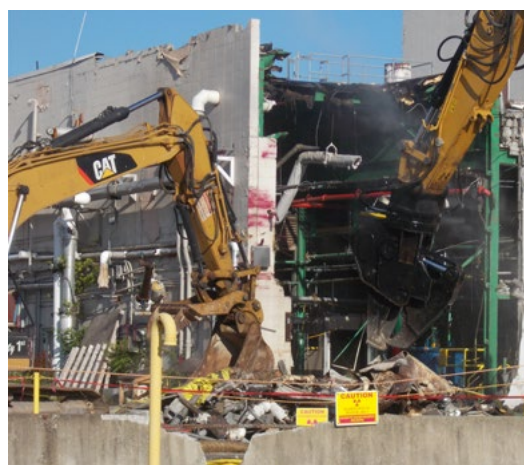
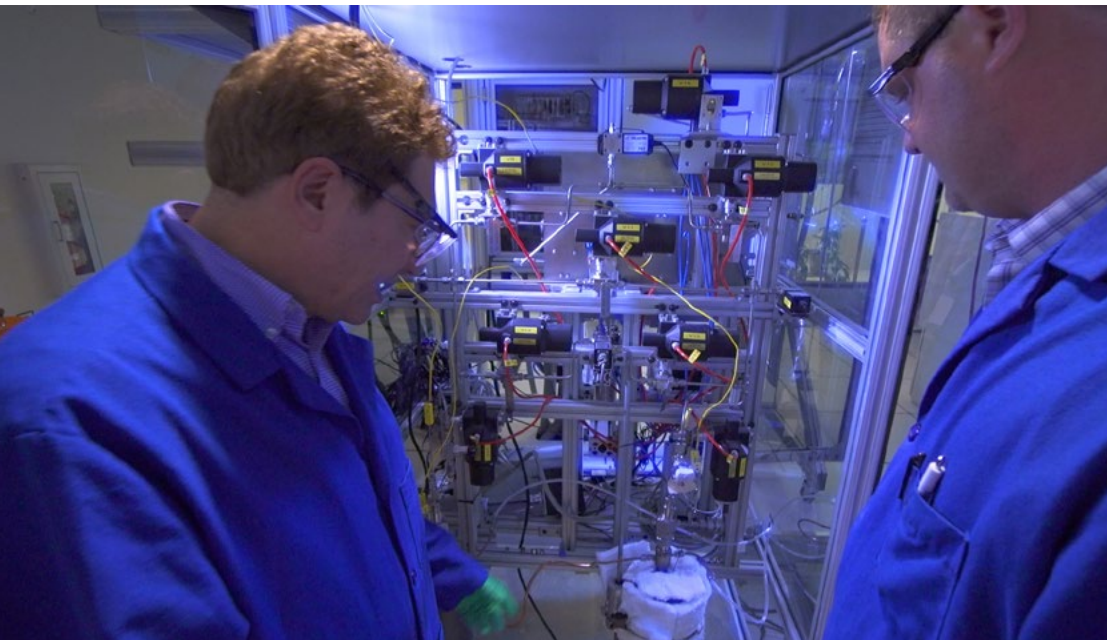




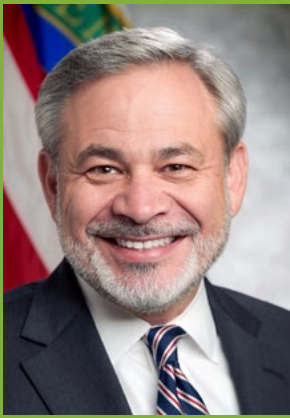
# 2020

## YEAR IN REVIEW



U.S. DEPARTMENT OF  
**ENERGY**

OFFICE OF  
**ENVIRONMENTAL  
MANAGEMENT**



“As the Department of Energy opens new horizons in innovation and American energy production, our responsibility to address the environmental liabilities that accrued while ending World War II and keeping the peace in the decades that followed is always at the forefront.

While adapting to the global pandemic, the EM team has focused on safely and effectively executing the cleanup mission, resulting in historic progress across the complex. The lasting impacts of these achievements set the stage for a decade of transformational progress that extends beyond EM to other Departmental missions.”

*—Dan Brouillette, Secretary,  
U.S. Department of Energy*



“The Department of Energy has achieved one of the most impactful slates of EM accomplishments in the history of the program, positioning cleanup sites for a new era of success. Over the course of the year, the EM team demonstrated an ability to not only deliver results, but in many cases bring them in ahead of schedule and under budget. The historic achievements of 2020 will propel DOE missions forward, reducing risks, enabling national security and science priorities, protecting the environment, and benefiting communities who host Departmental facilities for generations to come.”

*—Paul Dabbar, Under Secretary for Science,  
U.S. Department of Energy*



“From transformational tank waste capabilities to historic skyline changes, from a shrinking cleanup footprint to contracts that accelerate progress, 2020 has been an inflection point for sites across the EM mission. These achievements, coupled with initiatives laid out in the Strategic Vision, position EM to build on this momentum and achieve sustainable success. I am inspired by the way the EM workforce pulled together this year, adapting and finding ways to boost productivity and teamwork.”

*—William “Ike” White, Senior Advisor for Environmental  
Management to the Under Secretary for Science,  
U.S. Department of Energy*

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# Acronym List

|                |                                                                  |              |                                                   |
|----------------|------------------------------------------------------------------|--------------|---------------------------------------------------|
| <b>ACM</b>     | Asbestos-Containing Material                                     | <b>NNSS</b>  | Nevada National Security Site                     |
| <b>ALS</b>     | Advanced Light Source                                            | <b>NSC</b>   | National Safety Council                           |
| <b>AOC</b>     | Areas of Concern                                                 | <b>OEPA</b>  | Ohio Environmental Protection Agency              |
| <b>AMWTP</b>   | Advanced Mixed Waste Treatment Project                           | <b>ORNL</b>  | Oak Ridge National Laboratory                     |
| <b>ARP</b>     | Accelerated Retrieval Project                                    | <b>OSWDF</b> | On-Site Waste Disposal Facility                   |
| <b>CMS</b>     | Corrective Measures Study                                        | <b>PFP</b>   | Plutonium Finishing Plant                         |
| <b>DFLAW</b>   | Direct-Feed Low-Activity Waste                                   | <b>RANT</b>  | Radioassay and Nondestructive Testing Facility    |
| <b>DOE</b>     | U.S. Department of Energy                                        | <b>RCRA</b>  | Resource Conservation and Recovery Act            |
| <b>DUF6</b>    | Depleted Uranium Hexafluoride                                    | <b>RM/SM</b> | Rainier Mesa/Shoshone Mountain                    |
| <b>DWPF</b>    | Defense Waste Processing Facility                                | <b>RMHF</b>  | Radioactive Materials Handling Facility           |
| <b>EM</b>      | Environmental Management                                         | <b>RRM</b>   | Residual Radioactive Material                     |
| <b>EM-LA</b>   | Environmental Management Los Alamos Field Office                 | <b>SDU</b>   | Saltstone Disposal Unit                           |
| <b>ESP</b>     | Electrostatic Precipitator                                       | <b>SNF</b>   | Spent Nuclear Fuel                                |
| <b>ETEC</b>    | Energy Technology Engineering Center                             | <b>SPRU</b>  | Separations Process Research Unit                 |
| <b>ETTP</b>    | East Tennessee Technology Park                                   | <b>SRNL</b>  | Savannah River National Laboratory                |
| <b>HFBR</b>    | High Flux Beam Reactor                                           | <b>SRS</b>   | Savannah River Site                               |
| <b>HFIR</b>    | High Flux Isotope Reactor                                        | <b>SSCVS</b> | Safety Significant Confinement Ventilation System |
| <b>HWMF</b>    | Hazardous Waste Materials Facility                               | <b>SSFL</b>  | Santa Susana Field Laboratory                     |
| <b>ICP</b>     | Idaho Cleanup Project                                            | <b>SWPF</b>  | Salt Waste Processing Facility                    |
| <b>IM</b>      | Interim Measure                                                  | <b>TCCR</b>  | Tank Closure Cesium Removal                       |
| <b>INL</b>     | Idaho National Laboratory                                        | <b>TRU</b>   | Transuranic                                       |
| <b>INTEC</b>   | Idaho Nuclear Technology and Engineering Center                  | <b>TTR</b>   | Tonopah Test Range                                |
| <b>IWTU</b>    | Integrated Waste Treatment Unit                                  | <b>UMTRA</b> | Uranium Mill Tailings Remedial Action             |
| <b>LANL</b>    | Los Alamos National Laboratory                                   | <b>USACE</b> | U.S. Army Corps of Engineers                      |
| <b>LLNL</b>    | Lawrence Livermore National Laboratory                           | <b>WACIP</b> | Waste Acceptance Criteria Implementation Plan     |
| <b>LLNS</b>    | Lawrence Livermore National Security, LLC                        | <b>WCS</b>   | Waste Control Specialists, LLC                    |
| <b>LLW</b>     | Low-Level Radioactive Waste                                      | <b>WIPP</b>  | Waste Isolation Pilot Plant                       |
| <b>LM</b>      | Office of Legacy Management                                      | <b>WTP</b>   | Waste Treatment and Immobilization Plant          |
| <b>M&amp;O</b> | Management and Operating                                         | <b>WVDP</b>  | West Valley Demonstration Project                 |
| <b>NA-LA</b>   | National Nuclear Security Administration Los Alamos Field Office | <b>YF/CM</b> | Yucca Flat/Climax Mine                            |
| <b>NMED</b>    | New Mexico Environment Department                                | <b>Y-12</b>  | Y-12 National Security Complex                    |
| <b>NNSA</b>    | National Nuclear Security Administration                         |              |                                                   |

# OFFICE OF ENVIRONMENTAL MANAGEMENT

## HISTORIC PROGRESS REPRESENTS INFLECTION POINT FOR THE EM MISSION

Despite the unprecedented challenges of the COVID-19 pandemic, the U.S. Department of Energy (DOE) Office of Environmental Management (EM) completed historic accomplishments in 2020 that position the program for a new era of continued success. From completing a world-first with the East Tennessee Technology Park (ETTP) Vision 2020 at Oak Ridge, to bringing down what was once one of the highest-risk buildings at Hanford, to breaking ground on key infrastructure for the future at the Waste Isolation Pilot Plant (WIPP), to resuming cleanup at the Energy Technology Engineering Center (ETEC) after more than a decade, to transferring remediated cleanup sites near the Nevada National Security Site (NNSS) for long-term stewardship, the vast majority of 2020 priorities have been achieved.

