Hanford

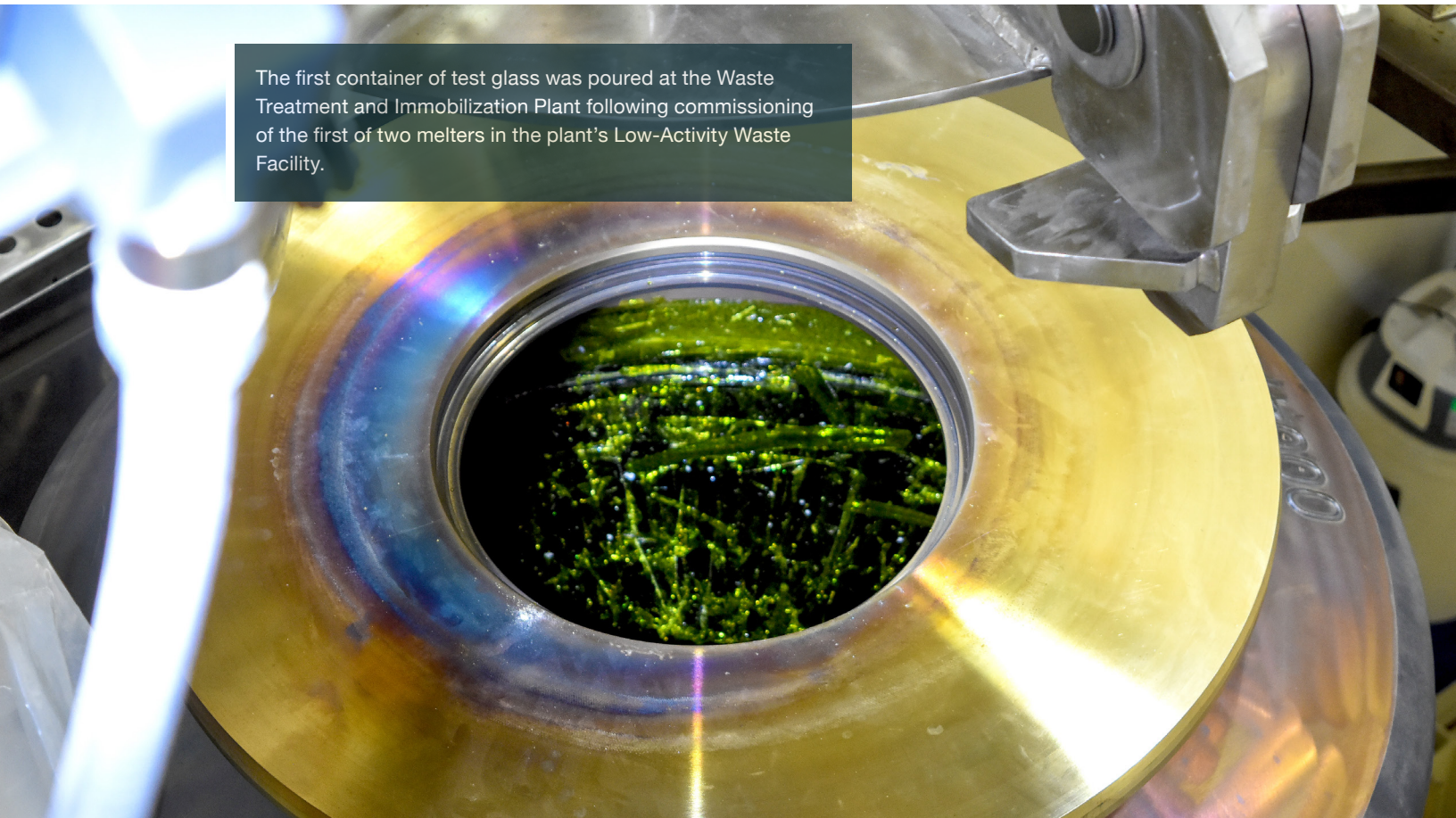
Overview

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 treating 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), in an integrated approach commonly referred to as One Hanford. 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 deactivation and decommissioning, management of solid waste and nuclear materials, and all site support services.

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



The first container of test glass was poured at the Waste Treatment and Immobilization Plant following commissioning of the first of two melters in the plant's Low-Activity Waste Facility.

