SRR Savannah River Remediation

A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

U.S. Department of Energy
Savannah River Site

Presentation to:

South Carolina Governor's Nuclear Advisory Council

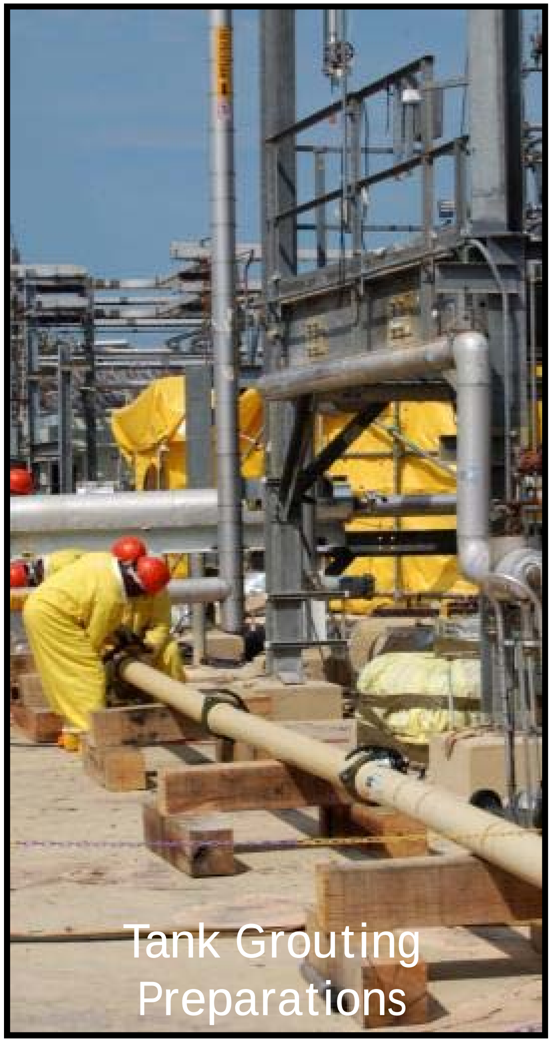
Jean Ridley, U.S. Department of Energy
Stuart MacVean, Savannah River Remediation

July 10, 2014

Overcoming Adversity/Distractions in Early FY14

- The Liquid Waste Program faced many challenges in the past 6 months:
  - Reduced Budget
    - *Workforce restructuring*
  - Lapse of Appropriations
    - *Cessation of Work*
    - *2 week furlough of SRR employees*
  - Weather Impacts
    - *Loss of Steam from cold weather resulted in outage/damage that halted work in most areas*
    - *Snow storm (Plant closure)*
    - *Historic ice storm (Plant closure)*

It has been one of the most unusual periods in the Site's history



Tank Grouting Preparations

Operational Highlights

Pump testing

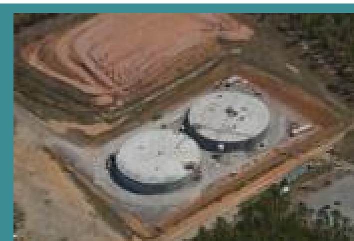
- Safety still a top priority:
  - > 5 million safe work hours in total liquid waste workforce
  - > 26 million safe work hours in liquid waste construction workforce
- Tank Closure
  - 6 tanks operationally closed; 2 of them this year
- Defense Waste Processing Facility (DWPF)
  - 3,833 of 8,582 canisters poured
- Saltstone Disposal Unit (SDU) 6 under construction
  - First mega-vault
  - 5,888 yd^3 concrete poured
  - 122,479 ft^2 of liner installed
- Saltstone Facility Production
  - 16,000,000 gallons of grout containing 414 kCi dispositioned
- Actinide Removal Process/Modular Caustic Side Solvent Extraction Unit (ARP/MCU)
  - 7,000,000 gallons salt waste treated

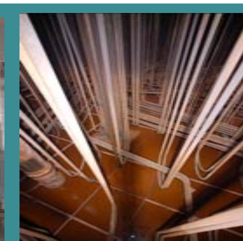
Savannah River Remediation LLC

Savannah River Remediation
A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

We do the right thing.







Z Area Salt Disposal Facility Update

Presentation to the GNAC

July 10, 2014

Steve Wilkerson
Defense Waste Processing Facility/Saltstone Director

Savannah River Remediation

A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

Background

We do the right thing.

- Savannah River Site's (SRR) Z Area Saltstone Facility
  - Status of Saltstone Disposal Facility Vault 4
  - Low-level radioactive contamination at Storm Water Outfall Z-01
- Actions SRR has and is taking to address these issues

Aiken Standard

September 5, 2013

Report reveals radionuclide leaks in SRS vault

The Savannah River Site has confirmed its efforts to maintain radionuclide leaks caused by cracking in a vault on Site.

Vault 4 was previously used for the disposal of nuclear waste from high-level waste tanks. As of now, the vault is no longer being used to receive radioactive salt waste.

Information on the leakage was uncovered after Tom Clements, a member of Friends of the Earth, filed a Freedom of Information Act request on Aug. 6.

The Department of Energy's Savannah River Site identified the leakage in February. Department officials stated the problem stems from cracks in the roof of the vault. On July 31, SRS submitted a letter to the S.C. Department of Health and Environmental Control outlining the issue and the Site's repair efforts.

These efforts include pouring a new concrete cap on the degraded sections of vault and the application of a sealant to those leaking sections.

"While SRS acted responsibly in identifying the degradation in the vault and in addressing the problems, there is concern about long-term stability of the structure and potential future radionuclide leakage," said Clements in a press release.

In addition, DOE has stated that it has increased monitoring of the vault roof and will aggressively make necessary repairs to lessen potential leakage in the future. The department is also looking to modernize vault designs to increase safety levels.

"A more permanent elastic coating is targeted for installation on Vault 4 disposal unit in 2014, which will eliminate rainwater infiltration and reduce the potential for low-level radioactive contamination on the vault exterior," stated Savannah River Remediation, the Site's liquid waste contractor.

Even with efforts to manage the leaks, SRS has stated that the radionuclide leaks are below DOE regulatory standards.

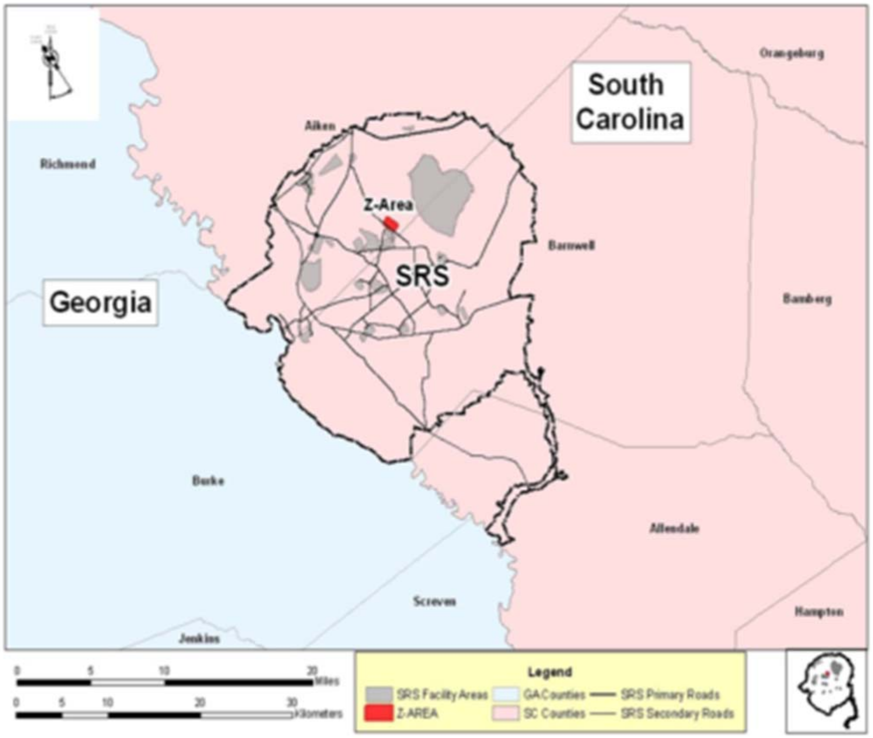
See Vault p XX

Savannah River Remediation

A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

Saltstone Disposal Facility

We do the right thing.

