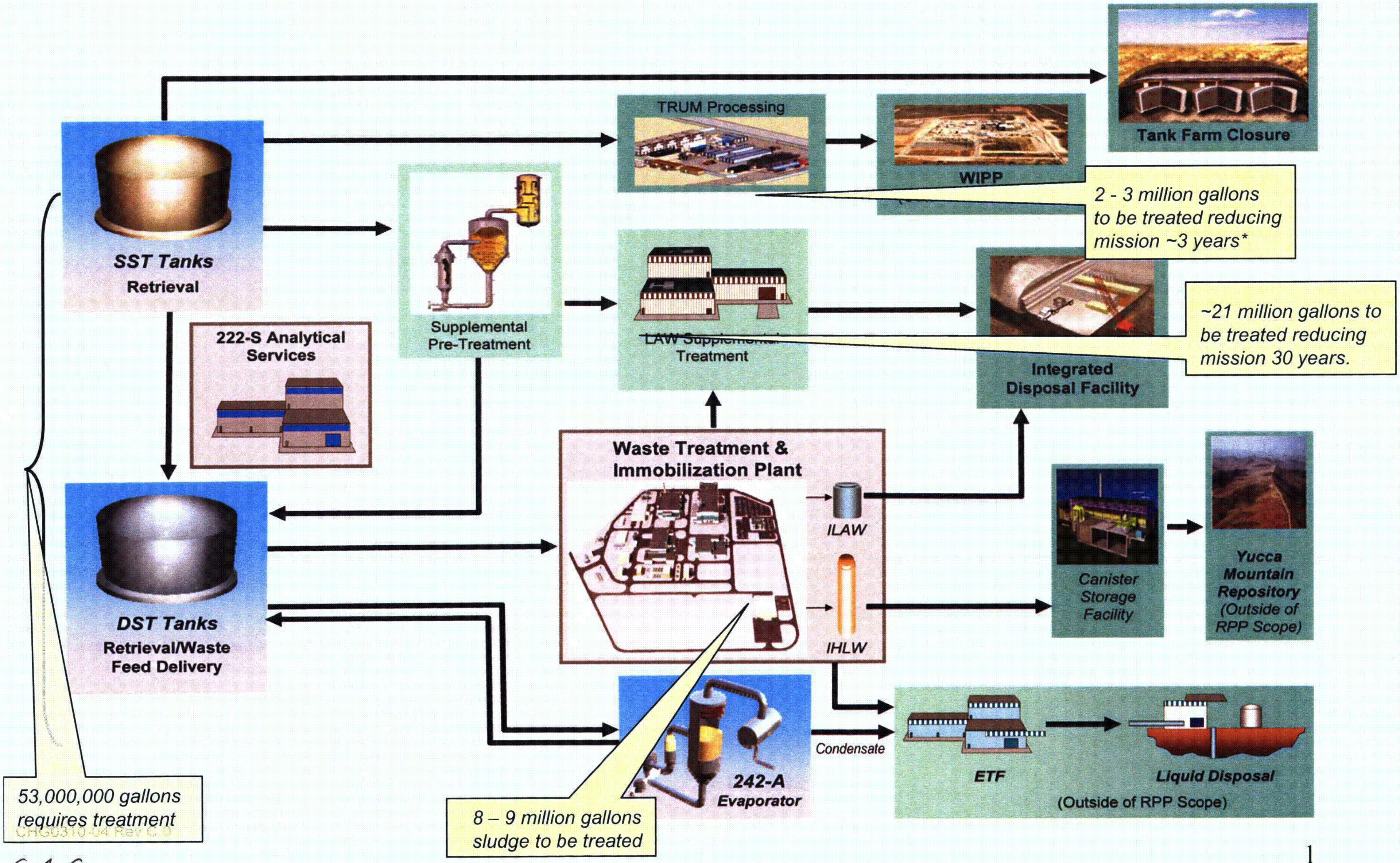
River Protection Project Mission



1.9 M Ci

137Cs 90Sr removed

*A decision for disposal at the Waste Isolation Pilot Plant (WIPP) will not be made until (1) the waste meets the WIPP Waste Acceptance Criteria, with special emphasis on the waste determination as delineated in the WIPP recertification decision by the Environmental Protection Agency in March 2006; and (2) it meets the regulatory eligibility requirements for disposal as described in the WIPP Hazardous Waste Facility Permit.

Multiple Treatment and Disposition Pathways Result in ~97% of the Hanford Tank Radioactivity Being Disposed of Off-Site.

Previously Removed - Cs/Sr Capsules (125 MCi) (4.6 EBq) and German Logs (11 MCi) (0.41 EBq) [Repository Disposal]

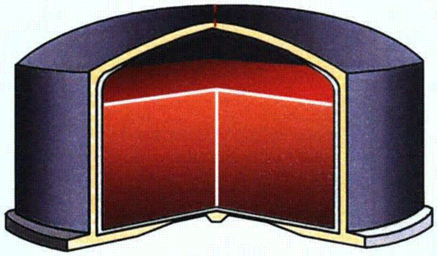
Vitrification and SF/HLW Repository Disposal

~180 M Ci (6.7 EBq) (primarily Cs-137 and Sr-90 plus daughters in nearly equal quantities); ~10,000 HLW Canisters

WTP LAW Vitrification

Supplemental Treatment

~5-10 M Ci (0.19 – 0.37 EBq)



Initial Waste Volume:

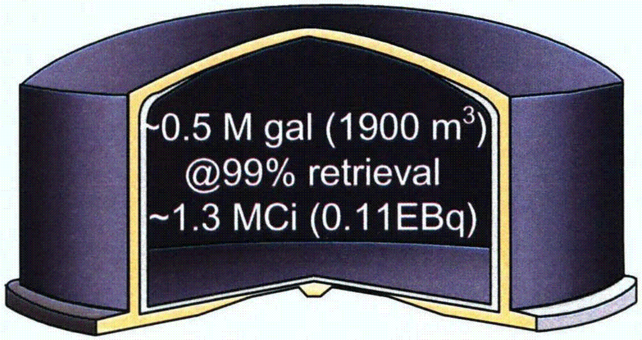
8-9 M gal HLW
(30,000 – 34,000 m^3)

42 M gal LAW
(159,000 m^3)

(Note: >30% is low-Cs-137 waste that is suitable for simplified pretreatment outside the WTP)

2-3 M gal TRU*
(7,600 – 11,400 m^3)
~2 MCi (0.074 EBq)

Package for WIPP Disposal



Waste Remaining in All Tanks at Closure

*Potential to eliminate 1500 HLW Canisters. A decision for disposal at the Waste Isolation Pilot Plant (WIPP) will not be made until (1) the waste meets the WIPP Waste Acceptance Criteria, with special emphasis on the waste determination as delineated in the WIPP recertification decision by the Environmental Protection Agency in March 2006; and (2) it meets the regulatory eligibility requirements for disposal as described in the WIPP Hazardous Waste Facility Permit.

Tank Farm Closure Technology Development

Presented by:
Moses Jaraysi

October 18, 2006

Office of River Protection

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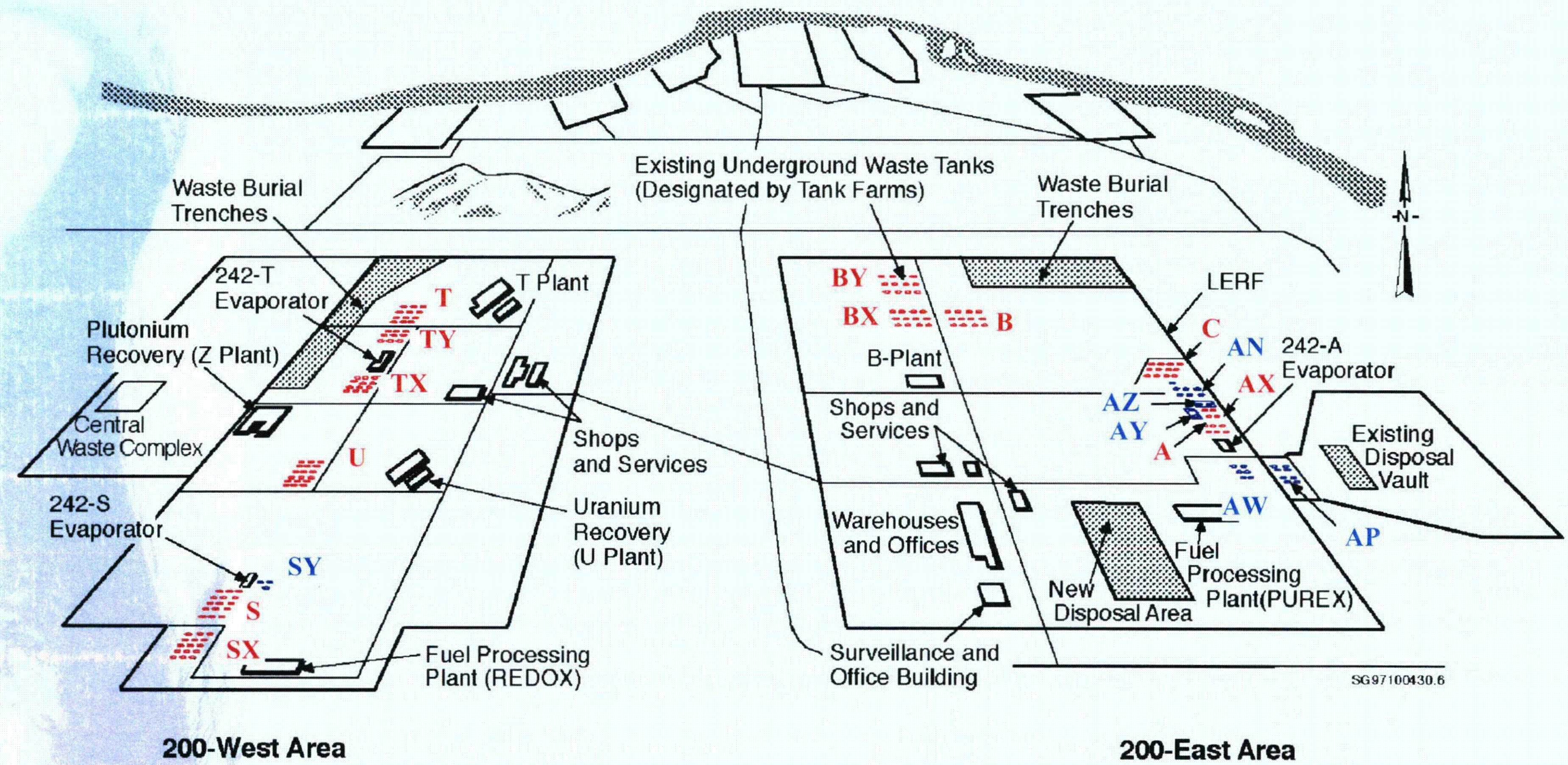
Topics and Presentations

- General Description of the Tank Farms
- Vadose Zone Characterization
- Tank Waste Retrieval
- Tank Closure
- Waste Treatment

Central Plateau and Tank Farms



Single Shell Tank Farms
Double Shell Tank Farms

Single Shell Tanks (Farms and Waste Management Areas)

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WMA	Number of SSTs
A, AX	6, 4 (10)
B, BX, BY	16, 12, 12 (40)
C	16
S, SX	12, 15 (27)
T	16
TX, TY	18, 6 (24)
U	16
Total = 7 WMAs	Total = 149 SSTs

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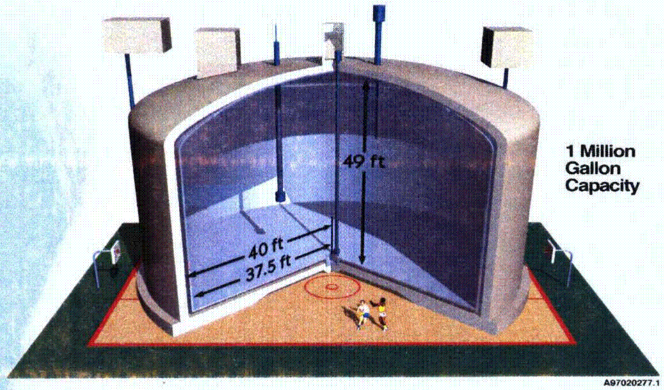
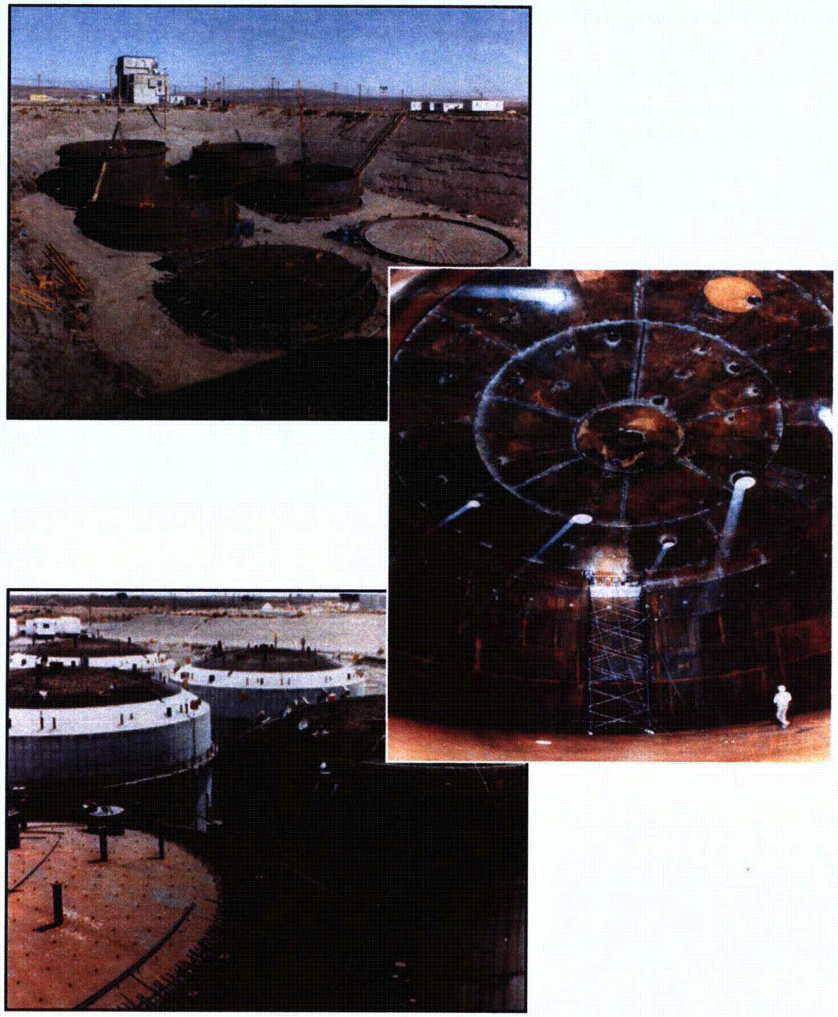
Double-Shell Tanks

