U.S. DEPARTMENT OF ENERGY | Legacy Management

# Lakeview, Oregon, Processing and Disposal Sites

## FACT SHEET

*This fact sheet provides information about the Uranium Mill Tailings Radiation Control Act of 1978 Title I processing site and disposal site near Lakeview, Oregon. This site is managed by the U.S. Department of Energy Office of Legacy Management.*

## Site Description and History

The Lakeview Processing Site is a former uranium ore processing facility located 1.5 miles north-northwest of the town of Lakeview in Lake County, Oregon, and 16 miles north of the California–Oregon border. The uranium milling process produced radioactive tailings, a predominantly sandy material. Lakeview Mining Company built the mill in 1958 and operated the facility for 3 years. No uranium ore was processed at the site after 1961. Kermac Nuclear Fuels Corporation owned the mill from 1961 to 1968, when it was purchased by Atlantic Richfield Company. Atlantic Richfield sold the site in 1974. A lumber company purchased the millsite property in 1978 and used some of the former uranium mill buildings and raffinate ponds in its operations.

The uppermost aquifer at the site consists of lake sediments that interfinger with sands and gravels shed from nearby uplands. These sediments are hydraulically connected but partially separated by the layers of clayey lake sediments. In the area of the former processing site and in areas south of the site, ground water flows southwest at rates ranging from 50 to 160 feet per year. Ground water from a geothermal artesian source northeast of the site flows southwest beneath the western portion of the site; the geothermal ground water also feeds springs that surface north of the 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.

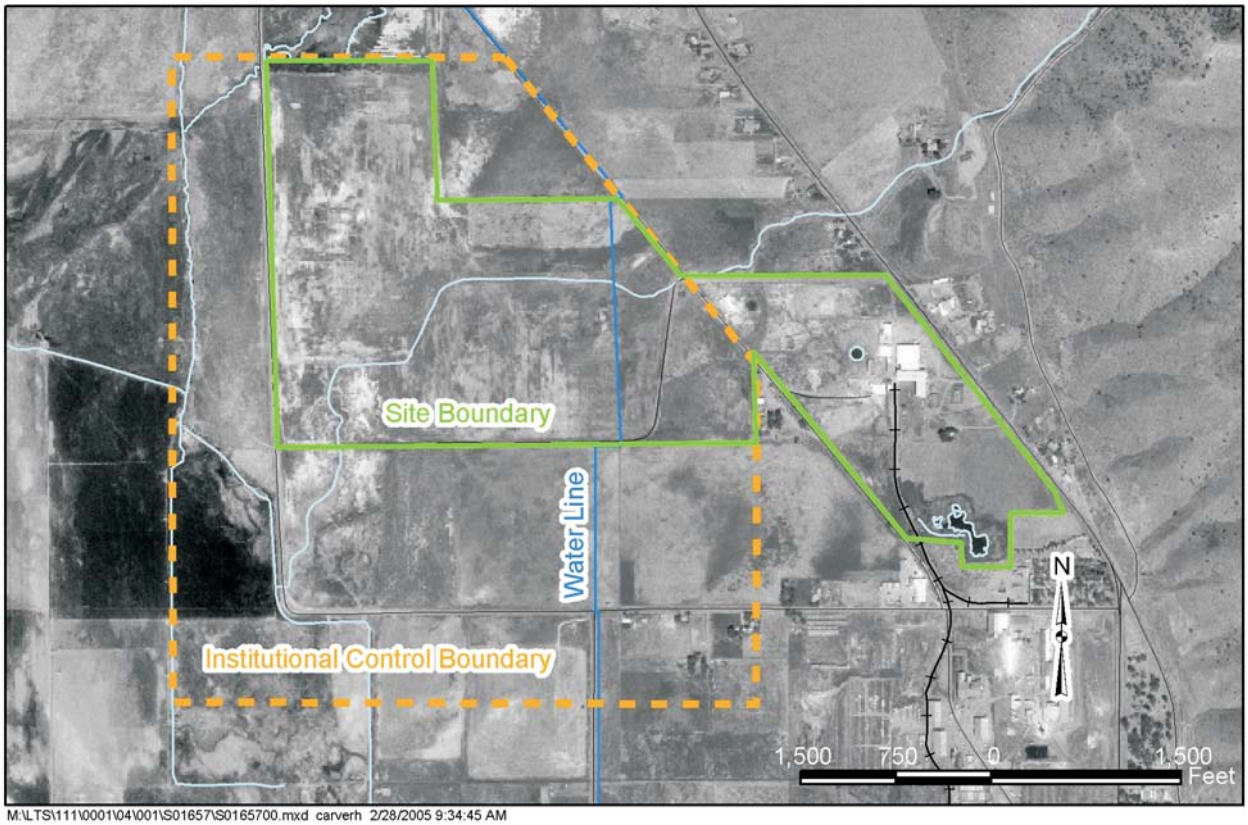

*Locations of the Lakeview Sites*

The Lakeview Disposal Site was included under the general license in 1995.

