DEEP VADOSE ZONE ACTIVITIES

HANFORD ADVISORY BOARD, RAP

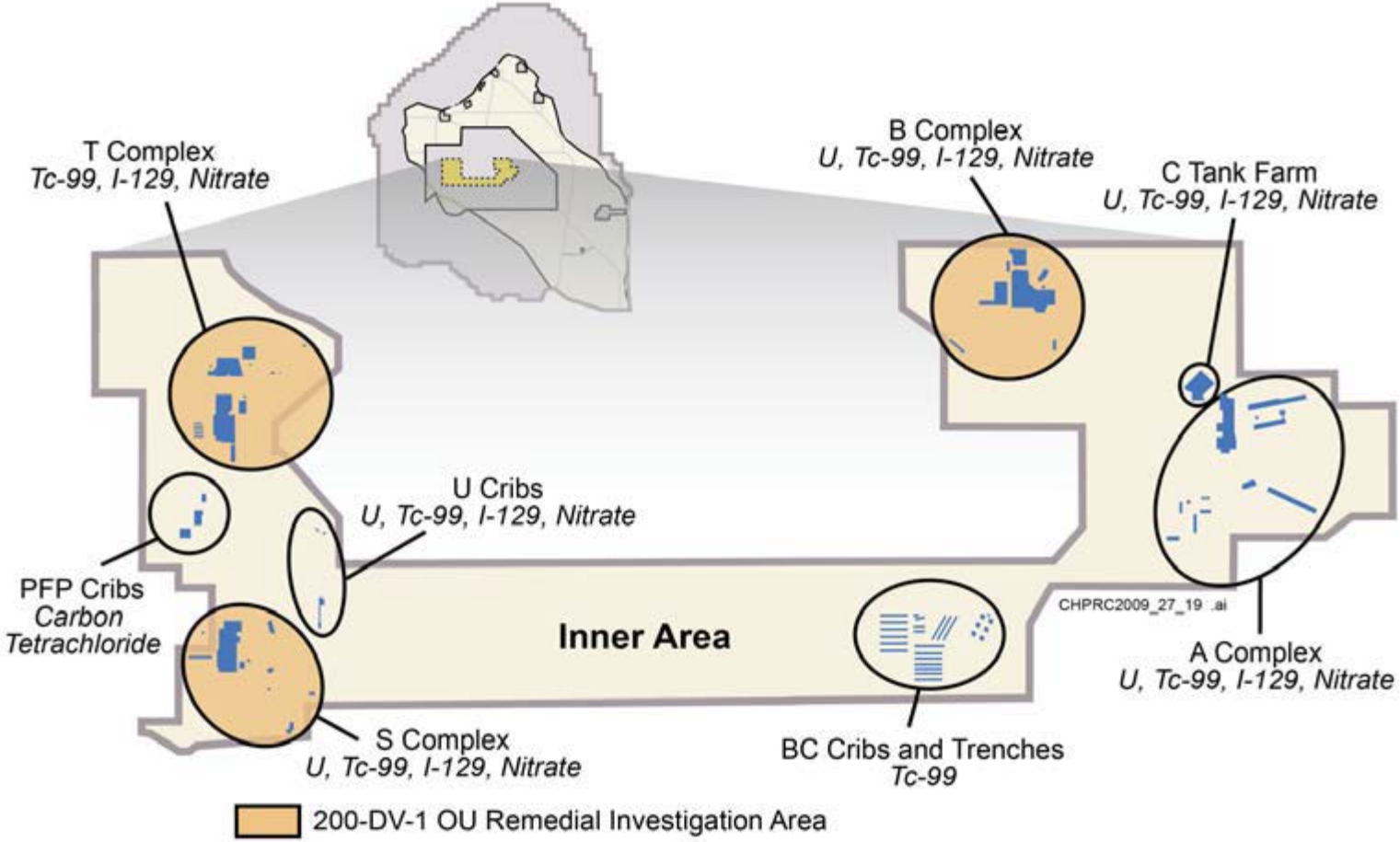
March 6, 2013

Presented by:

John Morse

U.S. DEPARTMENT OF ENERGY

Deep Vadose Zone Areas



Deep Vadose Zone Field Activities

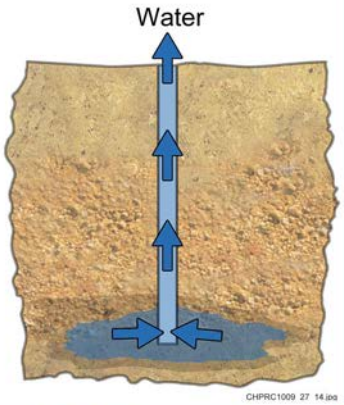
Surface Barrier Tests:
Began 2008

The intent of this technology is to stop water from moving into the vadose zone.