With the Savannah River Site's (SRS) Salt Waste Processing Facility (SWPF) now operational, and progress on capabilities at Hanford and Idaho, this year has been transformational for the tank waste mission. In addition to the ramp-up in tank waste treatment capabilities, implementation of the Department's high-level waste interpretation proved successful. The safe and successful removal of a small quantity of low-activity liquid reprocessing waste from SRS for safe off-site treatment and disposal at a low-level radioactive waste (LLW) commercial disposal facility outside of South Carolina was completed this year.



*Energy Secretary Dan Brouillette joins congressional and state officials in October to celebrate the completion of ETTP Vision 2020 at Oak Ridge.*

This science-driven approach enables the Department to better address one of its largest environmental risks by potentially opening new disposition paths for lower activity waste that has been stored for decades at DOE sites with no near-term path for disposal.

The achievements of 2020 demonstrate what is possible when collaboration is prioritized and a commitment to safe, results-focused cleanup is shared by government, regulators, industry, and key stakeholders. From a leap forward in tackling EM's highest-risk waste, shrinking the size of the cleanup footprint, and changing skylines across the complex, to supporting national security priorities and enabling local economic development and job growth, these accomplishments collectively represent an inflection point for EM, ushering in a new era for the mission.

## SETTING THE STAGE FOR FUTURE SUCCESS

With key long-term projects now across the finish line, EM has its sights set on the future. Several procurement, policy, and management initiatives have been implemented to leverage the momentum of recent accomplishments for the decade ahead. Program and project management policies have been updated to increase rigor in project management and increase accountability. Procurement initiatives have been implemented that provide significant opportunities to drive cleanup towards completion. The first end-state style contracts are in place at Hanford and Nevada, with several others progressing across the complex. The new Expert Acquisition Corps is bolstering EM procurement capabilities to ensure EM has the right teams doing the right work at a good value for American taxpayers. DOE announced a new standalone management and operating (M&O) contract for EM's Savannah River National Laboratory (SRNL). This contract tool is key to leveraging innovation for cleanup success as well as positioning the Lab for the future.



*West Valley Demonstration Project managers brief EM Senior Advisor Ike White (center) on various projects under way when he visited the site in August.*

A collaborative approach to success has achieved cleanup results. EM prioritizes coordination with intergovernmental groups, state regulators, tribal nations, and local communities to achieve

the shared goal of safe and effective cleanup. Work to leverage the expertise of international partners also continues to enhance EM technical capabilities, best practices, and lessons learned

## STRATEGIC ROADMAP FOR A DECADE OF PROGRESS

A major component of a more robust and integrated approach to program management is EM's Strategic Vision. First issued in 2020, this forward-looking roadmap is helping inform in-depth planning across the complex at every level, and is prompting productive engagement on the future of the mission. The Strategic Vision is driving focus on impactful priorities by providing a clear picture of where cleanup is headed and how those successes can be achieved. Areas of focus include a science-driven and risk-informed approach to cleanup, a strong pipeline of talent for the workforce of tomorrow, and strong relationships with EM's intergovernmental community, state regulators, tribal nations, and local communities. Through a series of webinars and meetings, EM sought input from these cleanup partners that is being used as the next iteration of the Strategic Vision is developed.

## NAVIGATING THE COVID-19 PANDEMIC

Demonstrating an ability to adjust and adapt to the challenging and changing conditions of 2020, EM maintained focus on meeting the federal government's responsibility to address the environmental legacy of defense programs that helped end World War II and the Cold War, and government-sponsored nuclear energy research that helped ensure domestic prosperity.

In response to the COVID-19 pandemic, the safety of the EM workforce remained paramount. EM successfully navigated a safe and orderly transition to an essential mission-critical operations posture across the cleanup complex. Best practices and protocols on returning to



*DOE Under Secretary for Science Paul Dabbar (third from left) joined DOE and National Nuclear Security Administration officials to celebrate the transfer of 70 remediated sites on and around Nevada's Tonopah Test Range to Office of Legacy Management for long-term stewardship.*

work were developed. Using a phased approach guided by safety, operations resumed throughout the year in a limited fashion as conditions allowed. EM successfully adapted to working with regulators, local communities, the workforce, key stakeholders, and international partners in a virtual manner to share information and keep progress moving forward.

EM is assessing potential impacts of the pandemic on cleanup plans and schedules, analyzing lessons learned during reduced operations that can be applied going forward, and looking at how the pandemic will fundamentally change the way the workforce advances the mission in the future.

# HANFORD SITE

“I am very proud of what we have accomplished at the Hanford Site this past year. Looking back, this has been a year of unprecedented challenges, but also remarkable growth. The advances our team has made on the DFLAW system put Hanford on the precipice of initiating tank waste treatment, which will transform the site in the years ahead. There is nothing more rewarding than doing important work on behalf of our community, the region, and our nation at such an important time in history.”

– Brian Vance, Manager, Hanford Site

## HIGHLIGHTS

- Increased progress in construction, startup, and commissioning activities at the Waste Treatment and Immobilization Plant (WTP) that are critical to the Direct-Feed Low-Activity Waste (DFLAW) system
- Completed all startup testing in the WTP Analytical Laboratory and handed it over to plant management for commissioning activities
- Delivered a pretreatment system for tank waste
- Completed demolition of the Plutonium Finishing Plant (PFP) – a 2020 EM priority
- Completed the concrete pad that will house nearly 2,000 capsules of cesium and strontium in dry storage
- Began to stabilize three aging underground disposal structures
- Treated over 2 billion gallons of contaminated groundwater

## ADVANCING THE TANK WASTE MISSION

In 2020, the Hanford Site made progress on critical projects that will support tank waste treatment using the DFLAW system. DFLAW involves a set of interdependent projects and infrastructure improvements operating together to successfully vitrify, or immobilize in glass, millions of gallons of low-activity tank waste.

Construction, startup, and commissioning activities steadily progressed throughout the year. The Analytical Laboratory at the WTP became the first nuclear facility to finish startup testing and become operational. A pretreatment system known as the Tank-Side Cesium Removal system was tested and arrived on-site, marking the last piece of the physical DFLAW system to be put in place in the tank farms. The first 20 containers that will hold vitrified tank waste are now in place, and improvements were also made to the disposal facility that will ultimately hold them. The last group of commissioning technicians this year began their training classes to successfully prepare the treatment plant for 24/7 operations.



*The final class of commissioning technicians completed the classroom portion of in-depth systems training for operating the Waste Treatment and Immobilization Plant.*



*With the placement of the Tank-Side Cesium Removal system between the AP Tank Farm and the WTP, all pieces of the physical DFLAW system are now in place in the tank farms.*

In addition, workers continued retrieving waste from Tank AX-102 while preparing the next series of single-shell tanks for retrievals.



*An important milestone was achieved when Secretary Brouillette and Under Secretary Dabbar cut the ribbon on the WTP's Analytical Laboratory to signify the transition to operations.*

## **PRIORITIZING RISK REDUCTION, SAFETY, AND SECURITY**

Despite unprecedented challenges due to the COVID-19 pandemic, Hanford teams advanced several important risk-reduction projects. Over 2 billion gallons of groundwater were treated, surpassing DOE's annual treatment goal for the sixth year in a row.



*Hanford workers treated more than 2 billion gallons of groundwater to remove contamination for the sixth year in a row, with more than 22 billion gallons treated since the important risk-reduction work began.*

Crews successfully completed construction of a concrete pad that will store nearly 2,000 cesium and strontium capsules, completed demolition of the main processing facility at the PFP, and began to stabilize three aging underground waste disposal structures located in the footprint of the PFP demolition area.

## **ENSURING FUTURE SUCCESS**

Infrastructure projects, facility upgrades, permitting, and construction all continued to support safe and efficient treatment operations at Hanford. Further setting the course for future cleanup successes at Hanford, major contract transitions progressed in 2020. The contract transition process began in August for the Hanford Mission Integration Solutions contract, and final preparations paved the way for the October start of the Central Plateau Cleanup Company contract transition. The contract represents the first implementation of EM's end-state contracting model, which is designed to accelerate progress of cleanup activities.

