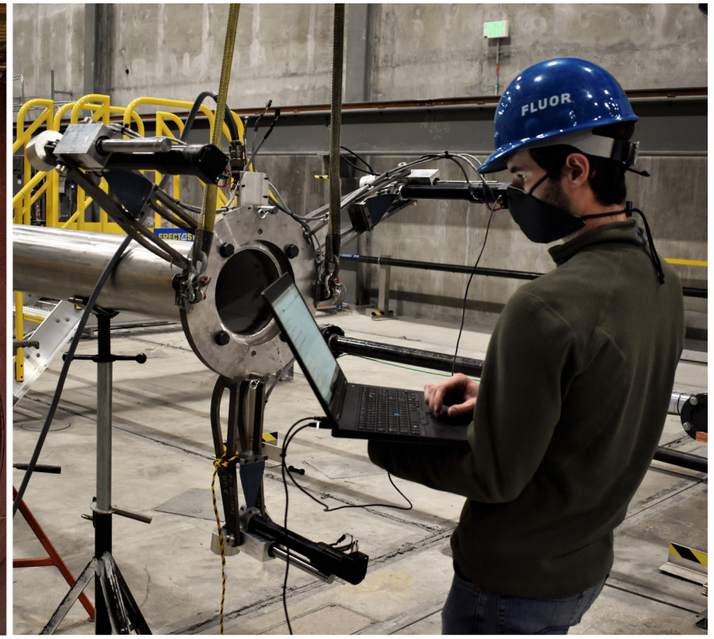
U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

EM Strategic Vision: 2023–2033





Introductory Message from EM-1

For more than 30 years, the EM program has tackled one of the largest environmental cleanup efforts in the world - addressing the legacy of decades of nuclear weapons production and government sponsored nuclear energy research in the United States.

While EM has had its fair share of challenges over its history, the program has also realized tremendous success to date, thanks primarily to the dedicated men and women throughout the DOE complex safely and efficiently performing legacy environmental cleanup every day. We've cleaned and closed major former weapons sites across the country. We've built the nation's first geological repository to safely manage and dispose of radioactive waste. We've built complex first-of-a-kind facilities to address one of the government's largest environmental risks. And we have successfully and safely demolished some of the largest buildings ever constructed.

From an original 107 sites under EM's responsibility, today we're down to just 15. Our successes aren't just in the past. Last year, we completed legacy cleanup work at Brookhaven National Laboratory in New York. We reached a milestone, decades in the making, with the successful start of tank waste treatment at the Hanford site in Washington state. We demolished the first of the former uranium enrichment process buildings at the Portsmouth site in Ohio. We completed the removal of buried radioactive waste above a major aquifer at the Idaho Cleanup Project.

Today, while we remain committed to driving down environmental risks, EM is increasingly empowered to pursue broader benefits for the communities near DOE sites that did so much for national security and prosperity, as well as the nation as a whole. Our work is increasingly focused on assisting other DOE programs pursue necessary modernization efforts so they can continue to play important national security and scientific research roles. We're working to attract, build and maintain the next generation of workers throughout the EM program, necessary not just for our long-term success but to help provide far-reaching benefits for the local communities. We're working with communities on how we can assist with site re-industrialization and reuse following successful cleanup, including potential clean energy deployment. As we do these things, we're placing an increased emphasis on how EM can better serve, and benefit, historically underserved communities through the Administration's Justice40 initiative and other efforts.

As this version of EM's 10-year Strategic Vision illustrates, we are poised for a set of significant accomplishments to aid the communities near DOE sites. EM will make great strides in addressing tank waste at Hanford, Idaho and the Savannah River Site in South Carolina. Continued progress will be made in tearing down aging excess facilities at sites including Oak Ridge in Tennessee, Portsmouth in Ohio and the West Valley Demonstration Project in New York. And we will continue to draw down waste inventories and address groundwater contamination at sites like the Los Alamos National Laboratory in New Mexico and the Paducah site in Kentucky.

There is no better visible sign of EM's progress, though, than completing work at a site. The coming decade positions EM to complete legacy cleanup activities at four sites --- the Lawrence Livermore National Laboratory in California, Moab in Utah, the Nevada National Security Site, and the Sandia National Laboratories in New Mexico.

This is an exciting time for the EM mission. I'm proud to be part of this program at this point in its history, and I want to again offer my gratitude to all of those whose efforts and support have not only played a role in EM's past success, but will be just as invaluable for the progress to come.

William "Ike" White
Senior Advisor for the Office of Environmental Management

EM Sites


Hanford
Idaho National Laboratory
Lawrence Livermore National Laboratory
Moab Uranium Mill Tailings Remedial Action Project
Nevada National Security Site
Paducah Gaseous Diffusion Plant
Los Alamos National Laboratory
Energy Technology Engineering Center
Sandia National Laboratories
Waste Isolation Pilot Plant
Portsmouth Gaseous Diffusion Plant
EM Consolidated Business Center New York Project Office (formerly SPRU)
West Valley Demonstration Project
Oak Ridge
Savannah River Site

EM Strategic Vision: 2023–2033

Introduction

The U.S. Department of Energy (DOE) Office of Environmental Management (EM) has its roots in the Manhattan Project and the development of the first atomic weapon. EM's mission is to complete the safe cleanup of the environmental legacy brought about from decades of nuclear weapons development and government-sponsored nuclear energy research.

At its inception in 1989, the EM program faced a daunting task. The production of more than 1,000 metric tons of weapons-grade uranium and more than 100 metric tons of plutonium resulted in environmental contamination at 107 sites throughout the United States — covering an area equal to the combined size of Delaware and Rhode Island. This contamination included more than 90 million gallons of liquid radioactive waste resulting from the separation of plutonium from spent nuclear fuel (SNF); more than 700,000 metric tons of depleted uranium produced as a byproduct of uranium enrichment activities; more than 5,000 contaminated facilities; millions of cubic meters of contaminated soil; and billions of gallons of contaminated groundwater. In addition, host communities, Tribal Nations, regulators, and others had little information about the extent and complexity of contamination at most DOE sites.

More Than Three Decades of Progress

During the past three decades, the EM program has made considerable progress in tackling this environmental legacy and building relationships with communities, Tribal Nations, stakeholders, and others. EM has eliminated, or mitigated, at most sites the environmental, safety, and health risks from the most dangerous legacy wastes and contaminated facilities. In addition, measures have been taken to control contaminant migration in groundwater and soils to mitigate potential future risks.

The program's combined active remediation footprint has been reduced by 90 percent, from approximately 3,300 square miles to fewer than 300 square miles.

Significant legacy cleanup work remains at the following locations:

- Energy Technology Engineering Center (ETEC)
- Hanford
- Idaho National Laboratory (INL)
- Lawrence Livermore National Laboratory (LLNL)
- Los Alamos National Laboratory (LANL)
- Moab Uranium Mill Tailings Remedial Action Project
- Nevada National Security Site (NNSS)
- Oak Ridge
- Paducah Gaseous Diffusion Plant
- Portsmouth Gaseous Diffusion Plant (GDP)
- Sandia National Laboratories (SNL)
- Savannah River Site (SRS)
- Waste Isolation Pilot Plant (WIPP)
- West Valley Demonstration Project (WVDP)

Highlights of EM's significant accomplishments to date have included:

- Initiated the first large-scale treatment of radioactive and chemical waste from large underground tanks at the Hanford Site via the Tank-Side Cesium Removal (TSCR) System
- Completed demolition of the Hanford Site's iconic Plutonium Finishing Plant, a facility that produced two-thirds of the nation's Cold War-era plutonium metal
- Opened the world's first geological repository at WIPP in New Mexico for transuranic (TRU) waste resulting from atomic energy defense activities
- Completed the bulk of cleanup activities along the 220-square-mile Columbia River corridor at the Hanford Site in the State of Washington, including placing seven of the nine former plutonium-producing reactors into long-term safe storage
- Completed the removal of the former uranium enrichment complex at Oak Ridge in Tennessee, including Building K-25, at one time the largest building in the world under one roof
- Completed the construction of all parts of the tank waste treatment system at SRS in South Carolina, including 27 years of successful operations at the Defense Waste Processing Facility (DWPF), as well as the construction and startup of the Salt Waste Processing Facility (SWPF)
- Completed the Advanced Mixed Waste Treatment Project at INL, where 65,000 cubic meters of legacy TRU waste were processed
- Completed construction and initiated operation of two depleted uranium hexafluoride (DUF6) conversion plants at the Paducah Site in Kentucky and Portsmouth Site in Ohio
- Completed waste vitrification activities and subsequent demolition of the Vitrification Facility at WVDP in New York — this was the first time EM has built, operated, and successfully decommissioned one of its major waste treatment facilities
- Transferred more than 25,000 acres of land to local communities for beneficial reuse

EM Priorities

EM pursues its cleanup objectives safely within a risk-informed framework of regulatory compliance commitments, best business practices, and community engagement. Taking many variables into account, EM's priorities are as follows:

- **Protection of the workforce, the public, and the environment**
- **Radioactive tank waste stabilization, treatment, and disposal**
- **Spent (used) nuclear fuel storage, receipt, and disposition**
- **Nuclear material consolidation, stabilization, and disposition**
- **Transuranic (TRU) and mixed/low-level waste disposition**
- **Soil and groundwater remediation**
- **Excess facilities deactivation and decommissioning**

Intent of the Strategic Vision

The intent of the Strategic Vision is to provide a concise high-level summary of the progress EM anticipates over the coming decade. The vision is based on current budget assumptions, as well as previous years' congressional appropriations. The Strategic Vision is not intended to document all planned cleanup projects at EM sites nor all actions necessary to meet administration goals. Instead, it is one of a set of integrated planning activities and tools EM uses that also includes more detailed site-specific planning documents and periodic strategic alternatives analyses.

2023: Risk Reduction and Strengthening Local Communities

Based on years of successful performance and progress, EM is empowered in 2023 to not only continue its focus on achieving tangible risk reduction, but to do so with an increased eye toward strengthening the local communities near DOE sites that have done so much for the country.

At Hanford, EM is continuing to treat tank waste through the Tank-Side Cesium Removal System (TSCR) and advance towards start up of the Direct Feed Low-Activity Waste System (DFLAW) that, once operational, will stabilize that waste in glass. Over the course of this year, EM will further advance capabilities necessary to tackle tank waste.

At Idaho, EM began operation of the Integrated Waste Treatment Unit (IWTU), which is key to addressing the remaining tank waste at the site. At Savannah River, efforts to address tank waste will continue to ramp up, with the SWPF projected to process a total of 4 million gallons of waste and construction set to be complete on Saltstone Disposal Unit (SDU)-8 to provide additional capacity to safely and effectively dispose of treated waste.

Along with continuing efforts to address tank waste, EM will pursue a number of significant risk reduction efforts across the DOE complex. At Idaho, work will finish to transfer EM-owned spent nuclear fuel from wet to safer dry storage. At Los Alamos, EM will continue to focus on shipping legacy transuranic waste to WIPP for disposal. At Paducah, another 1 million tons of hazardous refrigerant will be dispositioned, not only advancing cleanup but providing emission reduction benefits as well. And at Moab, EM will continue successful remediation efforts to disposition another 1 million tons of uranium mill tailings material, bringing the final amount disposed to 14 million out of an initial 16 million tons.

EM's efforts are not just about addressing the environmental legacies of the past, but helping other DOE programs prepare for today and the future. To aid with modernization efforts, EM also assists with performing deactivation and decommissioning activities on excess facilities for other organizations within DOE, such as the National Nuclear Security Administration (NNSA) and the Office of Science (SC).

EM began to support deactivation and decommissioning activities at the Office of Naval Reactors' Knolls Atomic Power Laboratory and Kesselring sites in calendar year 2022. EM is addressing excess facilities and performing remediation activities at the Old Town and Bayview sections at Lawrence Berkeley National Laboratory, with this work anticipated to be completed over the coming decade. EM is also addressing excess NNSA-owned facilities at LLNL and LANL. Future work for other DOE organizations will be dependent on programmatic needs and other factors.

As EM works to achieve its environmental remediation mission, the program can provide additional follow-on benefits to local communities. Given the length of time remaining in the EM mission, the development of the next generation of dedicated, talented and diverse workers will be essential.

To a large degree, preparing the workforce of tomorrow begins with our local communities through Science, Technology, Engineering, and Math (STEM) education and recruitment tools.

Some of EM's strategies include:

- **Making targeted investments in the Internship Program. Provide students with opportunities to work in EM and explore Federal careers while still in school. Students who successfully complete program requirements may be eligible for conversion to a permanent job.**
- **Extending our recruiting outreach and targeting of top-tier candidates through social media and web-based platforms that prospective candidates connect with frequently to booster the quality and quantity of potential entry-level and other candidates.**
- **Building DOE-High School partnerships and fostering ties with targeted local high schools and broadening faculty awareness of DOE and our mission.**
- **Creating a "pipeline" of minority engineers specifically trained and mentored to enter our workforce in mission critical areas of need.**

EM's Minority-Serving Institutions Partnership Program (MSIPP) addresses the need for building and maintaining a well-trained, technically skilled, and diverse workforce by promoting the education and development of the next generation in critical STEM disciplines.

EM is continuing to utilize an expanded EM MSIPP to attract and support undergraduates and graduate students who may be interested in the cleanup

mission. In 2022, EM was proud to award $30 million in EM MSIPP financial assistance grants to Minority Serving Institutions (MSIs) in South Carolina, Tennessee, and Washington. In 2023, EM is working towards additional financial assistance to MSIs based on approved appropriations from Congress. The $56 million program in FY 2023 expands on a Technology, Curriculum and Professional Development Program, an EM/MSIs Shared Research Partnership Program, a Postdoctoral Fellow Program, a Graduate Fellowship Program, and a program that helps college undergraduates obtain federal staff positions after graduating.

In addition, EM contractors use a variety of regional partnerships to ensure a consistent workforce pipeline. As one example, at Los Alamos, cleanup contractor N3B works with Northern New Mexico institutions to run a Nuclear Operators Apprenticeship Program, a Radiological Control Technician Boot Camp and a Waste Processing Operator Boot Camp.

This year will also see the launch of EM's Community Capacity Building efforts. This grant program is intended to prioritize resources to those near EM sites affected by high levels of poverty that may not have benefited to date from the economic activity generated by EM. This program will help support a variety of activities that can provide broad benefits to local communities, including site reindustrialization, community restoration projects and community and Tribal nation infrastructure projects, among others.

EM is also working to support DOE's broader goals concerning climate sustainability. Work will continue to update vulnerability assessments for EM sites to help mitigate or prevent impacts from extreme weather events. EM is also pursuing options that will enable a net-zero approach as well as resilience to cleanup, such as the utilization of electric vehicles and installation of charging infrastructure. Cleanup progress to date has also made resources available at sites such as Oak Ridge for use by companies interested in pursuing clean energy and advanced nuclear development.

The EM cleanup mission is in line with President Biden's Justice40 Initiative. The Justice40 Initiative establishes a goal that 40 percent of the overall benefits from certain Federal investments flow to disadvantaged communities. EM is proud to have 10 covered programs under the Justice40 Initiative which includes eight of the EM cleanup sites. EM has been interacting with stakeholders on the Justice40 Initiative through presentations, listening sessions, conference calls, in-person and virtual meetings, and workshops. EM will continue to work on the next steps of the Justice40 Initiative and its application at EM cleanup sites.

Alignment Key to Success

To best inform this latest iteration of the EM Strategic Vision, EM engaged in a concerted outreach effort with Tribes, regulators and stakeholder organizations that included dialogue with EM senior leadership. In parallel, EM sites routinely engage with stakeholders to solicit input and feedback on site-level cleanup plans.

More broadly, EM has numerous formal and informal interactions with Tribal Nations and our regulatory and stakeholder partners. These interactions are used to communicate cleanup status, raise technical and policy issues, and support timely and sustainable cleanup decisions that have implications across the complex. These decisions are made through complex and highly collaborative processes. Cleanup successes to date illustrate what can be achieved when successful alignment is realized among EM, state and local officials, Tribal representatives and stakeholders.

