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Hanford Dangerous Waste Permit

Tank-Related Units

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Nuclear Waste Program
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Why have permits?

- To regulate dangerous waste treatment, storage, and disposal facilities:
  - Thermal treatment units
  - Landfills
  - Tank systems
  - Container storage
  - Containment buildings
- To protect humans and the environment

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Parts of the Unit Permit

- Fact Sheet
- Unit description
- Operations and processes
- Permit conditions
- Requirements or limitations to maintain safe operating conditions and protect humans and the environment (WAP, personnel training, security)
- Closure plan

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Tank-Related Permit Units

New

- 149 single-shell tanks (SSTs)
- 28 double-shell tanks (DSTs)

Existing

- 242-A Evaporator
- Waste Treatment Plant (WTP)
- Effluent Treatment Facility (ETF)

Single-Shell Tank System

Closing Unit #4

- 149 tanks in 12 groups called tank farms.
- Capacity: 53,000 – 1 million gallons each.
- In total, Hanford's single-shell tanks (SSTs) hold about 30 million gallons of radioactive and chemical waste in the form of sludge, salt cake, and a small amount of liquid.
- SST system also includes ancillary equipment: vaults, diversion boxes, catch tanks, pits, pipelines, miscellaneous structures, and significant soil contamination.
- Built between 1943 and 1964.
- Because 67 tanks are suspected of leaking or of being overfilled, all the free liquids were pumped out before 2010.

T Tank Farm construction in 1944. See the truck for scale!

Where did the waste come from?

It came from dissolving irradiated fuel rods to recover plutonium. Extracting plutonium created huge quantities of radioactive and dangerous wastes. After the waste was put into the SSTs, workers added a wide variety of chemicals to the tanks to neutralize the acids and extract certain products. Those chemicals remain in the tanks and may form toxic compounds.

How does this part of the permit differ from the usual?

SSTs do not comply with regulations, so the permit requires SSTs to be closed as soon as possible. But they can't close yet because they still contain waste. The waste must be retrieved and the soil remediated before the tanks can be closed. There is no place to put all the retrieved tank waste until the Waste Treatment Plant is running. Though this is a closing unit, it will have conditions to allow retrieval, storage, monitoring, etc.

What's the risk?

The tanks and surrounding contaminated soil are one of Hanford's greatest challenges. We don't really know the full extent of the risks yet. Removing wastes from the tanks will greatly reduce the risks. An ongoing risk assessment for the SST closures will ensure the risks are below acceptable levels.

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Single-Shell Tanks

- Removed pumpable liquids and retrieving tank waste for treatment
- Leaked, contaminated soil
- Unfit-for-use tanks
- Closure will take 31 years (TPA)

First closure decision, TPA milestone M-045-82 (2015), requires permittees to submit a permit modification.

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Single-Shell Tanks

Permit conditions to:

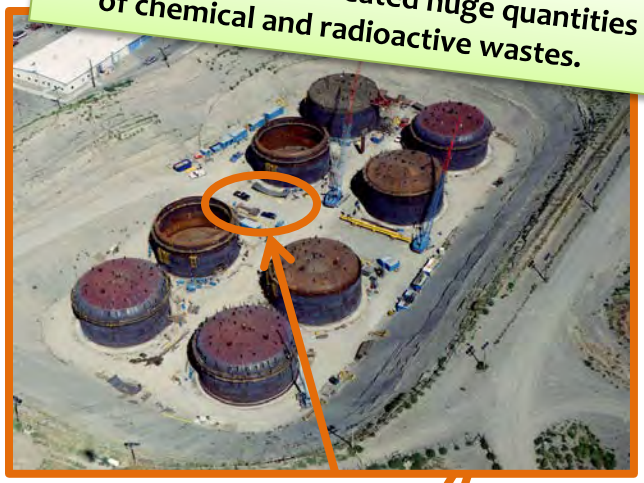
- Specify requirements and limitations
- Maintain safe conditions while closing
- Protect humans and the environment
- List closure plan requirements
- Incorporate TPA milestones and compliance schedule

Examples include integrity, soil cleanup, groundwater, and closure.

