FACT SHEET
PART V, CLOSURE UNIT GROUP 25, PUREX
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UNIT DESCRIPTION

The Plutonium-Uranium Extraction (PUREX) Plant is one of five processing facilities the Permittees used for reprocessing spent fuel. (These facilities are sometimes called “canyons” because they are large and their interiors look like canyons.) PUREX is in the southeast part of the 200 East Area.

At PUREX, the Permittees recovered plutonium and uranium from spent nuclear fuel. They used liquid processes to separate the plutonium and uranium.

The PUREX Plant was built in 1956. It extracted plutonium and uranium more efficiently than the older canyon facilities. So beginning in 1958, PUREX handled spent fuel Hanford produced. Also in 1958, the Permittees began recovering neptunium in PUREX in occasional batches.

In 1963 the Permittees began modifying PUREX to handle other fuel types, including fuel from N Reactor. During 1965 and 1966, PUREX processed powered thorium oxide fuel targets that had been irradiated for the production of uranium-233.

In September 1972, the PUREX Facility was shut down for 11 years. Maintenance and upgrades continued during this time. In 1983, the Permittees restarted PUREX at a decreased plutonium production rate.

In 1988, after steam pressures fell below levels needed to support backup safety equipment, PUREX closed for nearly a year. The Permittees repaired equipment and improved waste handling systems during that period. In early 1990, after a stabilization run lasting only a few weeks, PUREX closed again to prepare more environmental and safety documentation and facility upgrades. In October 1990, the U.S. Secretary of Energy placed the PUREX Facility on standby status. The U.S. Department of Energy (USDOE) issued a final closure order in December 1992.

PUREX includes the 202-A Building (the canyon building) and various support structures. The 202-A Building is a reinforced concrete structure about 306 meters long, 36 meters wide, and 30 meters high, with about 12 meters of the height underground. The 202-A Building has three main parts:

1. A thick-walled, concrete canyon containing remotely operated process equipment (in cells, mostly below grade).
2. Pipe and operating, sample, and storage galleries.
3. An annex with offices, process control rooms, laboratories, and building services.

PUREX also includes the two tunnels, PUREX Storage Tunnel Number 1 and PUREX Storage Tunnel Number 2. They are connected to and extend from the south side of the PUREX canyon.

The Permittees finished building PUREX Storage Tunnel Number 1 in 1956. The tunnel is about 5.8 meters (19 feet) wide by 6.7 meters (22 feet) high by 109 meters (358 feet) long. It has storage space for eight railcars. Between June 1960 and January 1965, the Permittees filled the eight railcar spaces and sealed the tunnel.

The Permittees finished building PUREX Storage Tunnel Number 2 in 1964. It is about 5.8 meters (19 feet) wide by 6.7 meters (22 feet) high by 514 meters (1,686 feet) long. It has storage space for 40 railcars. In December 1967, the first railcar went into in Tunnel Number 2. Tunnel Number 2 now has 28 railcars.

The PUREX permitted tank system treated and stored waste. A tank system includes the tank (vessel) and its related equipment. The storage tanks within PUREX specifically supported clean up transition phase activities in the mid-1990s. Tanks TK-P4 and TK-40 are outside of the 202-A building, but in the scope of this unit.

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The Permittees have removed liquids from all 45 tanks and have flushed the tanks. These tanks are considered empty, but have yet to formally satisfy closure performance standards. The tanks await final disposition.

PUREX also contains a mixed waste storage area. It includes the canyon deck and F-Cell. Ecology regulates it as a containment building. The containment building is subject to the dangerous waste requirements of Washington Administrative Code (WAC) 173-303-695.

The Permittees have removed all debris (process equipment from the PUREX process, lead shielding, etc.) that they stored on the canyon deck. They moved that debris to the PUREX Storage Tunnels. F-Cell stores a steel open-top skid with concrete chips from the E-Cell floor. Although the Permittees have removed waste from the canyon deck, the containment building has yet to meet closure performance standards in the Permit.

**TYPE AND QUANTITY OF WASTE**

The PUREX process used a recyclable salting agent, nitric acid, and tri-butyl phosphate (TBP) in a normal paraffin hydrocarbon (NPH) solution as a solvent.