In line with President Biden's Memorandum on Tribal Consultation and Strengthening Nation-to-Nation Relationships, EM continues to strengthen Nation-to-Nation interactions and remains committed to seeking Tribal feedback to guide our efforts, especially to inform updates to key documents that guide DOE's interactions. For instance, in 2022, EM, along with the rest of DOE, sought ways to integrate Tribal input into ways to improve Tribal consultation and strengthen Nation-to-Nation interactions. EM is participating in the review of the DOE Order 144.1 on Tribal policy and the DOE American Indian and Alaska Native Tribal Government Policy. EM will seek opportunities for Tribal staff and scientific experts to collaborate on cleanup priorities, facilitate meaningful discussions to assess traditional Tribal natural resources, and protect cultural resources. EM will continue to strengthen the consultation process, focusing on timely updates and information and feedback on how Tribal input has been considered in decision making, and develop Tribal training and Tribal STEM priorities.

Better Contracting, Better Cleanup

Approximately 95 percent of EM's annual budget is utilized through contracting with an array of industry partners. EM will continue to be a demanding client, expecting contractors to perform in a safe, efficient, and cost-effective manner and with the highest ethical standards. The contract is one of our most important enabling tools to execute our mission as it defines the requirements and expectations of performance between the government and EM contractors. Over the coming decade, EM will continue to refine its acquisition processes and contracts to address mission needs and increase consistency and efficiency in competing and awarding contracts.

A key initiative for EM is attracting new entrants to the EM cleanup market that ensures diversity of experience and solutions from commercial marketplaces, as well as relevant defense cleanup experience. In addition, it remains critically important to ensure that EM has a stable of qualified small businesses performing meaningful work throughout EM sites across the country.

The next two-to-three years will see EM continue implementation of the End-State Contracting Model (ESCM) through the task ordering process. In the ESCM, EM negotiates scope, cost, and schedule on specific elements of work through task orders in an indefinite delivery/indefinite quantity contract, instead of using cost-based contracts that span 10 (and sometimes more) years and typically have more general scopes of work. The ESCM provides EM the ability to group work under the contract into specific task orders to allow better clarity and shorter time horizons, as well as to provide more accurate cost and schedule targets. This will also provide for an accountability structure designed to motivate contractors toward improved cost and schedule performance. EM has already implemented six end-state contracts (Hanford Central Plateau Cleanup, Nevada Environmental Program Services, Idaho Cleanup Project, Oak Ridge Reservation Cleanup Contract, Savannah River Integrated Mission Completion Contract, and Moab Remedial Action Contract).

Two new end-state contracts; the Hanford Integrated Tank Disposition Contract awarded in April 2023, and the new Portsmouth Decontamination & Decommissioning Contract scheduled for later in the year will reflect a continued implementation of EM's End-State Program Plan. This plan defines the ESCM vision, explains how priorities are established, and clarifies roles and responsibilities of each entity within DOE, as well as provide the necessary strategic view to stakeholders and ensure continued requirements for community commitment.

Addressing PFAS

An emerging global issue and concern throughout the DOE complex, including at some EM sites, centers on per- and polyfluoroalkyl substances, or chemicals commonly known as PFAS. PFAS are a group of manufactured chemicals that have been used in industry and consumer products since the 1940s because of their useful properties. PFAS can be present in water, soil, air, and food as well as in materials found in our homes or workplaces. At the DOE complex, they were utilized in uranium separation activities during the Manhattan Project and later in a variety of commercial products, including firefighting foam. The Agency for Toxic Substances and Disease Registration has designated PFAS chemicals a public health concern. DOE is engaged in a concerted effort, led by the Department's Office of Environment, Health, Safety and Security, to fully assess and address the presence of PFAS chemicals at DOE sites. Over the coming decade, EM will be actively involved in this Departmental effort to help address PFAS concerns at cleanup sites.

Improving Waste Disposition

Disposal of radioactive waste is a core function of the EM program. Without waste disposal capabilities, cleanup cannot proceed. EM uses a combination of DOE and commercial disposal facilities, which are vital to the EM cleanup mission. EM's safety culture and well-established statutory and regulatory regime ensure waste is disposed in a manner that protects the public, workers, and the environment and is in accordance with the applicable requirements.

EM has a variety of disposal options for waste managers to consider. Waste disposal decisions are made at the local level based on waste characteristics, permitting/licensing, suitability of the DOE site for disposal and future use, transportation and packaging options, schedules, and costs. These factors support EM decisions that are in the best interest to the taxpayers and stakeholders. EM keeps waste disposal decision-making transparent. Input from the public, Tribal Nations, and stakeholders is received within the framework of NEPA and appropriate regulatory process (e.g., RCRA and CERCLA). Over the coming decade, EM will continue to apply integrated radioactive waste disposal strategies which consider environmental justice, climate change, and site equities to maintain the current and develop additional disposal options, ensuring a sustainable EM cleanup mission while fully protecting the public, workers, and the environment.

Innovation and Acceleration

Given the scale and scope of the remaining EM mission, it is critical to develop new and innovative cleanup approaches so that EM can conduct its work in a more efficient and more cost-effective manner.

One such approach is the department's interpretation of the statutory definition of HLW that makes clear that both source and risk are essential elements of the definition, and, also identifies science-based criteria for evaluating risk. EM has applied HLW interpretation for an initial waste stream at the SRS and is working to complete the final National Environmental Policy Act (NEPA) analysis for the second waste stream, also at SRS.

EM is also seeking to enhance its technology research and development (R&D) efforts to better identify and demonstrate new and innovative approaches for tackling cleanup challenges that offer a significant return on investment, and to effectively adapt commercially available technologies to EM cleanup needs. EM's past R&D efforts have led to innovations such as solvent extraction and ion exchange technologies implemented with Savannah River's SWPF to increase waste processing. EM has also supported R&D tied to deployment of robotics and use of artificial intelligence for remote operation.

EM has commissioned the Network of National Laboratories for Environmental Management and Stewardship (NNLEMS) to conduct an evaluation of the Hanford tank waste mission and develop an R&D Roadmap for accelerating the Hanford tank waste mission. Starting in FY23, in partnership with the Office of Science and Advanced Research Projects Agency-Energy (ARPA-E), EM will use the Roadmap to continually identify opportunities for R&D investment to develop and deploy game changing strategies and technologies that could help improve efficiency along with cost savings and schedule acceleration for the Hanford tank waste cleanup program.

Similarly, with the help of NNLEMS, EM is developing a national strategy for addressing the remaining challenges in soil and groundwater contamination

at complex sites towards site closure with accepted end state. This strategy will evaluate the needs for technology development, regulatory compliance, and stakeholder engagement.

Also, in partnership with the national laboratories, DOE is conducting a holistic EM technology review to evaluate technology development programs throughout the complex to ensure they have overall unity of effort, they are efficient, and that they provide maximum value. This assessment will be used to identify technology strengths, weaknesses, and gaps, and prioritize EM and DOE complex-wide issues, challenges, and risks for maximum potential value.

As a responsible steward of taxpayer resources, EM continually works to identify and assess opportunities to accelerate cleanup projects towards completion and sometimes closure of entire sites.

As part of a robust and integrated strategic planning process, EM conducts regular analyses of alternatives that support innovation and reducing cleanup schedules. Opportunities and alternate risk-based cleanup approaches continue to be identified and evaluated that could significantly shorten site cleanup and closure schedules, thereby reducing residual long-term environmental, safety, and health risks and ultimately saving billions in life cycle costs. These opportunities will be considered regularly as part of ongoing budget and long-term planning activities.

EM is also working with its regulatory partners to look at issues related to the equitable application of regulations. Finding parity in regulatory response actions coordinated under the Environmental Protection Agency (EPA) and the Nuclear Regulatory Commission (NRC) could ensure cost efficient cleanup and risk reduction activities.

The Decade to Come

Building on these anticipated successes, this Strategic Vision outlines the coming decade of transformational progress in its cleanup activities across the EM program, including:

- **Treating and stabilizing radioactive tank waste in glass at Hanford through the Direct Feed Low Activity Waste System, ramping up the site's high level tank waste capabilities, completing significant risk reduction activities such as transferring cesium and strontium capsules to dry storage, and placing the last of the former production reactors, K West Reactor, in interim safe storage**
- **Emptying and closing up to 22 of 51 underground waste tanks at SRS and completing disposal of remaining legacy TRU waste**
- **Completing the new Safety Significant Confinement Ventilation System (SSCVS), utility shaft, and other key infrastructure upgrades at WIPP**
- **Completing disposal of uranium-233 at Oak Ridge, along with completing construction of the site's new Mercury Treatment Facility**
- **Completing the treatment of remaining liquid sodium-bearing waste at INL**
- **Finalizing and implementing long-term treatment approaches for contaminated groundwater at LANL**
- **Demolishing two former uranium enrichment process buildings at Portsmouth**
- **Completing deactivation activities at the C-333 former uranium enrichment process building and beginning fieldwork for C-400 Remedial Action at Paducah**
- **Completing Phase 1 demolition activities at the WVDP**
- **Initiating soil remediation and final groundwater treatment approaches at ETEC**
- **Completing legacy cleanup activities at Moab**
- **Completing legacy cleanup activities at the NNSS**
- **Completing legacy cleanup activities at LLNL and SNL**

Decade Timeline

2023

Complete SNF wet-to-dry storage transfers at Idaho National Labratory

2023

Complete demolition of the former Main Plant Process Building at the WVDP

2025

Initiate immobilization of Hanford tank waste in glass via the Direct Feed Low Activity System

2025

Complete transfer of radioactive capsules from Hanford's Waste Encapsulation Storage Facility to dry storage

2025

Begin fieldwork for C-400 Remedial Action at Paducah

2025

Begin operation of the Mercury Treatment Facility at Oak Ridge

2027

Complete disposition of uranium-233 at Oak Ridge

2028

Complete the treatment of remaining liquid sodium-bearing waste at the INL Site

2030

Complete disposal of legacy TRU waste from SRS

2031

Complete legacy cleanup activities at LLNL and SNL

2031

Complete demolition of 2 out of 3 former uranium enrichment process buildings at Portsmouth

2031

Complete cleanup activities at Moab

2032

Demolition of excess contaminated facilities at Oak Ridge National Laboratory/Y-12 National Security Complex at Oak Ridge

2033

Transfer responsibility for the completed areas at LLNL to NNSA

2033

Convert approximately 56,000 metric tons of DUF6 and ship 8.5 million gallons of hydrogen fluoride off site in Portsmouth for commercial use

2023 → 2033

Energy Technology Engineering Center

Overview

The ETEC site is located at the Santa Susana Field Laboratory (SSFL), approximately 30 miles northwest of downtown Los Angeles, California. From the 1950s until 1988, DOE and its predecessor agencies conducted nuclear and liquid metals research on a portion of the site. While DOE does not own any land at the SSFL (today owned by The Boeing Company), the department is responsible for demolition of the DOE-owned buildings and remediation of Area IV (290 acres) and the adjoining Northern Buffer Zone.

The lead regulatory agency for cleanup of ETEC is the State of California Department of Toxic Substances Control (DTSC). However, the cleanup at ETEC is governed by many laws and regulations, and other federal, state, and local regulatory agencies.

Calendar Year 2022 Accomplishments

- Completed the demolition and waste disposal of all DOE-owned buildings at ETEC
- Continued work to protect groundwater by capturing and removing approximately 13,000 gallons of contaminated material, keeping it away from the deeper bedrock groundwater
- Coordinated with U.S. Fish and Wildlife Service and the California Botanic Garden to collect and preserve seeds from an endangered plant species on-site, Braunton's milkvetch (Astragalus brauntonii). These seeds will be used for future site restoration

Planned Cleanup Scope 2023–2033

Over the coming decade, EM will work with the state of California to reach a final agreement and Record of Decision (ROD) to enable the cleanup of contaminated soil. The State of California is expected in 2023 to issue a Final Program Environmental Impact Report, which is a necessary step for the state to approve DOE's remediation plan. If DOE and the state can reach a timely resolution on remaining issues, EM could begin soil cleanup activities by 2025. DOE will also work with the state of California on final groundwater treatment approaches.

Key Regulatory Milestones 2023-2033

In 2010, DOE signed an Administrative Order on Consent with California regulators that required soil remediation to background. EM is committed to meet this obligation and is engaging with California regulators on a path forward.

ETEC's final building for demolition - the Sodium Pump Test Facility - amid blasts from shaped charges.

Post-2033 Cleanup Scope

Remaining cleanup activities at ETEC post-2033 will depend on progress made on soil and groundwater remediation during the next 10 years. The envisioned end-state for the ETEC site is an open space for the surrounding community to enjoy and to provide habitat for the wildlife of the Santa Susana Mountains. The land's future as an open space habitat will preserve the land as a wildlife corridor, benefit the unique and critical habitat of local plants and animals (many of which are protected) and preserve its many Tribal and cultural resources.

Debris is removed following the Sodium Pump Test Facility demolition.

Hanford

Overview

The Hanford Site, a 580-square-mile section of semi-arid desert in southeast Washington, was established in 1943 as part of the Manhattan Project to produce plutonium for national defense. Construction began in October 1943 on the first industrial-scale nuclear reactor, B Reactor, which produced plutonium for the Trinity test and one of the atomic bombs used to help end World War II. During a national security mission that lasted nearly five decades, nine nuclear reactors were built along the banks of the Columbia River to provide materials for five processing facilities that operated throughout the Cold War era. Hanford produced nearly two-thirds of the plutonium used in the U.S. nuclear weapons stockpile.

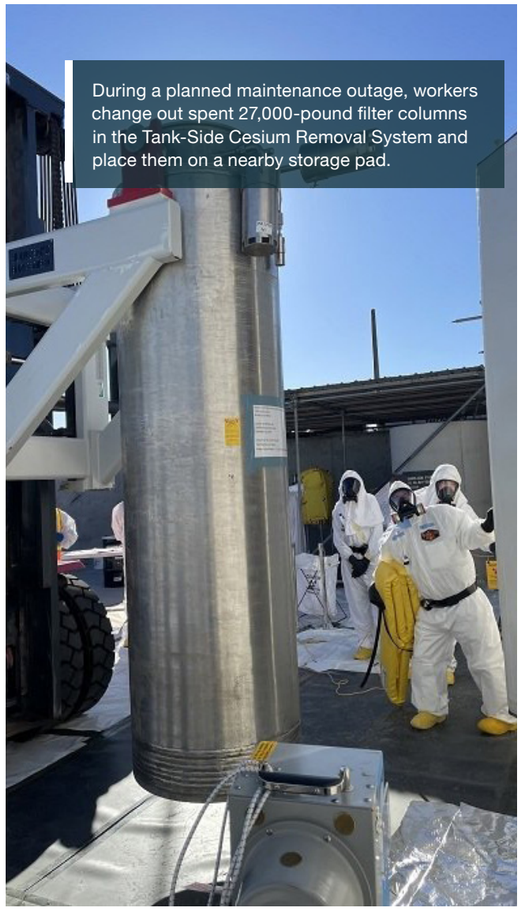
With the signing of the Hanford Federal Facility Agreement and Consent Order (Tri-Party Agreement) in 1989 by the DOE, the Washington State Department of Ecology, and the EPA, the primary mission of the Hanford Site shifted from national security to environmental cleanup. Hanford's current mission focuses on preparing to treat millions of gallons of waste in large underground tanks and reducing risks through remediation of contaminated areas, deactivation and decommissioning of facilities, groundwater treatment, and waste management (i.e., waste storage, treatment, and disposal).

Cleanup of the Hanford Site is managed by two DOE offices, the Richland Operations Office (DOE-RL) and the Office of River Protection (DOE-ORP). DOE executes the cleanup and risk-reduction efforts at the site through several prime contractors and their subcontractors. DOE-RL serves as the Hanford Site property owner and oversees cleanup along the Columbia River and in Hanford's Central Plateau, including groundwater and waste site cleanup, facility cleanout and deactivation and decommissioning, management of solid waste and nuclear materials, and all site support services.

