

## Uranium Mill Tailings Remedial Action (UMTRA) Ground Water Project at Tuba City, Arizona

*This fact sheet provides information about the UMTRA Ground Water Project site located at Tuba City, Arizona. The U.S. Department of Energy Grand Junction Office in Grand Junction, Colorado, manages the UMTRA Ground Water Project.*

### Site Description and History

The Tuba City UMTRA Ground Water Project site is located in Coconino County, Arizona, just south of U.S. Highway 160 and approximately 5 miles east of Tuba City and 85 miles northeast of Flagstaff, Arizona (Figure 1). The site is within the boundaries of the Navajo Nation and close to the Hopi Reservation; the village of Moenkopi is located southeast of Tuba City adjacent to Moenkopi Wash.

The site lies on a terrace that slopes gently to the southwest. The terrace surface is a thin veneer of unconsolidated dune sand and gravels that overlie the Navajo aquifer. Land use in the immediate vicinity of the Tuba City site is limited to occasional grazing. Lands farther from the site are used for dry and irrigated farming and for residences.

Moenkopi Wash that is located east of the site is the dominant natural surface water feature in the area. Members of the Navajo Nation and the Hopi Tribe who live in the vicinity of the site use water from Moenkopi Wash for agriculture and religious applications. The limited and highly variable supply of surface water makes ground water an important resource in the area. Two points of shallow ground water withdrawal exist within a 2-mile radius of the site, including a low-yield domestic well and spring. Four deeper water-supply wells located north of U.S. Highway 160 were used by the Tuba City millsite as processing water.

The Rare Metals Corporation and its successor, El Paso Natural Gas Company, operated a uranium ore-processing mill at the Tuba City site intermittently between 1956 and 1966. During the 10-year period, approximately 800,000 tons of uranium ore was processed. Between 1956 and 1962, the mill processed an average of 300 tons of ore per day using a sulfuric acid leach. The plant was reconfigured in 1962 to use sodium carbonate in an alkaline process; an average of 200 tons of ore per day were processed from 1963 to 1966. All tailings from milling operations were placed as slurry in unlined evaporation ponds that covered a 33.5-acre area at the site.

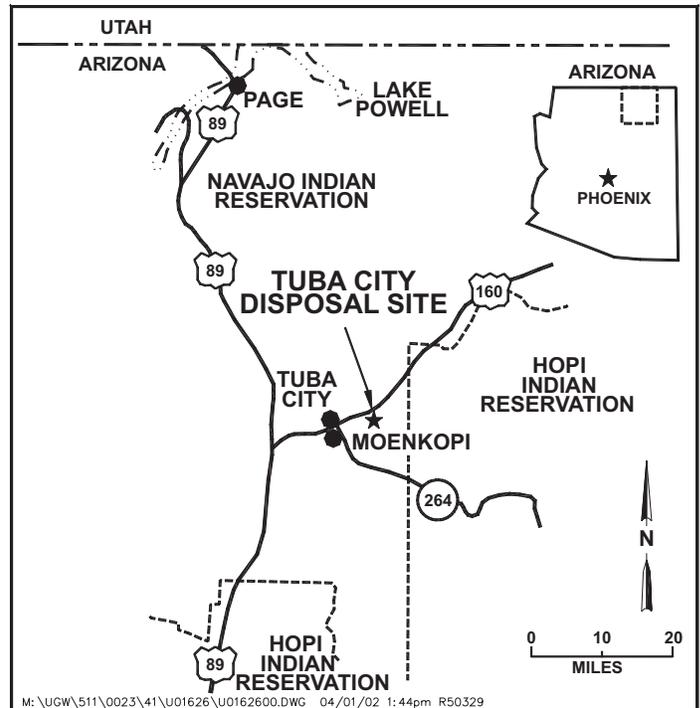


Figure 1. Location of Tuba City UMTRA Ground Water Project Site

The U.S. Department of Energy (DOE) began surface remedial action at the Tuba City site in 1988 under the UMTRA Surface Project. Uranium mill tailings and tailings-contaminated materials were moved and stabilized in an engineered disposal cell on the site. Windblown contaminated soils from surrounding properties were also placed in the disposal cell. The surface remedial action was completed in April 1990.