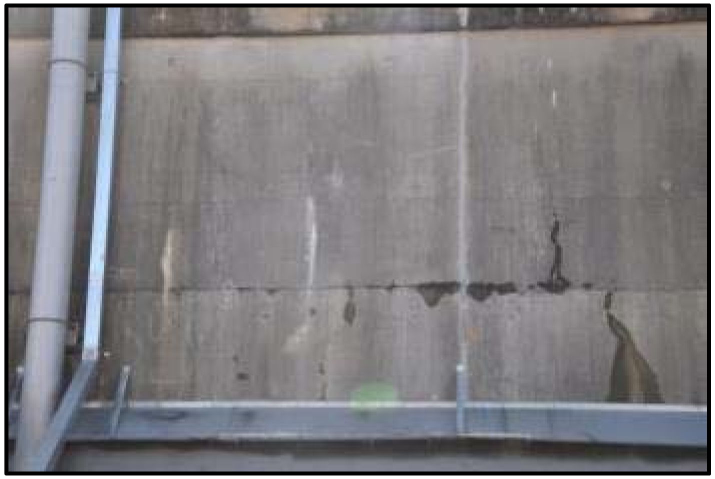


Location of SDF at SRS

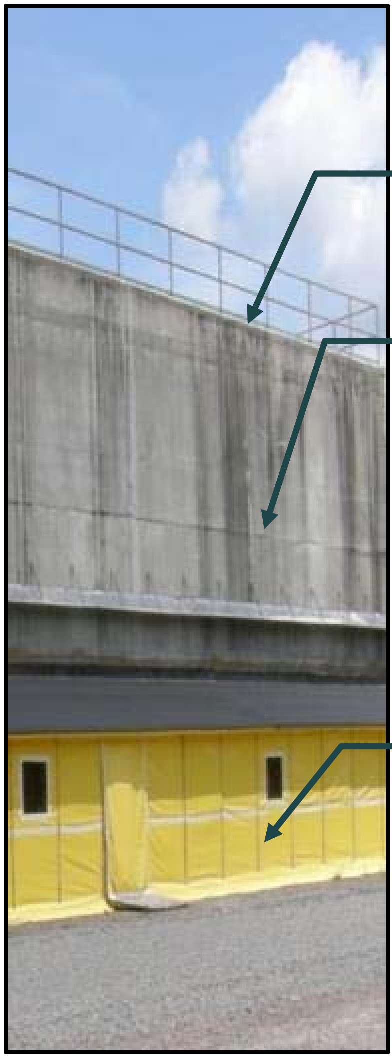
Saltstone Disposal Facility (SDF)

Vault 4 Water Intrusion

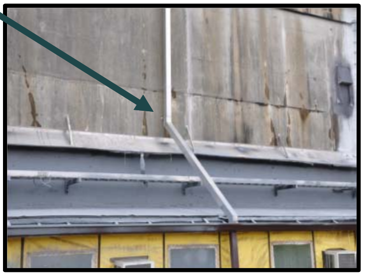
- Cracks in Vault 4 roof allowed rainwater to migrate into the vault
- Liquid collected in the narrow annular space between the grout waste form and the vault wall
- Contaminated liquid could weep through construction joints or cracks that existed in the vault wall



Existing Vault 4 Contamination Controls



- Prevent Rainwater Intrusion into Vault (Roof Coatings, Sealants)
- Control Rainwater Flow Path
  - Gutters on roof and weather enclosures
  - Grading to route rainwater to retention basin
- Fix Wall Contamination
- Manage Drain Water Levels Inside Vault
  - Drain water return system
  - Manage cell water level below hut level to prevent release of contamination to environment
- Containment
  - Weather enclosures up to 8’
  - Troughs to collect leakage
  - Isolate from rainwater
  - Installed Megamix coating on walls
  - Installed Xypex coating on walls

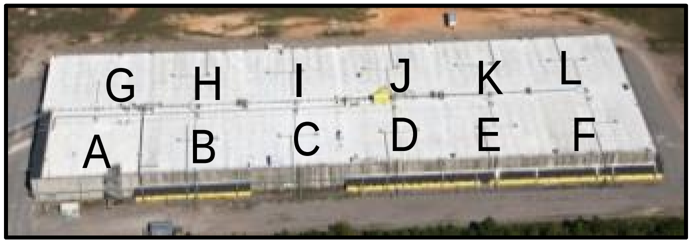


Vault 4 Stabilization

- Vault 4 is no longer in use
  - Last disposal operation in early 2012
- Several alternatives were evaluated to:
  - Eliminate rainwater infiltration to Vault 4
  - Mitigate worker and environmental risks
- Alternative selected:
  - Pour minimum "clean cap" to Vault 4 cells as necessary to establish roof dose rate <5 mrem/hr for worker exposure control
  - Install elastomeric roof covering on cells D, E, F, J, K, and L
    - Cells A, B, C, G, H, and I are already coated/sealed
  - Continue maintenance on roof and weather enclosures
  - Continue to manage drain water levels

Vault 4 Stabilization Project Status

- SRR and DOE are committed to Vault 4 Stabilization Plan
  - Project fully funded and on schedule
- Clean cap and elastomeric roof coating of three cells (J, K & L) scheduled in FY14
  - Roof coating material requirements determined
  - Testing of low-bleed grout mixtures completed and mix selected
    - Minimizes water introduced into cell during capping
  - Procurement of material completed
  - Capping of Cell J and K began in June 2014
- Capping and coating of remaining cells (D, E & F) planned to complete by February 2015



Z Area Retention Basin Contamination

Rainwater carried contamination from Vaults 1 and 4 area to the Storm Water drain line

- Drain line flows to Basin No. 4

Basin No. 4 only discharges if level reaches the height of spillway

- Feb 2013 first observed basin discharge

Spillway from Basin No. 4 flows to Storm Water Outfall Z-01

- Low-level contamination deposited

Storm Water Outfall Z-01 flows to McQueen's Branch

- Sedimentation breaks installed to minimize contamination spread

Z Area Storm Water Outfall

- Sedimentation basin being expanded to 100-year storm event size
  - Excavation began on June 12, 2014
  - Expansion projected to be completed in September 2014
- Storm Water Outfall
  - Completed work to excavate spots of contaminated soil in accordance with DOE Order 458.1 and consistent with the SDF Solid Waste Permit
- Radioactive effluent monitoring at Outfall and McQueen's Branch continues with no increases detected (sampled when liquid present)

Savannah River Remediation

A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

We do the right thing.

Savannah River Remediation LLC

Next Generation Solvent Update

Presentation to the GNAC

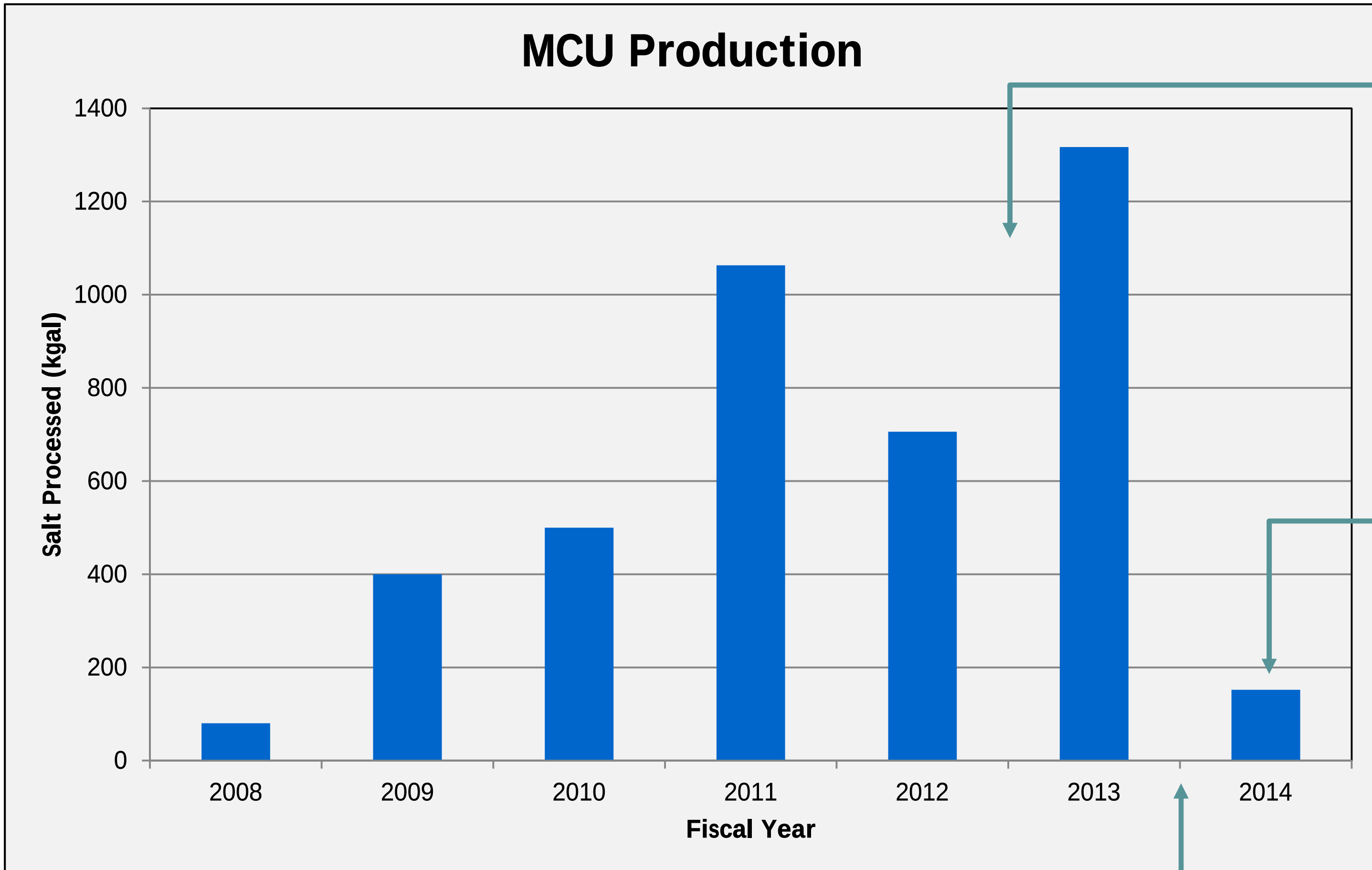
July 10, 2014

Neil Davis
Tank Farm/ETP Project Director

Background

- The Interim Salt Disposition Process at Savannah River consists of 2 processes to treat salt waste for disposition as Saltstone grout or glass:
  - Actinide Removal Process (ARP) reduces the concentration of Sr-90 and actinides; and
  - Modified Caustic Side Solvent Extraction Unit (MCU) reduces the concentration of Cs-137
- MCU processing started in 2008 and has processed 4.2 million gallons of salt waste while achieving a Cs-137 decontamination factor (DF) of 150-200
- MCU was shut down in August 2013 to deploy an improved solvent (MaxCalix) also known as Next Generation Solvent (NGS)

