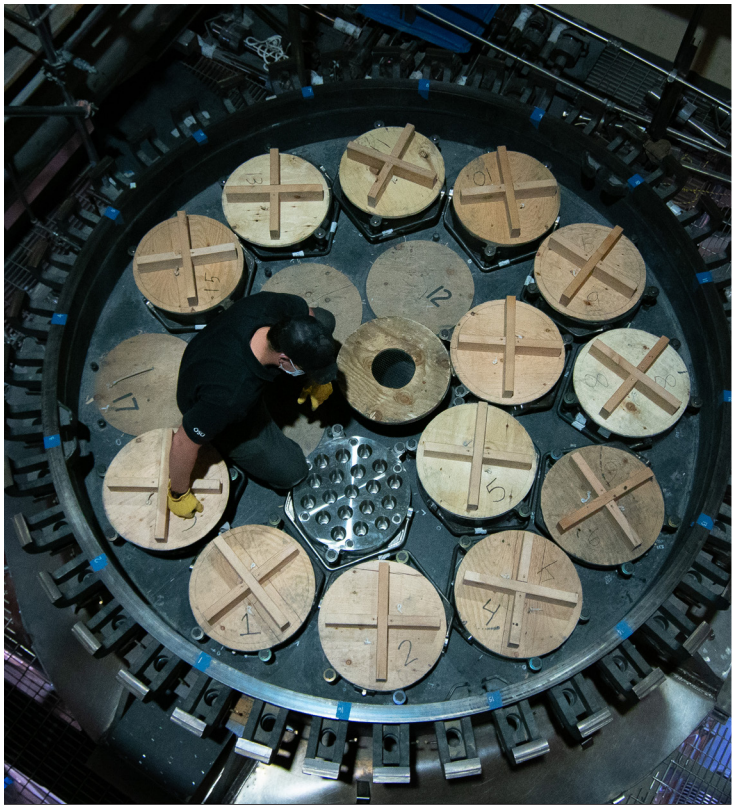
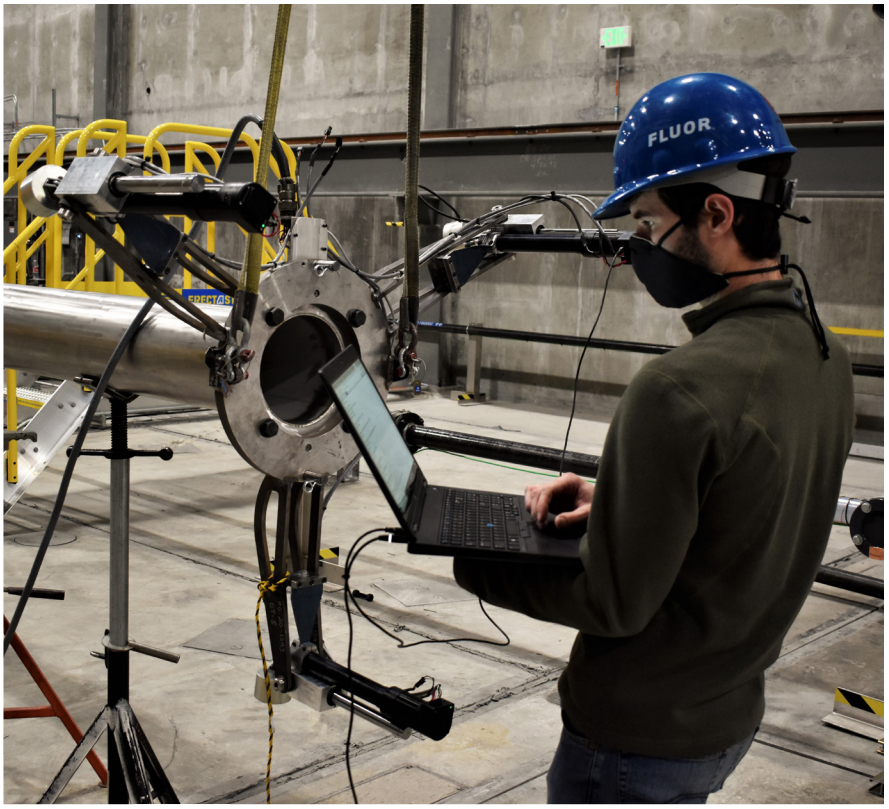
U.S. DEPARTMENT OF ENERGY | OFFICE OF ENVIRONMENTAL MANAGEMENT

EM Strategic Vision: 2022–2032





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Introductory Message from the Senior Advisor for the Office of Environmental Management

The U.S. Department of Energy's (DOE) Office of Environmental Management (EM) recently published key priorities for 2022, which will help focus our cleanup efforts this year. The Strategic Vision for 2022-2032 is intended to do more – to help us gaze further out to the point where we want to be in the future. It sets EM on a course that will span a decade and keeps us focused on achieving EM's vital nuclear cleanup mission safely, effectively, and at a practical cost to the American public.

The stakes could not be higher. EM is responsible for the largest environmental remediation effort in the world. In August, it will be 80 years since the Manhattan Project began, ushering in the development of nuclear weapons and government-sponsored nuclear energy research, which resulted in a significant environmental legacy at sites, often located in remote and rural areas of the country.

Those communities were vital to the United States' successes in World War II and the decades that followed during the Cold War. Established in 1989 with a specific mission to clean up former nuclear sites, EM continues to honor those communities as we fulfill our responsibility of safely dealing with contamination and delivering on environmental justice goals in those communities.

This is the third iteration of the EM Strategic Vision, which is a living document that we will update annually to better reflect program progress, budget profiles and anticipated accomplishments. As you read this year's version, I hope you will keep in mind the thousands of people who carry out our mission at sites across America.

I am impressed and proud of what our team has achieved since we first imagined what a strategic vision for EM might look like. As we rolled that first vision out in early 2020, we had high hopes and energy. Then, news began appearing about a virus overseas. It seemed distant at first, until the first cases appeared on the west coast. You know the rest of that recent history. Millions have been impacted by COVID-19 in the United States and across the globe, including some of our co-workers. I am convinced, though, that the safety protocols we implemented saved lives. They have also allowed us to continue our important work at all levels of our program.

Despite the pandemic, EM has made tremendous strides, working collaboratively and creatively, implementing new processes, and leveraging new approaches to advance our mission. From a step change in our capability to tackle tank waste, to shrinking the size of the cleanup footprint at several sites, to awarding new contracts that enable accelerated progress, we have turned years of preparation and work into an extraordinary slate of achievements.

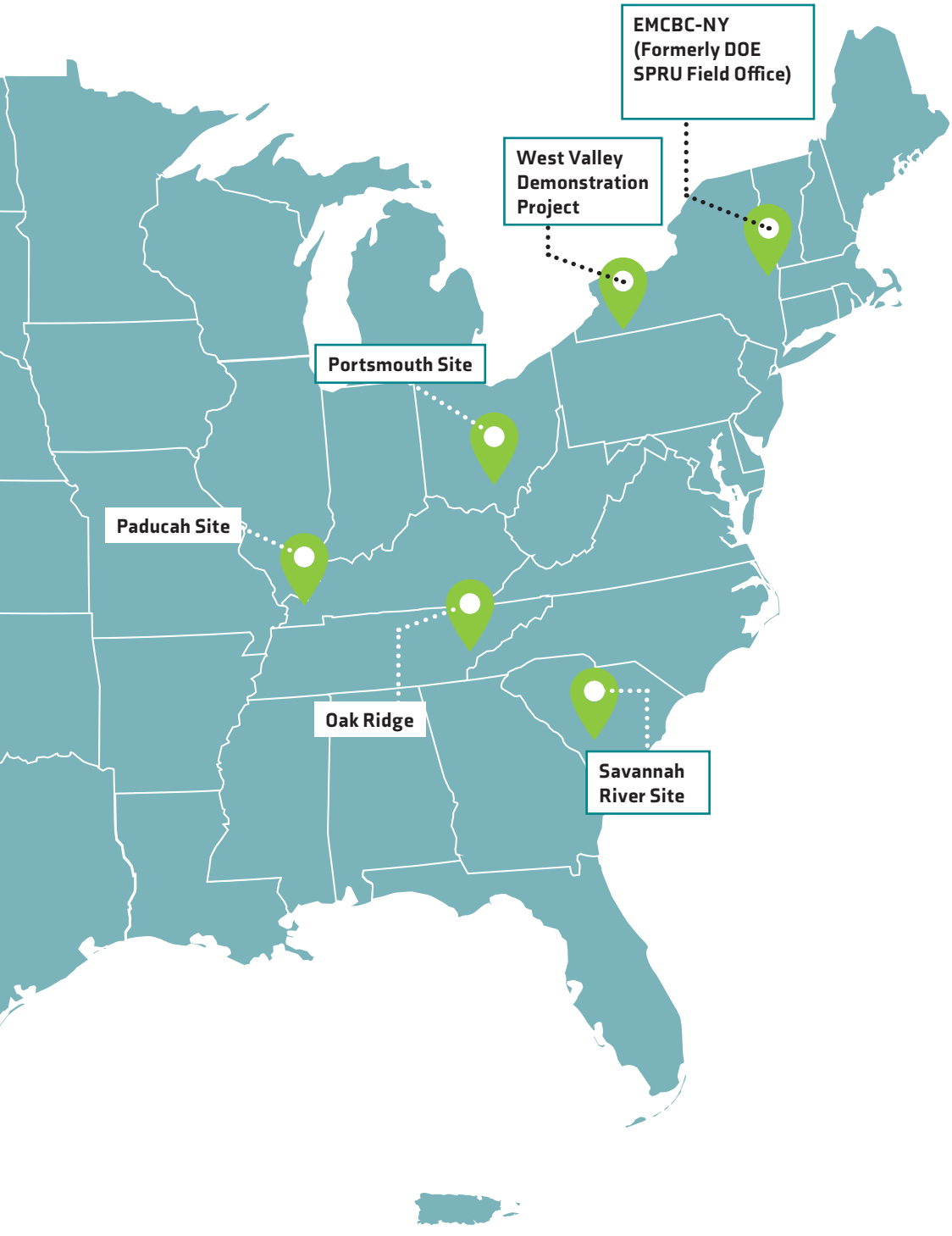
These remarkable accomplishments are due in large part to the dedication and resilience of EM's greatest asset — the men and women who make up EM's workforce. They are also the result of our strong partnerships with regulators, Tribal Nations, local communities, Congress, as well as state and local governments.

The journey signified in the pages of this Strategic Vision is well underway, and communities across the nation will continue to benefit from the work we do over the next decade. I see many of our priorities for 2022 as helping EM to "clear the decks" at several of our sites, moving us closer to positioning our sites for the sustained cleanup progress represented in the Vision. I look forward to taking this journey together, and hope you find the latest version of the Strategic Vision useful.

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
Los Alamos National Laboratory
Energy Technology Engineering Center
Sandia National Laboratories
Waste Isolation Pilot Plant


EMCBC-NY
(Formerly DOE
SPRU Field Office)
West Valley
Demonstration
Project
Portsmouth Site
Paducah Site
Oak Ridge
Savannah
River Site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WE HAVE A VOICE
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EM Strategic Vision: 2022–2032

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) and more than 700,000 metric tons of depleted uranium produced as a byproduct of uranium enrichment activities. More than 5,000 contaminated facilities needed to be addressed. Millions of cubic meters of contaminated soil, and billions of gallons of contaminated groundwater, needed to be remediated. In addition, host communities, Tribal Nations, regulators, and others had little information about the extent and complexity of contamination at most DOE sites.

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, contaminant pathways have been controlled 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 or operations work remain at the following sites:

- **Energy Technology Engineering Center (ETEC)**
- **Hanford**
- **Idaho National Laboratory (INL)**
- **Lawrence Livermore National Laboratory (LLNL)**
- **Los Alamos National Laboratory (LANL)**
- **Moab**
- **Nevada National Security Site (NNSS)**
- **Oak Ridge**
- **Paducah**
- **Portsmouth**
- **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**
- **Completed cleanup activities at major former weapons production sites such as Rocky Flats in Colorado and the Fernald and Mound sites in Ohio**
- **Opened the world's only deep geological repository for transuranic (TRU) waste resulting from atomic energy defense activities at WIPP in New Mexico**
- **Completed the bulk of cleanup activities along the 220-square-mile Columbia River corridor at Hanford in Washington State, including placing six former plutonium-producing reactors at the site into long-term stabilization**
- **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 25 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 and disposed**
- **Completed construction and initiating 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**
- **Transferred 92 sites to the DOE Office of Legacy Management (LM) for long-term stewardship following successful remediation activities**

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:

- Activities to maintain a safe, secure, and compliant posture in the EM complex
- Radioactive tank waste stabilization, treatment, and disposal
- Spent (used) nuclear fuel storage, receipt, and disposition
- Nuclear material consolidation, stabilization, and disposition
- Transuranic 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 or 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. The EM Program Plan will build on the EM Strategic Vision and describes the remaining challenges and cleanup work, summarizes key cleanup opportunities to complete earlier and reduce risk, and provides a framework for charting EM's path forward to complete the mission in a safe, timely, and cost-effective manner. The EM Program Plan will be informed by the latest knowledge in technologies and environmental management, safety and health (ES&H) and programmatic risks; and incorporates current site plans to complete work.

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

2021: The Start of a New Era for EM

EM's mission is more than demolishing buildings and remediating legacy waste and contamination. While cleanup provides clear environmental and risk reduction benefits to local communities, EM's mission also is intended to create diverse and sustainable futures for host communities and advance broader Biden Administration goals in the areas of clean energy, climate change and environmental justice.

