

ABANDONED URANIUM MINES PROJECT ATLAS

APPENDIX A.4a

USACE PROJECT HISTORY SUMMARY

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CONGRESSIONAL HEARINGS

The U. S. Environmental Protection Agency (USEPA) Abandoned Uranium Mines-Navajo Lands Study began following the July 1993 Congressional committee report entitled "Deep Pockets: Taxpayer Liability for Environmental Contamination" and Congressional hearings on November 4, 1993. At that time, the Navajo Nation presented testimony on the abandoned uranium mines and requested assistance in determining if the old mines pose a health risk to residents. USEPA presented testimony on its federal authority under the Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) also known as Superfund, and how the USEPA could assist the tribe. U. S. Department of Energy (USDOE) and the U.S. Department of Interior (USDOI) also participated. USEPA Region 9 conducted the investigations with technical assistance provided by the USDOE Remote Sensing Laboratory at Nellis Air Force Base and the U.S. Army Corps of Engineers (USACE).

The sampling was accomplished under CERCLA. At a few sites within the study areas, limited information had been obtained from earlier studies, such as Preliminary Assessments (PA) and Site Investigations (SI) conducted by the Navajo Nation Environmental Protection Agency (NNEPA). Studies were conducted by NNEPA and Navajo Nation Abandoned Mines Land Reclamation Department (NNAMLRD) in the late 1980s and early 1990s. Reports of most of these studies have not been issued. Information obtained by USEPA regarding these studies has largely been verbal and very limited. The USEPA project was designed to build upon this available information by collecting additional data through site reconnaissance, and collecting environmental samples to analyze for the presence of hazardous substances.

MINING AREAS

Six mining areas were selected for investigation because of the numerous mining sites located in close proximity. This assisted in a helicopter survey of the areas. Other mining areas were better suited for ground surveys. The ground surveys did not occur prior to cessation of field operations in January 2000.

The six areas investigated between June 1998 and January 2000 were situated on land held in trust for the Navajo Nation by the USDOE Bureau of Indian Affairs. The areas contain abandoned uranium/vanadium mines that were operated between 1942 and 1967. Several companies operated mines in these areas including Vanadium Corporation of America, UTCO Uranium Corporation, and U.S. Vanadium Corporation. After mining activities stopped, the mining rights were returned to the Navajo Nation.

The six areas investigated were historical mining districts in Arizona, Utah, and New Mexico. Each of these areas contained abandoned uranium/vanadium mines. The areas were: Four Corners, Monument Valley, Cameron-Tuba City, Bidahochi, Central Area-Many Farms/Rough Rock, and Chinle. The Eastern Agency Sampling Area would be added after the initial investigations were completed.

The Eastern Agency was identified as an area of investigation as early as 1995. The Eastern Agency was scheduled to be the last area scheduled for investigation since the logistics of information distribution and permissions to sample was more complicated given the mixed ownership. USDOE completed an aerial survey of the Sanostee Chapter, which is located in the Eastern Agency, but USACE was not able to complete the sampling in the eastern agency chapters.

The following paragraphs describe more specific activities at mine locations within each area.

Red Valley/ Beclabito (Four Corners Area)

Mines in this area were adits, shafts, pits or trenches in ore-bearing Salt Wash Member of the Morrison Formation. The area was mined using a combination of conventional blasting techniques and manual labor for the removal of overburden and ore. Extracted ore was manually sorted on site with the higher grades being transported off site to processing mills and the lower grades (proto-ore) remaining on site in debris piles.

Monument Valley

During the period 1942 through 1946, three "carnotite" (uranium/vanadium ore) leases in Monument Valley produced a total of 156,237 pounds of vanadium oxide. Among the most productive mines were Monument 1, Alma-Seggin, Fern 1, Utah 1, Big Chief 3 & 4, and Radium Hill. In addition, 4,783 pounds of uranium oxide contained in the Utah 1 lease were sold.