Perched Water Removal:

Fieldwork Began in 2011

The intent of this technology is to remove contaminated perched water.

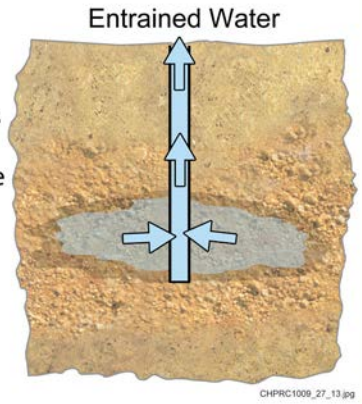


Pore Water Extraction Test:

Fieldwork planned in

FY 2014

The intent of this technology is to extract subsurface water.



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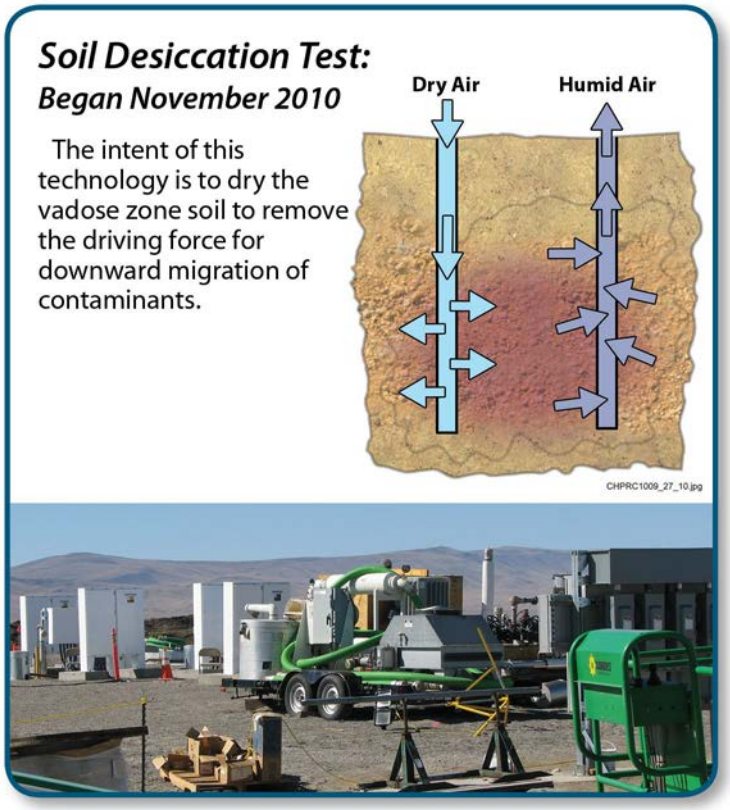
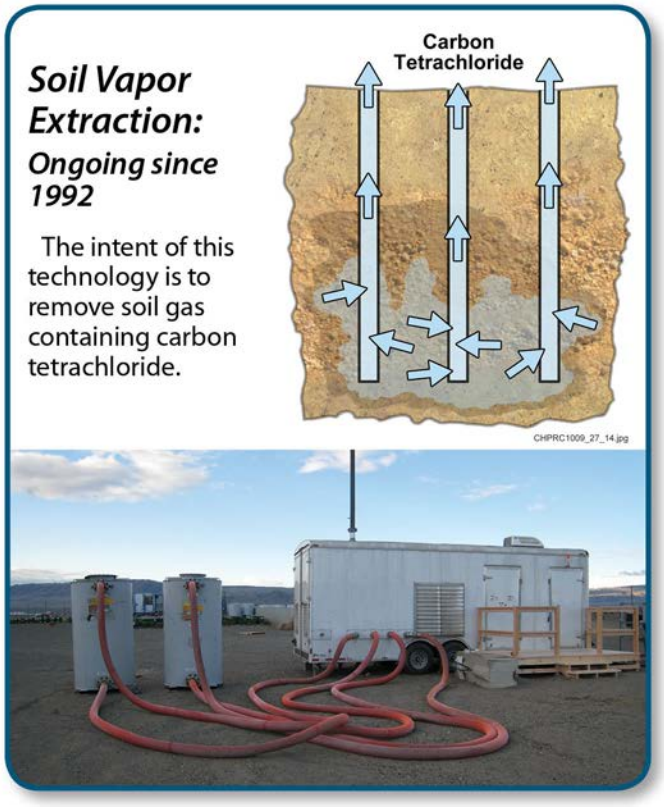
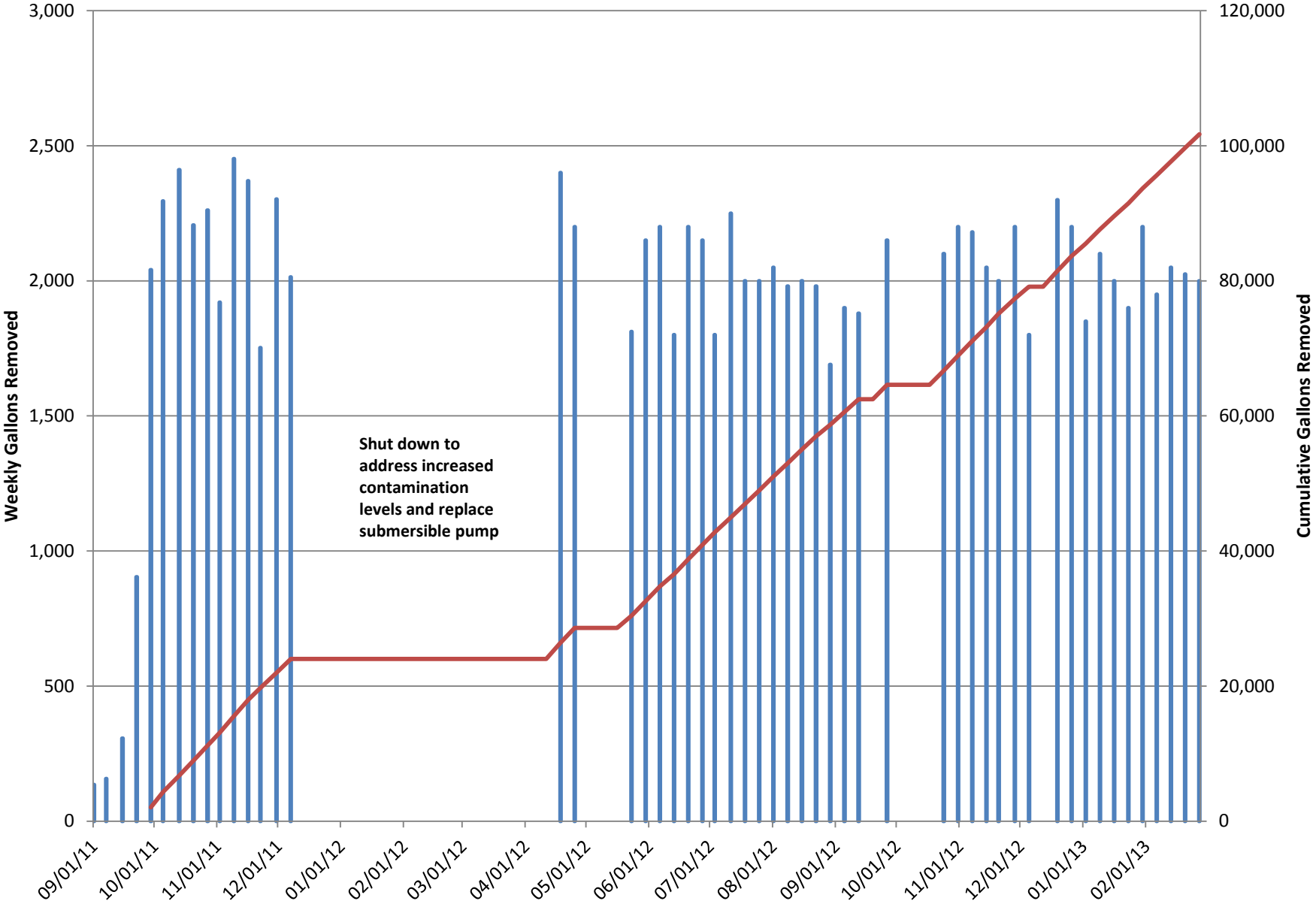
Deep Vadose Zone Field Activities, Continued