Hanford High-level Waste Radioactive Underground Storage Tanks are Large



- 28 double-shell tanks
- Built between 1968 and 1986
- 1 million gallon nominal capacity
- Contain ~20 million gallons of waste
- Primary/secondary carbon steel liners
- Reinforced concrete outer shell
- Compliant with regulations
- Limited remaining capacity
- No known or suspected “leakers”



Double-Shell Tank Construction – Circa 1970’s

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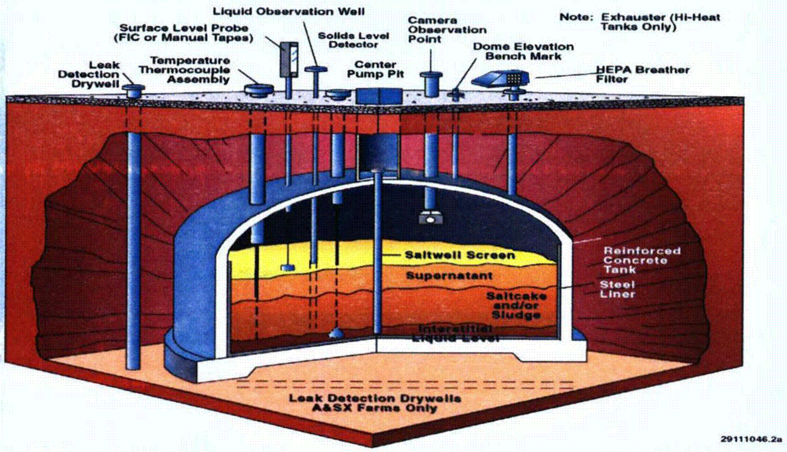
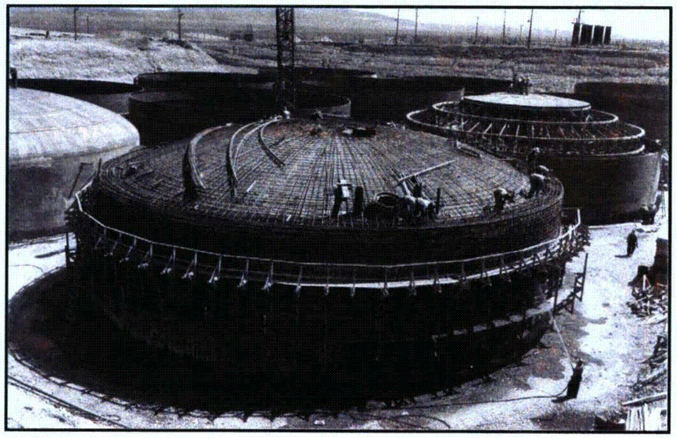
Single-Shell Tanks



- 149 single-shell tanks
- Built between 1943 and 1964
- 55,000 to 1 million gallon capacities
- Contain ~33 million gallons of waste
- Single carbon steel liner
- Reinforced concrete outer shell
- Non-compliant with regulations
- 67 known or suspected "leakers"
- Roughly 1 million gallons leaked
- All exceed design life



Single-Shell Tank Farm Construction – Circa 1943

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C Tank Farm 3-D Model

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Tank Closure

- Closure strategy (assumed)
- Closure requirements
- Performance Assessment
- Demonstration Project

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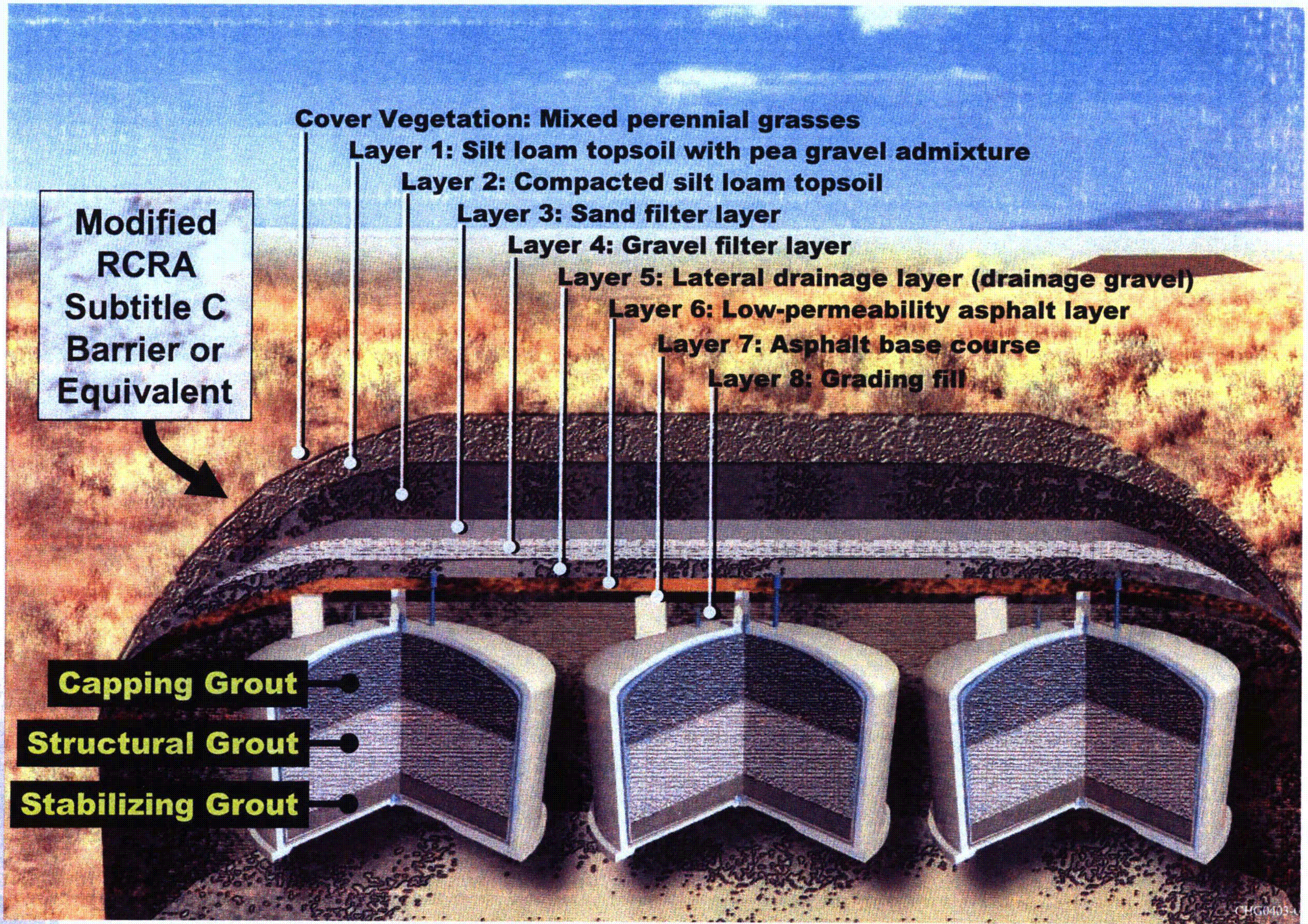
Conceptual Defense-in-Depth



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Conceptual design considered to Stabilize and Isolate Tanks Containing Residual Waste

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- **Grout (current plan)**: Fill tank with flowable grout
  - Layer 1: a 30-cm to 90-cm layer of free-flowing grout that will cover waste residuals and debris on the tank bottom and support subsequent fills
  - Layer 2: grout will enhance stability for the tank structure and fill the majority of the tank
  - Layer 3: high-compressive-strength grout placed in the remaining void space to discourage intruder access

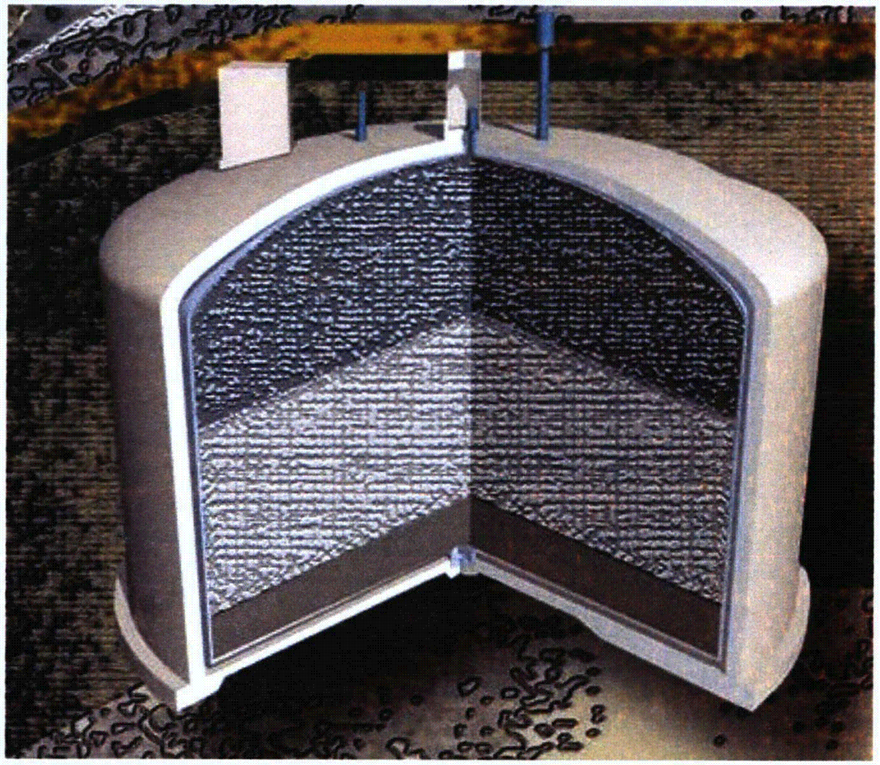

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Figure I-1. Single-Shell Tank Waste Management Area (WMA) Waste Retrieval and Closure Process

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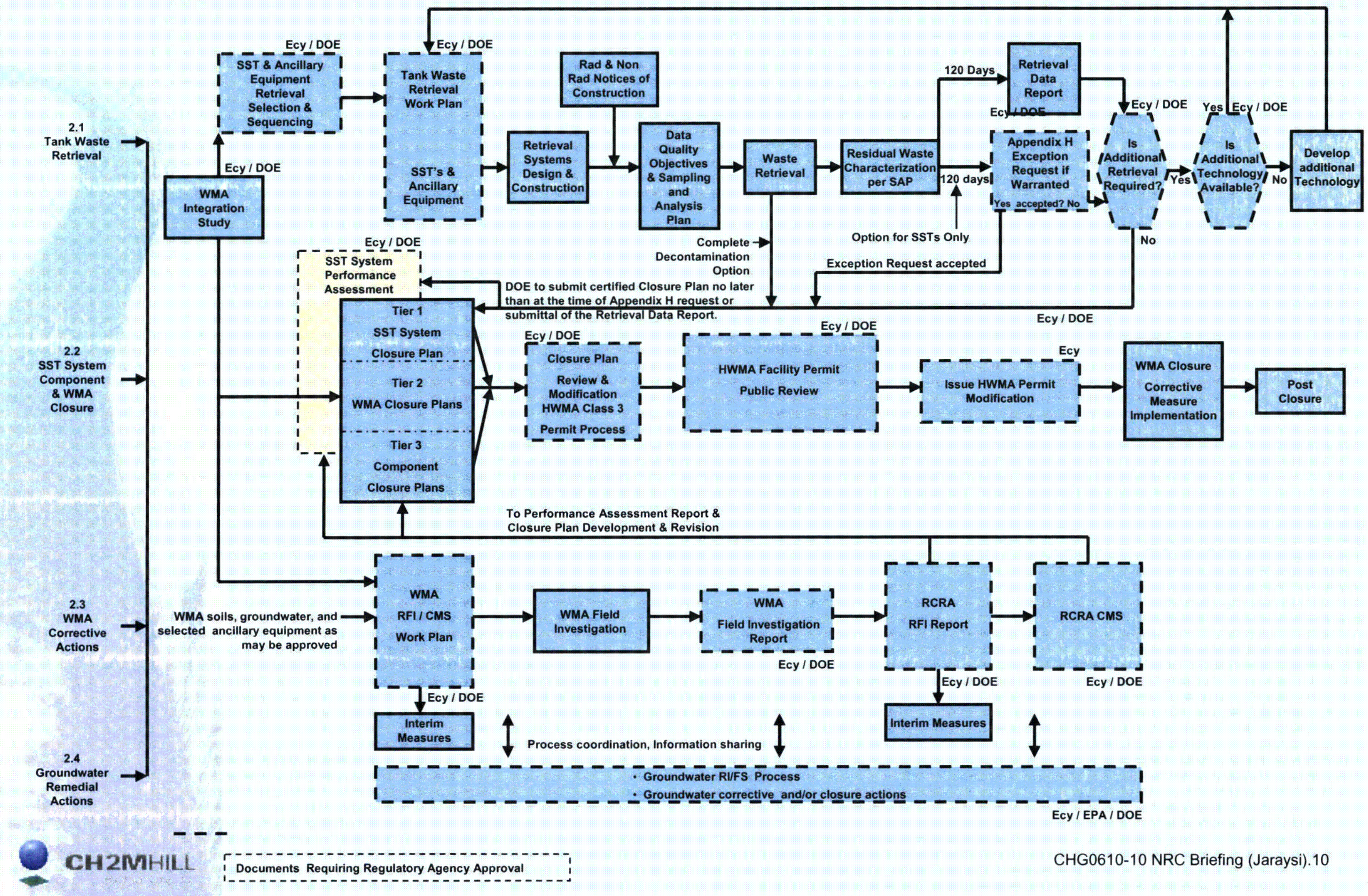