Calendar Year 2021 represented the start of a new and transformational era for EM. At the Savannah River Site, EM processed record amounts of radioactive tank waste with the Salt Waste Processing Facility in operation. At Hanford, EM made significant strides in initiating tank waste processing through the completion of the Tank-Side Cesium Removal (TSCR) system and continued progress in the startup and commissioning activities for the approaching operations of the Direct-Feed Low Activity Waste (DFLAW) system.

After successfully completing demolition activities at the East Tennessee Technology Park in Oak Ridge, EM has begun transitioning to cleanup activities at the Y-12 National Security Complex and Oak Ridge National Laboratory. After deactivation, demolition of the former massive uranium enrichment process buildings at the Portsmouth site got underway in 2021. EM completed the demolition of all DOE-owned buildings at the Energy Technology Engineering Center (ETEC) site and completed legacy cleanup activities at the Brookhaven National Laboratory, including demolition of the iconic High Flux Isotope Reactor (HFIR) stack.

In addition, over the course of 2021, EM safely and successfully performed a number of risk reduction projects across the program, including completing stabilization of underground cribs at Hanford; completing 35 shipments of legacy transuranic waste from Los Alamos to WIPP; dispositioning more than 1.5 million tons of hazardous refrigerant from the Paducah site; and removing a cumulative 12 million tons of former uranium mill tailings at the Moab site. EM also made progress in important infrastructure projects at WIPP and Savannah River.

EM awarded five major contracts to continue cleanup progress at Idaho, Oak Ridge and Savannah River, as well as to provide infrastructure services at Portsmouth and to provide deactivation and decommissioning services at Office of Naval Reactors sites. EM also moved forward with procurements for new contracts to manage WIPP and, in what is one of the largest single contracts EM has ever competed, to continue the tank waste cleanup at Hanford.

In addition, EM began the National Environmental Policy Act (NEPA) process to use the Department's high-level waste interpretation for a second waste stream from the Savannah River Site.

EM continued to navigate the changing conditions caused by the COVID-19 pandemic in 2021, with the safety, health, and wellness of employees as the top priority. Some mission and project impacts were unavoidable, or EM made the deliberate decision to re-sequence work. For instance, while safe preparations continued, EM did not achieve its goals to begin operation of the IWTU in Idaho or initiate demolition of the Main Plant Process Building in New York. EM also did not complete the waste incidental to reprocessing evaluation (WIR) for Hanford's Waste Management Area C, instead choosing to focus on other more urgent, near-term regulatory actions.

2022: Advancing Transformational Progress

With another solid year of performance in 2021, EM is poised to achieve even more in 2022 to continue advancing the program into a new era that will be transformational to the cleanup program. EM will experience a step change in the cleanup of tank waste - the program's most complex environmental risk and financial liability. EM will prepare tank waste for vitrification through the TSCR system – the first-time tank waste will be treated at Hanford on an industrial scale - and advance commissioning of key waste treatment support facilities to support DFLAW operations. EM will also address the remaining tank waste at Idaho with the startup of the IWTU and further ramp up tank waste processing at the Savannah River Site to 4 million gallons in 2022.

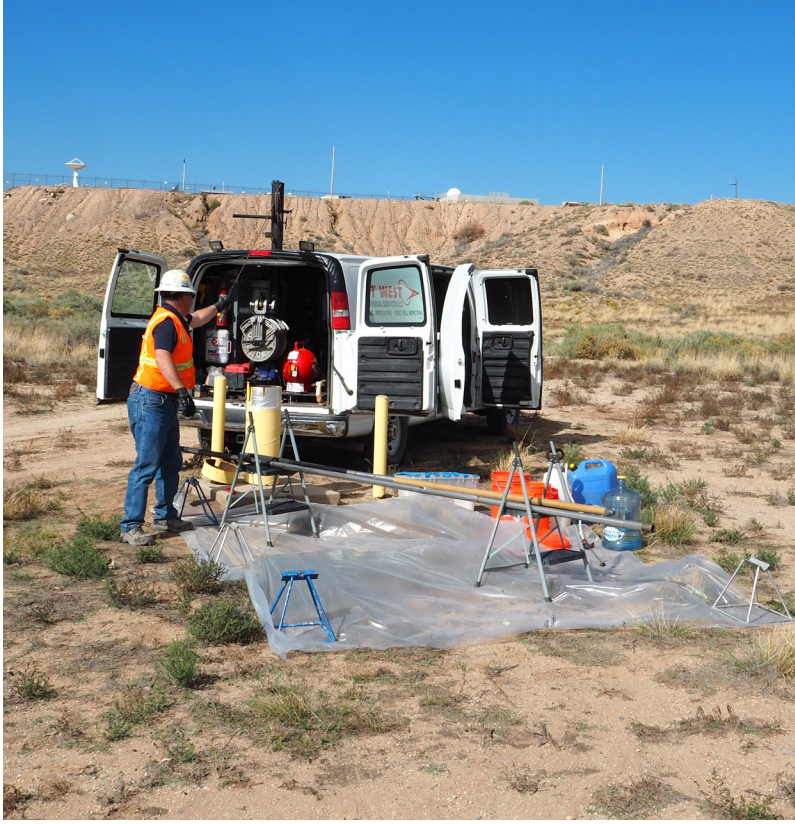
Also at the Idaho site, EM expects to realize a significant risk reduction milestone by completing the excavation of targeted buried waste. In addition to starting the demolition of the Main Plant at the West Valley site, EM will complete the demolition of all remaining support facilities at the site. EM will also complete demolition of the X-326 building at Portsmouth, finish deactivation activities at three former nuclear facilities at the Y-12 and ORNL sites in Oak Ridge and complete the removal of another 1 million tons of material from the Moab site.

To support future progress, EM expects to award in 2022 the new Hanford Integrated Tank Disposition contract and a new contract for the continued management-and-operation of WIPP. EM and our contractor partners aim to serve as an incubator and pipeline to attract our workforce of the future – a new generation workforce to meet cleanup mission needs and prepare the leaders of tomorrow. To a large degree, though, preparing the workforce of tomorrow begins with our local communities through STEM education and recruitment tools. 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. EM will also work to support DOE's broader goals by continuing the Justice40 pilot project at Los Alamos, as well as by conducting updated climate vulnerability assessments for EM sites.

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:

- Initiating radioactive tank waste treatment at Hanford, as well as completing significant risk-reduction activities such as transferring cesium and strontium capsules to dry storage and placing the last of the former production reactors 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 all former uranium enrichment process buildings at Portsmouth
- Completing deactivation activities at the C-333 former uranium enrichment process building and demolishing the former C-400 Cleaning Building at Paducah
- Completing Phase 1 decommissioning 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



Enabling Continued Success

EM is undertaking a variety of strategic initiatives to enable successes across the DOE complex in the coming decade, and for the remainder of its mission.

Safety and Security: Most importantly, EM will continue to perform its activities with a strong safety culture that integrates environmental, safety, security, health, and quality requirements and controls in all work activities. EM has a strong safety record and will continue to partner with EM contractor corporate leadership in strengthening corporate governance and oversight.

EM will continue to incorporate graded approaches to nuclear safety and quality assurance requirements into end-state-based contracts, as well as to promote technically sound and cost-effective implementation of the requirements based on hazards and risks. The health and safety of EM workers, the public, and the environment is and will continue to be a priority.

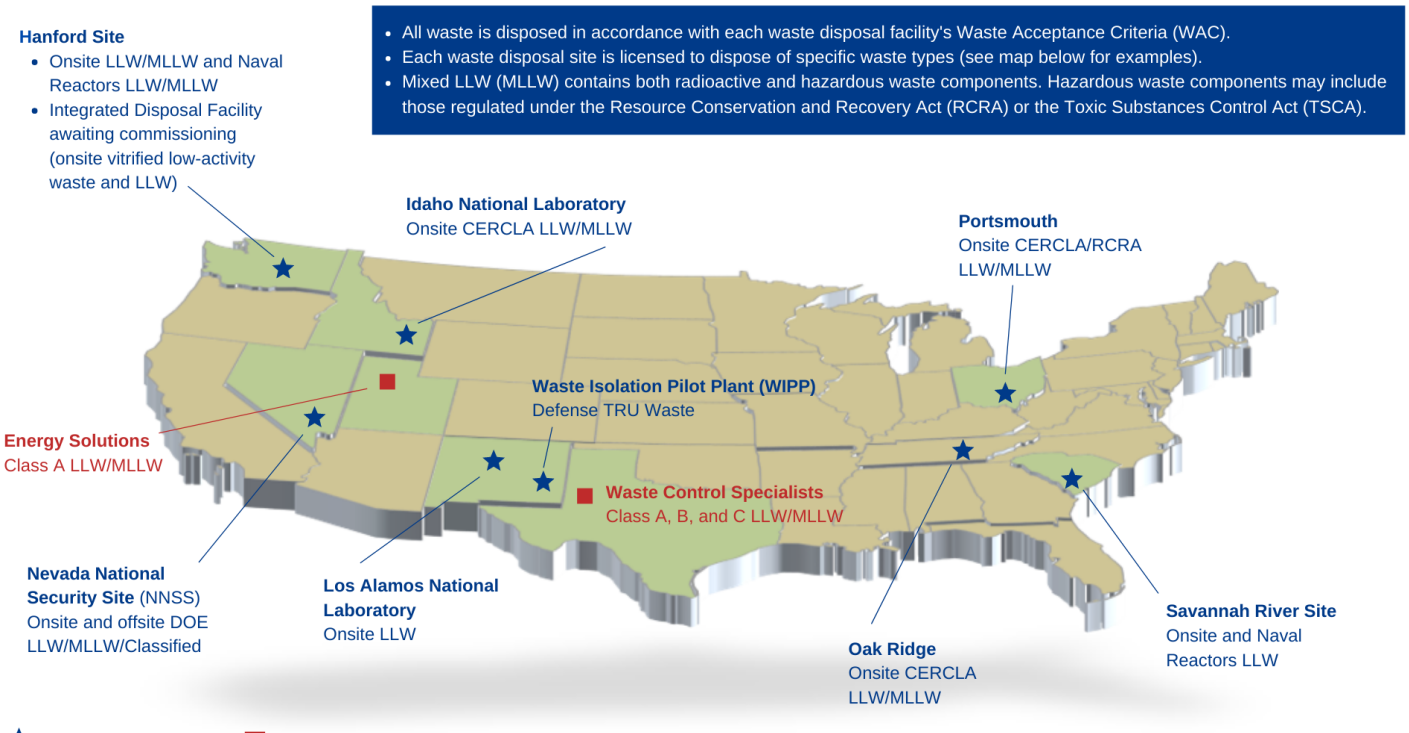
EM sites are home to a variety of special nuclear materials and facilities. EM will continue to address technology upgrades, infrastructure, and equipment; staffing and training; and processes to ensure safety, security, and emergency preparedness solutions provide effective protection of EM assets, operations, and essential functions.

Cybersecurity threats present a significant challenge to DOE and EM. EM continues to enhance its cybersecurity capabilities to enable the program to anticipate and defend against growing threats and provide assurance that its information and operating systems remain secure, communication is not compromised, and risks to data and system infiltrations are mitigated.

Radioactive Waste Disposal: 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 requrements.

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.

Low-level radioactive waste (LLW): EM waste generators will continue to strategically choose from available LLW and mixed LLW (MLLW) disposal options (see US map graphic below). EM is expected to generate and dispose of over 1.7 million cubic meters of LLW/MLLW over the next decade. Most LLW/MLLW is disposed onsite where the waste is generated. Some DOE sites, like Oak Ridge and Idaho, are taking steps toward additional onsite disposal capacity to meet their cleanup mission needs. EM expects the use of commercial disposal facilities to increase over this decade particularly from sites without active onsite disposal facilities, such as the West Valley Demonstration Project (WVDP), or from sites initiating disposal of converted depleted uranium oxide inventories, such as Portsmouth and Paducah.



Greater than class C (GTCC) LLW: Over the next decade, EM will advance development of disposal capability for greater-than-class C (GTCC) LLW from non-DOE facilities and DOE GTCC-like waste. Pursuant to DOE's statutory responsibilities and, working in partnership with the U.S Nuclear Regulatory Commission, industry, and key stakeholders, these efforts build on DOE's NEPA analyses, report to Congress on disposal alternatives, and NRC's Draft Regulatory Basis for Disposal of Greater-Than-Class C (GTCC) and Transuranic Waste. EM continues to work with Congress to ensure statutory requirements are met.

Transuranic (TRU) waste: The Waste Isolation Pilot Plant is the Department's disposal facility for defense TRU waste. With the completion of ongoing key ventilation and infrastructure projects at WIPP during the next few years, EM will be able to increase disposal shipments. As a result, EM will be able to greatly decrease inventories of legacy TRU wastes at LANL, INL, and SRS by 2030.

High-level Waste (HLW): EM continues to support efforts led by DOE's Office of Nuclear Energy for ongoing research and development related to long-term disposition of spent nuclear fuel and HLW. At the WVDP and SRS, HLW canisters will remain in secure storage over this decade as DOE works towards development of a disposal capability. Engaging with stakeholders, EM will continue to identify opportunities to apply science-based approaches to open new disposition paths for lower activity reprocessing waste that has been stored for decades. At SRS, DOE expects to complete much of the tank waste mission this decade, including vitrification of high-activity tank waste at the Defense Waste Processing Facility and on-site disposal of low activity salt waste by leveraging the increased operating efficiencies of the new Salt Waste Processing Facility. With the advent of new treatment facilities at Hanford and INL, EM has significant opportunities to achieve considerable risk-reduction in the treatment and disposal of tank waste generated from the historical reprocessing of spent nuclear fuel.