# SAVANNAH RIVER SITE

“Despite unprecedented challenges this year, our SRS team continued to make substantial progress in safely and effectively executing our many missions, including the successful startup of the Salt Waste Processing Facility. SWPF ushers in a new era of accelerated tank waste treatment at SRS, which significantly increases our ability to tackle the bulk of the remaining tank waste here within a decade.”

– Mike Budney, Manager, Savannah River Operations Office

## HIGHLIGHTS

- Started operations at the first-of-a-kind SWPF – a 2020 EM priority
- Processed salt waste through the Tank Closure Cesium Removal (TCCR) unit to accelerate tank closure
- Began construction on the next mega-volume Saltstone Disposal Unit (SDU) 9 and made progress on SDU 8
- Continued innovative double-stack approach in Glass Waste Storage Building 1, which increases interim storage space and saves over \$100 million
- Completed a three-phased K-Area Interim Surveillance Glovebox Optimization Outage Project, and initiated the first Production Operator Apprentice Program in partnership with Aiken Technical College
- Fabricated, installed, and tested the High Flux Isotope Reactor (HFIR) cleaning station to vacuum HFIR cores and remove resin prior to transport to H-Canyon
- Achieved closure of G-Area Oil Seepage Basin one year early
- Received the DOE Excellence Award for the D-Area Ash Basin Remediation Project

## ADVANCING THE TANK WASTE MISSION

SRS delivered results in 2020 with startup of the multi-billion dollar, first-of-a-kind SWPF. SWPF is the last major piece of the liquid waste system at SRS. This was a top EM priority in 2020 and represents a leap forward in the Department’s ability to tackle the largest and one of the most challenging environmental risks – tank waste. With the potential to process as many as 9 million gallons of liquid waste per year, SWPF will enable SRS to complete tank waste cleanup at the site decades earlier than would otherwise be possible.



*Aerial view of the SRS SWPF that started hot commissioning operations in October.*

The site landscape is changing again as construction work continued in 2020 on the SDU 8 cell. SDUs are permanent disposal units to contain low-activity waste grout produced primarily from the removal and treatment of salt waste from the high-level waste tanks at SRS. SDU 8 is the third 32-million-gallon-capacity, mega-volume SDU to be built at SRS.

Construction is expected to be complete by February 2023. SDU 9 cell construction preparation work is also in progress. As a strategic approach to maximize resources, SRS is building SDU 9 in parallel with SDU 8.



*Aerial view of the SDUs at SRS. Construction continues on SDUs 7, 8, and 9.*

SRS reached a significant production milestone by double-stacking the 1,000 vitrified waste canisters at the Defense Waste Processing Facility (DWPF). The canisters are filled with vitrified high-level radioactive sludge transferred from waste storage tanks. At DWPF, the waste is converted into a solid glass form that is suitable for long-term storage and disposal. The innovation of double-stacking has led to safe interim canister storage until at least 2029, and results in a cost avoidance of at least \$100 million.



*A Shielded Canister Transporter is used to double-stack canisters in Glass Waste Storage Building 1.*

In addition, SRS resumed processing high-level waste inside the TCCR module, following an extended maintenance outage. The innovative cesium-removal technology finished processing a batch of radioactive liquid waste recently, moving the TCCR feed tank, Tank 10, closer to final closure. It was the third batch of salt waste processed at SRS since the site began using TCCR in early 2019. TCCR has now processed and removed cesium from nearly 300,000 gallons of waste from Tank 10. Most of the salt waste inside the tanks at SRS will be processed through the SWPF. TCCR will supplement that processing to help accelerate EM's liquid waste mission.



*SRS engineers check components of a MicroBlower unit and inspect the solar panels that power the unit in the M-Area Settling Basin.*

## **SAFELY EXECUTING AND DELIVERING ON OPERATIONAL COMMITMENTS**

The SRS team safely executed and delivered on its operational commitments in 2020. Despite the global pandemic, SRS accelerated environmental cleanup and disposition of nuclear materials and made significant infrastructure improvements using savings from those efficiencies.

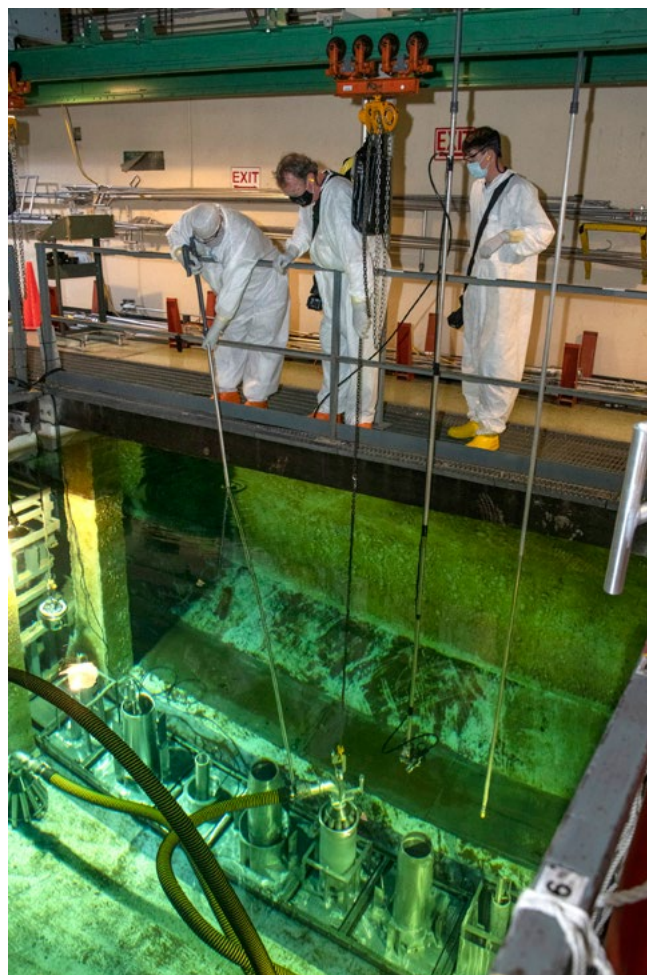
Some of those improvements were made in a three-phased K-Area Interim Surveillance Glovebox Optimization Outage Project to help DOE expedite plutonium down-blending and removal from South Carolina. The efficiencies are projected to result in significant cost avoidances over the next five years. The site initiated the first Production Operator Apprentice Program in partnership with Aiken Technical College. The eight-month program helps build the workforce pipeline by providing an opportunity for apprentices to simultaneously

complete classroom work while receiving on-the-job training.

Teams also fabricated, installed, and tested the HFIR cleaning station to remove resin from the HFIR cores in L-Basin before sending the cores to H-Canyon for processing. The resin deposits need to be removed to make the cores suitable for dissolution and processing in H-Canyon. This moves L-Basin closer to the completion of its storage mission.

SRS maintained its focus on environmental cleanup and closed the G-Area Oil Seepage Basin one year early. Analysis of G-Area Oil Seepage Basin sediment and water revealed that several types of waste were placed into the basin during the early years of the site. The pond-like basin was restored to regulatory standards after being filled with stone and dirt and capped with sod.

The site received the DOE Project Management Excellence Award for the D-Area Ash Basin Remediation Project, another achievement in a successful year. The SRS team completed the cleanup of coal ash-contaminated land a year early and at a savings of more than \$8 million.



*SRS operators use a long-handled tool to position an underwater vacuum on top of an HFIR core in L-Basin to remove resin prior to transport to H-Canyon.*

# SAVANNAH RIVER NATIONAL LABORATORY

“The talented team at SRNL continues to work hard and overcome many challenges as they develop and deploy technology that is critical to DOE’s environmental management and nuclear security missions.”

– Mike Budney, Manager, Savannah River Operations Office

## HIGHLIGHTS

- Won two prestigious safety awards from the National Safety Council (NSC)
- Assessed the potential reactivity of Los Alamos National Laboratory (LANL) remediated nitrate salt drums stored at the Waste Control Specialists, LLC (WCS) facility
- Pioneered cutting-edge technology to advance scientific research and develop solutions in nuclear cleanup, workplace safety, and in protection of the COVID-19 pandemic
- Advanced DOE’s work developing transformational technology enabling a sustainable fuel cycle for commercial fusion reactors

## RECOGNIZING OUTSTANDING SAFETY PERFORMANCE

The SRNL was nationally recognized for its outstanding safety performance by the NSC. The NSC awarded SRNL two prestigious safety awards based on outstanding safety statistics recorded in 2019 and 2020. SRNL was also awarded the Occupational Excellence Achievement Award for achieving a lost workday case incident rate better than the industry average.

## COLLABORATING ACROSS THE COMPLEX

SRNL led a multi-lab Technical Review Team to assess the potential reactivity of LANL remediated nitrate salt drums stored at the WCS facility. The team’s overarching conclusion was that the waste drums have become more stable over time with respect to nitric acid reactions. While existing data are insufficient to eliminate the potential of reactions leading to thermal runaway, actions such as engineering controls can be taken to reduce the likelihood of such an event during interim storage and transportation.



SRNL led a multi-laboratory team to review technical data to allow storage and movement of transuranic drums contained in standard waste boxes.

## RECOVERING RARE NUCLEAR MATERIAL

In an ongoing project to harvest plutonium-244, a material not found anywhere else within the United States and possibly the world, SRNL built a full-scale mock-up of equipment for training and process development for the Mark-18A project. The cutting system, including a water recirculation to capture aluminum fines, is now functioning and testing is ongoing. SRNL scientists are developing controls for the dissolvers and tracking deliveries. All activities for this project in support of key milestones are on schedule. The equipment, training, and processes will be used for the future transfer of the Mark-18A targets into SRNL hot cells. The targets will be reduced in size, and chemical processes will be applied to recover plutonium, americium/curium, and other elements.