Double-Shell Tank System
204-AR Waste Unloading Facility
Operating Unit #12

- 28 tanks in 6 groups, or *tank farms*.
- Capacity: 1 – 1.2 million gallons each.
- The double-shell tank (DST) system includes ancillary equipment: pipelines, pits with valves, jumpers, nozzles, and a cross-site transfer line from the SY Tank Farm in the 200 West Area to the AP Tank Farm in the 200 East Area.
- The 204-AR Waste Unloading Facility can receive and hold waste in a 1500-gallon tank to treat pH. It will not be used until it complies with regulations.
- The DSTs comply with regulations because they have leak detection. Their design is basically a tank inside a tank with leak detection in between.
- Built between 1971 and 1986.

Making plutonium created huge quantities of chemical and radioactive wastes.



241-AP Tank Farm construction.
See black pickup trucks for scale.

Where does the waste come from?

Waste comes from the single-shell tanks, as they are emptied. Much of the waste came from dissolving fuel rods in acid to recover plutonium. The waste is high-level waste and has dangerous chemicals in it too.

How does this part of the permit differ from the usual?

Ecology required an integrity assessment to show the tanks can store waste safely. Some tank farm components don't comply with strict interpretation of the regulations. This is partly because the tanks were built long before regulations were written.

What's the risk?

The DSTs have limited capacity and are aging. Maintaining these tanks is important to ensure that waste is ready to supply the Waste Treatment Plant. The permit requires continuous leak detection to protect humans and the environment.

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242-A Evaporator

Operating Unit #4

- Removes water and volatile organics from tank waste.
- Decreases the volume of water to create room in double-shell tanks, allowing them to accept waste from noncompliant single-shell tanks.
- Treats up to 1 million gallons to free up about 500,000 gallons in the double-shell tanks in each campaign.
- Near PUREX and most of the double-shell tanks in the 200 East Area.
- Began operating in 1977.

Vital for making room in double-shell tanks for waste from single-shell tanks

Where does the waste come from?

Waste comes to the 242-A Evaporator from the double-shell tanks.

Where does the waste go?

Two new waste streams leave the evaporator: a concentrated slurry of waste that goes back to a double-shell tank, and condensed water that goes to the Liquid Effluent Treatment Facility.

What's the risk?

This middle-aged unit must keep operating for decades! The evaporator is extremely important for Hanford's cleanup. We depend on it to make space in the double-shell tanks (by evaporating liquid) so we can empty the noncompliant single-shell tanks. The permit requires vigilant upkeep and maintenance, such as the recent replacement of piping and upgrades to instrumentation. USDOE plans to clean close the facility when they are done using it.

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Double-Shell Tanks & 242-A Evaporator

- Operating permits
- Built before Washington Administrative Code tank regulations (& RCRA)
- Requirements for operations
- Not for Tank Waste Treatment Mission requirements:
  - Timing/frequency of evaporator operations
  - DST space

Waste Treatment and Immobilization Plant (vit plant)

Operating Unit #10

- Permitted for storage and treatment of Hanford's tank waste in unique phased permit agreement.
- Four main facilities, plus support buildings:
  - Pretreatment facility (PTF), to separate waste into low-activity and high-level waste streams.
  - High-level waste vitrification facility (HLW).
  - Low-activity waste vitrification facility (LAW).
  - Laboratory to support all this work.
- On 65 acres east of 200 East Area.
- Under construction; starts operation in 2019.

Aerial view of construction, July 2011

Where does the waste come from?

56 million gallons of waste from World War II and Cold War plutonium production await treatment in 177 enormous, aging underground tanks. There is enough waste for everyone in the USA to have one 22-oz glass of it. All 308,400,408 million of us!

How will the waste be treated?

The waste will be thoroughly mixed with super-heated, liquefied glass – a process called vitrification (where the "vit" in vit plant comes from). Then it will be poured into large, stainless steel canisters and sealed. The waste canisters will still be radioactive, but will be safer because waste can no longer seep into places it shouldn't, like our water and soil.

