. The major funding source for NAIHS programs and services is from Congressional appropriations. Additional sources of funding for environmental health services include resources from the EPA and the Navajo Nation. IHS identified personal and environmental health-related objectives and progress against three (3) major objectives as reported in this section of the report.

**IHS Objective #1 – Diagnose and treat health conditions for eligible IHS beneficiaries.**

As noted earlier, the IHS is primarily a healthcare service delivery Agency serving eligible American Indian beneficiaries. During the course of the Five-Year Plan, sub-objectives were developed and targeted to segments of the service population and healthcare providers as follows.

A. Training to healthcare providers

In 2009 a CDC-ATSDR consultant provided training at five NAIHS hospitals and clinics to over 100 health professional staff across the Navajo reservation. The training covered the physics, exposure routes and the medical impact of exposure on humans for uranium as well as other heavy metals. In 2010 this type of training was provided once again in Window Rock, Arizona, utilizing CDC-ATSDR, Northern Arizona University, University of New Mexico and NAIHS staff as presenters targeted to over 130 Navajo Nation paraprofessionals as well as health care professionals.

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B. Radiation Exposure Screening and Education Program (RESEP)

The NAIHS has deployed, since 1990, a service delivery model for a screening and education program, most recently with grant resources from HHS through its Health Resources and Services Administration (HRSA) (\$200,000 in 2012) targeted towards potential Radiation Exposure and Compensation Act-eligible, occupationally exposed individuals, including former miners, millers and others. Program staff provided medical screening exams, education, and case management services at multiple Navajo Area hospital and health care locations to individuals exposed to uranium as a result of many years of work in the uranium mining industry on and off the Navajo reservation. In addition to the HRSA grant funds, NAIHS has spent an estimated \$257,000 of appropriated funds annually for laboratory tests, X-Rays, and office visit costs to supplement the efforts of the RESEP grant funded staff salaries and benefits.

C. Community Uranium Exposures Journey to Healing Program

Based upon the RESEP experience and in conversations with community leaders and residents the NAIHS created in January 2010 the Community Uranium Exposure Journey to Healing (CUE-JTH) program, which provides the following:

1. Community forum conversations providing health education to individuals across the reservation and gathering information on people's individual concerns and needs regarding their health problems that they believe may be attributable to non-occupational exposure to uranium.
2. Health screening and medical monitoring/case management services in clinics as well as in local community settings, utilizing at times a NAIHS mobile clinic vehicle.
3. Continuing education to hospital- and clinic-based health care professional and paraprofessional staff across the reservation.

Congressionally appropriated IHS Hospitals and Clinics funds (\$175,000 in 2009, \$175,000 in 2010, \$300,000 in 2011, and \$300,000 in 2012) were identified by the NAIHS Director to support the CUE-JTH program to cover the salaries of the current staff (3.5 FTEs) and operational costs.

Since the first employee began CUE-JTH work in 2010, community conversations have been held in 14 locations with over 200 participants. Contaminated water has easily been identified as the leading cause of concern among residents attending each community conversation.

*Summary of Results*

Twenty-two community-based medical screening exam events were conducted by CUE-JTH staff in 2011-2012. During these events 699 individuals presented themselves for examinations, and 578 of these individuals self-identified current or past non-occupational exposure to uranium. Results of the events are summarized below in Tables 7 and 8.

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**Table 7. Exposure Routes Identified by Community Members**

Route	Current	Past
Water	44	277
Abandoned Mines	142	123
Buildings	39	135
Meat	88	217
Plants	72	148

**Table 8. Frequent Health Issues Identified by Community Members**

Health Issue	Individuals	Health Issue	Individuals
Diabetes	201	Anxiety	117
Headaches	224	Skin	102
High Blood Pressure	253	Miscarriages	68
Eye Problems	289	Cancer	57
Arthritis	183	Developmental Issues	32
Depression	157	Learning Issues	72
Respiratory	131	Kidney	77
Heart	86	Speech Delay	63

Processes to share CUE-JTH information with each person’s primary care provider (system in place) and in the future with the NNEPA (planned) and the NNDOH (referral system design under discussion) are part of CUE-JTH goals. Health information results were shared with the University of New Mexico kidney health research staff for those individuals enrolled in their NIH funded study (described below under IHS Objective 3).

In addition to the above activities NAIHS CUE-JTH program staff will record medical screening and monitoring information in a database within the NAIHS patient record system for use by case management staff and potentially for future research activities. (It should be noted that there has not been any determination that any of these health issues is linked to uranium exposure.)

