OREM-20-7603

2020

Cleanup Progress

Annual Report to the Oak Ridge Regional Community

Message from the Manager

DOE Oak Ridge Office of Environmental Management

To the Oak Ridge Regional Community:

Like other workplaces across the nation, 2020 was an unusual and challenging year at the U.S. Department of Energy's (DOE) Oak Ridge Office of Environmental Management (OREM) due to the COVID-19 pandemic. Despite these circumstances, I couldn't be more proud of how our employees responded to stay protected while finding ways to advance our important cleanup mission.

This year, we completed DOE's largest-ever cleanup effort, and we became the first site in the world to remove an entire uranium enrichment complex. This milestone was the culmination of two decades of planning, decontamination, demolition, and soil remediation at the East Tennessee Technology Park (ETTP). The end result was the safe and successful removal of more than 500 structures that had a total footprint that could span the equivalent of 225 football fields. I'm proud not only of what we accomplished, but how it was accomplished. This work was completed four years ahead of schedule, avoiding $500 million in costs to taxpayers.

In 2020, we also finished construction and opened the K-25 History Center at ETTP, which fulfills a long-standing commitment we made to preserve the site's history. Over the past decade, nearly 1,000 oral histories were collected from former Manhattan Project and Cold War-era workers. These special, personal stories are available in the history center, and they were used by museum professionals to develop the exhibits and galleries.

With core cleanup complete at ETTP, we began transitioning the men and women responsible for that historic success to our next big cleanup endeavor at the Oak Ridge National Laboratory (ORNL) and Y-12 National Security Complex (Y-12). These employees are bringing extensive training and experience to take on the next complex tasks that lie ahead. We are very fortunate to have an equipped, knowledgeable workforce that's ready to begin transforming ORNL and Y-12 immediately.

Maintaining this highly skilled workforce is only possible through the strong continued support from Congress. It also provides funding that allows our program to address DOE's largest inventory of high-risk excess contaminated facilities. Through the progress made this year, we will eliminate several facilities from that list in the coming months, including Y-12's Biology Complex and the Building 3026 hot cells at ORNL. These removals will clear land that can be used for new research and national security missions.

Our work isn't stopping there. OREM initiated a host of other deactivation and pre-demolition projects at ORNL and Y-12 in 2020. Work is underway at numerous former research reactors and isotope facilities in ORNL's central campus area, including Buildings 3005, 3010, 3034, 3036, and 3042. Additionally, characterization and pre-demolition work is beginning at the massive Alpha-2 and Beta-1 Manhattan Project-era buildings at Y-12.

At ORNL, we are continuing to push forward on our highest priority—processing and disposing the remaining inventory of uranium-233 stored at the site. Part of this process involves extracting valuable medical isotopes that are being used for next-generation cancer treatment research by the private sector. Crews are actively processing the low-dose portion of the inventory, while other crews upgrade hot cells that will begin processing and downblending the high-dose portion of the inventory.

In addition to these projects, OREM is building infrastructure that will play a pivotal role for future cleanup. Construction continued on the Outfall 200 Mercury Treatment Facility, which is a linchpin project for Y-12's cleanup. It will open the door for demolition of Y-12's large, mercury-contaminated facilities and subsequent soil remediation by preventing potential mercury releases into the nearby creek. We also began constructing the Sludge Processing Mock Test Facility. When complete next year, this facility will mature the technologies needed to process Oak Ridge's 500,000-gallon inventory of sludge transuranic waste stored onsite.

In closing, our leadership team is intently focused on being responsible stewards of taxpayer dollars, achieving the most work possible to transform and modernize the site and creating new economic opportunities for the region. We recognize the impact our work has on the community, and we will continue to plan and collaborate with our local partners and stakeholders as we chart this exciting next chapter of cleanup.

Jay Mullis

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UCOR
an Amentum-led partnership with Jacobs

This report was produced by UCOR, DOE's Environmental Management contractor for the Oak Ridge Reservation.