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Initial Single-Shell Tank System Performance Assessment

- Evaluates the impacts to human-health of any waste remaining within the WMA after closure
  - Assumes the WMA will be closed as a landfill, awaiting decision from the Tank Closure and Waste Management EIS/ROD
  - Assumes tanks will be retrieved to the HFFACO goal of 99%
- Employs a "Defense-in-Depth" approach with multiple barriers providing protection to the public from waste remaining in WMA after closure

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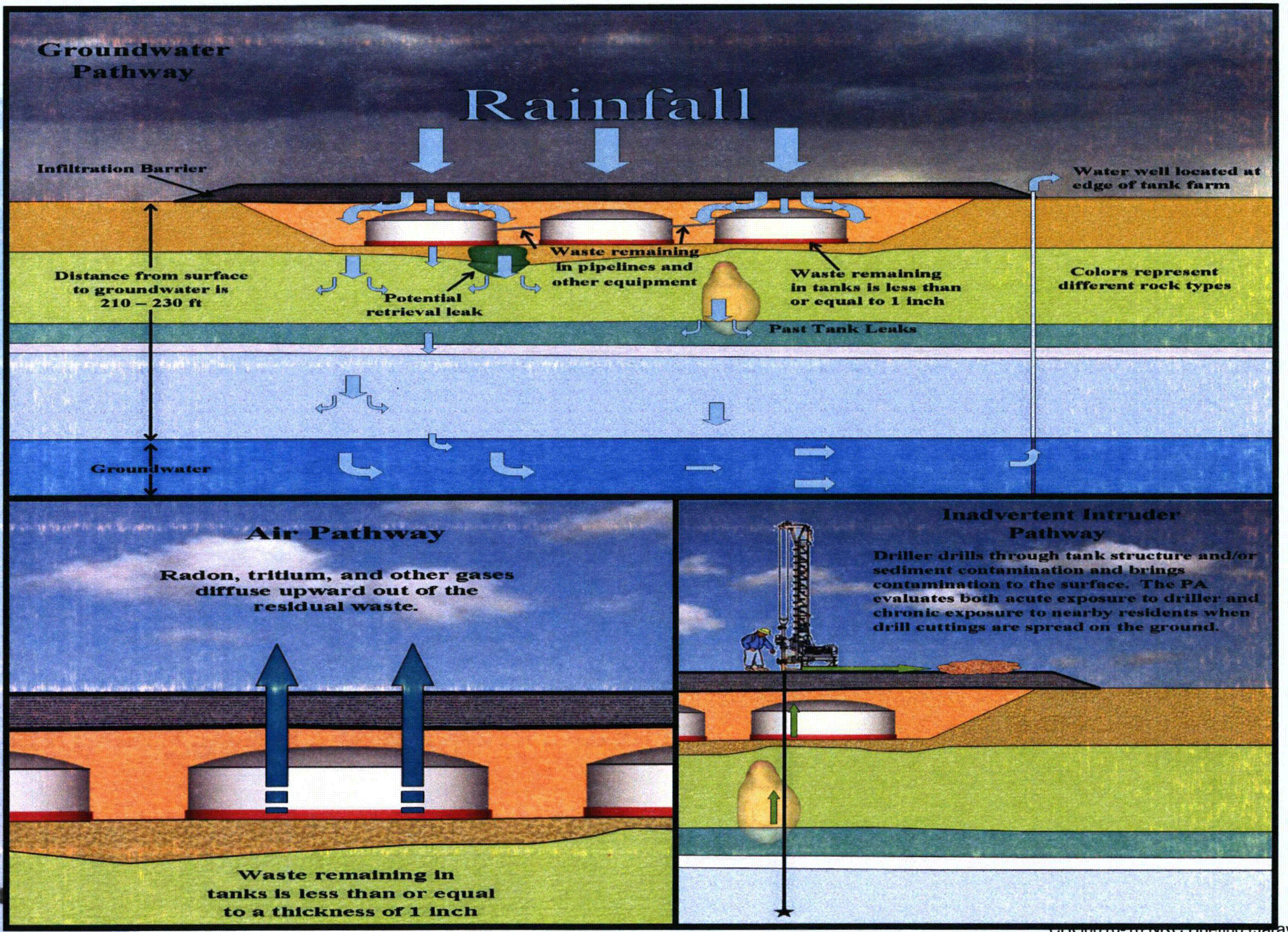
Pathways Evaluated in Initial SST PA



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SST Performance Assessment Model Methodology

- Developed a reference case for each contaminant pathway
  - representative of the closed WMA system Set of parameters and engineering assumptions
- Employs sensitivity analyses to compare against reference case
  - Single parameter variability
  - Cumulative parameter variability
  - "What if" scenarios (i.e. alternative conceptualizations)
- Uses sensitivity analyses to estimate the behavior of the selected set of barriers

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Estimated Reference Case Groundwater Impacts at the Waste Management Area Fenceline

		Maximum Contaminant Level [a]				Exposure Scenarios [b]		
		Beta-Photon	Tc-99	I-129	Cr	All-Pathways Farmer	Radiological ILCR Industrial	WAC 173-340 Hazard Index Method B
Regulatory Limit		4 mrem/yr	900 pCi/L	1 pCi/L	0.10 mg/L	15 mrem	1.0E-4 to 1.0E-5	1.0
WMA	***Peak Year***	***TANK RESIDUALS***						
S-SX	8191	Well Below	Well Below	Well Below	Below	Well Below	Well Below	Below
T	8191	Well Below	Well Below	Well Below	Well Below	Well Below	Well Below	Well Below
TX-TY	8191	Below	Below	Well Below	Well Below	Well Below	Below	Well Below
U	8191	Below	Below	Well Below	Well Below	Well Below	Below	Below
C	10461	Well Below	Well Below	Well Below	Well Below	Well Below	Well Below	Well Below
B-BX-BY	10461	Well Below	Well Below	Well Below	Well Below	Well Below	Well Below	Well Below
A-AX	10461	Well Below	Well Below	Well Below	Well Below	Well Below	Well Below	Below
WMA	***Peak Year***	***PAST RELEASES***						
S-SX*	2043	Well Above	Well Above	Below	Well Above	Below	Above	Above
T	2043	Well Above	Well Above	Below	Well Above	Below	Above	Below
TX-TY	2043	Well Above	Well Above	Below	Above	Well Below	Below	Below
U	2043	Well Above	Well Above	Well Below	Above	Well Below	Below	Below
C	2051	Below	Below	Well Below	Below	Well Below	Below	Below
B-BX-BY	2051	Well Above	Well Above	Well Below	Above	Well Below	Below	Below
A-AX	2051	Well Above	Well Above	Well Below	Above	Well Below	Below	Below

Below Regulatory Limit:

- (dark blue diamond) Well Below the Regulatory Limit (greater than 10 times)
- (light blue diamond) Below the Regulatory Limit (less than 10 times)

Above Regulatory Limit:

- (red oval) Well Above the Regulatory Limit (greater than 10 times)
- (yellow oval) Above the Regulatory Limit (less than 10 times)

[a] Evaluated from year 2000 to 12032.
[b] Evaluated from year 2332 to 12032.
ILCR = incremental lifetime cancer risk
Peak Year indicates the year that the highest concentration for Tc-99 and chromium arrive at the WMA fenceline

Decisions Supported by the Initial SST PA

- Interim Decisions (Initial SST PA)
  - Retrieval of Tank Waste (Tank Waste Retrieval Work Plans (start) and Retrieval Data Reports/Appendix H (completion))
  - Need for Interim Measures
  - Treatability Studies (if needed)
  - Identification and Prioritization of Data to Support Cleanup Actions
- Final Decisions (WMA PA)
  - Closure of Single-Shell Tanks

Initial PA Conclusions and Path Forward

- Conclusions
  - Retrieval of the tanks to the TPA Goal of 99% and filling the tanks with grout reduces human-health impacts
  - Groundwater impacts from past releases are above the performance objectives for every WMA except WMA C
- Path Forward
  - Work with reviewing agencies, tribal nations, and stakeholders to address critical elements of the analyses
  - Implement interim corrective measures, where possible
  - Confirm longevity of the grout used to stabilize the tanks
  - Identify technologies for deep vadose remediation
  - Start focused groundwater remediation
- Research Development and Demonstration
  - Tank Residual Release Rate Models (ongoing work at PNNL)
  - Use of Cementations Materials for waste treatment, disposal, remediation, and decommissioning (SRNL)
  - Deep vadose zone characterization and remediation

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Tank Farm Closure Technology Needs

- Efforts to date have focused on tank treatment (WTP, Supplemental Treatment) and retrieval technologies (dry and sluicing)
- Closure technology needs also exist for:
  - Tank stabilization (grout formulation; mixing systems)
  - Retrieving residuals in ancillary equipment (e.g., pipelines, catch tanks, vaults, diversion boxes)
  - Characterizing residuals in ancillary equipment
  - Defining closure alternatives for ancillary equipment (e.g., removal, stabilization)

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C-200 Demonstration Project

- Closure decisions will be made as part of the Tank Closure and Waste Management EIS, DOE Order 435.1 Compliance, and RCRA Permitting

- In lieu of these decisions, the C-200 Demonstration Project was formed as a collaborative DOE/Regulatory Agency project to identify and implement RD&D needs for closure of a tank farm

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C-200 Demonstration Project

- Objectives
  - Develop information and processes to support making decisions on tank farm system closure:
    - Obtain planning data
    - Obtain regulatory decision making data
    - Develop and qualify equipment, processes and procedures for characterization and closure of tanks and tank ancillaries
    - Obtain logistical and operational expertise
    - Obtain field execution data within the Tank Farm constraints
  - Define how the waste determination process can be implemented in coordination with Washington State

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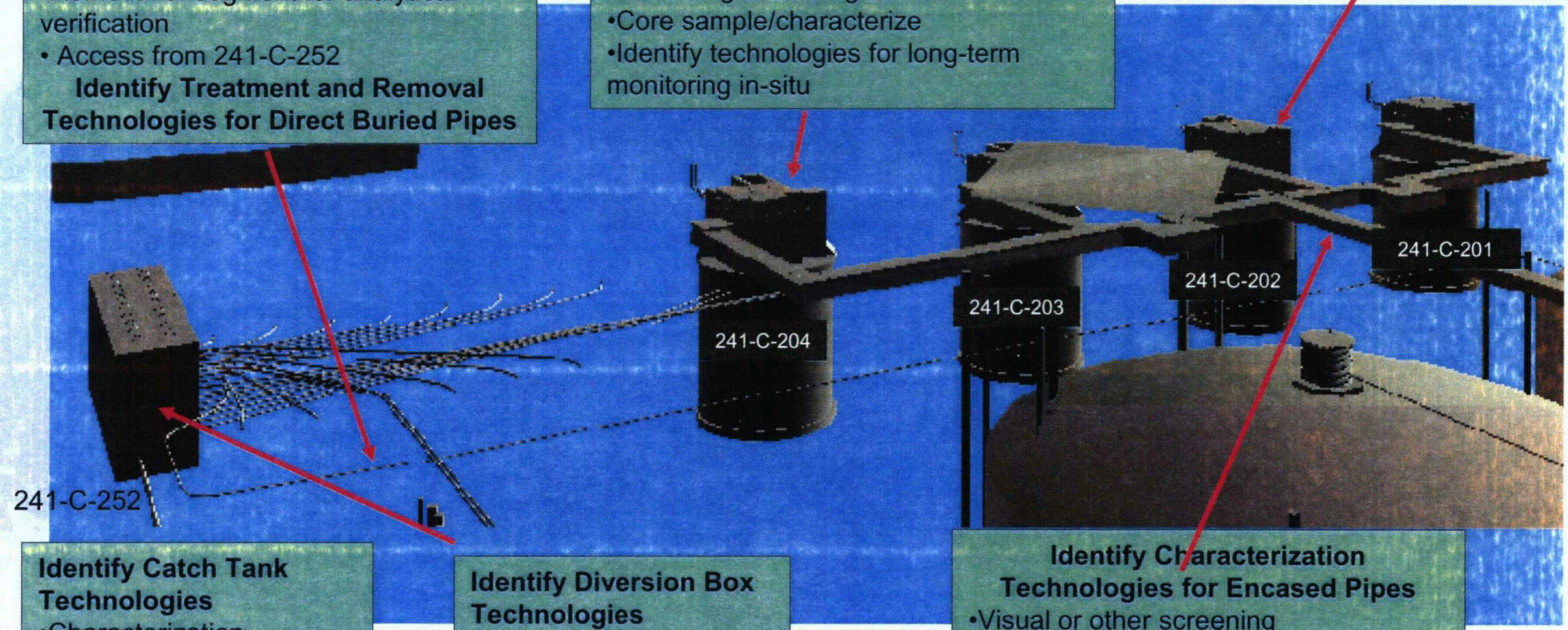
C-200 Demonstration Project Scope