*Using high-efficiency and low-cost materials, researchers at SRNL developed a metal hydride-based thermal energy storage system able to operate at high temperatures for next-generation concentrated solar power applications.*

## PIONEERING ROBOTICS FOR SAFETY

SRNL successfully demonstrated the transport of Model 9975 packaging – drum-style packaging designed to transport plutonium metal and oxide – with an Automated Guided Vehicle. In addition, the Lab demonstrated a six-axis robot retrieving a 3013 container from a Model 9975 package. SRNL engineers and scientists are researching ways to use robotics and automated technologies to handle and process nuclear material packages. These technologies could significantly reduce or eliminate personnel radiation exposure, making the workplace safer across the DOE complex.



*National Nuclear Security Administration and Savannah River officials tour the mock-up of the Mark-18A facility where SRNL staff will train to use equipment to eventually extract valuable Pu-244 from existing target materials on the site.*

## RESPONDING TO COVID-19 PANDEMIC USING SCIENCE

SRNL scientists engineered a system to remove viral and microbial contaminants from the air with extremely high efficiency. They developed a prototype for an electrostatic precipitator (ESP) that can be coupled with breathing hoods and masks to reduce infection risk for professionals working in high-risk spaces. Testing is under way to ensure the ESP system maintains consistency in deactivating the virus after multiple uses – a critical step before the system can be released for commercial use.



*An Automated Guided Vehicle moves drum-style packages, demonstrating how robotic technology can improve safety in handling nuclear materials.*

# OAK RIDGE

“This year, our incredible workforce completed a historic cleanup accomplishment and DOE’s largest project to date at the East Tennessee Technology Park. Our focus is now shifting to the next phase of cleanup at the Oak Ridge National Laboratory and Y-12 National Security Complex, where our work will remove risks, protect current-day missions, and open land for new research and national security facilities.”

– Jay Mullis, Manager, Oak Ridge Office of Environmental Management

## HIGHLIGHTS

- Completed ETPP Vision 2020, becoming the first site in the world to remove an entire uranium enrichment complex – a 2020 EM priority
- Continued addressing DOE’s largest inventory of high-risk facilities
- Continued processing the low-dose portion of Oak Ridge’s remaining uranium-233 inventory and providing medical isotopes for next-generation cancer research
- Advanced construction on the Mercury Treatment Facility
- Began construction on the Sludge Processing Mock Test Facility

## ACHIEVING VISION 2020

This year, Oak Ridge achieved its ambitious Vision 2020 goal of completing core cleanup at ETPP, becoming the first site in the world to remove an entire uranium enrichment complex. The most notable demolitions this year were the removal of the 235,000-square-foot, 180-foot-tall Centrifuge Complex and Building K-1600 – a former uranium enrichment test and demonstration facility. Crews also completed soil remediation projects on the K-25 footprint and the K-832 basin.

Through these efforts, Oak Ridge completed DOE’s largest cleanup project to date, removing more than 500 structures with a total footprint of

13 million square feet (equal to 225 football fields). This work was completed four years ahead of schedule, saving taxpayers \$500 million. EM is transforming the site into a privately owned multi-use industrial park. Nearly 1,300 acres have already been transferred to the community for economic development, with additional acreage set aside for recreation and historic preservation. This year also brought the opening of the K-25 History Center, which will share the site’s rich history with future generations.



*An aerial view of the ETPP now that EM has completed all demolitions at the site.*

Oak Ridge has begun transitioning the men and women who achieved a historic cleanup accomplishment at ETPP to the next big cleanup endeavors at Oak Ridge National Laboratory (ORNL) and the Y-12 National Security Complex (Y-12). The benefit of transitioning these workers is substantial. They are highly trained and experienced in challenging settings and are already grounded in the site’s rigorous safety culture. Their in-depth knowledge and experience in deactivating and

demolishing aging and contaminated facilities will help them perform tasks safely and efficiently. In addition, employees can start working on the new projects quickly, saving hours of training and costs per person.



*The 235,000-square-foot Centrifuge Complex was one of the final major demolitions required to achieve Vision 2020.*

## ELIMINATING HIGH-RISK FACILITIES

Completion of Vision 2020 enables the site to shift major cleanup efforts to the ORNL and Y-12. These areas house the largest inventory of high-risk excess contaminated facilities within the DOE complex. In 2020, crews initiated demolition on the remaining buildings in Y-12's Biology Complex. Preparations are under way at numerous former research reactors, isotope facilities, and remaining hot cells in the central campus area. In addition, characterization and pre-demolition work is beginning at two Manhattan Project-era buildings at Y-12. Collectively, these efforts are reducing risks, stabilizing facilities, and paving the way for large-scale demolition that will enhance safety and provide land for new research and national security missions.



*Crews installed a six-story protective cover over the final hot cells remaining from Building 2026 in the central campus area of ORNL. This cover will allow EM to demolish the structures while ensuring no impact to the nearby research and science missions.*

## BUILDING INFRASTRUCTURE FOR FUTURE CLEANUP PROJECTS

The Outfall 200 Mercury Treatment Facility is the linchpin for EM's cleanup strategy at Y-12. This vital piece of infrastructure will open the door for large-scale demolition at Y-12 by providing a mechanism to safeguard against potential mercury releases into the Upper East Fork Poplar Creek. Teams advanced construction on the treatment plant and headworks facilities. When operational, the facility will treat up to 3,000 gallons of water per minute, helping meet regulatory limits in compliance with the U.S. Environmental Protection Agency and State of Tennessee requirements. Construction also began on the Sludge Processing Mock Test Facility, which will help assess technologies needed to process a 500,000-gallon inventory of sludge transuranic (TRU) waste stored in Oak Ridge.



*Workers poured the foundation for the Mercury Treatment Facility this year.*

## PROCESSING OAK RIDGE'S LOW-DOSE INVENTORY OF URANIUM-233

EM has removed approximately half of its uranium-233 inventory that is stored in ORNL's Building 3019, the oldest operating nuclear facility in the world. In 2020, EM continued using innovative technology to process the remaining low-dose inventory of uranium-233 into a disposal-ready form. Part of this process involves extracting valuable medical isotopes being used for next-generation cancer treatment research. EM also made progress on upgrades in Building 2026 so processing can begin on the high-dose portion of the inventory next year.

# IDAHO CLEANUP PROJECT

“We have made progress in all mission areas, including towards the startup of the Integrated Waste Treatment Unit, continued efforts to remove spent nuclear fuel from wet storage, and continued disposition of transuranic waste at WIPP, even as the government has responded to the COVID-19 pandemic. I am very proud of my team for continuing to make progress during this unprecedented time.”

– *Connie Flohr, Manager, Idaho Cleanup Project*

## HIGHLIGHTS

- Reached the halfway point for targeted waste exhumation at the Accelerated Retrieval Project (ARP) IX facility, leaving just 0.34 acres left to remediate
- Completed 106 shipments of TRU waste to WIPP
- Made significant progress on the Resource Conservation and Recovery Act (RCRA) mandated closure of the Advanced Mixed Waste Treatment Project (AMWTP) TRU Storage Area Retrieval Enclosure
- Completed 22 Experimental Breeder Reactor-II spent nuclear fuel (SNF) shipments from wet storage to an interim dry storage location in support of the 2023 Idaho Settlement Agreement milestone
- Continued modifications at the Integrated Waste Treatment Unit (IWTU), which will turn about 900,000 gallons of liquid radioactive waste into a granular solid

## ADVANCING TRANSURANIC WASTE DISPOSITION

The Idaho Cleanup Project (ICP) teams made significant progress treating, repackaging, and shipping legacy TRU waste during 2020. Crews at the AMWTP facility repackaged 176 drums of potentially reactive and pyrophoric wastes containing uranium metal fines.

Following repackaging, the drums are now safe to ship to WIPP. Idaho continues to be the number one shipper to WIPP, constituting approximately 60 percent of all shipments.

The repurposed ARP VII facility began treating sludge wastes generated during the Cold War. Once an absorbent is added to the wastes, the wastes can be compliantly sent to WIPP.



*Crew unloads the first of many transfers of Experimental Breeder Reactor-II SNF to a vault at the Radioactive Scrap Waste Facility.*

The Idaho National Laboratory (INL) site is doubling its throughput by also using the AMWTP facility for additional sludge waste treatment. EM plans to complete all targeted waste exhumation from the ARP facilities in 2021, one year ahead of the regulatory milestone.

To date, over 58,000 cubic meters of TRU wastes have been sent off-site for permanent disposal, and ICP completed 106 shipments of TRU waste to WIPP during 2020. In addition, closure of AMWTP's Retrieval Enclosure began in 2020. The INL's largest building once contained 65,000 cubic meters of aboveground TRU waste. With the waste retrieved, crews are removing equipment and other material to facilitate its closure under RCRA.



*An excavator pours out the contents of a sludge waste drum at the ARP VII facility.*

## **IMPLEMENTING THE SPENT NUCLEAR FUEL WET-TO-DRY CAMPAIGN**

ICP's contracting partner began the first of many shipments of the Office of Nuclear Energy SNF from pool storage at the Idaho Nuclear Technology and Engineering Center (INTEC) to dry storage at the Materials and Fuels Complex's Radioactive and Scrap Waste Facility. A total of 35 shipments were completed in 2020.