Program and Project Management: Given the scope and magnitude of the cleanup work to be tackled over the coming decade, it is essential that EM is best in class when it comes to program and project management. EM has performed several root cause analyses to better understand why some projects have experienced cost and schedule issues. Lessons learned from these analyses resulted in EM implementing a set of actions across the complex, including new project management capabilities and requirements, improved assessment and reporting capabilities, milestone tracking, and increased guidance and training.

EM is in the process of developing its new program and project management guidance: the Environmental Management Program Management Protocol and the Cleanup Project Management Protocol. These protocols incorporate the principles of risk-informed decision-making and development of an integrated life cycle baseline, as well as follow the leading principles of program and project management.

The Program Management Protocol establishes the requirements and explains expectations for the

planning, budgeting, execution, and evaluation of all work within the EM program.

EM is also working to further strengthen project management rigor and effectiveness. Improvements in project management will focus on enhancing personnel capacity, use of project peer reviews, continued use of the Environmental Management Acquisition Advisory Board, and improved contractor performance evaluations. In the upcoming year, EM will develop implementation guides to further refine program and project management protocols.

Acquisition: 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 that contractors will 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. EM will continue to develop and improve acquisition tools, processes, and resources to increase consistency and efficiency in competing and awarding contracts. EM has implemented an Acquisition Corps at the EM Consolidated Business Center to provide experienced technical experts who can serve as chairpersons, voting members, and advisors on source evaluation boards to increase the proficiency and efficiency of technical evaluations, as well as provide technical expertise to aid complex-wide problem-solving.

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 undertake new procurements for cleanup contracts at almost every site, and/or continued 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 (IDIQ) contract, instead of using cost-based contracts that span ten (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.

As many as two new end-state contracts could be awarded in 2022, including the Hanford Integrated Tank Disposition Contract and the Moab Remedial Action Contract. This will reflect a continued implementation of EM's new 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.

Regulatory/Stakeholder Engagement: 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.

Across the country, more than 40 federal and state regulatory agreements set the milestones for much of EM's activities. EM works actively with regulatory partners in negotiating compliance agreement priorities and milestones for individual sites, endeavoring to apply innovative, risk-based approaches across the complex. EM is focused on identifying methods for streamlining regulatory approaches and accelerating cleanup by pursuing strategies that are faster and more cost-effective while still technically sound and protective of workers, the public, and the environment.

The EM cleanup mission is in line with President Biden's Justice40 Initiative. The Justice40 Initiative is a government effort to deliver at least 40 percent of the overall benefits from certain Federal investments

to disadvantaged communities. EM is proud that the EM-Los Alamos site in New Mexico was chosen as a Justice40 Initiative Pilot Program. EM will continue to work with the Administration on the next steps of the Justice40 Initiative and its application at EM cleanup sites.

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, is seeking 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.

Infrastructure: EM faces the continued challenge of performing cleanup activities at sites with decades-old infrastructure that, in some instances, originated in the World War II era. EM is achieving success in infrastructure upgrades that will amplify the ability to perform cleanup in the future. For example, the successful startup of the SWPF at Savannah River, and the ongoing construction of the SSCVS at WIPP, provide infrastructure upgrades that will enable continued future success. EM is also working to modernize infrastructure at Hanford, and to "right-size" infrastructure needs at the Paducah and Portsmouth sites to support future cleanup operations. EM actively works with other DOE organizations to assess infrastructure needs across the Department, and will continue to pursue similar modernizing efforts throughout the complex to facilitate project completion.

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 will support deactivation and decommissioning activities at the Office of Naval Reactors' Knolls Atomic Power Laboratory and Kesselring sites beginning 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 facilities at the LLNL. Future work for other DOE organizations will be dependent on programmatic needs and other factors.

Next-Generation Workforce: EM currently has a workforce of approximately 33,000 federal and contractor employees. These employees are critical to EM's plans for the coming decade. However, with the EM program currently anticipated to last for decades to come, and a workforce that has a significant portion eligible, or soon to be eligible, for retirement, an infusion of new professionals, including those early in their careers, in a variety of fields will be needed.

EM is committed to promoting and supporting an inclusive environment that provides all employees the chance to work to their full potential. EM continues to use diversity, inclusion training, and education tools to enhance the value and practice of an inclusive working environment. EM is also expanding our recruitment strategies and leadership development programs to foster the workforce for the future.

Some of these 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 platforms that prospective candidates connect with frequently, including Facebook, 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 and its contractors are working to continue building and sustaining a best-in-class workforce utilizing a diverse assortment of tools and hiring approaches.

These tools include making use of EM student programs by recruiting students with science, technology, engineering, and mathematics (STEM) areas of study to work on EM projects, and leveraging students in the STEM disciplines for internship opportunities through programs such as the DOE Scholars Program, the Minority Serving Institutions Partnership Program, and the DOE Florida International

University Fellows Program. EM also supports veterans, such as through the federal veterans' hiring preferences and contractors' participation in the Operation Warfighter Program, which is designed to provide recuperating service members meaningful activity outside of the hospital environment. In addition, EM is working to engage early career professionals through a variety of means, such as a relaunched Pathways internship program.

EM contractors utilize regional partnerships to ensure a consistent workforce pipeline. At Los Alamos, legacy cleanup contractor Newport News Nuclear BWXT Los Alamos, LLC (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. Pacific Northwest National Laboratory works closely with area colleges like Washington State University to facilitate research internships, including addressing Hanford-related cleanup challenges. Oak Ridge cleanup contractors UCOR and Isotek regularly invest in local schools for K-12 STEM activities, and UCOR partnered with the University of Tennessee to form new curricula that launched the nation's first nuclear decommissioning minor within the nuclear engineering department. The contractor has also helped develop programs to train chemical operators and water management specialists at two community colleges in the region. UCOR also expanded partnerships with Historically Black Colleges and Universities to provide students new educational and professional opportunities while helping build a pipeline of qualified candidates to successfully achieve future cleanup work.

The federal government's response to the COVID-19 pandemic has demonstrated the potential to perform work differently in the future. During the pandemic, the Department gathered data to inform the future of the workplace to ensure that the Department has an agile workforce capable of and equipped to continue delivering the mission effectively, equitably, and efficiently. Through this initiative, EM has realized increased flexibility in work locations, while maintaining readiness and focus on deliverable outcomes. By re-examining the nature and order of work performed and re-examining key project assumptions, EM remains committed to supporting flexibility in the workplace, while still ensuring mission achievement.

Innovative Approaches: Given the scale and scope of the remaining EM mission, it is critical to develop new and innovative approaches to performing cleanup activities so that EM can safely complete its work in a more efficient and more cost-effective manner. Such approaches should be science-based and focus on managing and disposing of waste in a safe manner, consistent with statutory and other legal requirements.

One such approach is the Department's interpretation of the statutory definition of "high-level waste," which makes clear that both source and risk are essential elements of the definition and also identifies science-based criteria for evaluating risk. EM has used this interpretation for an initial waste stream at the SRS

and has completed the 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 the commissioning of the new SWPF. 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. The Roadmap will be used to continually identify R&D opportunities to deploy effective, innovative and game changing strategies and technologies that could help improve efficiency along with cost savings and schedule acceleration for the Hanford tank waste cleanup program.

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. Similarly, EM will adapt and implement existing technologies to address emerging contaminants and achieve meaningful progress towards environmental remediation and site closure.

Potential Opportunities for Acceleration: As a responsible steward of taxpayer resources, EM continually works to identify and assess opportunities to accelerate cleanup projects towards completing 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. A number of 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 EPA and the NRC could ensure cost efficient cleanup and risk reduction activities.

For example, at Hanford, DOE is working with the State of Washington, Tribal Nations, the local community, stakeholders and others to consider technology options to potentially accelerate removal and disposal of Hanford low-activity tank waste. One such approach is the proposed Test Bed Initiative (TBI) Demonstration. The proposed TBI Demonstration would address independent recommendations and comments from the Government Accountability Office, the National Academy of Science, the Federally Funded Research and Development Center and the Energy Communities Alliance to further study the potential cost, safety and environmental performance of potential treatment and disposal alternatives. Implementation of this technology on an industrial scale may have the potential to safely pretreat low-activity waste from Hanford tanks, solidify the waste in grout, and dispose of it off site in a manner that would drive down risks to workers, the public and the environment. DOE continues to analyze approaches for the supplemental treatment of low-activity waste at Hanford.

At INL, closure of the Radioactive Waste Management Complex (RWMC) could be achieved by 2030. Modest investments at the Portsmouth Site could result in completing cleanup within this decade, years ahead of current schedules.

No decisions have been made at this time on these potential acceleration opportunities. EM will continue to assess these and other opportunities that may become apparent over the coming years, working with members of Congress, state and local governments, Tribal Nations, regulators, and other key partners.

Conclusion

In the past three decades, the EM program has demonstrated the ability to achieve significant and

lasting progress, helping to fulfill the government's commitment to the people who live near, and work at DOE sites. In 2021, EM launched a new era that will continue to shift the overall trajectory of the Department's cleanup program. Going forward, this update of the EM Strategic Vision outlines the breadth and scope of the planned progress at each of the remaining EM sites where significant legacy cleanup remains, none of which would be possible without the talented and hardworking men and women who perform this important work every day, safely and efficiently.

Decade Timeline

2022

Complete targeted buried waste exhumation at the INL Site

2022

Begin IWTU startup in Idaho

2022

Complete demolition of the first of three gaseous diffusion facilities at Portsmouth

2022

Begin Tank-Side Cesium Removal (TSCR) system at Hanford treating waste in early 2022 in preparation for DFLAW operations

2023

Complete transfers of spent nuclear fuel from wet to dry storage at the INL Site

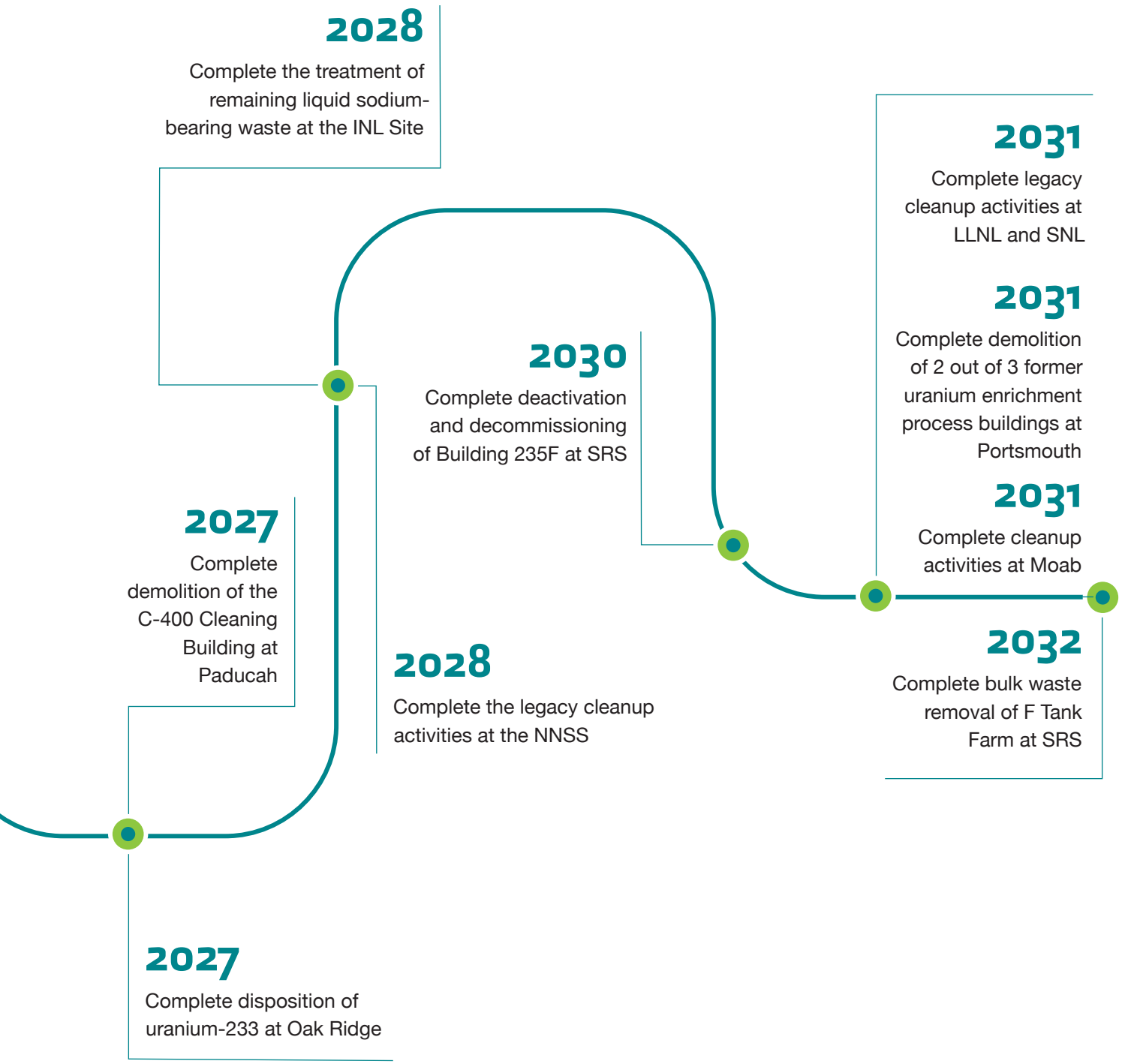
2023

Initiate radioactive tank waste vitrification at Hanford

2025

Begin operation of the Mercury Treatment Facility at Oak Ridge

2022


2028
Complete the treatment of remaining liquid sodium-bearing waste at the INL Site
2031
Complete legacy cleanup activities at LLNL and SNL
2031
Complete demolition of 2 out of 3 former uranium enrichment process buildings at Portsmouth
2030
Complete deactivation and decommissioning of Building 235F at SRS
2031
Complete cleanup activities at Moab
2027
Complete demolition of the C-400 Cleaning Building at Paducah
2028
Complete the legacy cleanup activities at the NNSS
2032
Complete bulk waste removal of F Tank Farm at SRS
2027
Complete disposition of uranium-233 at Oak Ridge
2032

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, the Department of Energy (DOE) and its predecessor agencies conducted nuclear and liquid metals research at the 90-acre 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 the 290 acres of the ETEC site and the adjoining Northern Buffer Zone.

