HNF-42282-VA
Revision 0

Reevaluation of the Permeable Material at the Base of the Unconfined Aquifer near LERF, Hanford Site, Washington

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

Contractor for the U.S. Department of Energy
under Contract DE-AC06-08RL14788

CH2MHILL
Plateau Remediation Company

P.O. Box 1600
Richland, Washington 99352

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J. L. Smoot
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J. L. Smoot 10/22/2009
Release Approval Date

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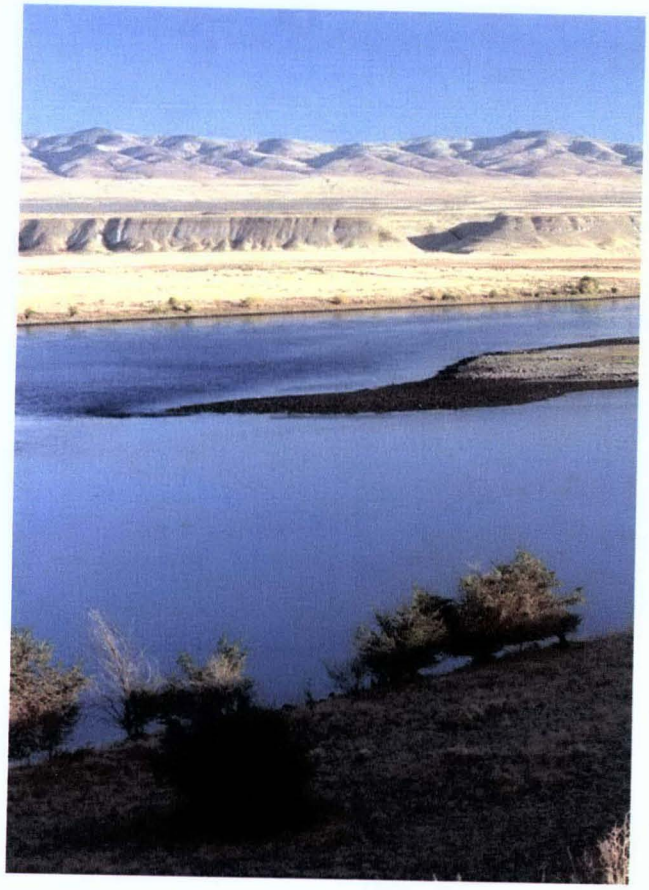

Reevaluation of the Permeable Material at the Base of the Unconfined Aquifer near LERF, Hanford Site, Washington

Presented to: Geological Society of America Annual Meeting, Memorial Session for Dr. Roy Williams

By: John L. Smoot and R. Doug Hildebrand

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One Culture. One Team.