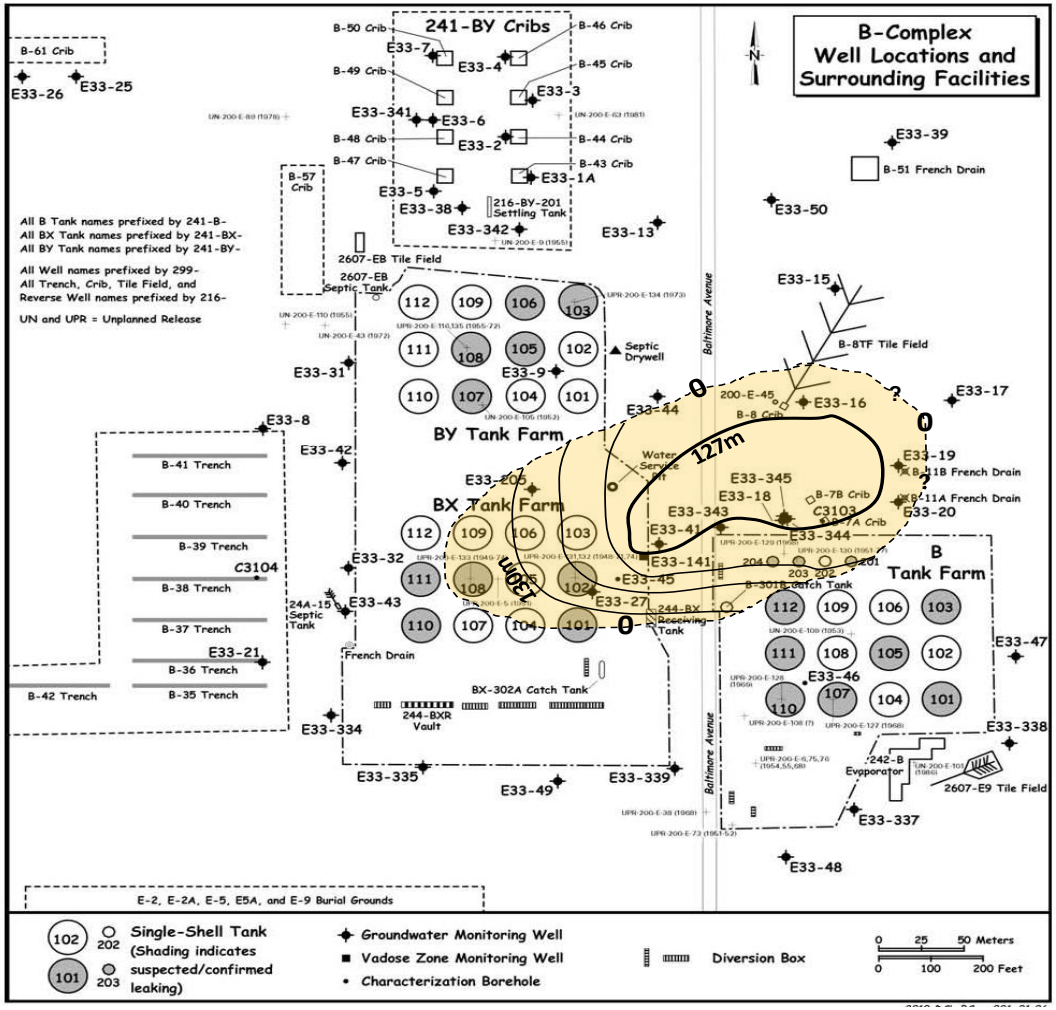




Perched Water Removal



Perched Water Zone in B/BX/BY Tank Farm Area



Structural Elevation Map – Cold Creek Unit Lower Silt/Clay

C. I. =1m

Average Concentration and Estimated Mass Removed To Date

Technetium 99	12,200 pCi/L	cumulative: 0.008 Ci
Uranium	26.6 mg/L	cumulative: 15,757 g
Nitrate (nitrate)	522 mg/L	cumulative: 201,168 g

