Advocate

A publication of the Oak Ridge Site Specific Advisory Board – a federally appointed citizens panel providing independent recommendations and advice to DOE's Environmental Management Program

Groundwater Remedies Move to Forefront at ETTP Site

With the recent achievement of Vision 2020 at East Tennessee Technology Park (ETTP), officials from the Department of Energy (DOE) Oak Ridge Office of Environmental Management (OREM) say they are ready to decide on a strategy to address the site's groundwater issues.

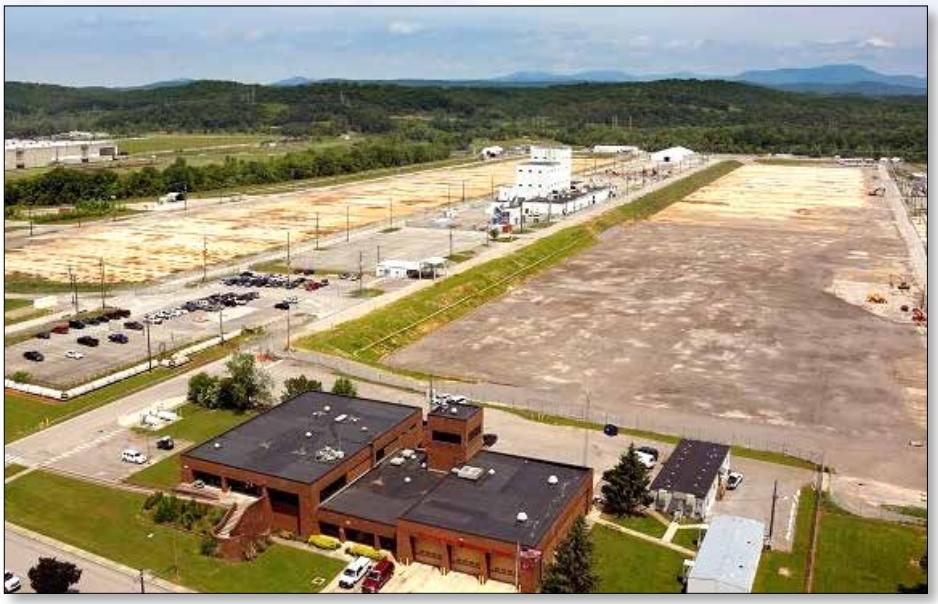
In 2020, OREM achieved a historic accomplishment by completing core cleanup at the 2,200-acre former uranium enrichment complex. The cleanup, which included demolishing more than 500 structures and addressing major areas of soil contamination, marked the first time in the world an entire uranium enrichment complex has been removed.

As a result of previous operations, which date back to the World War II Manhattan Project and included not only defense missions but also uranium enrichment operations for the commercial nuclear power industry, the ETTP site contained contaminated buildings, soil, sediment, and groundwater that required remediation to protect human health and the environment.

Now, with core cleanup complete, groundwater remediation is moving to the forefront at the site.

David Adler, an OREM division director and biologist who presented an update on ETTP groundwater remedies to ORSSAB recently, told board members that OREM has been studying and monitoring groundwater at the site since the late 1980s.

"We've done a very thorough characterization of the groundwater out there," he said. "We've analyzed for every chemical and radiological constituent of interest, so we have a lot of data on that site."



An aerial view of the K-25 footprint. This property comprises much of the Main Plant Area groundwater remediation zone at ETTP.

OREM uses more than 2,000 monitoring wells to understand where groundwater contamination is and isn't, how groundwater behaves in the subsurface, and how it interacts with surface water. Each year, OREM takes thousands of samples to test water quality. That data, combined with mapping technology, has allowed OREM to create a 3-D model of the subsurface to allow experts to better identify areas needing attention and to better develop remediation approaches.

Given the size of the site, the range of operations completed there, and the complexity of the groundwater system, experts have identified two distinct zones requiring different remediation approaches: the K-31/K-33 area, and the Main Plant area.