## **PREPARING THE IWTU FOR OPERATIONS**

Modifications to the IWTU are nearly complete, enabling a test run in 2021. Crews replaced metal matrix filters with ceramic filters in the off-gas system, employed wet and dry decontamination technologies to enable workers to safely replace equipment during waste treatment operations, and installed robotics to decontaminate stainless steel canisters before they are placed in concrete vaults.

Once operational, the IWTU will treat 900,000 gallons of liquid sodium-bearing waste remaining from legacy SNF reprocessing at the INTEC facility. A steam-reforming technology will be used to convert the liquid from a nearby tank farm to a more stable granular solid.

# PORTSMOUTH/PADUCAH PROJECT OFFICE

“The perseverance of our workforce to maintain momentum during the COVID-19 posture has allowed critical projects to continue at Portsmouth and Paducah that will permanently change the landscape of the sites over the next five years.”

– Robert Edwards, Manager, Portsmouth/Paducah Project Office

## HIGHLIGHTS

- Completed pre-demolition support systems at Portsmouth’s X-326 Process Building, allowing full-scale demolition to begin in 2021
- Installed co-located air monitors at Portsmouth to allow DOE and Ohio Environmental Protection Agency (OEPA) to provide parallel evaluation of sampling data during demolition and cleanup
- Completed key components of the On-Site Waste Disposal Facility (OSWDF) that moved the project towards operational status, including Cell 1 installation of the 3-foot Select Material Layer, and installation of the facility’s operations trailer complex
- Issued a final environmental assessment for the transportation of waste from the Paducah site to existing permitted, off-site DOE and commercial disposal facilities
- Completed the first phase of a multi-year project at Paducah, removing over 750,000 pounds of R-114 Freon® stored at the site
- Disposed of 22 cold traps that removed over 40 percent of the inventoried enriched uranium stored at Paducah
- Issued a formal record of decision for the safe shipment and disposal of depleted uranium oxide from the former gaseous diffusion plants and completed first uranium oxide shipment from Paducah, establishing the transportation pathway for future shipments

## PORTSMOUTH

In 2020, the Portsmouth team completed and aligned critical projects to bring the site one step closer to beginning the demolition of its former uranium enrichment process buildings.



*One of five co-located air monitors at the site that will allow for parallel analysis of sampling data with OEPA during site demolition.*

## PREPARING THE FIRST PROCESS BUILDING FOR DEMOLITION

Pre-demolition activities were wrapped up at the X-326 former uranium enrichment process building, allowing for the start of demolition. As part of pre-demolition, the site completed the co-location of five air monitors with OEPA and added 18 air monitors with the Ohio Department of Health. The monitors were set alongside existing DOE monitors to provide parallel evaluation of sampling data related to site cleanup. Other support operations, such as completing the water retention system

and approval of the Waste Acceptance Criteria Implementation Plan (WACIP), advanced plans for the safe demolition and disposal of material from the X-326 Process Building.



*Workers install liner in the water retention berm as an infrastructure support and safety measure during X-326 Process Building demolition.*

## READYING THE ON-SITE WASTE DISPOSAL FACILITY FOR OPERATIONS

Key project activities were completed to prepare OSWDF for the first waste placement from the X-326 Process Building in 2021. The OSWDF is specifically engineered to safely accept debris from the gaseous diffusion buildings at Portsmouth. OEPA approval of the WACIP was critical in standing up the new Waste Acceptance organization, an independent arm of the cleanup program to ensure all safety and regulatory requirements will be met

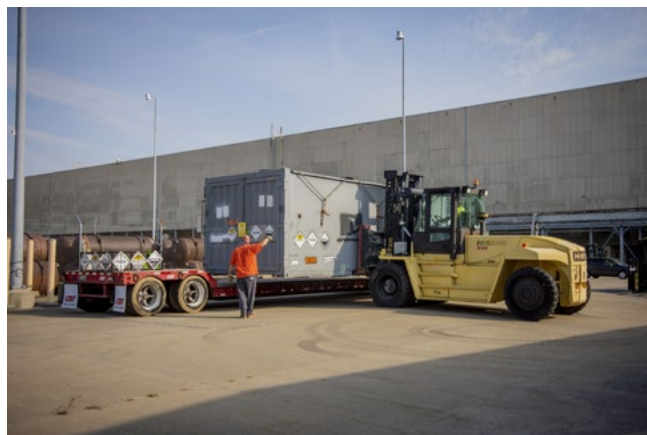


*The Modular Leachate Treatment System at the Portsmouth site nears completion to support OSWDF operations.*

during cleanup. One of the final support systems for the OSWDF, the Modular Leachate Treatment System, will be completed in early 2021.

## PADUCAH

At Paducah, the last government-owned uranium enrichment facility that operated in the United States, deactivation activities took priority as the site continues to prepare for future cleanup. Large, bulk-type materials that hinder movement in the buildings and on the site were removed. Deactivation projects disposed of unnecessary hazards, such as process gas equipment that reside at the site, delivering added cleanup benefits and safeguarding the environment.



*Cold traps are loaded for disposal, ranging in size and weighing as much as 15,200 pounds, about four times the weight of an automobile.*

## ELIMINATING ON-SITE RISK, ADVANCING DEACTIVATION

In 2020, DOE completed two tasks designed to eliminate and reduce hazards and advance deactivation efforts. Site workers prepared and shipped 22 cold traps that were formerly used as part of the uranium enrichment process at the site. Cold traps are cylindrical heat exchangers weighing as much as 15,200 pounds, and were used in the C-410 Feed Plant to convert uranium hexafluoride gas to a solid. The shipment removed approximately 42 percent of the site's enriched uranium inventory.

The project team began removal of R-114 refrigerant, commonly known as Freon®, from the Paducah Site. R-114 was used to cool equipment in the uranium enrichment process at gaseous diffusion plants during production years. In 2020, this long-term project removed 750,000 pounds of this site hazard to an off-site treatment, storage, and disposal facility.



*The Paducah site celebrates the first shipment of R-114 Freon® from the site.*

## MARKING DUF6 CONVERSION PROJECT MILESTONE

The Portsmouth/Paducah Project Office's project to convert depleted uranium hexafluoride (DUF6) has processed close to 85,000 metric tons of DOE's more than 800,000 metric-ton inventory of DUF6 since the conversion facilities were commissioned in 2010.

In 2020, the project met a significant milestone as the first oxide shipment packaged for disposal was accepted at WCS's facility in Texas, in accordance with the supplemental environmental impact statement/record of decision approved earlier in the year.



*Workers prepare a gondola car for the first oxide shipments from the DUF6 Paducah Plant in Western Kentucky.*

# WASTE ISOLATION PILOT PLANT

“We continued to improve WIPP’s infrastructure in 2020. We are making great progress on many fronts, with safety being the cornerstone of everything we do. WIPP employees proved to be incredibly resilient in 2020, carrying out WIPP’s critical mission despite the many challenges connected to the COVID-19 pandemic.”

– Reinhard Knerr, Manager, Carlsbad Field Office

## HIGHLIGHTS

- Achieved all-time one-week and one-month rock-bolting records to enhance underground safety
- Began excavating the 2,275-foot-deep utility shaft – a 2020 EM priority
- Safely received up to five waste shipments per week despite COVID-19 restrictions
- Completed a bypass road to redirect traffic away from the site
- Attained Voluntary Protection Program Star Site status
- Began upgrading infrastructure with 15 general plant projects under way, including a fire water system

## MAKING PROGRESS ON VITAL CAPITAL IMPROVEMENTS

Significant progress was made in 2020 on the largest capital improvement projects at WIPP, the nation’s only geologic repository for the disposal of TRU waste. Work continues on the Safety Significant Confinement Ventilation System

(SSCVS), which will be the largest containment fan system in the DOE complex and will significantly increase airflow underground. Work on the system’s three major facilities includes excavating the subsurface, pouring concrete, installing steel components, and laying utilities. Despite the COVID-19 pandemic, work continued on SSCVS systems at vendor locations, including the system’s 1,000-horsepower fans, filters, and housings. WIPP teams have also started excavation on the 2,275-foot-deep utility shaft, an EM high-priority construction project, which will provide a new air intake and hoisting capability to the WIPP underground. With a finished diameter of 26 feet, it will be the largest of WIPP’s five shafts.



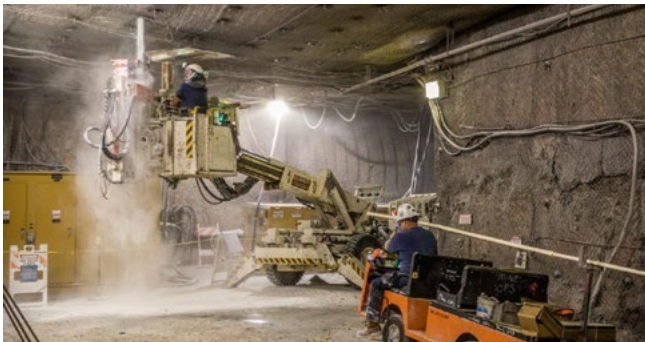
As part of the SSCVS, concrete forms are installed in preparation for construction of the Salt Reduction Building.

