U.S. DEPARTMENT OF ENERGY | Legacy Management

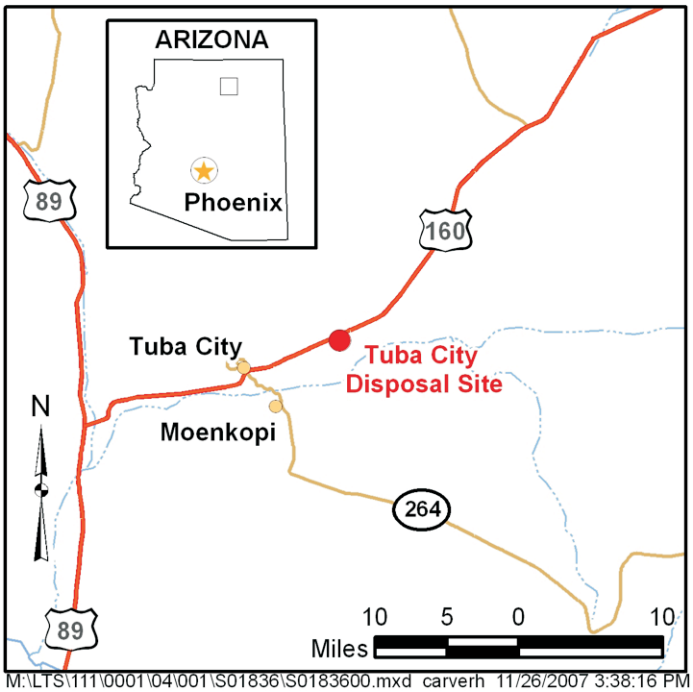
Tuba City, Arizona, Disposal Site

FACT SHEET

This fact sheet provides information about the Uranium Mill Tailings Radiation Control Act of 1978 Title I disposal site at Tuba City, Arizona. This site is managed by the U.S. Department of Energy Office of Legacy Management.

Site Description and History

The Tuba City, Arizona, Disposal Site is within the Navajo Nation and close to the Hopi Reservation, approximately 5 miles east of Tuba City and 85 miles northeast of Flagstaff, Arizona. The Rare Metals Corporation and its successor, El Paso Natural Gas Company, operated a uranium mill at the site between 1956 and 1966. During its 10 years of operations, the Tuba City mill processed about 800,000 tons of uranium ore. The milling operations created radioactive mill tailings, a predominantly sandy material. The tailings were conveyed in a slurry from the mill to evaporation ponds at the site. These ponds covered an area of 33.5 acres, and windblown tailings affected an additional 250 acres northeast of the millsite. The U.S. Department of Energy (DOE) began surface remedial action at the Tuba City site in 1988. All uranium mill tailings from the on-site piles, debris from demolished mill buildings, and windblown tailings were moved and stabilized in an engineered disposal cell on site. DOE completed site cleanup in 1990.



Location of the Tuba City Disposal Site

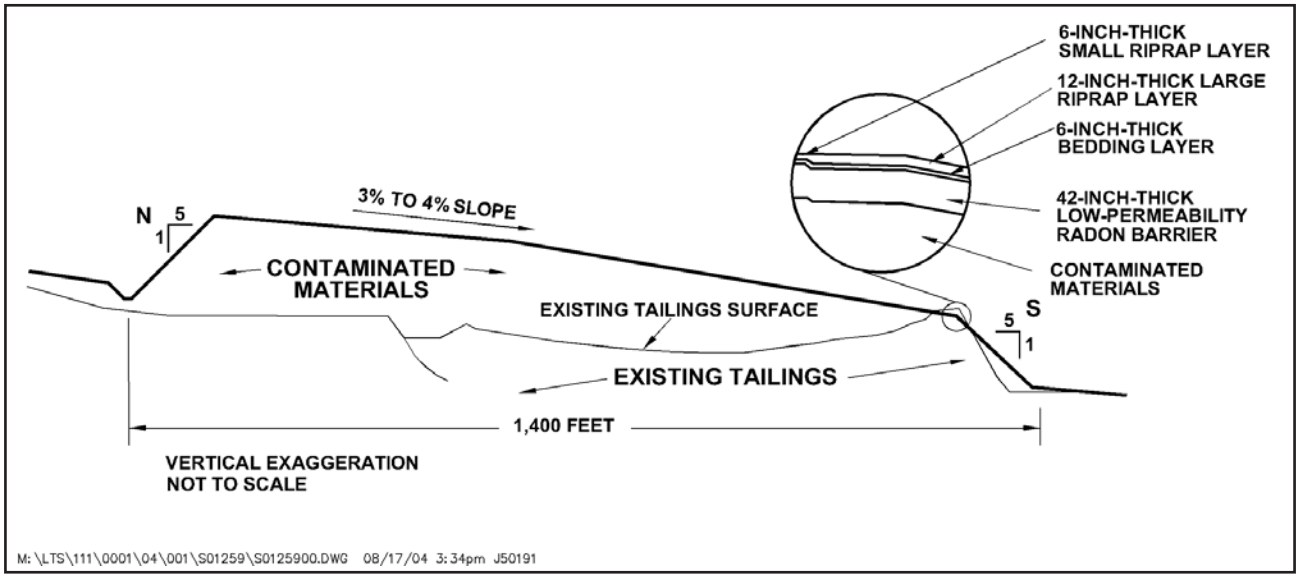
Regulatory Setting

Congress passed the Uranium Mill Tailings Radiation Control Act (UMTRCA) in 1978 (Public Law 95-604), and DOE remediated 22 inactive uranium-ore processing sites under the Uranium Mill Tailings Remedial Action Project in accordance with standards promulgated by the U.S. Environmental Protection Agency in Title 40 *Code of Federal Regulations* (CFR) Part 192. Subpart B of 40 CFR 192 regulated cleanup of contaminated ground water at the processing sites. The radioactive materials were encapsulated in U.S. Nuclear Regulatory Commission–approved disposal cells. The U.S. Nuclear Regulatory Commission general license for UMTRCA Title I sites is established in 10 CFR 40.27. The Tuba City Disposal Cell was included under the general license in 1996.