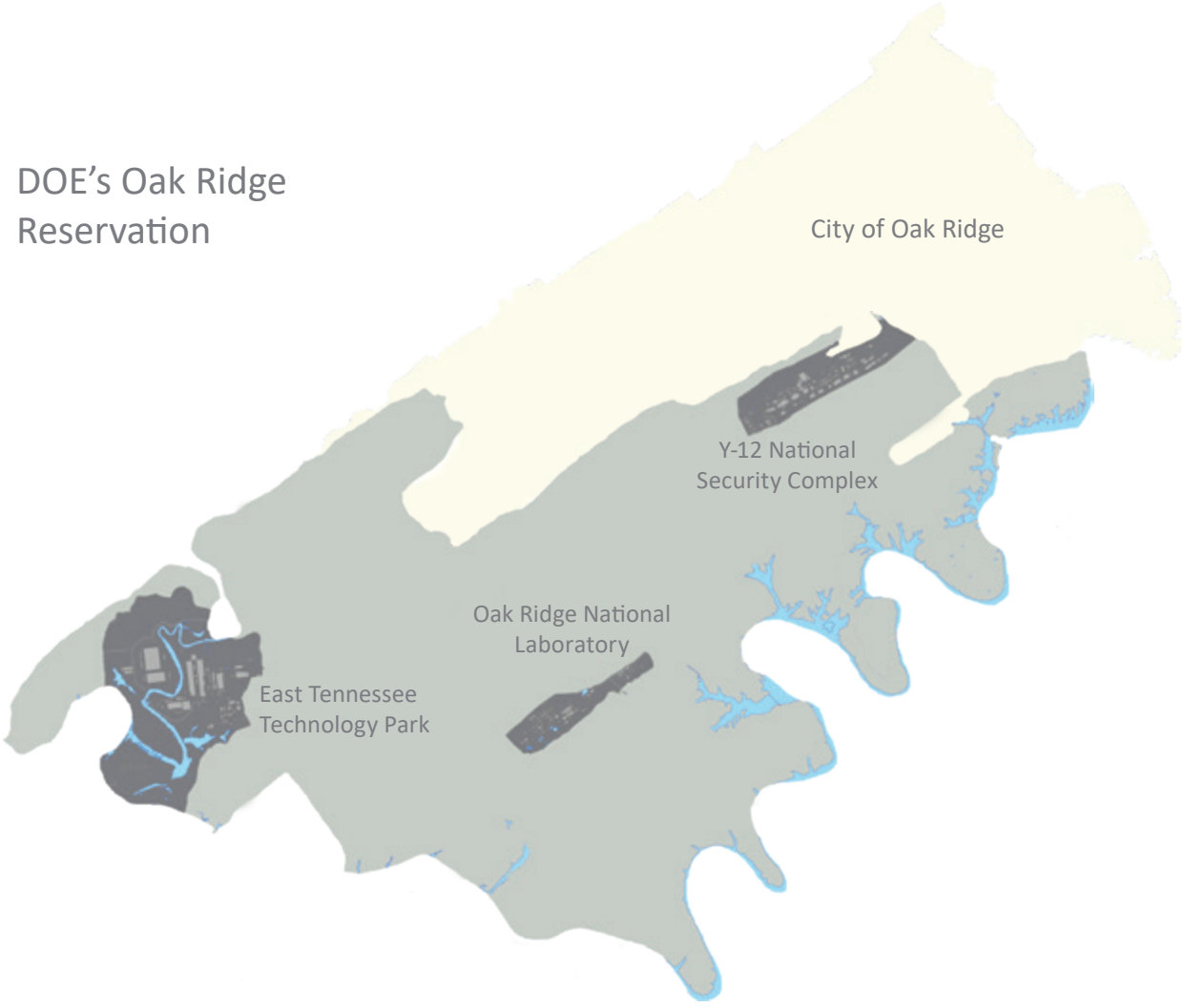
Introduction

VISION 2020 DONE
from teardown to turnover

In FY 2020, OREM made history by achieving Vision 2020—completing major cleanup at ETTP. This achievement marked the first time in the world a former uranium enrichment complex has been removed. Clearing away these structures and remediating the soil is making land available to the community for new economic development opportunities. OREM also continued significant risk reduction activities at Y-12 and ORNL, including stabilizing and preparing numerous excess contaminated facilities for demolition.

The Oak Ridge Reservation has played key roles in our nation's defense and energy research. However, past waste disposal practices and unintentional releases have left portions of the land and facilities contaminated and in need of environmental cleanup. The contaminated areas of the reservation are on the U.S. Environmental Protection Agency's (EPA) National Priorities List, which includes sites across the nation that require cleanup under the Comprehensive Environmental Response, Compensation and Liability Act of 1980 (CERCLA). These areas on the Oak Ridge Reservation have been clearly defined, and OREM is working to clean and restore them under a partnership with the EPA and the Tennessee Department of Environment and Conservation (TDEC).

Together, through the support provided by contractors, unions, Congress, and elected officials, OREM is enhancing safety, removing barriers to economic development, and enabling vital missions in science, energy, and national security.



East Tennessee Technology Park

The former Oak Ridge Gaseous Diffusion Plant began operations during World War II as part of the Manhattan Project. Its original mission was to produce enriched uranium for use in atomic weapons. The 2,200-acre plant was shut down permanently in 1987 and is undergoing cleanup for ultimate conversion to a multi-use industrial park. Major activities at the site include environmental restoration, facility deactivation and demolition, waste disposition, and land transfers.

Centrifuge tower demolition

Centrifuge Complex demolition changes ETTP skyline

The last remaining mega-structure at ETTP was demolished in FY 2020. Workers completed demolition of the Centrifuge Complex, a sprawling 235,000-foot facility that no longer had a purpose at the site. This facility was the next to last to be demolished at ETTP.

The Centrifuge Complex was built in stages to provide development, testing, reliability, and demonstration capability of uranium enrichment using centrifuges. The last of these facilities ceased operation in the mid-1980s.

Centrifuge Complex before and after demolition

DOE and its cleanup contractor, UCOR—an Amentum-led partnership with Jacobs—have been demolishing unneeded facilities at ETTP and cleaning up the site, which is being converted into a multi-use industrial park, national park, and conservation area. Demolition of the Centrifuge Complex was one of the most visible skyline changes at the site, removing a facility that scaled as high as 180 feet.

The Centrifuge Complex contained four major sections. The K-1004-J lab section was an original Manhattan Project facility built for research and development in 1944. The K-1200 section, known as the Advanced Machine Development Laboratory and Component Preparation Laboratory, was used from 1975 to 1985 to develop machines and manufacturing processes for centrifuges.

The K-1210 section was referred to as the Component Test Facility and Advanced Equipment Test Facility. It operated from 1975 to 1985 to test the reliability and operability of centrifuge machines. The facility also served as a pilot plant for testing feed, withdrawal, and depleted uranium hexafluoride transfer systems.

The final section—the K-1220 Complex Centrifuge Plant Demonstration Facility—was used from 1981 to 1985 primarily to test production centrifuges to be used in the Gas Centrifuge Enrichment Plant. It also contained the tallest section of the complex, the southwest tower. Due to its height, conventional demolition equipment could not be used, and workers used large winches to pull over that section of the building—a feat that took a great deal of preparation and planning.

K-1600 becomes final facility to be demolished

The final unneeded structure at ETTP was demolished, bringing an end to demolition activities that have removed more than 13 million square feet of facilities at the site.

UCOR demolished the 42,000-square-foot K-1600 Building, a former test and demonstration facility for uranium enrichment centrifuges. The building was decommissioned by Centrus Energy Corp., which had leased it since 2002 to test and demonstrate uranium enrichment centrifuges. The company consolidated its centrifuge testing and demonstration activities into its Technology and Manufacturing Center in Oak Ridge and no longer needed to lease K-1600. Centrus removed equipment from the facility to eliminate any classification concerns. UCOR then performed deactivation, a process that included asbestos abatement, utility disconnections, and universal waste removal.

The K-1600 Building was located in the center of the former U-shaped, mile-long K-25 Building. Enrichment operations at the site, once called the Oak Ridge Gaseous Diffusion Plant, ceased in the mid-1980s. With completion of this demolition, DOE has achieved an historic milestone—the first-ever removal of a gaseous diffusion plant.

The K-25 footprint area is part of the Manhattan Project National Historic Park. The removal of K-1600 helps facilitate future plans for the area, which will include the eventual construction of additional facilities that will complement historic preservation efforts at the K-25 History Center.

Demolition debris disposal at K-1600

K-1600 complex before and after demolition

Demolition projects complete ETTP core cleanup

The final unneeded facilities at ETTP came down in FY 2020, totaling more than 512,000 square feet. In addition to the Centrifuge Complex and Building K-1600, crews also tore down the following structures:

K-1039 Facilities: K-1039-1 served as the central telecommunications office for ETTP since 1997 until last year. The adjacent K-1039 building housed supporting equipment.

K-1095 Paint Shop: Constructed in 1979, the K-1095 paint shop was used to prepare paint and signs for all three sites on the Oak Ridge Reservation. From the late 1990s until recently, the 13,500-square-foot facility was used as an electrical maintenance shop.

K-1006 Building: The K-1006 Building was constructed in 1962 to support overall K-25 site operations. The 18,000-square-foot structure was leased until 2019. Because the company relocated and there were portions of the aging facility that required cleanup, it was torn down.

Segmentation Shop: Demolition of ETTP major facilities generated contaminated equipment, piping, and other items that required size reduction and deposit mining. Those items were sent to the ETTP Segmentation Shop, where they were processed to facilitate their disposal. With all of the facilities at the site demolished, the Segmentation Shop was no longer needed.