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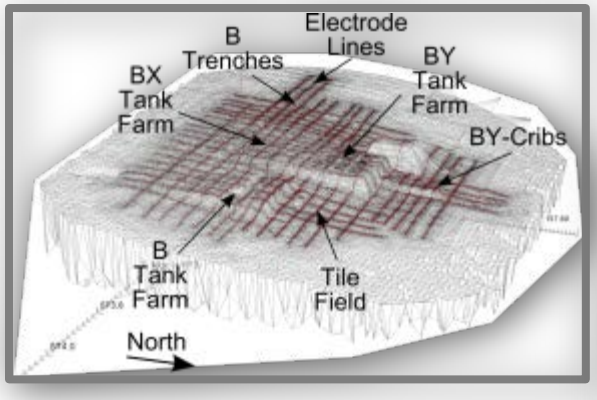
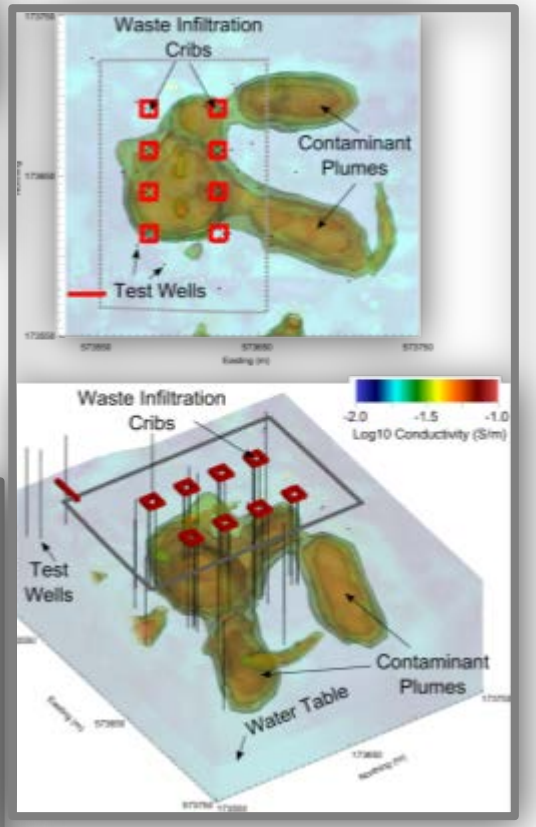
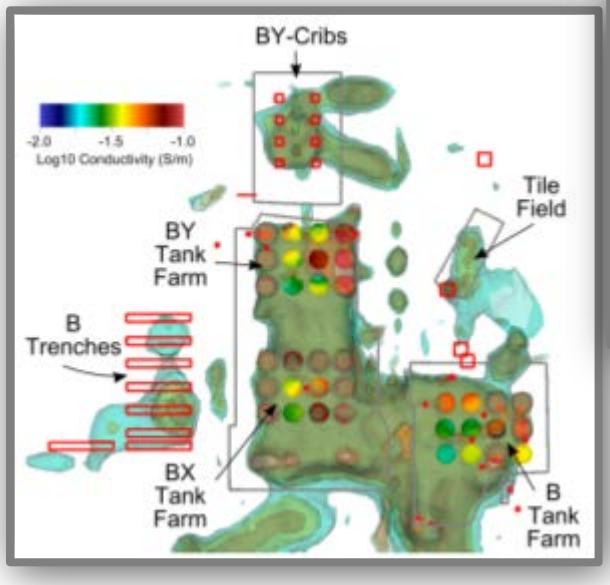
- **Challenge:** Locate and define the extent of subsurface contamination
- **Approach:** Develop advanced geophysical imaging technologies to enable remote, high-resolution 3D imaging of vadose zone contaminant plumes
- **Impact:** Improve understanding of contaminant distribution enabling efficient, targeted investigation and cleanup strategies







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Prepared for the U.S. Department of Energy under Contract DE-AC05-76RL01830

PNNL-21326

Treatability Test Report: Characterization of Vadose Zone Carbon Tetrachloride Source Strength Using Tomographic Methods at the 216-Z-9 Site