Where will the waste go?

LAW canisters will go to shallow disposal at Hanford's Integrated Disposal Facility. HLW canisters will go to a deep geologic repository when one is available. Until then, it will be stored on-surface at Hanford in a facility not yet designed.

What's the risk? Safe disposition of our nation's most dangerous waste relies on the vit plant's safe completion and ability to process waste for 20+ years.

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Nuclear Waste Program

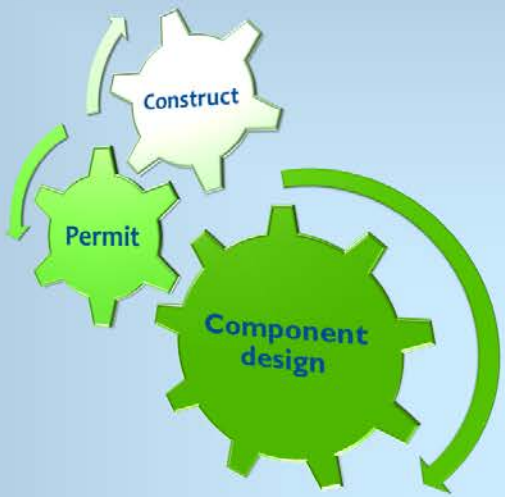
Tank Waste Treatment Section

Working to ensure treatment that's fully functional, safe, and compliant with state and federal laws.

hanford@ecy.wa.gov | 800-321-2008

Our phased permitting approach keeps WTP wheels turning

- Comments resolved on informal permit change request (one cycle)
- Prompt approval of formal permit change request
- 40+ permit modifications in design phase per quarter
- 2 – 4 major permit modifications for new design submittals per year



The WTP construction and operating permit is massive!

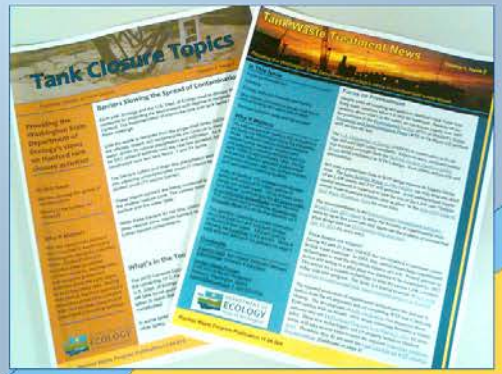
14 addenda + 12 appendices + 59 sub-appendices = ~1,500 documents or 9,000 pages

Since 2000, we have been actively involved in identifying and resolving WTP issues

- Adequate waste mixing
- Supplemental treatment of low-activity waste
- Tank erosion
- Pretreatment capabilities and capacity
- Vessel retrofitting