Identify Characterization Technologies for Direct Buried Pipes
- Visual or other screening
- Removal of segment for analytical verification
- Access from 241-C-252

Identify Treatment and Removal Technologies for Direct Buried Pipes

Identify Stabilization Technologies for C-200 Tank(s)
- Test Waste Determination process
- Grout formulation for optimization of long-term performance
- Fill/mixing technologies
- Core sample/characterize
- Identify technologies for long-term monitoring in-situ

Tank Removal Feasibility Study
- One-piece removal
- Mining



Identify Catch Tank Technologies
- Characterization
- Waste Removal
- Closure

Identify Diversion Box Technologies
- Characterization
- Waste Removal
- Closure

Identify Characterization Technologies for Encased Pipes
- Visual or other screening
- Removal of segment for analytical verification

Identify Treatment and Removal Technologies for Encased Pipes

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C-200 Demonstration Project – Recent Work on Pipeline Characterization Technologies

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- Challenge of Pipeline Closure:
  - Pipelines are 40 – 60 years old and of questionable integrity
  - Over 100 miles of pipeline containing highly radioactive mixed waste residuals
  - Numerous elevation changes, bends, layers, and connection points
  - Some pipelines have failed others are plugged
  - Difficulties accessing lines due too numerous interferences and highly radioactive environment
- Recent EM-21 Workshop Expert Panel convened to:
  - Recommend technologies for characterization and sampling of operational and out-of-service pipelines
  - Recommend technologies to screen pipelines with ultimate goal of reducing costly laboratory sampling
  - Assess how technologies can be incorporated into the field as part of the Hanford C-200 Demonstration Project
  - Results expected January 2008

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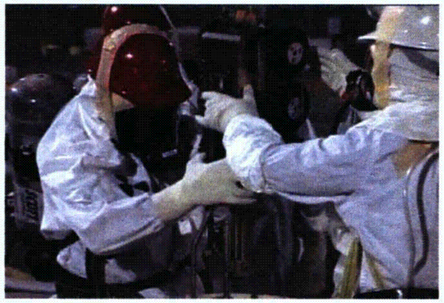
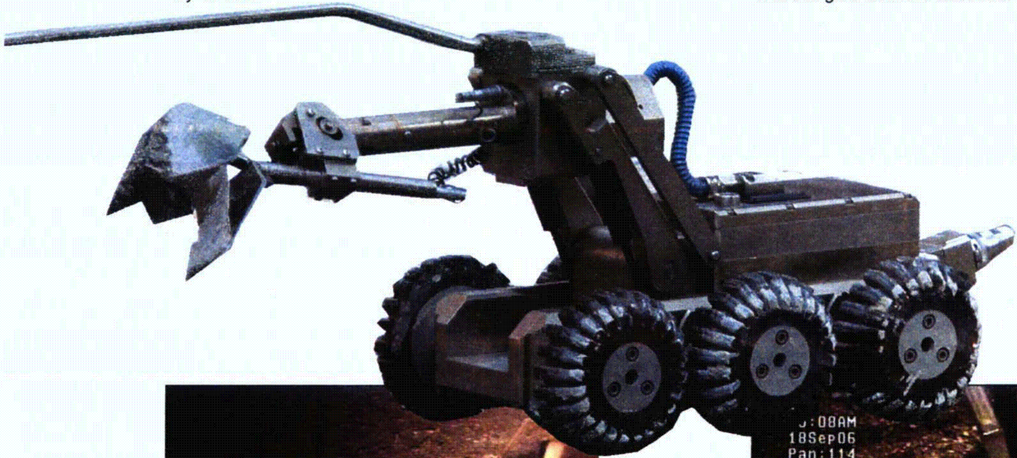
Post-Retrieval Tank Sampling – Off-Riser Sampler

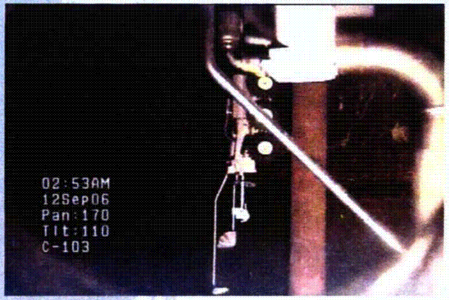
A well prepared and rehearsed team of skilled tank farm workers installed the Off Riser Sampling System (ORSS) in single-shell tank C-103. The device is capable of moving around inside a tank and improves our capability to obtain residual waste samples in locations not accessible beneath access risers.



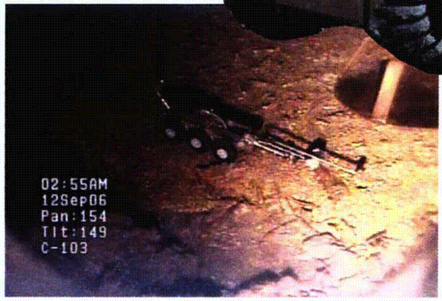
The remotely-operated device is nicknamed the "Possum," because it is lowered into the tank by its tail.

Once ready to be lowered into the tank a glove bag is installed to contain any potential contamination and still give workers access to the equipment.





The ORSS made a flawless entry into C-103, fitting through a 12" diameter pipe.



The ORSS gathered residual waste samples from multiple locations within the tank.

The small scoop on the front of the ORSS is similar to the bucket on a backhoe. The bucket collects waste samples, then tilts to put the sample into a container that is then brought to the surface.

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Vadose Zone

Presented by:
John Kristofzski

October 18, 2006

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Agenda

- RCRA Corrective Action Program Under the Tri-Party Agreement
- Completed and Ongoing Characterization Activities
- What We Have Learned?
- Future Plans

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Why Does the Vadose Zone Project Exist?

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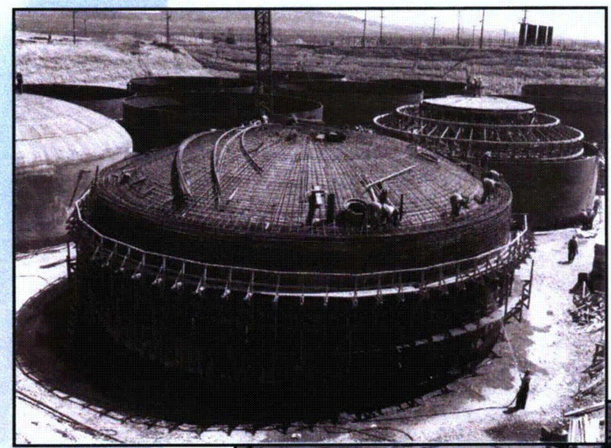
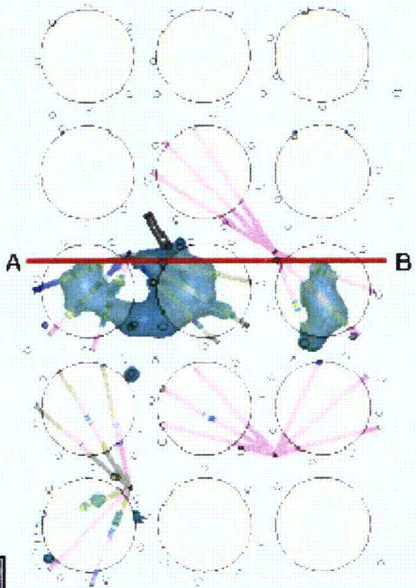
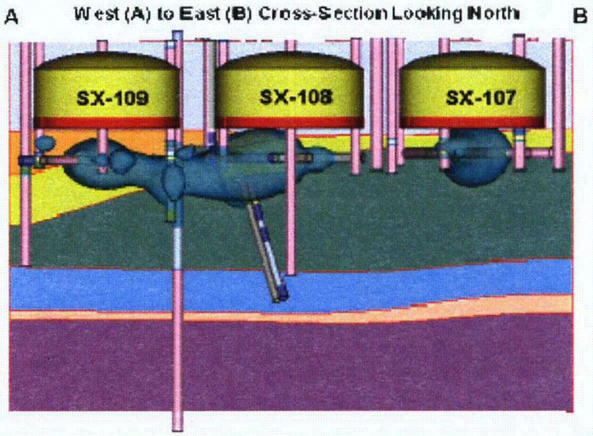
Problem: Single Shell Tanks and Infrastructure Have Leaked
Response: RCRA Corrective Program for Vadose Zone Established under TPA-M-45

Single-Shell Tank Farm Construction – Circa 1943







Furthermore, groundwater monitoring data inferred the presence of tank waste contaminants in the unconfined aquifer near tank farm boundaries

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Leak Testing Single-Shell Tanks during Construction

Vadose Zone Program

Phase 1 Purpose: Evaluate environmental impacts by characterizing the ***substantial leaks and spills*** in all single-shell tank farms and to protect human health by installing interim measures to reduce groundwater impacts

Initial Planning Effort

- *Tank Waste Remediation System Vadose Zone Program Plan* (DOE/RL-98-49, 1998)
- *A Summary and Evaluation of Hanford Site Tank Farm Subsurface Contamination* (HNF-2603, 1998)
- *Phase 1 RCRA Facility Investigation & Corrective Measures Study Work Plan for SST WMAs (DOE/RL-99-36)*
  - **Primary Document under TPA M-45-51**

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WMA Specific Phase 1 Characterization Activities

- Surveyed Existing Information
  - Subsurface Conditions Description Reports (SCDR)
    - **HNF-4936 (S-SX), HNF-5507 (B-BX-BY), RPP-7123 (T, TX-TY), RPP-14430 (C, A-AX), RPP-15808 (U)**
- Conducted Field Investigations
  - Defined by Work Plan Addendums
    - **TPA M-45-52 (S-SX), TPA M-45-53 (B-BX-BY), TPA M-45-54 (T, TX-TY)**
  - Used conventional characterization techniques
    - **Boreholes and soil sampling with chemical analyses**
  - Developed new technologies to collect data
    - **Direct push, subsurface geophysics**
- Issued Field Investigation Reports
  - RPP-7884 (S-SX), RPP-10098 (B-BX-BY), RPP-14594 (T,TX-TY)

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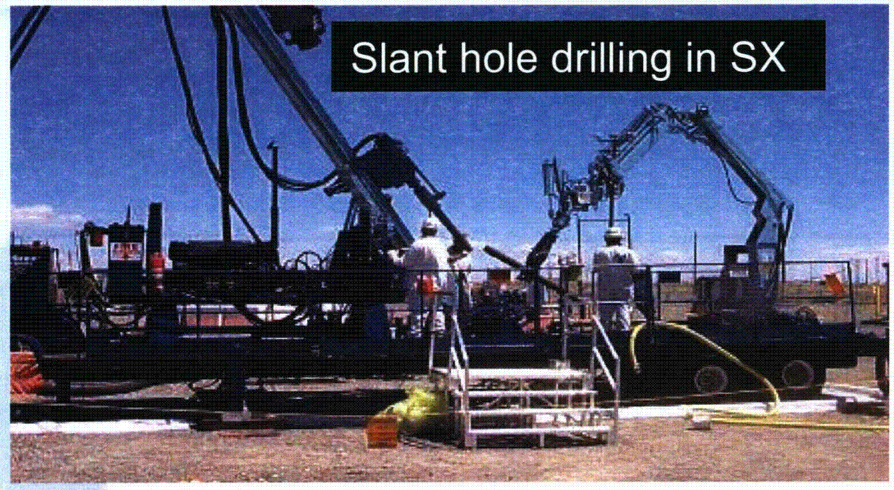
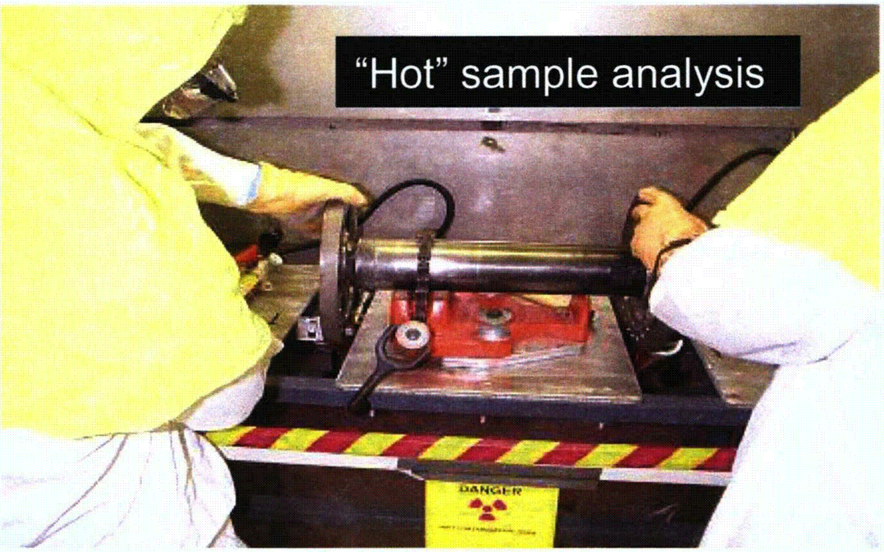
Phase 1 Collection of Field Data to Estimate Nature and Extent of Major Leaks