MJ Truex
KC Carroll
VJ Rohay
RD Mackley
KR Parker

September 2012

Pacific Northwest NATIONAL LABORATORY

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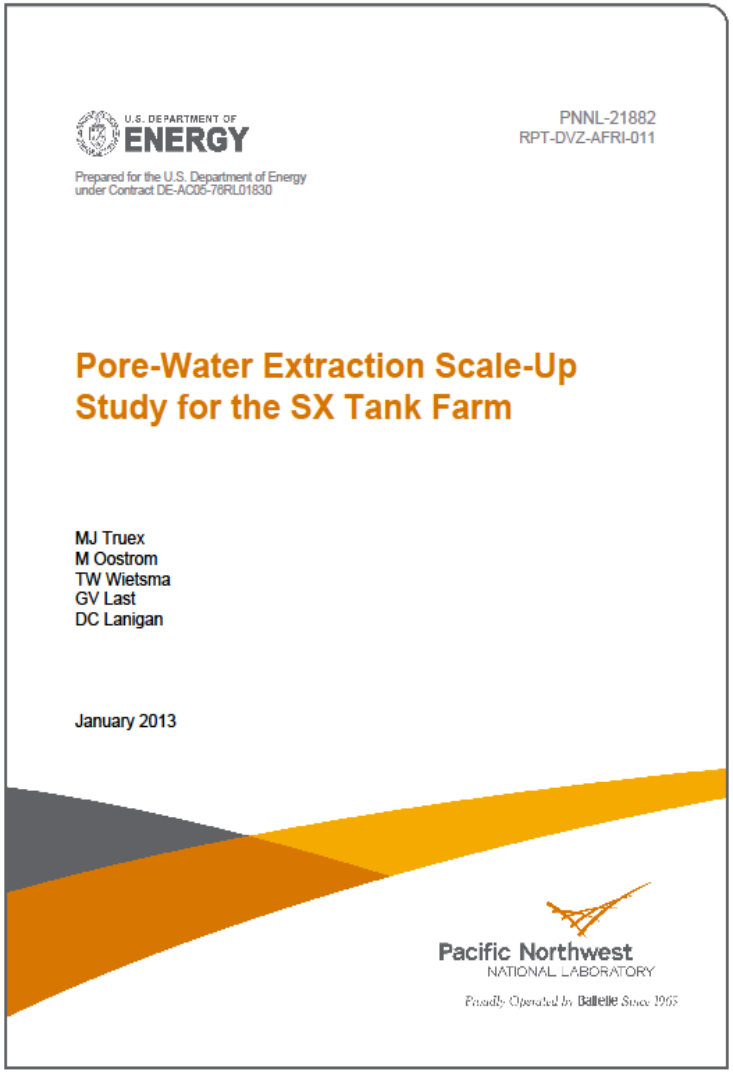
DOE/RL-2012-34
Revision 0

Deep Vadose Zone Treatability Test for the Hanford Central Plateau: Soil Desiccation Pilot Test Results

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

U.S. DEPARTMENT OF ENERGY | Richland Operations Office
P.O. Box 550
Richland, Washington 99352

Approved for Public Release; Further Dissemination Unlimited



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Prepared for the U.S. Department of Energy under Contract DE-AC05-76RL01830

