



FFRDC Draft Report & NAS Review #3

Alex Smith & Suzanne Dahl

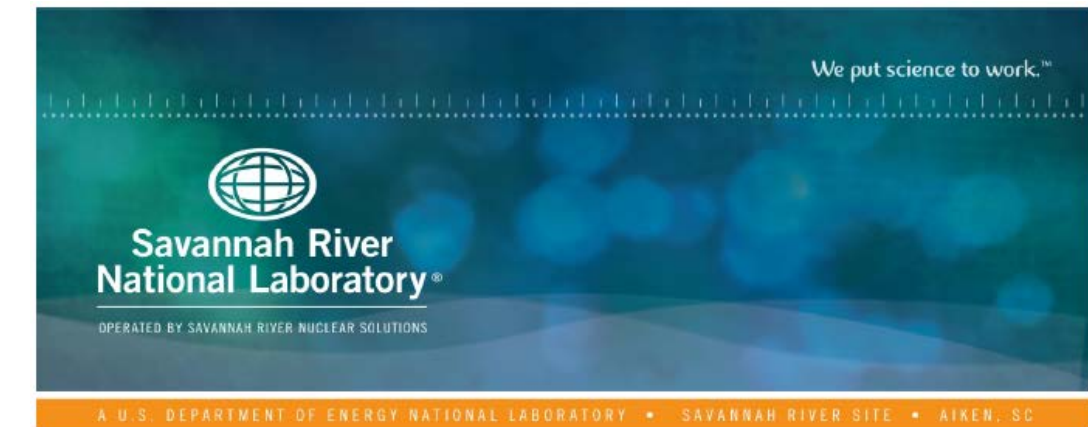
Nuclear Waste Program

October 31, 2019



Federally Funded Research and Development Center (FFRDC) Study & National Academies of Sciences (NAS) Reviews

- Enormous body of information underlies the scope of the FFRDC study.
- Virtually impossible for the FFRDC to address every issue for every audience.
- Thank you to the FFRDC for the effort they put into this report.
- Thank you to the NAS committees for their thoughtful and cogent reviews.



**Report of Analysis of Approaches to
Supplemental Treatment of Low-Activity
Waste at the Hanford Nuclear Reservation**

PRELIMINARY DRAFT

2019- 04-05 DRAFT



SRNL.DOE.GOV



Pretreatment of Tc-99 and/or I-129

- IDF risk analysis for these two contaminants drives the treatment technology.
- A combined pretreatment and enhanced grout technology may be the best grout-based technology alternative.
- Missed opportunity – pretreatment alternative.
 - Tc-99 ion exchange pretreatment.
 - I-129 getter, e.g., layered bismuth hydroxides.
 - Allows the use of Portland cement based grout formulation.
 - Eliminate completion to maintain a reducing environment for Tc-99 retention within an otherwise oxidizing environment favorable to I-129 retention.