Congress established DOE-ORP in 1998 as a field office to manage the retrieval, treatment, and disposal of approximately 56 million gallons of radioactive tank waste stored in 177 underground tanks in the Central Plateau. The tank waste is material left over from nearly 50 years of plutonium production. In support of this mission, DOE-ORP is responsible for the safe operation of the tank farms and associated 200 Area facilities along with construction and operation of waste transfer systems and treatment facilities, including the Waste Treatment and Immobilization Plant (WTP) located in the Central Plateau.

The Department continues to meet its annual goal of treating more than 2 billion gallons of groundwater to remove contamination, in facilities like this one in the 200 West Area of the Hanford Site.

EM leadership regularly engages a variety of stakeholders and consults with Tribal Nations regarding the cleanup vision for the Hanford Site. These include regional elected officials, business leaders, and advisory board members representing more than 30 individual interests and the public at large. Through engagement during development of the Strategic Vision, stakeholders and Tribal Nations identified several areas in which the Strategic Vision for Hanford could be strengthened, including identifying established dates for noted milestones and completion dates for planned work, as well as goals that could allow quantifiable assessment of results.



During a planned maintenance outage, workers change out spent 27,000-pound filter columns in the Tank-Side Cesium Removal System and place them on a nearby storage pad.

Calendar Year 2022 Accomplishments

- **Began the first industrial-scale treatment of waste from large underground storage tanks with the start of Tank-Side Cesium Removal System (TSCR) operations—an EM 2022 priority**
- **Initiated heat up of the first tank-waste vitrification melter in the Waste Treatment and Immobilization Plant (WTP)**
- **Completed construction of a protective enclosure, or "cocoon," around K East Reactor—an EM 2022 priority**
- **Treated more than 2 billion gallons of contaminated groundwater for the eighth consecutive year**

Planned Cleanup Scope 2023–2033

The coming decade will see the successful launch of one of EM's largest and most significant cleanup activities — the start of tank waste vitrification at Hanford through the DFLAW program. This is a goal EM has been pursuing for more than two decades at Hanford and will address one of the largest environmental challenges in the EM complex.

TANK WASTE TREATMENT

In 2023, DOE will continue to advance DFLAW commissioning activities for the LAW Facility by heating up and commissioning the facility's two large melters. Transitioning the remaining DFLAW facilities to operational status will commence the treatment of the most mobile form of tank waste, beginning an important new phase of the Hanford Site cleanup effort.

The DFLAW program requires a pretreatment system known as the TSCR system. This system is treating liquid tank waste, called supernate, in preparation for waste feed delivery when the WTP LAW Facility is operational. To date, TSCR has treated about 440,000 gallons of waste to provide the initial waste feed for the start of DFLAW operations. EM plans to double that amount by the end of 2023.

In 2023, upgrades will also be completed at the Liquid Effluent Retention Facility (LERF) and Effluent Treatment Facility (ETF) to support the treatment of the anticipated secondary liquid effluent from DFLAW operations. Additionally, the Integrated Disposal Facility, where the

vitrified low-level tank waste will be disposed, will be completed and ready for operations.

Recent DFLAW successes illustrate what is possible when there is unified alignment around an achievable goal. Building on that success, DOE, the Environmental Protection Agency and the state of Washington reached a conceptual agreement (in May 2023) on a safe and viable path forward for Hanford's high-level tank waste. In addition, DOE has developed a Research and Development Roadmap to guide investments in additional technology options to accelerate the Hanford high-level tank waste mission. EM will ramp up engineering, design and construction on the WTP High-Level Waste Facility to maintain progress towards treating the remaining Hanford tank waste.

In parallel with the DFLAW Program, EM is evaluating additional technology options to potentially accelerate removal and disposal of the remaining portion of Hanford low-activity tank waste. As part of that effort, EM is advancing the Test Bed Initiative (TBI) Demonstration which will involve pretreatment, solidification, and offsite disposal of 2,000 gallons of Hanford's low-activity tank waste.

EM will continue design activities at the WTP High-Level Waste Facility to maintain progress towards treating the remaining Hanford tank waste beginning in the mid-2030s.

RISK REDUCTION

By the end of the decade, DOE will address the risks and contamination at the 324 Building. Additionally, the K West Reactor Fuel Storage Basin will be deactivated and demolished, allowing the K-West reactor to be placed in interim safe storage. Active groundwater remediation systems will continue operating along the Columbia River and on the Hanford Central Plateau, reducing the risk that contaminated groundwater will leave the site.

DOE will complete the transfer of cesium and strontium capsules, currently at the Waste Encapsulation and Storage Facility, to safer and stable dry storage at a nearby Capsule Storage Area. Stabilization activities at the Reduction-Oxidation Plant, the Plutonium Uranium Extraction Plan, and B Plant will place these facilities in a low-risk and low-cost surveillance and maintenance (S&M) configuration. Several high-risk facilities involved in plutonium production at Hanford will be demolished, and waste site remediation efforts will continue throughout the Central Plateau with the waste disposed at the Environmental Restoration Disposal Facility. Finally, later in the decade, TRU waste shipments to WIPP are set to resume.

Key Regulatory Milestones 2023–2033*

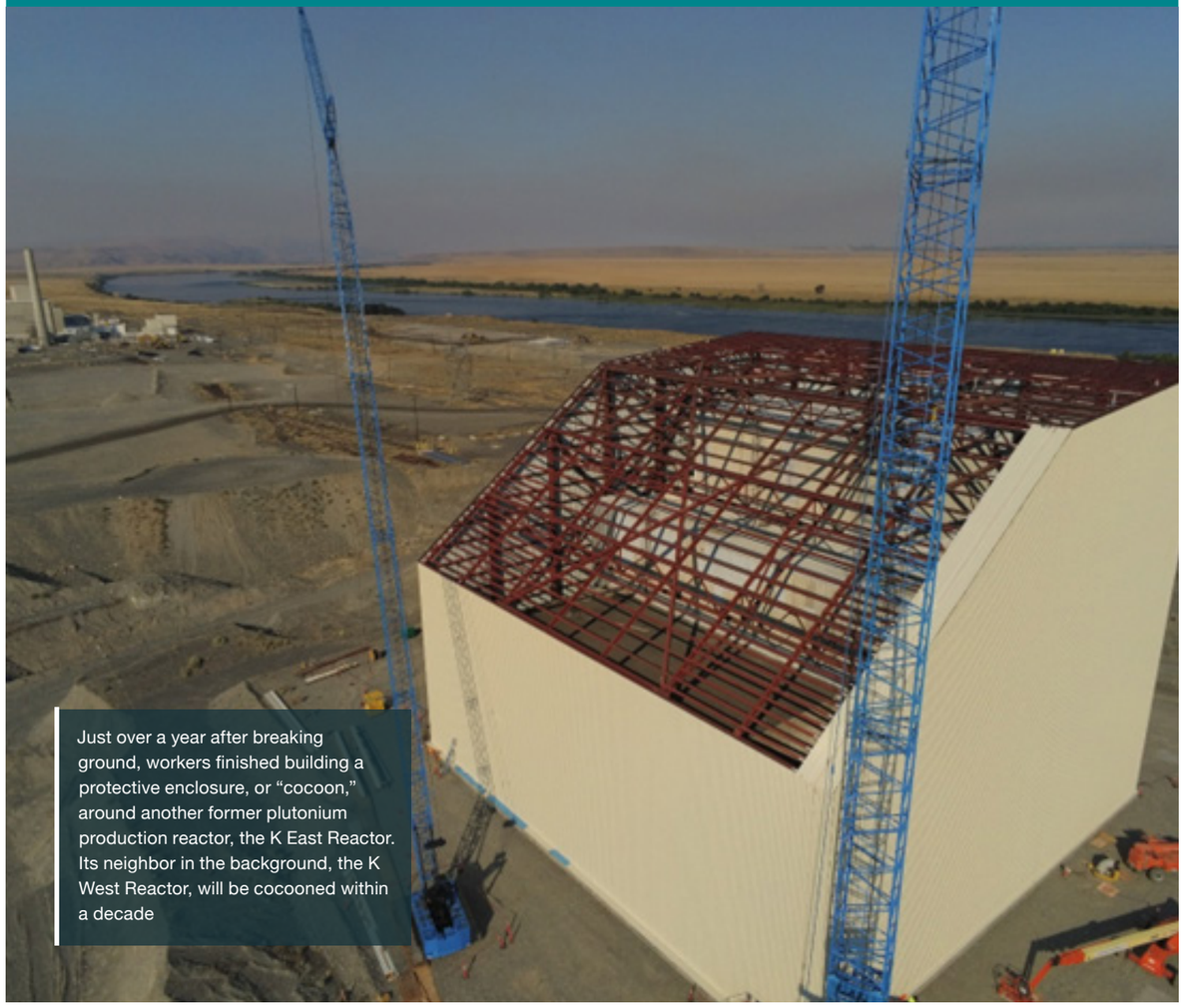
Cleanup activities at Hanford are governed by the Tri-Party Agreement. Some cleanup activities are also governed by a Consent Decree between DOE and the State of Washington.

- **Complete LERF and ETF upgrades to support DFLAW hot commissioning — 2023**
- **Complete LAW Facility hot commissioning and begin production-scale tank waste disposition — 2025**
- **Complete remedial actions for contaminated soil beneath the 324 Building — 2030**
- **Remove all mixed waste containers currently located at the Central Waste Storage Complex from outside Storage Areas A and B — 2026**
- **Transfer cesium/strontium capsules to dry storage — 2025**
- **Complete single-shell tank retrievals in A/AX Farms — 2028**
- **Initiate certification activities by processing TRU waste container — 2026**
- **Complete interim safe stabilization for K West Reactor — 2024**
- **Substantially complete construction of the WTP High-Level Waste Facility – 2030**
- **Start cold commissioning of the HLW Facility — 2032**

**Some scheduled milestones have been revised due to COVID. DOE will continue to work with regulators to revise milestones, as needed*

Post-2033 Cleanup Scope

Post-2033, cleanup activities at Hanford are expected to include continued tank waste retrieval and treatment, along with tank closure activities; construction of additional waste treatment facilities; TRU waste treatment and shipments for disposal; and extensive facility demolition and waste site remediation activities. Most of the River Corridor and Central Plateau Outer Area remediation activities, including active groundwater treatment, will be nearly completed, allowing for a greater focus on the extensive waste sites and facilities surrounding the B Plant, PUREX, REDOX, U Plant, and T Plant processing canyons on the Central Plateau. The Hanford Site infrastructure will consistently be right-sized and reconfigured to support the focused efforts on the Central Plateau. DOE currently anticipates completing cleanup activities at Hanford in the 2078-2091 timeframe.



Just over a year after breaking ground, workers finished building a protective enclosure, or "cocoon," around another former plutonium production reactor, the K East Reactor. Its neighbor in the background, the K West Reactor, will be cocooned within a decade

Idaho Cleanup Project

Overview

The INL Site was established in 1949 as the National Reactor Testing Station. The original mission of the INL Site was to develop and test civilian and defense nuclear reactor technologies and manage SNF. Fifty-two reactors — most of them first of a kind — were built at the site, including the Navy's first prototype nuclear propulsion plant. Of the 52 reactors, four remain in operation.

In 1951, the INL Site achieved one of the most significant scientific accomplishments of the century — the first use of nuclear fission to produce a usable quantity of electricity at the Experimental Breeder Reactor No. 1 (EBR-I). The EBR-I is now a registered National Historic Landmark open to the public.

The Idaho Cleanup Project (ICP) at the INL Site is responsible for treating, storing, and dispositioning a variety of radioactive and hazardous wastes; removing and dispositioning targeted buried waste; removing or deactivating unneeded facilities; and managing — and ultimately removing — SNF and HLW from Idaho. Activities are primarily performed at the Radioactive Waste Management Complex (RWMC) and the Idaho Nuclear Technology and Engineering Center (INTEC) facilities.

ICP conducts briefings regularly with Tribal, state, and local officials. ICP often provides updates about cleanup activities to the Shoshone-Bannock Tribes, the Idaho Department of Environmental Quality, the Idaho Cleanup Project Citizen's Advisory Board, and the Idaho congressional delegation's regional staff.

Inside the Integrated Waste Treatment Unit control room as operators prepare to introduce radiological sodium-bearing liquid waste into the facility.

Calendar Year 2022 Accomplishments

- **Completed exhumation of 5.69 acres of the Radioactive Waste Management Complex Subsurface Disposal Area—an EM 2022 priority**
- **Retrieved the last of the Advanced Test Reactor's spent nuclear fuel elements from a storage basin and transferred them to a nearby dry-storage facility**
- **Completed demolition of the S1W reactor support buildings B608/625 at the Naval Reactors Facility**
- **Completed a successful Confirmatory Run at the Integrated Waste Treatment Unit, a key step in preparing the facility for radiological operations**

Planned Cleanup Scope 2023–2033

Over the coming decade, cleanup activities at the INL Site will focus on completing treatment of remaining liquid sodium-bearing waste, facility decontamination and demolition, shipment of remaining TRU waste, and decommissioning and closure of facilities at the RWMC and INTEC.

With the completion of buried waste exhumation at the RWMC, work is now underway to close and demolish waste processing facilities at the Subsurface Disposal Area (SDA). The SDA will be closed and permanently capped to meet a 2028 requirement. RWMC area closure is planned for 2028.

Post-2033 Cleanup Scope

At INTEC, HLW processing and SNF packaging are expected to be completed in the 2030s. In support of the Office of Nuclear Energy, processing and shipping remote-handled TRU, mixed low-level waste (MLLW), and low-level waste (LLW) will continue into the 2040s. After closure of the RWMC and INTEC facilities, the area will continue to be monitored and assessed for any further needed remediation as part of DOE's long-term stewardship. DOE currently anticipates completing cleanup work at the INL Site in the 2049-2060 timeframe.

Activities at INTEC will increase for sodium-bearing waste, calcine, and SNF operations during the coming decade. Sodium-bearing waste processing at the IWTU is expected to finish by the end of 2028. The calcine retrieval and processing systems needed to make the waste road-ready are in their early stages of development. Mockups of the waste retrieval and bin set cleaning systems are being tested and readied for installation. The capabilities for calcine waste processing will be developed, installed, and placed into operations. For SNF, wet-to-dry storage transfers were completed nine months early in March 2023. Additionally, fuel packaging capabilities will be developed, installed, and packaging operations commenced to make the fuel ready for shipment out of Idaho.

EM will support Naval Reactors by demolishing the S1W, A1W, and S5G reactor prototypes and associated buildings, freeing up several acres at the Naval Reactors Facility.

Lastly, EM will expand the capacity of its onsite low-level waste disposal facility to support cleanup operations across the entire 890-square-mile Site. This expansion will allow for safe, cost-effective disposal activities of contaminated soil and debris until 2050.