PNNL-21882
RPT-DVZ-AFRI-011

Pore-Water Extraction Scale-Up Study for the SX Tank Farm

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GV Last
DC Lanigan

January 2013

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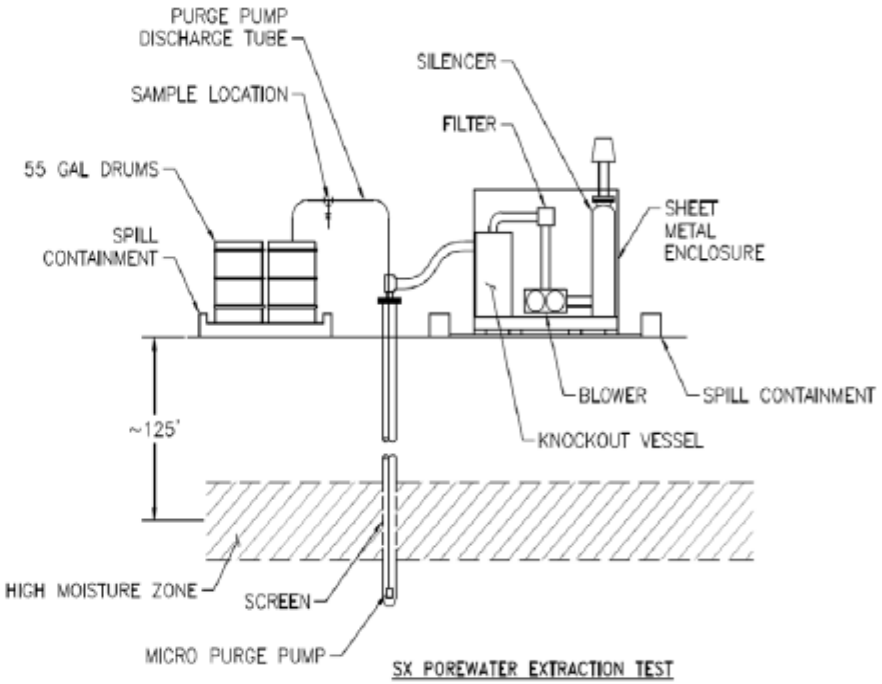
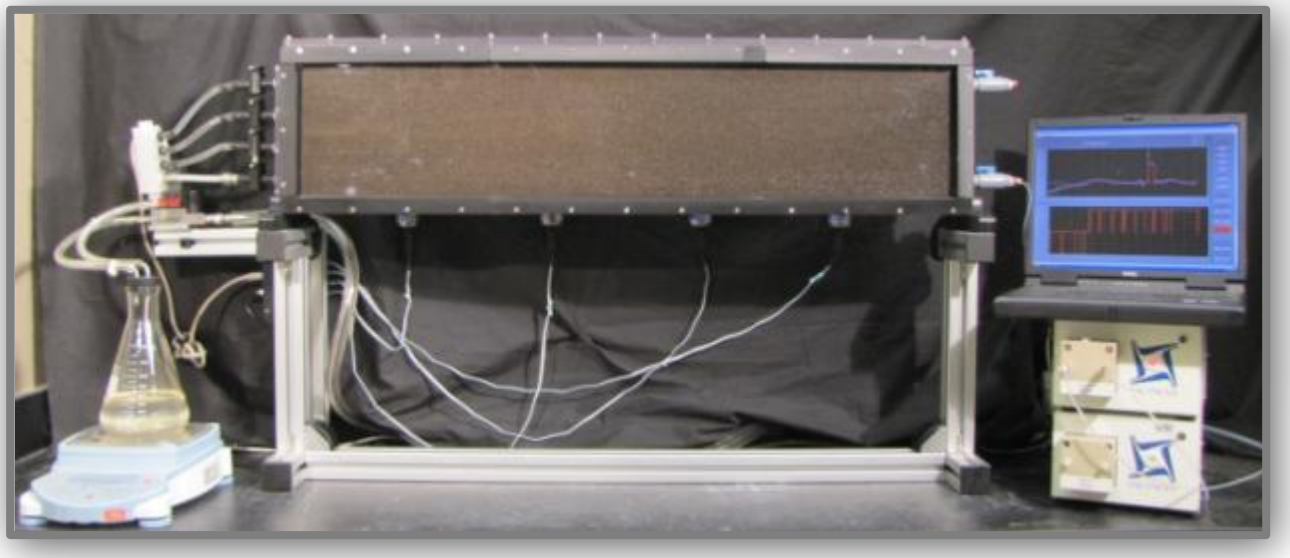
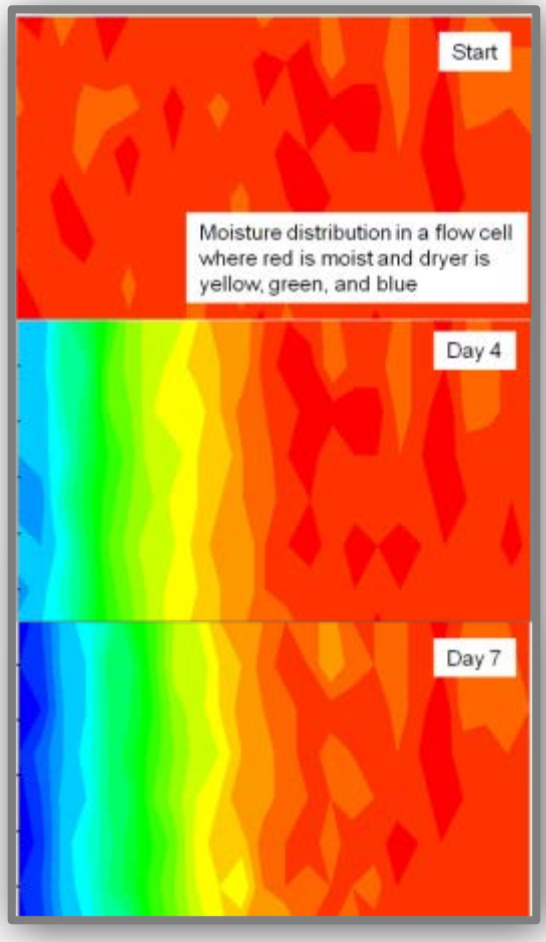
SX Pore Water Extraction Test

- Test will use vacuum to remove contaminated pore water from sub-surface soil.
- Will determine if pore water extraction is feasible for soil remediation using tank farm deployable equipment and techniques.
- Proof of principle test is underway and scheduled to complete 2014.
- Being performed south of SX Farm in an area of known vadose zone contamination