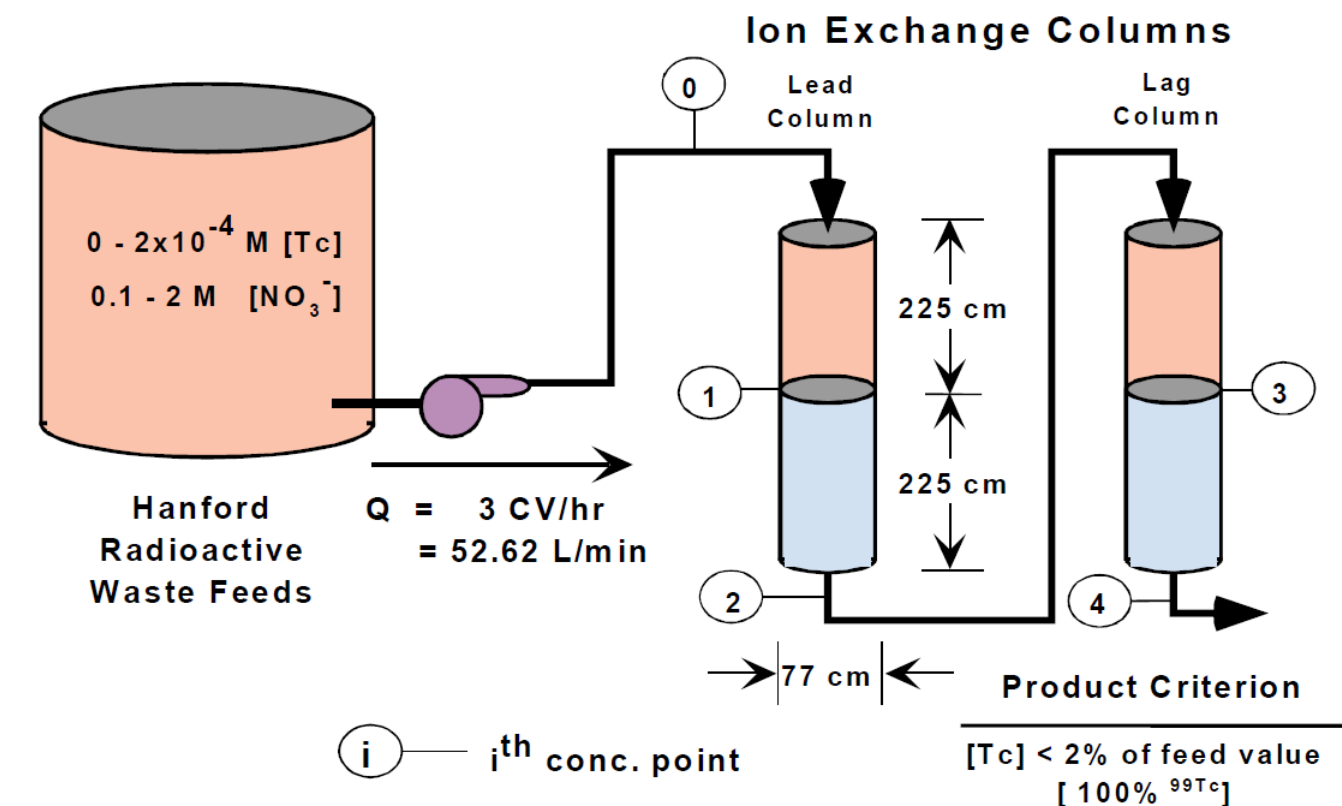


Figure 10-1. Basic flowsheet for full-scale ion exchange facility for removal of technetium (in its pertechnetate form) using the SuperLig[®] 639 resin.

Misrepresentation of waste forms as being acceptable

Grout:

- “Best case grout” is still in R&D.
- Best case grout is not yet proven to meet regulatory waste form requirements for onsite disposal (despite what the FFRDC report might indicate).
- PNNL plans for continuing research appear to include verifying the waste form long-term durability and performance.
- Grout may be considered; however, groundwater must still be protected to the “good as glass” standard.

FBSR:

- Research result looks promising, but the waste form is not yet proven for onsite disposal at Hanford (despite what the FFRDC report might indicate).