K-31/K-33 Area

The K-31/K-33 area, which is located in the northwest portion of the site and used to contain the K-31 and K-33 Gaseous Diffusion facilities, will likely require less intervention, said Adler.

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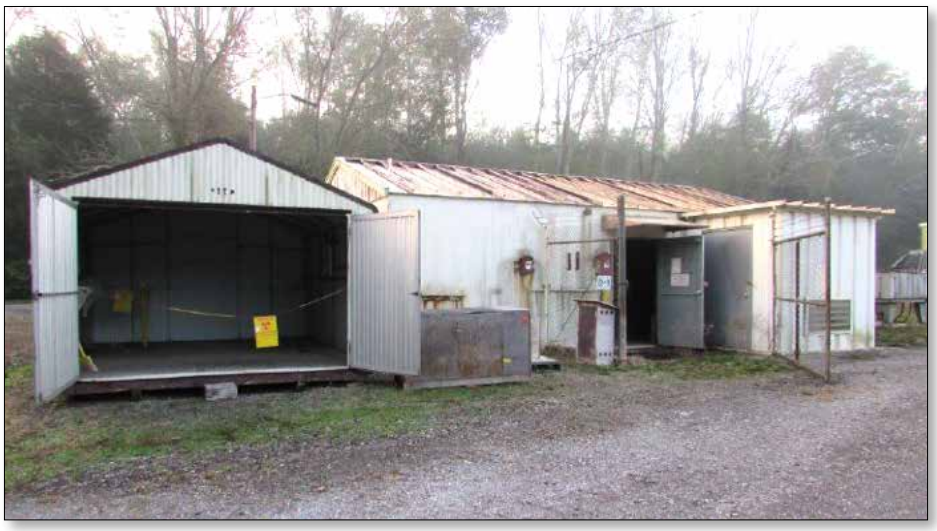
Reservation Update



The Tritium Target Preparation Facility at Oak Ridge National Laboratory prior to demolition. The building was constructed in 1968 and had not operated since 1990.

Crews Demolish ORNL Tritium Facility, Begin Soil Removal

EM crews in late March completed demolition on a contaminated 1960s-era building at Oak Ridge National Laboratory, opening land that DOE can reuse for future missions.

With the Tritium Target Preparation Facility removed, crews can address the soils and substructures associated with the building. The cleanup effort eliminated several contaminated areas, allowing for a transformation in a location that can support the department in the years ahead.

The Tritium Target Preparation Facility, also known as Building 7025, was constructed in 1968 and operated until 1990, producing tritium targets for nuclear operations for hundreds of customers around the world. The facility was deactivated in 1997 and all of its systems were left in place. The general work area around the structure was identified as a contamination area due to the tritium present inside the building.

Crews Break Ground on Y-12 Protected Area Reduction

OREM will avoid millions of dollars in costs and accelerate cleanup thanks to a project that broke ground in April at the Y-12 National Security Complex.

The West End Protected Area Reduction project (WEPAR), led by the National Nuclear Security Administration (NNSA) and Y-12 management-and-operations contractor Consolidated Nuclear Security, will reduce the size of the high-security protected area at Y-12 by approximately 50 percent.

The project holds numerous benefits for NNSA and EM. It supports efforts to modernize Y-12's high-security boundary and includes the installation of new sections of a high-security perimeter system. This work will ease EM's access to this area of Y-12, reduce the cleanup program's costs dramatically, and allow more cleanup to advance at the site.

The new Y-12 boundary will exclude areas with vacant, deteriorating buildings identified for deactivation and demolition by EM. The fencing will continue to surround buildings used for operations that support national security missions.

The most significant sources of mercury contamination and the largest aging and deteriorated facilities currently sit behind the boundary of a Y-12 high-security protected area.

Without the changes to the high-security boundary that will result from the project, EM cleanup in this area would be costly because it would require all workers to hold top security clearances. High costs are also associated with the work to get crews, equipment, and transportation in and out of the area.