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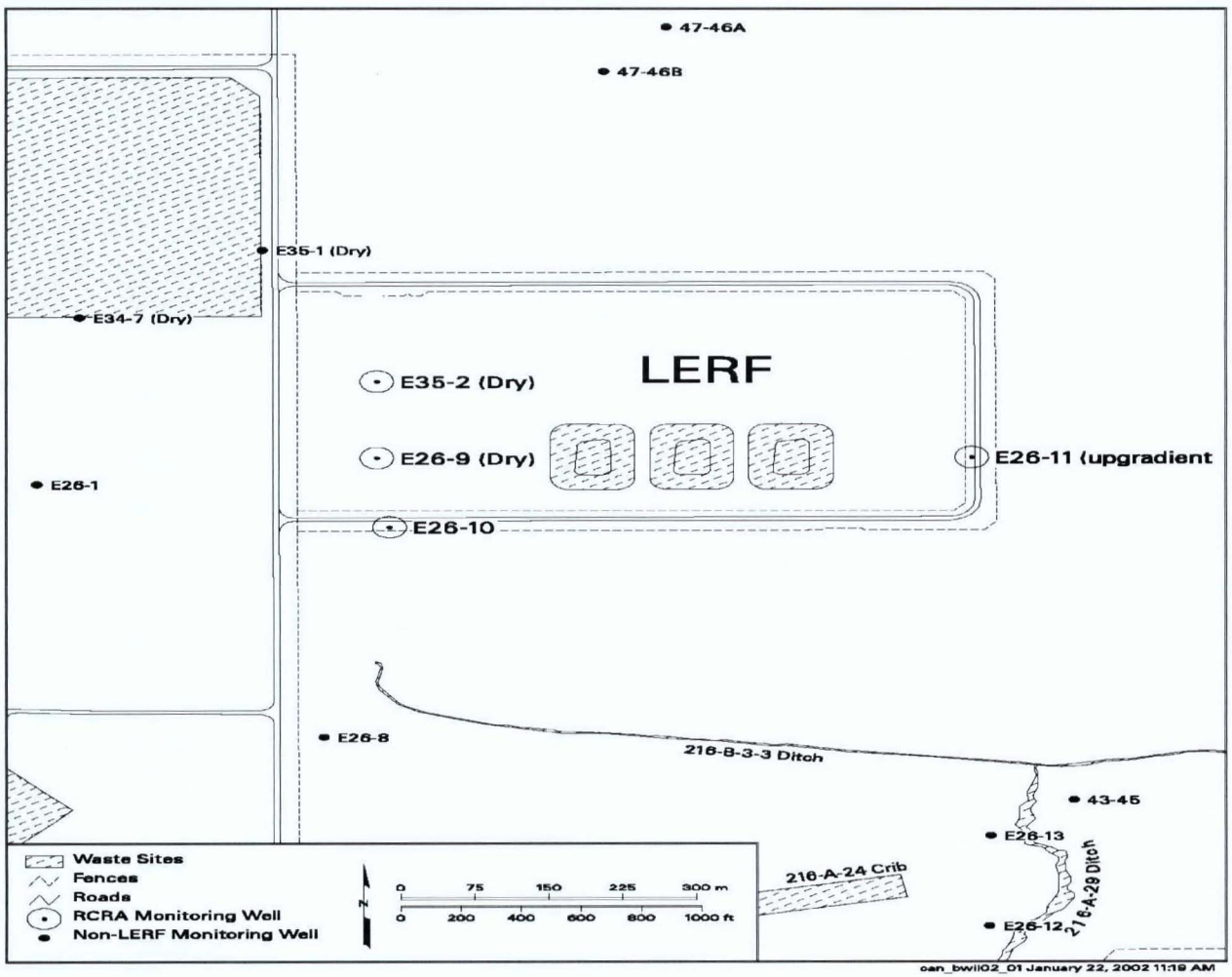
CHPRC0910-20

Introduction

- Things Roy would appreciate about Liquid Effluent Retention Facility (LERF) hydrogeology:
  - Apparently simple problem with some complexities
  - Plight of field hydrogeologist
  - Basalt Waste Isolation Project (BWIP) angle
  - Resource Conservation and Recovery Act of 1976 (RCRA)
- What is a LERF?

Liquid Effluent Retention Facility



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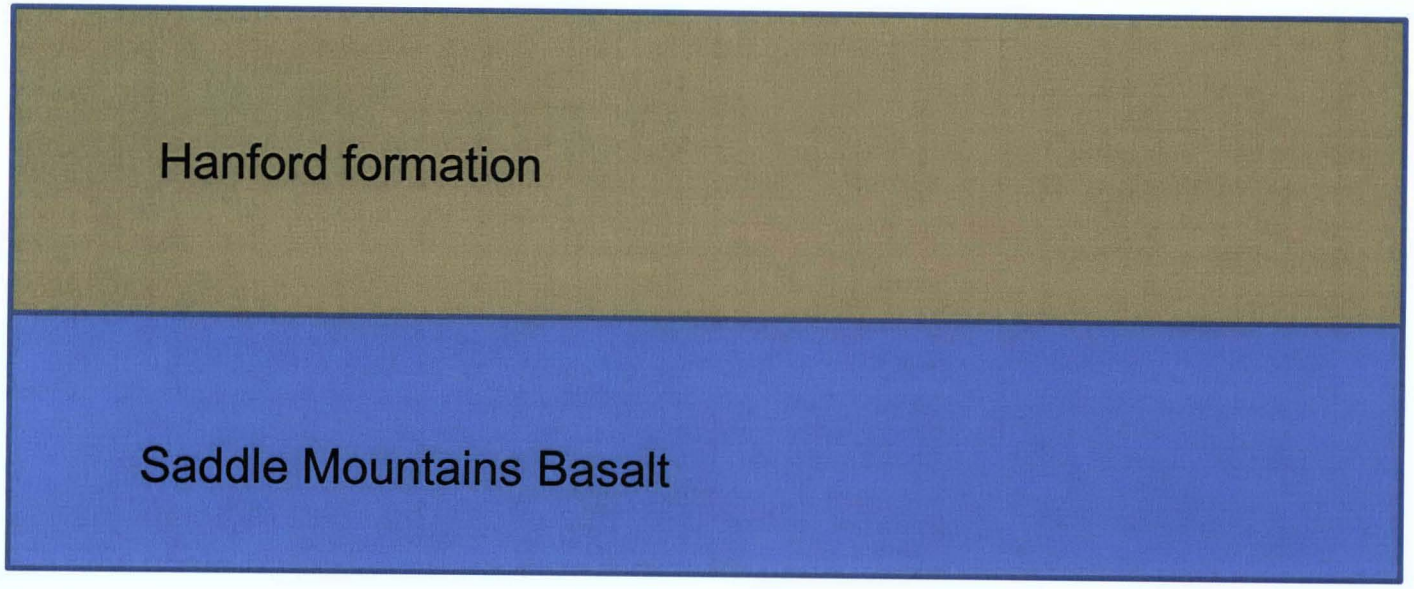
Basic Geology

