

Oak Ridge National Laboratory



Background

The U.S. Department of Energy's (DOE) Oak Ridge Reservation includes several contaminated areas that are a result of years of operation at Oak Ridge National Laboratory (ORNL). To better address the restoration of ORNL, the Environmental Management program has divided ORNL into two major areas: Bethel Valley and Melton Valley. The Bethel Valley area includes the principal research facilities. The Melton Valley Area was used for reactors and waste management. Remediation of these areas is under way.

Bethel Valley

Bethel Valley is a challenging site for remediation for many reasons. It is an active operational research center, having dealt with a multitude of chemical elements, compounds, and radioactive materials. Cleanup must be performed on a schedule that does not interfere with current research activities. Along with the active Surveillance and Maintenance program at

the site, cleanup activities are being initiated by Removal Actions and Remediation efforts approved in the Bethel Valley Record of Decision (ROD).

Tank W-1A Removal Action Project

In January 2012, DOE contractor URS | CH2M Oak Ridge LLC (UCOR) removed Tank W-1A at the central campus of the Oak Ridge National Laboratory (ORNL). The 4,000-gallon tank, commissioned in 1951, and the surrounding contaminated soil are considered the largest source of groundwater contamination in Bethel Valley at ORNL.

The stainless steel tank collected and stored liquid wastes from radiochemical separations and high-radiation analytical facilities at ORNL. The tank was removed from service and emptied in 1986 when significant levels of soil and groundwater contamination were traced to the area surrounding the vessel.

Field work began at Tank W-1A in September 2011, shortly after UCOR assumed the cleanup contract on Aug. 1. The project was originally assigned under another scope, but UCOR accepted the task during the transition period.

The remediation process included excavating, packaging, and transporting contaminated soil for disposal, as well as removing, cutting up, containerizing, and transporting the concrete pad, tank supports, and tank shell for disposal.



Tank W-1A being removed from the ground

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Building 3026 Hot Cells Facility

The 3026 hot cells facility at ORNL has been downgraded from a Hazard Category 3 nuclear facility to a radiological facility. Crews installed a new roofing membrane to minimize or prevent rainwater intrusion into the cells, poured new concrete caps over and around the two existing pedestals on the 3026C pad to stabilize the surface contamination, and characterized, removed, and transferred for treatment water from the transfer tunnel. This work will reduce the potential for contaminant releases, risks to onsite workers, and the cost of surveillance and maintenance and future cleanup.

Building 7500

Building 7500, Homogeneous Reactor Experiment, was placed in standby mode in 1961, and the insulation has degraded over the years. Physical asbestos abatement began in late FY

2017, which will significantly reduce risk to the public and the environment.

Non-Reactor Facilities Removal Action

Legacy material removal and demolition activities have been completed at several ORNL facilities. These contaminated non-reactor facilities are surplus buildings, some dating from the original Manhattan Project, that were no longer needed.

As part of the 34 Buildings D&D Project, legacy material was removed from more than 32,000 ft² of facility space, and a total of 115,600 ft² of building space was demolished and the demolition debris disposed. The 34 buildings, located in the busy central campus portion of ORNL, were safely and successfully demolished without impacting adjacent laboratory facilities. This project has eliminated the risk associated with



Asbestos abatement in Building 7500

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these unused facilities and will allow re-use of the area to support ORNL's ongoing and future research activities.

2000 Complex D&D Project

Eight facilities associated with the 2000 Complex at ORNL have been demolished. The complex, located in the northwest corner of the ORNL central campus, encompassed approximately 58,000 ft².

The facilities were constructed in the late 1940s to support various ORNL research projects. They were in severe disrepair and had been vacant for approximately six years. DOE determined that the resulting risks warranted implementing a time-critical Removal Action.

In FY 2010, demolition of the first phase (six buildings with a combined area of approximately 35,000 ft²) was completed. Demolition of the second phase was completed in FY 2011 with the removal of Buildings 2000 and 2034, a combined area of 23,200 ft².

The specific hazards encountered in this facility complex included the extremely poor physical condition of the structures, constant flaking of PCB-containing paint, extensive quantities of friable and non-friable asbestos in restricted attic areas, and radiologically contaminated ductwork and fume hoods.

Bethel Valley Burial Grounds Project

Workers have completed the Bethel Valley Burial Grounds Remediation Project, which included capping of two solid waste storage areas (SWSAs): SWSA 1 in Central Bethel Valley and SWSA 3 in West Bethel Valley. Remediation of contaminated soil hot spots and five landfills near the two SWSAs were also part of the project.

Capping of SWSA 1 was completed in 2010, and the SWSA 3 cap was completed in August 2011. Two areas of soil contamination and the former Closed Scrap Metal Area were also covered by the SWSA 3 cap. A gravel road that crosses the capped area was rebuilt on top of the cap. Both caps are constructed of several layers of impermeable cap material placed to prevent migration of contaminants. This process is called hydrologic isolation, which also involves various other methods to keep water from infiltrating the buried waste. The SWSA 3 cap included two upgradient French drains and surface water ditches that will divert shallow groundwater and rain water away from the capped area, further enhancing the hydrologic isolation of the waste.