The WEPAR project is one of the two essential efforts that pave the way for EM to begin addressing some of the most pressing cleanup needs at Y-12. The other — EM's Mercury Treatment Facility, now under construction — will limit and control potential mercury releases as crews take down the massive Cold War buildings and address soils. The facility is designed to treat up to 3,000 gallons of water per minute and includes a 2-million-gallon storage tank to collect stormwater.

Together, the projects will allow EM to address buildings Alpha-4, Alpha-5, and Beta-4, along with the concentrated sources of mercury in the environment around them. Those buildings are categorized as high-risk excess contaminated facilities, and some were listed in a report to Congress as being "the worst of the worst."

The WEPAR project is scheduled for completion in 2025, the same year the Mercury Treatment Facility is scheduled to be operational.

Isotek, TerraPower Expand Rare Isotope Partnership

An innovative public-private partnership continues to grow after a nuclear innovation company recently announced additional work in Oak Ridge that will generate increased taxpayer savings while helping accelerate cancer treatment research.

New terms of an agreement between the company TerraPower and OREM contractor Isotek allow Isotek to conduct additional refining of thorium-229 (Th-229), a rare isotope extracted from uranium-233 (U-233).

An operations technician removes a tube of thorium-229. Under a newly expanded agreement, EM contractor Isotek will further refine the thorium to provide TerraPower an enhanced purified product to generate Actinium-225 for cancer research and treatment.

The work will provide TerraPower with medical isotopes with higher purity for next-generation cancer research and treatment. Isotek will further refine the thorium before TerraPower transports the material to its research facility. Isotek will receive additional funds that can be invested back into the project.

EM's highest priority at ORNL involves eliminating the inventory of U-233 currently stored in the world's oldest operating nuclear facility. Isotek leads EM's U-233 disposition project, which involves processing and downblending the remaining inventory into a form that can be safely shipped and disposed.

The latest addition to the workflow will start later this year when Isotek begins processing a high-dose inventory of U-233 in hot cells. Currently, employees are processing the low-dose inventory. Hot cells are radiation containment chambers.

Isotek is expected to extract enough Th-229 to allow TerraPower to produce 100 times more cancer treatment doses per year than the 4,000 doses currently available worldwide to patients with prostate cancer, melanoma, leukemia, and glioma.

Biology Complex Demolished, Achieving EM 2021 Priority

EM crews in June completed demolition on Building 9207, the largest and final building in the former Biology Complex at Y-12.

The project, which is one of EM's 2021 priorities, removes significant structural risks and opens land for national security missions.

Removal of the massive six-story, 255,000-square-foot Building 9207 ushers in a new chapter of transformation at Y-12. Earlier this year, workers also completed demolition of the three-story 65,000-square-foot Building 9210 in the Biology Complex.

EM's latest cleanup phase at Oak Ridge, now underway, involves addressing hundreds of excess, contaminated, and deteriorating facilities scattered throughout Y-12 and ORNL that present hazards and occupy land that can be used for future research and national security missions. Combined, these sites house DOE's largest inventory of high-risk buildings.

EM's latest efforts at the Biology Complex have shortened that list, and plans are underway to address more high-risk facilities in the months and years ahead.

The cleared 18-acre footprint where the former Biology Complex once stood is the planned location for the future Lithium Processing Facility.

EM is working to remove the buildings' foundations, which is slated for completion this fall. That marks the final step before the land is available for reuse by NNSA.

Crews have completed demolition on the last of 11 structures that comprised the former Biology Complex. Its removal enhances safety at the site and clears land for the National Nuclear Security Administration to reuse for current security missions.

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Updated EM Strategic Vision Outlines Coming Decade of Achievements

The Department of Energy Office of Environmental Management recently released its Strategic Vision 2021-2031, a blueprint to the program's anticipated accomplishments over the next decade that will protect the public and environment.

The Strategic Vision outlines goals for 2021-2031, focused on safety, environmental cleanup priorities, innovation, and improved performance. EM is working to fulfill the commitment to clean up the environment in communities that supported past national security and energy research programs so they can continue to grow and thrive.