The cleanup of ETEC is regulated by the State of California Department of Toxic Substance Control (DTSC), and other affiliated agencies, in addition to DOE.

Key Regulatory Milestones 2022-2032

In 2010, DOE signed an Administrative Order on Consent with California regulators that required soil remediation to be completed by 2017. EM is engaging with California regulators on a path forward.

Calendar Year 2021 Accomplishments

- **Met an EM 2021 priority by completing the demolition of all DOE-owned buildings at ETEC**
- **Safely transported 350 shipments (22,000 cubic yards) of demolition debris to disposal**
- **Continued groundwater interim measures by capturing and removing approximately 9,000 gallons of solvent impacted groundwater, keeping it away from the deeper bedrock groundwater**

Planned Cleanup Scope 2022–2032

Over the coming decade, EM plans to initiate final groundwater treatment approaches, complete a ROD for soils cleanup, and begin soil remediation.

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

Post-2032 Cleanup Scope

Remaining cleanup activities at ETEC post-2032 will be dependent in large part on decisions and progress made on soil and groundwater remediation during the next 10 years. In 2017, Boeing applied for and received a conservation easement, which ensures the preservation and protection of the unique and critical habitat, Tribal cultural resources, and open space of its land at Santa Susana. The conservation easement is a legally enforceable property restriction that forever prohibits development or use of the land for residential or agricultural purposes. The land's future as an open space habitat will preserve the land as a wildlife corridor, benefit local plants and animals (many of which are protected), and preserve its many cultural resources. The envisioned end state for the ETEC site is an open space park for the surrounding community to enjoy and to provide habitat for the wildlife of the Santa Susana Mountains.

Debris is removed following the Sodium Pump Test Facility demolition.

Hanford

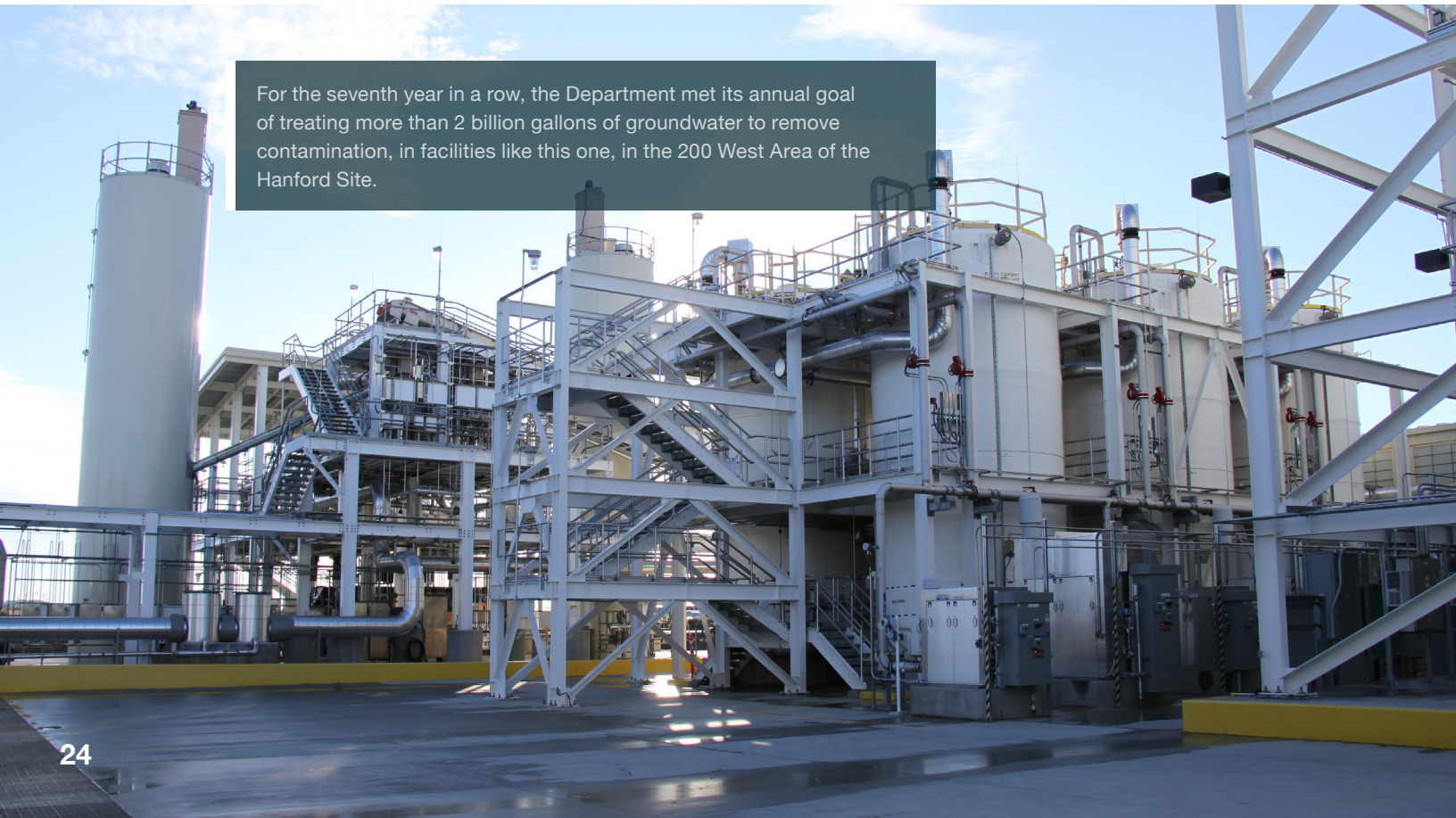
Overview

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 Environmental Protection Agency (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



For the seventh year in a row, the Department met 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.

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.

EM leadership regularly engage 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.

Following installation near the AP Tank Farm and rigorous testing, the TSCR is ready to start treating tank waste in 2022 to build up a large supply of liquids that can be fed directly to the nearby vitrification facility beginning in 2023.

Calendar Year 2021 Accomplishments

- **Completed construction of all WTP facilities required to support the Direct Feed Low Activity Waste program**
- **Completed the Loss of Power Test at the WTP, the first major integrated plant test in the commissioning program**
- **Began tank waste treatment at Hanford through newly operational Tank-Side Cesium Removal (TSCR) System that removes radioactive cesium and solids from tank waste**
- **Completed retrieval of single-shell tanks AX-102 and AX-104**
- **Completed stabilization of below grade cribs/ tanks at Hanford – an EM priority**
- **Initiated ground preparations for the installation of the steel enclosure for the K-East Reactor**
- **Treated more than 2 billion gallons of contaminated groundwater for the seventh consecutive year**

Planned Cleanup Scope 2022–2032

The coming decade will see the successful launch of one of EM's largest and most significant cleanup activities — the start of tank waste treatment 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 2022, DOE will progress DFLAW commissioning activities for the WTP LAW Facility, Balance of Facilities, and Analytical Laboratory. Through the DFLAW program, EM anticipates the commencement of low-activity tank waste treatment by the end of 2023. Transitioning these 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 will pretreat tank waste supernate in preparation for waste feed delivery when the WTP LAW Facility is operational. In 2022, TSCR will be operated to achieve a goal

of 1 million gallons of pretreated waste for DFLAW operations.

By the end of 2022, 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. EM will continue design activities at the WTP High-Level Waste facility to maintain progress towards treating the remaining Hanford tank waste in the mid-2030s.

RISK REDUCTION

By the end of the decade, the 324 Building will be demolished following the remote excavation of the contaminated soil underneath the facility. Additionally, the 105-K West Fuel Storage Basin will be deactivated and demolished, allowing the K-East and K-West reactors 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 that is currently under construction. Stabilization activities at the Reduction-Oxidation Plant (REDOX), the Plutonium Uranium Extraction Plant (PUREX), 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 2022–2032*

Cleanup activities at Hanford are governed by the Tri-Party Agreement. Some cleanup activities are also governed by a 2010 Consent Decree between DOE and the State of Washington (as significantly amended by the court in 2016).

- **Complete LERF and ETF upgrades to support DFLAW hot commissioning — 2023**
- **Complete LAW Facility hot commissioning and begin production-scale tank waste disposition — 2023**
- **Complete interim safe stabilization for K East and K West Reactors — 2024**
- **Transfer cesium/strontium capsules to dry storage — 2025**
- **Complete soil remediation and 324 Building demolition — 2025**
- **Complete single-shell tank retrievals in A/AX Farms — 2026**
- **Remove all mixed waste containers currently located at the Central Waste Storage Complex from outside Storage Areas A and B — 2026**
- **Initiate certification activities by processing TRU container – 2028**
- **Complete remedial actions for contaminated soil beneath and disposition of the 324 Building – 2030**
- **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 restrictions, necessary protocols, and the resulting inefficiencies. Other milestones may require revision due to the ongoing pandemic. DOE will continue to work with regulators to revise milestones, as needed.*

Post-2032 Cleanup Scope

Post-2032, 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; transuranic waste treatment and shipment for disposal; and extensive facility demolition and waste site remediation activities. Most of the River Corridor and 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.

By the end of 2023, Hanford's vitrification plant will be immobilizing tank waste in glass in the Low-Activity Waste Facility (center, right), supported by the plant's Analytical Laboratory (center) and 14 support facilities (top). By the end of 2032, construction of the plant's High-Level Waste Facility (lower right) will be completed, and cold commissioning will be underway.

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 RWMC and the Idaho Nuclear Technology and Engineering Center (INTEC) facilities.

ICP conducts stakeholder briefings regularly with state, Tribal, 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.

A mechanical engineer inspects calcine retrieval technology.

Calendar Year 2021 Accomplishments

- Concluded a two-year outage at the Integrated Waste Treatment Unit where more than 50 modifications were made to the facility in preparation for radiological operations in 2022
- Began treatment of potentially reactive and pyrophoric wastes at the Advanced Mixed Waste Treatment Facility
- Awardedand transitioned the new Idaho Cleanup Project End State Contract

Planned Cleanup Scope 2022–2032

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

At the RWMC facilities, buried waste exhumation and sludge processing operations are expected to be completed by the end of 2022. With the finish of waste processing operations, facility closures and demolitions will commence 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.

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 will be completed by the end of 2023. Additionally, fuel packaging capabilities will be developed, installed, and packaging operations commenced to make the fuel ready for shipment out of Idaho.

Workers prepare a TRUPACT-II Container for shipment to WIPP.

Key Regulatory Milestones 2022–2032

The regulatory milestones are contained in the 1995 Idaho Settlement Agreement (ISA), 2019 Supplement 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)
- Complete targeted waste exhumation from SDA — 2023 (AI)
- Complete 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

Post-2032 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, 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.

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.

EM has completed demolition of the southern two-thirds of Building 175, seen here from an above drone capture.

Calendar Year 2021 Accomplishments

- Removal of the Building 280 Livermore Pool Type Reactor internals and commenced reactor demolition
- Completed demolition of the southern two-thirds of Building 175
- Commenced characterization of Building 251
- Awarded a DD&R indefinite delivery/indefinite quantity (IDIQ) for the demolition of Building 251

Planned Cleanup Scope 2022–2032

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.

At Site 300, EM will move 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 2026. Implementation of the selected path forward is anticipated to be initiated in 2029, and responsibility for the completed actions is anticipated to be transferred to NNSA in 2031.

Post-2032 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.

Key Regulatory Milestones 2022–2032

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 — 2022
- Final RI/FS for Building 812 — 2023
- Final proposed plan for Building 812, Building 865, Building 850 perchlorate in groundwater — 2025
- Final ROD amendment for Building 812, Building 865, and perchlorate in Building 850 groundwater — 2026
- Final remedial design for Building 812, Building 865, and perchlorate in Building 850 groundwater — 2027

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 Los Alamos National Laboratory (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 Field Office (NA-LA).

Of the more than 2,100 areas of concern of potential contamination originally identified at LANL, more than half (approximately 1,100) 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. There are two legacy groundwater contamination plumes that are being evaluated by EM-LA. 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 has chemical constituents, including Royal Demolition Explosives (RDX), which were used widely in World War II, and is undergoing characterization to determine potential remediation alternatives.

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 3,500 cubic meters of legacy transuranic (TRU) waste stored at Technical Area 54, MDA G destined for disposal at the Waste Isolation Pilot Project (WIPP) near Carlsbad, NM. The waste is stored in configurations that are protective of the environment, workers, and the public.

In 2021, legacy debris and soil with very low levels of contamination along DP Road in Los Alamos townsite were investigated and excavated. The contamination was discovered in 2020 in land that DOE had previously conveyed to Los Alamos County. EM-LA remediated the area, known as the Middle DP Road Site, with no impact on the environment or to the community.