- **Hanford formation overlying basalt with horizontal contact**



Developed Evaluation Plan

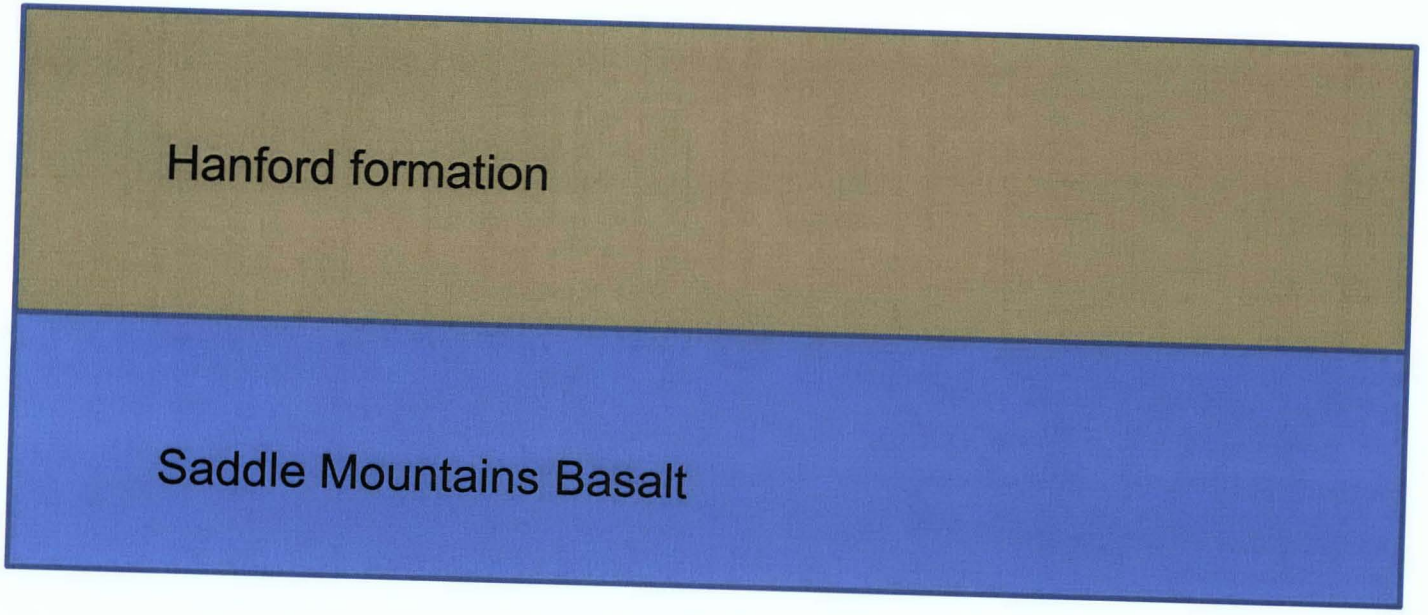
- Collaborative effort among U.S. Department of Energy, Washington State Department of Ecology, and U.S. Environmental Protection Agency to develop and answer study questions:
  - "What are the thickness, extent, and continuity of the uppermost aquifer that is continuous under the LERF basins and capable of yielding representative samples?"
  - "What are the geologic and/or stratigraphic characteristics of the continuous uppermost aquifer under the LERF basins?"
  - "What are the hydrologic properties of the aquifer?"
  - "What are the groundwater flow rates and directions in the aquifer?"