Production



Continuous Operations Outage

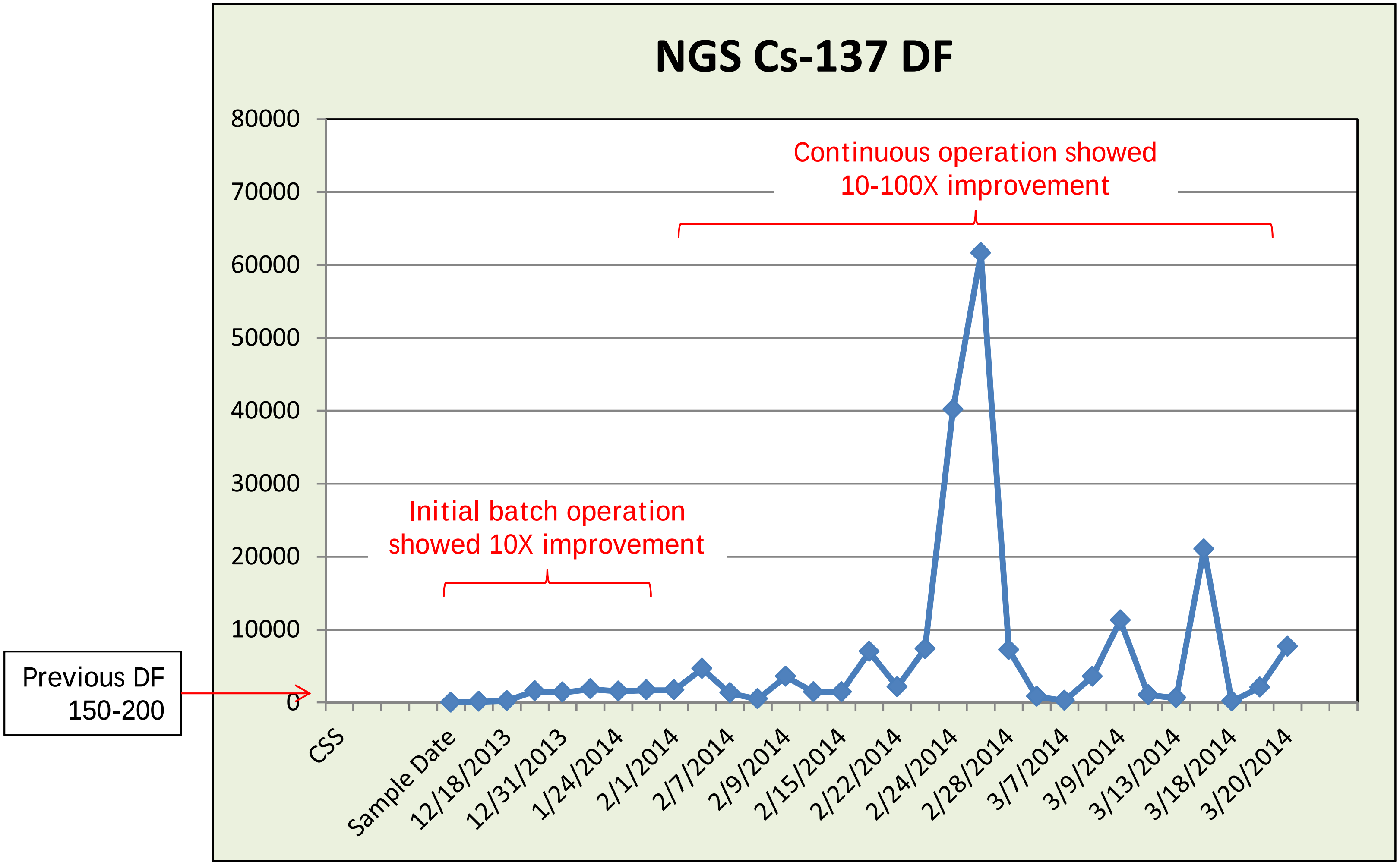
Outage to evaluate solids accumulation

NGS Deployed

Next Generation Solvent

- NGS was deployed in the MCU process 8/23 – 9/15/2013
- This was followed by a 2 month maintenance outage overlayed by the furlough period
- Processing with NGS started 12/7/2013
- Initial operations were deliberate to demonstrate NGS chemistry in the plant
  - Processed 6 batches at ~7,600 gallons of salt waste per batch
- Initial results showed Cs-137 DFs improved by a factor of 10
- Transitioned to continuous operation with even better results
- NGS deployment received a DOE Secretarial Award

Decontamination Factor



Moving Forward

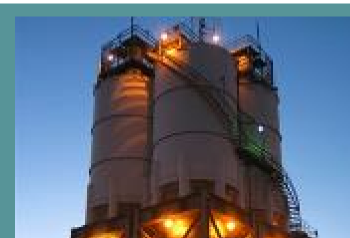
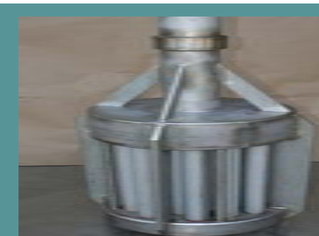
- MCU entered an outage on 4/7 to investigate solids accumulation in the process tanks
- Solids were determined to be primarily sodium oxalate resulting from ARP filter cleaning
- Solids were removed and processing resumed 7/9
- Long term operation expected to enable "fine tuning" the operation to maximize DF and thus further reduce the total amount of radioactive material disposed of in the State
- Information shared with Salt Waste Processing Facility counterparts

Savannah River Remediation
A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

We do the right thing.

Savannah River Remediation LLC



Tank Closure Status

Presentation to the GNAC

July 10, 2014

Dan Wood
Tank Closure and Regulatory Director

Savannah River Remediation

A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

Tank Closure Progress

We do the right thing.

Safe Storage — Tanks 1, 2, 3, 9, 14, 21, 22, 23, 24

Bulk Waste Removal — Tanks 10, 13, & 15

- 15: BWR efforts
- 13: BWR efforts and supporting other waste disposition

Tanks 26 & 33 also in BWR (sludge) preps

Heel Removal — Tanks 4, 7, 8, & 11

- 11: Will receive pumps from Tank 12

Cooling Coil Flushing

Annulus Cleaning

Isolation & Final Sampling

- Tank 12: Concurrence received to enter sampling & analysis
- Tank 16: Sampling complete - lab analysis in progress