**IHS Objective #2—Environmental and Public Health Work in Cooperation with other Agencies**

As part of IHS staff work, the IHS Director has emphasized partnering with other Agencies and organizations to support the IHS mission. Two major sub-objectives consistent with the Five-Year Plan were undertaken: fencing of the Tuba City Landfill and the Provision of Safe Water/Sewers to Homes, discussed in more detail in objectives 6 and 2, respectively, above.

**IHS Objective #3—Conduct activities supporting health research on non-occupational exposure to uranium**

The NAIHS in the provision of direct healthcare services actively supports Navajo Nation Institutional Review Board approved research activities. During the Five-Year Plan timeframe, work was conducted by IHS staff on research activities related to non-occupational exposure to uranium follows.

A. Navajo Uranium Assessment and Kidney Health Project:

The NIH awarded the above project to the University of New Mexico. From 2011-2012, NAIHS CUE-JTH staff assisted UNM staff by completing medical evaluations on enrolled study participants living in the New Mexico portion of the reservation. NAIHS staff from the Crownpoint, New Mexico, Service Unit provided other in-kind services to the researchers as part of an agreement entered into between NAIHS and UNM.

To date all articles resulting from this study are in the pre-publication phase of work by UNM staff. In community presentations and in communications with NAIHS staff, an increase in kidney disease among study participants seemed to be related more to a history of active mining rather than non-occupational uranium exposure.

B. Assistance to ATSDR Prospective Birth Cohort Study Involving Environmental Uranium Exposure on the Navajo Nation:

This CDC-ATSDR study, including the assistance by NAIHS to the study, is discussed below.

*Future Plans*

The NAIHS intends to continue work within the framework of the three (3) objectives noted earlier in this report. Training for health professionals and paraprofessionals on the occupational and non-occupational health impact of uranium on beneficiaries will continue. The NAIHS medical monitoring program for beneficiaries will continue to place an increased emphasis on screening individuals referred by Navajo Nation and other Federal agency partners along with the expansion of the database of information of screening results for potential use by future researchers. Completion of ongoing safe water projects will occur in the period covered by the next Five-Year Plan with new projects designed and constructed once information has been developed on their feasibility. Finally, NAIHS will collaborate with health researchers and the NNDOH to complete a prospective birth cohort study on the potential impact of uranium exposure on pregnant women and infant health.

## **ATSDR Prospective Birth Cohort Study Involving Environmental Uranium Exposure in Navajo Nation.**

### *Study Objectives*

To evaluate the potential association between environmental contaminants (i.e., uranium and other heavy metal exposures) and reproductive birth outcomes, by recruiting Navajo mothers, assessing their uranium exposure at key developmental milestones, and then following their children post-birth to evaluate any associations with birth defects or developmental delays. Exposures will be assessed through bio-monitoring, home assessments, and surveys. The information generated by this study may be of value in developing programs to mitigate environmental uranium exposure. Additionally, the study will provide additional baseline data on exposures, behaviors, and chronic health that may be of value in developing health education and outreach to increase prenatal care utilization.

### *Summary of Actions*

In 2009, ATSDR representatives met with Navajo Nation Division of Health (NNDOH), NNEPA, NAIHS, EPA, and local university researchers to gain further understanding of previous research activities conducted at the Navajo Nation, to summarize current activities, and to discuss knowledge gaps in environmental uranium exposure and potential health effects. In addition, NNEPA staff led ATSDR representatives on a tour through parts of the reservation to observe some of the abandoned mine areas and three of the four milling sites. While on the tour, ATSDR staff had the opportunity to discuss health concerns with community members.

In 2010, ATSDR published a Funding Opportunity Announcement, “A Prospective Birth Cohort Study Involving Environmental Uranium Exposure in the Navajo Nation,” soliciting investigator initiated proposals. In August 2010, an Interagency Agreement (IAA) with NAIHS was finalized to support the Cooperative Research Agreement. The IAA outlined provisions for NAIHS’s role in facilitating the clinical and recruitment/outreach (through Navajo Nation Division of Health) aspects of the overall study.

The Cooperative Research Agreement for the Prospective Birth Cohort Study was awarded to Dr. Johnnye Lewis, Director of the Community Environmental Health Program at the University of New Mexico (9/21/10 -8/31/13). ATSDR representatives presented the study design and objectives of the Prospective Birth Cohort Study at the 2010 Uranium Contamination Stakeholder Workshop in Tuba City, Arizona and addressed questions from the Navajo community.