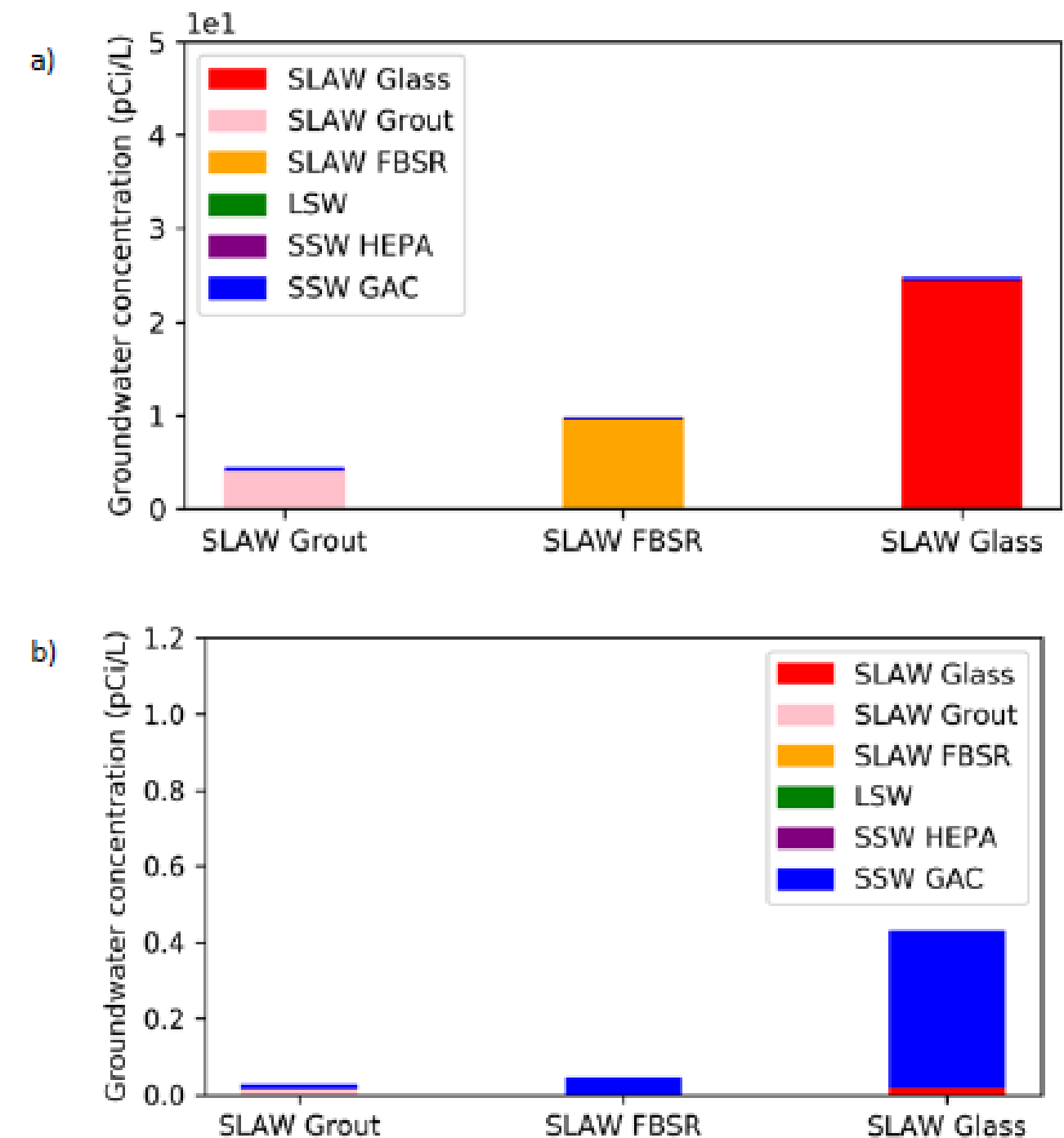


Figure F-16. Best Projected Cases for a) Tc-99 and b) I-129 for all three wasteform systems