Grout Tank

Operationally Closed — Tanks 5, 6, 17, 18, 19, & 20

6 tanks operationally closed

5 more active in the closure sequence

Tank 5 and 6 Grouting Complete

Savannah River Remediation

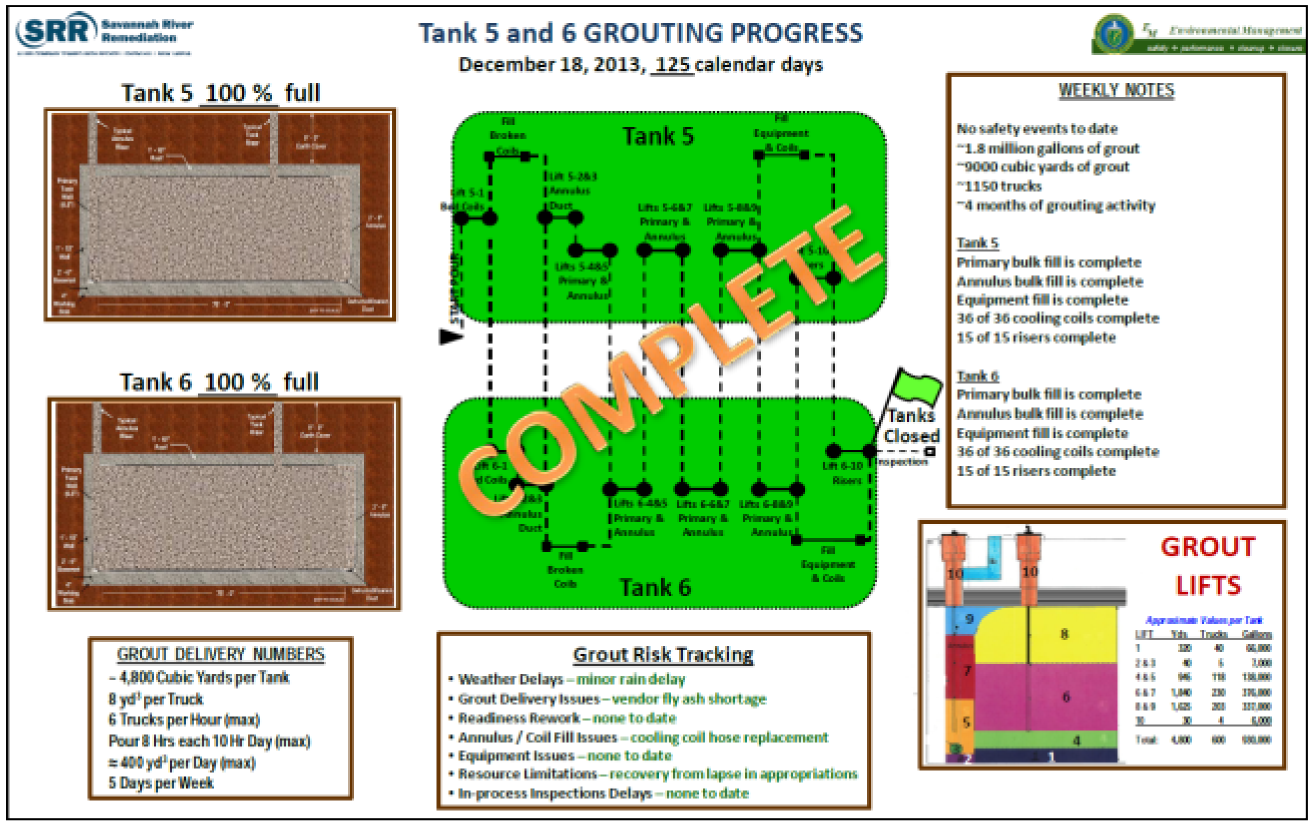
A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

Recent Successes

We do the right thing.

Secretary of Energy's 2013 Honor Award – Tank Closure

- Tanks 5 and 6 Grouting Completed
- Tank 12 Cease Waste Removal
- Tank 16 Sampling
- HTF Performance Assessment



Tank 12

- Received concurrence to enter sampling and analysis phase
- Tank ventilation modified to support drying
- Sampling activities initiated
- Sampling tools and techniques developed
- Critical path includes sampling, analysis, regulatory processes, and grouting
- Forecast completion in September 2016
  - Working to accelerate

Tank 12 Tank Top Preparations

Tank 12 Post-Chemical Cleaning

Tank 15

- Largest sludge inventory in an Old-Style tank
- Sludge will be rehydrated to facilitate safe removal
- Four mixing pumps will be installed
- Plan to complete Bulk Waste Removal Efforts and move into Heel Removal without delay

Tanks 13 through 16

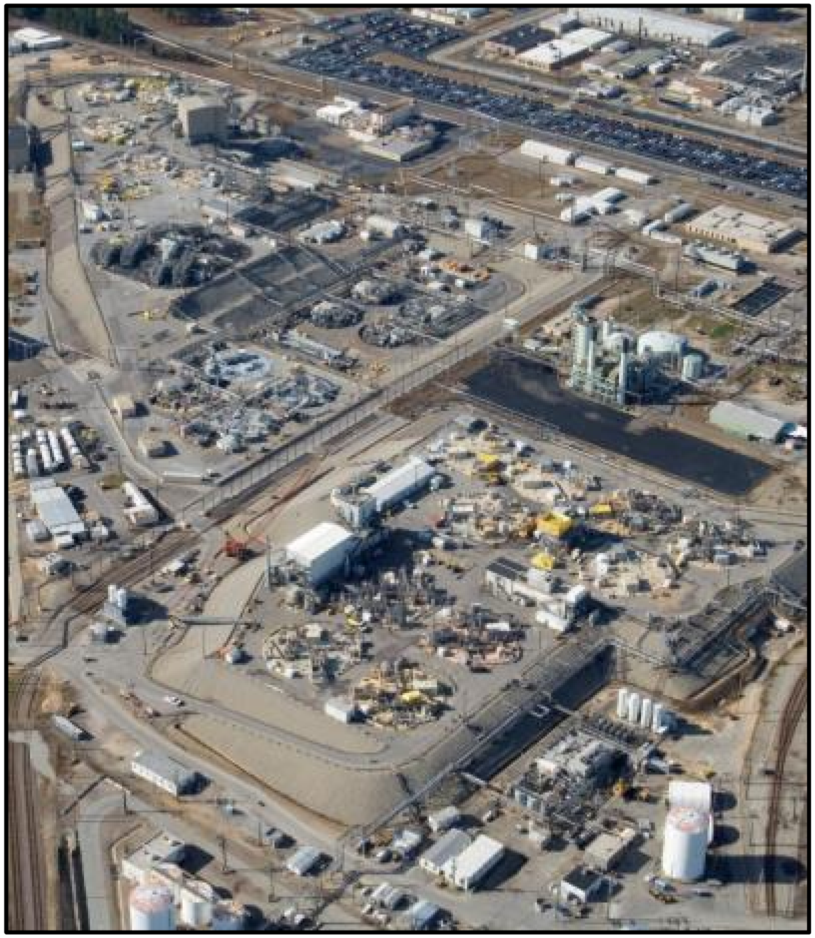
Tank 16

- Primary and Annulus sample analyses nearing completion
- Working isolation and grout preparations
- Closure Module development underway
- Forecast completion in September 2015

Tank 16 during Sampling

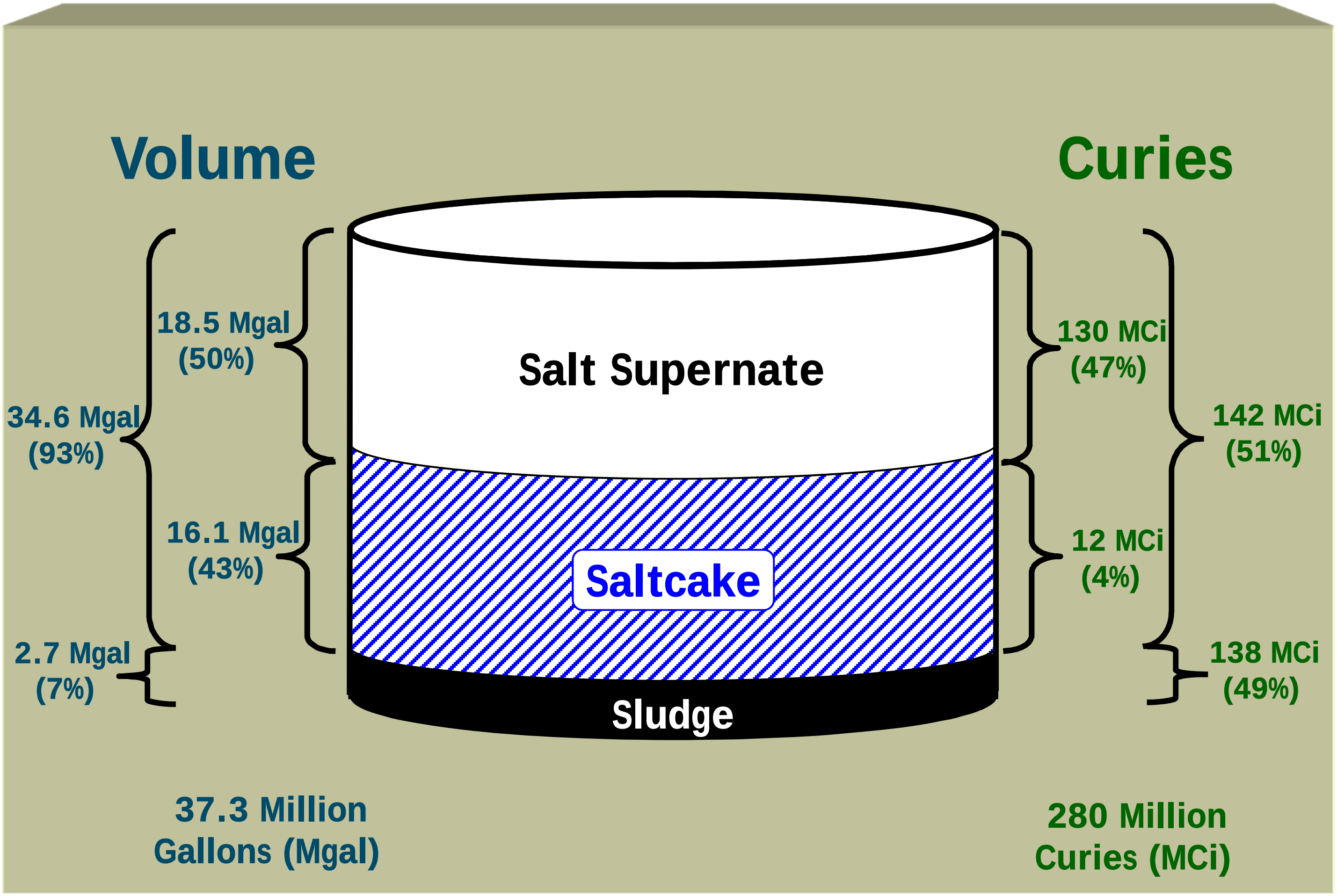
H-Tank Farm NDAA 3116

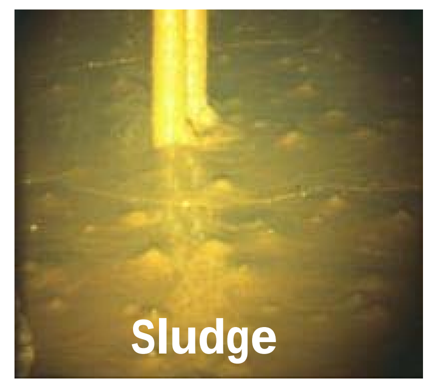
- NRC Technical Evaluation Report (TER) has been received
- DOE-SR working with DOE-HQ to obtain H-Tank Farm Waste Determination approval