In PUREX Tunnel Number 1, the combined volume of the equipment stored on the eight railcars is about 596 cubic meters (780 cubic yards). The maximum process design capacity for storage in this tunnel is about 4,129 cubic meters (5,400 cubic yards).

In PUREX Tunnel Number 2, the volume of equipment stored on the 28 railcars is about 2,204 cubic meters (2,883 cubic yards). The maximum process design capacity for storage in this tunnel is about 19,878 cubic meters (26,000 cubic yards).

The PUREX Storage Tunnels are designated as a Miscellaneous Unit. They store mixed waste subject to the requirements of WAC 173-303-680. The two tunnels store waste from the PUREX Plant and other onsite sources. The Permittees store mixed waste in the tunnels on railcars, but not all the stored material contains mixed waste.

PUREX consists of three types or groups of dangerous waste management units. Table 1 shows the units, including the permitting authorizations for managing existing waste and accepting other waste.

### Table 1  Closure Unit Group 25 (PUREX) Dangerous Waste Management Units

<table>
<thead>
<tr>
<th>Dangerous Waste Management Unit(s)</th>
<th>Manages Existing Waste?</th>
<th>Authorized to Accept Additional Waste?</th>
<th>Regulated Unit Type</th>
</tr>
</thead>
<tbody>
<tr>
<td>PUREX Storage Tunnels</td>
<td>Yes</td>
<td>Tunnel 1 - No</td>
<td>Miscellaneous Unit</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Tunnel 2 – Yes</td>
<td>WAC 173-303-680</td>
</tr>
<tr>
<td>PUREX Tank System (See Addendum A)</td>
<td>No</td>
<td>No</td>
<td>Tank System</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>WAC 173-303-640</td>
</tr>
</tbody>
</table>

**BASIS FOR PERMIT CONDITIONS**

Only PUREX Storage Tunnel 1, PUREX Storage Tunnel 2, and the F-Cell in the PUREX Canyon are authorized to manage existing waste. Only PUREX Storage Tunnel 2 is authorized to accept waste.

Closure Unit Group 25 (PUREX) includes both closure and operating unit groups. All of the dangerous waste management units are subject to the closure requirements of WAC 173-303-610. The individual units are subject to different WACs:
• The tank system is subject to WAC 173-303-640(8).
• The containment building is subject to WAC 173-303-695, which incorporates 40 CFR 264.1102 by reference.
• The two PUREX Storage Tunnels are subject to WAC 173-303-680.

The Permittees store mixed waste in the tank system, the containment building, and the tunnels. All this mixed waste is subject to restrictions on disposal of land disposal restricted (LDR) waste under WAC 173-303-140(2)(a). (The regulation incorporates the LDR restrictions in the federal RCRA regulations.) Permittees must treat dangerous waste that is land disposal restricted to prescriptive standards before disposing it to landfills or other land-based units. (See 40 CFR§268.30-.39.)

The Resource Conservation and Recovery Act (RCRA) and the Hazardous Waste Management Act both contain a “storage prohibition.” They prohibit any storage of LDR waste in tanks, containers, or containment buildings unless such storage is “solely for the purpose of the accumulation of such quantities of hazardous waste as necessary to facilitate proper recovery, treatment, or disposal....” This is to discourage the continued accumulation of untreated waste.

A permitted treatment, storage, and disposal unit may store LDR wastes for up to one year. Storage can exceed one year only if the facility proves that the storage is solely for the purpose of accumulating enough waste to facilitate proper recovery, treatment, or disposal.

In 1992, Congress passed the Federal Facility Compliance Act (FFCA, codified in RCRA). Among other things, it drives USDOE facilities like Hanford to address their backlogs of untreated mixed waste. The FFCA required USDOE to develop plans and schedules for developing “treatment capacities and technologies” to address mixed waste backlogs. Once a state approves and incorporates the plan into a state order, a “site treatment plan” becomes an enforceable compliance schedule. (See 42 US Code, Section 6939C: Mixed waste inventory reports and plan.) So long as USDOE complies with an approved plan, it will not be subject to fines or penalties for storage prohibition violations.

At Hanford, the Tri-Party Agreement (TPA) satisfies the site treatment plan requirement. In particular, the LDR report the Permittees develop and maintain under the M-26 milestone serves as a site treatment plan.