"EM has its sights set on the future," said William "Ike" White, Acting Assistant Secretary for Environmental Management. "We have many goals at our sites, including transformational progress in addressing tank waste challenges, demolishing contaminated buildings, remediating contaminated soil and groundwater, safely managing and disposing of waste, and completing work at projects and sites."

Built on successes achieved in recent years, EM is entering a new era across the cleanup complex. The Strategic Vision 2021-2031, developed with feedback from regulators, tribal nations, local communities, and other partners, is an update to the inaugural edition issued in 2020.

"EM values and seeks the diverse views and opinions of all of those who have a shared interest in our mission," White said. "EM looks forward to continuing to work with state and local governments, tribal nations, federal and state regulators, and local communities to advance our mutual goals of safe, effective cleanup and fiscal responsibility."

EM's vision for its cleanup sites over the next decade includes:

- Completing legacy cleanup activities at the Nevada National Security Site, the Uranium Mill Tailings Remedial Action project in Moab, Utah and the Sandia National Laboratories in New Mexico.
- Initiating radioactive tank waste treatment at the Hanford Site in Washington state, as well as completing significant risk reduction activities, such as placing the last of the former production reactors into interim safe storage.
- Emptying and closing 22 of 51 underground waste tanks at the Savannah River Site in South Carolina and completing disposal of remaining legacy transuranic waste.
- Completing the treatment of remaining liquid sodium-bearing waste at the Idaho National Laboratory Site, along with completing targeted buried waste exhumation and shipments of remaining legacy transuranic waste to the Waste Isolation Pilot Plant in New Mexico for disposal.
- Completing disposal of remaining legacy transuranic waste and uranium-233 at the Oak Ridge site in Tennessee, along with completing construction of the site's new Mercury Treatment Facility.
- Completing demolition of the former Main Plant Process Building at the West Valley Demonstration Project in New York.
- Demolishing two of three former uranium enrichment process buildings at the former Portsmouth Gaseous Diffusion Plant in southern Ohio.
- Completing deactivation activities at the C-333 former uranium enrichment process building and demolishing the former C-400 Cleaning Building at the former Paducah Gaseous Diffusion Plant in Kentucky.

Workers continued construction on the Outfall 200 Mercury Treatment Facility in 2020. Completion of MTF is a key part of EM's vision for the program's next decade.

Most importantly, EM will continue to perform work activities with a strong safety culture that integrates worker and public health, safety, and environmental requirements.

The full report and additional details on 2020 achievements and ongoing progress in 2021 are available at www.energy.gov/em/annual-priorities-strategic-vision.

Recent Recommendations

Recommendation 248: On FY 2023 OREM Budget Priorities

Each year the DOE-EM Program develops its budget request for the fiscal year (FY) two years beyond the current year, including requests from DOE field offices to develop the EM Program budget request to the president.

DOE-EM Headquarters typically issues guidelines to the field offices advising them how much funding to reasonably expect when developing their FY+2 budget requests. The field offices then brief the public, the regulatory agencies, and the respective site-specific advisory boards and seek input from each regarding budget requests.

On March 10, OREM officials presented on OREM's FY 2023 budget formulation process to ORSSAB. The meeting was attended by several EM portfolio project directors who gave specifics on their projects. This presentation provided content and discussions that ORSSAB used to draft its recommendations.

In creating its recommendations for the FY 2021 OREM budget, ORSSAB focused on general near-term and long-term cleanup priorities identified by OREM:

- Complete ETTP cleanup including all remedial action consistent with CERCLA agreements and fully implement reindustrialization and historic preservation activities
- Disposition ORNL uranium-233 inventory
- Disposition ORNL transuranic debris waste inventory and complete construction of the Sludge Processing Facility
- Address Y-12 mercury contamination by planning for future cleanup and reduce mercury in surface water exiting Y-12.

Project-specific objectives provided additional details for discussions that took place at the March 24, EM & Stewardship Committee meeting. The committee also referred to the OREM 10-year Program Plan, the EM Strategic Vision: 2021–2031, the EM Budget Request, and the board's previous Recommendations.