In October 2010, ATSDR and UNM hosted the Navajo Prospective Birth Cohort Study Kick-off meeting at the UNM Center for Development and Disability in Albuquerque. Attendees included UNM staff, NAIHS, NNDOH, NNEPA, Community Liaison Group, and Growing in Beauty. The purpose of the meeting was to discuss stakeholder roles and responsibilities and other issues that needed to be addressed before commencing the study.

In April 2011, ATSDR presented the study objectives with UNM to Navajo Nation Human Health and Review Board (NNHHRB) during the HHS Tribal Consultation Meeting in Window Rock, AZ. That August, ATSDR awarded a sole source contract to the NNDOH to provide

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health education, training, and outreach regarding the study. NNHRRB and University of New Mexico Institutional Review Board (UNMIRB) approved the study protocol. CDC/ATSDR formalized an agreement to rely on UNMIRB for approval. ATSDR presented at the Uranium Contamination Stakeholder Workshop in which was held in Farmington, NM, November 8-10. The 60-Day Federal Register Notice for the study was published on November 22, 2011. No comments were received.

In January 2012, ATSDR provided study updates at the Tribal Advisory Committee Meeting in Atlanta, GA. During February and March, ATSDR assisted with survey administration and bio-monitoring training of research study team. The 30-Day Federal Register Notice of the study was published on March 27, 2012. No comments were received. In May 2012, ATSDR, UNM, and NNDOH presented the Navajo Birth Cohort study at the National Indian Health Board 2012 Tribal Public Health Summit in Tulsa, OK.

UNM, NDOH, and IHS are conducting trainings among the study team in order to successfully recruit approximately 1,500 pregnant participants once field work begins. UNM has also conducted several laboratory trainings with the IHS hospitals to ensure proper collection, processing, and shipment of study samples. When the study is approved, NAIHS and Pub. L. No. 93-638-contracted and -compact staff will collect specimens from pregnant women who enroll in the study and from their children who are enrolled after their births.

## AGENCY COLLABORATION AND COMMUNITY ENGAGEMENT

Significant and active agency collaboration between federal, tribal, and academic partners was a key part of achieving success during the five-year period. As discussed above, multiple agencies worked together on nearly every aspect of the Plan.

The following projects and events highlight some of the ways various groups worked together to achieve the goal of providing opportunities for meaningful community engagement.

- Annual Uranium Contamination Stakeholder Workshops (UCSW) occurred in 2008, 2009, 2010, and 2011. The UCSW provides a forum for federal agencies to discuss their goals, programs and activities for the Five-Year Plan and get feedback from stakeholders. In addition, the Uranium Contamination Stakeholders Workshop provides education and facilitated discussions. Due to the release of the Five-Year Plan Report (2008-2012) and the need for community input on the completed Five-Year Plan Report (2008-2012) and the next Five-Year Plan (2013-2017), the next Uranium Contamination Stakeholder Workshop will take place in April 2013.
- The EPA, HUD and IHS partnered to provide \$26.7 million for 14 projects that will provide piped water to 808 homes.
- DOE and NNEPA staff worked together to complete remediation of the Highway 160 site. DOE provided funding and technical assistance to NNEPA to conduct the remediation and for ultimate disposal of waste at the DOE Grand Junction Disposal Site. The NRC reviewed the project completion report documenting the site cleanup and agreed that the site met the 40 CFR 192 cleanup standards.
- The IHS Community Uranium Exposure-Journey to Healing program organizes health fairs and health screenings at many Navajo Nation Chapter Houses around the Navajo Nation. EPA, NNEPA and other Navajo departments have participated in health screening events in order to provide information about soil and water contamination due to uranium.
- Representatives from the EPA, New Mexico Environment Department, the Navajo Nation, DOE and the NRC have worked together since 2011 to discuss and resolve technical, regulatory and policy issues related to the cell pre-design for the NECR mine waste repository.
- BIA, the EPA, the Hopi Tribe and the Navajo Nation have collaborated during investigation at the Tuba City Dump. As part of this collaboration, BIA provided funding to the Hopi Tribe to conduct a Wellhead Protection Study.
- The EPA partnered with Navajo Nation to hold the first tribal Superfund Job Training Initiative (Super JTI) program. The Superfund Job Training Initiative is a national job training program that provides free technical training, job skills, and networking opportunities to program participants. The EPA worked with SuperJTI program participants to empower and prepare them for job opportunities. The 20 program graduates received certificates in CPR/First Aid, Radon Measurement and Mitigation, and Hazardous Waste Operations and Emergency Response (40 Hour HAZWOPER) at a graduation ceremony on December 4, 2012.