H-Tank Farm

Background: Primary Waste Forms





Inventory values as of 2014-03-31

Background:
51 Waste Tanks, ~37M Gallons

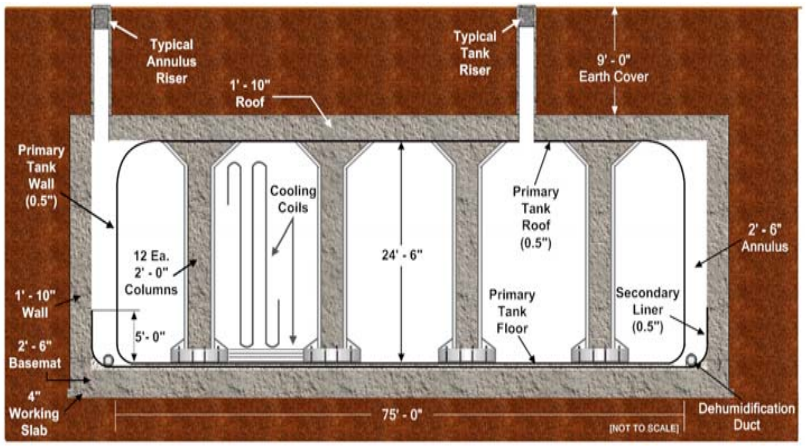
Savannah River Remediation

A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

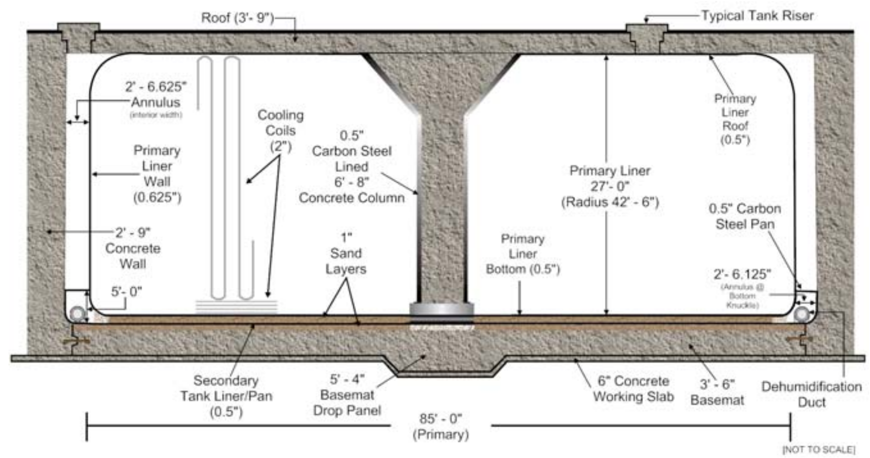
We do the right thing.

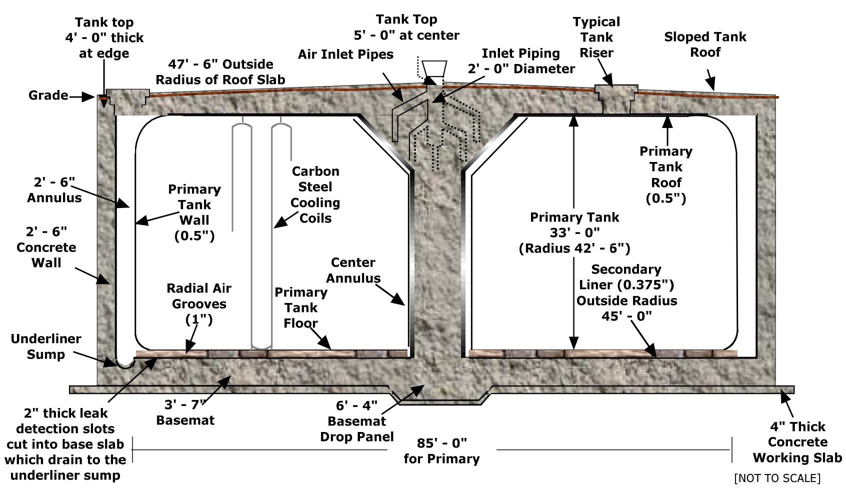
Background: Waste Tank Types

Type I - 750,000 gallons

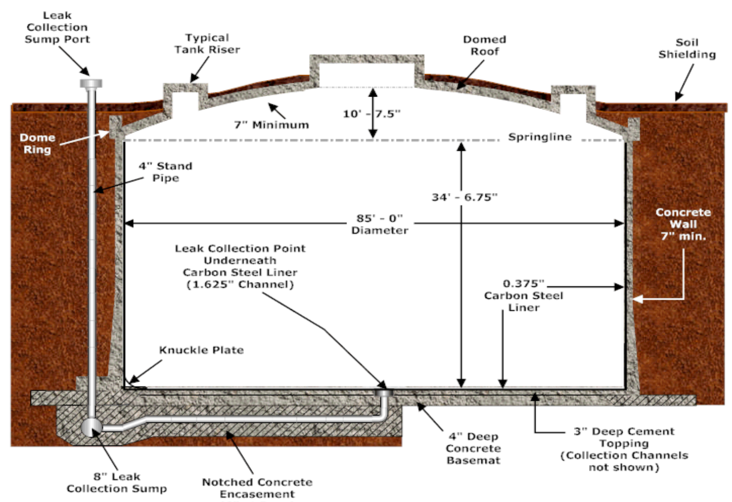


Type II - 1,070,00 gallons



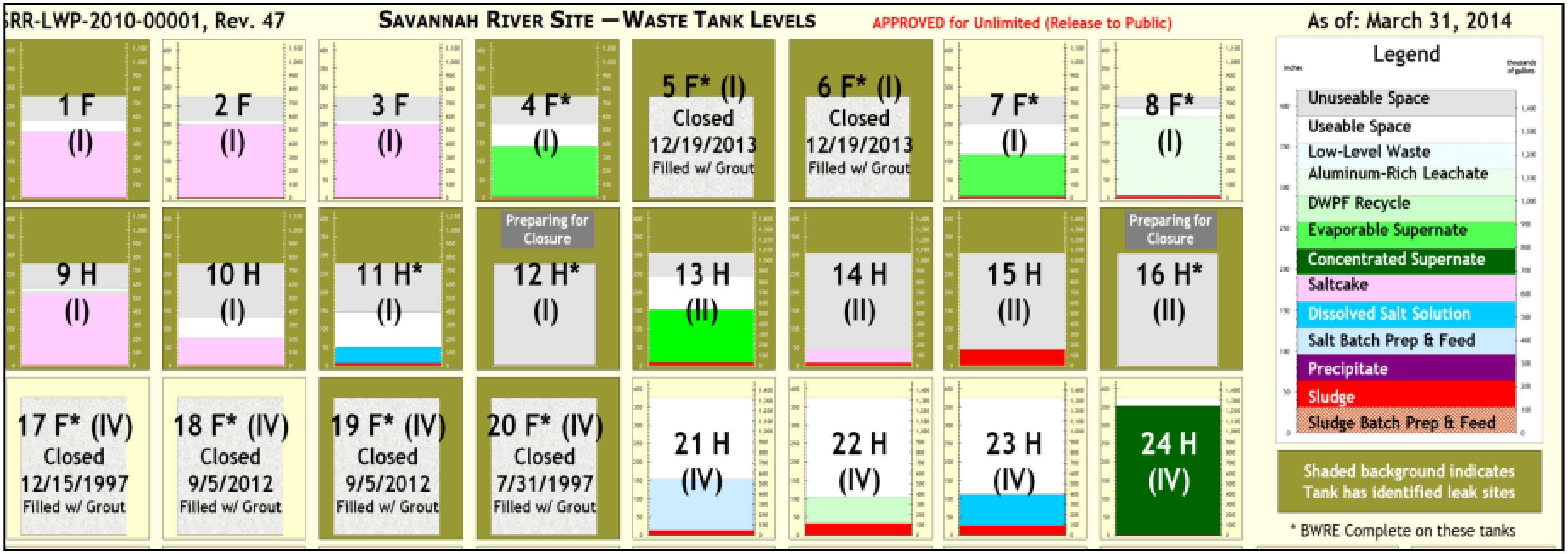


Type III - 1,300,000 gallons



Type IV - 1,300,000 gallons

Background:
Status of 'Old-Style' Tanks



14 of 24 tanks with known leak sites:

- 4 grouted
- 2 preliminary cease waste removal complete
- 2 contain mostly solids with limited amounts of free liquid
- 6 contain free liquid at levels below known leak sites

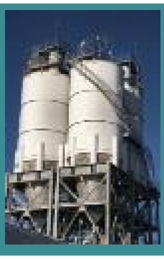
10 of 24 tanks without known leak sites:

- 2 grouted
- 2 contain mostly solids with limited amounts of free liquid
- 6 contain free liquids

SRR
Savannah River Remediation
A URS COMPANY TEAMED WITH BECHTEL | CH2M HILL | B&W | AREVA

We do the right thing.