SWSAs 1 and 3 and the associated remediated areas will be inspected periodically and maintained to ensure that they



The 3085 tanks were among the non-reactor facilities that were demolished

remain in good condition, and that damage, if any, is quickly repaired. Groundwater and surface water sampling and analyses will be performed and reported annually in the Remediation Effectiveness Report.

ORNL-Focused Groundwater Project

Work began in 2017 on a project that focuses on groundwater in exit pathways in Melton Valley and Bethel Valley. This is the third project to be implemented under the Oak Ridge Reservation Groundwater Strategy report that was approved in 2014. The Melton Valley/Bethel Valley Exit Pathway project will use flow modeling and data evaluation to identify data needs and guide placement of proposed new wells. Findings will be reported in a work plan to be issued in September 2018.

Reporting was also underway on the first two projects that were completed in 2016 under the Reservation Groundwater Strategy—an offsite groundwater study and a regional groundwater flow model. DOE issued a revised report on the offsite groundwater study in 2017 to address EPA and TDEC comments. The project is a cooperative effort among the agencies to investigate offsite groundwater quality and potential movement. DOE issued a report on development of the regional groundwater flow model in 2017 for regulator review.

U-233 Material Downblending and Disposition

Oak Ridge has a significant inventory of uranium-233 (U-233) in Building 3019 at ORNL. Due to the strict safeguard and security needs for the special nuclear material, DOE initiated the U-233 Disposition Project to downgrade the security demands at ORNL, eliminate safety and nuclear criticality concerns, and safely dispose the material offsite.

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In FY 2017, OREM completed the direct disposition of the Consolidated Edison Uranium Solidification Project (CEUSP) material. CEUSP, which comprises a portion of Oak Ridge's U-233 inventory, originated from a 1960s research and development test of thorium and uranium fuel at the Consolidated Edison's Indian Point 1 Nuclear Plant in New York.

OREM also continued preparations for the next phase of the U-233 Disposition Project, which involves processing the remaining portion of the U-233 inventory that cannot be directly disposed in its current form.

DOE approved the initial package allowing OREM to begin preparing and modifying Building 2026 for future processing activities in September 2016. Building 2026, located directly across from Building 3019 at ORNL, was transferred from the Office of Science to the Office of Environmental Management on May 1, 2017.

OREM's schedule for approval of the final design for the Processing Preparation Campaign is in the second quarter of FY 2018.

Building 3550 Slab Excavated

Building 3550 is one of 34 buildings demolished in the Central Campus area of ORNL. Since this slab is the largest in the area and the only one located along Central Avenue, it was selected for excavation. In FY 2013, the concrete slab was excavated, along with contaminated soil beneath the slab to a depth of up to two feet, and the area was graded and seeded with grass.

A completion report documenting the work performed was prepared and submitted to the Environmental Protection Agency and Tennessee Department of Environment and Conservation.

Building 3038

Building 3038 is a 7,773-square-foot nuclear facility located in the ORNL Central Campus area. Building 3038 was used for packaging, inspecting, and shipping activities for radioisotopes. All operations ceased in 1994.

During FY 2014, a report documenting completion of demolition of Building 3038 was approved by the Environmental Protection Agency and the Tennessee Department of Environment and Conservation. In the previous fiscal year, in order to prepare the building for demolition, all waste was removed from the building and disposed, stabilization activities were completed, the local ventilation system was re-started and air-monitoring equipment was placed on-line.

Building 3042 – Oak Ridge Research Reactor

Component removal and capping of a pool in the 60-year-old Oak Ridge Research Reactor highlighted efforts to remedy a seep that was discovered in the pool in September 2014. Four irradiated components – the source of 96 percent of the radiation – were removed from the pool. The items were moved by long-handled tools into a container that was placed in the pool. The container was then retrieved, moved by a crane into an 80,000 pound, heavily-shielded cask, and transported for disposal. The pool was then capped, and workers drained the structure with the wastewater being treated at an on-site facility.

Building 3042, which houses the reactor, is one of hundreds of Manhattan Project and Cold War era structures across the Oak Ridge Reservation monitored by DOE. Nuclear research had not been conducted at the facility since 1988, but it still contained highly irradiated components from those operations. The seep was causing the pool to lose water that served as a protective shielding agent for the irradiated components.

4500 Gaseous Waste System Completed

A Phased Construction Completion Report (PCCR) for 4500 Hot Cells/Duct Stabilization was approved by the Environmental Protection Agency and Tennessee Department of Environment and Conservation in FY 2014. A PCCR is used to report completion of individual remediation projects that are part of a CERCLA Record of Decision involving a large number of remediation projects that will be performed over a long period of time.

