



# Hanford Test Bed Initiative

## Initiative Summary

The DOE Office of Environmental Management (DOE-EM) is conducting a 2,000-gallon Test Bed Initiative (TBI) to demonstrate the feasibility of options for retrieval and treatment of the low activity portion of the tank waste at the Hanford Site in Washington State. This waste is designated as 'low activity waste' or LAW at Hanford. Once treated, it contains the same constituents as low level radioactive waste (LLW), and would be similar to LLW managed at Hanford, other DOE sites, and commercially-generated LLW regulated by the Nuclear Regulatory Commission. The TBI will use existing processes and commercial facilities to immobilize the treated Hanford tank waste in a solid form which will then be disposed of at Waste Control Specialists LLC (WCS) in Andrews, Texas.

While the TBI is using known technologies, Hanford tank wastes have not previously been pretreated using these technologies and this engineered-scale unit will provide an early validation that the wastes will behave as expected, prior to completion of design for a larger pretreatment facility.

Previously, DOE-EM conducted a proof-of-concept demonstration using 3-gallons of Hanford tank waste and a slightly modified technology. This TBI is a larger scale test of 2,000 gallons of Hanford tank waste using the technology chosen in the currently-planned demonstration facility.

Planning for the 2,000-gallon TBI began in 2018, and coordination with regulators and interested stakeholders is ongoing. TBI will be performed in accordance with all applicable regulations and is consistent with the Record of Decision (ROD) for the Tank Closure and Waste Management Environmental Impact Statement. In that ROD, DOE did not identify a preferred alternative for all of the Hanford pretreated tank waste, but instead stated, "DOE believes it is beneficial to study further the potential cost, safety, and environmental performance of supplemental treatment technologies."

## Background

DOE-EM, through its Office of River Protection (ORP), is responsible for managing nearly 56 million gallons of radioactive waste generated from the Hanford Site's role in our nation's defense program during the Manhattan Project and the Cold War. These wastes, stored in 177 carbon steel underground tanks, must be treated in accordance with the Hanford Federal Facility Agreement and Consent Order, also referred to as the Tri-Party Agreement (TPA), among DOE, the U.S. Environmental Protection Agency (EPA) and the State of Washington, if being disposed onsite.

In August 2014, the state of Texas modified the radioactive material license for the WCS Federal Waste Facility (FWF) that increased disposal limits for technetium, iodine and other soluble radionuclides commonly found in Hanford's tank waste. The Savannah River National Laboratory performed an evaluation to assess the viability of disposing of Hanford treated tank LLW at WCS FWF and concluded that, DOE could potentially accelerate Hanford's tank closure efforts if commercial treatment and disposal facilities were included as an alternative for managing Hanford tank waste.

## 3 Gallon --- Proof of Concept Success

The initial 3 gallon test, completed in December 2017, demonstrated that Hanford tank waste could be successfully pretreated, transported to Perma-Fix Environmental Services Northwest (PFNW) for stabilization, and disposed of as treated LLW in a solid waste form at WCS FWF. Approximately three gallons of tank waste were pretreated using filtration and ion-exchange at Hanford's 222-S Laboratory, operated by Washington River Protection Solutions (WRPS), to remove suspended solids and cesium. Following stabilization at PFWN, the resulting material was determined to be LLW in accordance with the Waste Incidental to Reprocessing (WIR) requirements in DOE Manual 435.1-1, and complied with federal and state regulatory requirements. The pretreatment used a different filter and ion-exchange media than planned in the 2,000-gallon TBI which is why the TBI is important for validating results for future work.