Sample crews wear snake gaiters to protect themselves against potential rattlesnake bites as they collect water for analysis at a spring along the Rio Grande.

Confirmatory sampling is being conducted to verify that the site poses no future risk to human health or the environment.

As part of its ongoing commitment to transparency and to maintaining a regular dialog with the 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, Los Alamos County Council meetings, and Buckman Direct Diversion Board meetings. EM-LA also hosts public Environmental Management Cleanup Forums and meets monthly with LANL Legacy Cleanup Technical Working Group stakeholders.

Calendar Year 2021 Accomplishments

- **Completed 32 TRU waste shipments to WIPP**
- **Removed 114 pounds of hexavalent chromium from the regional aquifer and moved the boundry of the plume farther from adjacent Tribal lands**
- **Disposed of 1,338 cubic meters of low-level waste and mixed low-level waste**
- **Remediated 210 cubic meters of contaminated soil and debris from Aggregate Areas and transition materials**
- **Completed planned investigation and remediation of low-level radioactive debris and soil at the Middle DP Road Site**

Planned Cleanup Scope 2022–2032

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 (WCS) commercial disposal site in Texas. Development of alternatives is ongoing.

Completion of the Middle DP Road Site is targeted for 2022. An assessment report with confirmatory sampling results will be submitted to the New Mexico Environment Department (NMED).

Site investigations will continue and, where required, contaminated soil will be removed from the site and transported for disposal with sampling to confirm compliant cleanup. EM-LA will begin development of a strategy to transition from groundwater characterization to a final remedy for the hexavalent chromium plume, while the interim measure will continue operation. In 2023, the final remedy for the RDX groundwater plume will be proposed for regulatory approval, and the Southern External Boundary Aggregate Area Campaign will be completed.

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 (AOC). The Pajarito Watershed and Upper

As part of a new processing line at Los Alamos National Laboratory's Technical Area 54, low-level waste is processed and repackaged in drums for disposal.

Water Watershed Aggregate Area Campaigns will be completed in succession, finishing in 2026, and will involve the removal of a variety of materials. 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 transuranic 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 2022–2032

The 2016 Consent Order between DOE and NMED establishes an annual process by which both agencies jointly determine cleanup activities on a priority basis. Cleanup campaigns in the 2016 Consent Order are organized using a risk-based approach to grouping, prioritizing, and completing corrective action activities. Legacy cleanup at LANL under the Consent Order with NMED is organized into 17 campaigns. Work is ongoing in 11 campaigns, while three campaigns have been completed. DOE and NMED establish approximately 10 to 20 Consent Order milestones annually.

A drilling contractor advances casing during construction of Well R-71.

Post-2032 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 2032. This work will require additional facility infrastructure to ensure the waste is safely excavated and processed to enable shipment to WIPP.

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 active 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 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.

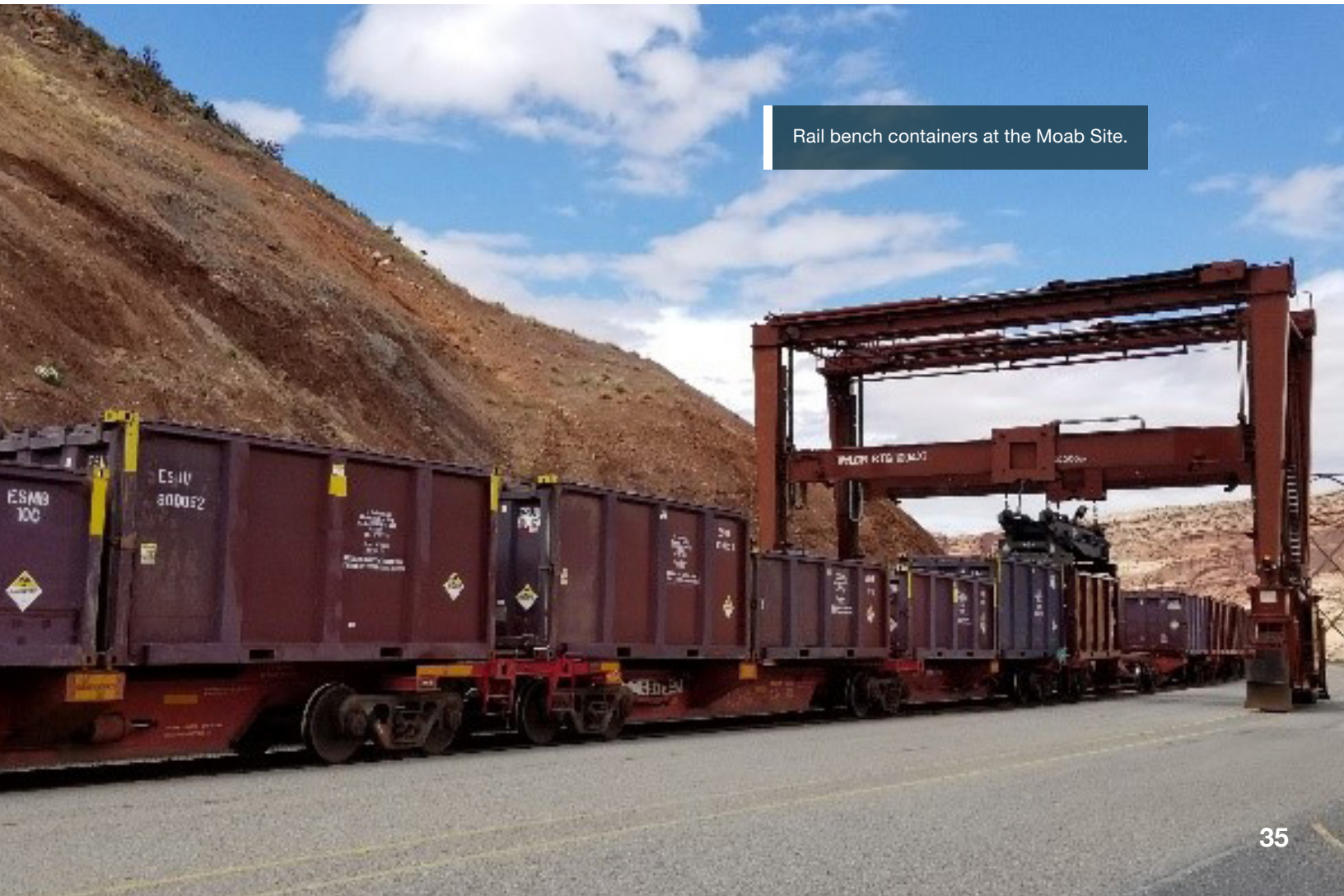
Calendar Year 2021 Accomplishments

- **Met an EM priority to dispose of a cumulative total of 12 million tons of uranium mill tailings out of the original total of 16 million tons**
- **Removed a cumulative total of more than 970,000 pounds of ammonia and 5,480 pounds of uranium from groundwater, diverting those constituents from the Colorado River**

Planned Cleanup Scope 2022–2032

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 CY 2029. It will take an additional two years to complete the restoration of the Moab Site, dispose of potentially contaminated equipment and intermodal containers, and to install the cover on the disposal cell.

DOE also plans to continue transportation and disposal of oversize debris from the Moab Site, including 14

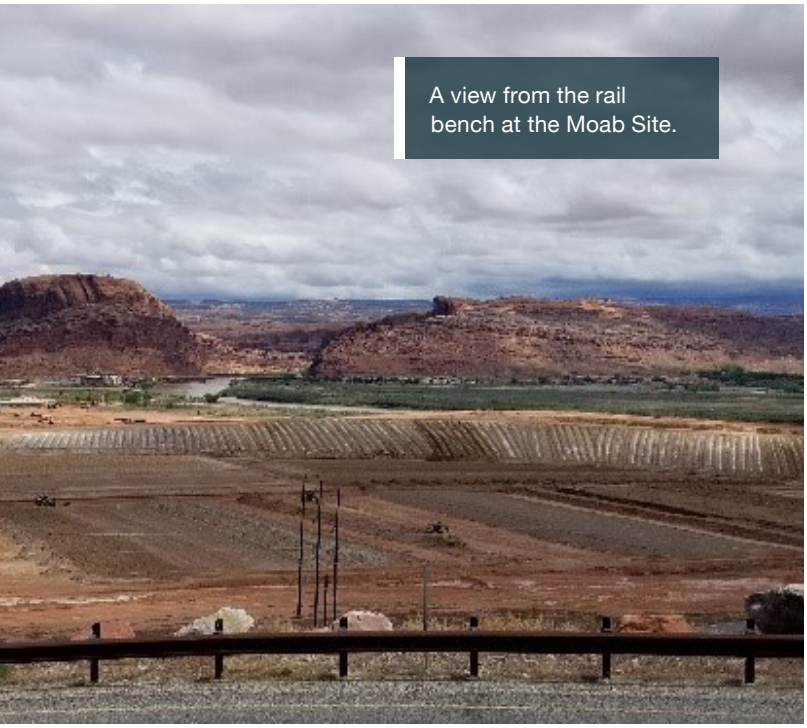


Rail bench containers at the Moab Site.

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 CY 2028.

Key Regulatory Milestones 2022–2032

- None



A view from the rail bench at the Moab Site.

The Crescent Junction disposal cell, about 30 miles away from the Moab Site.

Post-2032 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 revise 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 (NTTR). The Department of Energy's Environmental Management (EM) Nevada Program is responsible for completing cleanup actions at these historic nuclear testing locations, as well as waste disposal for both on site and off site generators.

In accordance with the Federal Facility Agreement and Consent Order (FFACO), the EM Nevada Program is responsible for environmental corrective actions at 148 surface soil locations, 1,013 industrial site locations, and groundwater contaminated by historical nuclear testing.

Cleanup has been completed at all surface soil sites covered in the FFACO, an accomplishment reached six years ahead of schedule in 2019, with cost savings of approximately $67 million in federal funding. Cleanup has also been completed at 99 percent of all industrial sites to date, which includes legacy facilities, infrastructure, and waste disposal locations, among others.

For groundwater contamination, the EM Nevada program is working to identify contaminant boundaries, restrict access to contaminated groundwater, and implement a long-term monitoring program. Because of the vast and complex geology of the NNSS, groundwater contamination is grouped into characterization areas based on location and similar geology. Three of the four groundwater characterizations areas at the NNSS have transitioned into long-term monitoring.

The EM Nevada Program welcomes stakeholder feedback through a variety of means, including regular meetings with intergovernmental stakeholders and the Nevada Site Specific Advisory Board (NSSAB).

The Engine Maintenance, Assembly, and Disassembly complex, where nuclear propulsion rocket development and testing programs were once conducted at the Nevada National Security Site, is being prepared for demolition. The larger photo is a rendering of the area upon the completion of demolition.

Calendar Year 2021 Accomplishments

- **Initiated characterization and hazard reduction activities to prepare for demolition and closure of two legacy facilities at the Nevada National Security Site (NNSS)**
- **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 ~550,000 cubic feet of classified and low-level (LLW)/mixed low-level (MLLW) radioactive waste in support of cleanup and activities at federal sites across the U.S. involved in nuclear research, development, and testing, and ongoing national security and science missions**

Planned Cleanup Scope 2022–2032

Over the coming decade, the EM Nevada program expects to complete its current scope of cleanup activities safely, securely, and successfully at the NNSS. EM Nevada will continue to closely collaborate with local stakeholders, including the Nevada Site Specific Advisory Board (NSSAB), Intergovernmental Liaisons group, Low Level Waste Stakeholders Forum, and others, to to complete it's cleanup in a manner that prioritizes the protection of people, communities, and the environment.

In 2020, EM Nevada transitioned the second and third of four groundwater corrective action areas at the NNSS into long-term monitoring, bringing the Program's overall groundwater mission to 75 percent completion.

Technicians collect samples from a groundwater well at the NNSS.

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, external peer review, and regulatory approval of the corrective action plan) is anticipated to be completed by the end of 2023. By the end of 2027, EM anticipates completing the model evaluation phase for Pahute Mesa, including the drilling of two model evaluation 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 landlord of the NNSS, the NNSA.

In 2021, the EM Nevada Program initiated characterization and hazard reduction activities in preparation for the demolition and closure of two large, unique, and complex legacy nuclear facilities on the NNSS. 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. In 2022, the EM Nevada Program will begin demolition work at EMAD and TCC, including site preparation, staging, and grading activities, as well as the removal of asbestos and perlite.

Long-term monitoring of industrial sites will remain the responsibility of EM Nevada until the Program completes its environmental restoration mission at the NNSS. It is currently anticipated that, at that time, long-term stewardship responsibilities for closed industrial sites will be transferred to the landlord of the NNSS, the NNSA.

The EM Nevada Program will continue to support cleanup and activities at federal sites across the U.S. involved in nuclear research, development, and 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.

Characterization is underway in preparation for demolition and closure of the EMAD facility.

Key Regulatory Milestones 2022–2032

EM Nevada environmental restoration 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 Low-Level Waste disposal operations. The federal Resource Conservation and Recovery Act, which regulates hazardous waste management, also governs certain aspects of Mixed Low-Level Waste disposal at the NNSS.

- **Submit the TCC closure report to the regulator — 2023**
- **Submit the EMAD closure report to the regulator — 2024**
- **Transition post-closure monitoring for most sites to NNSA — 2027**
- **Transition post-closure monitoring of Pahute Mesa to NNSA — 2028**

Post-2032 Cleanup Scope

The EM Nevada Program is scheduled to reach end-state for its cleanup mission by 2028, which will ultimately involve the completion of all active remediation activities and the conveyance of remediated sites for long-term stewardship. It is currently anticipated that there will be a need within the DOE complex for NNSS waste disposal beyond 2030.