K-1095

K-1006

K-1039

Segmentation Shop

Since demolition activities began at ETTP, more than 13 million square feet of facilities have been demolished. The graphic above highlights all the facilities that have been removed at the site, creating opportunities for new industrial development.

Vision 2020 completed

Soil remediation at forefront of ETTP cleanup efforts

With demolition activities completed at ETTP, soil remediation moves to the forefront in site cleanup efforts. Soil remediation at ETTP is helping to eliminate hazards at the site and pave the way for its future industrial use.

ETTP is divided into two cleanup regions: Zone 1, a 1,400-acre area outside the main plant, and Zone 2, an 800-acre area that comprises the main plant area. The areas in these zones are divided into varying-sized exposure units (EUs) for the purpose of remediation.

Zone 1

The Interim Record of Decision (ROD), which documents the cleanup method for Zone 1, requires OREM to remediate soil for the protection of groundwater and a future industrial workforce and includes land use controls. The ROD divides Zone 1 into 80 EUs that range in size from 4 to 66 acres.

In FY 2020, OREM and UCOR initiated the planning for remediation to eliminate ecological risk to wildlife, particularly in the K-901 Drainage Ditch. Additionally,

OREM and UCOR remediated two subsurface faults associated with the abandoned underground utility system in the Powerhouse Area and initiated installing a soil cover in the area that contains buried asbestos. Agreement was reached with EPA and TDEC that the cleanup levels also are suitable for recreational use.

Zone 2

The Zone 2 ROD requires OREM to remediate soil for the protection of groundwater and a future industrial workforce and includes land use controls. It divides Zone 2 into 44 EUs that range in size from 6 to 38 acres.

In FY 2020, OREM and UCOR completed the excavation and removal of soil contaminated with concentrations of technetium-99 (Tc-99) to meet regulatory standards.

Workers also completed removal of the K-832 Basin in the Poplar Creek area of ETTP and restored the area. The large basin once held the cooling water used in the site's uranium enrichment operations. The basin worked in conjunction with a pumphouse and cooling tower, both of which were previously demolished.

Once housing a sanitary sewer system, the K-1203 site has also been remediated. The buildings that sat on the site were previously demolished. The underground structures were removed this fiscal year, leaving behind a grassy field after remediation.

Tc-99 remediation on the K-25 footprint

Remediation completed

ETTP transforming thanks to reindustrialization

Oak Ridge's Reindustrialization Program entered its 24th year as the model DOE asset reuse program. During that time, OREM has been transforming ETTP from a former government-owned uranium enrichment complex into a multi-use industrial business park. OREM has successfully transferred almost 1,300 acres at ETTP for beneficial reuse and is working to complete transfer of the remaining acreage at the site. During FY 2020, Reindustrialization initiated and received regulatory approval for the transfer of Access Portals 4 and 11 and prepared documentation for transfer of the K-1037 area and the former K-732 Switchyard.

As OREM completes the final phases of environmental cleanup at ETTP, the site continues toward its future as a multi-use industrial park, national historical park, and conservation area. With the successful demolition of all excess buildings, a new End State and Closure Plan will be prepared to address the necessary transfers for all of the site assets, including facilities, land, and utility infrastructure.

As part of ETTP reuse, a general aviation airport has been proposed and received initial Federal Aviation Administration (FAA) approvals. In FY 2020, the Metropolitan Knoxville Airport Authority transferred management of the airport project to the City of Oak Ridge. Since the management oversight transfer, the City of Oak Ridge submitted the Benefit Cost Analysis to the FAA and also initiated an Environmental Assessment and preliminary design of the proposed airport. The viability of the airport project will depend on the results of these documents and funding availability.

In areas where redevelopment is more challenging due to terrain or wetlands, UCOR has facilitated opportunities to enrich the community through potential greenspace initiatives that will be integrated into the industrial park and the national historical park. This effort led to a partnership between OREM and the Tennessee Wildlife Resources Agency, which will be receiving ownership of the greenspace areas.

History Center opens

The K-25 History Center was completed and opened to the community in February 2020. This commemorative facility was commissioned through a Memorandum of Agreement to enable OREM to complete decontamination, decommissioning, and demolition of historic ETTP structures. The K-25 History Center features exhibits, artifacts, and audio-visual displays to interpret the significant role of the K-25 site in the Manhattan Project and Cold War and to commemorate the people who worked there.

The history center offers visitors 7,500 square feet of exhibits with more than 250 original artifacts on display. Nearly 1,000 oral histories were collected over a 10-year span from former workers that museum professionals used to develop the exhibits and interactive galleries.

Inside the K-25 History Center

Oak Ridge National Laboratory

The Oak Ridge National Laboratory is DOE's largest multi-program national laboratory that conducts cutting-edge research in energy, materials and chemical sciences, nuclear science, and supercomputing. However, the site also houses numerous old, contaminated buildings and forms of waste from previous research and operations in past decades.

Characterization, deactivation ramping up on excess contaminated facilities

With core cleanup complete at ETTP, OREM is transitioning crews to the next major phase of Oak Ridge's cleanup. One of those areas is ORNL's central campus which houses numerous former research reactors and isotope production facilities. Many of these buildings date back to the 1940s and 1950s.

One of the priority projects was to prepare the 3026 facility—the Radioisotope Development Lab—for demolition. Using a 175-ton crane, workers installed a protective tent to keep nearby research facilities protected while the final two hot cells (heavily shielded concrete rooms) are demolished.

Crews conducted deactivation operations in Buildings 3005 and 3010, which were brought to the cold and dark state (when all utilities are isolated). Building 3005 was the first project to receive crews transferring from ETTP. Those workers have removed asbestos and all universal waste.

Building 3042, a research reactor, and the buildings in "Isotope Row" that supported and produced radioisotopes were also priority projects. Building 3042 went cold and dark at the end of the fiscal year, and crews began deactivation work.

Efforts were underway at the end of the fiscal year to place the 11 Isotope Row buildings (3029, 3030, 3031, 3032, 3033, 3033A, 3034, 3036, 3038, 3093, and 3118) in a cold and dark state.

Characterization and deactivation of Buildings 3009, 3010, 3010-A, 3080, 3083, and 3107 continued, including asbestos abatement, removal of combustible materials, and isolation of electrical and mechanical utilities.

Deactivating these facilities paves the way for future demolition, which will remove a significant risk from the heart of ORNL and provide land for future research and science missions.

A protective tent over the 3026 facilities will ensure demolition does not impact the surrounding area

Uranium-233 processing begins ahead of schedule

Oak Ridge has a significant inventory of uranium-233 (U-233) stored in Building 3019 at ORNL. OREM initiated the U-233 Disposition Project to safely disposition the material, eliminate safety and nuclear criticality concerns, and downgrade the security demands at ORNL.

Completing the project is OREM's highest priority at ORNL. It will remove a significant risk by eliminating the inventory of highly enriched fissile material stored in the world's oldest operating nuclear facility located in the heart of one of the nation's most important scientific research sites.