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Cameron-Tuba City

During its lifetime, the Tuba City mill (operated by Rare Metals Corporation of America) processed 800,000 tons of ore, most of which was generated from the Orphan Lode Mine. Orphan Load closed in 1969. Peak production was in 1956 from Cameron area mines. The most significant Cameron area mines were Jack Daniel, Charles Huskon 4, Paul Huskon 3, Charles Huskon 3, Charles Huskon 1, and Ramco 20.

Rare Metals' Ramco pits collectively produced about 47,600 tons of ore between 1956 and 1960. Rare Metals also acquired Charles Huskon Mines 1, 3, 5-8, 10-12, 14, 17 and 26 from Arrowhead in 1955. Charles Huskon mines 4, 9, 18, 19 and 20 were operated by UTCO Uranium Corporation during 1956-1959. Late production (1961-1963) is recorded from Charles Huskon 1, 3, 6, 10, 11, 12 and 17; Evans Huskon 2: Jack Daniels; Julius Chee 3; Yazzie 2, 101 and 312; and Section 9 mines.

Bidahochi

The most significant Bidahochi mines were Boot Jack Mine, Fern 1 Mine, Bidahochi Butte prospects, and the Calvin Chee prospect. No mining production information is available for this area.

Many Farms/Rough Rock

Significant mine leases included the Dan Taylor Mine, Tah Chee Wash leases 8 and 31, Rough Rock Slope 9, Begay and Bahe 1, Todecheenie 1, Charley 1, and Etsitty 1. No mining production information is available for this area.

Chinle/ Nazlini

There is no available information on mining activities in this area.

KING TUTT MESA STUDY

In 1994 USEPA, with the assistance of NNEPA, investigated the abandoned uranium mines in the area of Red Valley. From the King Tutt Mesa Study Area, a process was developed for investigating other areas with abandoned uranium mines. The process involved the following three steps:

1. A radiation survey conducted by helicopter to find the sources of radiation in the areas of old mines.
2. The testing of water used for human consumption.
3. The surveying of homes for construction with materials from the mines.

In July 1998, USEPA and Bechtel Environmental, Inc. issued an Integrated Assessment, Navajo Uranium Mines-King Tutt Mesa Study Area, Red Valley Chapter, Navajo Nation, Oak Spring, New Mexico 87420, Site EPA ID Number: NND 986667434. The Principal Investigator for USEPA Region 9 was Patti Collins. The Principal Investigator for Bechtel Environmental, Inc. was Kim Geisler. Project Investigators were: Bechtel Environmental, Inc., Field Reconnaissance and Field Sampling; Bechtel Nevada for the USDOE, Aerial Gamma Radiation Survey; Lockheed Environmental Systems & Technologies, Aerial Photography Review. Navajo Nation EPA and USEPA jointly completed an In-Home Radon Gas and Home Construction Study.

USEPA AND USACE

In March 1998, USEPA Region 9 and the USACE signed an inter-agency Agreement for technical and other assistance on the Abandoned Uranium Mines Study-Navajo Lands. The USACE formed a team to investigate the effects of uranium mines on the groundwater and water used for human consumption in the areas of abandoned uranium mines. The area of investigation for the work encompassed 17.5 million acres of very rugged terrain with a minimum amount of paved roads located in the states of Arizona, Utah and New Mexico.

The lead agency was the USEPA Region 9, with Patti Collins as the Project Manager and Senior Scientist and Vickie Rosen as the Community Involvement Coordinator. The other government agencies that worked with the USEPA on the project were: Navajo Nation Environmental Protection Agency (NNEPA), U.S. Department of Energy (USDOE), Navajo Nation Abandoned Mines Land Reclamation Department (NNAMLRD), and the USACE. USACE supplied or assisted in supplying technical support, water sampling, radiation monitoring, home surveys, community involvement, public relations, project management and data management under an inter-agency agreement with USEPA Region 9. USDOE supplied helicopter radiation surveys, maps of existing wells, springs, and mining areas, Global Positioning System (GPS) equipment, and Geographic Information System (GIS) services. USEPA provided the overall project management, funding, and the field radiation survey equipment to the field team.