## Benefits

- Provides scale-up demonstration of the technology to be used for Hanford tank wastes
- Potential to accelerate tank closures
- Near-term safe disposition of Hanford tank LLW
- Use of commercial treatment and disposal facilities
- Significant cost savings

## TBI Timeline

- TBI contract initiated – 05/2016
- 3-Gallon Proof of Concept complete –12/2017
- 2000-Gallon planning initiated – 05/2018
- 2000-Gallon projected completion – FY 2019



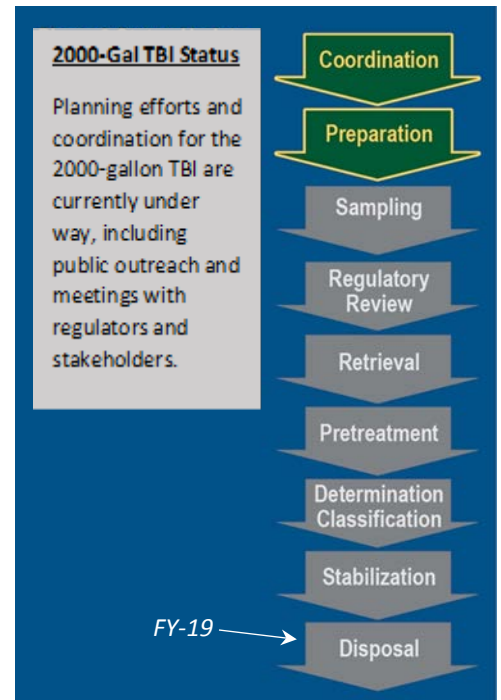
## 2,000 Gallon TBI --- Planning Underway

DOE-EM is currently planning for the TBI, which will involve the retrieval, treatment and disposal of 2,000 gallons of LLW. Data gathered from this engineering scale filtration and ion exchange system will provide inputs to support the design and operation of Hanford tank waste mission facilities currently planned or under construction. This includes addressing management of secondary waste including cesium ion exchange media and filtrate. Using higher flow rates than the original three gallon test, this engineering scale system will mimic the proposed full-scale Tank Side Cesium Removal (TSCR) equipment. The demonstration of the engineering scale system will be complementary to the completion of the design of TSCR and will provide early validation of this technology for Hanford tank waste to reduce the risk and provide laboratory data to improve confidence in the TSCR equipment at Hanford.

In addition to the pretreatment process described above, the waste is also regulated under the Washington State Dangerous Waste requirements and the pretreated waste will be shipped to PFNW for this treatment and for stabilization.

## 2,000 Gallon TBI

- Source tank contains supernatant from Hanford tanks.
- Supernatant exhibits low levels of radioactivity.
- Supernatant contains few dissolved solids and very low amounts of transuranics.
- Treatment is to be conducted consistent with regulatory and safety requirements.



### Why Invest in the Hanford Test Bed Initiative?

1. Addresses GAO report 17-306 recommendations, Energy Community Alliance recommendations, and the ROD provisions to analyze potential treatment and disposal alternatives.
2. Shows near-term progress by shipping waste out of Washington State for commercial disposal.
3. Provides an engineering scale demonstration of the filtration processes and ion exchange media expected to be used in TSCR.
4. Consistent with existing regulations, as well as mature and available commercial facilities and capabilities.
5. Could provide an option for treatment and disposal of Hanford tank LLW without the need for new capital facilities.
6. Validates methods for near-term enhancement of double-shell tank space.

#### Commercial Partners



Overall project management and controls, coordination, communication, and administration.



Waste treatment, LLW stabilization and immobilization at PFNW, packaging for commercial transportation, and support.



Design, fabrication, equipment installation and testing.



LLW waste receipt and disposal.



Hanford tank operations contractor



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Why do Test Bed?

DOE explores new and innovative ways to perform its cleanup mission to ensure the safety of its workforce, the public and the environment, and to serve as a good steward of taxpayer resources. The TBI addresses the ROD provisions on supplemental waste treatment and recommendations in the Energy Community Alliance report “*A New Approach to DOE Waste Management Must be Pursued*” from September 2017, and GAO report 17-306, to evaluate alternative options. In addition, DOE is using this initiative to obtain data on the best ways to assess the performance of ion-exchange resins and identify infrastructure and equipment needs. It implements the technology to provide early verification of the treatment technology for full-scale deployment of TSCR.

How is DOE able to dispose of Hanford treated tank LLW off-site?