Key Regulatory Milestones 2023–2033

The regulatory milestones are contained in the 1995 Idaho Settlement Agreement (ISA), 2019 Supplemental Agreement (SA), the Agreement to Implement the ISA (AI), the Site Treatment Plan (STP), and the Federal Facility Agreement Compliance Order (FFACO). The milestones include:

- **Idaho provides at least 55 percent of transuranic waste shipments to WIPP, based on an annual three-year average (SA)**
- **Completed SNF wet-to-dry storage transfers — 2023 (ISA)**
- **Commence treatment of calcine waste — 2024 (STP)**
- **Complete certification of original volume TRU waste — 2024 (STP)**
- **Complete sodium-bearing waste operations — 2028 (STP)**
- **Complete SDA cap — 2028**

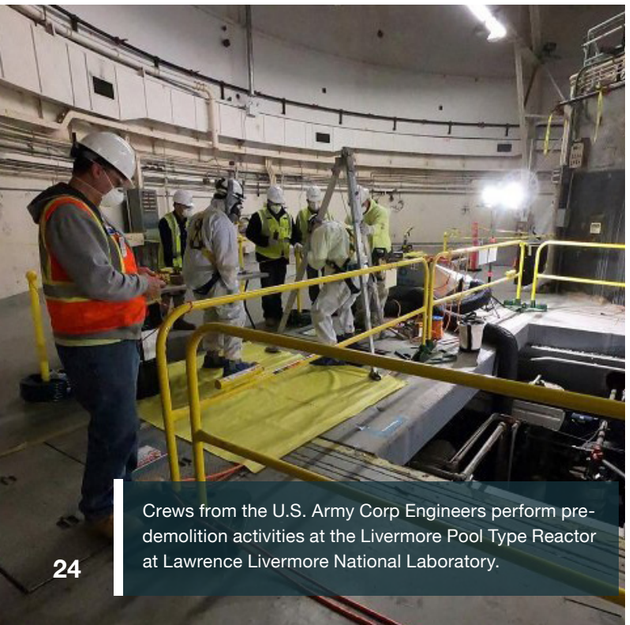
Lawrence Livermore National Laboratory

Overview

Located in California, LLNL was established in 1952 as a multidisciplinary R&D center focusing on weapons development and stewardship and homeland security. At the LLNL main site, EM has been tasked by Congress to demolish several excess facilities. LLNL Site 300 is a remote experimental testing facility where the department conducts research, development, and testing of high explosives and integrated non-nuclear weapons components. EM is responsible for addressing the remaining groundwater contamination issues at Buildings 812, 850 and 865 at Site 300.

Calendar Year 2022 Accomplishments

- **Completed characterization and began demolition prep activities at Building 251, a high-risk excess facility - meeting an EM 2022 priority**
- **Completed the Building 280 Reactor Removal Project**
- **Completed the Building 175 demolition to slab project, removing a high-risk excess facility**



Crews from the U.S. Army Corp Engineers perform pre-demolition activities at the Livermore Pool Type Reactor at Lawrence Livermore National Laboratory.

Planned Cleanup Scope 2023–2033

At Site 300, EM will address the remaining legacy cleanup scope by moving forward with selecting and implementing remedial actions for Building 812, Building 865, and Building 850 groundwater. An amended ROD documenting the selected treatment path forward is expected to be issued in 2028. Implementation of the selected path forward is anticipated to be initiated in 2031, and responsibility for the completed actions is anticipated to be transferred to NNSA in 2033.

Over the next decade, based on NNSA mission needs, EM anticipates continuing to perform demolition work on remaining higher risk excess facilities. These facilities include Building 251 (Heavy Elements Facility), Building 292 (Rotating Target Neutron Source), Building 241 (Pluto Project Testing and Fabrication Facility), Building 343 (Explosives and High-Pressure Testing Facility), LS212/Building 212 (Accelerator Facility), and other process contaminated facilities.

Key Regulatory Milestones 2023–2033

The key regulatory milestones listed below for soil and water remediation are required by the Lawrence Livermore National Laboratory Site 300 Federal Facility Agreement and the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA).

- **Final remedial investigation/feasibility study (RI/FS) for Building 865 part 2 — 2025**
- **Final RI/FS for Building 812 — 2025**
- **Final proposed plan for Building 812, Building 865, Building 850 perchlorate in groundwater — 2027**
- **Final ROD amendment for Building 812, Building 865, and perchlorate in Building 850 groundwater — 2028**
- **Final remedial design for Building 812, Building 865, and perchlorate in Building 850 groundwater — 2029**

The Livermore Pool Type Reactor, which was deactivated and decommissioned in 1981.

Post-2033 Cleanup Scope

None identified at this time, although there may be additional work if additional excess facilities are identified and transferred to EM for demolition

Los Alamos National Laboratory

Overview

The EM Los Alamos Field Office (EM-LA) is dedicated to the cleanup of legacy contamination left behind by nuclear weapons production and research during the Manhattan Project and Cold War era at LANL in New Mexico. EM-LA's cleanup mission includes legacy waste remediation and disposition, soil and groundwater remediation, and deactivation and decommissioning of excess buildings and facilities. Waste generated after 1999 is the responsibility of the NNSA Los Alamos Field Office.

Of the more than 2,100 areas of concern of potential contamination originally identified at LANL, 60 percent have been investigated, remediated, and closed. These areas range from small spill sites with a few cubic feet of contaminated soil to large landfills encompassing several acres. EM-LA is working to characterize and address two legacy groundwater contamination plumes. One plume contains hexavalent chromium and is being managed by a pump-and-treat system on an interim basis while a final remedy is under development. The second plume contains chemical constituents, including Royal Demolition Explosives (RDX), which were used widely in World War II and the Cold War.

Approximately 500,000 cubic meters of legacy hazardous and radioactive waste is located at LANL. Most of this waste is buried in 26 material disposal areas (MDAs). Eight of these MDAs have been closed. There are approximately 3,200 cubic meters of legacy TRU waste stored at Technical Area 54 destined for disposal at WIPP. The waste is stored in configurations protective of the environment, workers, and the public.

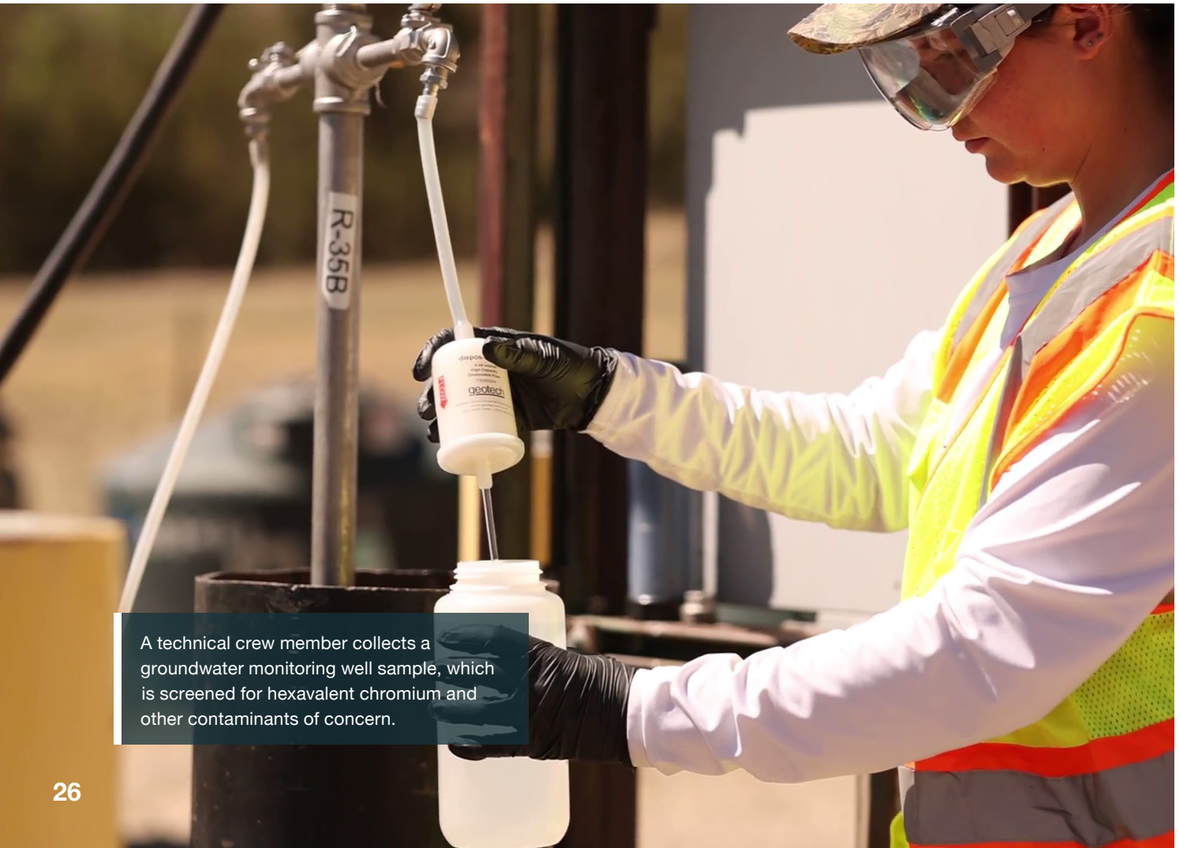
As part of its ongoing commitment to transparency and maintaining a regular dialog with the Accord Pueblos and other local communities on legacy cleanup, EM-LA frequently participates in discussions on its mission at stakeholder-led events, such as Northern New Mexico Citizens' Advisory Board meetings, Accord Technical Exchange meetings, and Los Alamos County Council meetings. EM-LA also hosts public Environmental Management Cleanup Forums and meets monthly with LANL Legacy Cleanup Technical Working Group stakeholders.

In 2022, EM-LA began implementing efforts for the Justice40 Initiative, which directs certain federal investments to achieve a goal that 40 percent of the overall benefits flow to disadvantaged communities. Justice40 Initiative engagements have been conducted with stakeholders, pueblos in northern New Mexico, local community organizations, and the public to develop a deeper understanding of how EM-LA could further support disadvantaged communities. EM-LA will continue engagement and efforts to support the Justice40 Initiative.

EM-LA has also started the process of developing a long-term strategic vision to enhance the way it approaches legacy cleanup. EM-LA is actively engaging with a diverse group of stakeholders, pueblos, local communities and organizations, advocacy groups, regulators, and the public. The feedback, values, and opinions obtained from listening sessions will be incorporated into the EM-LA Strategic Vision to prioritize work scope for future legacy cleanup projects.

Calendar Year 2022 Accomplishments

- **Completed 64 TRU waste shipments to WIPP - exceeding an EM 2022 priority**
- **Commenced corrugated metal pipe retrievals at Technical Area 54 (TA-54), Area G**
- **Started up TRU waste remediation operations in Dome 231 at TA-54, Area G for treatment of drums not compliant for WIPP**
- **Disposed of 2,887 cubic meters of LLW and MLLW**
- **Installed two new monitoring wells (R-71 and R-72) for hexavalent chromium plume control and characterization**



A technical crew member collects a groundwater monitoring well sample, which is screened for hexavalent chromium and other contaminants of concern.

Environmental crew members conduct excavation to clean up contamination in Lower Water Canyon near one of Los Alamos National Laboratory's Cold War-era underground explosives firing chambers.

Planned Cleanup Scope 2023–2033

Over the coming decade, DOE will focus on addressing the groundwater contamination plumes, processing TRU waste stored aboveground, and retrieving below-ground TRU waste for disposal. DOE will continue work to complete disposition of LANL TRU waste currently in storage at the Waste Control Specialists commercial disposal site in Texas.

Work is underway to retrieve 158 corrugated metal pipes (CMPs) containing cemented waste from a former LANL radioactive liquid waste treatment facility at TA-54, Area G. Following retrieval, the CMPs will be characterized and resized for shipment to WIPP. In 2024, the CMPs will be ready for shipment to WIPP.

At the Middle DP Road Site—where Manhattan Project contamination was remediated on Los Alamos County land—EM-LA is evaluating additional confirmation samples collected to determine whether there is a need for further excavation. An assessment report with confirmatory sampling results will be submitted to the New Mexico Environment Department (NMED) in 2023.

Site investigations will continue and, where required, contaminated soil will be removed from the site and transported for disposal. In 2023, EM-LA will continue to work with NMED on a strategy to transition from groundwater characterization to a final remedy for the hexavalent chromium plume.

Deactivation and decommissioning of Building 257, industrial waste lines, and DP West slabs in Technical Area 21 (TA-21) is anticipated in 2025. This will be followed by the investigation and remediation of the TA-21 Solid Waste Management Units and Areas of Concern. The Southern External Boundary and Pajarito Watershed Campaigns will be completed in succession, finishing in 2026, investigating and closing over 200 legacy contamination sites. The latter part of the decade will see considerable focus on completing the closure of MDAs.

Over the next decade, work at TA-54 will center on processing and disposal of above-ground waste inventories, and processing of retrievably stored below-grade TRU waste. Waste treatment processing lines are currently active but will be modified to address the range of materials requiring treatment. Retrieval processes will be developed for below-ground legacy waste, as necessary, to exhume waste containers of various sizes and content. Some waste items will require size reduction to facilitate packaging for transport.

Key Regulatory Milestones 2023–2033

The 2016 Compliance Order on Consent (2016 Consent Order) between DOE and NMED establishes an annual process by which both agencies jointly agree to between 10 to 20 enforceable milestones to be completed during the fiscal year. DOE and NMED also mutually establish between 10 and 20 targets for each of the next two fiscal years. In addition to enforceable annual milestones, there are a significant number of other deliverables that DOE completes during the fiscal year per the 2016 Consent Order.

Post-2033 Cleanup Scope

Activities associated with the deactivation and decommissioning of TA-54 structures and subsequent closure of MDA G and MDA L are expected to extend beyond 2033. This work will require additional facility infrastructure to safely excavate and process waste for shipment to WIPP.

Input received during the EM-LA Strategic Vision process will be considered in developing EM-LA's remedy proposals for remaining legacy cleanup work. The remedies selected by NMED may change the current estimated completion dates.

With the mobile-loading unit, Newport News Nuclear BWXT-Los Alamos operators secure the TRUPACT lid prior to shipping Los Alamos National Laboratory's legacy transuranic waste to the Waste Isolation Pilot Plant.

Moab

Overview

The Moab Uranium Mill Tailings Remedial Action Project (Moab Site or Project) is located in southeastern Utah. Its 480-acre Moab Site includes a former uranium-ore processing facility that operated under private ownership from 1956 to 1984. The Project includes relocation of the estimated 16-million-ton pile of uranium mill tailings and other contaminated material near the Colorado River to an engineered disposal cell constructed 30 miles north near Crescent Junction, Utah. The scope also includes remediation of contaminated groundwater at the Moab Site. After contaminated soil, tailings, debris, vicinity properties, and groundwater are remediated, the Moab Site may be transferred to the Office of Legacy Management (LM) for continued groundwater monitoring and potential reutilization of the site. The Crescent Junction Site will also be transferred to LM for monitoring and required stewardship of the disposal cell.

Calendar Year 2022 Accomplishments

- Disposed of a cumulative total of 13 million tons of uranium mill tailings out of the original total of 16 million tons --- meeting an EM 2022 priority
- Removed a cumulative total of more than 979,000 pounds of ammonia and 5,578 pounds of uranium from groundwater, diverting those constituents from the Colorado River
- Improved the disposal cell cover to make it better suited for the site's arid climate increase long-term performance and reliability

Planned Cleanup Scope 2023–2033

Over the next several years, DOE expects to ship nearly one million tons of uranium mill tailings annually to the Crescent Junction disposal site. As a result, DOE expects to complete the relocation and disposal of the pile by 2027. It will take an additional two years to complete the restoration of the Moab Site, dispose of potentially contaminated equipment and intermodal containers, and install the cover on the disposal cell.

DOE also plans to continue transportation and disposal of oversize debris from the Moab Site, including 14 autoclaves decommissioned by the Atlas Minerals Corporation. They are assumed to weigh at least 40 tons each and could be filled with asbestos. Transportation of oversize debris will continue through 2027.

Key Regulatory Milestones 2023–2033

- Submittal of Groundwater Compliance Action Plan (GCAP) to Nuclear Regulatory Commission - 2025

This sealed steel container of uranium mill tailings brought the Moab Uranium Mill Tailings Remedial Action Project's cumulative total to 13 million tons of the material removed from the Moab Site for disposal at the Crescent Junction, Utah, disposal cell. Moab Project Laborer Alfredo Tellez is pictured holding a banner marking the achievement.

Post-2033 Cleanup Scope

The main cleanup activities at the Moab Site are scheduled to be completed in 2029 with site responsibility potentially transferred to LM approximately two years later after the remaining site restoration work is completed. The Crescent Junction Site will be transferred to LM in this time frame also.

Every five years, a group of Grand County, Utah, volunteers revisit a community vision for the Moab Site should the property be available for reuse after the Project is complete. Stakeholders involved in the update include representatives from the city of Moab; the Bureau of Land Management; Grand County; Utah Division of Forestry, Fire and State Lands; the National Park Service; and local citizens. The public's vision for reuse of the site includes: a park with an event center, multipurpose play areas, a lined lake or swimming pool facility, transportation facilities, a boat ramp, federal offices, a plaza with an "artist village" and performing arts center, trails, and an information center. The committee will revisit the community vision again in 2023.