For PUREX, TPA Milestone 85-20A requires the Permittees to submit a remedial investigation and feasibility study work plan by September 2015.

CLOSURE

PUREX is undergoing a phased decommissioning and closure process. The process has three distinct phases:

1. Transition.
2. Surveillance and maintenance.
3. Disposition.

The Permittees use a phased approach because development of closure performance standards and a complete closure plan during the transition phase is impractical, and future land use determinations are not final.

The transition phase began in December 1992, when USDOE ordered the termination of PUREX and directed the shutdown and clean-out activities. The Permittees defined end point criteria for deactivation activities for PUREX in WHC-SD-WM-TPP-053, PUREX Deactivation End Points. The criteria were to isolate the facility, mitigate contamination migration, and stabilize the facility.

The Permittees achieved this through the removal, stabilization, disposal, or excessing of major radioactive sources, dangerous chemicals, and waste. This included flushing and removal of dangerous
waste constituents from vessels regulated as dangerous waste management units. This work placed
PUREX in a safe and environmentally secure configuration suitable for a long-term surveillance and
maintenance program.

The transition phase is complete. PUREX is now safe and stable in the surveillance and maintenance
phase. Before this phase started, the Permittees submitted a PUREX Facility Pre-closure Work Plan
(DOE/RL-95-78) to Ecology. This work plan defined steps to ensure protection of human health and the
environment from dangerous waste management units, and to provide a defensible basis to establish a
compliance schedule for final closure of these units during the disposition phase.

The Tri-Party Agreement Action Plan Section 8 requirements govern the surveillance and maintenance
phase. (See Surveillance and Maintenance Plan for the Plutonium/Uranium Extraction [PUREX] Plant,
DOE/RL-98-35, Rev. 3, January 2008.) No other work is needed to comply with the permit or to protect
human health and the environment.

The Permittees must establish the current drained and flushed configuration of PUREX dangerous waste
management tank systems and the current configuration of the PUREX Canyon Deck as an interim
closure performance standard. No specific permit conditions are needed since all tank systems and the
PUREX Canyon Deck are now in this configuration. No additional work is needed. The basis of this
interim closure performance standard is WAC 173 303-610(2), WAC 173-303-640(8), and 40 CFR

The Permittees must submit a closure plan outline when they submit the remedial action work plan to the
U.S. Environmental Protection Agency (EPA) under the CERCLA Record of Decision. The Permittees
must submit a permit modification request to incorporate closure plan performance standards and closure
activities into Addendum H. The outline will identify elements of the remedial action work plan the
Permittees expect to use to satisfy Permit Condition V.25.L.2. Ecology will review and comment to
ensure integration of CERCLA and dangerous waste closure requirements.

After completing activities in Condition V.25.L.1, the Permittees will request a permit modification to
incorporate a closure and post-closure plan. The plan must comply with WAC 173-303-610, WAC 173-303-640(8) and 40 CFR 264.1102 (incorporated by reference by WAC 173-303-695) for the tank system
and containment buildings identified in Addendum A.

A permit modification to add a closure plan is usually a Class 2 or Class 3 permit change. In this
instance, Ecology will accept notice and comment through the CERCLA process at the proposed plan
stage. This will satisfy the notice and comment requirements under WAC 173-303-830.

The actual closure could be carried out through permit requirements, CERCLA requirements, or some
combination of the two. The closure must satisfy closure performance standards established through a
permit modification.

Closure will be based on PUREX’s safe and stable configuration, and the inspection and maintenance
requirements of the Surveillance and Maintenance Plan for the Plutonium/Uranium Extraction (PUREX)
Facility, DOE/RL-98-35. The same requirements can also satisfy the operating requirements for storing
concrete debris in the F-cell containment building.

The permit will establish the canyon deck and F-Cell as a containment building. Closure for the canyon
deck and F-Cell will require closure performance standards and treatment, decontamination, or
verification to meet the standards. The Canyon Disposition Initiative allows use of canyon facilities as
disposal units, if the appropriate CERCLA and dangerous waste permit authorizations are in place.

GENERAL WASTE MANAGEMENT

1 Although PUREX is included in the dangerous waste permit as a closure unit group, the F-Cell portion of the containment
building dangerous waste management unit will receive operating authorization through the permit to store debris.
Conditions V.25.B.1 and V.25.B.2 authorize the Permittees to store existing dangerous/mixed waste in the two PUREX Storage Tunnels, and the PUREX Containment Building (F-Cell). These conditions ensure continuity of operations between the expired and re-issued permit.