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**SUMMARY OF AGENCY EXPENDITURES**

Since 2008, Congressional appropriations have supported the activities related to the Five-Year Plan to address uranium contamination on the Navajo Nation. Agencies have spent close to \$110 million conducting these activities. The following tables provide actual extramural expenditures data by agency.

**Summary of EPA Expenditures (in millions)**

<b>Expenditure</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Total</b>
Structures: Assessment and Remediation	\$3.4	\$5.3	\$1.3	\$5.3	\$5.4	\$20.7
Water: Source Contamination Assessment	\$0.3	\$6.3	\$2.4	\$0.3	\$0.7	\$9.9
Abandoned Mines: Assessment and Cleanup	\$0.3	\$1.8	\$7.3	\$3.8	\$0.8	\$14.0
Grants to Navajo Nation	\$1.3	\$1.5	\$1.5	\$1.3	\$0.7	\$6.3
<b>Total Expenditures (EPA Budget)</b>	<b>\$5.3</b>	<b>\$14.9</b>	<b>\$12.5</b>	<b>\$10.7</b>	<b>\$7.6</b>	<b>\$50.9</b>

In addition to the amounts spent from the EPA's budget, Responsible Parties have contributed over \$17 million to the investigation and cleanup of abandoned mines either directly or through EPA use of funds recovered in bankruptcy from Tronox, Inc., formerly Kerr-McGee.

**Summary of BIA Expenditures (in millions)**

<b>Expenditure</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Total</b>
Tribal support	\$0.08	\$0.39	--	--	\$0.15	\$0.62
Studies and IAR	--	--	\$0.01	--	--	\$0.01
EPA/Hot spot study	\$1.69	--	--	\$0.30	\$0.15	\$2.14
Interim Actions	\$0.09	--	--	--	--	\$0.09
Consultation	\$0.11	--	--	--	--	\$0.11
RI/FS	\$0.16	\$0.24	\$1.80	\$0.14	\$1.44	\$3.78
Groundwater	\$0.09	\$0.19	\$0.44	\$0.12	\$0.04	\$0.88
<b>Total Expenditures (BIA Budget)</b>	<b>\$2.2</b>	<b>\$0.8</b>	<b>\$2.3</b>	<b>\$0.6</b>	<b>\$1.8</b>	<b>\$7.6</b>

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**Summary of DOE Expenditures (in millions)**

<b>Expenditure</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Total</b>
Mexican Hat	\$0.02	\$0.02	\$0.02	\$0.03	\$0.02	\$0.11
Monument Valley	\$0.43	\$0.65	\$0.25	\$0.47	\$0.43	\$2.23
Shiprock	\$0.56	\$0.91	\$0.91	\$1.13	\$1.27	\$4.78
Tuba City	\$2.9	\$2.6	\$2.42	\$2.82	\$3.22	\$13.96
Highway 160 Site Clean up	--	--	--	\$5.00 <sup>3</sup>	\$1.00	\$6.0
Navajo Nation Cooperative Agreement	\$0.47	\$0.24	\$0.33	\$0.55	\$0.45	\$2.04
Hopi Indian Tribe Cooperative Agreement <sup>4</sup>	\$0.10	\$0.04	\$0.03	\$0.06	\$0.03	\$0.26
<b>Total Expenditures (DOE Budget)</b>	<b>\$4.5</b>	<b>\$4.5</b>	<b>\$3.9</b>	<b>\$10.1</b>	<b>\$6.4</b>	<b>\$29.4</b>

**Summary of IHS Expenditures (in millions)**

<b>Expenditure</b>	<b>2008</b>	<b>2009</b>	<b>2010</b>	<b>2011</b>	<b>2012</b>	<b>Total</b>
RESEP Costs <sup>5</sup>	\$0.3	\$0.3	\$0.3	\$0.3	\$0.3	\$1.5
Medical Monitoring <sup>6</sup>	--	\$0.2	\$0.3	\$0.3	\$0.3	\$1.1
Tuba City <sup>7</sup>	--	\$0.1	--	--	--	\$0.1
Water Projects <sup>8</sup>	--	\$6.6	\$3.7	\$2.5	\$0.3	\$13.1
Kidney Health Project <sup>9</sup>	--	--	--	\$0.1	\$0.1	\$0.2
<b>Total Expenditures (IHS Budget)</b>	<b>\$0.3</b>	<b>\$7.2</b>	<b>\$4.3</b>	<b>\$3.2</b>	<b>\$1.0</b>	<b>\$16.0</b>

