

#15302 Hanford Double-Shell Tank AY-102 Radioactive Waste Leak Investigation Update

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
Office of River Protection under Contract DE-AC27-08RV14800



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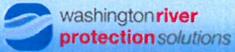
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Session 6
Continued Efforts to Resolve
DOE Hanford HLW Tank AY-102

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Presentation Outline

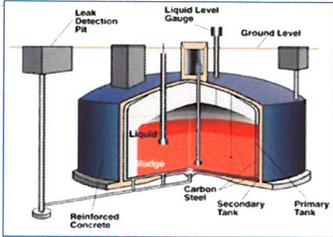
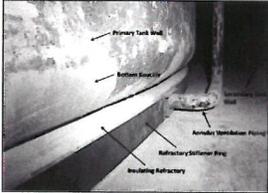
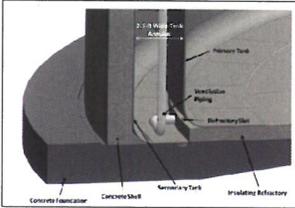
- Briefly review leak integrity status of tank AY-102 and current leak behavior
- Summarize recent initiatives to understand leak mechanism and to verify integrity of remaining waste confinement structures
- Describe planned waste recovery activities
- Introduce papers on Tank AY-102 topics:
 - #15298 *Disposition of Hanford Waste Sludge from Tank AY-102*
 - #15341 *Double-Shell Tank Corrosion Testing Program*
 - #15498 *Double-Shell Tank Extent of Condition Construction Review*
 - #15678 *Leak Detection Pit Visual Inspection*

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Hanford Double-Shell Tanks

At Hanford 28 double-wall tanks built in six generations between 1968 – 1986 contain ~ 27 million gallons radioactive waste

• Tank AY-102 was the first double-shell tank constructed at Hanford

Double-Shell Tank Annulus Detail

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Tank AY-102 – First Hanford Double-Shell Tank

- Prior to August, 2012 no indication of incipient tank leakage
 - No primary tank wall loss from corrosion
 - No tank annulus video inspection anomalies
 - In-tank corrosion probe results within limits
 - Waste chemistry within corrosion control limits
 - Tank operated within allowable thermal and operating load limits
- Probable cause of failure:

“Corrosion at high temperatures in a tank whose waste containment margins had been reduced by construction difficulties ...”

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Waste Accumulation Sites

- Waste is accumulating at three annulus sites
- No evidence of waste temperature rise expected if cooling air channels blocked with drying waste

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Waste Accumulation Site Behavior

**Waste Accumulation Site 1 ("Riser 83")
Southwest Quadrant**

- As of December, 2014 total estimated volume of drying waste on annulus floor is ~39 gallons
- Accumulation rate is constant and low:
 - 1.4 gal/mo for six month period ending October, 2014
 - 1.3 gal/mo for six week period ending December, 2014
- Sudden stepwise flow increases seem unlikely

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Secondary Liner Lifetime

- Preliminary estimates for corrosion pitting breach of secondary liner were 8-19 years
- Corrosion testing of coupons began in FY 2013, representing range of primary and secondary liner conditions mimicking:
 - Post-fabrication stresses
 - Contact with evaporating waste and wetted insulating refractory
 - Secondary liner outside surface contact with moisture
- Preliminary results* indicate both cracking and pitting are unlikely mechanisms except at test boundary extremes