Stay informed about this important project

Blogger ECOconnect



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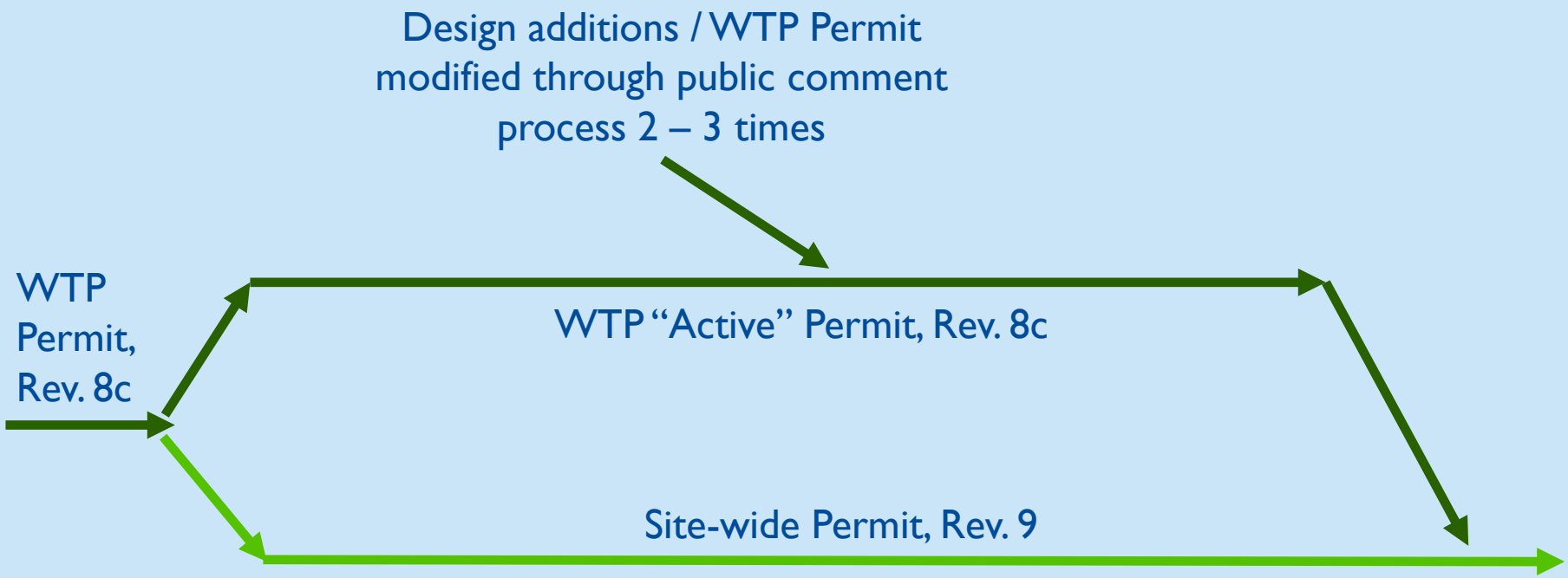
WTP Parallel Permit Modification Process



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WTP Permit

- 77 Tank Systems
  - Pretreatment Facility: 50; HLW: 13; LAW: 11; LAB: 3
  - Black cells cannot be modified after hot start
  - Leak detection, secondary containment, tank integrity assessments
- Several Miscellaneous Units (combination of thermal treatment regulations, tank systems, containment buildings)
  - 4 stacks with air emissions
    - Complete risk assessment forecasting impact from emissions
    - "Trial burns" or demonstration testing to establish safe emission levels
- Containment Buildings
- Container Storage

Liquid Effluent Retention Facility
Effluent Treatment Facility

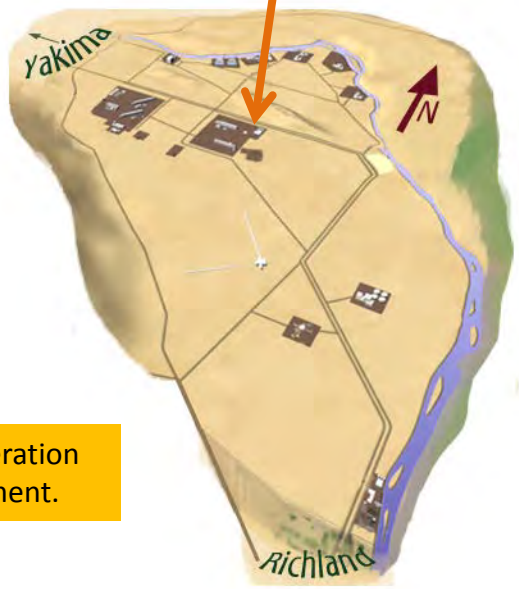
Operating Unit #3

- After the 242-A Evaporator boils off liquid effluent to condense tank wastes, the Liquid Effluent Retention Facility (LERF) stores that liquid until the Effluent Treatment Facility (ETF) can treat it.
- Treated effluents go to a permitted discharge site.
- These facilities store and treat other liquid wastes from Hanford, such as contaminated groundwater from pump-and-treat systems.
- Began operating in early 1990s.

Imagine 44 MILLION two-liter soda bottles

What happens to the waste it receives?