Slant hole drilling in SX


Shallow leak investigation


Slant – shallow leak investigation


"Hot" sample analysis

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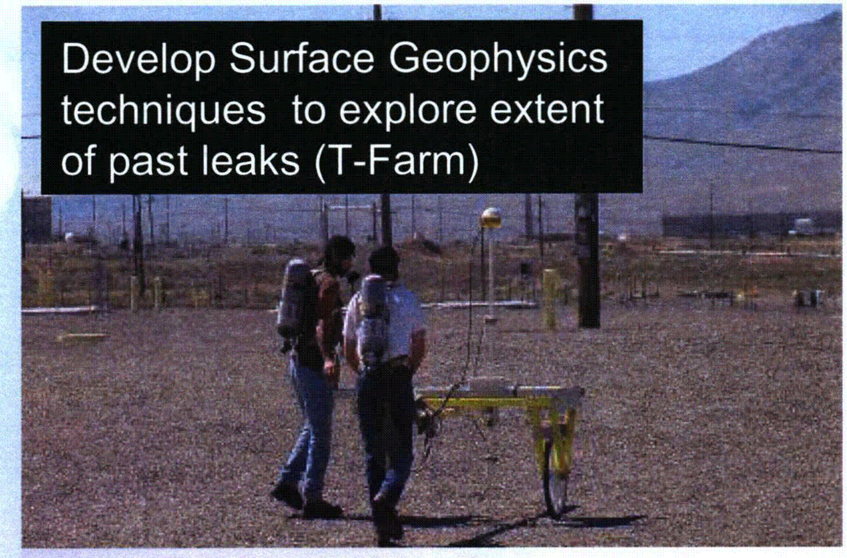
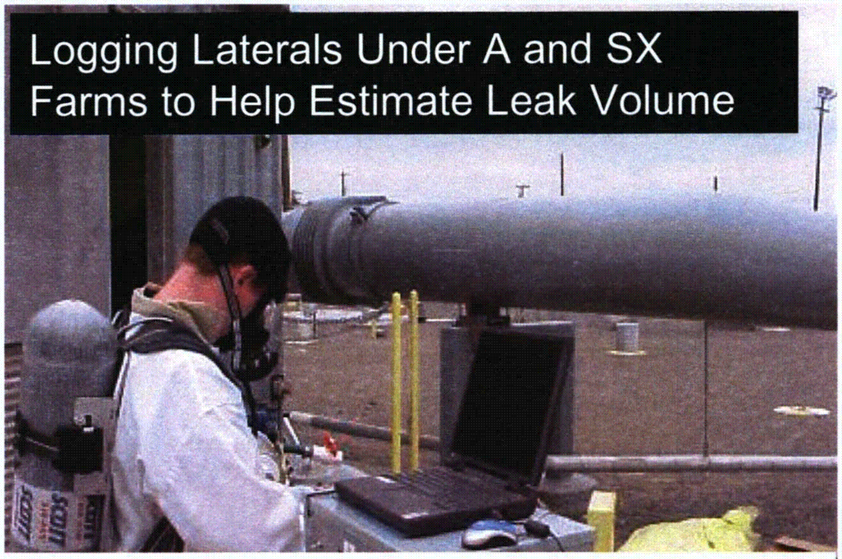
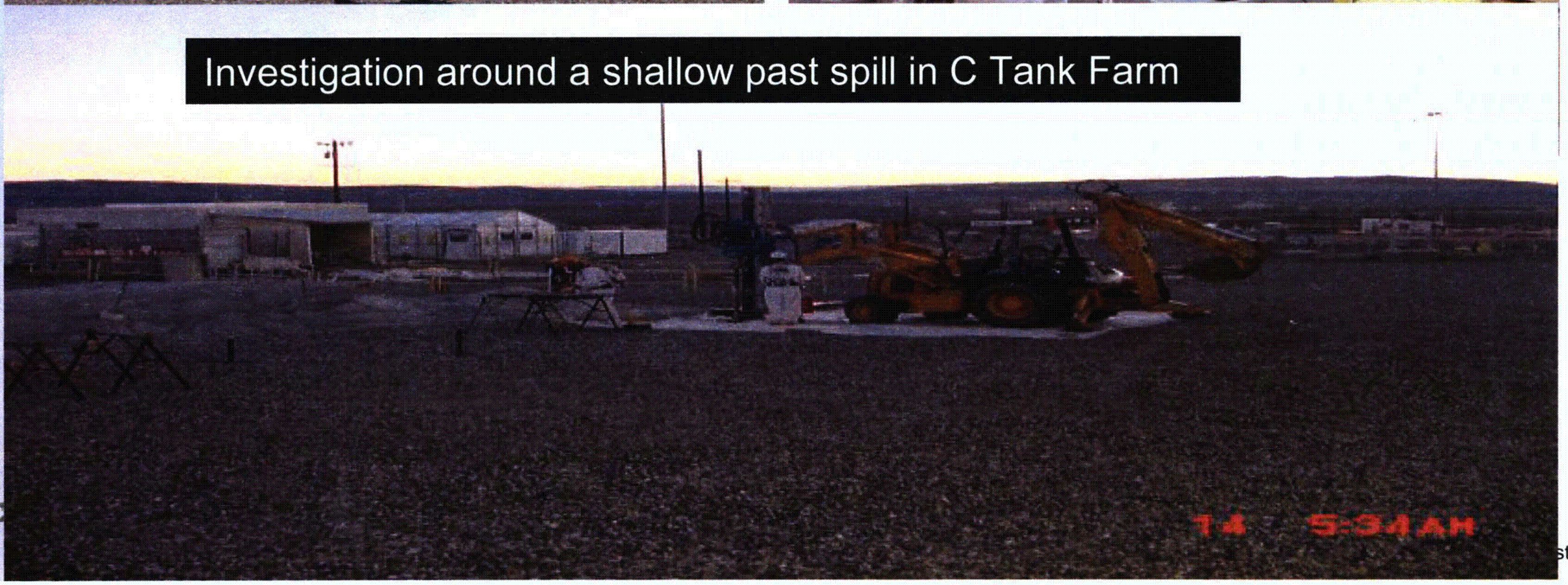
Phase 1 Current Activities

Field Investigations Continue Using ***New Technologies***

Surface Geophysical Exploration (SGE), Lateral Logging, Direct Push







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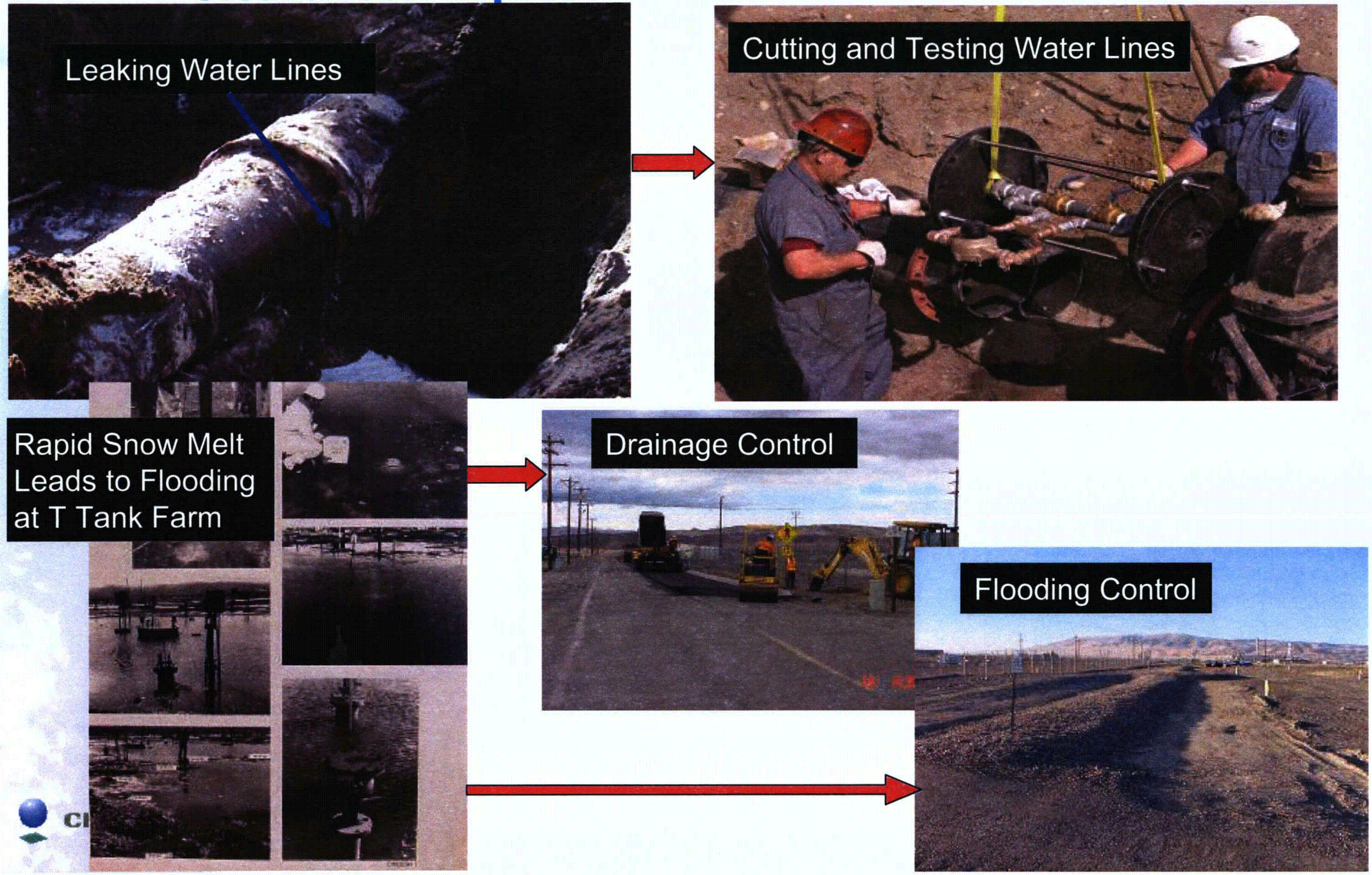
Phase 1 Interim Measures

- TPA M-45-56 Complete implementation of agreed-to interim measures
  - Installed Drainage and Flooding Controls in and around Waste Management Areas
  - Leak Tested Water Lines
    - **Cut and Removed from Service Leaking Water Lines**

- TPA M-45-57 Completed Upgrade of Leak-Tight Caps on Monitoring Drywells around Single-Shell Tanks

Phase 1 Interim Measures (TPA M-45-56)

Implemented at the Single Shell Tank Farms to Reduce Groundwater Impacts



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Phase 1 Interim Measures (TPA M-45-57) Implemented at the Single Shell Tank Farms to Upgrade Well Caps

Old Well Cap

New Well Cap

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Phase 1 Accomplishments

Overview	
Number of tank farms investigated	9
Number of leaks investigated	20
Number of boreholes drilled	10
Number of direct pushes	80
New technologies developed or installed	5
Number of major documents produced	12
Number of farms where interim measures deployed	12
Number of tanks farms included in Initial System Performance Assessment	12
Number of TWRWPs supported	5
Number of RDRs supported	5
Number of Appendix H submittals supported	1
Number of milestones met	15
Number of milestones missed	0

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What did We Learn in Phase 1?

- Field Investigation Reports [e.g. RPP-7884 p. ES-iii] concluded that past tank leaks have contaminated soils and groundwater
  - Impacts to groundwater from tanks leaks are primarily driven by subsequent water discharge events (e.g. leaking water lines and storm driven ponding within tank farms).
- Inventory of tank leak contaminants remain largely within the vadose zone
  - Supported by site-specific WMA characterization data
  - Other sites receiving waste streams/discharge volumes approximating large tank leaks show similar contaminant distributions in the vadose zone (BC Cribs)
- In some cases, chemical interactions between leaked waste and subsurface sediments have influenced contaminant mobility,
- Leaked technetium-99, chromium, nitrate and nitrite generally remain mobile in the subsurface after leak events
  - Uranium shows varying degrees of mobility
- Future impacts to groundwater from past leaks will be driven by infiltrating precipitation and vadose inventory