Nevada National Security Site

Overview

The Nevada National Security Site (NNSS) was used from 1951 to 1992 to conduct a total of 100 atmospheric and 828 underground nuclear weapons tests. As a result, some groundwater, surface soils, and industrial-type facilities were contaminated on the NNSS and the surrounding Nevada Test and Training Range. The EM Nevada Program is responsible for completing cleanup actions at these historic nuclear testing locations. EM Nevada also manages the safe and secure disposal of waste at the NNSS, in support of cleanup and activities at federal sites across the United States involved in nuclear research, development, testing, and ongoing national security and science missions.

Calendar Year 2022 Accomplishments

- **Continued characterization and hazard reduction activities to prepare two legacy facilities for demolition**
- **Obtained regulatory approval of data completeness for the Pahute Mesa groundwater region – the last active groundwater corrective action area at the NNSS**
- **Safely and securely disposed of more than 635,000 cubic feet of LLW, MLLW, and classified waste**

Technicians collect samples from a groundwater well at the NNSS.

Planned Cleanup Scope 2023–2033

The last active groundwater corrective action area at the NNSS is Pahute Mesa, where the investigation phase, including completion of the flow and transport model, was completed in 2022. The external peer review started in 2022 is expected to be completed early 2023. By the end of 2027, EM anticipates completing the model evaluation phase for Pahute Mesa, including the drilling of groundwater wells. By the end of 2028, EM anticipates transitioning the Pahute Mesa groundwater corrective action area into long-term monitoring. This action will complete EM Nevada's groundwater mission at the NNSS. It is anticipated that long-term stewardship responsibilities for closed groundwater corrective action areas will thereafter be transferred to the site landlord, NNSA.

In 2022, the EM Nevada Program continued characterization and hazard reduction activities in preparation for the demolition and closure of two large, unique, and complex legacy nuclear facilities. The facilities are the Engine Maintenance, Assembly, and Disassembly (EMAD) and Test Cell C (TCC) complexes, which supported historical nuclear propulsion rocket development and testing programs. EMAD and TCC represent the last major demolition and closure efforts currently identified in EM Nevada's environmental remediation mission. Demolition of EMAD and TCC will be handled in two phases; the first phase is expected to be complete in 2025 and includes full demolition of TCC and demolition of certain structures at EMAD and the second phase includes demolition of the remaining EMAD superstructure and is scheduled to begin in 2029.

Long-term monitoring of sites closed with contamination left in place will remain the responsibility of EM Nevada until the program completes its environmental restoration mission at the NNSS site. It is currently anticipated that long-term stewardship responsibilities for closed sites will be transferred to NNSA.

The EM Nevada Program will continue to support cleanup and activities at federal sites across the United States involved in nuclear research, development, testing, and ongoing national security and science missions, by disposing of up to 1.2 million cubic feet annually of LLW, MLLW, and classified waste through at least 2030.

Perlite is extracted via a vacuum and hose system from one of the dewars at Test Cell C.

Key Regulatory Milestones 2023–2033

EM Nevada Program activities are primarily regulated by the Federal Facility Agreement and Consent Order (FFACO), an agreement between the State of Nevada and the Department of Energy governing environmental corrective actions at sites impacted by historical nuclear activities. A supplemental Agreement in Principle between the Department and the State exists to provide a role for the Nevada Division of Environmental Protection in oversight of NNSS LLW disposal operations. The federal Resource Conservation and Recovery Act, which regulates hazardous waste management, also governs certain aspects of MLLW disposal at the NNSS.

- **Submit the TCC facility closure report - 2023**
- **Submit the EMAD facility closure report - 2024**
- **Submit closure reports for the Pahute Mesa groundwater corrective action area - 2030**

Post-2033 Cleanup Scope

The EM Nevada Program is currently scheduled to finish its cleanup mission by 2035, which will ultimately involve the completion of all active environmental restoration activities and the conveyance of remediated sites for long-term stewardship.

Oak Ridge

Overview

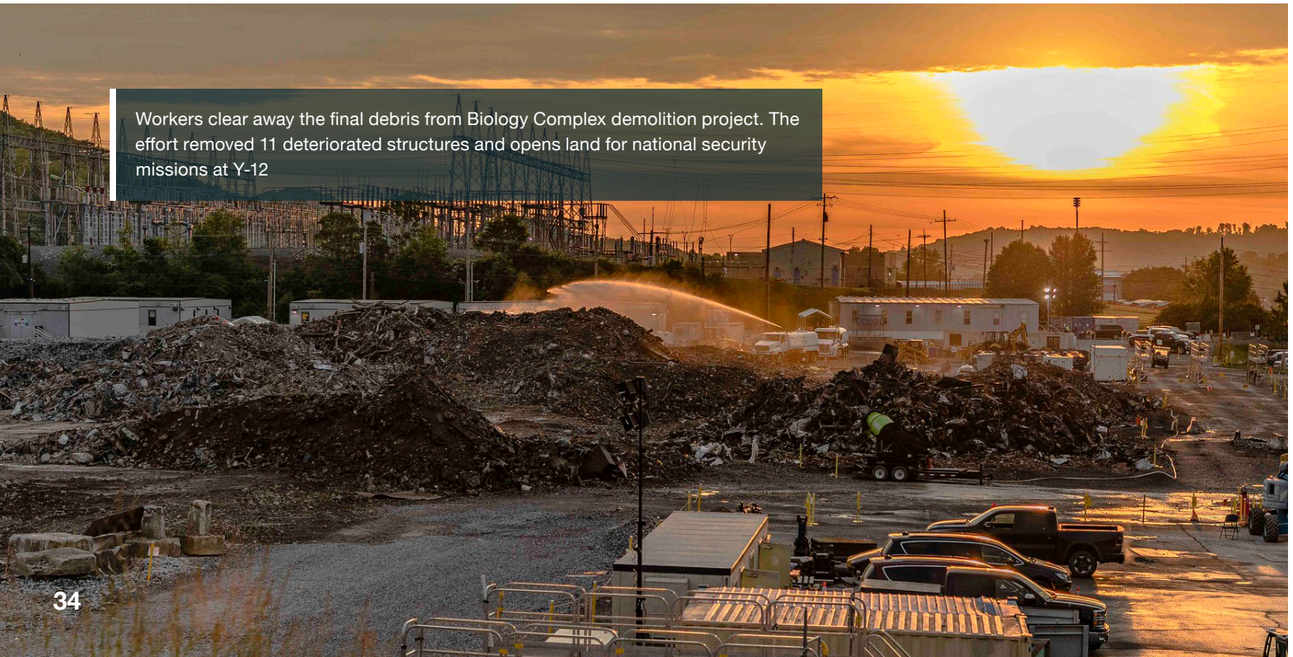
The Oak Ridge Site, located in eastern Tennessee, is one of the three original sites in the Manhattan Project. The U.S. Army Corps of Engineers began acquiring land in the area in October 1942. By March 1943, 56,000 acres were sealed behind fences and major industrial facilities were under construction. The K-25 and Y-12 plants were built to explore different methods to enrich uranium, while the X-10 Site was established as a pilot plant for the Graphite Reactor and to explore methods for the production of plutonium.

Throughout the following decades, the three sites — K-25 (present day East Tennessee Technology Park (ETTP)), X-10 (present day Oak Ridge National Laboratory (ORNL)), and Y-12 — purified isotopes, conducted advanced research, manufactured weapons components, and enriched uranium. These activities created environmental legacies that placed Oak Ridge on EPA's National Priorities List in 1989.

The Oak Ridge Office of Environmental Management (OREM) is responsible for the CERCLA cleanup at Y-12 and ORNL. OREM has achieved significant risk reduction across the Oak Ridge site, including the removal of all facilities at ETTP. Now a new chapter of cleanup is underway in Oak Ridge.

With demolition complete at ETTP, OREM transitioned the skilled, experienced workforce from there to address the many high-risk facilities at ORNL and Y-12. Demolition prep and deactivation work is already underway at numerous buildings at those sites. OREM's work will address DOE's largest inventory of high-risk, excess contaminated facilities (former research reactors, isotope production facilities at ORNL, and former process buildings and former process buildings at Y-12); eliminate the site's remaining inventory of uranium-233; and remediate areas with dense mercury contamination to provide valuable real estate for NNSA and SC missions.

Throughout all this work, OREM works to keep the surrounding communities in Anderson and Roane counties and the city of Oak Ridge safe and informed. The program also fosters and maintains strong partnerships by involvement with organizations focused on economic opportunities including the East Tennessee Economic Council, Energy Technology and Environmental Business Association, Chamber of Commerce, and the Community Reuse Organization of East Tennessee. OREM launched a first-of-a-kind news program to raise awareness about its impact and mission. Additionally, OREM leadership provides updates and is available to answer the public's questions at monthly Oak Ridge Site Specific Advisory Board meetings and at other organized public events.



Workers clear away the final debris from Biology Complex demolition project. The effort removed 11 deteriorated structures and opens land for national security missions at Y-12

OREM representatives also regularly correspond with local city and county officials.

Calendar Year 2022 Accomplishments

- **Completed cleanup and transfer of Biology Complex area – a 2022 EM priority**
- **Began processing uranium-233 material in hot cells – a 2022 EM priority**
- **Completed demolition on the Bulk Shielding Reactor at ORNL**
- **Completed demolition on the Criticality Experiment Laboratory at Y-12**
- **Finished construction of the Sludge Processing Mock Test Facility**
- **Signed the final Record of Decision with regulators for the Environmental Management Disposal Facility**
- **Transitioned to the new end-state contract for cleanup on the Oak Ridge Reservation**

Planned Cleanup Scope 2023–2033

Over the next 10 years, OREM expects to make significant progress on cleanup activities at Y-12 and ORNL to help support the important missions of NNSA and SC, as well as eliminating one of the largest remaining security risks at ORNL.

OREM successfully completed demolition at ETTP in 2020 and has made significant progress addressing areas with impacted soil. OREM is slated to complete remaining soil remediation at ETTP by 2024. By 2028, OREM plans to implement all required groundwater treatment remedies, transfer all economically viable parcels of land to the community for reuse, and transfer conservation areas to the Tennessee Wildlife Resources Agency. By 2029, all remaining portions of ETTP will transition to long-term stewardship.

Large scale cleanup operations are now underway up at ORNL and Y-12. In 2022, EM demolished high-risk structures that eliminated risks and opened land for ongoing missions at both sites. Crews tore down the former Criticality Experiment Lab at Y-12 and the Bulk Shielding Reactor at ORNL. The latter's demolition marked the first removal of a former reactor is ORNL's central campus and starts a major transformation in the heart of that site. Crews also prepared former enrichment facilities for demolition at Y-12, and they advanced deactivation at former reactors and isotope labs at ORNL.

In 2023, OREM will continue deactivation at several former enrichment facilities at Y-12 and numerous former reactors and isotope labs at ORNL. Crews are slated to tear down the Low Intensity Test Reactor. They are also scheduled to demolish the East Cell Bank at the former Radioisotope Development Lab in ORNL's central campus. That effort removes the last of the building's six hot cells and eliminates a highly contaminated structure. OREM will also continue removing inventories of nuclear and TRU waste this year. Teams are actively processing and dispositioning the inventory of high-dose uranium-233 and processing and shipping Oak Ridge's inventory of transuranic debris waste.

In 2025, the Outfall 200 Mercury Treatment Facility is expected to be operational at Y-12. The facility will be able to treat 3,000 gallons of water per minute, and it will include a two-million-gallon storage tank to collect stormwater. It is a key piece of infrastructure that will enable OREM to begin large-scale mercury cleanup at Y-12.

By 2027, OREM expects to complete demolition activities at ORNL's Central Campus. In addition, two Manhattan Project-era buildings at Y-12 that supported uranium enrichment, Beta-1 and Alpha-2, will also be brought down by 2027. OREM expects to have all mercury-contaminated buildings at Y-12 demolished by the end of 2031.

OREM is expected to finish processing, downblending, and disposing the remaining inventory of uranium-233 stored at ORNL by 2028. This is EM's highest priority at ORNL because it drives the security posture of the site. The completion of this project will significantly reduce risks and security costs, and it will enable deactivation of a Manhattan Project- era facility located in the heart of ORNL. All of the processing and shipments of Oak Ridge's inventory of legacy TRU debris waste will also be completed that year. This inventory includes both contact-handled and remote-handled waste.

In 2029, OREM expects to complete construction on the first phase of the new Environmental Management Disposal Facility. This crucial facility will provide the

on-site waste disposal capacity for LLW generated from completing cleanup at ORNL and Y-12.

Key Regulatory Milestones 2023–2033

Cleanup of the Oak Ridge Reservation is governed by a Federal Facility Agreement among DOE, EPA, and the Tennessee Department of Environment and Conservation. This agreement establishes the guidelines and milestones for cleanup in Oak Ridge in accordance with CERCLA and other laws.

- **Complete the Record of Decision (ROD) for Final Soils Actions in Zone 1, ETTP — 2023**
- **Complete ETTP Main Plant Area groundwater interim ROD — 2023**
- **Preparing for demolition of ORNL Central Campus Research Reactor Complex — 2023**
- **Complete demolition of Building 3005 and Building 3010 — 2023**
- **Start demolition on the Old Steam Plant at Y-12 – 2023**
- **Complete demolition on the former Criticality Experiment Laboratory at Y-12 –2023**

Heavy equipment tears into the massive six-story Building 9207 at Y-12 as crews work to remove excess contaminated facilities at the site

Post-2033 Cleanup Scope

At Oak Ridge, the remaining work will focus on completing cleanup at ORNL and Y-12. This will include deactivating and demolishing the remaining excess contaminated facilities, remediating soil and groundwater, and addressing source contamination. OREM will also work to complete the processing of 400,000 gallons of TRU sludge and operate the program's waste treatment and disposal facilities. DOE currently expects to complete cleanup at Oak Ridge by 2047.

Paducah

Overview

In 1950, the Atomic Energy Commission (AEC), a predecessor agency to DOE, selected a 3,556-acre tract of government-owned land near Paducah, Kentucky, in McCracken County, as the location to construct a second Gaseous Diffusion Uranium Enrichment Plant (GDP) to support U.S. national security needs. The Paducah GDP enriched uranium from 1952 to 2013 and was the last government-owned uranium enrichment facility operating in the United States. The Paducah GDP produced low-enriched uranium originally as feedstock for nuclear weapons materials and later for commercial nuclear power plants.

Environmental cleanup of the Paducah GDP began in 1988 when groundwater contamination resulting from plant operations was discovered outside of the DOE property. Environmental cleanup includes remediation of groundwater, surface water, soil, lagoons, and burial grounds. All of the more than 500 facilities and buildings will be evaluated for removal and/or remediation, including four process buildings measuring more than 74 acres under roof.