LERF has three lined basins with a capacity of 88.5 million liters. ETF removes or destroys dangerous waste in liquid waste. It uses treatments such as filters, reverse osmosis, pH adjustment, and ultraviolet light. Water is treated, then discharged at a permitted area a few miles away. Remaining sludge is solidified in containers, dried, and sent to the Environmental Restoration Disposal Facility.



What's the risk?

We don't expect any risk from this site. The permit ensures operation and closure of this facility do not harm humans or the environment.

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EIS Impacts/Relationships

- Used Tank Waste Remediation System EIS for SEPA for operations of SSTs, DSTs, the 242-A Evaporator, and WTP
- Use final Tank Closure & Waste Management EIS (TC & WM EIS) for closure, supplemental treatment, and disposal in IDF beyond limited waste streams

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Appendix I/RCRA Permit

Identifies closure process and relationships to TPA requirements

- Retrievals
- Performance Assessment
- Closure Plan
- RCRA Facility Investigation/Corrective Measure Study

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Public Involvement Opportunities

- May 3, 9:00 a.m., Full-day workshop, Ecology office (agenda available)
- Public hearings
  - May 15, 7:00 p.m., Seattle
  - May 16, 7:00 p.m., Portland
  - June 5, 6:30 p.m., Spokane
  - June 6, 6:30 p.m., Richland

More info:

www.ecy.wa.gov/programs/nwp

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800-321-2008

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Hanford Dangerous Waste Permit

Integrated Disposal Facility & the Risk Budget Tool

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Nuclear Waste Program

April 17, 2012

Integrated Disposal Facility

Operating Unit #11

- Disposal site for vitrified low-activity waste.
- IDF is being built in two phases; the first phase is complete.
  - East section is for low-level radioactive waste outside the scope of the permit. (USDOE regulates itself for radioactive materials.)
  - West section is for mixed wastes (radioactive and chemical) that the permit regulates. This side is about 223 meters wide, 555 meters long, and up to 14 meters deep. It will hold up to 450,000 cubic meters of waste—four layers of vitrified low activity waste containers separated by 0.9 meters of soil.

Aerial view of IDF looking south. Note semi-truck trailer for scale.

Where did the waste come from?

No waste is stored here yet. IDF will receive vitrified waste when the Waste Treatment Plant starts operating. It may also receive secondary waste resulting from processing. Waste will remain here.

How does this part of the permit differ from the usual?

The permit requires USDOE to model future impacts to groundwater from all waste disposed at IDF using a risk budget tool. The risk budget tool is due to Ecology in July 2013.

What's the risk?

There are risks to groundwater in the future from secondary waste, according to modeling. Secondary waste would have to be significantly mitigated before it could be disposed at IDF.

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Integrated Disposal Facility Permit

- Only allows disposal of ILAW containers, 50 bulk vitrification test boxes, and limited mixed waste produced related to landfill management
  - Permit will be modified to consider disposal of other mixed waste from Hanford and secondary waste from WTP operations
  - Will need the Final TC & WM EIS to allow additional waste streams

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Integrated Disposal Facility Permit

- Waste acceptance criteria tools are built into Permit conditions
  - **III.11.C.8 ILAW Waste Form Technical Requirements Document (IWTRD)** For any ILAW glass form(s) that the Permittees intend to dispose of in IDF, the Permittees will provide to Ecology for review an IWTRD.
  - **III.11.C.6 Modeling – Risk Budget Tool** The Permittees must create and maintain a modeling - risk budget tool, which models the future impacts of the planned IDF waste forms including input from analysis performed as specified in Permit Condition III.11.C.8 (IWTRD) and their impact to underlying vadose and groundwater.

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IWTRD

Defines specific waste streams and their attributes

Risk Budget Tool

A modeling exercise that assesses the cumulative effects of all waste streams. It will identify which waste streams will cause problems and which waste streams need further mitigation

Ecology decided we needed these tools to ensure that IDF would not have impacts to the soil and groundwater in the future. Both will help us to have an iterative, forward-looking approach to waste acceptance criteria for the landfill.

More info:

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