## PREPARING FOR FUTURE WASTE EMPLACEMENT

Waste shipments to WIPP were curtailed during the COVID-19 pandemic but did not stop as WIPP continued its vital role. WIPP's first six panels have been filled, and waste is being placed in the seventh. Rooms 3 and 4 of Panel 7 were filled during 2020, with two rooms remaining to be filled in the panel. When Panel 7 is full, anticipated in late 2021, it will be sealed, and waste emplacement will then move to Panel 8.



*Workers lay asphalt, completing the new WIPP bypass road.*



*Rock bolts are installed to ensure worker safety and stability of the WIPP underground.*

WIPP miners reached a milestone by completing a “rough cut” of Panel 8, shaping the next disposal area where TRU waste will be placed 2,150 feet beneath the surface. When trim and floor work is finished, miners will have extracted approximately 200,000 tons of salt to create the panel. Mining at WIPP is timed so that a disposal panel is only ready when it is needed. This is because the natural movement of salt causes mined openings to close at a rate of 2 to 4 inches a year.

Panels are mined slightly larger than the desired size to account for this closure, which is attributed to salt rock movement that will eventually permanently encapsulate the waste.



*A shipment of TRU waste safely arriving at the WIPP site.*



*New fire water tanks being installed at the WIPP site, as part of the new fire water system.*

## IMPROVING TRAFFIC SAFETY

With heavy construction in the WIPP vicinity, including on the utility shaft across the main road from the site, it is vitally important to increase safety by keeping non-WIPP traffic away from the area. WIPP crews completed a 3.3-mile bypass road around the site, creating a safer workspace and community.



*A bucket of excavated dirt is lifted out of the utility shaft being excavated at WIPP.*

## OVERHAULING AGING INFRASTRUCTURE

After 30 years of operation, aging WIPP infrastructure is undergoing a massive overhaul with 15 general plant projects under way. New 200,000-gallon tanks, pump house, and mains will improve fire safety. New lighting protection arrays protect key buildings. Up-to-date equipment provides compressed air for underground airlocks and ventilation controls. Updated substations above and belowground will replace aging equipment, and a new Central Monitoring Room and fiber-optic network will allow close monitoring of all WIPP operations.



*A continuous miner completes the initial rough cut of Panel 8, creating additional space for TRU waste disposal.*

# LOS ALAMOS NATIONAL LABORATORY

“This year presented unique challenges, none more so than COVID-19. Even so, we continued to make significant strides in key mission scope and to respond to newly discovered legacy materials. As we look forward to a new year, our focus will remain on executing our cleanup campaigns, shipping waste off-site, and operating our extensive groundwater and surface water monitoring network. As we conduct our work across LANL, we will continue to ensure the safety of the public, workers, and the environment.”

*-Kirk Lachman, Manager, EM Los Alamos Field Office*

## HIGHLIGHTS

- Completed the Known Cleanup Sites Campaign, marking the first time a campaign in the 2016 Consent Order has been finished
- Continued operation of the Chromium Plume Interim Measure (IM) to mitigate migration and size of the plume
- Remediated 67 cubic meters (335 drum equivalents) of TRU waste
- Remediated 1,945 cubic yards of contaminated soil and debris

## MAKING PROGRESS WITH LEGACY CLEANUP AND WASTE MANAGEMENT

With a sustained focus on safety, the EM Los Alamos Field Office (EM-LA) achieved measurable progress with its legacy cleanup and legacy waste management mission at LANL in 2020. EM-LA successfully completed all 17 fiscal year 2020 milestones set under the Consent Order with the New Mexico Environment Department (NMED) and completed the Known Cleanup Sites Campaign – the first Consent Order campaign to be completed. Several sites at LANL with elevated levels of soil contamination were cleaned up throughout the campaign.

## SETTING A STRONG FOUNDATION FOR TRANSURANIC WASTE REMEDIATION AND SHIPMENT

In 2020, the equipment for two glovebag process lines was installed in Technical Area 54's Area G, which is dedicated to storing, characterizing, and remediating LANL's TRU and LLW to ship off-site for permanent disposal. These process lines will enable the processing of approximately 1,500 containers of TRU waste for disposal at WIPP. At the end of fiscal year 2020, 553 containers of TRU waste, or approximately 25 shipments, were certified and ready for shipment to WIPP.



*An EM TRU waste shipment from the Radioassay and Nondestructive Testing facility at LANL departs for WIPP.*



*Workers dig a trench on former LANL along DP Road.*

Close coordination throughout the year between the National Nuclear Security Administration's (NNSA) Los Alamos Field Office (NA-LA) and EM-LA led to EM being able to use NNSA's Radioassay and Nondestructive Testing (RANT) facility at LANL for TRU shipments to WIPP. The use of the RANT facility will enable EM to ship TRU waste year-round, as the shipping schedule permits.

### **IMPLEMENTING CHROMIUM PLUME INTERIM MEASURE TO HALT MIGRATION**

EM-LA's priority cleanup activity is addressing the hexavalent chromium plume in the regional aquifer beneath Sandia and Mortandad canyons and ensuring it stays within LANL's boundary. In 2020, the project team continued implementing the IM, which involves extracting contaminated water and injecting treated water to control plume advancement and shrink its footprint. The IM campaign is under way along the plume's southern and eastern boundaries.

In 2020, the IM treated approximately 65 million gallons of chromium-contaminated groundwater. Recent groundwater samples taken near the boundary between LANL and the Pueblo de San Ildefonso indicate that the chromium levels there remain below the state standard. Field and laboratory studies continue to progress to determine a final remedy for the plume.



*Workers prepare purged well water for shipment at the R-3 well pad in Pueblo Canyon.*

### **ADDRESSING LEGACY MATERIALS ALONG DP ROAD**

EM-LA coordinated with NA-LA, Los Alamos County, and NMED throughout the year on the discovery of materials from historic LANL operations along DP Road in the Los Alamos townsite. In the summer, EM-LA dug a trench on one of the adjacent land parcels to support a private developer's construction work. No debris of laboratory origin was found in the trench. Out of an abundance of caution, EM-LA subsequently conducted further sampling on other areas within the land parcel and no elevated radiological activity was found. In the year ahead, EM-LA will sample the two parcels along DP Road where materials from historic LANL activities were found.

# WEST VALLEY DEMONSTRATION PROJECT

“The West Valley Demonstration Project team continues to use their expertise and knowledge to safely perform on-site demolition work. Their completion of several demolitions has changed the landscape of the site and the community. It is a reminder of the hard work that is being done to clean up the site and reduce its footprint for future generations. This team’s commitment to perform work in a safe and compliant manner speaks volumes of their dedication to protect each other, the public, and the environment. I am truly proud to be a part of this team, and I look forward to continuing our work together in our cleanup mission.”

– Bryan Bower, Director, West Valley Demonstration Project

## HIGHLIGHTS

- Completed demolition of the Main Plant Office and Utility Room buildings
- Completed deactivation of the below-grade rooms and cells in the Main Plant Process Building and of asbestos-containing material (ACM) from the Fuel Receiving and Storage Facility
- Advanced infrastructure improvements

## REMOVING SUPPORT STRUCTURES

In 2020, the West Valley Demonstration Project (WVDP) team completed the demolition of the Main Plant Office Building and Utility Room and the Acid Recovery Cell airlock. The Main Plant Office Building was a 3,760-square-foot, three-story facility built in 1964 as part of the original commercial nuclear fuel reprocessing plant. The building housed many different departments over the years, including the Chemical Process Cell, which was once used to store containers holding high-dose fuel reprocessing equipment and high-level waste canisters. These latest demolitions represent a significant step forward for the site’s cleanup mission, bringing EM’s total number of buildings removed at the site to 68.



A heavy equipment operator removes and size-reduces concrete and steel during the demolition of the Main Plant Office Building. In the foreground, workers prepare to remove a full waste container from the demolition area.

## PREPARING FACILITIES FOR DEMOLITION

WVDP crews completed the deactivation of below-grade cells and rooms of the Main Plant Process Building that were used during reprocessing operations from 1966 to 1972. This included extensive equipment and material removal, flushing of vessels, and fixing internal and external contamination in place to allow their removal during demolition.



*An excavator with shear attachment is used to cut and size-reduce concrete and steel during the demolition of the Utility Room building.*

Crews also completed the safe removal of ACM from inside the Fuel Receiving and Storage facility. The piping and insulation inside the building contained ACM, which needed to be removed in preparation for future demolition. A total of 700 linear feet (the equivalent of 17.5 school bus lengths) of piping was removed safely and compliantly over a period of five months.



*Professional divers enter the top of West Valley's 40-foot Fire Water Storage Tank to perform underwater inspections, cleaning, and repairs.*



*Senior Advisor Ike White (at left) and other EM officials get a tour of WVDP, including views of the ongoing demolition of the Utility Room building.*

## INVESTING IN INFRASTRUCTURE IMPROVEMENTS

WVDP teams completed significant infrastructure improvements that help safeguard the workforce and accelerate safe environmental cleanup. Improvements include repairs to the off-site railroad line, modifications to the drum cell building, and a new heavy-duty fork truck with a long-reach arm for future waste operations. In addition, the south parking lot was paved for future employee parking in preparation for the demolition of the Main Plant Process Building. Divers completed underwater inspections, cleaning, and repairing the site's 40-foot, 460,000-gallon storage tank. These repairs will increase the life expectancy and viability of the tank for several years, at which time the tank will no longer be needed and will be demolished.