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Vadose Zone Project

Future Plans

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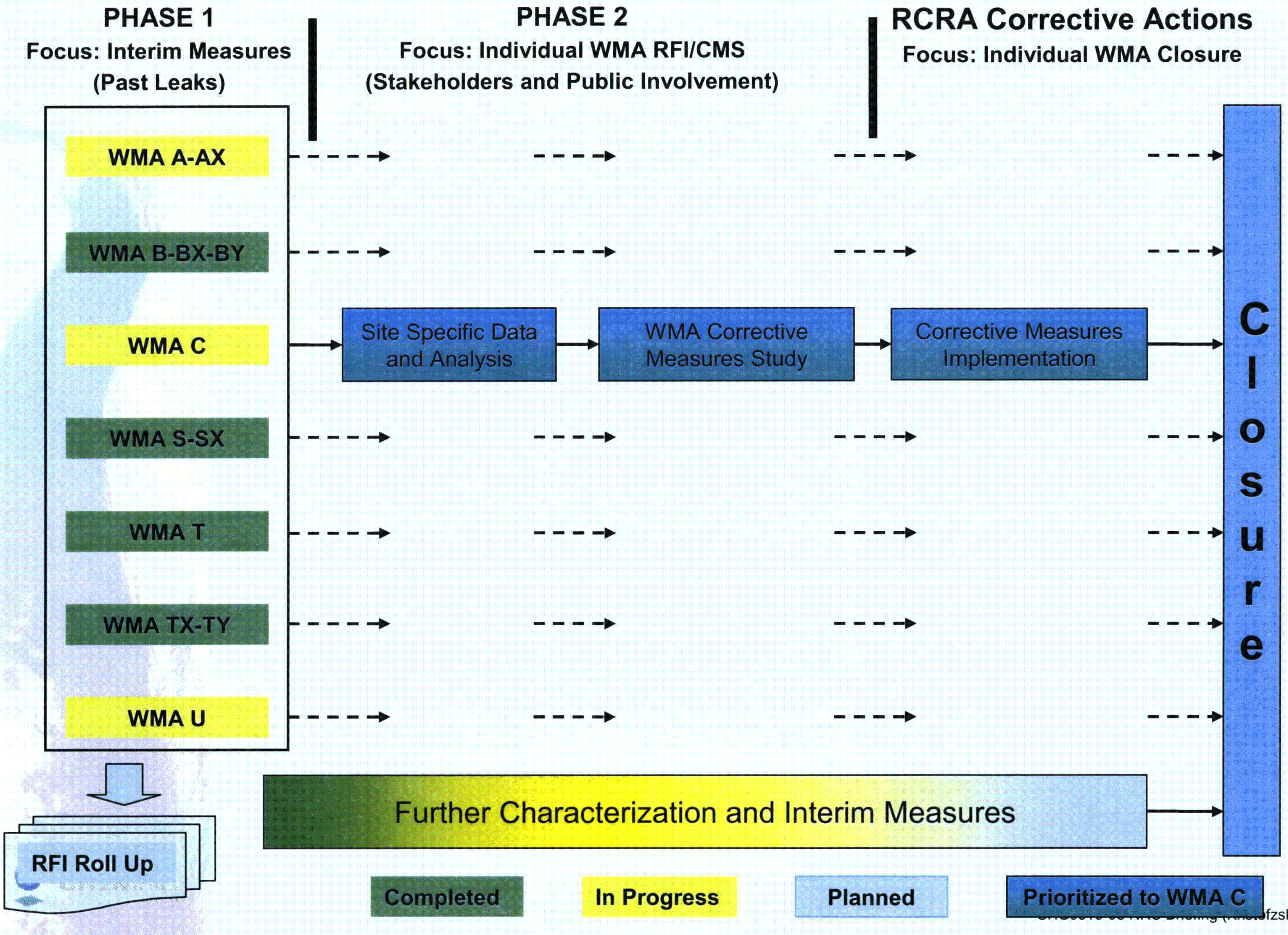
Phase 1 will transition to Phase 2 and Support WMA Closure



Interim Barriers

Demonstration of Interim Barriers to Reduce Infiltration are Planned for:

- T Farm
- SX Farm
- During the demonstration establish monitoring techniques to characterize moisture build up under the barrier and monitor moisture movement through the vadose zone

Integrate development of interim barriers with similar applications with Central Area Plateau liquid discharge sites.

Waste Retrieval Technologies

Presented by:
Ryan A. Dodd,
Director, Closure Operations
C Farm Project
CH2M HILL Hanford Group, Inc.

October 18, 2006

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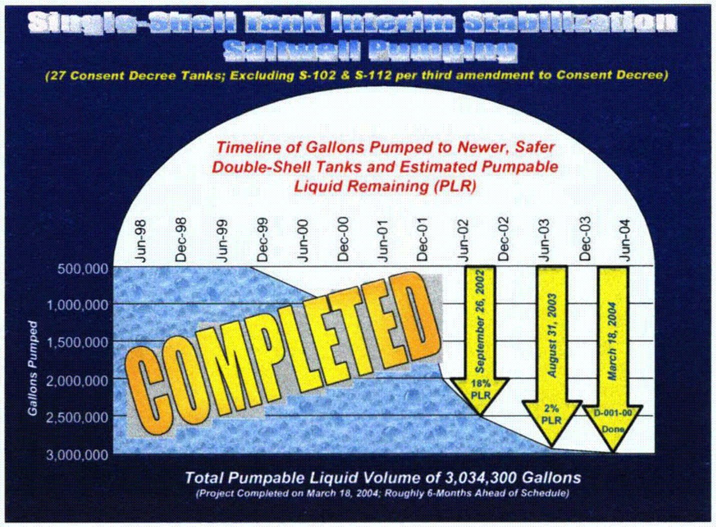
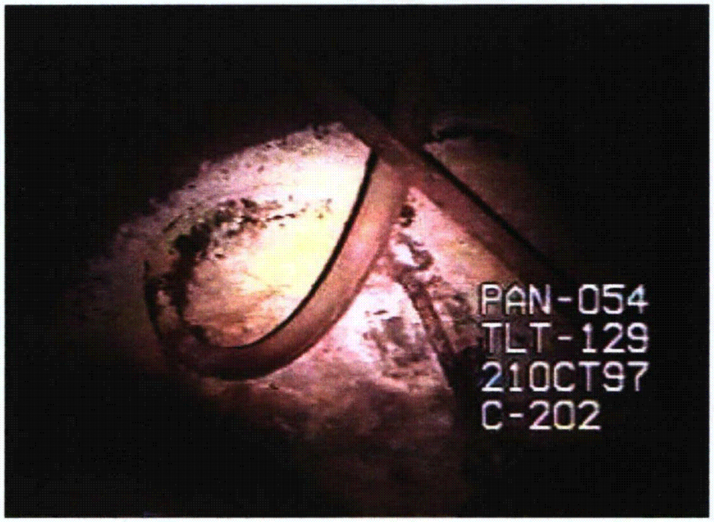
Tank-Waste Retrieval Challenges

- Retrieval goals ≤ 360 ft^3 in 100-Series tanks, ≤ 30 ft^3 in 200-Series tanks or limit of technology, whichever is less
  - Completed interim stabilization of SSTs in 2004 to reduce potential for leakage
- Aged systems, structures, and components in SST and DST farms
  - All SSTs exceed design life; 67 of 149 SSTs "assumed" to have leaked
- Old, abandoned equipment in tanks and number of available risers is limited
- Limited DST space in support of SST retrievals; reduce liquids used to retrieve
- Execute multiple projects simultaneously

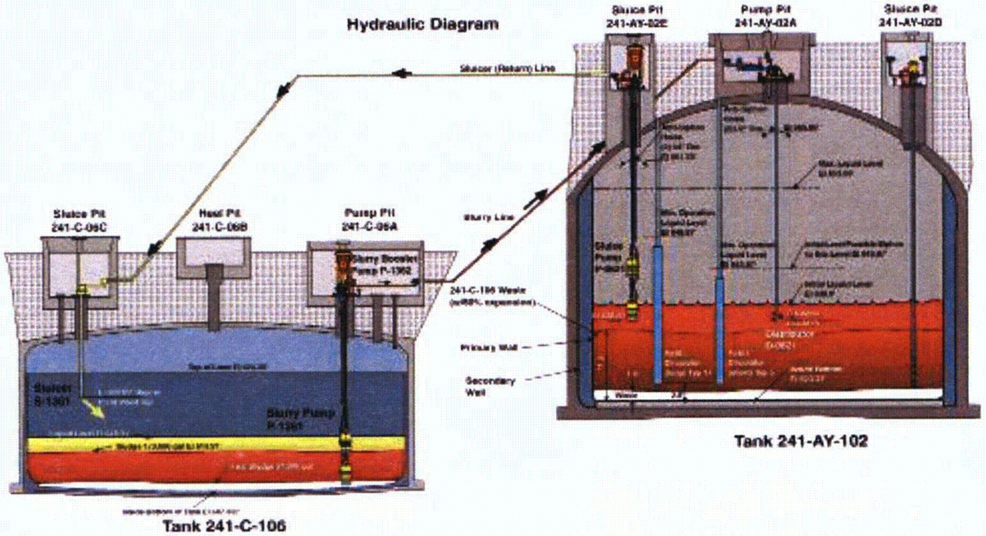




Abandoned Flex-Hose and Piping in Tank

Past-Practice Sluicing of Tank C-106

- 100-Series tank; 530 Kgal capacity; on “watch list” due to high-heat safety issue from Strontium-90 decay
- Stopped when sludge recovery rate approached zero; removed 150 Kgal of waste leaving 36 Kgal of residual waste
- Resolved high-heat safety issue; did not meet Tri-Party Agreement volume goal



“Past-Practice” Sluicing – High Liquid Volume

- Second Retrieval Attempts
  - Removed 18 Kgal of supernatant
  - Removed 14 Kgal of waste using modified sluicing and oxalic acid dissolution
  - Retrieval completed to “limits of technology” on December 31, 2003
    - –Nominal residual waste volume of 370 ft^3 solids remaining
    - –Reduced pre-retrieval inventory from 10.1 MCi to 135 KCi (99% reduction) – mostly Sr-90/Yt-90
  - Tri-Party Agreement Appendix H Exception Request reviewed with Ecology and NRC

Project W-320 Waste Retrieval Pump

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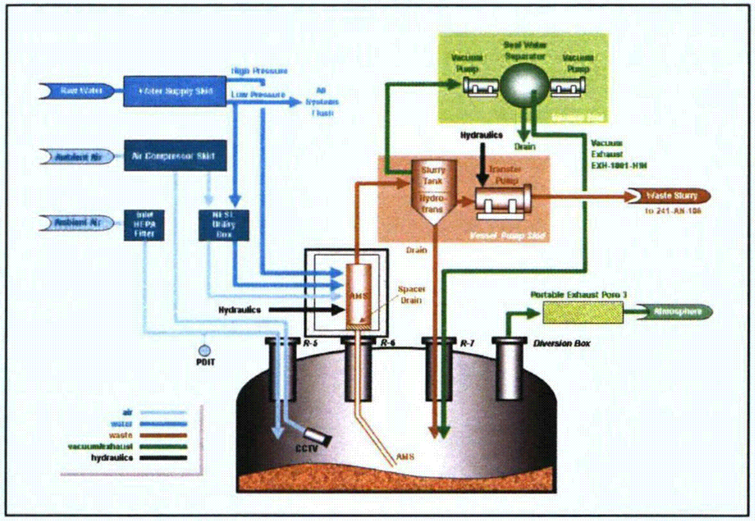
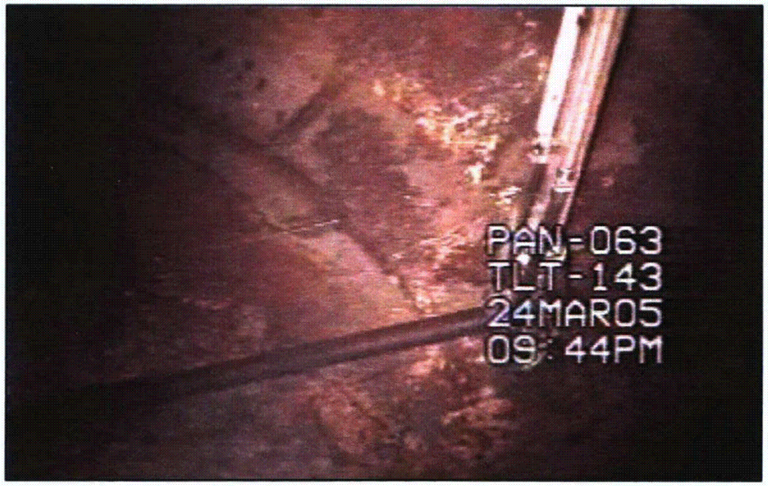
Tank C-200s Vacuum Retrieval

Smaller 200-Series Tank; 55 Kgal

- Completed retrieval of C-203 to limits of technology on March 24, 2005
  - 3,040 gallons of waste retrieved
  - Estimate 13.4 ft^3 on bottom and 5.1 ft^3 on side walls for total residual waste volume of 18.5 ft^3
- Completed retrieval of C-202 on August 11, 2005
  - ~1030 gallons of waste retrieved
  - Estimate 8.4 ft^3 (63 gal) on the floor, 5.1 ft^3 (38 gal) on the walls, 6.1 ft^3 (46 gal) of debris, Total residual waste volume is 19.6 ft^3
- Prepare for continued retrieval of C-204
- Completed retrieval of C-201 on March 23, 2006
  - 687 gallons of waste retrieved
  - 12 ft^3 (90 gal) on the floor, 5.1 ft^3 (38 gal) on Tank walls. 3.4 ft^3 (25 gal) of debris, total residual waste volume is 20.5 ft^3 (153 gal).
- Tri-Party Agreement retrieval goal for 200-Series tanks met



Vacuum Retrieval System Schematic



Bottom of Tank C-203 After Vacuum Retrieval

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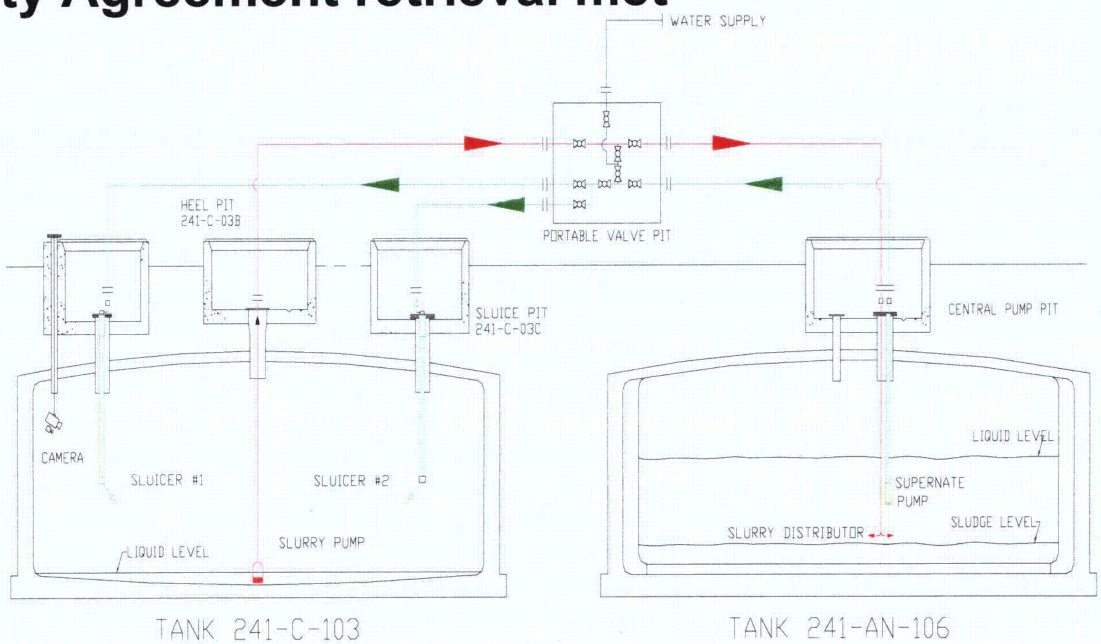
Tank C-103 Retrieval