The 4500 Area central gaseous waste system (CGWS) provides containment ventilation, off-gas treatment and



A worker in 3038 uses a glove box to package and dispose of waste.

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discharge of gaseous waste from many ORNL Central Campus facilities. The system is designed to prevent environment, safety, and health (ES&H) risk associated with accidental release of airborne pollutants. Risk has increased over the years as the CGWS and connected facilities have aged

The objective of the 4500 Area gaseous waste system upgrades project was to deactivate one of the five cell ventilation system branches and remove several facilities from the central hot off-gas system.

The ventilation system branches and off-gas system are part of the central gaseous waste system that vent through the 3039 Central Stack. The project provided localized ventilation systems to the 4501, 4505, 4500N, and 4507 facilities; stabilized the hot cells in Building 4507; cleaned out filter pits 3106 and 4556; and stabilized hundreds of feet of deactivated underground ductwork.

Past work includes demolition, removal of existing equipment, and fabrication and installation of the replacement ventilation system for the 4501, 4505, and 4500N facilities, characterization and stabilization of the underground ductwork and cleanout of the 3106 and 4556 filter pits. Design, fabrication, installation, and operation of the local ventilation system for Building 4507 were also completed along with stabilization of the 4507 hot cells.

Melton Valley

Contamination source remediation activities were completed under the Melton Valley Interim ROD. A fact sheet is available that details these activities. Remaining at this site to be addressed are some inactive, excess reactors (and soils surrounding these facilities), the watershed area ecology, sediment, and groundwater.

Another ROD will be developed to address the reactors, and then a final ROD will be developed for the entire Melton Valley area.

Molten Salt Reactor Experiment

Work continued in FY 2017 to characterize and dispose of waste items from the Molten Salt Reactor Experiment (MSRE) facility, a graphite-moderated, liquid-fueled test reactor that operated at ORNL from June 1965 until December 1969.

In 2014, an addendum to the waste handling plan was approved to address the disposition of waste that remained from the earlier actions. The addendum includes a schedule for characterizing and dispositioning 74 waste items.

In FY 2017, all items were disposed and characterized per the schedule. Several items were disposed ahead of schedule; most notably, four of the MSRE salt probes were characterized and sent for downsizing and disposal. In addition four FY 2018 waste items were sent for disposal. In total, six items were



Workers load a cask containing irradiated components at the Oak Ridge Research Reactor, Building 3042.

disposed ahead of schedule. Since the reactor's shutdown, OREM has performed several studies and removal actions to stabilize the facility, including removing uranium deposits and defueling the reactor salts. Employees are characterizing and disposing legacy defueling equipment, such as the fuel salt probes and fuel salt probe glove box. OREM is continuing its routine surveillance and maintenance activities at the facility to manage the remaining hazards, including periodically removing reactive gas generated by the defueled salts.

Monitoring Wells

DOE has completed installation of monitoring wells opposite the Oak Ridge Reservation side of the Clinch River to monitor for potential ORNL site-related contaminants.

The Melton Valley Off-site Monitoring Well project installed 16 new monitoring wells that are constructed to depths equivalent to monitoring zones on the DOE side of the river. The new wells were drilled to depths from 250 to 650 feet deep. Geophysical logging and in situ permeability testing was

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conducted on each of the wells. Two of the proposed well sites adjacent to the river utilized previously operated drinking water wells to install multiple zoned wells in the open borehole.

The driller was demobilized and the well sites were restored in August 2010. Field work was completed with repairs to Jones Road and Upper Jones Road. The new wells are now included in the Melton Valley monitoring network and incorporated into the recently proposed Melton Valley Monitoring Plan. The 16 new wells and 5 nearby residential wells are being sampled quarterly.

Surveillance and Maintenance

Surveillance and Maintenance (S&M) activities involve maintaining facilities in a safe and compliant condition until sites are remediated or facilities are demolished through EM cleanup projects. The project is responsible for safekeeping of contaminated structures and equipment, radiological sources and other reactive chemicals inventory. The main objective of the S&M project is to not only keep site personnel and the public safe but also to prevent any impacts to the environment.

The S&M scope covers former experimental land areas/sites, and surplus process buildings. The S&M project oversees 100

facilities and 273 sites. These facilities and sites include nuclear, radiological, or other industrial facilities.

Routine S&M includes numerous activities, such as characterization of hazards, material inventory, facility/site inspections; maintenance of property and key inventory, leachate collection and transport for treatment, fence and sign maintenance, and radiological surveys.

ORNL Water Quality Program

The ORNL Water Quality Program conducts surface water and groundwater monitoring to measure the performance of remedial actions in Melton Valley and Bethel Valley. The Program also supports elements of the Biological Monitoring and Abatement Program in monitoring the recovery of aquatic ecosystems in areas of the ORNL site where the CERCLA Program has the lead responsibility for environmental compliance. The ORNL Water Quality Program monitoring is dovetailed with UT-Battelle's ORNL site environmental compliance monitoring activities through data-sharing agreements.