# NEVADA NATIONAL SECURITY SITE

“This was a year of great challenges and great successes for EM Nevada. Not only did our program mark a major accomplishment by transferring our Tonopah Test Range sites to Legacy Management in less than half the time initially expected, we also drew significantly closer to completing our overall groundwater mission – an effort that promises to come in well ahead of schedule and well under budget. Through it all, the dedicated men and women of our program adapted to changing conditions and continued to execute our cleanup and waste acceptance missions safely, securely, and successfully. They have my thanks.”

– Rob Boehlecke, Program Manager, EM Nevada Program

## HIGHLIGHTS

- Completed the transfer of 70 closed cleanup sites on and around the Tonopah Test Range (TTR) to the DOE Office of Legacy Management (LM) – the first EM-to-LM transfer in more than a decade – a 2020 EM priority
- Closed the Rainier Mesa/Shoshone Mountain (RM/SM) and Yucca Flat/Climax Mine (YF/CM) groundwater areas, bringing 75 percent of all NNSS groundwater areas to end-state completion
- Safely and securely disposed ~500,000 cubic feet of classified LLW and mixed low-level radioactive waste in support of DOE sites involved with ongoing national security and science missions

## TRANSFERRING SITES TO LEGACY MANAGEMENT

In 2020, the EM Nevada Program successfully transferred 70 remediated sites on and around Nevada’s historic TTR, a strategic location chosen by the U.S. Atomic Energy Commission in 1957 to test ballistics and nonnuclear features of atomic weapons, to LM for long-term stewardship. This accomplishment, completed in less than half the time initially estimated, was among EM’s ambitious priority items for 2020. Prior to transfer, EM Nevada completed cleanup activities at sites on and around TTR where contamination had resulted



Members of an external peer review panel observe a tunnel portal at the RM/SM groundwater area.

from historic nuclear weapons testing and support activities. The process to transition sites from EM to LM involved more than 100 unique actions across 10 key focus areas, including coordinating stakeholder commitments, transmitting more than 7,200 documents and records, and identifying and transferring existing infrastructure, such as fences and monuments. The transfer was officially complete on September 30, 2020.



*EM Nevada completed the transfer of more than 7,200 documents and records to LM for long-term stewardship of 70 sites on the Nevada Test and Training Range, including TTR. (Photo taken prior to COVID-19.)*



*Crews unload waste containers at the Radioactive Waste Management Complex, Area 5, NNSS.*

## ACCELERATING GROUNDWATER CLOSURE

In 2020, the EM Nevada Program reached the final stage of groundwater activities – regulatory closure – at two of the three remaining underground test area corrective action regions at the NNSS. In April, EM Nevada earned regulatory approval for closure at the RM/SM groundwater area, a milestone reached three years ahead of schedule, saving \$5 million. In October, EM Nevada further achieved regulatory approval at the YF/CM groundwater area, bringing 75 percent of all NNSS groundwater regions to completion. Combined, these dual accomplishments cap off more than 35 years of testing, analysis, and modeling work in the Rainier Mesa and Yucca Flat groundwater areas, which have led the EM Nevada Program to an even better understanding of the nature and movement of groundwater beneath the NNSS.



*An EM Nevada Program manager briefs members of the Nevada Site Specific Advisory Board on groundwater activities at Yucca Flat. (Photo taken prior to COVID-19.)*

To accelerate its groundwater mission safely and successfully, EM Nevada has broadly adopted the use of risk-informed decision-making in the development of cleanup strategies, which prioritizes the protection of human health and the environment, while considering future land use. This approach is anticipated to accelerate the closure of all groundwater areas at the NNSS by two full years, and is estimated to save taxpayers around \$80 million.

# MOAB URANIUM MILL TAILINGS REMEDIAL ACTION PROJECT

“This year presented many challenges, forcing us all to adapt to rapidly changing conditions. I am proud of our team for safely sustaining operations and meeting a milestone, all while adapting to new protocols brought on by the global pandemic. We celebrate this year’s successes propelling cleanup mission advancement.”

– Russell McCallister, Federal Cleanup Director, Moab Uranium Mill Tailings Remedial Action Project

## HIGHLIGHTS

- Reached a cumulative 11 million tons of residual radioactive material (RRM) shipped from Moab to Crescent Junction – a 2020 EM priority
- Diverted a cumulative total of more than 950,000 pounds of ammonia and 5,300 pounds of uranium from the Colorado River
- Expanded a portion of the Crescent Junction disposal cell

## MARKING THE 11 MILLION-TON MILESTONE

The Moab Uranium Mill Tailings Remedial Action (UMTRA) Project reached a milestone in October, commemorating 11 million tons of RRM shipped from a former uranium ore processing facility in Moab, Utah, to the disposal cell near Crescent Junction, Utah.

## PROTECTING THE COLORADO RIVER

The Moab site sits adjacent to the Colorado River. Efforts to protect the vital water source include extracting ammonia and uranium mass from groundwater underlying the site. This year, the project surpassed a total of 950,000 pounds of

ammonia removed from the groundwater system since 2003, preventing that contaminant from discharging into the river. More than 5,300 pounds of uranium have also been removed.



A reach-stacker lifts a container off a railcar at the Crescent Junction Site.

## DELIVERING MORE EFFICIENT CLEANUP

Once RRM and other contaminated materials arrive at the Crescent Junction site, they are placed and compacted in the disposal cell. Over the life of the project, the cell has been excavated in phases. One million cubic yards of material were excavated this year. Following excavation, the material is repurposed to continue building an embankment that helps divert surface water runoff.



*A side channel of the Colorado River adjacent to the Moab Site was mostly dry in July. In addition to extraction wells that remove contaminants from groundwater underlying the site, the concrete vaults (seen here on the left) house injection wells that create a hydraulic barrier to help prevent constituents from entering the river.*

The Moab UMTRA Project added substantial equipment to aid in its mission to relocate RRM from Moab to Crescent Junction. Additional railcars were incorporated, making it possible to increase the quantity of material in each train shipment, driving down the project's environmental liability. The project also purchased new equipment, including an excavator, articulated haul truck, and 51 new containers to support operations and extend the longevity of older equipment. The new purchases helped reduce the burden on older apparatus that may need more maintenance and breaks from service over time.



*Project leadership thanked Moab Site employees shortly after the 11-million-ton milestone was achieved.*

# ENERGY TECHNOLOGY ENGINEERING CENTER

“By delivering on EM’s commitment to complete a key phase of demolition, the Energy Technology Engineering Center had an incredible year moving a step closer to final closure. An agreement reached with the State of California enabled demolition to restart after 13 years. This was a joint effort, and I could not be prouder of the team’s accomplishments. With 12 buildings down this year, I look forward to another productive year towards environmental remediation and closure.”

– John Jones, Site Director, Energy Technology Engineering Center

## HIGHLIGHTS

- Met an EM 2020 priority to resume building demolition, and completed demolition of 10 buildings at the Radioactive Materials Handling Facility (RMHF)
- Completed negotiations with the State of California to enable demolition of the eight buildings at the Hazardous Waste Materials Facility (HWMF)
- Issued the Record of Decision for Groundwater Remediation, Area IV, Santa Susana Field Laboratory (SSFL)

## DEFINING THE ROAD TO CLOSURE

Personal engagement of DOE leadership at the highest levels led to a landmark agreement with the State of California this year, breaking a 13-year-long impasse and enabling active cleanup work to resume. The agreement led to the subsequent demolition of the 10 remaining DOE-owned buildings at the RMHF complex, used for the processing, packaging, and shipment of radioactive and mixed hazardous wastes during the Cold War era. The ETEC team completed demolition of the complex safely and on time, representing significant risk reduction and a step towards final cleanup of the site.



Aerial view of Area IV RMHF in 1976.

With demolition of the 10 buildings in the RMHF complex complete, only eight DOE structures remained at ETEC. A second agreement reached this year with the State of California enabled



Aerial view of the ETEC site in 2005.



*Crews use heavy equipment within the RMHF complex for demolition activities at Building 4022 – the last building demolished at the RMHF.*

demolition work to commence at those eight buildings, located in the HWMF, and two were removed. The remainder of HWMF demolition will fulfill DOE's commitment to complete building demolition at the site.

## **DETERMINING NEXT STEPS IN GROUNDWATER REMEDIATION**

This year ETEC completed a corrective measures study (CMS) – the last part of an ongoing process to develop the final remedy for contaminated groundwater at the site. The CMS improves DOE's understanding of groundwater impacts and allows DOE to evaluate a range of alternatives and to determine the best remediation course of action to address environmental impacts. Completion of the CMS clears the way for developing a corrective measures implementation plan and brings the site closer to final remedies for groundwater.

This year the ETEC project also announced its decision to initiate groundwater remediation in Area IV of the SSFL. The record of decision described the preferred alternatives for groundwater remediation identified in the SSFL Area IV Final Environmental Impact Statement.

# SEPARATIONS PROCESS RESEARCH UNIT

“Completing the SPRU project removes the long-standing liability of a Cold War era nuclear facility and enables returning the former SPRU areas to the Naval Reactors landlord for future site operations. Significant credit is due to the federal-contractor team that completed this project.”

– Hugh Davis, Program Manager, Separations Process Research Unit

## HIGHLIGHTS

- Completed land transfer to the Office of Naval Reactors – a 2020 EM priority
- Restored and revegetated the former building grounds
- Issued final radiological and chemical cleanup reports
- Constructed a storage area for TRU waste from the project, pending final disposition

## RESTORING THE SITE FOR FUTURE USE

In 2020, DOE made progress in the field and in site restoration at Separations Process Research Unit (SPRU), the site of the former research facility that was used to develop chemical processes to separate plutonium from other radioactive material during the Cold War. After the main processing facility (Building G2) and the waste processing facility (Building H2) were removed in 2018, soil below the excavation site was characterized and independently verified to meet cleanup criteria.