The main aquifer near the Tuba City site is the Navajo multiple aquifer system. Milling-related activities have caused ground water contamination in the Navajo aquifer near the site. However, there is no contamination in springs or in private wells, and contamination will not affect these areas in the future. The primary source of ground water contamination in the Navajo aquifer results from water that drained from the tailings piles during operation of the mill. The volume of water required at the Tuba City mill to

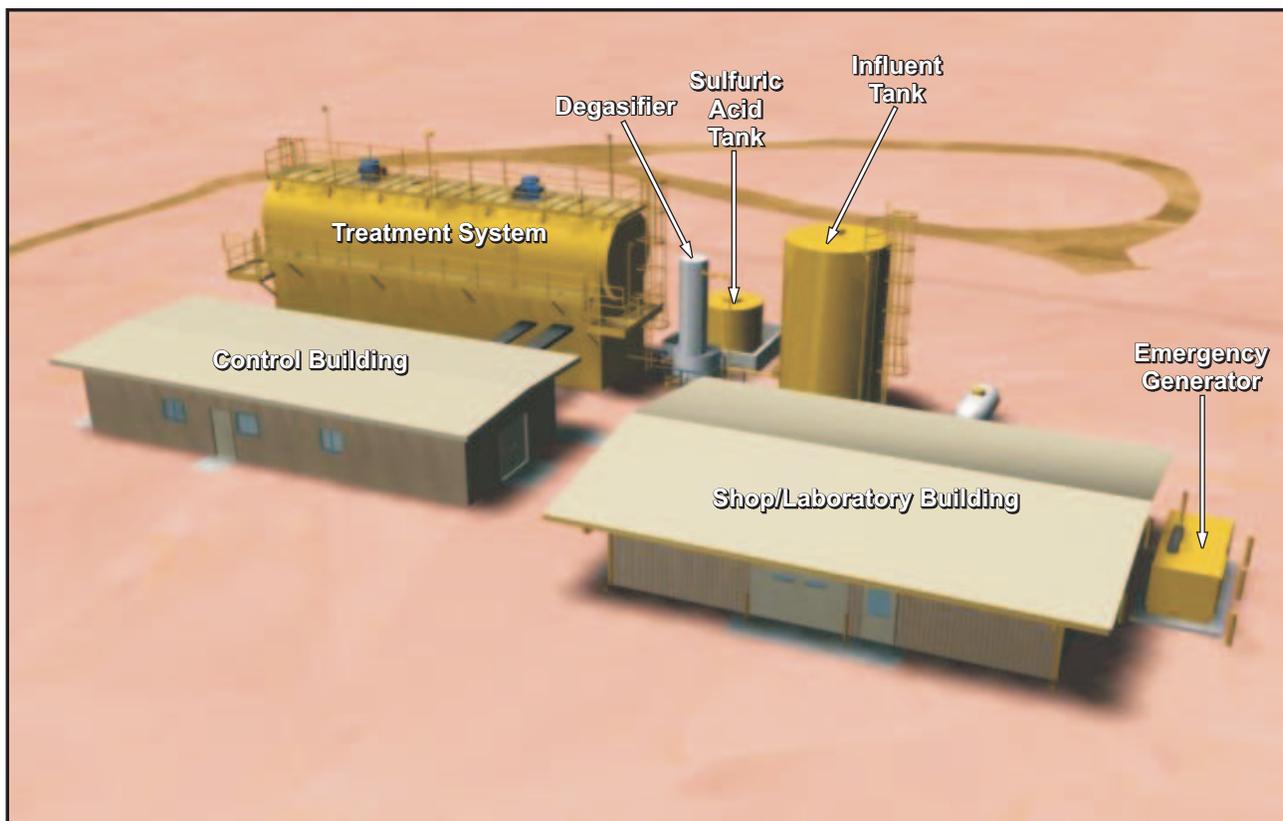


Figure 2. Distillation Unit at Tuba City UMTRA Ground Water Project Site

process uranium ore ranged from 200 gallons to as much as 1,000 gallons per ton of ore; acid leaching generally required more water than carbonate leaching. Water used by the mill to process uranium ore was acquired from four deep water-supply wells that tapped the Navajo aquifer north of U.S. Highway 160. After the ore was processed, the water was discharged with the mill tailings as slurry into evaporation ponds. These evaporation ponds were not lined; consequently, some of the water that did not evaporate flowed downward into the Navajo aquifer. Water in the evaporation ponds contained high concentrations of dissolved constituents, such as nitrate, sulfate, sodium, calcium, and uranium, derived from the milling process.