Savannah River Remediation LLC





System Plan Revision 19

Presentation to the GNAC

July 10, 2014

Peter Hill
System Planning Manager

Agenda

- Liquid Waste System Overview/Status
- Rev 19 Inputs & Assumptions
- Rev 19 Results
- Summary

SRS Liquid Waste Program

(status through March 2014)

We do the right thing.

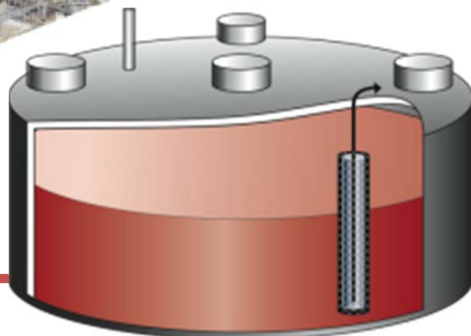
Operational Goals

✓Radionuclides to glass
✓Chemicals to Saltstone
✓Tanks closed

Legend:

ARP	Actinide Removal Process
DWPF	Defense Waste Processing Facility
MCU	Modular Caustic Side Solvent Extraction Unit
SWPF	Salt Waste Processing Facility

Legacy Liquid Waste
43 tanks
37 Mgal
280 MCi



Salt waste • 7.0 Mgal treated

Salt Processing

SWPF
(under construction)

Sludge waste
• 3.7 Mgal treated

<1% radionuclides remain in tanks

51 Tanks
- 6 grouted & closed
- 2 heel removal complete
- 6 BWRE complete
- 70% empty (old style)
- 14% empty (new style)

Radionuclides

Inert chemicals

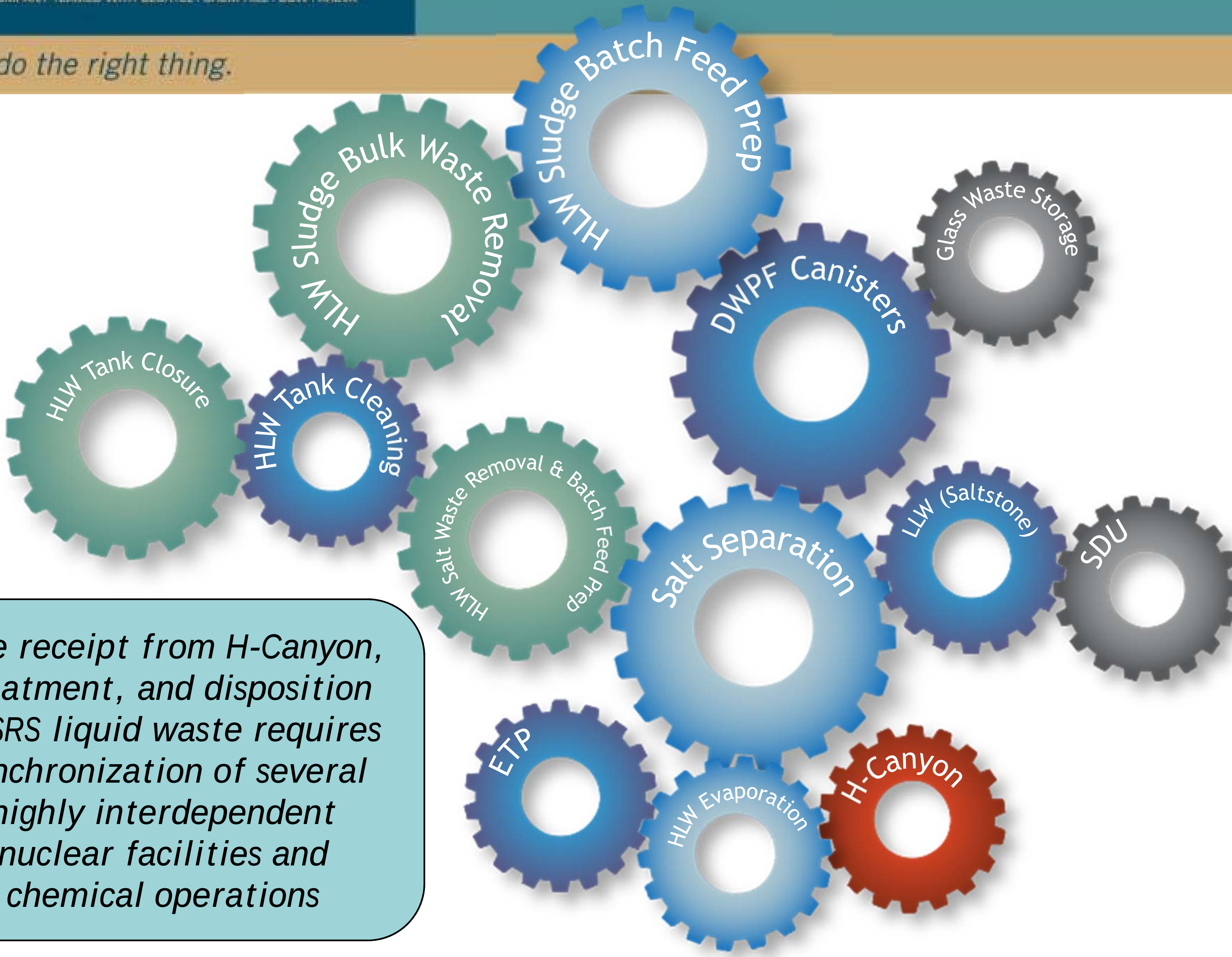
>99% radionuclides to glass

- Poured 3,781 cans of projected 8,582
- 53 million curies immobilized in glass

<<1% radionuclides to saltstone

- 15 Mgal grout dispositioned containing 414 kCi

SRS Liquid Waste Integration



Safe receipt from H-Canyon, treatment, and disposition of SRS liquid waste requires synchronization of several highly interdependent nuclear facilities and chemical operations

System Planning

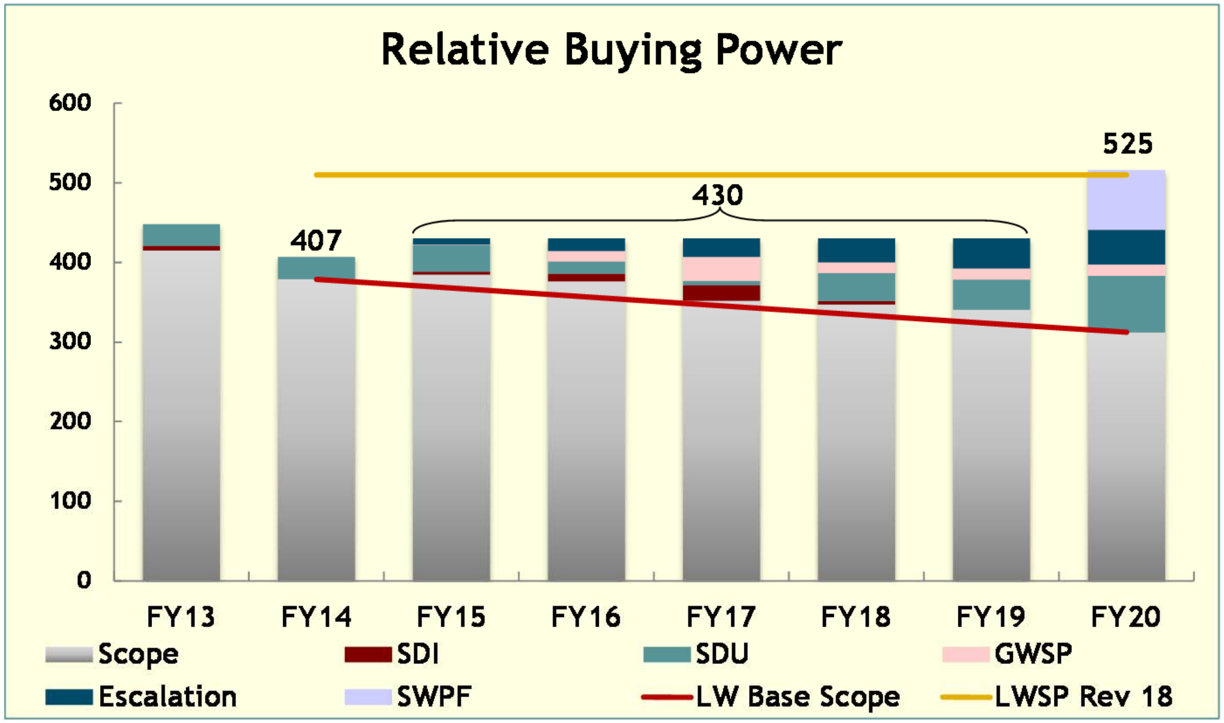
- Changes to System Plans are driven by:
  - Advances in Technology
  - Change in Sequencing
  - Acceleration Opportunities
  - Funding Adjustments