## Processing Site

The 258-acre former processing site includes areas formerly occupied by a tailings pond and six raffinate ponds that covered a total of 69 acres, a 30-acre tailings pile, and mill buildings. Raffinate is the spent solution remaining after removal of uranium by solvent extraction. From 1986 to 1988, all mill tailings and other process-related solid waste were removed from the site and placed in an engineered disposal cell 7 miles northwest of Lakeview.

Shallow ground water in the former millsite area has elevated concentrations of arsenic, boron, chloride, manganese, sodium, and sulfate. These constituents appear to derive from several sources, as described below.




*Institutional Control Boundary, Site Boundary, and Water Line at the Lakeview Processing Site*

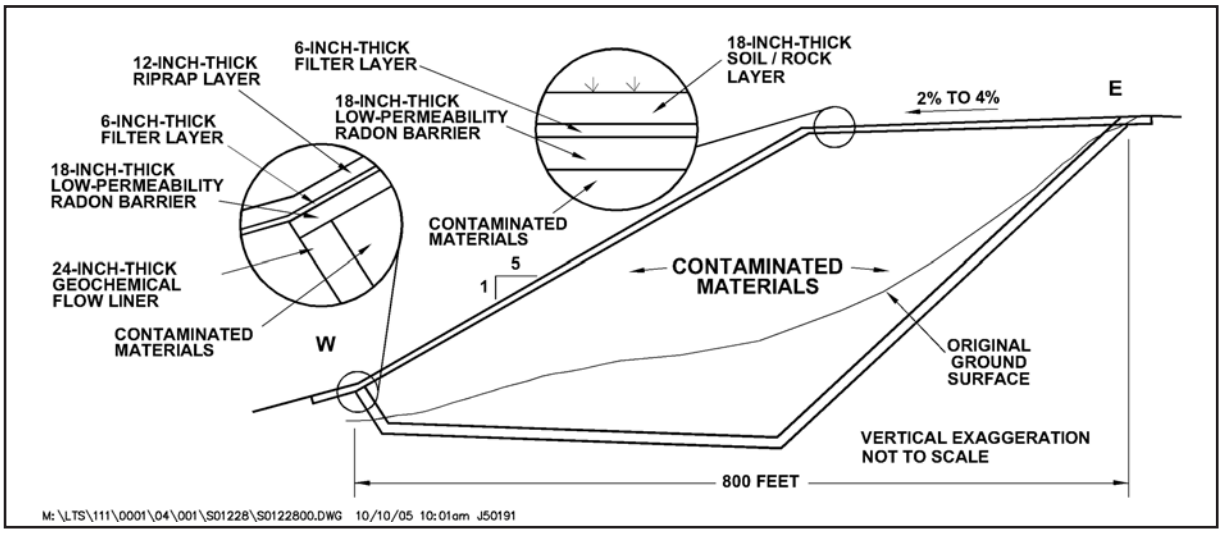
Most of the soil in the Lakeview area has high salt content. High concentrations of chloride, manganese, sodium, and sulfate in ground water probably came from salts that leached from the soil when water seeped into the ground from the ponds used during uranium-ore processing and lumber production. Similar concentrations of these constituents have been identified in ground water samples from other locations that were not influenced by past milling operations. Ground water from the geothermal springs northeast of the site flows beneath the western portion of the site and contributes elevated levels of arsenic and boron to local ground water. Concentrations of these constituents are higher in geothermal spring water than in ground water on the former processing site, and their continued presence is attributed to the geothermal activity. Constituents in the mill tailings pile probably leached into ground water. However, the uranium mill operated only 3 years and ceased operations more than 40 years ago, and the contaminant source (the tailings pile) was removed in 1988. Elevated concentrations of manganese and sulfate in ground water beneath and just downgradient of the site are probably at least partially attributable to uranium-milling operations.