Oak Ridge

Overview

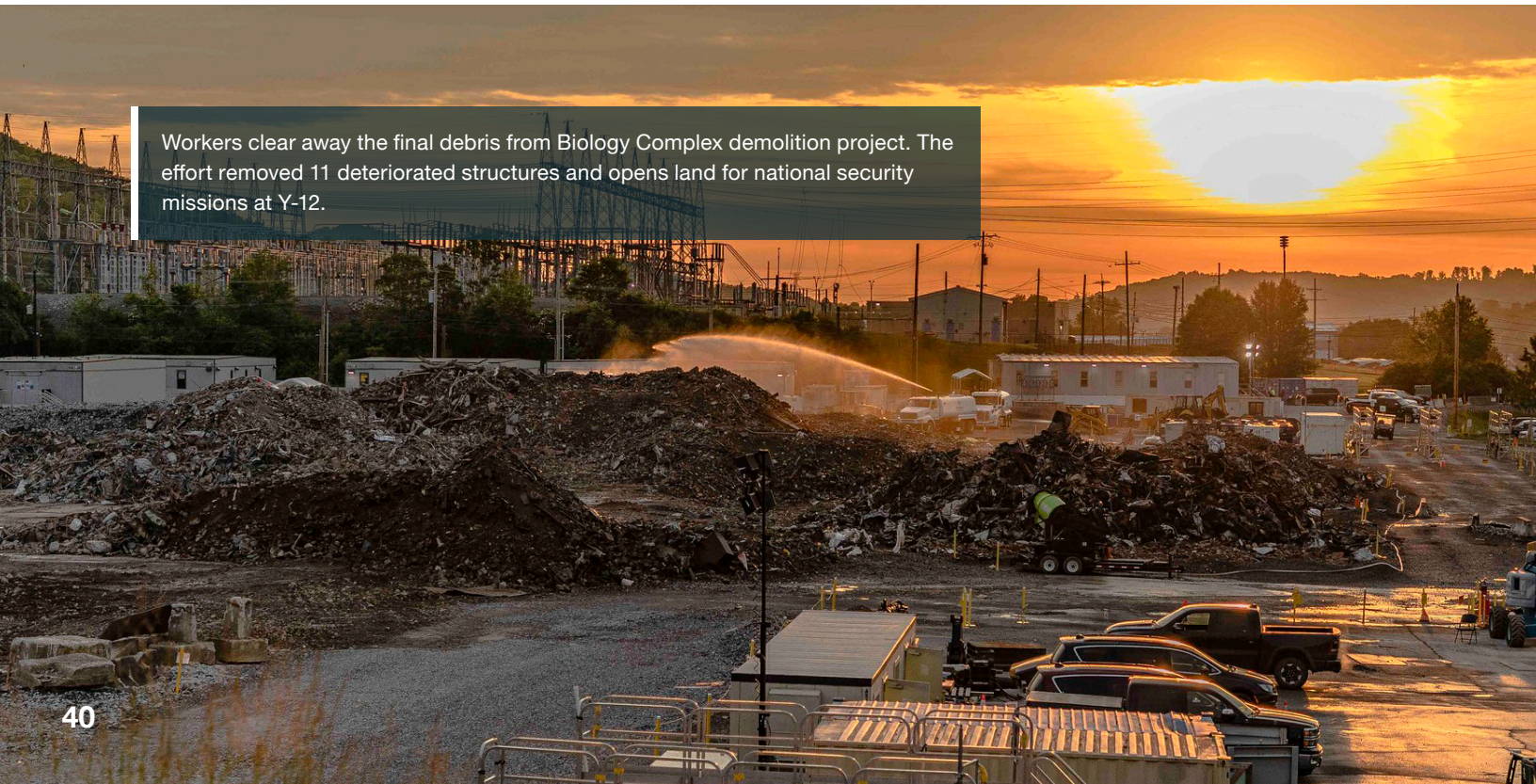
The Oak Ridge Site, located in eastern Tennessee, is one of the three original sites in the Manhattan Project. The U.S. Army Corps of Engineers began acquiring land in the area in October 1942. By March 1943, 56,000 acres were sealed behind fences and major industrial facilities were under construction. 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 ETTP), X-10 (present day ORNL), and Y-12 — purified isotopes, conducted advanced research, manufactured weapons components, and enriched uranium. These activities created environmental legacies that placed the Oak Ridge Reservation on EPA's National Priorities List in 1989.

The Oak Ridge Office of Environmental Management (OREM) is the landlord of ETTP, and it is responsible for the CERCLA cleanup at Y-12 and ORNL. OREM has achieved significant risk reduction across the Oak Ridge Reservation, 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 23 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, and former process buildings considered to be the worst of the worst); eliminate the site's remaining inventory of uranium-233; remediate areas with dense mercury contamination; and 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. 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. OREM representatives also regularly correspond with local city and county officials.



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.

Calendar Year 2021 Accomplishments

- **Met an EM priority by completing demolition at Y-12's Biology Complex, which eliminated large high-risk structures and opened land for the new Lithium Processing Facility**
- **Demolished the Radiological Development Lab's West Cell Bank at ORNL**
- **Processed and disposed the remaining low-dose portion of Oak Ridge's uranium-233 inventory that was stored at ORNL. This project also provided medical isotopes for next-generation cancer treatment research**
- **Demolished the Tritium Target Preparation Facility at ORNL**
- **Completed land restorative work at the former Centrifuge Complex and Powerhouse areas at ETTP for transfer and future use**
- **Completed 100th shipment of transuranic waste from Oak Ridge since waste disposal resumed at WIPP**
- **Awarded the Oak Ridge Cleanup Contract, which will lead cleanup for the next decade**
- **Completed an EM priority by completing multiple real property and land transfers at ETTP**

Planned Cleanup Scope 2022–2032

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 made significant progress addressing areas with impacted soil in 2021. OREM is slated to complete remaining soil remediation at ETTP by 2024. It also reached agreement with Tennessee state regulators to complete necessary RODs for groundwater remedies at ETTP by 2026 with remedies expected to be in place by 2028. Much of land is expected to be transferred to the community for industrial redevelopment.

With cleanup nearing the finish line at ETTP, large scale cleanup operations are ramping up at ORNL and Y-12. In 2021, EM demolished high-risk structures that eliminated risks and opened land for ongoing missions at both sites. Crews tore down the remaining buildings in Y-12's massive Biology Complex, and workers also demolished the Tritium Target Preparation Facility (Building 7025) and West Bank Hot Cell at the former Radioisotope Development Lab (Building 3026) at the Oak Ridge National Laboratory (ORNL).

In 2022, OREM will complete soil remediation at the former Biology Complex site to enable the transfer of 18 acres for NNSA to construct a new facility to support national security missions. Deactivation will also continue at numerous facilities located at Y-12 and ORNL, preparing them for future demolition. By 2023, OREM is scheduled to complete deactivation and demolition of the East Cell Bank at the former Radioisotope Development Lab. That effort removes the last of the building's six hot cells and eliminates highly contaminated structures in the heart of ORNL.

In 2023, OREM is scheduled to complete mockup testing for sludge processing. This involves finishing construction on the Sludge Processing Mock Test Facility and operating that facility to assist in technology testing and maturation related to future processing of Oak Ridge's inventory of sludge TRU waste. OREM will also complete demolition of two former research reactors – the Bulk Shielding Reactor (Building 3010) and Low Intensity Reactor (Building 3005) – located in the central campus of ORNL that year. These projects eliminate hazards and enhance accessibility to the Graphite Reactor, which is a component of the Manhattan National Historical Park.

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.

OREM is expected to finish processing, downblending, and disposing the remaining inventory of uranium-233 stored at ORNL by 2027 based on the contractor's planned approach. 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. By 2028, all of the processing and shipments of Oak Ridge's inventory of legacy TRU debris waste will

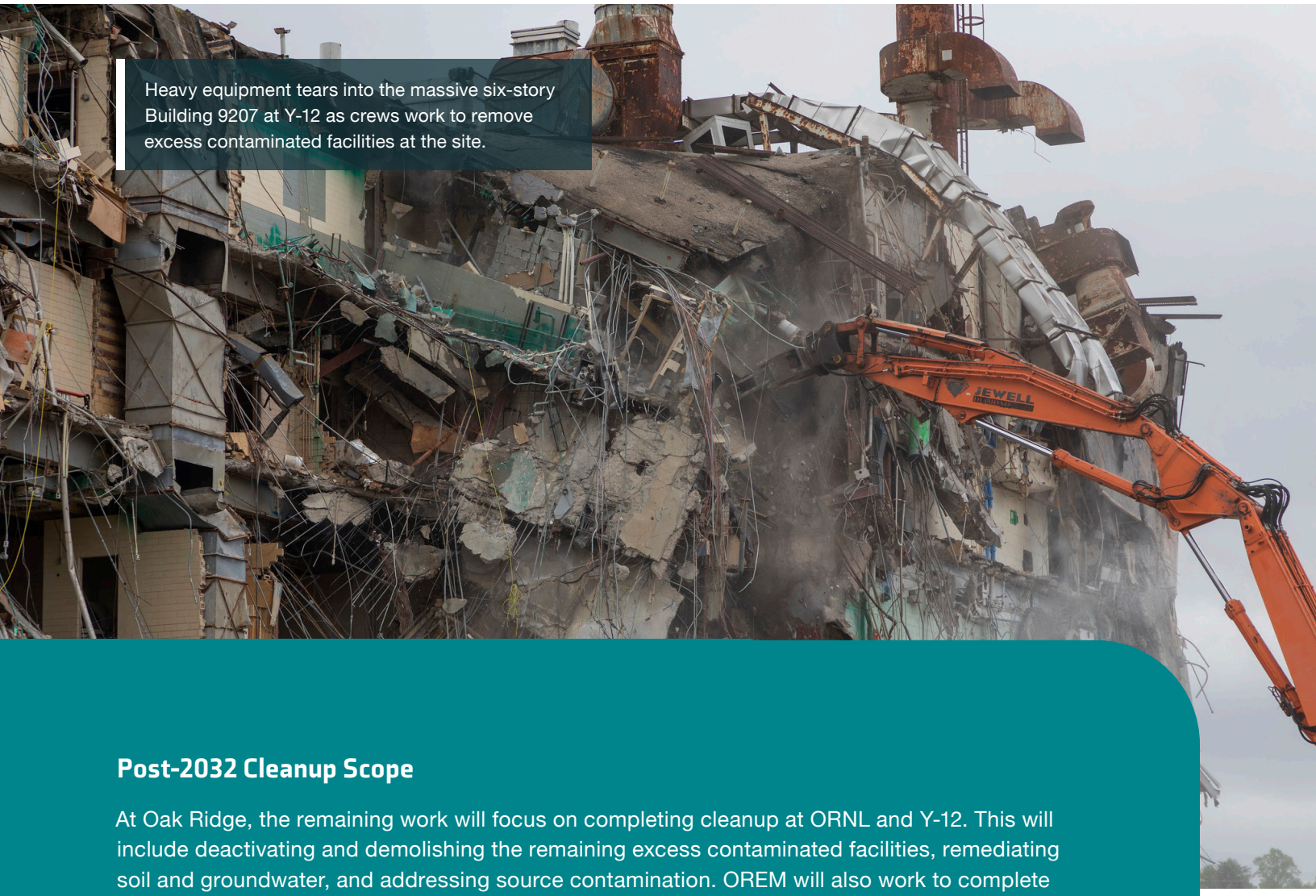
be completed. This inventory includes both contact-handled and remote-handled waste.

By the late 2020s, 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 low-level waste generated from completing cleanup at ORNL and Y-12.

Key Regulatory Milestones 2022–2032

Cleanup of the Oak Ridge Reservation is governed by a Federal Facility Agreement between 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 soil remediation at the Exposure Unit 5 area (former Biology Complex Area) of Y-12 — 2022**
- **Complete the Record of Decision (ROD) for Final Soils Actions in Zone 1, ETTP — 2022**
- **Complete ETTP Main Plant Area groundwater interim ROD — 2022**
- **Preparing for demolition of ORNL Central Campus Research Reactor Complex — 2023**
- **Complete demolition of Building 3005 and Building 3010 — 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-2032 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 530,000 gallons of TRU sludge and operate the program's waste treatment and disposal facilities.

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.