## Selected Compliance Strategy

Sampling and analyses of the contaminated ground water identified 18 contaminants attributable to milling activities. These constituents were then screened for potential risks to human health and the environment. Thirteen of the 18 contaminants — ammonium, cadmium, calcium, chloride, chromium, iron, magnesium, manganese, potassium, sodium, strontium, tin, and zinc — do not exceed the maximum concentration limits established by the U.S. Environmental Protection Agency and are not potential risks to human health or the environment. DOE has selected the compliance strategy of no remediation for these contaminants.

Of the remaining five contaminants, four contaminants — molybdenum, nitrate, selenium, and uranium — are present in the ground water at concentrations that exceed their respective maximum concentration limits. One contaminant, sulfate, is not regulated but is present at concentrations that cause an excess potential risk. Active remediation will be used for these five contaminants.

Cleanup of the ground water is being performed with a system that extracts contaminated ground water, treats the extracted ground water, and injects clean water back into the aquifer (i.e., a pump-and-treat system). Implementation of the system is being done in phases.

## Phase I

Phase I involves installation of a limited number of extraction wells, injection wells, an infiltration trench, and installation of the treatment system (Figure 2). The selected method for treating the extracted ground water is distillation. This type of treatment allows 85 to 90 percent of the extracted water to be injected back into the aquifer.

## Treatment Capabilities

The treatment system currently produces approximately 100 gallons per minute, which is more than

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1 million gallons per week, of distillate-quality water. The treated water is returned to the aquifer. The treatment system also generates 10 to 15 gallons per minute of wastewater that is pumped to a solar evaporation pond constructed at the site. To enhance operation of the remediation system, the analytical capabilities of the Tuba City site have been expanded by construction of an enlarged on-site laboratory and shop.

## **Phase II**

The treatment system is planned to operate for 20 years, at which time concentrations of contaminants should meet U.S. Environmental Protection Agency standards and, to the extent practicable, will be within the cleanup goals requested by the Navajo Nation. Monitoring and modeling results will be used to design Phase II of the project. DOE would like to use the observational approach to achieve a better understanding of how the contaminated aquifer is responding to Phase I remedial action and to determine that the model predictions and the aquifer response are synchronized.

At the completion of groundwater cleanup, DOE will remove the distillation treatment unit(s), water storage tank, evaporation pond, existing ponds, and infiltration trench. A limited number of the injection and extraction wells will be left in place for use as long-term ground water monitoring wells.

## **Wildlife Management Plan**

The solar evaporation pond is the collection point for discharge of brine (i.e., waste) from the treatment system. The liquid contained in the evaporation pond is a concentrated salt solution. It is not anticipated that the pond would have a significant adverse effect on wildlife species. However, some mortality could occur if brine in the pond reaches toxic levels and if wildlife species have access to the pond. A *Wildlife Management Plan* has been created and includes considerations to minimize potential adverse effects to federally listed or Navajo-listed threatened, endangered, or sensitive species that may be affected by the brine pond. DOE has worked with the Navajo Fish and Wildlife Department and U.S. Fish and Wildlife Service to implement the plan.

## **Long-Term Surveillance and Maintenance**

Once the compliance strategy has been finalized, it is the responsibility of DOE to ensure that the selected compliance strategy continues to be protective of

human health and the environment. Ground water sites become part of the Long-Term Surveillance and Maintenance (LTSM) Program administered by the DOE Grand Junction Office. The LTSM Program manages the site according to a Long-Term Surveillance Plan prepared specifically for the Tuba City site.

## **Documents Available**

The following program documents are available on the DOE Grand Junction Office Internet website at <http://www.gjo.doe.gov/ugw>:

*UMTRA Ground Water Project, Final Site Observational Work Plan for the UMTRA Project Site Near Tuba City, Arizona, September 1998*

*UMTRA Ground Water Project, Environmental Assessment of Ground Water Compliance at the Tuba City Uranium Mill Tailings Site, December 1998*

*Finding of No Significant Impact, Ground Water Compliance at the Tuba City, Arizona, Uranium Mill Tailings Site, December 1998*

*UMTRA Ground Water Project, Phase I Ground Water Compliance Action Plan for the Tuba City, Arizona, UMTRA Site, June 1999*

*UMTRA Ground Water Project, Plan for Injection of Treated Ground Water at the Tuba City, Arizona, UMTRA Project Site, March 2002*

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