The U-233 Disposition Project involves two phases—the Direct Disposition Campaign and the Processing Campaign. The Direct Disposition Campaign, which was completed in 2017, transferred U-233 material suitable for beneficial reuse to other programs and directly disposed of materials that did not require further processing.

The Processing Campaign was able to begin a year ahead of schedule in FY 2020 due to an innovative partnership between DOE, its contractor Isotek, and nuclear innovation company TerraPower. Through this partnership, Isotek is extracting thorium from the inventory for TerraPower before it is processed into a disposal-ready form. TerraPower, in turn, will use this unique isotope to support next-generation cancer treatment research. Isotek used the proceeds from the sale of the thorium to install glove boxes and begin processing the low-dose material while upgrades are completed on the hot cells that will be used to process the high-dose inventory for disposal.

In FY 2020, Isotek began glove box processing, and they are nearing completion on the upgrades required to convert the high-dose inventory into a disposal-ready form. That work is scheduled to begin next year, and processing operations are expected to continue through the mid-2020s.

Isotek employees are extracting medical isotopes, before they process the U-233 material, that will be used for next-generation cancer treatment research

MSRE cleanup and life extension upgrades underway

Employees completed characterization and disposal on several waste items from the Molten Salt Reactor Experiment (MSRE) facility—a test reactor that operated at ORNL from June 1965 until December 1969. 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. In FY 2020, OREM disposed of waste from previous sampling campaigns and several tanks.

Additionally, work is underway to modernize and conduct life-extending upgrades that will extend the facility life by 40 years. These changes will allow for in situ decommissioning of MSRE. The upgrades include electrical investigation and verification, roof repair, a new steam system, and fire panel upgrades. The most significant upgrade is the design of the Continuous Purge System to replace the aging Reactive Gas Recovery System.

The facility requires routine surveillance and maintenance to manage the remaining hazards, including periodically removing reactive gas generated by the defueled salts. Once implemented, the new Continuous Purge System will substantially improve the safety posture of the facility through replacement and isolation of legacy systems and components.

LGWO improvements extending service life

At Liquid and Gaseous Waste Operations (LGWO), significant improvements are being made to the Gaseous Waste system, the Liquid Low-Level Waste system (LLLW), and the Process Waste system. To support the nuclear-related operations at ORNL, having functioning and reliable treatment systems is essential. These efforts are fulfilling that goal by improving operation and reliability and extending the service life of this important support function that is vital to ORNL's ongoing operations.

The Gaseous Waste system life span has been greatly extended due to the upgraded Central Off-Gas system with turbine replacements and the current Variable Frequency Drive replacement. Updates to both mechanical and electrical equipment with new technology are extending service by decades.

Evaporation in the LLLW system is nearing re-start. An evaporator in the 2531 Building received focused attention in FY 2020, after years of nonuse. Every system has been evaluated, and valving, pumps, instruments, and ventilation have been repaired. The LLLW system is being greatly assisted by the Process Waste Pre-Treatment System at Building 3571. The new Process Waste Pre-Treatment system will treat wastewater currently going into the LLLW system. Once this project is successfully commissioned, 80 percent of the wastewater formerly being stored in the LLLW system will be treated and discharged through the Process Waste System, thereby extending LLLW storage capacity.

Crews made notable progress in the Process Waste system with the installation of the new Zeolite Treatment System at Building 3608. The newly installed system is removing cesium and strontium from LGWO wastewater. As a result, the Rad Process Waste Treatment Complex (Building 3544), which has exceeded its design life, is now in standby and will be available for decommissioning once the new Zeolite treatment process has been optimized and confirmed reliable. The new Zeolite treatment process has already demonstrated increased capabilities in treatment throughput as well as proven simpler to operate and maintain.

Zeolite tank installation

Y-12 National Security Complex

The Y-12 National Security Complex is a premier manufacturing facility dedicated to protecting our nation. Y-12 helps ensure a safe and reliable nuclear weapons deterrent. The site also retrieves and stores nuclear materials from around the world, fuels the nation's naval reactors, and performs highly skilled, specialized manufacturing for government agencies and private-sector entities.

Construction of mercury treatment facility underway

The Outfall 200 Mercury Treatment Facility is the linchpin for OREM's cleanup strategy at Y-12. This vital piece of infrastructure will open the door for demolition of Y-12's large, deteriorated, mercury-contaminated facilities and subsequent soil remediation by providing a mechanism to limit potential mercury releases into the Upper East Fork Poplar Creek. When operational, the facility will be able to treat 3,000 gallons of water per minute and help Oak Ridge meet regulatory limits in compliance with EPA and state of Tennessee requirements.

In FY 2020, contractors began excavations at the Treatment Plant site and at the Headworks site, and they installed and operated a small treatment system to remove mercury from water collected in the Headworks excavation site. Additionally, crews poured the concrete pads and began installing rebar for the walls of the treatment plant. Shoring walls and excavations will be completed at the Headworks site in FY 2021, and the entire facility is slated to be operational in the mid-2020s.

Final Biology Complex facilities prepped for demo

OREM is preparing to remove the remaining buildings in Y-12's Biology Complex, which are listed as high-risk excess contaminated facilities. The 350,000-square-foot area poses asbestos hazards as well as structural deterioration risks. Demolition of these facilities is part of an effort to eliminate excess contaminated facilities throughout the DOE complex. Asbestos abatement and material removal continued in FY 2020.

Originally constructed in the 1940s to recover uranium from process streams, the complex later housed ORNL's biology research division, which among other things made strides in understanding genetics and the effects of radiation. The facilities once housed more individuals with doctorates than anywhere in the world.

The complex originally consisted of 11 buildings until OREM demolished four of them in 2010 as part of the American Recovery and Reinvestment Act of 2009. Buildings 9743-2 and 9770-2 were demolished in FY 2018, when mobilization also started for the demolition of the remaining buildings. The completion of this project will clear land for important future national security missions.

Asbestos removal in the Biology Complex

More than 5.1 tons of mercury removed at COLEX

At the Alpha-4 Building, an additional half ton of mercury was recovered during the treatment of debris and grit from the building's Column Exchange (COLEX) equipment in FY 2020. Combined with the mercury previously removed from the West and East COLEX equipment, more than 5.1 tons of mercury have been removed.

The four-story, 500,000-square-foot Alpha-4 facility was used for uranium separation from 1944 to 1945. Workers finished installing the COLEX equipment in 1955 for lithium separation, a process that required large amounts of mercury. A significant amount of the element was lost into the equipment, buildings, and surrounding soils, and its cleanup is one of OREM's top priorities. The COLEX project has successfully prevented a large release of mercury into the environment from deteriorating, rusted equipment that was exposed to the elements.