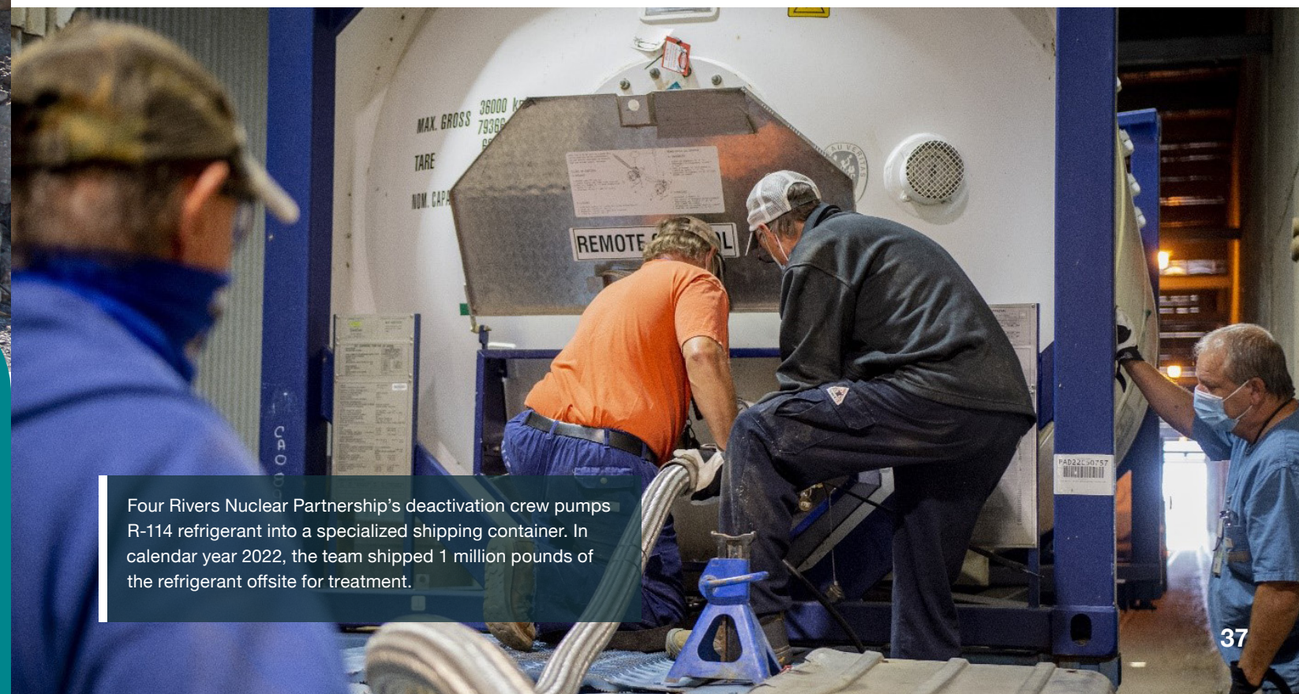
The Paducah Site is also home to one of two DOE depleted uranium hexafluoride (DUF6) conversion plants. DUF6 was a byproduct from uranium enrichment operations at Oak Ridge, Tennessee; Portsmouth, Ohio; and Paducah, Kentucky. DOE is safely converting the DUF6 material from approximately 67,000 steel cylinders at the Portsmouth and Paducah sites to more stable and usable compounds. At Paducah, the DUF6 conversion facility began operation in 2011.

Calendar Year 2022 Accomplishments

- **Completed disposition of 1 million pounds of hazardous refrigerant R-114 --- meeting an EM 2022 priority**
- **Completed construction of the Large Item Neutron Assay System facility**
- **Completed Southwest Plume Solid Waste Management Unit 211-A bioremediation field work**

Planned Cleanup Scope 2023–2033

At Paducah, work over the next decade will continue to focus on remediating a trichloroethylene (TCE) groundwater contamination plume, along with activities to prepare the site's former uranium enrichment process buildings for demolition.



Four Rivers Nuclear Partnership's deactivation crew pumps R-114 refrigerant into a specialized shipping container. In calendar year 2022, the team shipped 1 million pounds of the refrigerant offsite for treatment.

During calendar year 2022, EM's Paducah Site packaged 1 million pounds of ozone-depleting R-114 refrigerant for offsite shipment and treatment using specialized containers like the one pictured here on a flatbed trailer.

In 2024, DOE anticipates issuing a ROD to identify the final remedial action for the C-400 Complex. The C-400 Complex includes the C-400 Cleaning Building, which utilized TCE for cleaning equipment. As part of the remediation of the C-400 Complex, DOE expects to begin fieldwork for C-400 Remedial Action at Paducah in 2025.

Over the next decade, DOE plans to complete deactivation work at the C-333 Process Building, one of the four large former enrichment process buildings at the site. These activities include hazard removal (including refrigerant, chemicals, fire hazards, etc.), characterization of the components within the facility, and other actions to prepare the C-333 Process Building for demolition. DOE is actively leveraging lessons learned from the work underway to deactivate and decommission former enrichment process buildings at the Portsmouth site to aid and improve activities at Paducah.

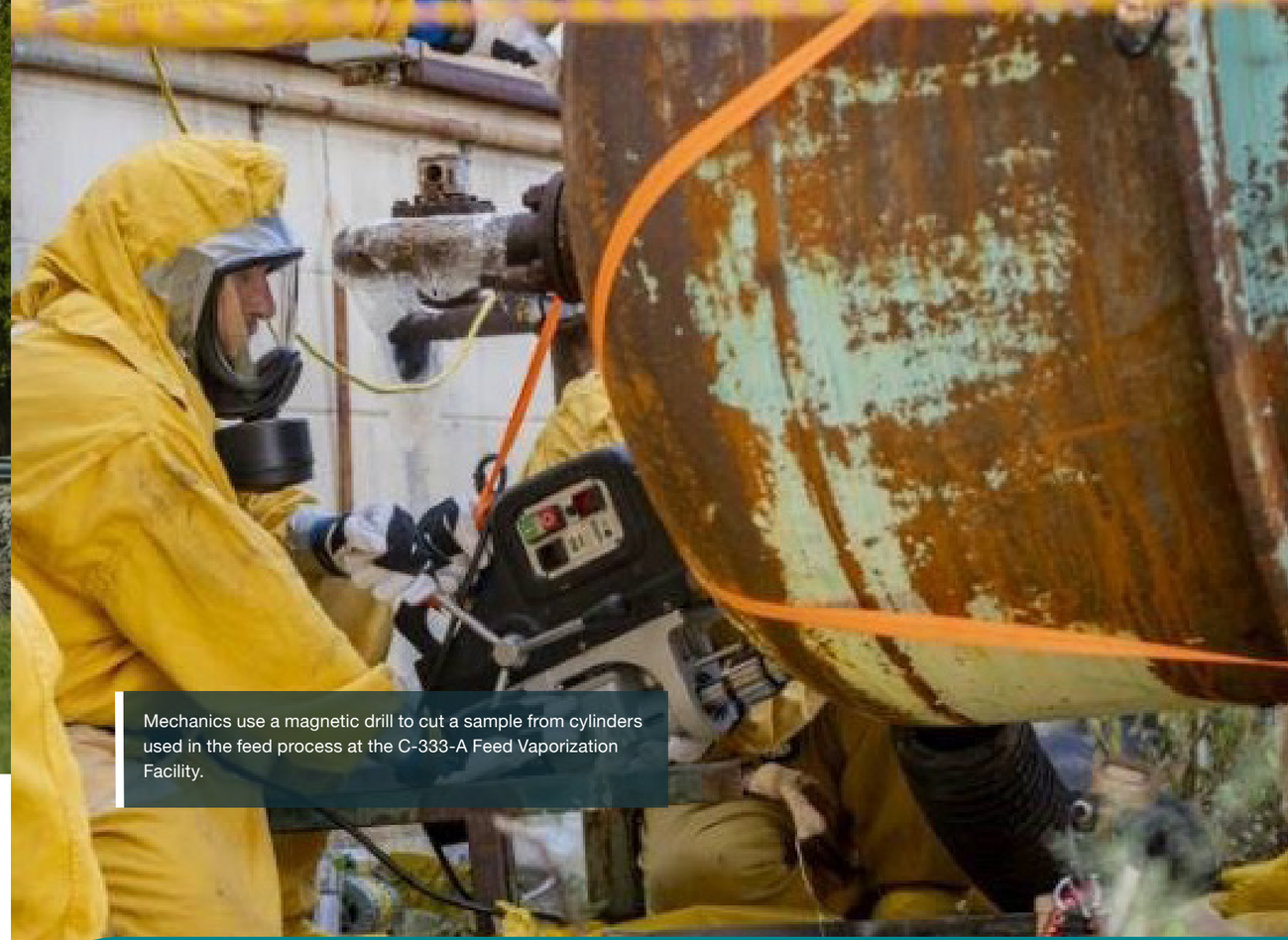
By 2027, Paducah is also expected to begin the regulatory documentation process to determine the waste disposal options associated with demolition of the process buildings and balance of plant cleanup activities.

At the DUF6 facility in Paducah, DOE plans to complete a major upgrade outage, resume steady state conversion operations, complete Integrated Control System upgrade modifications and re-line the Hydrogen Fluoride storage tanks. DOE will also complete shipments of railcars and continue progress on infrastructure upgrades supporting uranium oxide disposal.

Over the next 10 years, the plant expects approximately 73,500 metric tons of DUF6 material will be converted, and approximately 11 million gallons of hydrogen fluoride will be shipped off site for commercial use.

Key Regulatory Milestones 2023–2033

- **Complete RI/FS for C-400 final remedial action — 2023**
- **Complete proposed plan for C-400 final remedial action — 2023**



Mechanics use a magnetic drill to cut a sample from cylinders used in the feed process at the C-333-A Feed Vaporization Facility.

Post-2033 Cleanup Scope

Beyond 2033, site activities will include implementation of the selected remedy for waste disposal and continued demolition of the more than 500 site facilities. The remaining environmental cleanup activities related to groundwater, surface water, soils, lagoons, and burial grounds are expected to also be completed. DOE expects to complete disposition of DUF6 located at Paducah by 2057. DOE currently projects completing cleanup activities at Paducah in the 2065-2070 timeframe.

As future cleanup progresses, the planned Paducah end state is intended to allow the site to be used for light/heavy industrial purposes. This end state was developed in 2011 through a process conducted by the University of Kentucky that captured stakeholder input through a series of community meetings and integration of input from public, stakeholder, regulatory, and local community leaders. DOE continues to solicit and obtain stakeholder input through monthly meetings with the Paducah Citizens Advisory Board and community leaders.

Portsmouth

Overview

In August 1952, the AEC selected a tract of land in the Ohio Valley along the Scioto River in Pike County, Ohio, for the site of the Portsmouth Gaseous Diffusion Uranium Enrichment Plant (GDP), the third of three GDPs in the United States. In 1956, construction of the plant was completed, and the plant began enriching uranium for nuclear weapons. In the 1960s, Portsmouth's mission changed to focus on producing fuel for commercial nuclear power plants and other national security applications.

An extensive environmental cleanup program began at the 3,777-acre site in 1989, with deactivation and decommissioning activities initiated in 2011. The DOE's near-term focus is the deactivation and decommissioning of 415 facilities, including the three former uranium enrichment process buildings (X-326, X-333, and X-330), each measuring over 50 acres of floor area. The site also continues to maintain utility operations, monitor air and water emissions, and operate several groundwater treatment facilities to address legacy groundwater contamination caused by former plant operations.

The Portsmouth Site is also home to one of DOE's two depleted uranium hexafluoride (DUF6) conversion plants. DUF6 was a byproduct from uranium enrichment operations at Oak Ridge, Tennessee; Portsmouth, Ohio; and Paducah, Kentucky. DOE is safely converting the DUF6 material from approximately 67,000 steel cylinders at the Portsmouth and Paducah sites to more stable and usable compounds. At Portsmouth, the DUF6 conversion facility began operation in 2010.

Calendar Year 2022 Accomplishments

- **Completed structural demolition of X-326 Process Building - meeting an EM 2022 priority.**
- **Completed excavation of X-231B landfill for use at the On-site Waste Disposal Facility**
- **Completed construction of three cells (1,4 and 5) for the On-Site Waste Disposal Facility**

Planned Cleanup Scope 2023–2033

Over the next decade, DOE plans to make significant progress in addressing the three former uranium enrichment process buildings at the site, with demolition of two to be completed in that time frame.

In 2023, deactivation work will continue on the second process building to be addressed, Building X-333. This will include size reduction and disposal of large components from the building. X-333 is scheduled to be demolished by 2031. Also, by 2031, DOE expects to complete deactivation of the third and final process building, Building X-330.

The first of an additional three new cells at the On-site Waste Disposal Facility (OSWDF) will be ready to accept waste in the 2025 timeframe to support demolition of the X-333 Process Building. The 5th and 6th cells of the OSWDF will begin accepting X-333 Process Building waste in the 2026 timeframe. Based on capacity needs to support the demolition of X-330 and other remaining site facilities, four-to-six additional OSWDF cells will be constructed. Additionally, over the next decade, two landfills and an additional plume will be excavated and disposed at the OSWDF..

In 2023, the Portsmouth DUF6 conversion facility expects to convert more than 2,000 metric tons of DUF6. DOE will also complete shipments of railcars and continue progress on infrastructure upgrades supporting uranium oxide disposal. By the end of 2033, approximately 56,000 metric tons of DUF6 will be converted and approximately 8.5 million gallons of hydrogen fluoride will be shipped off site for commercial use.

Key Regulatory Milestones 2023–2033

- None

After the recent success of the X-326 demolition, workers continue to deactivate and prepare for demolition of the X-333 and X-330 process buildings at the Portsmouth site.

Post-2033 Cleanup Scope

Beyond 2033, the last three OSWDF cells are expected to be constructed to support the demolition of the X-330 Process Building and remaining balance of plant facilities. In addition, a Resource Conservation and Recovery Act (RCRA) decision will be made regarding final soil remediation. Cleanup activities are anticipated to be completed in the 2039-2043 timeframe, including the disposition of DUF6 located at Portsmouth.

As cleanup reaches its end state at Portsmouth, DOE will continue to transfer land for economic development. Through a grant with Ohio University, a multi-faceted community outreach program was completed to understand the community's future use vision for the Portsmouth site, which led to community interest in an industrial style future use of the site. With the assistance of the PORTS Future Project and interaction with the Southern Ohio Diversification Initiative, the Portsmouth Site Specific Advisory Board, elected officials, economic development professionals, and others, the community has expressed a consensus vision to reindustrialize appropriate portions of the Portsmouth Site property.

Sandia National Laboratories

Overview

EM's cleanup activities at SNL take place at the SNL section located on Kirtland Air Force Base, adjacent to Albuquerque, New Mexico. The Sandia National Laboratories-New Mexico Environmental Restoration (ER) Operations Project scope includes the remediation of inactive waste disposal and release sites, along with the characterization and remediation of three plumes of contaminated groundwater.

The regulatory driver for completing this work is the Compliance Order on Consent signed in 2004 by DOE, the Sandia Corporation, and the NMED. DOE's approach is to work closely with NMED to complete RCRA corrective actions at the last three ER sites using cost-effective approaches that meet regulatory requirements.

The remaining cleanup scope includes three areas with contaminated groundwater in various stages of characterization and remedy selection — the Tijeras Arroyo Groundwater Investigation Area of Concern (AOC), the Burn Site Groundwater Investigation AOC, and the Technical Area-V Groundwater AOC. All soil sites in SNL's baseline have received Corrective Action Complete status from NMED and have been transferred to the laboratory's landlord, the NNSA.

Calendar Year 2022 Accomplishments

- **Proposed groundwater remedies to NMED for consideration**

Planned Cleanup Scope 2023–2033

In 2023, the Tijeras Arroyo Groundwater AOC is planned to transition to long-term stewardship. DOE will continue monitoring activities and expects to provide NMED with any additional analysis in support of beginning the corrective measure process for the Burn Site Groundwater AOC.

Long-term monitoring requirements are expected to transition to NNSA by 2031.

Key Regulatory Milestones 2023–2033

- **None**

Installation of a groundwater monitoring well at the Burn Site Groundwater AOC.

Post-2032 Cleanup Scope

EM work is expected to be completed by this time frame. Long-term monitoring requirements are expected to transition to NNSA by 2031.

Savannah River Site

Overview

The SRS, a 310 square mile site in Aiken, South Carolina, focused on the production of plutonium and tritium for use in the manufacture of nuclear weapons from its inception in the early 1950s until the end of the Cold War. In 1992, the focus at SRS turned to environmental cleanup, nuclear materials management, and R&D activities.

Today, SRS is run by EM and host to NNSA and the U.S. Forest Service. The DOE Savannah River Operations Office (DOE-SR) works in partnership with multiple contractors in technically sophisticated nuclear and non-nuclear facilities. Cleanup activities at SRS include addressing 34.5 million gallons of radioactive liquid waste stored in 43 underground tanks; surplus plutonium downblending with eventual disposition as TRU waste at WIPP; disposition of highly enriched uranium and receipt/storage/processing of foreign and domestic research reactor spent nuclear fuel; facility deactivation and decommissioning; and soil and groundwater remediation.