System Plan Revision 19

- August 2013 inputs and assumptions (modified April 2014 & May 2014) for Rev. 19 of the Liquid Waste System Plan:
  - $407.1M new Budget Authority (BA) to the LW contractor in FY14
  - $430M/yr (constant dollar funding) to the LW contractor FY15–FY19
    - Includes Line Item funding, including assigned contingency, for SDUs beginning with SDU-7
    - Includes Glass Waste Storage Project (GWSP) Line Item beginning in FY15
  - $525 M (in FY20 and escalated thereafter) per year until the end of the program
    - Includes $80M/yr (in FY20 and escalated thereafter) for operation of SWPF

System Plan Revision 19

- Using these inputs, two significant impacts of the lower funding levels are realized:
  - SWPF is not supported at its rated capacity upon startup
  - After grouting Tanks 5, 6, 12, & 16, no tanks are grouted until 2024



System Plan Revision 19 Specific Results

- SWPF operations not supported at rated capacity
  - Sufficient salt batch blend tanks not available at SWPF startup
  - ARP/MCU operations limited due to funding and SDU space
  - Funding for DWPF enhancements not available until FY20 with completion in 2022
  - ELAWD II enhancements and increased staffing at Saltstone not funded until FY24
  - Inability to afford sludge waste removal at a pace sufficient to support desired canister and salt throughput
  - Limited canister storage locations prior to completion of the GWSP
- Comparison of SWPF capability versus predicted throughput modeling shows a cumulative difference of over 18 million gallons between FY19 and FY24, representing an additional two years to the Liquid Waste lifecycle

Fiscal Year	SWPF Capacity	Rev 19	Delta
FY19	4.625 Mgal	4 Mgal	-0.625 Mgal
FY20	7.2 Mgal	3 Mgal	-4.2 Mgal
FY21	7.2 Mgal	3 Mgal	-4.2 Mgal
FY22	9 Mgal	6 Mgal	-3 Mgal
FY23	9 Mgal	6 Mgal	-3 Mgal
FY24	9 Mgal	6 Mgal	-3 Mgal
Total	46.025 Mgal	28 Mgal	-18.025 Mgal

System Plan Revision 19 Specific Results (Continued)

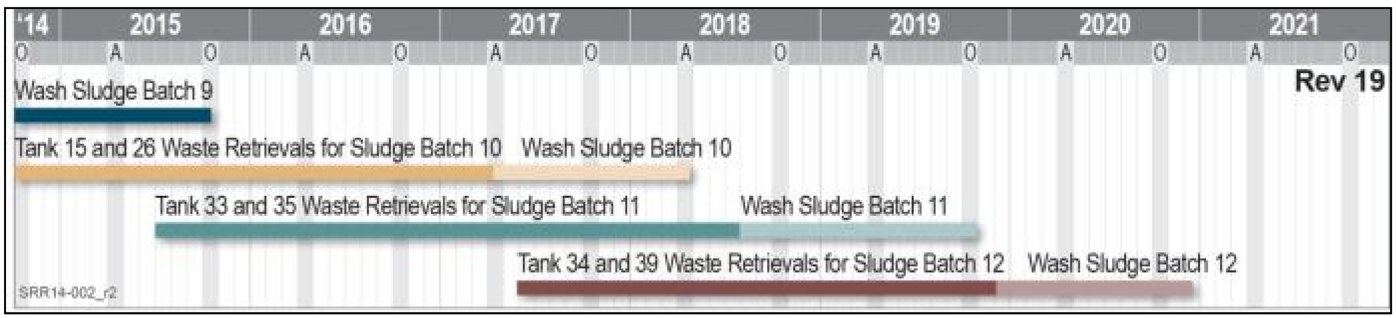
- Tank Closure Activities
  - Grouting of Tanks 5 and 6 completed in FY14
  - Grouting of Tanks 16 and 12 to be complete in FY16 (FFA date: FY15)
  - Given the Rev 19 inputs, next tank grouting occurs in 2024
- Interim Salt Processing
  - ARP/MCU operations provide tank space for preparation of sludge batches for DWPF, support of waste receipts from H-Canyon, progress towards closure of old-style tanks, and support of SWPF upon startup in 2018
  - ARP/MCU will utilize NGS
  - ARP/MCU throughput is determined by:
    - Operator staffing levels at Saltstone & ARP/MCU
    - Availability of Saltstone Disposal Unit space
    - Availability of canister storage
    - Funding to perform sludge waste retrievals
  - Salt processing at ARP/MCU will continue until 6 months prior to SWPF startup then shutdown for transfer line modifications to tie SWPF in to the Liquid Waste System

Fiscal Year	ARP/MCU Production Forecast (kgal)
FY14	800
FY15	1,500
FY16	1,200
FY17	2,000
FY18	1,000

System Plan Revision 19 Specific Results (Continued)

- Sludge Processing
  - DWPF canister production synchronized with ARP/MCU production
  - GWSB 2 had 822 available canister storage locations at start of FY14
  - Limited storage capacity in GWSB 2, and expected timing of the GWSP line item, limits DWPF operation until FY19
  - Bulk sludge waste retrievals and sludge batch washing and qualification are limited to just-in-time supply

Fiscal Year	Expected Canister Production
FY14	125
FY15	155
FY16	135
FY17	170
FY18	160
FY19	275
FY20	275
FY21	275
FY22	275
FY23	275



System Plan Revision 19 Specific Results (Continued)

- Saltstone Disposal Unit (SDU) Construction
  - SDU required to support grout production and salt treatment at either ARP/MCU or SWPF
  - Without available SDU space, salt treatment cannot occur
  - SDU construction costs have significant impact to overall funding profile
  - SDUs must be available as follows to prevent impacting planned salt processing:

Saltstone Disposal Unit	Need Date
SDU 6	May 2017
SDU 7	October 2021
SDU 8	December 2023
SDU 9	September 2025

Revision 19 Results

Parameter	Revision 18	Revision 19
Final Type I, II, and IV tanks BWRE complete	2023	2028
Final Type I, II, and IV tanks complete operational closure	2028	2032
Complete bulk sludge treatment	2026	2030
Complete bulk salt treatment	2028	2033
Complete heel treatment	2032	2039
SCIX for supplemental salt waste treatment	Yes	No
Next generation extractant for increased SWPF throughput	Yes	Yes
Maximum canister waste loading	40 wt%	40 wt%
Nominal annual canister throughput rate	275	275
Total number of cesium-only canisters produced	0	0
Radionuclides (curies) dispositioned in SDF within LW Strategy	Yes	Yes

Alternative Case

- Maximize salt treatment by supporting SWPF at rated capacity
  - LWSP Rev 19 § 5.1

Maximize SWPF Throughput

- Scope
  - DWPF Enhancements, ELAWD Phase II, SPF @ 24/7, Accelerate Sludge BWRE
  - Enhance ARP/MCU production
  - Accelerate SDU Construction
  - Increase GWSB #1 capacity
- Results

Fiscal Year	Rev 19 ARP/MCU	Alt Case ARP/MCU	Rev 19 SWPF	Alt Case SWPF
FY14	800	800		
FY15	1,500	1,500		
FY16	1,200	1,200		
FY17	2,000	4,700		
FY18	1,000	2,350		
FY19			4,000	4,625
FY20			3,000	7,200
FY21			3,000	7,200
FY22			6,000	9,000
FY23			6,000	9,000
FY24			6,000	9,000
Total	**6,500**	**10,550**	**28,000**	**46,025**

Parameter	Rev 19	Alt Case
Final Type I, II, & IV tanks BWRE complete	2028	2027
Final Type I, II, & IV tanks grout complete	2032	2031
Complete bulk sludge treatment	2030	2028
Complete bulk salt treatment	2033	2031
Complete heel treatment	2039	2037
SCIX for supplemental salt waste treatment	No	No