Condition V.25.B.3 authorizes the Permittees to accept additional waste for storage in PUREX Tunnel 2. Such acceptance is governed by the criteria and waste acceptance process in Addendum B, the waste analysis plan. Most or all the discarded or failed equipment or waste the Permittees may place in PUREX Storage Tunnel 2 is expected to be from on-site. It would be similar to what is now in the tunnel.

Condition V.25.B.4 requires operation of the PUREX Storage Tunnels according to Addendum C. Ecology believes Addendum C satisfies the requirements for authorizing miscellaneous units in WAC 173-303-680.

WASTE ANALYSIS

Addendum B characterizes wastes in the PUREX Storage Tunnels and the PUREX Containment Building (Cell F-11). The basis for this addendum is WAC 173-303-300.

Condition V.25.C requires the Permittees to document newly received wastes in a waste profile. They must maintain waste profiles in the facility operating record. The profiles comply with the recordkeeping requirements of WAC 173-303-380(1)(a) through (c), and document the characteristics of new wastes to ensure they comply with waste acceptance criteria.

Sampling and analysis is not necessary for the purposes of accepting new waste into PUREX Storage Tunnel 2 based on waste acceptance criteria established in Section 4.4 of Addendum B. These waste criteria, based on physical and regulatory designation factors, ensure that wastes meeting the criteria are acceptable for storage, and can be stored in a manner compliant with the permit and as necessary to protect human health and the environment.

RECORDKEEPING AND REPORTING

Condition V.25.D requires the Permittees to document all work, such as results of monitoring, testing, and analytical work, and quality assurance and control data, in the Hanford Facility Operating Record. This condition follows the requirements of Condition II.I.2, WAC 173-303-380 and WAC 173-303-810(16) to ensure proper recordkeeping and reporting.

SECURITY

PUREX is within the secured area of Hanford. Access to the unit is subject to the general security provision of Condition II.L. Security provisions, access controls, and signage specific to this unit will comply with the requirements of WAC 173-303-310.

PREPAREDNESS AND PREVENTION

Condition V.25.F covers preparedness and prevention. The basis for this condition is WAC 173-303-340. The permit has specific requirements to control ignition sources and to manage ignitable and reactive wastes. The Permittees will prevent ignitable and reactive wastes from exposure to excessive heat and sources of ignition. The Permittees must store incompatible wastes in separate containers to prevent mixing.

CONTINGENCY PLAN

The basis for Condition II.A for contingency plan requirements is WAC 173-303-350.

INSPECTIONS

The basis for inspection requirements in Conditions II.X and V.25.H, and Addendum I, is WAC 173-303-320. We do not require the Permittees to inspect inside PUREX Tunnels 1 and 2 because
of the hazard to workers from potential exposure to the mixed wastes stored there. We do require an
annual inspection of the exterior of both tunnels. The inspections are to detect structural deterioration,
tunnel subsidence, erosion of the earth cover, and vent stack damage, or any other condition or discharge
that could harm human health or the environment.

TRAINING

The Permittees must ensure employees have the skills and knowledge to do their work safely. The Permit
requires that the training requirements established in Addendum G be maintained in a Dangerous Waste
Training Plan prepared according to Condition II.C.1. The training program and written training plan
must meet the requirements of WAC 173-303-330.

REQUESTED VARIANCES OR ALTERNATIVES

The dissolvers in the PUREX Storage Tunnels are not labeled as containing characteristic toxic mercury
(D009) [WAC 173-303-090(8)(c)]. The Permittees stored the waste in the tunnels before those
procedures for labeling were in effect. Labeling the waste now is not feasible because of the hazard to
workers from exposure to the mixed waste. Ecology will not require the Permittees to label the mixed
waste now in the tunnels. But the Permittees must label any new mixed waste they put into the
PUREX Storage Tunnels. They must label the railcars as specified by WAC 173-303-395(6) and
WAC 173-303-630(3).

STATE ENVIRONMENTAL POLICY ACT (SEPA)

The SEPA determination for this unit is in the Hanford-Wide Permit Fact Sheet.
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