Conducting a clam filtration test in the Aquatic Ecology Lab

Mercury treatment tools being assessed

Mercury remediation is OREM's highest priority at the Y-12 National Security Complex due to the large historical losses of the element in buildings, soils, and surface waters in previous decades. Mercury contamination in the environment poses significant technical and regulatory challenges and can benefit from development of new tools and approaches that might be more effective, reduce costs, and accelerate cleanup schedules.

OREM is making significant investments into the development of new remediation technologies to help address the complex mercury challenge in Oak Ridge. In the near-term, mercury technology development activities will support the successful completion of the demolition of Y-12's mercury-contaminated facilities and soils remediation, waste disposition, and reduction of mercury-related ecological risks in East Fork Poplar Creek.

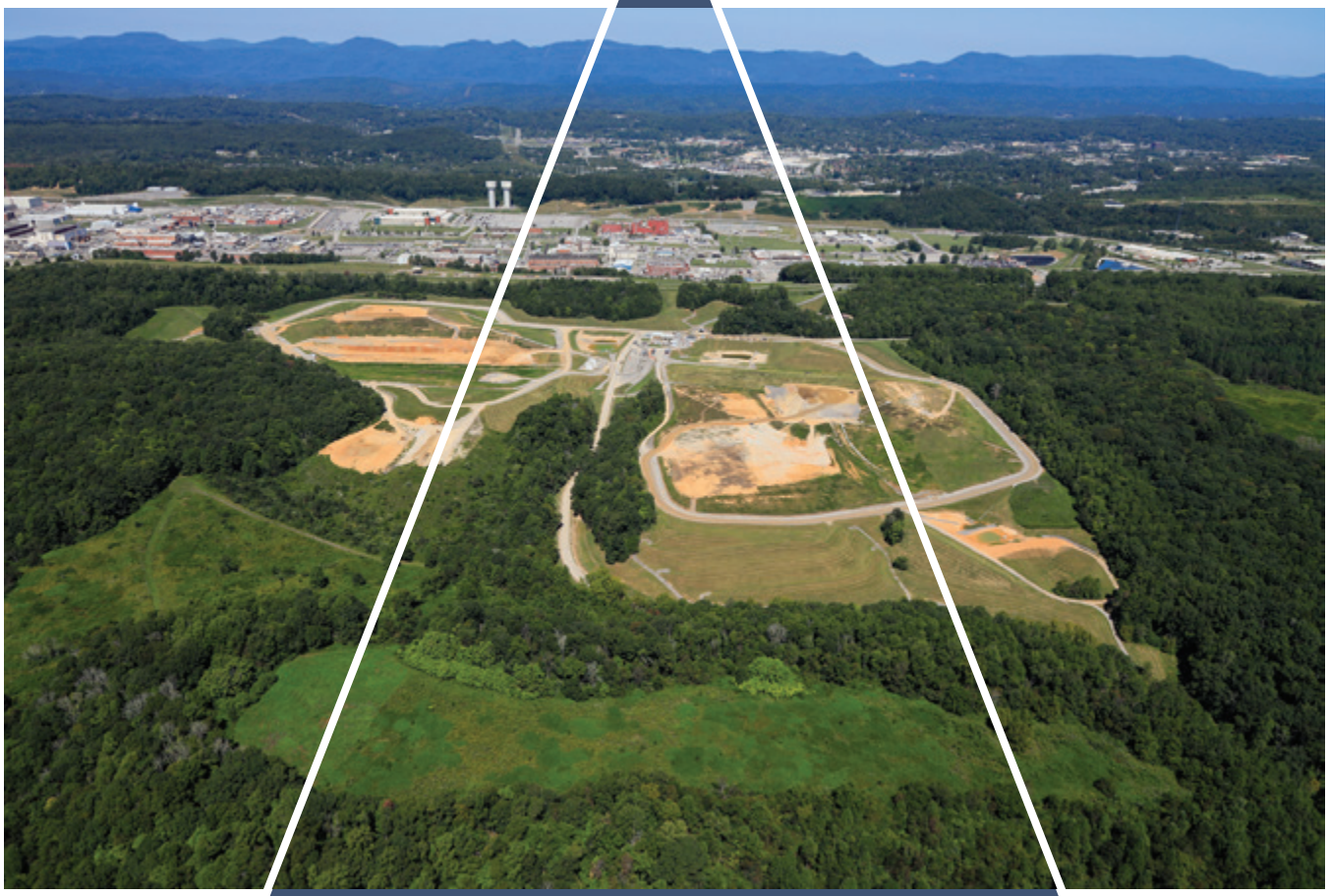
In 2020, COVID-19 restrictions led to reduced access to lab and field facilities, but work on the major mercury technology tasks (i.e., studying water chemistry, soil and sediment, and ecological manipulation) continued. A work-from-home plan allowed scientists to continue data analysis while essential personnel kept laboratory and fieldwork running. A larger emphasis was placed on quantitative modeling to simulate various remediation and technology development scenarios and better inform future remedial decision-making. With a better understanding of mercury transport processes in the watershed system, specific technologies and strategies can be assessed and implemented to aid future cleanup.

In spring FY 2020, construction was completed on a major addition to ORNL's Aquatic Ecology Lab. This new infrastructure is allowing scientists to bring water from the East Fork Poplar Creek and run it through the lab to test remediation technologies. This upgrade provides real world settings to test technologies to ensure greater effectiveness when they are implemented in the field.

In the downstream environment, field characterization and research undertaken during the 2015-2021 time period will support an evaluation of potential remediation alternatives for the creek in the mid-2020s. As a new task added to the project, algae and bacteria, which are abundant in stream systems, have been recognized to play an important role in mercury methylation and bioaccumulation. In FY 2021, major efforts will be involved in mapping these areas to determine the role and impact they play in the ecosystem related to mercury methylation and bioaccumulation.

Studies have been conducted to evaluate alternative treatment chemicals on mercury flux, the effect of sorbents on mercury and methylmercury concentrations in the presence of dissolved organic matter, and the use of mussels as a tool for reducing mercury in the water column. ORNL scientists have prepared a report titled "Mercury Remediation Technology Development for Lower East Fork Poplar Creek—FY 2020 Update." This report provides a detailed description of each of the study areas and findings from studies performed in FY 2020.

Tank installation at the ORNL Aquatic Ecology Lab



Waste Management

Wastes generated from cleanup activities on the Oak Ridge Reservation are addressed in a variety of ways. Most of the volume is disposed of onsite in the Environmental Management Waste Management Facility (EMWMF) or the Oak Ridge Reservation Landfills. However, the highly contaminated material is shipped offsite. Wastewater is treated at various facilities on the Oak Ridge Reservation.

Onsite disposal essential to reservation cleanup

Most of the waste generated during FY 2020 cleanup activities in Oak Ridge went to disposal facilities on the Oak Ridge Reservation.