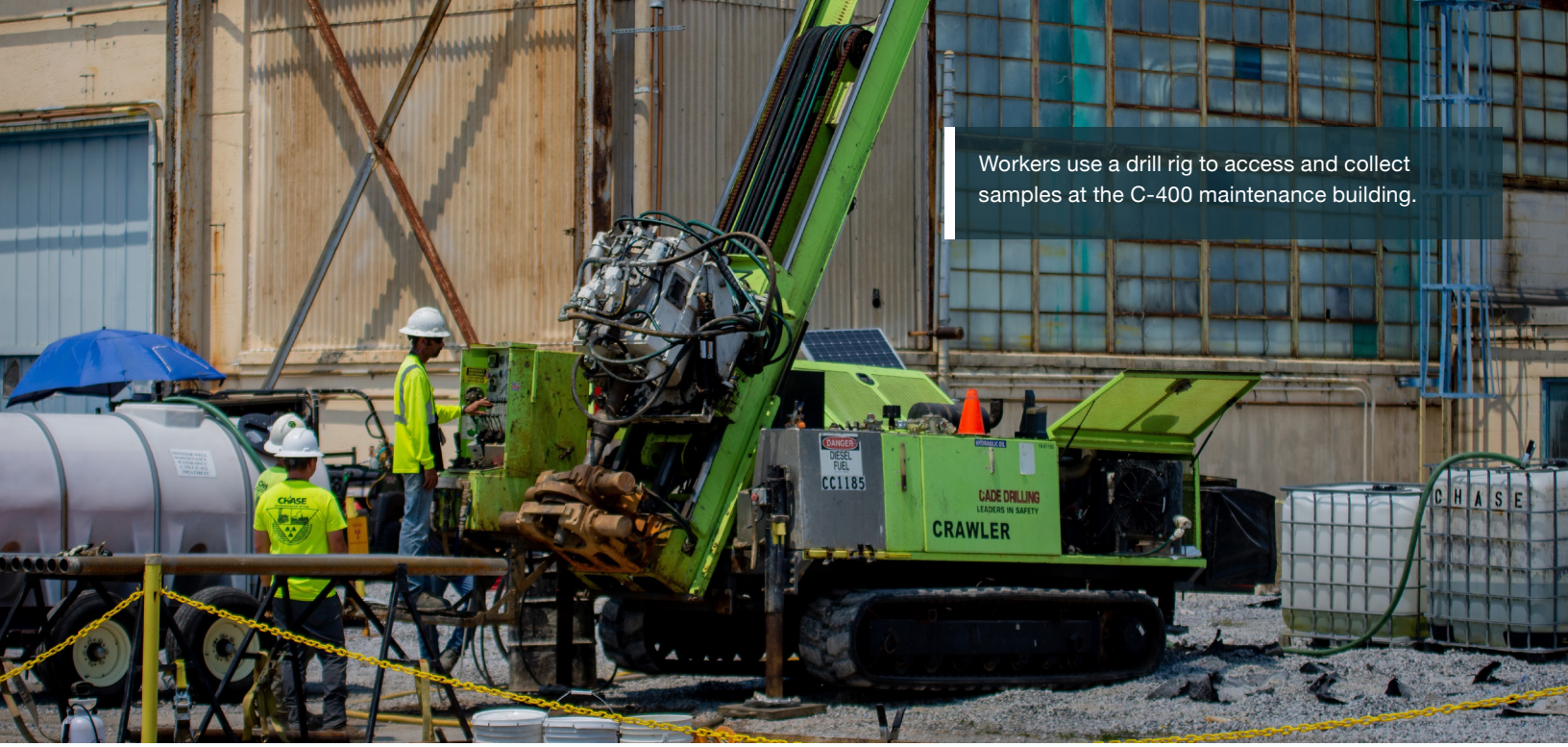
Environmental cleanup of the Paducah GDP began in 1988 when groundwater contamination resulting from plant operations was discovered outside of the DOE property. Environmental cleanup includes remediation of groundwater, surface water, soil, lagoons, and burial grounds. All of the more than 500 facilities 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 hexaflouride conversion plants. DUF6 was a byproduct from the uranium enrichment operations at the three enrichment plants in Oak Ridge, Tennessee; Portsmouth, Ohio; and Paducah, Kentucky. DOE has a total inventory of approximately 67,000 steel cylinders at the Portsmouth and Paducah sites. At Paducah, the DUF6 conversion facility began operation in 2011.

Calendar Year 2021 Accomplishments

- **Removed approximately 1.7 million pounds of hazardous refrigerant from the site - an EM priority**
- **Completed base sampling for C-400 Remedial Investigation/Feasibility Study (RI/FS)**
- **Completed deactivation of the C-531 switchyard**
- **Reduced limited area footprint by 65 acres** *(Reduces security concerns, costs and advances the schedule for cleanup)*
- **Completed installation of DUF6 backup bulk hydrogen system**

This year crews at the Paducah site will package 1 million pounds of R-114 for off site shipment and treatment.



Workers use a drill rig to access and collect samples at the C-400 maintenance building.

Planned Cleanup Scope 2022–2032

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.

In 2022, DOE will submit the C-400 Remedial Investigation/Feasibility Study (RI/FS). The RI/FS is the first document in the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) decision process that will develop a path for eliminating the primary source of the TCE groundwater contamination that was discovered off the DOE property in 1988.

DOE will continue to work with federal and state environmental regulators in the coming years to develop and reach consensus on final remedial actions, and preparing and implementing the remedial action work plans.

In 2025, DOE anticipates 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. The demolition of the C-400 Cleaning Building in 2027 will facilitate this action.

Over the next decade, DOE plans to complete deactivation work at the C-333 Process Building, one of the four large 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.

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.

In 2022, approximately 5,000 metric tons of inventory at the DUF6 conversion plant are expected to be processed. 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 2022–2032

Cleanup activities at Paducah are covered by Federal Facilities Agreement between DOE, the Commonwealth of Kentucky, and the EPA.

- **Complete RI/FS for C-400 final remedial action — 2022**
- **Complete proposed plan for C-400 final remedial action — 2023**

DUF6 operations are ramping back up following COVID related closures. The Paducah site has restarted operations, with the Portsmouth site to follow in 2022.

Post-2032 Cleanup Scope

Beyond 2032, 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 the entire inventory of DUF6 located at Paducah by 2057. DOE currently projects completing cleanup activities at Paducah in 2065.

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. In 2020, DOE completed a land transfer process model to raise awareness of DOE's plans for future land transfer. In addition, ongoing meetings with community leaders will continue to support future development of the site.

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 Plant, 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 DUF6 conversion plants. DUF6 was a byproduct from the uranium enrichment operations at the three enrichment plants in Oak Ridge, Tennessee; Portsmouth, Ohio; and Paducah, Kentucky. DOE has a total inventory of approximately 67,000 steel cylinders at the Portsmouth and Paducah sites. At Portsmouth, the DUF6 conversion facility began operation in 2010.

Calendar Year 2021 Accomplishments

- Demolished 40 percent of the X-326 process building
- Initiated operation of the On-Site Waste Disposal Facility (OSWDF) with the first waste placement
- Completed excavation of X-740 groundwater plume
- Completed installation of bulk hydrogen backup system at DUF6 plant

Planned Cleanup Scope 2022–2032

Over the next decade, DOE plans to make significant progress in addressing the three former uranium

In 2022 workers will complete demolition of Portsmouth's X-326 process building.

At the OSWDF, placement operations continue as a landfill compactor compresses debris from the X-326 demolition project

enrichment process buildings at the site, with demolition of two to be completed in that time frame.

By the end of 2022, the X-326 process building will be structurally demolished, and work will continue on deactivation of the X-333 process building. The second of the three process buildings, X-333 is scheduled to be demolished by 2031. During this same time period DOE expects to complete deactivation of the X-330 Process Building.

In 2023, DOE will complete construction of the first three cells of the OSWDF that accepts demolition debris from the X-326 process building. Also, in 2022 DOE will complete excavation of the X-231B landfill to be used for fill in the OSWDF.

Construction of three new cells, as well as new infrastructure, is scheduled to begin in the 2025 time frame. This will support demolition of the X-333 Process Building. 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.

At the Portsmouth DUF6 conversion facility, DOE expects to convert 2,000 metric tons of DUF6. By the end of 2032, 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 2022–2032

- None

Post-2032 Cleanup Scope

Beyond 2032, the last three OSWDF cells are expected to be constructed to support 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 2038, including the disposition of the entire inventory 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 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.

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

Calendar Year 2021 Accomplishments

- **Continued monitoring activities at three groundwater contamination sites.**
- **Proposed groundwater remedies to state regulator for consideration**

Planned Cleanup Scope 2022–2032

Beginning in 2022, 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.

In 2023, the Tijeras Arroyo Groundwater AOC is planned to transition to long-term stewardship. In 2021 the Phase I treatability study was completed. In 2022 DOE will continue monitoring activities and expects to provide NMED with any additional analysis in support of developing the Corrective Measures Evaluation due to NMED by January 2023. This would support moving forward with the decision process for Long Term Stewardship of the Tijeras Arroyo Groundwater AOC.

Key Regulatory Milestones 2022–2032

- None

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 a complex site 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 35 million gallons of radioactive liquid waste stored in 43 underground tanks; surplus plutonium downblending with eventual disposition as transuranic 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, 308 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 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,

SRS continues to meet mission needs by constructing megasized SDUs to permanently dispose of decontaminated saltstone.

SRS completed modifications to convert Tank 42 into the third blend tank for the SWPF feed. Pictured is the site of Tank 42.

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 and the vision for the coming decade has their support. 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 2021 Accomplishments

- **Processed more than 2 million gallons of waste at SWPF in its first year of operations**
- **Completed construction ahead of schedule and under budget for Saltstone Disposal Unit 7, the second mega-sized SDU built at SRS to permanently dispose of decontaminated saltstone**
- **Treated and disposed of more than 3 million gallons of decontaminated salt solution at the Saltstone Production Facility — a record for any fiscal year in the history of the high-level waste program at SRS**
- **Increased throughput of H-Canyon with processing of 11 spent nuclear fuel dissolutions**
- **Transitioned to a new standalone management and operating contract for SRNL**
- **Deactivated and decommissioned five buildings in D Area and completed D Area Coal Yard cleanup project to excavate and blend soil with fine grade limestone to lower pH levels**

Planned Cleanup Scope 2022–2032

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 transuranic 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 9 million gallons of waste per year by FY 2024 following the implementation of the Next-Generation Solvent. By 2031, it is expected that nearly all of the salt waste inventory will be processed, and F-Tank Farm will be nearly empty.

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 amount of Defense Waste Processing Facility (DWPF) recycle wastewater was treated and disposed. In 2021, the Department released a draft environmental assessment analyzing the proposed commercial disposal of certain contaminated process equipment at SRS utilizing the high level waste interpretation.

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 being closed in the next decade. By 2031, the DWPF is forecast to have produced more than 6,800 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 eventual disposal at WIPP. Shipment of waste to WIPP is expected to begin in 2022. 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.

Workers mixed more than a million pounds of iron filings with a food-grade, starch-like material (shown here) to create the P Area Permeable Reactor Barrier Wall, which won a 2021 DOE Sustainability Award.

The Receiving Basin for Off Site Fuels, 235-F, and F/H Analytical Laboratories will complete deactivation activities, enabling transfer to the decommissioning program.

The solid waste program will continue to characterize, store, and disposition site-generated wastes in compliance with applicable regulations and requirements. All remaining SRS legacy transuranic waste (approximately 460 cubic meters) will be disposed of at WIPP.

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).

SAVANNAH RIVER NATIONAL LABORATORY

In 2021, EM transitioned to the new standalone M&O contract for SRNL. This new contract positions the laboratory for long-term growth and continued success in support of the DOE strategic goals in the cleanup of the nuclear legacy, science and energy, and nuclear security. It also enables SRNL to focus on its strategic plans for expanding the R&D portfolio supporting DOE missions and other federal agencies, while allowing the SRS M&O to focus on its program priorities in managing and operating the SRS.

DOE is also moving forward with design and build of the Advanced Manufacturing Collaborative (AMC). 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.

Key Regulatory Milestones 2022–2032

Cleanup work at Savannah River is governed by a Federal Facility Agreement between 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**

SRS completed the D Area Coal Yard cleanup project to excavate and blend soil with fine-grade limestone to lower pH levels.

Post-2032 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.

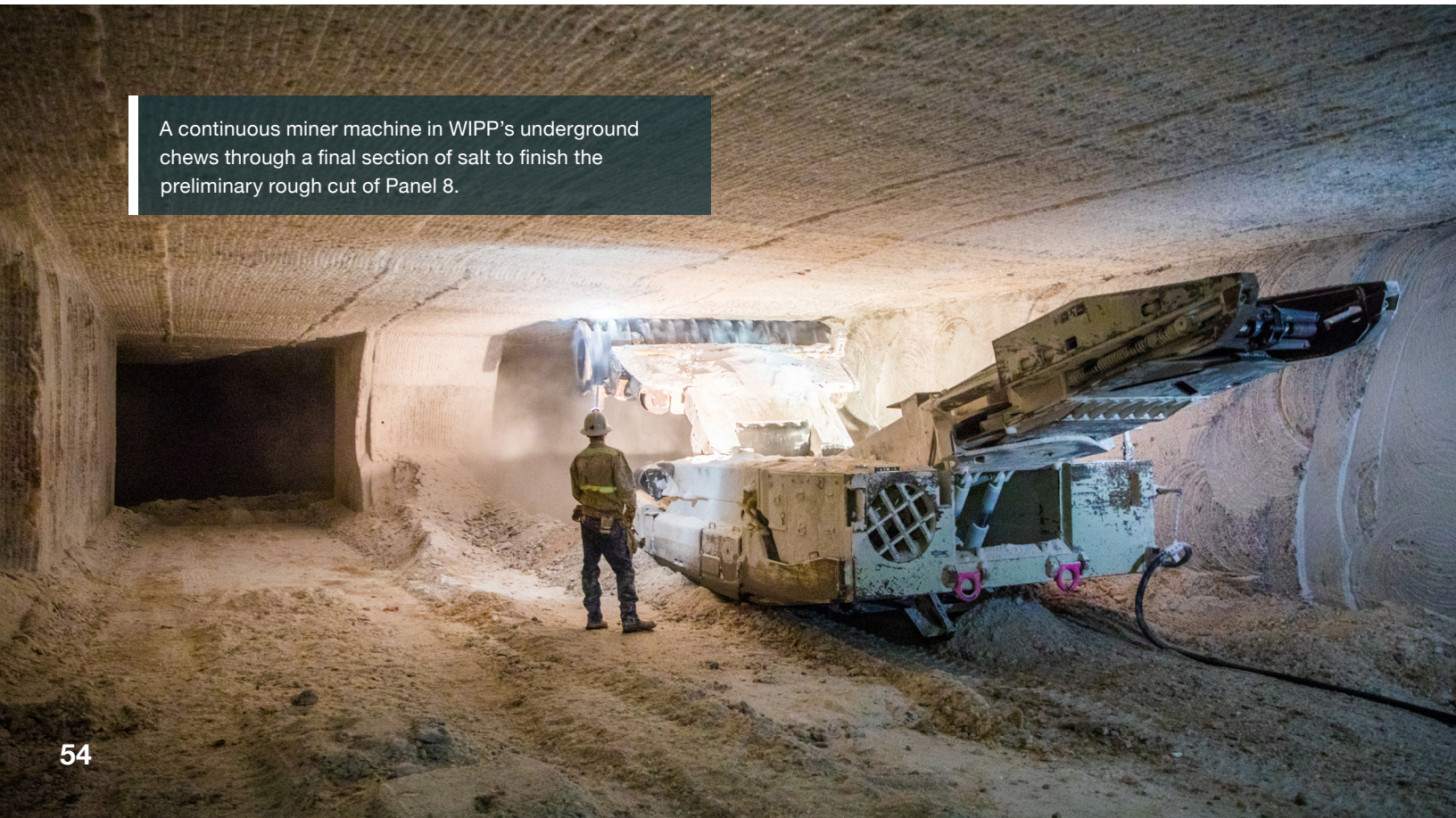
Waste Isolation Pilot Plant

Overview

WIPP is the nation's only deep geologic repository for the disposal of transuranic (TRU) waste generated by atomic energy defense activities. WIPP is located 33 miles southeast of Carlsbad, New Mexico, in the Chihuahuan Desert, far from major population centers. 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 operation in 1999 and celebrated 20 years of operations in 2019. To date, WIPP has received nearly 13,000 shipments. Those shipments were safely transported more than 15 million cumulative miles.