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

Workers move ion exchange columns filled with radioactive cesium and solids at the Tank-Side Cesium Removal System storage pad.

Calendar Year 2023 Accomplishments

- **Continued tank waste treatment through Tank-Side Cesium Removal (TSCR) System operations, with more than 800,000 gallons of waste treated in preparation for feed for the start of DFLAW activities — an EM 2023 priority**
- **Completed heat up of the first tank-waste vitrification melter in the WTP, producing its first container of test glass in October**
- **Completed more than 40 upgrades to the Effluent Treatment Facility, boosting its capacity and efficiency to support Direct Feed Low-Activity Waste System (DFLAW) operations**
- **Completed the Integrated Disposal Facility where vitrified waste from DFLAW will be taken for disposal**
- **Treated more than 2 billion gallons of contaminated groundwater for the ninth consecutive year — an EM 2023 priority**
- **Completed a 144,000 square-foot interim surface barrier over the U Tank Farm to protect groundwater**
- **Completed demolition of the K West Reactor Annex**
- **Continued upgrades at the Waste Encapsulation Storage Facility to prepare to transfer 1,936 radioactive capsules to dry-storage casks**

Planned Cleanup Scope 2024–2034

The successful launch of one of EM's largest and most significant cleanup activities — the start of tank waste vitrification at Hanford through the DFLAW program — is expected in 2025. 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 2024, DOE will continue to advance DFLAW commissioning activities for the Low Activity Waste (LAW) Facility by heating up and commissioning the second of the facility's two large melters. Transitioning the remaining DFLAW facilities to operational status will commence the treatment of the most mobile form of

tank waste, beginning an important new phase of the Hanford Site cleanup effort.

Recent DFLAW successes illustrate what is possible when there is unified alignment around an achievable goal. Building on that success, DOE, the EPA and the state of Washington reached a conceptual agreement on a safe and viable path forward for Hanford's high-level tank waste. In addition, DOE has developed an R&D Roadmap to guide investments in additional technology options to accelerate the Hanford high-level tank waste mission. EM will ramp up engineering, design and low-risk construction on the WTP High-Level Waste (HLW) Facility to maintain progress towards treating the remaining Hanford tank waste in the mid-2030s.

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

RISK REDUCTION

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

DOE will complete the transfer of cesium and strontium capsules, currently housed in water pools at the Waste Encapsulation and Storage Facility, to safer and stable dry storage at a nearby Capsule Storage Area. Stabilization activities at the Reduction-Oxidation Plant (REDOX), the Plutonium Uranium Extraction Plant (PUREX), and B Plant will place these facilities in a low-risk and low-cost surveillance and maintenance 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.

Later in the decade, transuranic (TRU) waste shipments to WIPP are set to resume.

Key Regulatory Milestones 2024–2034*

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

- **Transfer cesium/strontium capsules to dry storage — 2025**
- **Complete LAW Facility hot commissioning and begin production-scale tank waste disposition — 2025**
- **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 waste containers — 2026**
- **Complete single-shell tank retrievals in A/AX Farms — 2028**
- **Complete remedial actions for contaminated soil beneath the 324 Building — 2030**
- **Substantially complete construction of the WTP HLW Facility — 2030**
- **Start cold commissioning of the HLW Facility — 2032**

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

Post-2034 Cleanup Scope

Post-2034, cleanup activities at Hanford are expected to include continued tank waste retrieval and treatment, along with tank closure activities; construction of additional waste treatment facilities; TRU waste treatment and shipments for disposal; and extensive facility demolition and waste site remediation activities. Most of the River Corridor and significant portions of the Central Plateau Outer Area remediation activities, including active groundwater treatment, will be nearly completed, allowing for a greater focus on the extensive waste sites and facilities surrounding the B Plant, PUREX, REDOX, U Plant, and T Plant processing canyons on the Central Plateau. The Hanford Site infrastructure will consistently be right-sized and reconfigured to support the focused efforts on the Central Plateau. DOE currently anticipates completing cleanup activities at Hanford in the 2078-2091 timeframe.

Demolishing the KW Annex facility once used to transfer containers of radioactive sludge that had been stored in a water-filled basin adjacent to the K West Reactor.