The Environmental Management Waste Management Facility (EMWMF) received 12,271 waste shipments, totaling 75,408 cubic yards, from cleanup projects at ETTP, ORNL, and Y-12. This engineered landfill consists of six disposal cells that only accept low-level radioactive and hazardous waste meeting specific criteria. These wastes include soil, dried sludge and sediment, building debris, and personal protective equipment.

This disposal facility, which accepts a larger volume of waste that does not contain highly hazardous materials, has been vital to Oak Ridge's cleanup progress and success. It has enabled OREM to accomplish more cleanup by avoiding costly and unnecessary cross-country shipments and being able to focus its resources on projects that eliminate risks across the site.

EMWMF operations shipped approximately 4.3 million gallons of leachate for treatment and disposal at the ORNL Liquid and Gaseous Waste Operations Facility. Contact water, which comes in contact with waste but does not enter the leachate collection system, did not require treatment in FY 2020; however, approximately 2.9 million gallons of contact water were conditioned for hexavalent chromium prior to release. The contact water is only released after laboratory analysis verifies it meets all regulatory limits and discharge standards.

DOE also operates and maintains the Oak Ridge Reservation Landfills, which accept sanitary waste and construction debris. In FY 2020, these three active landfills received 6,334 waste shipments, totaling 79,710 cubic yards of waste.

In FY 2020, OREM continued to maintain and improve sediment and erosion controls at the Oak Ridge Reservation Landfills, which significantly reduces the amount of sediment released from these landfills.

EMWMF

Design documents drafted for new disposal facility

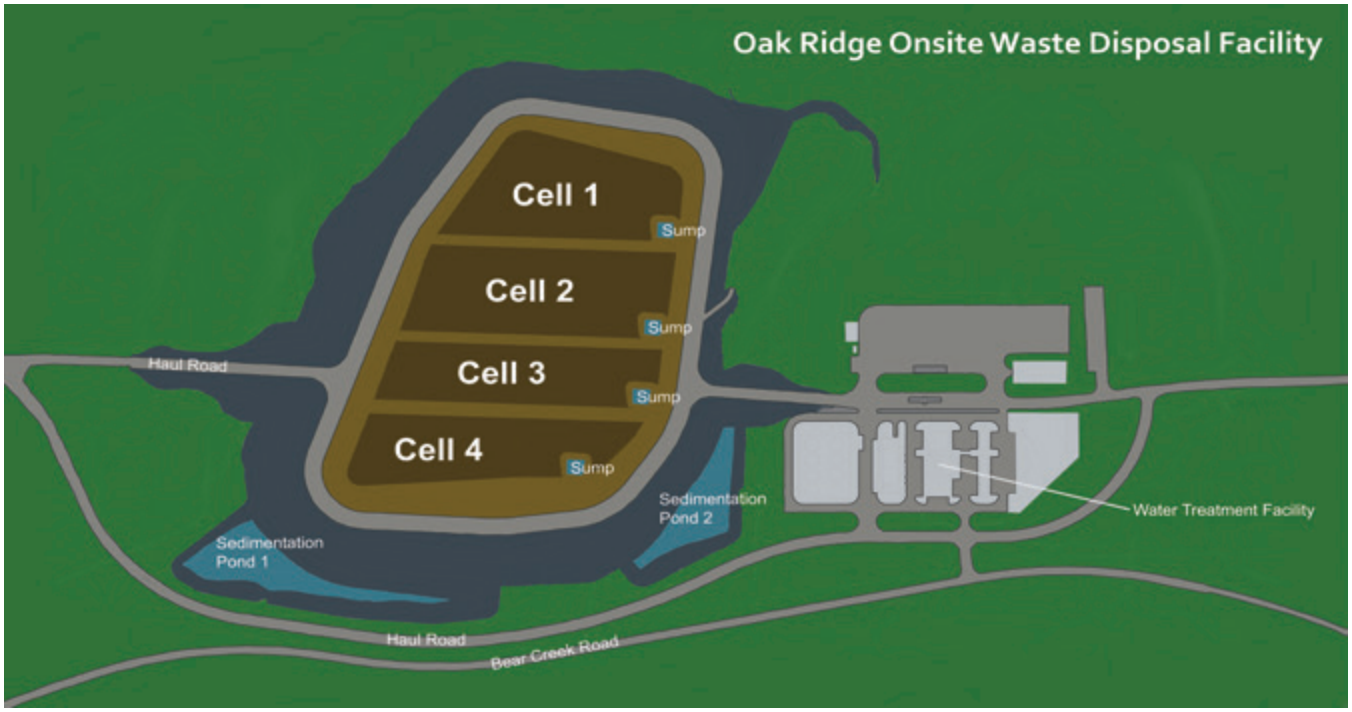
EMWMF will reach capacity in the near term before OREM completes its cleanup at Y-12 and ORNL.

Planning continued in FY 2020 for another disposal facility that will provide the capacity required to complete Oak Ridge's cleanup. The new facility will be called the Environmental Management Disposal Facility (EMDF).

OREM continued to monitor a total of 31 wells at the proposed site for the disposal facility (measuring and recording water levels and groundwater characteristic data) for the entire year.

Preliminary design of the facility was completed in draft, and a detailed evaluation of the facility's long-term performance was completed in accordance with DOE Orders.

OREM continues to work with EPA and TDEC to move forward on planning documents related to the project.



Millions of gallons of wastewater treated

Each year, activities on the Oak Ridge Reservation generate millions of gallons of wastewater that must be treated to remove oil, chemicals, radiological constituents, and other contaminants.

Y-12 treats wastewater and groundwater generated from production and environmental cleanup activities. The site provided safe and compliant treatment of almost 115 million gallons of wastewater and groundwater during FY 2020.

At ORNL, the Process Waste Treatment Complex treated approximately 89 million gallons of wastewater in FY 2020.

In addition, the liquid low-level waste system at ORNL received approximately 40,604 gallons for treatment.

The ORNL 3039 Stack Facility treated 0.84 billion cubic meters of gaseous waste. These waste treatment activities supported both OREM and DOE Office of Science mission activities safely and compliantly.

TWPC continues waste processing, shipments

North Wind Solutions, LLC, operator of the Transuranic Waste Processing Center (TWPC), continued processing waste in FY 2020, although both processing and waste shipments were impacted by the time spent in limited operations due to the COVID-19 pandemic. TWPC is responsible for processing and packaging Oak Ridge Reservation transuranic (TRU) waste for shipment to DOE's Waste Isolation Pilot Plant (WIPP), near Carlsbad, New Mexico.

This form of waste consists of materials and debris that are contaminated with elements that have a higher atomic mass and are listed after uranium on the periodic table. The majority of Oak Ridge's inventory originated from previous research and isotope production missions at ORNL.

Both contact-handled (CH) and remote-handled (RH) waste are treated at the facility. CH waste can be safely handled without remote equipment, although workers never actually touch the waste without protective barriers.