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The USACE assembled a team of experts from various locations in the United States to obtain the expertise needed to accomplish the mission and assignments with USEPA Region 9. USACE utilized the Los Angeles District's Environmental Construction Branch for project management, field supervision, field technicians, community coordination, agency coordination, on-site safety and radiation officer, sampling services and training. USACE's Albuquerque District provided the Project Chemist, data management, sampling supplies and field personnel. Tulsa District provided the Health Physicist, personnel Thermo-Luminescence Dosimeter (TLD) monitoring and site safety reviews. Omaha HTRW-CX provided Quality Assurance for the project chemical data. Omaha's Waterways Experiment Station (WES) Chemical Quality Assurance Branch provided the laboratory services with a contract with Quanterra Environmental Laboratories.

The purpose of the Abandoned Uranium Mines-Navajo Lands Study was to identify the radiation sources, characterize the exposure, and recommend methods to reduce radiation exposure from abandoned uranium mines on the Navajo Nation. To evaluate risks to human health by ingestion of stable and radioactive metals in water, the USACE sampling program was designed to measure analyte concentrations in water sources used for human consumption. The sampling program consisted of collecting one water sample at each well, tap, spring, or tank identified as a source for human consumption. All samples were collected as a point of use sample designed to duplicate the most likely method in which a person would obtain water for human consumption. If there was a common source for multiple users, such as a community well or tap, only the common source location would be sampled.

Samples were collected at locations determined in the field based on interviews with representatives of the Navajo Nation Chapters. Chapter Officials were the most knowledgeable in land and water uses in their communities.

The project objectives were:

1. Data representative of the condition and quality with respect to the stable and radioactive metals in the water.
2. Data at levels of precision and accuracy such that the data can be compared and evaluated against standard benchmarks of human risk of consuming the water.
3. Data of sufficient quality, documentation and verification to be available for use for the USEPA Superfund administrative and enforcement processes, including but not limited to the various removal and remedial actions intended for exposure reduction.
4. Provide data in a format that is easily accessible to the end user.

Providing education and outreach about the radiation and working with individual communities living in proximity to the abandoned mines was also an important component of the project.

Available information for certain sites within the study areas indicated the presence of several naturally occurring isotopes of uranium, thorium and radium; as well as metals such as arsenic, lead, mercury, antimony, beryllium, cadmium, selenium and thallium in drinking water.

The study areas are located in geologic terrain that contains deposits of uranium and vanadium ores in the sandstone beds of the Morrison Formation. The ore deposits vary with the region you are in, but are located at shallow depths beneath ground surfaces or exposed on slopes and mesa tops. The ore deposits contain naturally-occurring metals and radionuclides; parent isotopes uranium²³⁸, thorium²³², and uranium²³⁵, and daughter isotopes from their decay series (uranium, thorium, and actinium decay series, respectively).

Water quality data obtained from U.S. Geological Survey and USEPA, as well as the study from the Integrated Assessment Report for the King Tutt Mesa study Area, showed that groundwater in the six areas contain detectable levels of gross alpha and beta activity that in many cases exceed the MCLs. Radium²²⁶ and Radium²²⁸, Uranium²³⁴, Uranium²³⁵ and Uranium²³⁸, and other radioisotopes have also been detected at concentrations above the MCLs. Metals detected in groundwater include aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

Using a format similar to sampling used during the 1994 fieldwork, USEPA Region 9, Bechtel Environmental, Inc., and USACE developed the 1998 Field Sampling Plan. The home surveys were conducted using a modified plan developed in the 1994 survey. Field operations accomplished by the USACE included water sampling, home construction surveys, radiation surveys, and mine surveys. Field operations covered 30 communities across 26,000 square miles of New Mexico, Utah and Arizona.

USACE completed 227 water samples, 27 Quality Control Samples (of which 14 were field blanks, and 13 were duplicates), 28 home surveys, and 34 radiation surveys.