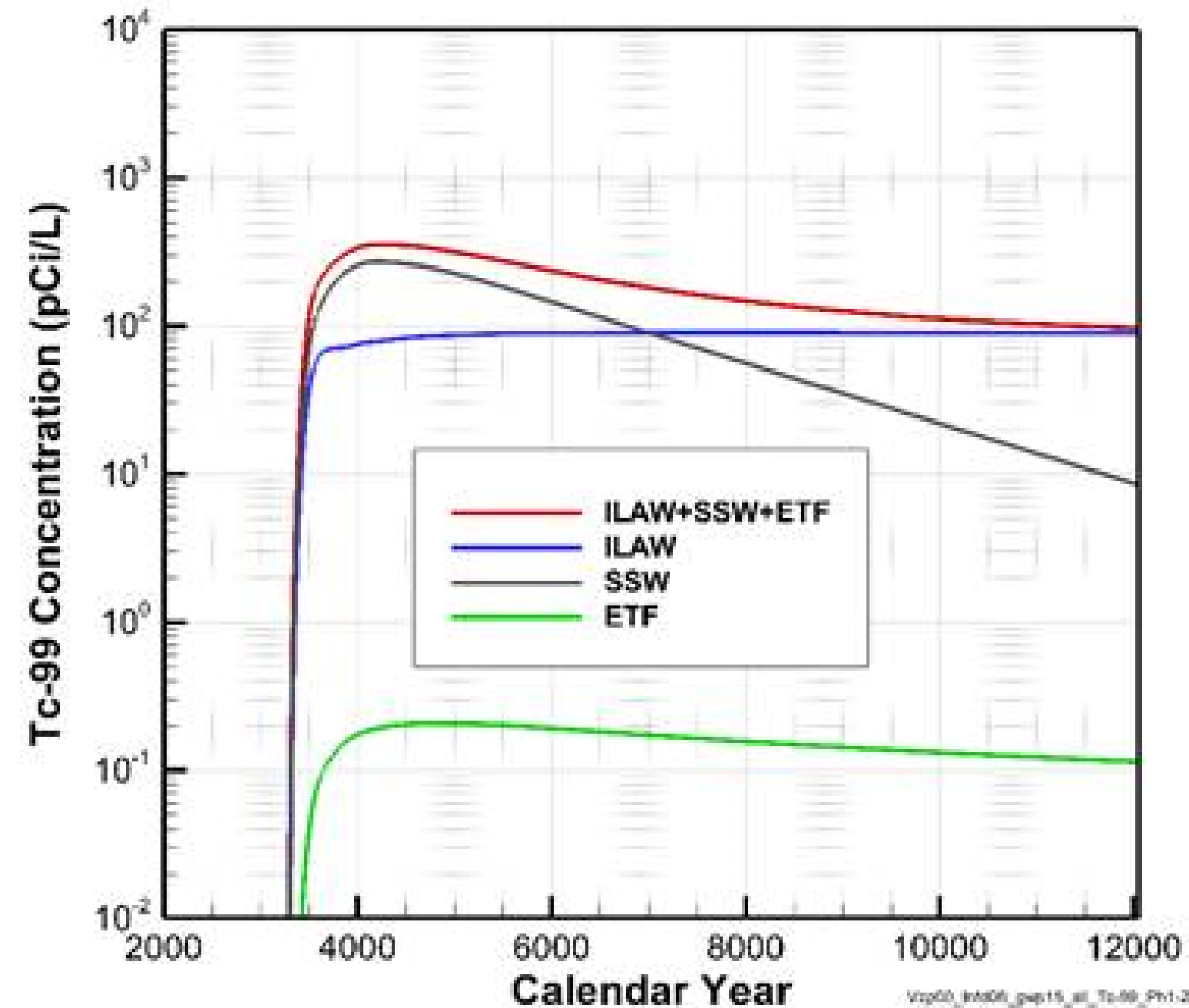
Secondary waste groundwater (GW) contribution & allowable IDF contributions to GW

Secondary waste GW contribution:

- Secondary waste, particularly encapsulated HEPA filters, drives source release rates.
- Secondary waste is an opportunity for enhanced grout or off-site disposal, e.g., WCS.

Allowable IDF contributions to GW:

- Other sources are already predicted to result in Tc-99 and I-129 GW concentrations greater than drinking water MCLs far into the future and overlap IDF predictions (200-PO-1 RI Report, DOE/RL-2009-85).
- IDF contributions should be less than MCLs.



Disposal Location Importance

- Cautiously optimistic about the WCS disposal alternative.
- Offsite disposal of secondary vitrification waste could mitigate groundwater risk.
- Offsite disposal of grouted supplemental LAW could facilitate mission acceleration.
- Energy needs to continue DFLAW with full commitment. Pursuit of grouted waste disposal at WCS has to be secondary to DFLAW.