### *Compliance Strategy*

The proposed ground water compliance strategy for the uppermost aquifer at the Lakeview Processing Site is no remediation with application of supplemental standards in conjunction with institutional controls and monitoring as a best management practice. Supplemental standards may be applied at locations where ground water is classified as limited use (not a current or potential source of drinking water) because it meets any of several criteria. At the Lakeview site, ground water is classified as limited use because of widespread ambient contamination not related to milling activities that cannot be cleaned up using treatment methods reasonably employed in public water systems (40 CFR 192.11[e][2]). Widespread, elevated concentrations of naturally occurring chloride, manganese, sodium, and sulfate have probably leached from lake deposits that make up the shallow aquifer system. Arsenic and boron levels are also more elevated locally because of a geothermal area northeast of the site. DOE established institutional controls to ensure protection of human health and the environment and continues to conduct a ground water monitoring program.

### *Institutional Controls*

Institutional controls at the Lakeview Processing Site are safeguards that protect human health and the environment by limiting access to contaminated ground water. An institutional control boundary was established around the western part of the former millsite that includes land within and extending beyond probable millsite contamination as defined by a ground water plume of elevated sulfate concentrations. The controls consist of a requirement for hookup to a domestic water line and a requirement for the minimum depth of a domestic well.




*West-East Cross Section of the Lakeview Disposal Cell*

Because of variations in the materials that compose the aquifer and because the contaminants have various sources, contamination is not uniformly distributed in area or depth throughout the uppermost aquifer in the region. Water quality is generally better at depths greater than 100 feet below ground surface, though it is poor enough at some locations that private well users install some type of treatment system. Water quality is improved in wells that are several hundred feet deep.

DOE negotiated with the City of Lakeview and Lake County to increase the capacity of a domestic water line under construction in the institutional control area and funded the cost of the increase. In return, both the city and county passed ordinances requiring future landowners inside the institutional control boundary to obtain hookups to the new domestic water line or to drill a well to a depth that ensures satisfactory water quality. The Oregon Water Resources Department, the state agency responsible for ensuring that domestic well applications are reviewed and approved before drilling permits are issued, passed an ordinance requiring all new domestic wells within the institutional control boundary to be screened at a minimum depth of 250 feet below ground surface.

## Disposal Site

The Lakeview Disposal Site is approximately 7 miles northwest of the town of Lakeview on land historically known as the Collins Ranch. The predominant land use in the area is grazing; the region is sparsely populated.

The cell is located near the northern end of Goose Lake Valley, a large, flat mountain valley at an elevation of 4,950 feet above sea level. Vegetation consists of pine forest in the higher mountain areas and grasses, sage, and scrub brush in the foothills and valley. The disposal site is underlain by as much as 1,000 feet of sand, silt, and lakebed clay. Depth to bedrock is unknown but is estimated to be more than 1,000 feet below ground surface. Depth to ground water beneath the disposal cell is about 100 feet.

### *Disposal Cell Design*

The disposal cell measures approximately 1,050 feet by 800 feet and occupies an area of 16 acres on the 40-acre site. The cell contains about 926,000 cubic yards of contaminated material with a total activity of 42 curies of radium-226. A wire fence with warning signs surrounds the cell.

The cell is on a hillside and was excavated to contain a portion of the contaminated materials below the original grade. Contaminated materials were placed on a geochemical flow liner of low-permeability clayey soil.

The cell cover is a multicomponent system designed to encapsulate and isolate the contaminated materials. The cover consists of (1) a low-permeability radon barrier (first layer placed over compacted tailings), (2) a sand filter/drainage layer, and (3) a soil/rock matrix layer on the top and rock (riprap) on the side slopes to protect against wind and water erosion. The top of the disposal cell supports native grasses.

The cell design promotes rapid runoff of precipitation to minimize leachate. Runoff flows down the 20-percent side slopes into a rock-lined diversion channel on the north and a rock-lined toe drain on the west. The channel and the drains are armored with rock to dissipate energy and reduce the potential for erosion.

## Legacy Management Activities

DOE is responsible for ensuring that the proposed ground water compliance strategy at the Lakeview Processing Site continues to be protective of human

health and the environment. DOE also conducts a limited ground water monitoring program at the former processing site.

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 conditions 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 Lakeview Disposal Cell will last indefinitely.

## Contacts

Site-specific documents related to the Lakeview Processing and Disposal Sites are available on the DOE Office of Legacy Management website at http://www.LM.doe.gov/land/sites/or/lake/lakeviewd/lake_d.htm (disposal site), and

http://www.LM.doe.gov/land/sites/or/lake/lakeviewp/lake_p.htm (processing site).

For more information about DOE Office of Legacy Management activities at the Lakeview Processing and Disposal Sites, contact

U.S. Department of Energy
Office of Legacy Management
2597 B¾ Road, Grand Junction, CO 81503

(970) 248-6070 (monitored continuously), or
(877) 695-5322 (toll free)