Higher energy radioactive waste is processed by remote control equipment in special protective rooms called "hot cells." Workers who process this form of waste are protected by barriers, such as thick concrete walls and leaded-glass viewing windows. TWPC has processed approximately 99 percent of the CH TRU waste and 98 percent of the RH TRU.

In FY 2020, North Wind Solutions completed 9 CH TRU waste shipments containing 378 drums to WIPP. As a result, OREM has been able to disposition approximately 78 percent of the CH TRU waste and 63 percent of the RH TRU waste.

TWPC operators using manipulators to handle waste

Sludge Processing Mock Test Facility being built

Construction began in FY 2020 on the Sludge Processing Mock Test Facility, which will play a vital role in maturing technologies needed to begin processing Oak Ridge's 500,000-gallon inventory of TRU sludge waste.

OREM has been working since 2003 to process, repackage, and ship Oak Ridge's inventory of CH and RH transuranic debris waste for permanent disposal at WIPP. With that processing scheduled for completion in 2022, OREM is now working to address the site's inventory of TRU sludge waste.

OREM will test six critical technology elements to gather the data necessary to complete the final design and construction of the Sludge Processing Facility later this decade. Two of those technologies will be tested at the mock test facility.

This facility will be used to test pump technologies and instrumentation measurement technologies. Advanced pump technologies are needed to pull the sludge wastes out of their storage tanks for processing. The instrumentation measurement technologies will inform operators what material is moving through the pumps, including its contents and density, to assist with processing needs.

Construction of the mock test facility is slated for completion in October 2021. OREM anticipates approximately two years of testing to gather the data needed to determine the best designs and approaches for the Sludge Processing Facility's final design.

Mock test facility rendering

Oak Ridge Reservation

The DOE Oak Ridge Reservation is home to ETTP, ORNL, and Y-12. It contains approximately 32,400 acres that are predominantly undeveloped, forested areas. In addition to cleanup projects at the three sites on the reservation, OREM is taking measures to address reservation-wide issues.

Reservation groundwater monitoring continues

OREM continued to implement its groundwater strategy for the Oak Ridge Reservation in FY 2020. Three groundwater exit pathways wells were installed to the west of Bethel Valley, near the Clinch River. Exit pathways are areas where contaminants have the potential to exit the Oak Ridge Reservation to offsite areas. In FY 2020, the wells were drilled to approximate depths of 300, 400, and 600 feet below ground surface; monitoring equipment will be installed in the wells in FY 2021.

Monitoring of the new wells will supplement current exit pathway monitoring and offsite monitoring.

Offsite detection monitoring completed in FY 2020 confirmed that there were no results above primary drinking water standards.

Also in FY 2020, the *Bethel Valley Final Groundwater ROD Remedial Investigation Work Plan* was submitted to the regulators for review. This plan will outline a dynamic investigation strategy to support a future, final groundwater decision for Bethel Valley. To support this plan, OREM started a groundwater flow model detailing Bethel Valley. This flow model will be used to help simulate and better understand groundwater movement in Bethel Valley.

A network of monitoring wells, including those installed in FY 2020, provide valuable groundwater data

Public Involvement

The public is involved in all cleanup decisions made by DOE. To keep the public informed, DOE provides information through a variety of outlets, including tours, meetings, briefings, conferences, media outreach, fact sheets, public notices, websites, social media, and various publications.

Elected officials join DOE at Vision 2020 celebration

A special event was held celebrating completion of Vision 2020 featuring Secretary of Energy Dan Brouillette (above), Tennessee Gov. Bill Lee (right), Sen. Lamar Alexander, Rep. Chuck Fleischmann, and other state and local leaders. Local media also attended. Participants were socially distanced and masked to abide by COVID-19 regulations. OREM received praise from the secretary and governor for completing this massive cleanup project ahead of schedule and under budget. Vision 2020—completing ETTP major cleanup—removed all unneeded facilities from the site, which is transitioning to a multi-use industrial park.

Groundbreaking ceremony held for History Center

After years of preparation and planning, the K-25 History Center has become a reality. A grand opening was held in early 2020, giving the public a first look at the artifacts and stories of the men and women who built and operated a site that helped end a global war and powered America. The center is housed in 7,500 square feet of space on the second floor of the city-owned fire station at ETTP. The numerous exhibits and theater at the facility provide an in-depth experience and a look back at life in the "Secret City."

Advisory board provides public input on DOE cleanup activities

The Oak Ridge Site Specific Advisory Board (ORSSAB) is a federally chartered volunteer citizens panel that provides independent advice and recommendations to OREM. ORSSAB provides DOE and regulators at EPA and TDEC with a forum for understanding stakeholder perspectives. It also serves as a venue for members of the community to express their views or ask questions.

Since 1995, ORSSAB has provided 247 recommendations to OREM on important aspects of the cleanup program, such as land use and reindustrialization; stewardship; cleanup standards, activities, and budgets; and waste management. Every major ROD developed under Environmental Management (EM) has had heavy SSAB involvement, and none of the final RODs have been at odds with majority SSAB opinions.

ORSSAB may have up to 22 members. Individuals apply for membership annually and are selected by DOE to reflect a diversity of interests, gender, race, and other criteria of persons in the multi-county area that surrounds the Oak Ridge Reservation.

ORSSAB meets the second Wednesday of most months at 6 p.m. at the DOE Information Center, located at 1 Science.gov Way in Oak Ridge. Meetings are always open to the public and include time for public comment. More information about ORSSAB is available at www.energy.gov/orssab.

ORSSAB members

The primary way individuals can learn about the latest cleanup efforts is by attending board meetings. Meetings offer a unique opportunity to interact with OREM experts who are leading cleanup efforts as they present progress updates and answer questions directly. The board met in person four times in FY 2020 and attended public meetings hosted by DOE in its official capacity.

The board also has two standing committees, and those meetings are also open to the public. The Executive Committee meets the first Wednesday of most months at 5 p.m. at the DOE Information Center to discuss board business including upcoming meetings, member travel, and membership. The EM & Stewardship Committee meets the fourth Wednesday of most months at the DOE Information Center at 6 p.m. for in-depth discussion of the month's topic issue. These meetings are also where work to craft recommendations is completed. Members of the public may attend and can become members of this committee on request.

Additionally, ORSSAB continues a long-standing tradition of appointing student representatives to the board as part of its interest in long-term stewardship of the Oak Ridge Reservation. Educating and engaging students about OREM's work ensures the next generation of stewards are prepared for their role in making sure cleanup is completed and stewardship of the site continues. This year, Avigail Duke represented Oak Ridge High School.

ORSSAB offers additional opportunities outside of its meetings for the public to learn about and express views on OREM's cleanup mission. Board members and staff are also available on request to educate community groups and organizations about the board's function.