Disposal Site

The disposal site is approximately 6,000 feet northwest of and 300 to 400 feet in elevation above Moenkopi Wash, an intermittent stream that drains to the southwest into the Little Colorado River. The disposal site lies at an elevation of approximately 5,100 feet above sea level on the middle of three alluvial terraces associated with ancestral flows in Moenkopi Wash. Thin surficial deposits of unconsolidated dune sand and gravels overlie the Navajo aquifer, which is the main aquifer near the Tuba City site. On a regional scale, the Navajo aquifer is vast and encompasses all the Navajo Sandstone deposits. The saturated thickness of the aquifer near the disposal cell is about 500 feet, although within 2,000 feet south of the disposal cell the aquifer thins rapidly. Depth to ground water ranges from about 60 to 75 feet below land surface.

Land near the site is used only for occasional grazing. The Navajos and Hopis near the site use water from Moenkopi Wash for stock watering and agricultural diversions. The limited and highly variable supply of surface water makes ground water an important resource in the area. Analyses of surface water samples from seeps draining to Moenkopi Wash



North-South Cross Section of the Tuba City Disposal Cell

indicate that contamination from the disposal site has not migrated to the wash.

Historical milling operations contaminated ground water in the Navajo aquifer. The primary source of contamination is water that drained from the unlined evaporation ponds and infiltrated into the subsurface. Site-related contamination in the uppermost part of the aquifer has been detected 2,500 feet hydraulically downgradient from the disposal site. Monitoring results indicate that the original volume of contaminated ground water was between 1.5 and 3 billion gallons. Ground water contaminants with concentrations that exceed their standards in 40 CFR 192 are molybdenum, nitrate, selenium, and uranium. High levels of sulfate are also present in the ground water. Although sulfate is not a constituent included in 40 CFR 192, its concentration in the ground water is high enough to cause a potential health risk.

Compliance Strategy

Middle Terrace. The compliance strategy for contaminated ground water underlying the middle terrace is active remediation. The objective is to pump ground water from the portion of the aquifer defined by the uranium plume, treat the water by distillation to remove contaminants, and return the treated water to the aquifer through an infiltration trench located upgradient of the contaminant plume. The concentrated brine containing the contaminants and other dissolved solids that remained after distillation are pumped to a lined evaporation pond, where the liquid evaporates. The remaining brine solids will be removed to an approved repository at the completion of remedial action.

The active remediation system has been in full-scale operation since mid-2002. DOE continues to evaluate system performance through the observational approach and in 2005 installed additional extraction wells to decrease the time needed to achieve remediation goals. DOE also increased the existing treatment plant capacity through various efficiency improvements in 2004, eliminating the need for a second treatment plant.

Lower Terrace. Because the extent and magnitude of ground water contamination underlying the lower terrace is much less than in the middle terrace, the compliance strategy for the lower terrace is natural flushing with continued monitoring. This process relies on natural phenomena such as dispersion, adsorption, and evapotranspiration to reduce contaminant concentrations in a reasonable time frame. Although ground water that is discharged as spring flow to Moenkopi Wash may occasionally be consumed for ceremonial or other purposes, the water is presently not contaminated by site-derived constituents. It is likely that natural dispersion will reduce ground water contaminant concentrations to acceptable levels within 100 years on the lower terrace and that concentrations will indefinitely remain at acceptable levels at the seeps.

Disposal Cell Design

The five-sided disposal cell occupies an area of 50 acres on the 145-acre site. The cell rises 44 feet above the surrounding land. An interceptor ditch was constructed on the upslope side of the cell. A woven wire fence with locked gates surrounds the cell, and the site perimeter is marked with warning signs and permanent monuments.

The cover of the disposal cell is a multicomponent system designed to encapsulate and protect the contaminated materials. The disposal cell cover comprises (1) a low-permeability radon barrier (first layer placed over compacted tailings) consisting of clayey soil, (2) a granular bedding material placed

as a capillary break, and (3) rock (riprap) erosion protection layers.

The cell location and design were selected to minimize the potential for erosion from wind and storm water runoff. Surrounding disturbed areas were regraded and reseeded with native vegetation.

Legacy Management Activities

DOE is responsible for ensuring that the selected ground water compliance strategy at the Tuba City Disposal Site continues to be protective of human health and the environment.

DOE manages the disposal site according to a site-specific Long-Term Surveillance Plan to ensure that the disposal cell systems continue to prevent release of contaminants to the environment. Under provisions of this plan, DOE conducts annual inspections of the site to evaluate the condition of surface features, performs site maintenance as necessary, and monitors ground water to verify the continued integrity of the disposal cell. The encapsulated materials will remain potentially hazardous for thousands of years.

In accordance with 40 CFR 192.32, the disposal cell is designed to be effective for 1,000 years, to the extent reasonably achievable, and, in any case, for at least 200 years. However, the general license has no expiration date, and DOE's responsibility for the safety and integrity of the Tuba City Disposal Cell will last indefinitely.

Contacts

Documents related to the Tuba City Disposal Site are