To date, 317 of 1,126 facilities have undergone deactivation and decommissioning; 412 of 515 waste units across multiple industrial areas have been remediated; and 40 remediation systems are in operation addressing 14 groundwater contamination areas. Notably, collaboration among SRS stakeholders and state and federal regulators resulted in the in-situ decommissioning of P- and R-Area Reactors in 2011 — the first in the DOE complex. Finally, the operational footprint of SRS has been reduced by 85 percent.

SRS processes and stores nuclear materials in support of national defense and U.S. nuclear nonproliferation efforts. SRS is also responsible for operational oversight of the Savannah River National Laboratory (SRNL), EM's only national laboratory. SRNL assists EM in achieving the nation's legacy nuclear waste cleanup objectives and plays an equally important role supporting NNSA through its work in tritium R&D, operations support,

H Canyon employees load drums of a solution used to prepare for material transfer from H Canyon to the Defense Waste Processing Facility at Savannah River Site.

The H Canyon chemical separations facility at the Savannah River Site.

stockpile stewardship, nuclear nonproliferation, and other critical national security programs.

SRS leadership is dedicated to meaningful engagement with stakeholders and the citizens of the Central Savannah River Area. DOE-SR and contractor managers meet regularly with federal and state regulators, business and community leaders, and citizen groups to provide updates on SRS operations and to solicit input regarding the missions and budget priorities. SRS enjoys a positive working relationship with stakeholders who support the vision for the coming decade. SRS stakeholders include EPA, South Carolina Department of Health and Environmental Control (SCDHEC), the Savannah River Site Community Reuse Organization, the SRS Citizens Advisory Board, and a host of state and local elected officials.

Calendar Year 2022 Accomplishments

- **Removed more than 3.5 million curies from the high-level waste tanks**
- **Processed approximately 2.2 million gallons of waste at the SWPF**
- **Completed all concrete placements for SDU 9 - meeting an EM 202 priority**
- **Initiated the Accelerated Basin De-inventory mission to significantly accelerate spent nuclear fuel disposition**
- **Transitioned the 235-F Facility to cold and dark status**
- **Received the DOE Sustainability Award for treatment of legacy contaminant tritium through phytoremediation**

Planned Cleanup Scope 2023–2033

Over the coming decade, DOE expects to significantly enhance its ability to tackle the largest remaining environmental risk at SRS — radioactive tank waste — with the ramp up of new waste treatment facilities. DOE will also make continued progress in addressing nuclear materials stored at SRS, and complete disposition of the remaining TRU waste.

The liquid waste program will achieve significant risk reduction through continued stabilization and immobilization of the high-activity fraction of the waste in a glass waste form and immobilization of the low-level fraction of the waste as a saltstone waste form. The SWPF began hot operations in January 2021 and expects to process up to nine million gallons of waste per year following the implementation of the Next-Generation Solvent.

DOE will continue to perform environmental analyses in an effort toward the use of the department's interpretation of high-level waste for waste streams at SRS. The interpretation was successfully demonstrated in 2020 when a small of amount of DWPF recycle wastewater was shipped to a licensed commercial facility for treatment and disposal. EM has set a priority for 2023 to complete its NEPA analysis for the proposed disposal of contaminated process equipment from SRS.

With the startup and operation of SWPF and its integration with the liquid waste system, substantial progress toward tank closure will continue with up to 22 of the 51 underground tanks set to be closed in the next decade. By 2033, the DWPF is forecast to have produced more than 7,200 canisters of vitrified radioactive waste (more than 85 percent of the anticipated total). The liquid waste program will continue to support receipt of waste from H-Canyon operations.

The near-term nuclear materials disposition program strategic objectives are to continue disposition of legacy material stored in L- and K-Areas, as well as continued surveillance and maintenance of excess, non-operating nuclear facilities awaiting decommissioning. Over the next 10 years, the K-Area facilities will continue to downblend and disposition both EM and NNSA surplus plutonium to produce transuranic waste for disposal at WIPP. In early 2023, Savannah River began shipping downblended plutonium to WIPP. The NNSA capital project for Surplus Plutonium Disposition is underway and will expand the existing downblending capability by installing three new gloveboxes and support systems. The K-Area facilities will continue to provide long-term storage of special nuclear material owned by both EM and NNSA.

The L-Area facilities will continue to provide wet storage of spent nuclear fuel received as part of the domestic and foreign research reactor fuel receipt programs. The Receiving Basin for Off Site Fuels and F/H Analytical

A Motor Specialist replaces long strands of copper wire — a process known as motor rewinding — found within this electric motor for the EM program at Savannah River Site.

Laboratories will complete deactivation activities, enabling transfer to the decommissioning program.

The SRS environmental remediation program employs an approach to address remediation of waste units and facility deactivation and decommissioning per the various site areas. The program will continue to clean up contaminated soils, groundwater, streams and associated wetlands, and legacy waste units, which include ash basins and coal yards. EM is committed to reducing risk and protecting groundwater aquifers and surface waters from the spread of contamination by addressing sources of contamination and employing innovative technologies such as the in-ground reactive barrier wall in P-Area to treat solvent-contaminated groundwater.

In addition, an integral part of the cleanup mission is the deactivation and decommissioning of legacy facilities constructed in support of industrial operations, common infrastructure systems, and past nuclear materials production, such as the 235-F Plutonium Processing Facility, C/K/L Reactors, and F-Area Tank Farm. SRS will continue to operate and maintain soil and groundwater remedial systems, and conduct post-closure and post-ROD care, surveillance, and maintenance of 73 closed areas (approximately 1,000 acres).

EM-NNSA TRANSFER

EM also expects over the next few years to complete transfer of site landlord responsibilities to NNSA. This transfer is being pursued in recognition of the increasing role Savannah River will play in NNSA's ongoing nuclear security missions. EM will remain focused on completing the remaining legacy cleanup activities at the site. A transition plan is expected to be completed by the summer of 2023 that will define responsibilities and management of functions and capabilities for each organization. DOE currently expects the transfer to begin in 2025.

SAVANNAH RIVER NATIONAL LABORATORY

SRNL starts its second year under an independent Management and Operating contract, to grow and modernize to assure it meets DOE's mission needs. SRNL's core missions are to provide innovative and practical solutions to address complex environmental cleanup, long-term stewardship, and nuclear security problems in EM, LM, and NNSA missions.

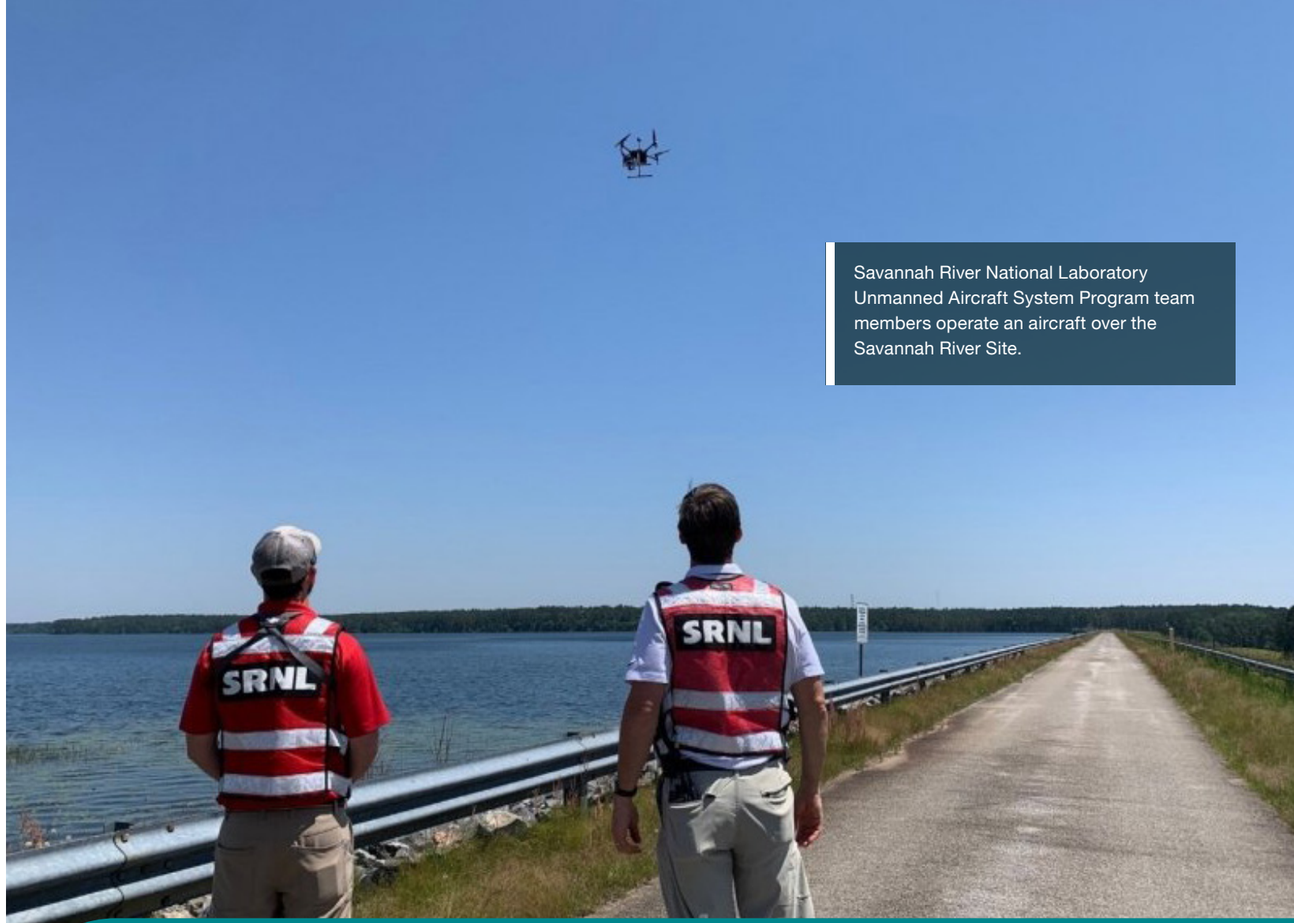
To support the SRNL mission, EM is building the Advanced Manufacturing Collaborative (AMC) facility on the campus of University of South Carolina, Aiken. Once constructed, the AMC will provide SRNL with an accessible, modern facility for R&D that brings government, industry, and academia together to develop and share advanced manufacturing technology. It will also support STEM education to train the next generation of advanced manufacturing workers to support both DOE missions and U.S. industry that will increase manufacturing competitiveness across the state, region and nation. Construction of the AMC facility is expected to be completed in 2024.

Following the completion of the transfer of overall site responsibility from EM to NNSA, EM will retain management of SRNL.

Key Regulatory Milestones 2023–2033

Cleanup work at Savannah River is governed by a Federal Facility Agreement among the DOE, SCDHEC, and the EPA. In addition, the Dispute Resolution Agreement with SCDHEC governs salt waste processing quantities for the liquid waste program.

- **Start remedial action for Lower Three Runs Stream System — 2023**
- **Start coal ash remediation in A-Area — 2026**
- **Start remedial action for ancillary facilities in F-Area — 2027**
- **Start remedial action for C-Area groundwater — 2028**
- **Start coal ash remediation in K-Area — 2028**
- **Start remedial action for D-Area groundwater — 2029**
- **Start coal ash remediation in L-Area — 2029**



Savannah River National Laboratory Unmanned Aircraft System Program team members operate an aircraft over the Savannah River Site.

Post-2033 Cleanup Scope

The liquid waste program will start shutting down its operations after DWPF completes treatment operations for the remaining sludge and salt waste and operational closure of the tank farms is completed. Once the liquid waste program cleanup mission is completed, the surveillance and maintenance of the vitrification canisters in storage will be transferred to the solid waste program before eventual disposition at a federal repository yet to be determined. The remaining non-operational nuclear material facilities (e.g., F-Canyon/FB-Line, H-Canyon/HB- Line) will complete deactivation and be turned over for decommissioning. Operations in K-Area will continue to support the disposition of surplus plutonium with a significant downblending mission, with the facility deactivated after the special nuclear material is dispositioned.

Newly generated wastes resulting from the EM cleanup program will continue to be disposed of in accordance with the EM mission as the waste is generated. As the nuclear materials and liquid waste programs complete their missions, the environmental remediation and deactivation and decommissioning programs will ramp up to provide for remediation of approximately 100 legacy waste units and deactivation and decommissioning of over 800 industrial, nuclear, and radioactive facilities. DOE currently expects to complete legacy cleanup activities at Savannah River by 2065.