The board regularly issues news releases, advertises in local media, broadcasts a portion of its monthly meetings on local cable stations, and archives the video to its YouTube channel, www.youtube.com/user/ORSSAB. The Staff maintains an active social media presence at www.facebook.com/ORSSAB and administers mailing lists, including email distribution of meeting materials and a weekly news update.

The board publishes and mails a print quarterly newsletter, the *Advocate* – sign up for any of these items by emailing orssab@orem.doe.gov.

Members pursue continuing education as part of advisory role

Since board members are not required to be subject matter experts, DOE supports ongoing education for members, including regular site tours and travel to select cleanup-related conferences such as the National Cleanup Workshop, Waste Management Symposium, and National Environmental Justice Conference.

Member reports and materials from offsite events are included in board meeting packets and archived at the DOE Information Center. These activities allow members to understand the wider impact of cleanup and receive information and training that improves

their ability to carry out their advisory role. In FY 2020, board members participated in the following local activities:

- K-25 History Center: Board officers received a tour of the new history center as part of the grand opening celebration and as part of the board's partnership in the historic preservation memorandum of agreement that created the project.
- Molten Salt Reactor Experiment: Members toured ORNL's MSRE, which OREM monitors and maintains in a safe posture until its decommissioning. MSRE staff also shared how they collaborate with academic and industry professionals pursuing modern uses of the molten salt technology. ORSSAB had shared its thoughts on the reactor's closure and cleanup with the EM program.
- U-233 Disposition Project: Following a presentation by cleanup contractor Isotek's President, Jim Bolon, at a monthly meeting, members toured Isotek's facilities at ORNL, where downblending and shipment of remaining uranium-233 waste materials takes place. They also learned about the innovative partnership with TerraPower, which will provide isotopes from the process for cancer research and treatment. Board recommendations have previously encouraged the prioritization of the U-233 project and additional funding.
- Members used virtual resources to continue their education efforts this year, attending the Fall Chairs Meeting, National Cleanup Workshop, and Five-Year Review of OREM cleanup progress remotely. They also participated in the Vision 2020 town halls and completion celebration presented by DOE.

Isotek President Jim Bolon updated members on the U-233 Disposition Project in February

DOE Information Center in Oak Ridge

The DOE Information Center is a one-stop information facility that maintains a collection of more than 48,000 documents regarding environmental activities in Oak Ridge.

The center hosts various meetings, including some of the ORSSAB meetings, relevant to cleanup activities in Oak Ridge. Staff is available Monday through Friday, 8 a.m. to 5 p.m., to assist with information needs. Users can consult the following website for information available from the center.

The DOE Information Center is located at the Office of Scientific and Technical Information, Building 1916 – T1,
1 Science.gov Way, Oak Ridge, Tennessee 37831
E-mail: doeic@science.doe.gov
Hours: 8 a.m. to 5 p.m., Monday – Friday
http://doeic.science.energy.gov
Phone: (865) 241-4780

FY 2020 Stats

Number of public meetings held	19
Total citizen inquiries	472
Total number of documents at the center	49,369
Total number of documents online	17,910

Websites for Additional Information

DOE OREM Public Information
(865) 574-4912
www.energy.gov/orem

Oak Ridge Site Specific Advisory Board
(865) 241-4583, (865) 241-4584
1-800-382-6938
www.energy.gov/orssab

Tennessee Department of Environment and Conservation–DOE Oversight Office
(865) 481-0995
https://tdec.tn.gov/

U.S. Environmental Protection Agency
Region 4
1-800-241-1754
www.epa.gov/aboutepa/about-epa-region-4-southeast

Commonly Used Acronyms

CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act of 1980
COLEX	Column Exchange
CROET	Community Reuse Organization of East Tennessee
DOE	U.S. Department of Energy
EM	Environmental Management
EMDF	Environmental Management Disposal Facility
EMWMF	Environmental Management Waste Management Facility
EPA	U.S. Environmental Protection Agency
ETTP	East Tennessee Technology Park
EU	Exposure Unit
FAA	Federal Aviation Administration
FY	Fiscal year
LGWO	Liquid and Gaseous Waste Operations
LLLW	Liquid Low Level Waste
MSRE	Molten Salt Reactor Experiment
OREM	Oak Ridge Office of Environmental Management
ORNL	Oak Ridge National Laboratory
ORSSAB	Oak Ridge Site Specific Advisory Board
ROD	Record of Decision
TDEC	Tennessee Department of Environment and Conservation
TRU	Transuranic
TWPC	Transuranic Waste Processing Center
U-233	Uranium 233
WIPP	Waste Isolation Pilot Plant

Commonly Used Terms

CERCLA: The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) established prohibitions and requirements concerning closed and abandoned hazardous waste sites, provided for liability of persons responsible for hazardous waste releases at these sites, and established a trust fund to provide cleanup when no responsible party could be identified. The law, which governs cleanup operations on the Oak Ridge Reservation, authorizes two kinds of response actions: short-term removal actions, where actions may be taken to address releases or threatened releases requiring prompt response, and long-term remedial actions, which permanently and significantly reduce the dangers associated with releases or threats of releases. Long-term actions can be conducted at sites on the U.S. Environmental Protection Agency's National Priorities List, a listing of the nation's most hazardous waste sites. The Oak Ridge Reservation was added to that list in 1989.

Federal Facility Agreement: CERCLA requires an agreement between state and federal entities to guide cleanup work at CERCLA sites. For the DOE Oak Ridge Office, the parties of this agreement, called a Federal Facility Agreement, is DOE, the U.S. Environmental Protection Agency, and the Tennessee Department of Environment and Conservation. The Federal Facility Agreement for Oak Ridge was initiated in January 1992.

Removal Actions: Some cleanup activities on the Oak Ridge Reservation are conducted as Removal Actions under CERCLA. These actions provide an important method for moving sites more quickly through the CERCLA process. When a site presents a relatively time-sensitive, non-complex problem that can and should be addressed, a Removal Action would be warranted.

Remedial Actions: Remedial actions are long-term response actions that seek to permanently and significantly reduce the risks associated with the release or threat of release of hazardous substances.

Remedial Investigation/Feasibility Study: The purpose of the remedial investigation/feasibility study (RI/FS) is to assess site conditions and evaluate alternatives to the extent necessary to select a remedy. Developing and conducting an RI/FS generally includes the following activities: project scoping, data collection, risk assessments, treatability studies, and analysis of alternatives. The scope and timing of these activities should be tailored to the nature and complexity of the problem and the response alternatives being considered.

Record of Decision: Under the CERCLA process, a Record of Decision formally documents the selection of a preferred cleanup method after a series of steps, including an RI/FS. A preferred cleanup alternative is selected and presented to the public for comment in a Proposed Plan. EPA, the state, and the lead agency then select a remedy and document it in the ROD.

Fiscal Year: The 2020 fiscal year spans from Oct. 1, 2019, to Sept. 30, 2020.

For more information, please contact
the DOE Oak Ridge Public Affairs Office at (865) 574-4912.