Figure F-17 Aerial View of Radioactive Waste Disposal Facilities at WCS

“As Good as Glass”

- Report cited “as good as glass” hampered FFRDC work.
- A detailed definition was developed in 2003.
- Ecology welcomes further discussion on this comprehensive definition.
- It is important to have a common understand of what it to be considered a proven waste form.



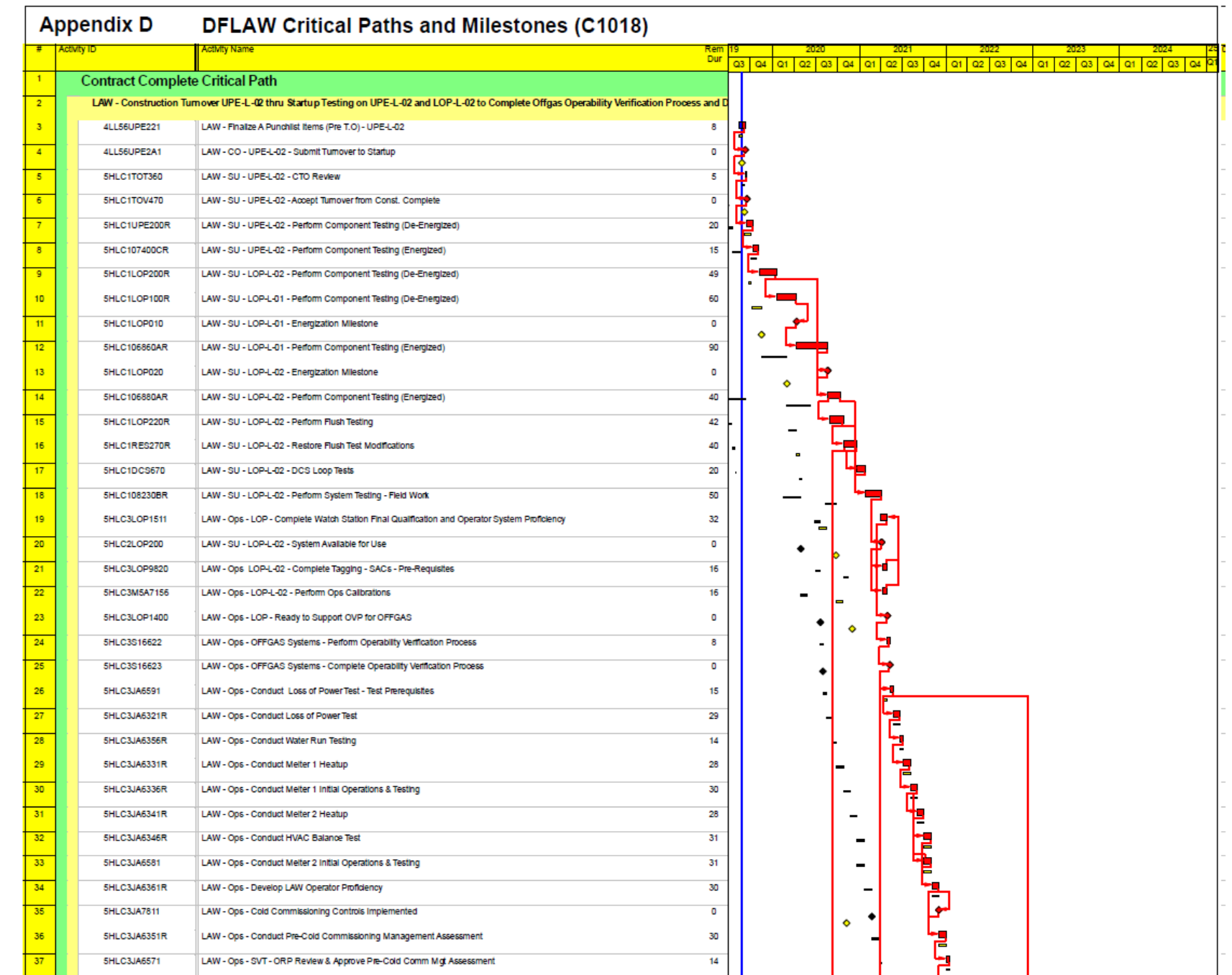
IDF Performance Enhancements

- NAS review report appeared to advocate enhancing the IDF to enhance the performance – mentioned at least three times in the report.
- Is there a proven basis for enhancements for the long term, e.g., >1,000 years, performance of a disposal facility?
- The waste considered in this report persists long enough that its changes in the earth surface need to be considered.
- The Hanford Site is dynamic enough that relying on landfill enhancements would require robust enhancements, and we know of no such proven disposal facility enhancements.



SLAW Schedule Driver

- SLAW need is driven by pretreatment of HLW, specifically HLW sludge washing that generates additional LAW requiring storage/treatment.
- Energy has notified Ecology that HLW and PT facilities could be delayed, which delays the SLAW capacity need.
- PT facility operations will most likely be delayed another decade.
- PT delay and available volume created by DFLAW operations further delay the need for SLAW.



Feasibility/Scope Study Value

- The Hanford tank waste mission is taking longer and costing more than ever imagined.
- This study might be a valuable stepping stone toward selection of a SLAW treatment technology other than vitrification.
- This study is insufficient as basis for selection of a SLAW treatment technology other than vitrification for onsite disposal.
- WCS might be a more readily implementable alternative without a significant R&D effort.

ESTIMATE CLASS	Primary Characteristic	Secondary Characteristic			