Recommendations

ORSSAB supports OREM's Program Plan and recommends fully funding the activities that are supported by that Plan for FY 2023. In addition, ORSSAB has identified the following priorities for Oak Ridge Reservation cleanup.

The board recommends that the FY 2023 OREM budget request reflect adequate funding to maintain or accelerate these projects. In addition, when extra funds from suitable plus-ups and savings become available, we recommend that these funds be targeted for the following projects.

1. Complete transfer of all applicable land parcels at ETTP for productive purposes. Continue working with community partners to fully realize the economic development potential of reindustrialization after transfer.
2. Provide adequate funding to construct and operate the urgently needed new onsite disposition facility to allow uninterrupted cleanup progress at ORNL and Y-12.
3. Increase funding where possible to ensure the Mercury Treatment Facility meets the operational date of 2025 as presented to the community and ORSSAB. In addition, consider using plus-ups or surplus funds to upgrade equipment and technology that may have improved since the original schedule was developed.
4. The expansion of ORNL's Aquatic Ecology Laboratory provides a vital resource to the EM complex. Future requests should continue funding support for research into mercury and methyl-mercury pollution and prioritize designing and testing new and improved remediation technologies.
5. Provide adequate funds to maintain or upgrade infrastructure to ensure safe transportation of waste from cleanup projects to disposal.

President's FY 2022 Budget Request Heads to Congress

At the end of May the Biden administration released its first budget to Congress. Details on DOE's part of the FY 2022 Budget Request can be found at www.energy.gov/cfo/articles/fy-2022-budget-justification. The request includes $7.6 billion for DOE's Office of Environmental Management — a record high in the history of the EM program.

For Oak Ridge, the budget provides $561 million to support slab and soil remediation at ETTP and work to address high-risk excess facilities at the Y-12 National Security Complex and Oak Ridge National Laboratory. More than $12 million is included for the proposed Environmental Management Disposal Facility (see page 8 for details).

The budget request now heads to Congress for its input, which usually includes significant changes. Energy Secretary Jennifer Granholm testified before House subcommittees on May 6 (https://appropriations.house.gov/events/hearings) and 19 (https://energycommerce.house.gov/committee-activity/hearings). She appeared in the Senate on June 15 (https://www.energy.senate.gov/hearings) and 23 (www.appropriations.senate.gov/hearings).

Groundwater

(Continued from page 1)

"[The data] tells us that the water at the K-31/K-33 site is in pretty good shape," he said. "Most of the samples come back at measured values that are below drinking water standards."

Adler told members that OREM had previously submitted a feasibility study for the K-31/K-33 area, but plans to resubmit it within a month with additional monitoring data at the request of EPA and Tennessee Department of Environment and Conservation (TDEC) regulators.

He said that now that the sources of contaminants that had been degrading the groundwater have been removed, the residual contamination seems to be naturally diminishing over time.

Although no formal proposal has been made yet, Adler said a range of technologies were investigated for the area, and the likely solution would be to implement a robust monitoring system and usage controls and allow the groundwater to improve naturally over time.

"We're already almost there," he said.

Main Plant Area

The Main Plant area, located in the southern portion of the site, used to contain the K-25 facility and presents more challenges in groundwater remediation.

"The degradation of the groundwater there is pretty typical of what you see at 1930s- to 1950s-era industrial sites," Adler said.

He told members that the facility once housed sumps and lines containing halogenated or halocarbon solvents for chilling baths and degreasing operations and those solvents leaked. He said significant quantities of those solvents worked their way into the soil and into the groundwater.

"Because these solvents are heavier than water, they actually sink down through the water table till they can find rock or something to sit on," he said.

OREM has already completed extensive studies to investigate viable technological remediation approaches for the Main Plant area, including In-Situ Thermal Treatment, "pump-and-treat" operations, and bio-remediation.

In-Situ Thermal Treatment involves lowering electrically powered probes into the ground to heat the ground up and drive the volatiles off, while "pump-and-treat" operations involve dropping wells in the ground to draw out water, which is then treated before being discharged back to surface water.