The WIPP 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). Approximately 2.44 million cubic-feet (69,000 cubic-meters) of TRU waste, or about 39 percent of the LWA TRU volume limit, has been emplaced in the underground repository to date. 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 local area stakeholders in the city of Carlsbad and Eddy and Lea counties 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 and their 25-member states which 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.



A continuous miner machine in WIPP's underground chews through a final section of salt to finish the preliminary rough cut of Panel 8.

Workers attach guiding tag lines to ductwork before lowering it into a channel adjacent to the utility shaft at WIPP.

Calendar Year 2021 Accomplishments

- Completed mining of Panel 8
- Substantial construction progress on the two primary buildings of the Safety Significant Confinement Ventilation System (SSCVS), including the 25,000 square-foot Salt Reduction Building and the 55,000 square-foot New Filter Building – an EM priority for 2021
- Restarted the 700-C ventilation fan, increasing air movement in WIPP underground from 170,000 cubic-feet-per-minute to 240,000 cubic-feet-per-minute during mining, bolting and maintenance activities
- Maintained a shipping rate from EM sites of five shipments weekly

Planned Cleanup Scope 2022–2032

It 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. 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 for the long term. By the end of 2025, a set of key infrastructure projects will be completed, improving WIPP's capabilities in mining and waste emplacement. These include the new SSCVS, which provides 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 serves 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.

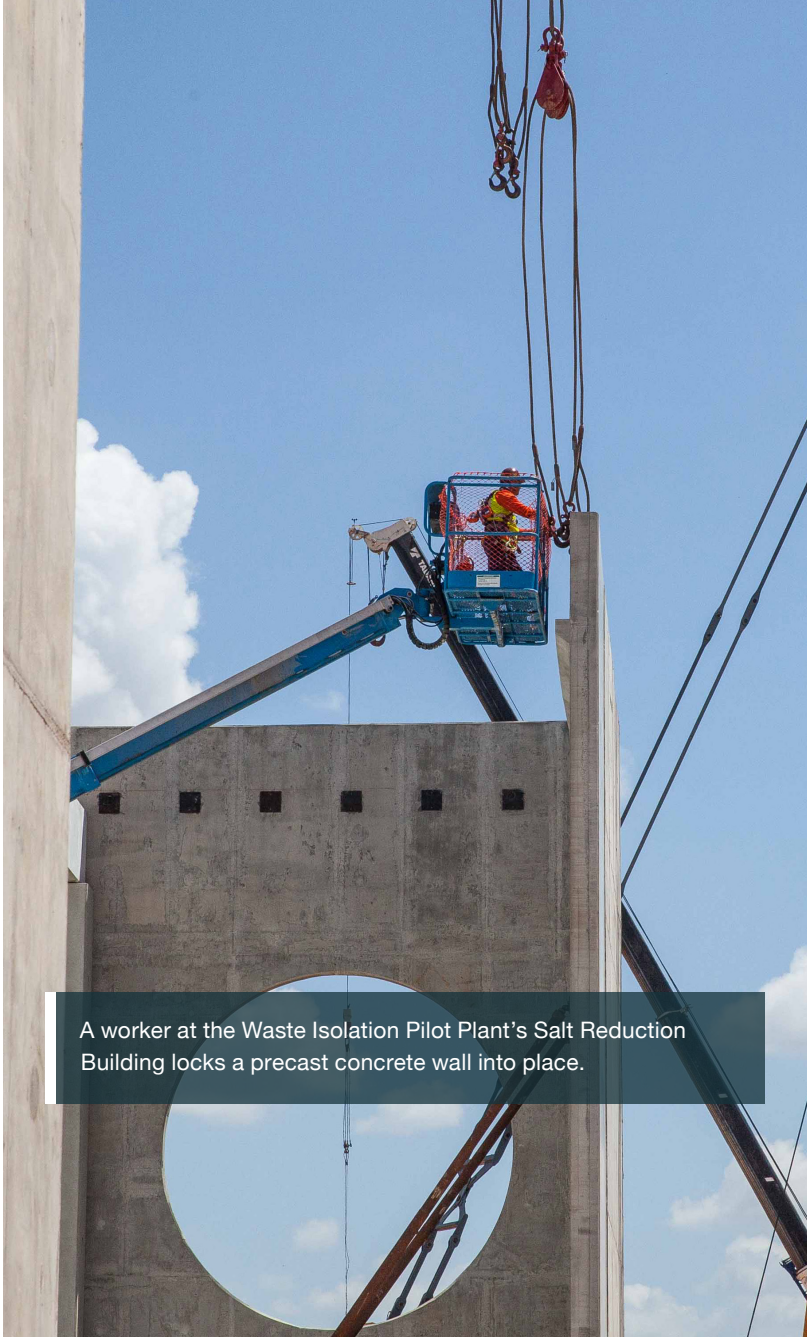
EM completed mining Panel 8 in 2021 and is expected to begin emplacing waste in Panel 8 in 2022. WIPP has applied to the state of New Mexico for approval to mine Panels 11 and 12 to replace emplacement space lost from the abandonment of Panels 9 and 10.

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 and site network 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
- Modernization of WIPP's Central Monitoring Room
- Installation of a new digitally based geotechnical monitoring system in the WIPP underground

Regulatory Milestones 2022–2032

- None



A worker at the Waste Isolation Pilot Plant's Salt Reduction Building locks a precast concrete wall into place.

Post-2032 Cleanup Scope

WIPP continues mining and waste emplacement operations to dispose of a total of 6.2 million cubic-feet of TRU waste, supporting key NNSA and SC missions, along with the remaining EM cleanup mission. Initially, it was assumed that WIPP would complete its mission and cease operation in 2030. However, based on revised TRU waste estimates, it has been determined additional time is required for WIPP to fully complete its mission. 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

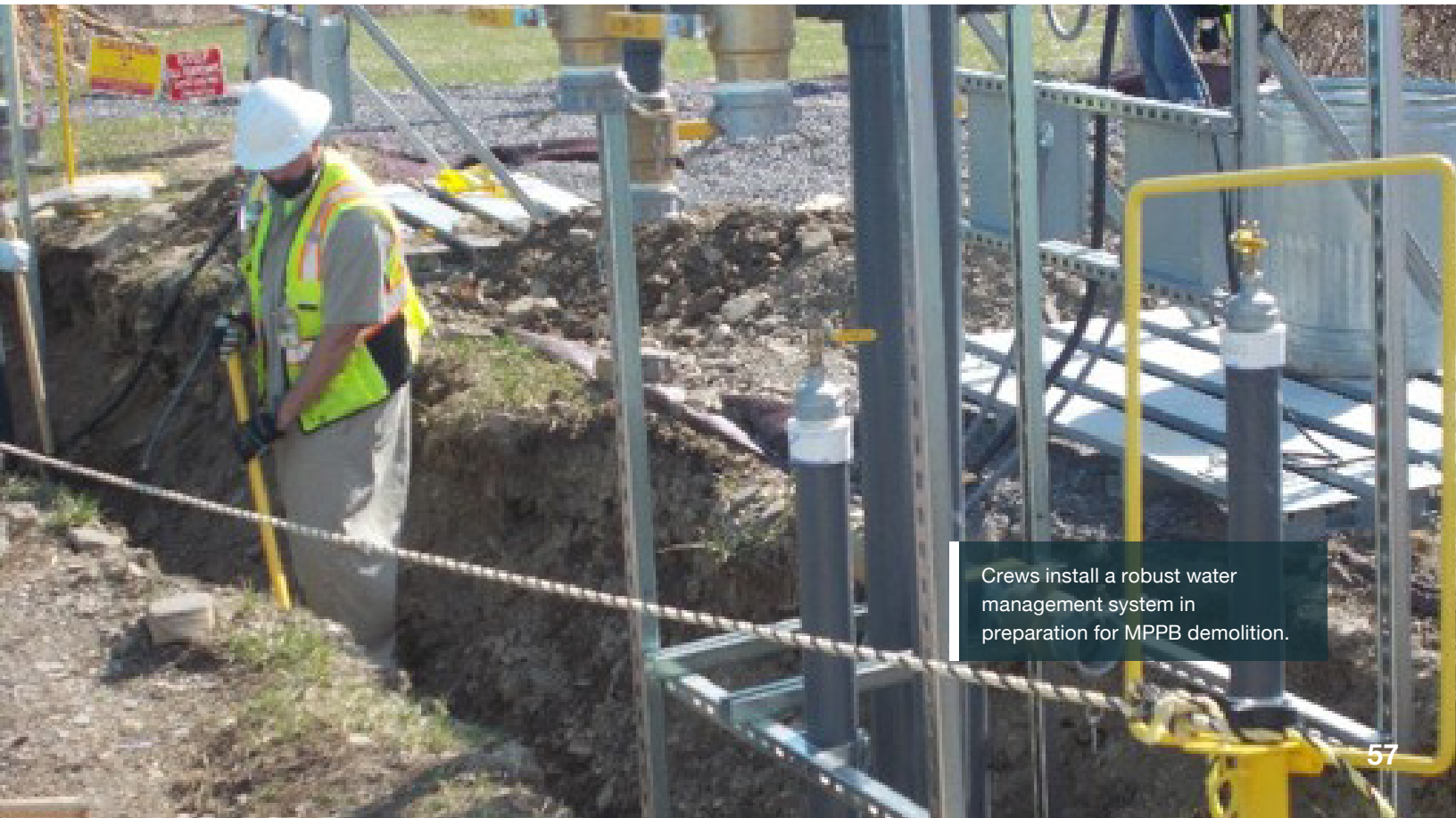
Overview

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 spent nuclear fuel (SNF) reprocessing facility to operate in the United States. In 1962, Nuclear Fuel Services, Inc., entered into agreements with the Atomic Energy Commission (AEC) and New York State to construct, license, and operate the commercial reprocessing plant. The fuel reprocessing plant, along with two associated waste burial grounds and an underground set of four tanks for reprocessing waste, operated from 1963 to 1972, processing 640 metric tons of SNF and generating over 600,000 gallons of liquid high-level waste (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 it 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 low-level waste (LLW) and transuranic (TRU) waste produced by the HLW solidification process***

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



Crews install a robust water management system in preparation for MPPB demolition.

A worker gets trained on how to get suited up for Product Purification Cell-South 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 1998, 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 Record of Decision (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 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 two in-person Town Hall Meetings to discuss the upcoming demolition of the Main Plant Process Building

Calendar Year 2021 Accomplishments

- Restored rail shipment capabilities for the site
- Continued preparation for the Main Plant Process Building (MPPB) demolition by installing a new water collection and treatment system and repurposing an administrative trailer complex into a multipurpose building designed to support MPPB demolition activities
- Completed final General Purpose Cell related stabilization activities and completed the deactivation of the Equipment Decontamination Room (EDR) and Chemical Process Cell (CPC)
- Completed the removal and restoration of the last of the 46 balance of site facilities that are no longer needed for current or future cleanup efforts

Planned Cleanup Scope 2022–2032

Over the next decade, DOE will complete Phase 1 soil remediation and facility decommissioning activities, though completion could be impacted by a lack of disposal options for GTCC-like waste. In 2022, DOE will start the demolition of the last major remaining facility, the Main Plant Process Building (MPPB). By February 2025, DOE expects to complete demolition of the MPPB.

By the end of 2028, 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 2030, DOE will complete soil remediation efforts in Waste Management Area-1 and Waste Management Area-2.

By 2023, 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.

Key Regulatory Milestones 2022–2032

- None

Post-2032 Cleanup Scope

Remaining work at West Valley post-2032 will focus on disposal of "orphan" waste (waste which currently does not have a pathway for disposal) and completion of Phase 2 decommissioning activities. 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.

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