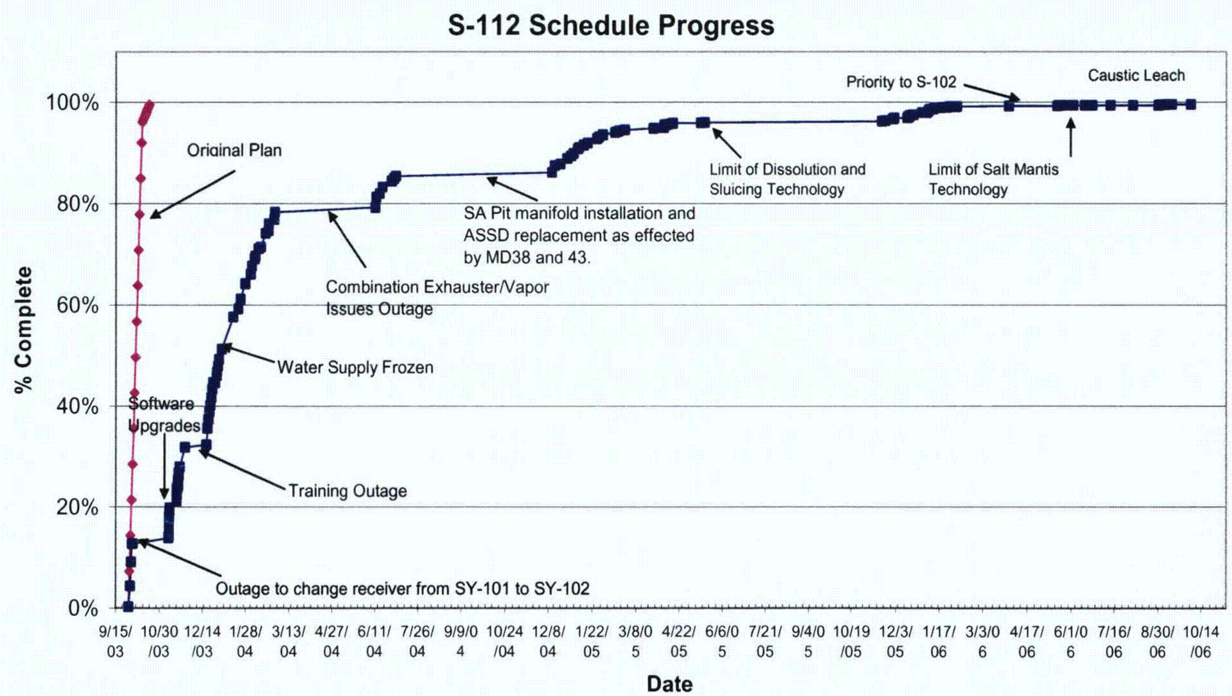
530 Kgal Tank

- **Completed retrieval of C-103 to limits of technology on June 30, 2006**
  - **Estimated 351 ft^3**
    - **279 ft^3 2087 gallons on bottom**
    - **3.6 ft^3 26.9 gallons in equipment**
    - **19.6 ft^3 147 gallons on Tank Walls**
    - **48.8 ft^3 356 gallons on Tank Stiffener Rings**
- **Tri-Party Agreement retrieval met**



Tank S-112 Retrieval

- Completed S-112 retrieval to limits of technology on 5/17/05; TPA M-45-03C
- Technology: modified sluicing and saltcake dissolution
- 583 Kgal of waste retrieved; 95% of pre-retrieval volume
- 31 Kgal (~ 4,100 ft^3) of waste remained
- Salt Mantis deployed to breakup hard heel
- Caustic added to allow dissolution
- Sluicing
- Level determination in process



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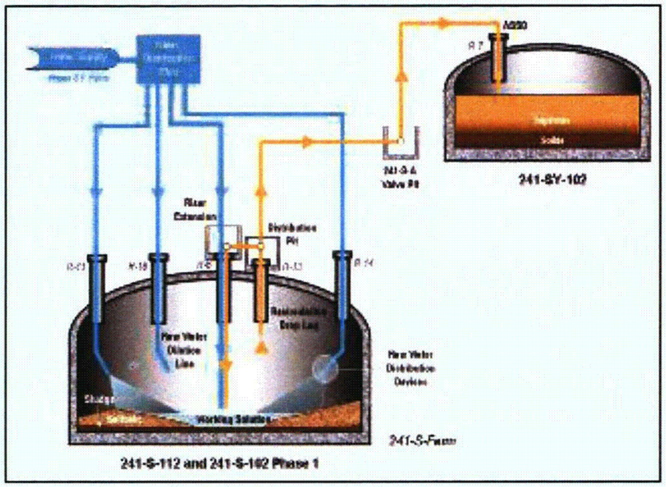
Tank S-102 Retrieval

- Initial sludge waste retrieval initiated per Tri-Party Agreement M-45-05A
- Technology: modified sluicing
- Retrieval temporarily suspended due to pump screen plugging
- Adjustable height pump installed
- Implemented controls to prevent phosphate gel formation
  - Temperature (85 - 95 degrees F)
  - Specific gravity (1.25 – 1.29)
- Restarted retrieval on June 2, 2005
- Sluicing Operations enhanced with air sparging
  - > 52% Retrieved
- New Rotary Viper to be added



Modified Sluicing Retrieval System Schematic

Adjustable Height Retrieval Pump

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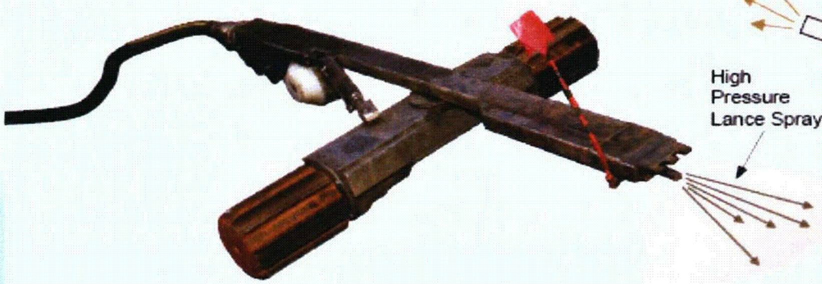
New Technologies

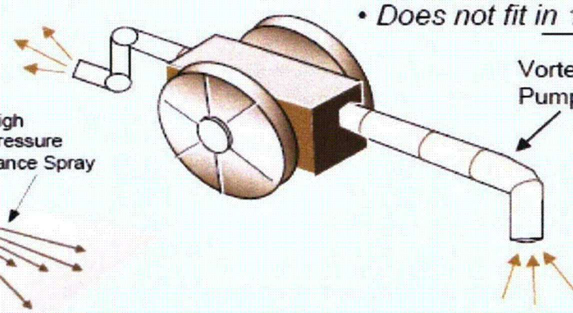
Salt Mantis: Waste Breakup and Mixing Tool

- *High pressure spray breaks up and mixes waste*
- *Augments other retrieval systems*



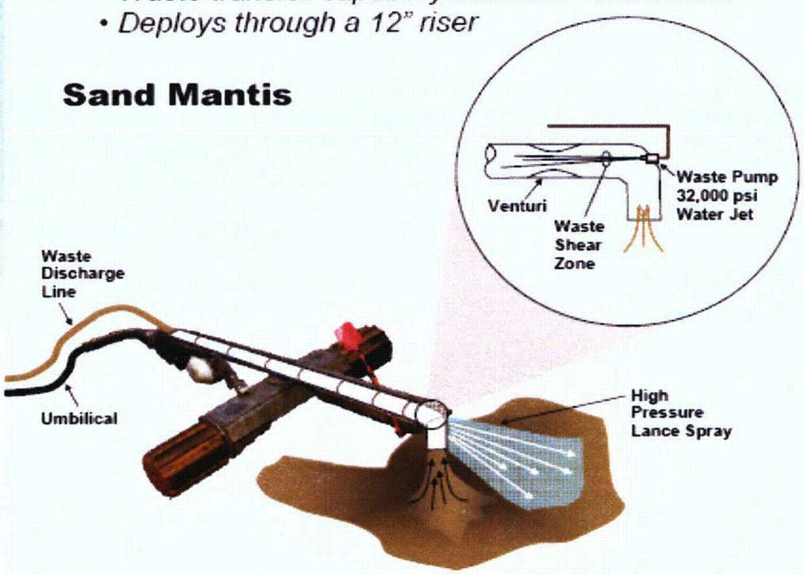
Aardvark: Waste Breakup and Transfer Tool

- *Developed for mining industry*
- *Pumps material with Vortex Pump*
- *Does not fit in 12" riser*



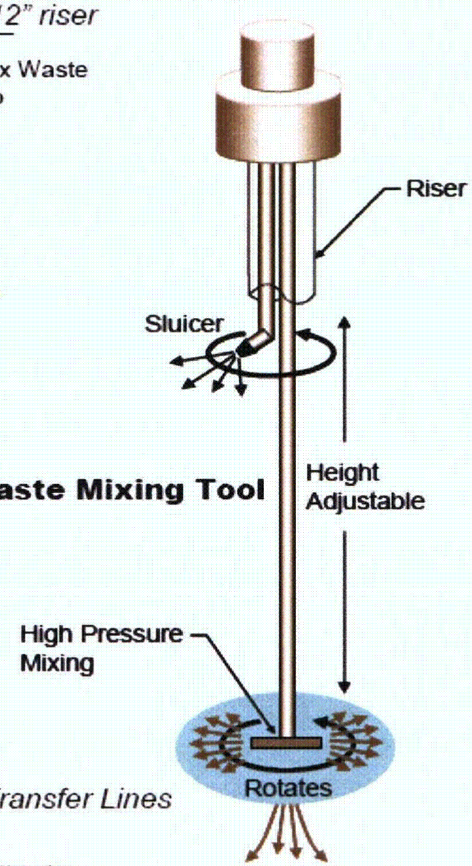
Sand Mantis: Waste Breakup, Mixing, and Transfer Tool

- *Waste transfer capability added to "Salt Mantis"*
- *Deploys through a 12" riser*



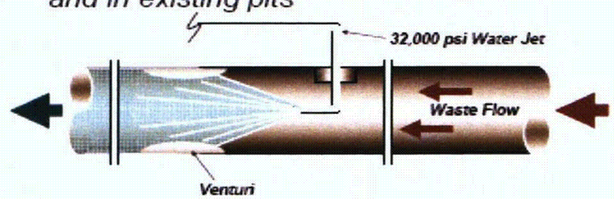
Rotary Viper: Waste Mixing Tool

- *Sluicer*
- *Mixes Waste*
- *Fits down 4" Riser*



Squid Pump:
In-Line Waste Transfer Tool

- *Small size allows installation of Transfer Lines and in existing pits*



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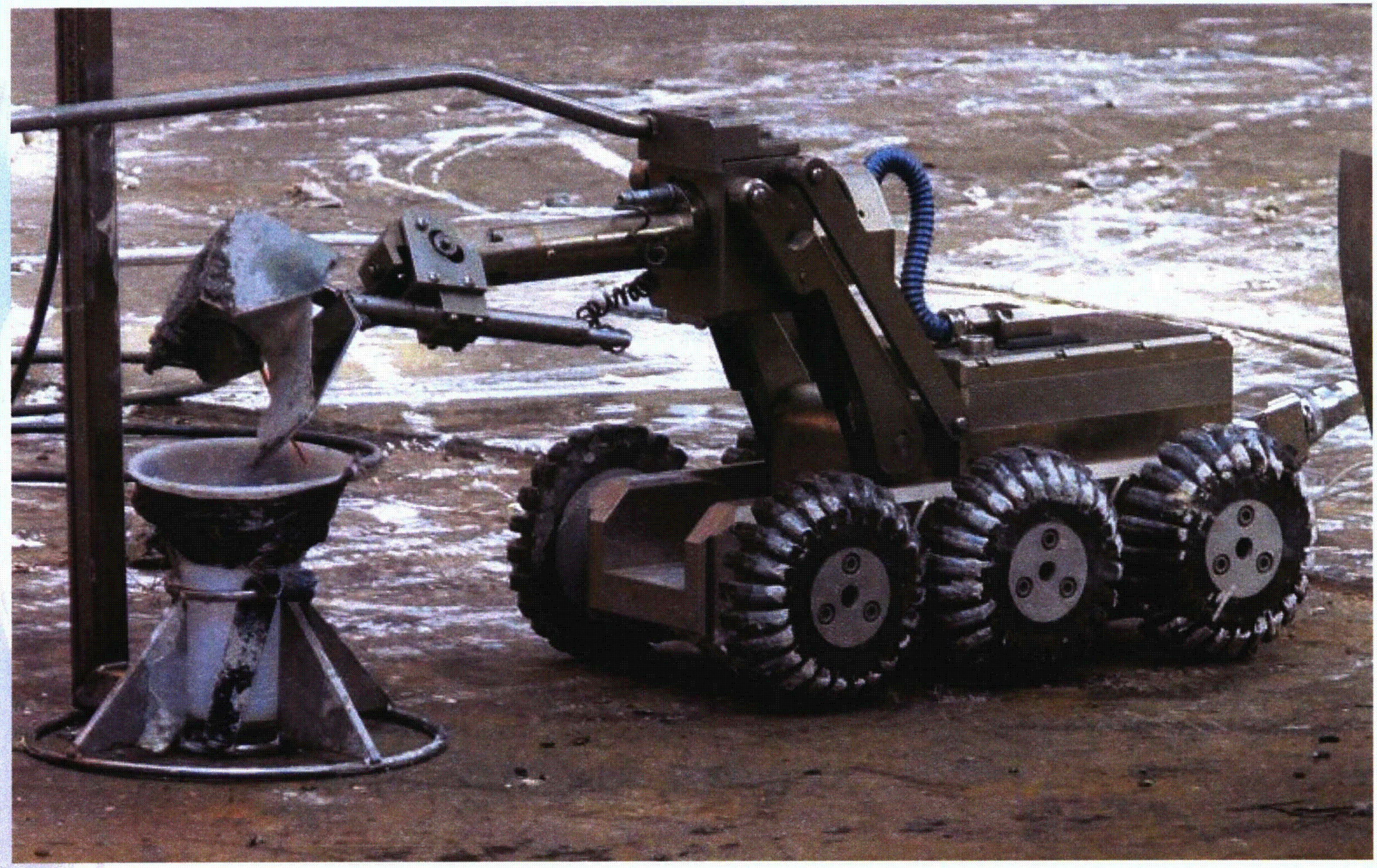
Sampling Possum