Bio-remediation, which Adler said currently seems to be the preferred option, involves using bacteria already present in the water column to convert the solvents into carbon dioxide and water.

"We would be accelerating the natural decay by the addition of nutrients, possibly some microbes, but primarily by the addition of nutrients that would spawn an increase in the population of microbes in the groundwater," Adler said. "The idea is the bacteria then flourish because they have a new food source, they then are in a position to co-metabolize the contaminants that we're trying to get rid of."

He said bio-remediation is becoming increasingly utilized to clean up solvents, and studies at ORNL have shown efficacy in the approach.

"When you talk to the experts, they feel that they can predict the general effect that a bio-remediation approach will have," he said.

While bio-remediation currently shows promise, Adler noted the uncertainty inherent in groundwater remediation.

"I want to stress that making decisions for groundwater is challenging because there's always a fairly high level of uncertainty associated with groundwater contamination, particularly in a place like East Tennessee, where the geology is so complex," he said.

Because of this, OREM, EPA, and TDEC have agreed that rather than try to pick a final remedy for the Main Plant area, they will instead choose an interim remedy.

"[An interim remedy] is exactly what it sounds like," said Adler. "It's a remedy that we hope will make things better, that doesn't break the bank, but that we will have to monitor and see how it works."

Future Actions

OREM is pursuing an agreement with EPA and TDEC for No Further Action for the K-31/K-33 site, which means the site does not present a danger to the public or the environment, and has submitted a Remedial Investigation Feasibility Study (RI/FS) to regulators. At regulators request, OREM is preparing to submit a revised RI/FS with additional monitoring data.

Regarding the Main Plant area, OREM recently submitted a Focused Feasibility Study (FFS) for the site and regulators will be providing their comments. After OREM and regulators reach a consensus on what approach to take, they plan to hold an official public comment period.

"We think that we're getting to that break in the curve where we need to start taking that information we've generated and try to use it to advance cleanup activities at the site," said Adler. "But that is a conclusion we have to reach with everybody — ourselves, our experts, our regulators, and the public."

Related Documents

Full versions of the DOE studies submitted to-date are available online at *doeic.science.energy.gov*.

To view documents related to the **ETTP Main Plant Area Groundwater Feasibility Study**, search **01-2835**

To view documents related to the **ETTP K-31/K-33 Area Groundwater Feasibility Study**, search **01-2893**

EMDF

(Continued from page 8)

Following the release of the EMDF proposed plan in 2018 through the public comment period that ended in 2019, OREM has been addressing comments and working with the regulators at the U.S. EPA and Tennessee Department of Environment and Conservation to put together an agreement on the project. The main concerns from both regulators and the public have been about groundwater and site characterization; waste acceptance criteria; and the presence of mercury in some waste materials, Henry said.

A draft Record of Decision, including responses to all of the public comments and incorporating solutions to issues raised by the regulators, is currently expected in July 2021.

OREM considered several sites for the proposed new disposal facility.

Safety of people, environment the top priority for OREM

CERCLA-permitted landfills like EMWMF and EMDF do handle contaminated wastes, Henry said, but the problem in Oak Ridge's case is not exceptionally hazardous material. More than 99 percent of radiologically active materials are processed, packaged, and shipped off-site for safe disposal in the dry, stable conditions of the Western United States. But that type of material makes up only about five percent of Oak Ridge's demolition waste by volume.

For the large buildings at Y-12, it will take a number of years to do the characterization and to clean out those buildings to get them ready for demolition. OREM typically removes areas of higher contamination first before dealing with items that would go in an on-site facility. However, there would ideally be at least two years of overlap in the closure of EMWMF and opening of EMDF, he added. That would, among other things, allow OREM to respond quickly if Congress allocated additional funds to Oak Ridge cleanup, as has occurred in the past.

There are three major activities that must be completed in parallel to build a new disposal facility. First, under DOE Order 435.1, OREM received a Preliminary Disposal Authorization Statement (DAS) and will develop remaining documents for eventual Operational DAS. Second, OREM is working through the CERCLA regulatory process, which includes submitting the draft ROD for review and approval by regulators. Third, under DOE Order 413.3B, OREM will develop the final design and complete associated documentation and approvals to support construction.