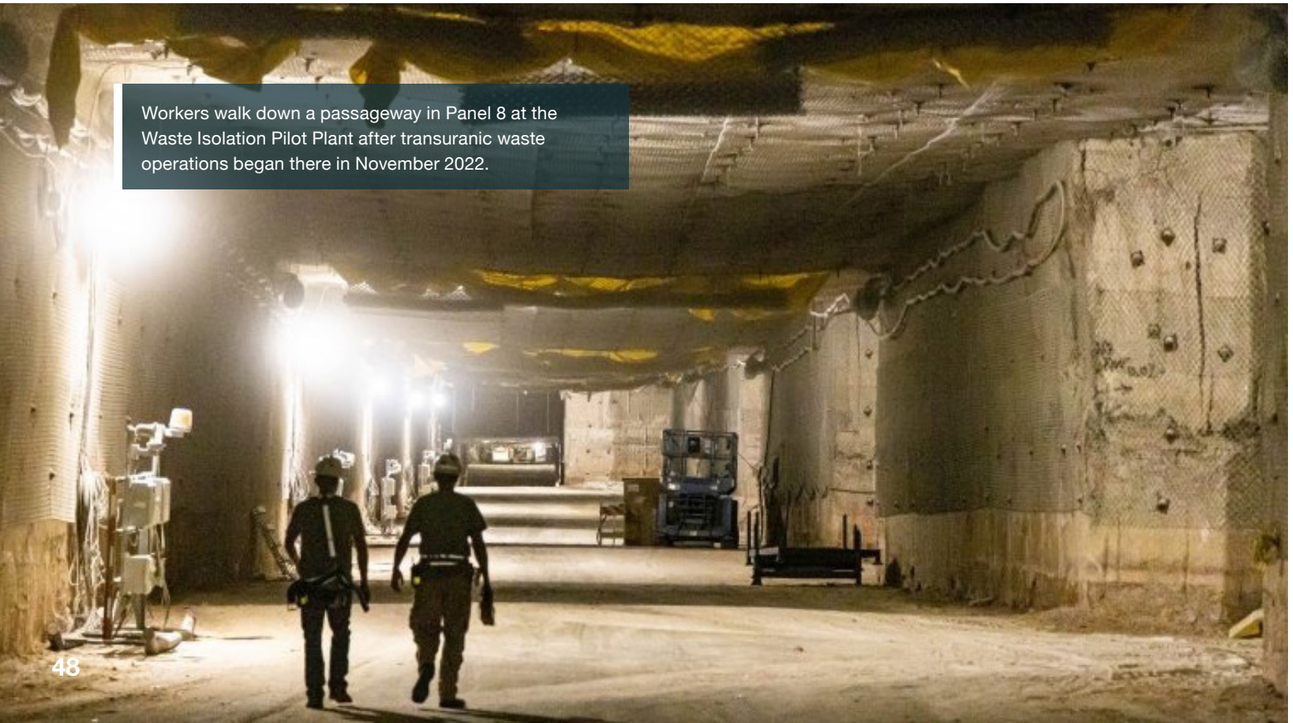
Waste Isolation Pilot Plant

Overview

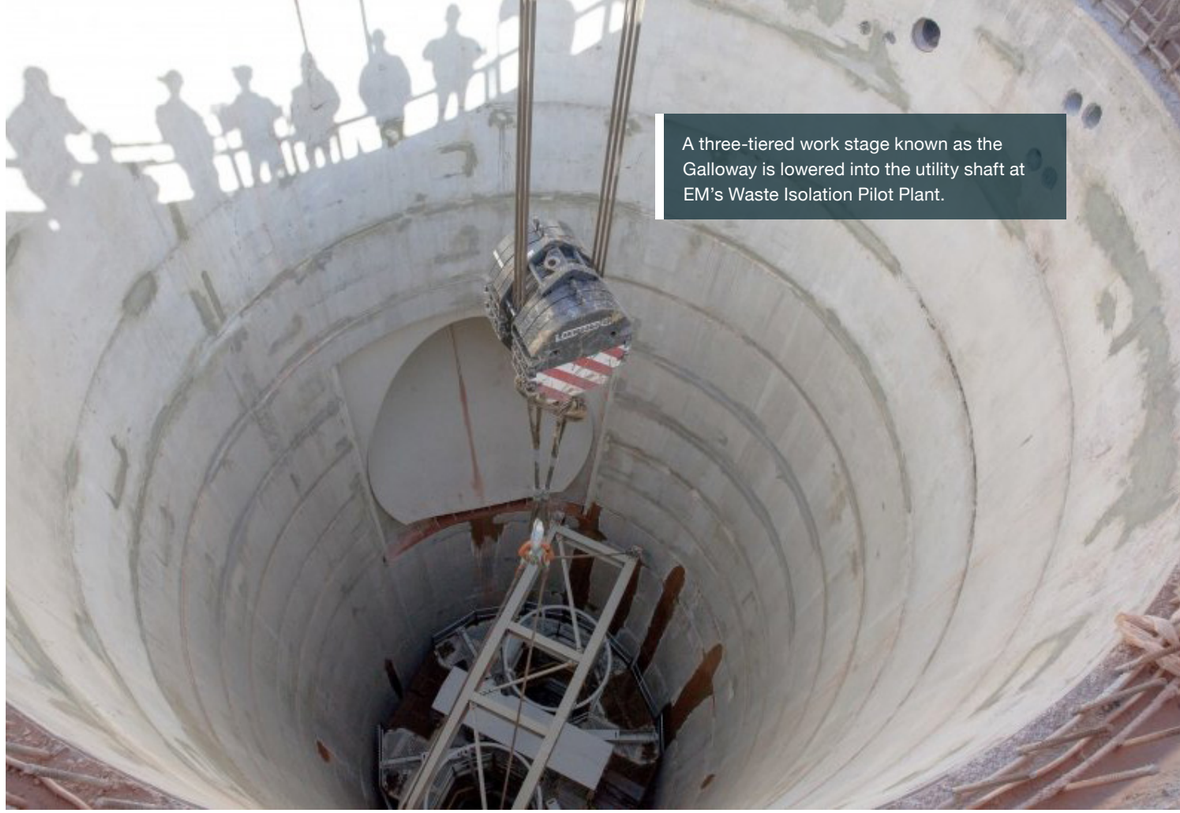
WIPP is the nation's only deep geologic repository for the disposal of TRU waste generated by atomic defense activities. WIPP is located 33 miles southeast of Carlsbad, New Mexico, in the Chihuahuan Desert. Waste is disposed of in a set of panels located nearly one-half mile below the surface (2,150 feet) in a deep geologic salt bed formed 250 million years ago. Construction of WIPP started in the early 1980s. The facility began emplacing TRU waste in 1999 and celebrated 20 years of operations in 2019. To date, WIPP has received more than 13,400 shipments. Those shipments were safely transported more than 16 million cumulative miles.

The Waste Isolation Pilot Plant Land Withdrawal Act (LWA), Public Law 102-579 as amended by Public Law 104-201, limits the amount of TRU waste which can be disposed of in the repository to 6.2 million cubic feet (about 176,000 cubic meters). WIPP is currently anticipated to operate beyond 2050.

A number of diverse stakeholder groups closely monitor all aspects of WIPP and the National TRU Program. WIPP has pursued significant engagement with stakeholders across New Mexico with an interest in WIPP events, progress, and the role WIPP has in the overall cleanup of the DOE complex. WIPP engages routinely with state and federal regulators, and advocacy groups that tend to serve a watchdog role in their interest in WIPP. DOE provides technical, training, logistical, and funding support to six Tribal nations and state regional groups that focus on the safe transport of TRU waste through their jurisdictions. The Carlsbad Field Office continues to work with its stakeholders and foster the ongoing collaborative relationships developed since the inception of WIPP.



Workers walk down a passageway in Panel 8 at the Waste Isolation Pilot Plant after transuranic waste operations began there in November 2022.



A three-tiered work stage known as the Galloway is lowered into the utility shaft at EM's Waste Isolation Pilot Plant.

Calendar Year 2022 Accomplishments

- **Received a total of 272 TRU waste shipments from sites across the DOE complex**
- **Completed waste emplacement activities in Panel 7 and began emplacement in Panel 8**
- **Completed 50 percent of the necessary mining for the West Access Drifts that will lead to planned replacement panels - meeting an EM 2022 priority**
- **Completed installation of the salt reduction units for the new Safety Significant Confinement Ventilation System**
- **Excavated to the 800-foot-level (out of a planned 2,150 feet) for the new Utility Shaft**

Planned Cleanup Scope 2023–2033

It is anticipated during the next 10 years, approximately 883,000 cubic feet (25,000 cubic- meters) of TRU waste from EM, NNSA and small quantity sites will be emplaced at WIPP. WIPP will continue to work closely with EM-LA to expedite the shipping of their legacy waste. EM-LA will remain the only EM site with an "at-ready" arrangement with WIPP, meaning when EM-LA has waste ready to ship, WIPP will accept it.

To support planned waste emplacement activities, much of the work to be performed at WIPP over the next decade focuses on necessary infrastructure improvements to ensure the facility can continue to play its important role in the EM complex.

By the end of 2026, a set of key infrastructure projects will be completed, improving WIPP's capabilities in mining and waste emplacement. These include the new SSCVS, which will provide 540,000 cubic-feet-per-minute of ventilation to the underground, allowing concurrent mining, waste emplacement, and ground control operations throughout the life of the facility. In addition, the new Utility Shaft will serve as an air intake entry point to support the SSCVS, and house a new, larger capacity hoisting capability to transport materials in and out of the repository.

WIPP will also work to replace disposal capability that was lost following a radiological incident that occurred in 2014. WIPP has applied to the state of New Mexico

for approval to mine two new panels (Panels 11 and 12). Panels 11 and 12 will be replacement panels for space lost in Panels 1-7 and from the abandonment of Panel 9.

Additional site infrastructure improvements scheduled for completion during the next decade include:

- Recapitalization of key safety systems
- Replacement/refurbishment of shaft and hoist systems
- Upgrades to monitoring systems
- Replacement of electrical substations
- Installation of additional backup generators
- Modernizing underground equipment to zero-emission, battery-electric vehicles, or very low-emission Tier IV diesel-powered equipment
- Replacement of underground electrical system switch stations
- Installation of a new digitally based geotechnical monitoring system in the WIPP underground

Regulatory Milestones 2023–2033

- None

As part of the Safety Significant Confinement Ventilation System, this Salt Reduction Building (SRB) ductwork will connect to fans that will move air from the underground to the New Filter Building after removing salt.

Post-2033 Cleanup Scope

DOE currently anticipates operating WIPP beyond 2050.

The expected life of the project is limited by the volume of waste allowed under the LWA, which does not specify an operating period for WIPP. Before taking any actions outside the scope of DOE's existing NEPA analysis and decisions, DOE will determine the need for and conduct, as appropriate, further NEPA analyses.

West Valley Demonstration Project

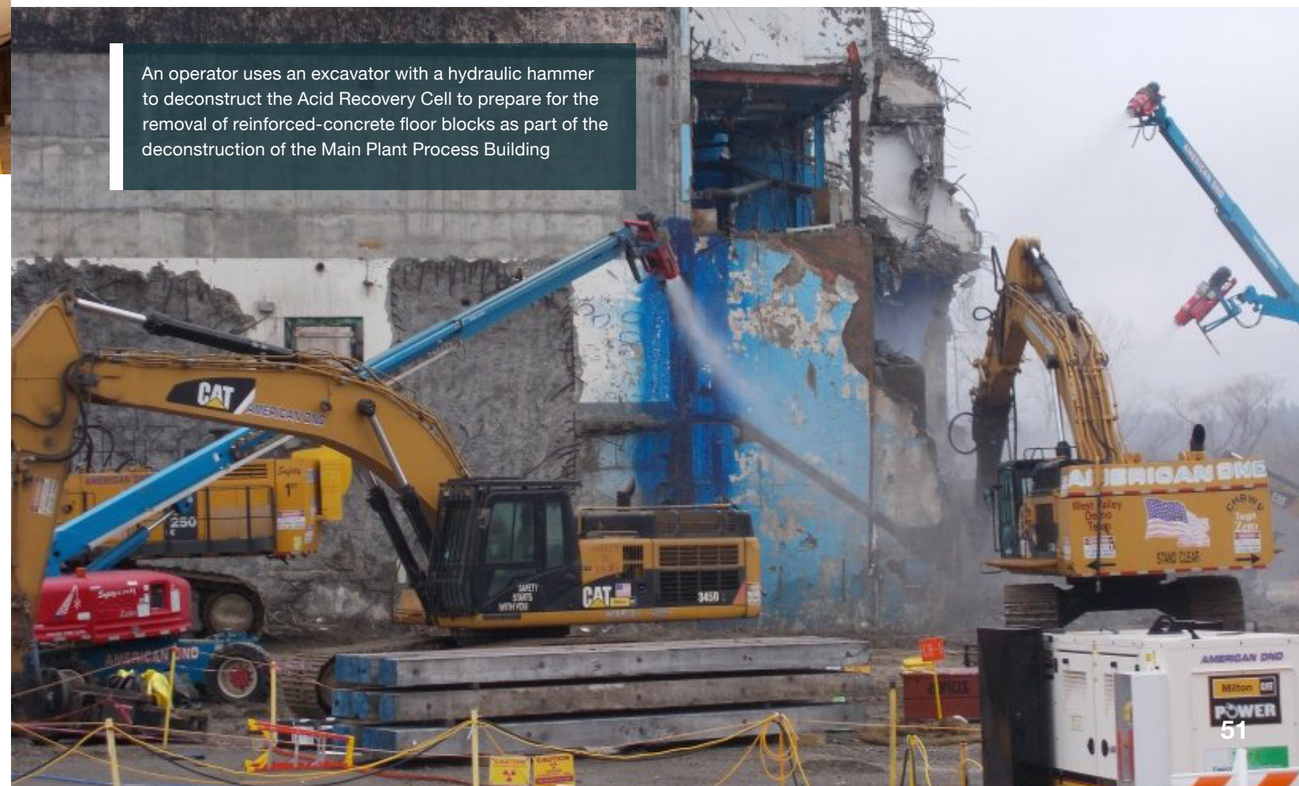
Overview

The WVDP is an approximate 150-acre area located within the Western New York Nuclear Service Center (WNYNSC), which is a 3,338-acre site located 35 miles south of Buffalo, New York. The site is owned by the New York State Energy Research and Development Authority (NYSERDA) and is home to the only commercial SNF reprocessing facility to operate in the United States. In 1962, Nuclear Fuel Services, Inc., entered into agreements with the AEC and New York State to construct, license, and operate the commercial reprocessing plant, along with two associated waste burial grounds and an underground set of four tanks for reprocessing waste. The fuel reprocessing plant operated from 1966 to 1972, processing 640 metric tons of SNF and generating over 600,000 gallons of liquid HLW.

In 1980, Congress passed the West Valley Demonstration Project (WVDP) Act, which required DOE to conduct a HLW management demonstration project at the WNYNSC and transport the HLW to a federal repository for disposal. The WVDP Act directed DOE to:

- Solidify the HLW in a suitable form for transportation and disposal
- Develop containers suitable for the HLW's disposal
- Transport the solidified waste to a federal repository for disposal as soon as feasible.
- Dispose of LLW and TRU waste produced by the HLW solidification process*.

* *Since WVDP TRU waste was derived from commercial nuclear fuel reprocessing, it is considered non-defense TRU waste. DOE refers to this waste stream as Greater than Class C (GTCC)-like waste.*



An operator uses an excavator with a hydraulic hammer to deconstruct the Acid Recovery Cell to prepare for the removal of reinforced-concrete floor blocks as part of the deconstruction of the Main Plant Process Building

A worker gets trained on how to get suited up for PPC-S decontamination work.

- **Decontaminate and decommission the tanks and other facilities used at the WNYNSC in which the HLW was solidified, the facilities used in the waste's solidification, and any material and hardware used in connection with the WVDP**

DOE chose vitrification as the technology for solidifying the HLW, and DOE completed vitrifying the HLW in 2002. The resulting 278 canisters of vitrified HLW are currently stored on-site. Since 1997 DOE has been disposing of LLW at off-site disposal facilities; processing and packaging both contact-handled and remote-handled GTCC-like waste; and deactivating, decontaminating, and removing unneeded facilities.

In 2010, DOE and NYSERDA published, in compliance with the National Environmental Policy Act, a joint final environmental impact statement that addressed both DOE's completion of the WVDP and NYSERDA's decommissioning and/or long-term stewardship of the WNYNSC. The same year, DOE issued a ROD and NYSERDA issued a Statement of Finding to proceed with a phased decision-making approach for remaining cleanup activities. Phase 1 covers soil remediation and disposition of the remaining facilities. Phase 2 will address the four underground waste tanks, the two on-site disposal areas, the non-source area of a groundwater plume, and several other minor facilities. DOE and NYSERDA intend to complete the remaining decision-making with its Phase 2 decision in a supplemental environmental impact statement.

DOE has a strong public outreach program at WVDP including conducting Quarterly Public Meetings (QPMs) and participating in eight monthly meetings with the West Valley Citizen Task Force (CTF). During the planning of the Phase 1 decommissioning decision, DOE discussed the approach at both the QPMs and CTF meetings. DOE provides updates of the status of ongoing Phase 1 decommissioning activities at both the QPM and CTF meetings. DOE also provides a status of site progress at the monthly Ashford Town Board meetings. This year, the site held an in-person informational session for Town of Ashford residents to discuss the upcoming demolition of the Main Plant Process Building (MPPB).

Calendar Year 2022 Accomplishments

- **Began demolition of the last remaining major facility at the site - the Main Plant Process Building - meeting an EM 2022 priority**
- **Completed demolition of the Load-In/Load-Out Facility, the last remaining ancillary support facility**
- **Completed the Permeable Treatment Wall Soil and Structure Removal Project, and re-instated rail operations**

Planned Cleanup Scope 2023–2033

Work underway at West Valley is now focused on completing demolition of the MPPB. By 2025, DOE expects to complete the removal of the above grade portion of the MPPB.

By 2025, DOE and NYSERDA intend to make an integrated decision on the path forward for the Phase 2 decommissioning activities and/or long-term stewardship of the WNYNSC. Phase 2 decommissioning decisions will address the four underground tanks, the two waste disposal areas, the non-source area of the groundwater plume, and several other facilities.

By the end of 2030, DOE expects to complete the decommissioning of the below-grade portions of the MPPB and the Vitrification Facility, where above ground demolition was completed in 2019. DOE will also complete the decommissioning of the site's radioactive water treatment system, including four active lagoons and one closed lagoon. By the end of 2032, DOE will complete soil remediation efforts in Waste Management Area-1 and Waste Management Area-2.

If a disposal option for GTCC-like waste is available, DOE could, by the end of 2033, complete the processing, packaging, shipment, and disposal of GTCC-like waste and removal of remaining waste processing facilities, such as the Remote-Handled Waste Facility, once GTCC- like waste shipping and disposal is complete.

Key Regulatory Milestones 2023–2033

- None

Post-2032 Cleanup Scope

Remaining work at West Valley post-2033 will focus on disposal of "orphan" waste (waste which currently does not have a pathway for disposal) and completion of Phase 2 decommissioning activities. DOE currently anticipates completing cleanup activities at West Valley by 2043.

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