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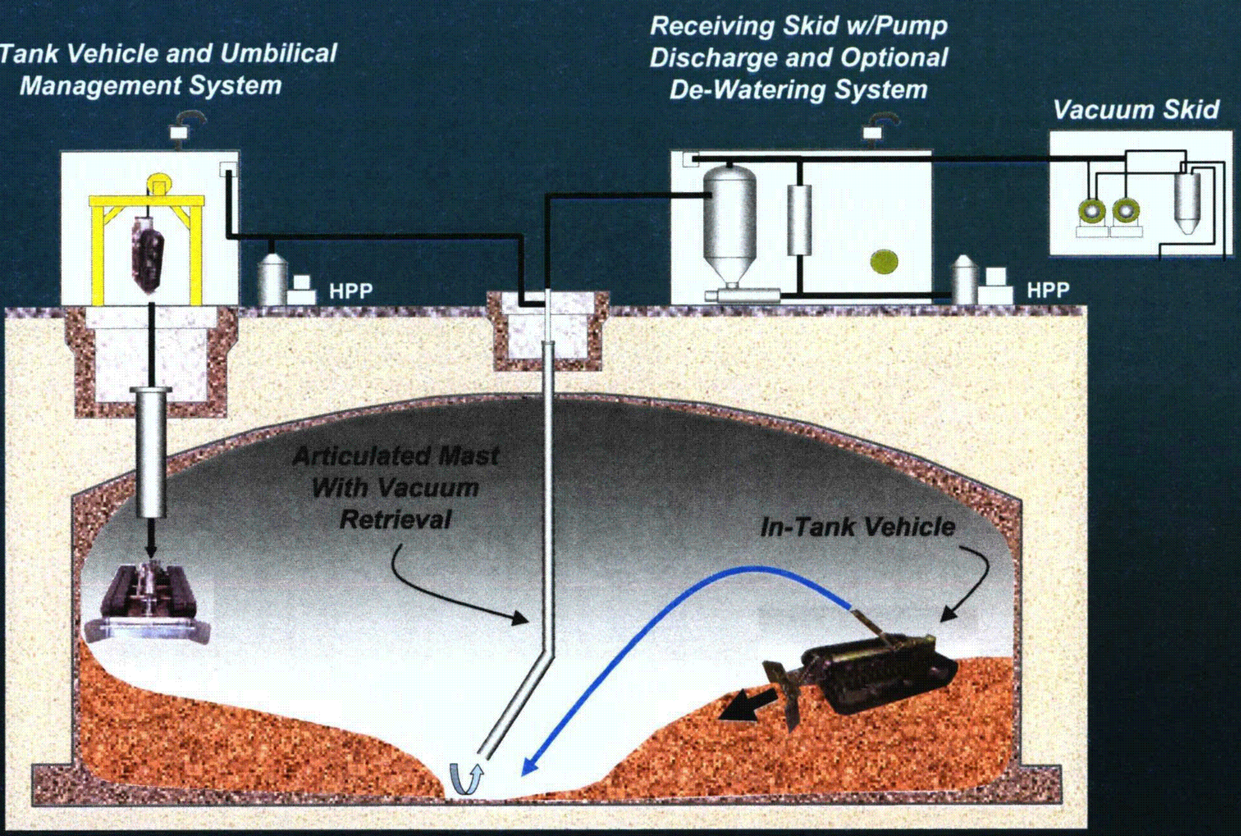
Mobile Retrieval System – Future



Articulated Mast + In-Tank Vehicle

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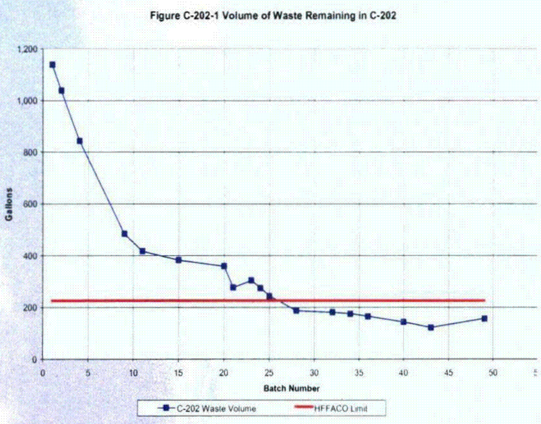
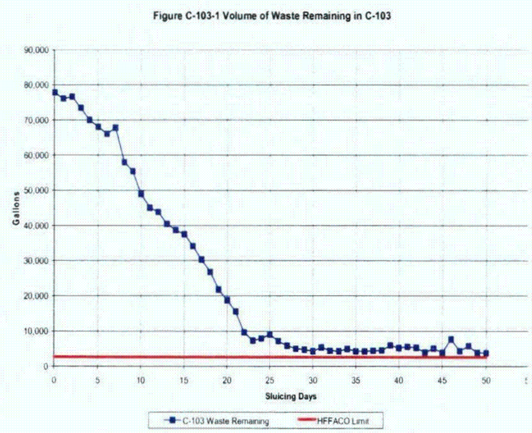
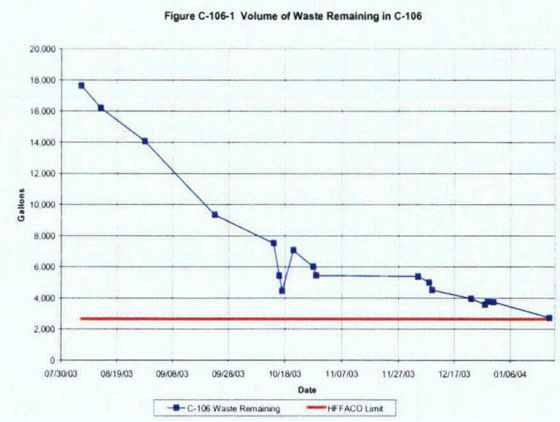
TPA Appendix H
Limit of Technology

- TPA Milestone M-45-00 sets a retrieval goal not to exceed 360 cubic feet in a 100 series tank and 30 cubic feet in 200 series tank, "or the limit of the waste retrieval technology capability, whichever is less."
- Appendix H identifies a process for exemption from the numeric goals if the limit of waste retrieval technology has been met.
- The graphs below for tanks C-106, C-103, & C-202 show that, the limit of the installed technology has been met.
- Newly identified and proved technologies would not remove more waste.







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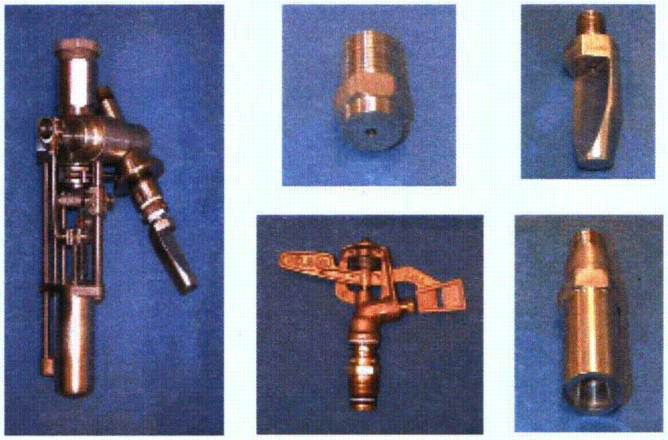
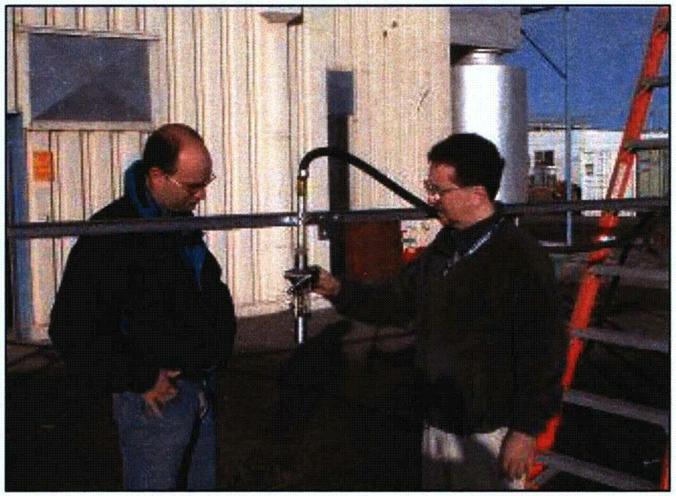
Major Retrieval Lessons Learned

- Sluicing to remove small residual volume of insoluble material depends on ability to move material to the pump
- Single nozzle sluicing system has blind spots and lower efficiency areas that prevent effective removal
- Use of hose-in-hose transfer line instead of double-encased stainless steel pipe
- Saltcake dissolution strategy important
  - Original strategy to "mine" hole near pump and work outwards abandoned when drop in specific gravity (SpG) observed
  - Strategy changed for steady removal of waste layers to control SpG with higher removal efficiency





Testing Saltcake Dissolution Nozzles

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Major Retrieval Lessons Learned (cont.)

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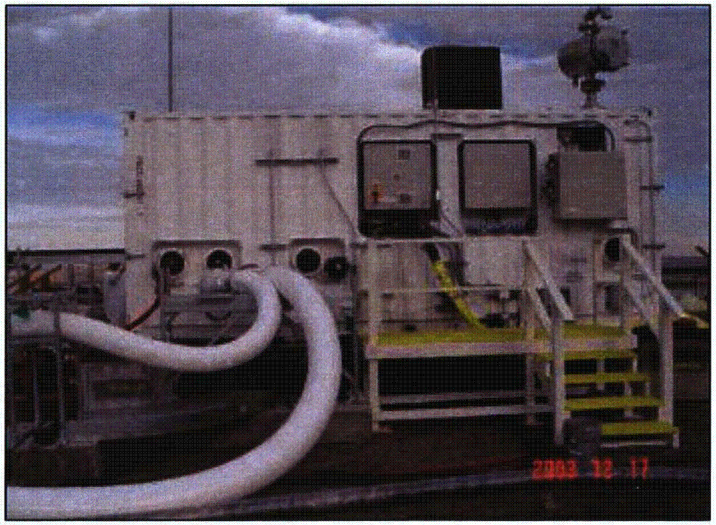
- Water temperature and pressure impacts saltcake dissolution kinetics
  - Higher water temperature compensates for heat loss due to endothermic dissolution and solubility of certain waste (e.g., sodium phosphate)
  - Higher temperature water can cause misting; impacts in-tank visibility and off-gas ventilation system operations
- Vacuum retrieval system suction impacted by hose length, bends, and low points
- Mock-up testing of retrieval systems in Hanford's Cold Test Facility important to future success



Vacuum Retrieval System

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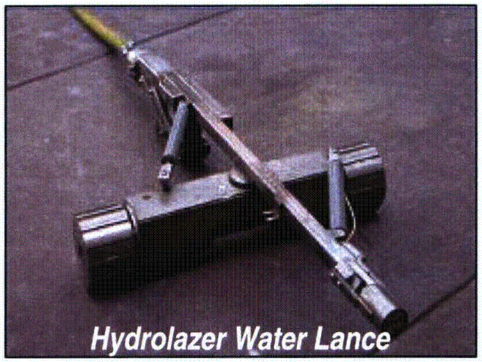
Summary

- Alternatives to "past-practice" sluicing methods successfully demonstrated
- Retrieval completed in five tanks in accordance with Tri-Party Agreement (C-106, C-103, C-203, C-202, C-201)
- Retrieval under way in three tanks (S-102, S-112, C-204)
- Retrieval system design and installation activities underway for remainder of C Farm tanks
- Incorporating "lessons learned"
- Additional Techniques and Tools Needed and under development
- Retrieval technology demonstrations conducted at Cold Test Facility (e.g., in-tank vehicle, off-riser sampler, hydrolaser water lance)


Cold Test Facility


Off-Riser Sampler


Hydrolazer Water Lance