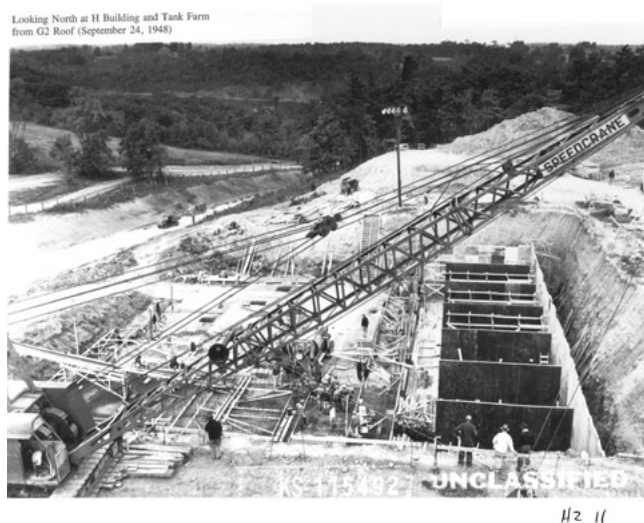


TRU waste storage area during inspection.



Former location of Building H2, backfilled and restored.

SPRU project crews completed backfilling of the excavations, which involved over 35,000 tons of imported fill, and graded and revegetated the project areas. DOE also issued final radiological and chemical cleanup reports to prepare the site to turn the land areas over to the Office of Naval Reactors. EM completed the land turnover for future national security missions in late 2020.



*Building H2 in 1948, showing construction of tank vaults.*

# SANDIA NATIONAL LABORATORY

“With all soil site corrective actions now complete, the Sandia New Mexico Environmental Restoration Project is focusing fully on the execution of our groundwater mission at three remaining areas of concern at Kirtland Air Force Base. On behalf of the team, I thank our project partners for their continued support, including Sandia National Laboratories and the New Mexico Environment Department.”

– Bill Wilborn, EM Federal Project Director, Sandia National Laboratory-New Mexico Environmental Restoration Operations Project

## HIGHLIGHTS

- Continued characterization, remediation, and monitoring of three contaminated groundwater plumes: Tijeras Arroyo Groundwater Investigation Area of Concern (AOC), Technical Area-V Groundwater AOC, and Burn Site Groundwater Investigation AOC
- Installed four new groundwater sampling wells at the Burn Site Groundwater AOC

## CONTINUED EXECUTION OF GROUNDWATER MISSION

In 2020, the Sandia Environmental Restoration Project continued the characterization and remediation of three plumes of contaminated groundwater at the Sandia National Laboratories section of Kirtland Air Force Base, adjacent to Albuquerque, New Mexico. The primary sources of contamination are elevated nitrates present in the Perched Groundwater System, derived from man-made and natural sources. Activities in 2020 also included the installation of four new groundwater sampling wells at the Burn Site Groundwater AOC. At the Technical Area V AOC, continued performance monitoring, analysis, and validation of a bio-remediation study is ongoing. EM continues



*Investigative operations at the Burn Site Groundwater Area of Concern.*

to collaborate with the NMED to complete RCRA corrective actions using cost-effective approaches that meet regulatory requirements.

# BROOKHAVEN NATIONAL LABORATORY

“We remain committed to fully achieving our goals associated with the High Flux Beam Reactor Stack Demolition Project despite early challenges associated with the COVID-19 pandemic.”

– Paul Lucas, Federal Project Director, Brookhaven National Laboratory

## HIGHLIGHTS

- Awarded and mobilized new demolition contract
- Completed exterior coating abatement

## PROGRESSING TOWARD STACK DEMOLITION

Through an agreement with DOE, the U.S. Army Corps of Engineers (USACE) awarded a contract to demolish the 320-foot-tall High Flux Beam Reactor (HFBR) exhaust stack. Once used for multidisciplinary scientific research, the reactor stack is no longer needed. In June, the HFBR project pre-mobilization commenced to conduct limited sampling and characterization and support further waste disposition planning. In August, the demolition contractor completed mobilization and transitioned to the abatement phase for asbestos and lead-contaminated paint.



DOE Under Secretary for Science Paul Dabbar views the iconic Brookhaven Reactor stack and gets briefed on progress during a site visit.



Western facing half of stack abatement progress as of October.

When decommissioning and demolition is complete, the facility will be transferred back to the Office of Science for long-term surveillance and maintenance.

# LAWRENCE LIVERMORE NATIONAL LABORATORY

“Many individuals across multiple contractors have worked hard throughout 2020 to establish the integration relationships necessary for EM to be successful while working on a non-EM site. We are looking forward to commencing demolition at the first two high-risk facilities in 2021 in support of the ongoing mission while performing the work safely and within the established COVID-19 safety protocols.”

– Kevin Bazzell, Federal Project Director, Lawrence Livermore National Laboratory

## HIGHLIGHTS

- Shipped TRU waste to WIPP for the first time in a decade
- Began demolition activities for the Pool Type Reactor - a 2020 EM priority
- Completed characterization and preparation activities for demolition of Building 175
- Demolished Building 175 ancillary facility, T1736

## SHIPPING TRANSURANIC WASTE FOR THE FIRST TIME IN A DECADE

Lawrence Livermore National Laboratory (LLNL), a national security laboratory established in 1952, generates TRU waste as a result of cutting-edge national defense research. LLNL reached a milestone this year by sending the first TRU waste shipment in a decade for permanent disposal at WIPP. This waste shipment milestone is the result of several years of effort and collaboration with other DOE offices and contractors. LLNL met the

stringent requirements necessary to certify its TRU waste and received authorization to ship in August 2020. Cleanup efforts will continue until all the newly certificated TRU waste is safely removed.

## SETTING THE STAGE FOR BUILDING 280 REACTOR REMOVAL

The USACE awarded a contract to demolish the Building 280 Livermore Pool Type Reactor. This sets the stage for initiating characterization activities early next year. The project involves removing Building 280 Livermore Pool Type Reactor and associated support equipment.



Looking west across the Building 280 area in October.

## PREPARING TO DEMOLISH BUILDINGS 175 AND 251

Lawrence Livermore National Security, LLC (LLNS), the M&O contractor at LLNL, characterized Building 175, the MARS E-Beam Facility, and demolished an associated ancillary office building, T1736. The acquisition process for obtaining a contractor to demolish Building 175 is also already

under way. These actions position DOE on track to complete demolition of Building 175 to slab-on-grade by the end of 2021.

In 2020, LLNS also commenced the characterization acquisition process that will ultimately lead to removal of Building 251, the Heavy Element Facility, and associated external equipment.



*Looking north at T1736 in June.*



*Looking north at Building 175 after T1736 was demolished in July.*

# LAWRENCE BERKELEY NATIONAL LABORATORY

“This has been a year marked by both progress and challenges. We were able to perform demolition work in two different areas of the site for the first time, and we look forward to continued progress in support of the Office of Science mission.”

– Kevin Bazzell, Federal Project Director, Lawrence Berkeley National Laboratory

## HIGHLIGHTS

- Completed Building 4 demolition and began demolition of Building 7
- Began Bayview Parcel 1 South cleanup

## PRIMING OLD TOWN BUILDINGS FOR DEMOLITION

The purpose of the Old Town Demolition Project is to demolish 1940s-era laboratory buildings that were declared seismically deficient and clean up existing contamination. Work is under way to demolish the remaining two of the original seven Old Town buildings, remove the last two slabs from buildings previously demolished, remove contaminated soil, and restore the area to a clean and stable site. Completion of the projects will make available approximately two acres of land for future DOE Office of Science missions.



Looking northwest across the Bayview area in January.



Looking west across the Bayview area in October.

In 2020, the Old Town team completed demolition of Building 4, the Advanced Light Source (ALS) Support Facility; and commenced abatement of Buildings 7, ALS Shipping and Receiving, and 7C, Building 7 Admin Annex, in preparation for demolition.



Looking south across the Old Town area in February.

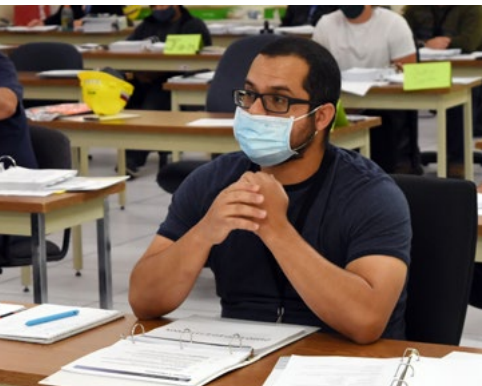
## **PREPARING BAYVIEW PARCEL 1 FOR FUTURE USE**

The Bayview Parcel 1 Cleanup Project includes demolition and removal of the former Bevatron utility tunnels and related concrete slab, grade beams, pilings, and associated contaminated soil.

In 2020, the Bayview team commenced the Parcel 1 South Cleanup Project to remove the southern utility tunnels and other demolition debris and soils to help prepare the area for future DOE Office of Science mission use.



*Looking south across the Old Town Area in May 2014.*



DOEEEnvironmentalManagement



EMcleanup