	LEVEL OF PROJECT DEFINITION Expressed as % of complete definition	END USAGE Typical purpose of estimate	METHODOLOGY Typical estimating method	EXPECTED ACCURACY RANGE Typical variation in low and high ranges [a]	PREPARATION EFFORT Typical degree of effort relative to least cost index of 1 [b]
Class 5	0% to 2%	Concept Screening	Capacity Factored, Parametric Models, Judgment, or Analogy	L: -20% to -50% H: +30% to +100%	1
Class 4	1% to 15%	Study or Feasibility	Equipment Factored or Parametric Models	L: -15% to -30% H: +20% to +50%	2 to 4
Class 3	10% to 40%	Budget, Authorization, or Control	Semi-Detailed Unit Costs with Assembly Level Line Items	L: -10% to -20% H: +10% to +30%	3 to 10
Class 2	30% to 70%	Control or Bid/Tender	Detailed Unit Cost with Forced Detailed Take-Off	L: -5% to -15% H: +5% to +20%	4 to 20
Class 1	50% to 100%	Check Estimate or Bid/Tender	Detailed Unit Cost with Detailed Take-Off	L: -3% to -10% H: +3% to +15%	5 to 100



Tank Integrity & Consequence of Delay

- The first DST failure (AY-102) has already occurred and took almost 3 years to retrieve.
- The number of “available” DSTs is limited and expected to decrease:
 - One tank is assigned the role as the feed tank to the 242-A Evaporator.
 - 7 tanks can have no waste added to them due to soluble Pu, high temperature, and buoyant displacement gas release event risk.
 - TSCR assigns process roles to 5 tanks, 3 of which are expected to be dedicated roles.
- Between existing and planned DST limitations and integrity risk, there is mounting evidence that tank infrastructure is running out of capacity and time.



Top: Tank A-105, Bottom: Tank T-111

Summary

- Ecology understands that the alternatives in this study could save time and money on the tank waste mission.
- The approach has merit. However, we have seen too many ideas that did not work out, resulting in long delays.
- Grout may be considered; however, groundwater must be protected to the “good as glass” standard.
- The State does not want anything to derail DFLAW commitment, focus, and funding – the start of tank waste treatment was too long awaited.
- The State thanks FFRDC for the effort undertaken, and thanks NAS for their thoughtful reviews.