<sup>3</sup> \$5 million was appropriated by Congress under the Omnibus Appropriations Act, 2009 (Pub. L. No. 111-8) for the Highway 160 site; Navajo Nation expended the majority of funds, leading the cleanup in 2011 and early 2012 through a cooperative agreement with DOE. An additional \$1 million was spent by DOE to remove the waste material, transport it, and place it in the Grand Junction, CO disposal cell, the only UMTRCA site that remains open. The cost distribution between 2011 and 2012 is an estimate.

<sup>4</sup> The cooperative agreement provides support for the Hopi Tribe for UMTRCA disposal sites located on the Navajo Nation which are near Hopi lands (e.g., Tuba City, AZ).

<sup>5</sup> RESEP (Radiation Exposure Screening and Education Program) costs incurred by IHS supplementing HHS HRSA grant funds.

<sup>6</sup> Medical Monitoring Community Outreach and Medical Screening Program costs.

<sup>7</sup> Tuba City Landfill fencing project.

<sup>8</sup> IHS-only costs for water projects for homes within a 10-mile radius of abandoned mines or contaminated stock wells. Excludes EPA and Navajo Nation contributed funds.

<sup>9</sup> Estimated IHS in-kind contributions to University of New Mexico Kidney Health Project.

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**Summary of ATSDR Expenditures (in millions)**

Expenditure	2008	2009	2010	2011	2012	Total
Cooperative Agreement with University of New Mexico for Prospective Study (Birth Cohort Study)	--	--	\$1.0	\$1.0	\$1.0	\$3.0
NNDOH for Health Education, Training & Outreach	--	--	\$.4	\$.6	--	\$1.0
Inter-Agency Agreement with Indian Health Service for Medical Screenings, Prenatal Care, & Administrative Activities	--	--	\$.4	\$.4	\$.4	\$1.1
Biomonitoring and Laboratory Expenses	--	--	--	--	\$.4	\$.4
<b>Total Expenditures (ATSDR Budget)</b>	--	--	<b>\$1.8</b>	<b>\$2.0</b>	<b>\$1.8</b>	<b>\$5.5</b>

**NRC Expenditures:**

Resources associated with the Five-Year Plan are included in NRC's Decommissioning and Low-Level Waste Program. NRC does not currently have any contracts for cleanup or oversight of the sites on the Navajo Nation so resources associated with the Program are primarily staff activities. To date, the NRC has expended approximately 830 staff hours in activities directly related to the Five-Year Plan. The Commission has provided the staff with adequate resources to conduct oversight of UMTRCA sites, to perform safety reviews for new uranium recovery applications, and to maintain outreach with the Navajo Nation, and it is anticipated that the Commission will provide the staff with the same level of resources in the foreseeable future.

**Future Expenditures:**

The funding for the second Five-Year Plan cannot be reasonably estimated at this time as much of the follow-on work is dependent upon on-going studies and assessments. The agencies will continue to submit resource requirements on an annual basis through the budget formulation process for Congressional consideration. Congressionally appropriated resources will then be allocated by agencies to projects and activities based upon future project plans and program funding prioritization needs and guidelines including, for example, EPA's response program's "worst sites first" principle.

As discussed in Objective 4 above, funding provided by PRPs will supplement Agency resources to address uranium contamination. GE/UNC has agreed to pay past costs and costs of a 2012 interim removal at the NECR Site. Region 9 and Region 6 anticipate proposing additional agreements with GE/UNC to fund the proposed long-term remedial action for the NECR Site,

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which is anticipated to cost approximately \$44 million, following Region 6's issuance of a Record of Decision, scheduled for early 2013. As noted above, EPA is negotiating agreements with El Paso (subsidiary of Kinder Morgan) to perform response actions in the Cameron area and with Western Nuclear, Inc. (subsidiary of Freeport-McMoRan) to perform actions at the Ruby Mines.

## **CONCLUSION**

The agencies met the overarching goal of protecting Navajo residents from urgent risks first by addressing structures, water supplies, mills, dumps, and mines with the highest levels of radiation. Much more was learned about the scope of the problem and it is clear that additional work will be needed. All agencies are committed to continue working with the Navajo Nation to reduce the health and environmental risks and to finding long-term solutions to the remaining uranium issues on Navajo lands.

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