In August 2014, the State of Texas modified the radioactive material license for the WCS FWF to allow for the disposal of commercially-treated and immobilized LLW that meets the facility’s waste acceptance criteria. The waste produced from the 3 gallon test met the WCS FWF waste acceptance criteria, and was determined by DOE to be LLW through implementation of the Waste Incidental to Reprocessing (WIR) requirements in DOE Manual 435.1-1. This allows for treated tank waste to be managed as LLW once an evaluation is conducted that the treated waste meets the WIR criteria in the Manual. This treated, solidified tank waste was therefore eligible to be disposed of at the WCS FWF. One drum containing approximately 3 gallons of treated tank LLW has already been disposed of at the WCS FWF. Before more treated tank waste can be shipped offsite as LLW from Hanford, DOE will complete a new WIR evaluation and determination. This evaluation will consider the specific characteristics and proposed management of the 2,000 gallons of waste, and make a determination as to whether it can be safely managed as LLW in accordance with the DOE Manual.

Why would the Hanford treated tank LLW go to Texas?

In order to achieve the best value for the taxpayer, DOE is evaluating potential disposal options, including existing commercial disposal options, such as those available at the WCS FWF in Texas. Waste that meets the WCS FWF waste acceptance criteria can safely and efficiently be disposed of at the WCS FWF, which provides an existing permitted and licensed facility.

Is the WCS FWF licensed to accept the Hanford treated tank LLW?

Yes. The WCS FWF is licensed to receive wastes that meet its waste acceptance criteria. Preliminary analysis indicates that much of the Hanford treated tank LLW may meet these criteria. Only waste that meets the WCS FWF waste acceptance criteria will be shipped to WCS.

Why can't this waste be disposed of on-site?

Hanford currently does not have a disposal facility permitted to dispose of tank waste that is treated by a means other than vitrification, whereas the WCS FWF in Andrews, TX does. WCS is licensed to receive and dispose of treated and immobilized wastes that meet its waste acceptance criteria. WCS' license does not require LLW to be placed in a glass matrix like that planned for Hanford.

What organization is responsible for granting approval?

The Washington State Department of Ecology regulates the hazardous constituents in the tank wastes and will need to issue appropriate permits and approvals for certain aspects of the 2,000 gallon TBI. Appropriate Federal, Washington State and State of Texas regulatory authorities are also involved in providing approvals for the TBI.

Does this study mean that DOE is now looking to use media other than glass as a treatment option for Hanford tank waste?

This project does not imply a change from the ROD. The TBI will determine if this option for pretreatment and stabilization of Hanford treated tank LLW can be performed in accordance with regulations.

Will DOE ship additional Hanford treated tank LLW off-site for treatment and disposal?

DOE is pursuing the 2,000-gallon TBI. DOE has made no decision at this time whether additional technology validation efforts are expected.

Does this initiative have any impact on the WTP?

No. DOE is proceeding with construction of the Waste Treatment and Immobilization Plant (WTP). Funds used for the TBI activities do not adversely impact schedules or activities for DFLAW. For example, the 2,000 gallon TBI is an engineered-scale test of the major elements of the Tank Side Cesium Removal (TSCR) system currently under development at Hanford.

How long is the 2,000 gallon TBI expected to take?

The 2,000-gallon demonstration project is expected to be completed in Fiscal Year 2019.

Is the 2,000 gallon pretreated Hanford tank LLW safe to ship off-site?

Yes. The pretreated tank waste will be shipped by truck to PFNW's facility for chemical stabilization and immobilization in licensed packages in accordance with DOE (and DOT) transportation requirements. From PFNW, the immobilized Hanford tank LLW will be transported to Texas in DOT approved packages. Similar shipments are made routinely from hospitals, university laboratories, military installations, commercial reactor plants and DOE sites around the U.S. In 2017, DOE conducted 7,700 radioactive waste and materials shipments traveling over 2.6 million miles with no DOT recordable accidents.

Why wasn't this concept considered before?

The WCS FWF was not previously available or permitted to accept waste like Hanford's treated tank LLW. The Texas facility began operation in 2013. The WCS FWF received a license modification in 2014 that made the potential disposal of Hanford treated tank LLW possible.