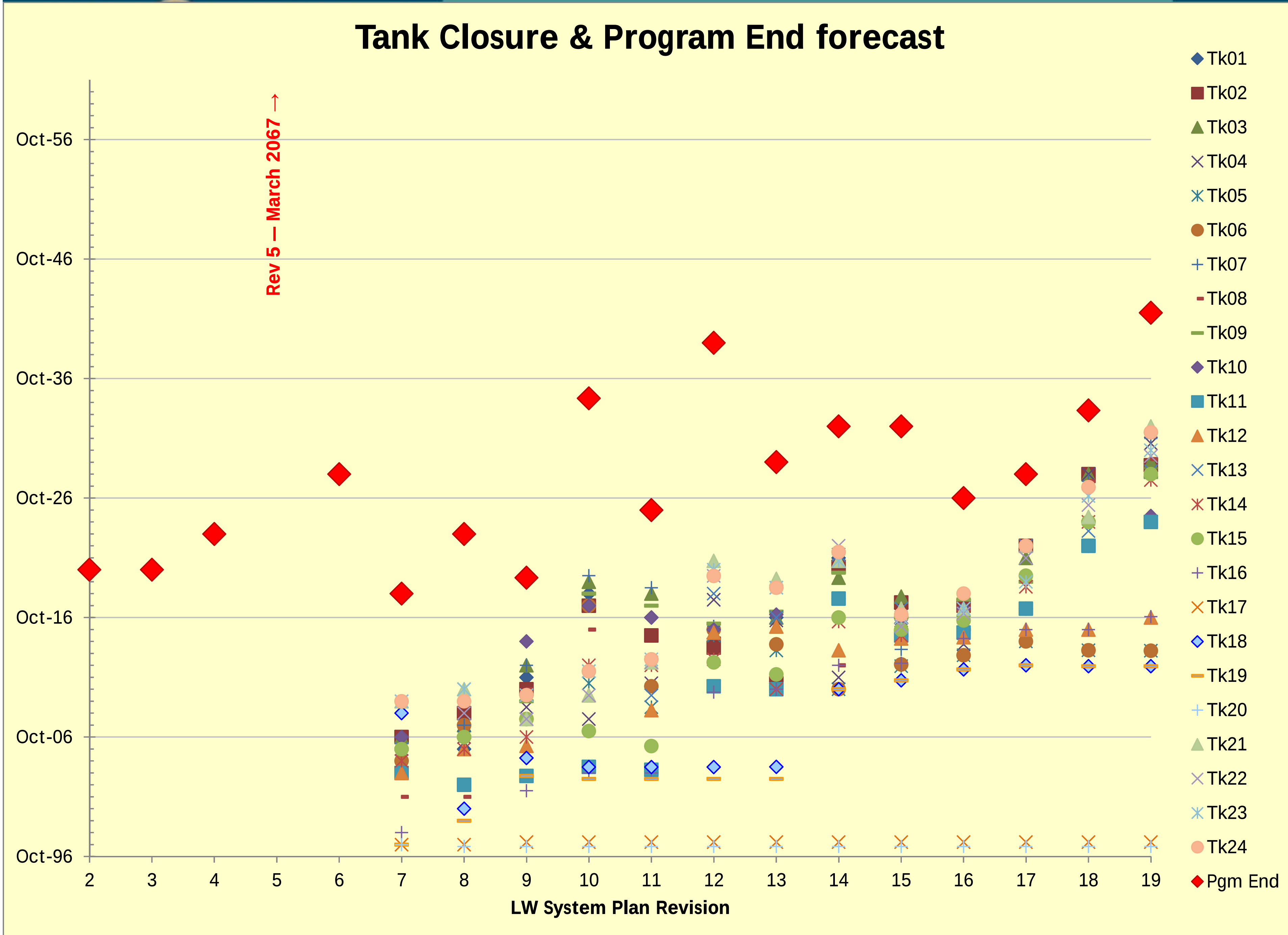
Rev. 19 Addendum

- Currently under development - Due August 15, 2014

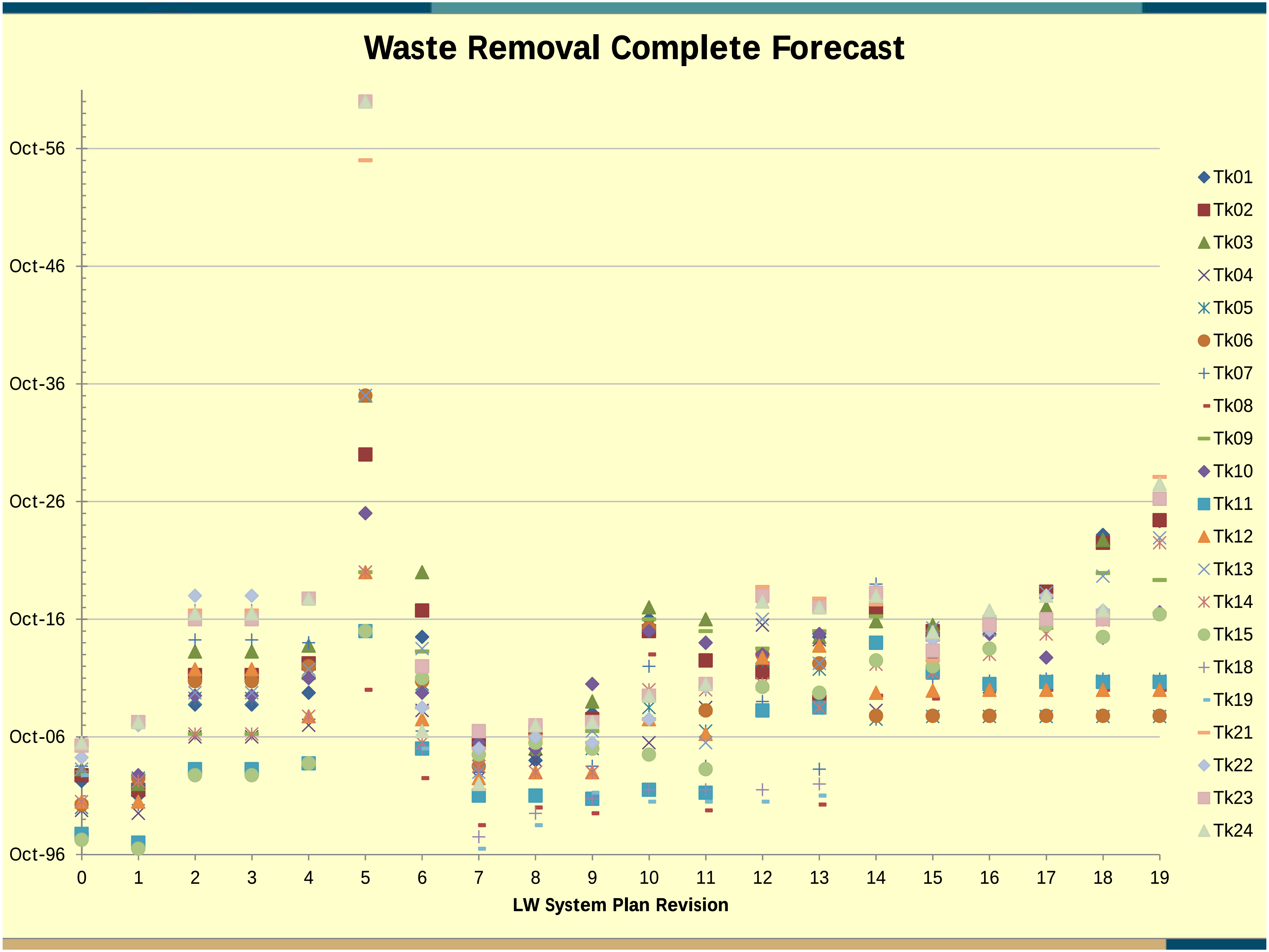
- While maintaining risk reduction, emphasize removing waste from old-style tanks and providing enhanced capability for feeding SWPF

Summary

- Lessons Learned from Rev. 19 modeling:
  - Importance of SWPF in lifecycle planning
  - Importance of near-term salt processing
  - Need for SWPF support projects
  - Need/importance of SDUs



Tank Closure & Program End forecast
Rev 5 — March 2067 →
Oct-56
Oct-46
Oct-36
Oct-26
Oct-16
Oct-06
Oct-96
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
LW System Plan Revision
Tk01
Tk02
Tk03
Tk04
Tk05
Tk06
Tk07
Tk08
Tk09
Tk10
Tk11
Tk12
Tk13
Tk14
Tk15
Tk16
Tk17
Tk18
Tk19
Tk20
Tk21
Tk22
Tk23
Tk24
Pgm End


Waste Removal Complete Forecast
Oct-56
Oct-46
Oct-36
Oct-26
Oct-16
Oct-06
Oct-96
0
1
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
LW System Plan Revision
Tk01
Tk02
Tk03
Tk04
Tk05
Tk06
Tk07
Tk08
Tk09
Tk10
Tk11
Tk12
Tk13
Tk14
Tk15
Tk18
Tk19
Tk21
Tk22
Tk23
Tk24

Acronyms

ARP	Actinide Removal Process
BA	Budget Authority
BWR	Bulk Waste Removal
BWRE	Bulk Waste Removal Efforts
DF	Decontamination Factor
DOE	Department of Energy
DOE-EM	Department of Energy – Environmental Management
DWPF	Defense Waste Processing Facility
ELAWD	Enhanced Low Activity Waste Disposal
ETP	Effluent Treatment Plant
FFA	Federal Facilities Agreement
FY	Fiscal Year (October 1 – September 30)
GWSB	Glass Waste Storage Building
GWSP	Glass Waste Storage Project
HLW	High-Level Waste
LLW	Low-Level Waste
LW	Liquid Waste
LWSP	Liquid Waste System Plan
MCi	Million Curies
MCU	Modular Caustic-Side Solvent Extraction Unit
Mgal	Million Gallons
NGS	Next Generation Solvent
SCIX	Small Column Ion Exchange
SDF	Saltstone Disposal Facility
SDI	Salt Disposition Integration
SDU	Saltstone Disposal Unit
SRR	Savannah River Remediation, LLC
STP	Site Treatment Plan
SWPF	Salt Waste Processing Facility
TER	Technical Evaluation Report