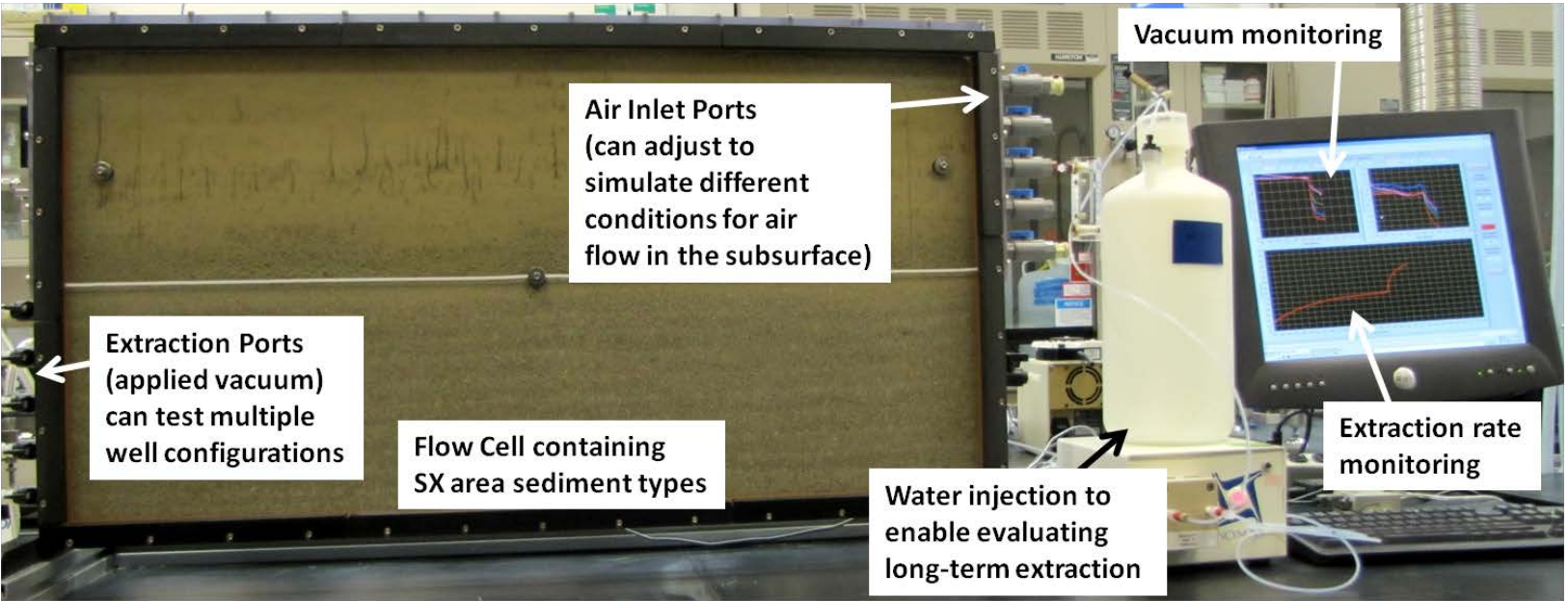


- **Challenge:** Remove highly mobile contaminants for moderate water content areas in the vadose zone to protect groundwater
- **Approach:** Provide the scientific and technical understanding to implement vacuum extraction or use wicking materials in a well to remove contaminated water out of the vadose zone where a standard pump such as used for groundwater cannot be used
  - Quantify efficacy of vacuum extraction to remove a portion of the water from different types of sediments
  - Demonstrate performance of wicking material to remove a portion of the water from different types of sediment
- **Impact:** Demonstrated pore water extraction in the laboratory and provided a scientific and technical basis for removing water and associated mobile contaminants from the vadose zone as a potential treatment option





- **Challenge:** Provide appropriate data and analysis to support design of a field test for pore water extraction near the SX Tank Farm
- **Approach:** Experiments and modeling are being conducted for SX Tank Farm conditions to
  - Quantify the rate and extent of water removal under different operational conditions for SX Tank Farm sediments.
  - Evaluate the impact of sediment and moisture heterogeneity on water removal effectiveness
  - Evaluate candidate test configurations in terms of extraction well design, monitoring network, and predicted performance based on SX test site characterization data.
- **Impact:** Support contractor efforts to design an appropriate system for field implementation of pore-water extraction in a Tank Farm



Next Steps

- Finalize field test location
- Continue flow cell testing and modeling supporting field test optimization (Pacific Northwest National Lab)
- Design/procure extraction equipment
- Install extraction well(s) and monitoring sites
- Finalize test protocol
- Perform test
- Determine effectiveness and potential applicability for scale-up and application in tank farms.