* Discussed in Paper #15341

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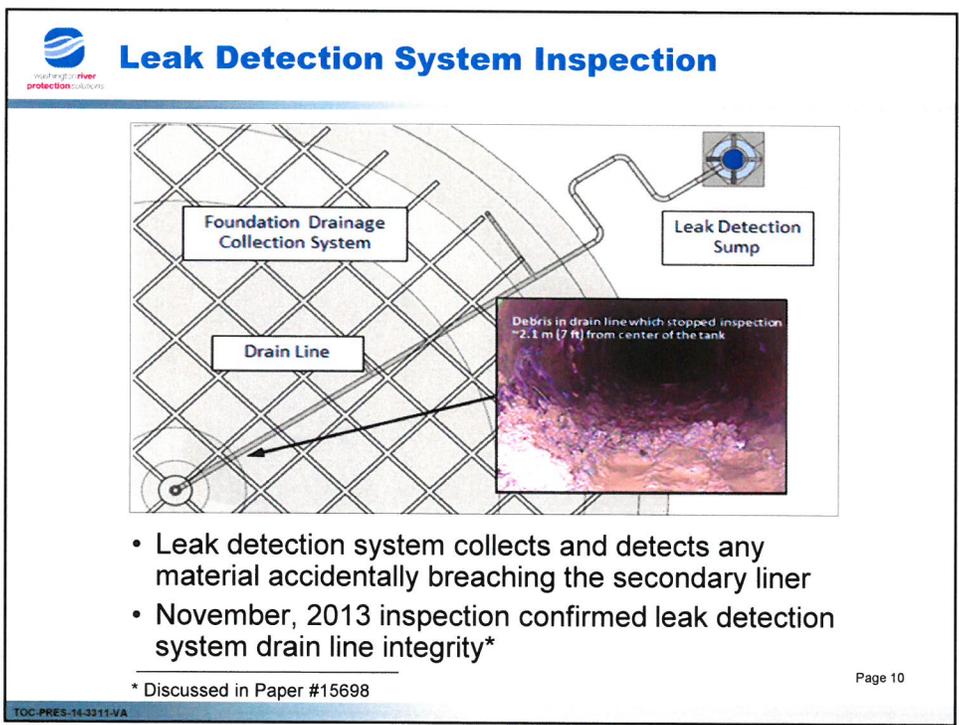
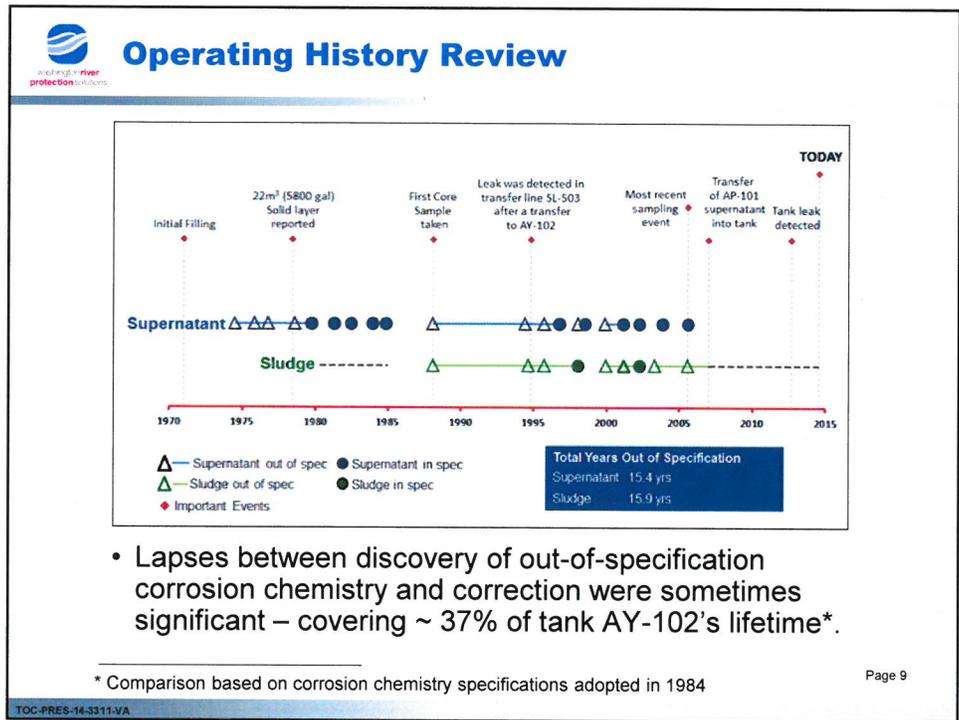
Construction History Review

- Evaluated construction history of all Hanford DSTs for difficulties similar to those encountered during tank AY-102 construction:*
 - In general difficulties diminished or disappeared due to accumulating construction experience and design evolution
 - Recurrence most strongly coordinated with selection of tank farm new construction contractor

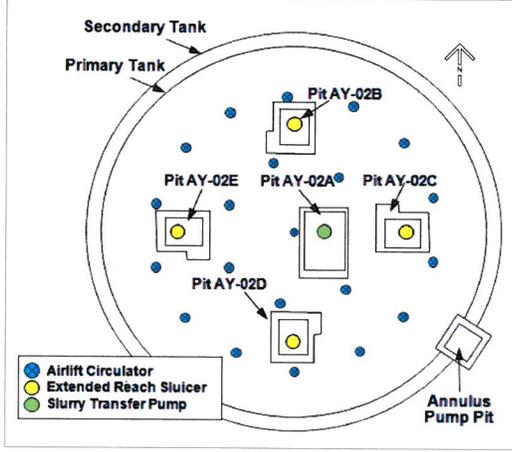
* Discussed in Paper #15498

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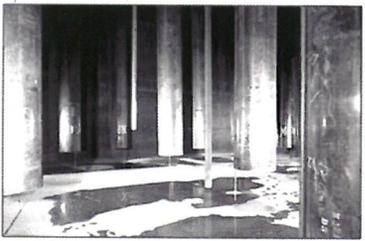
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 **Waste Recovery Preparation**



- Waste recovery with extended reach sluicers completed March, 2017*
- Cause of tank failure determined during post-retrieval forensic inspection



Tank AY-102 Waste Recovery Equipment Configuration

Tank AY-102 Airlift Circulator Arrangement

* Discussed in Paper #15298

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 **Tank AY-102 Leak Investigation Update - Summary**

- Waste from primary tank continues to slowly accumulate in the annulus between primary tank and secondary liner at ~ 1.4 gal/mo.
- No evidence that secondary liner has been breached.
- Extent of condition construction reviews indicate problems during tank AY-102 construction diminished or were absent in later tank farms.
- Laboratory work during the FY2013 – 2015 period is expected to identify the corrosion mechanism that caused the tank leak.
- Preparations are underway to move tank AY-102 contents to sound double-shell tanks.

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QUESTIONS?