Since much of the design will be based on EMWMF and related regulations, there are some design elements that are known. There are rules under CERCLA as well as the Resource Conservation and Recovery Act that very strictly define and enforce liner systems, for example, said Henry. There is generally a 10-foot-thick geologic buffer at the bottom of a landfill to separate the waste from the groundwater. Above that, there will be about a three-foot-thick clay liner, and then a leachate collection system and a leak-detection system – both including geomembranes between the layers. These combined layers and membranes total about 15 feet between the waste and the groundwater.

Like EMWMF, water and sediment ponds will allow on-site containment and removal for treatment. The landfill will also be built with multiple cells, or sections, where waste can be placed in the best order to fill the available space. Heavier items, such as foundation material or large equipment, should go in the bottom of a landfill, for example.

Additionally, OREM has completed significant characterization efforts to ensure the suitability of its preferred site in Central Bear Creek Valley. For example, several wells were drilled to estimate groundwater levels. Even with excessive rainfall these past few years those have proven the suitability of the site, said Henry. Monitoring wells will also be used at the site following construction to ensure no negative impact to the public or the environment in the future.

More information on these issues and waste acceptance criteria will be included in the draft ROD. OREM also intends to present a public forum in the future to discuss waste acceptance criteria in detail.

Advocate
Oak Ridge Site Specific Advisory Board
July 2021

Action on New Disposal Site Critical for Timely Cleanup at ORNL, Y-12

OREM makes every effort during its cleanup mission to recycle, reuse and remove uncontaminated materials from the waste stream, but there's no getting around the fact that packing the remains of hundreds of buildings and adjacent soils into a safe disposal site takes a lot of space.

Current waste disposal options on the Oak Ridge Reservation (ORR) will allow for the remaining cleanup work at East Tennessee Technology Park, but a new facility is urgently needed to accept decommissioning and demolition waste from ORNL and Y-12, where OREM is currently working and plans to remove more than 200 facilities, said Brian Henry, OREM's portfolio federal project director for Y-12 cleanup, at the May ORSSAB meeting.

While the ORR has several regular landfills, referred to as "sanitary landfills," a special type of landfill, permitted under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) is also required due to the types of wastes present in the Oak Ridge facilities. The current CERCLA disposal facility, EMWMF, has been in operation since 2002 and is about 80 percent full after taking in waste from demolition of more than 500 facilities at ETTP.

Given that OREM has worked with regulators over the years to expand EMWMF to 2.3 million cubic yards capacity, it may sound like there is a lot of room left, but it will be filled before the end of the decade, Henry said. Additionally, special attention is needed to choose the final wastes that enter the facility, such as soils, to properly support the closure and capping process. That makes the Environmental Management Disposal Facility (EMDF) project one of OREM's largest and most vital near-term efforts, he said. Henry, who has overseen Y-12 cleanup since 2016 and previously spent time managing the EMDF project from initial meetings with community leaders in 2015, said time is short before schedule delays begin impacting cleanup operations. The soonest the new facility could be finished currently is 2026.

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Oak Ridge Site Specific Advisory Board
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UPCOMING MEETINGS

Meetings are held at 6 p.m. virtually until further notice. Email orssab@orem.doe.govat least 1 week prior to attend or comment.

Board: Wednesday, September 8
EM & Stewardship Committee: Wednesday, September 22

ABBREVIATIONS

CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act, also known as Superfund
DOE – Department of Energy
EM – Environmental Management
EMWMF – Environmental Management Waste Management Facility
ETTP – East Tennessee Technology Park
OREM – Oak Ridge Environmental Management
ORNL – Oak Ridge National Laboratory
ORR – Oak Ridge Reservation
ORSSAB – Oak Ridge Site Specific Advisory Board
TDEC – Tennessee Department of Environment & Conservation
UCOR – URS | CH2M Oak Ridge
Y-12 – Y-12 National Security Complex

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