Back to Basics

- "An aquifer is a formation, group of formations, or part of a formation that contains sufficient saturated permeable material to provide significant quantities of water to wells and springs." (user defined)
- Look more closely at basalt under LERF

Basalt Surface

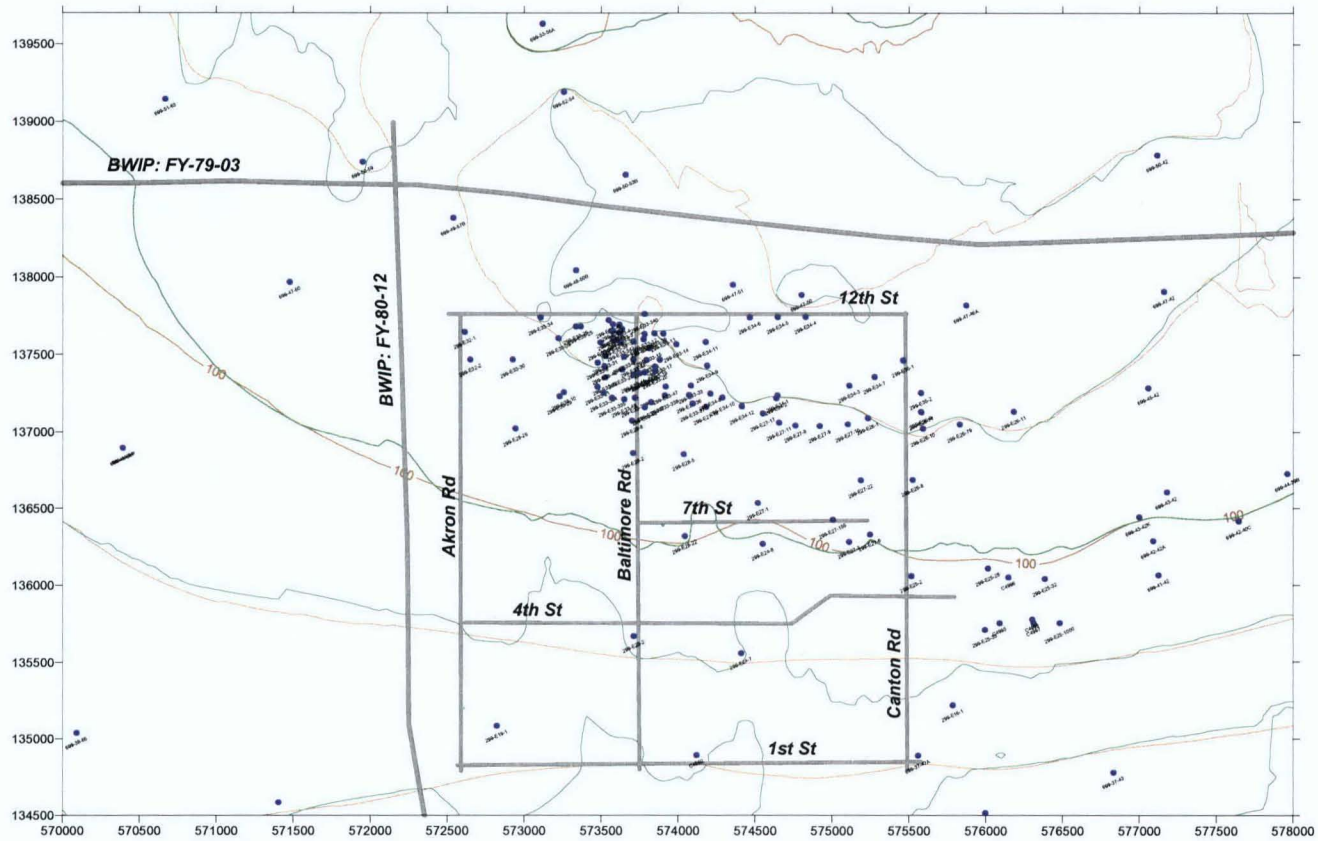
- **Original cross section**



Basalt Surface

- **Structural contour map (top of basalt)**

Basalt Elevation (Green: Wells and Seismic) (Brown: Wells Only)



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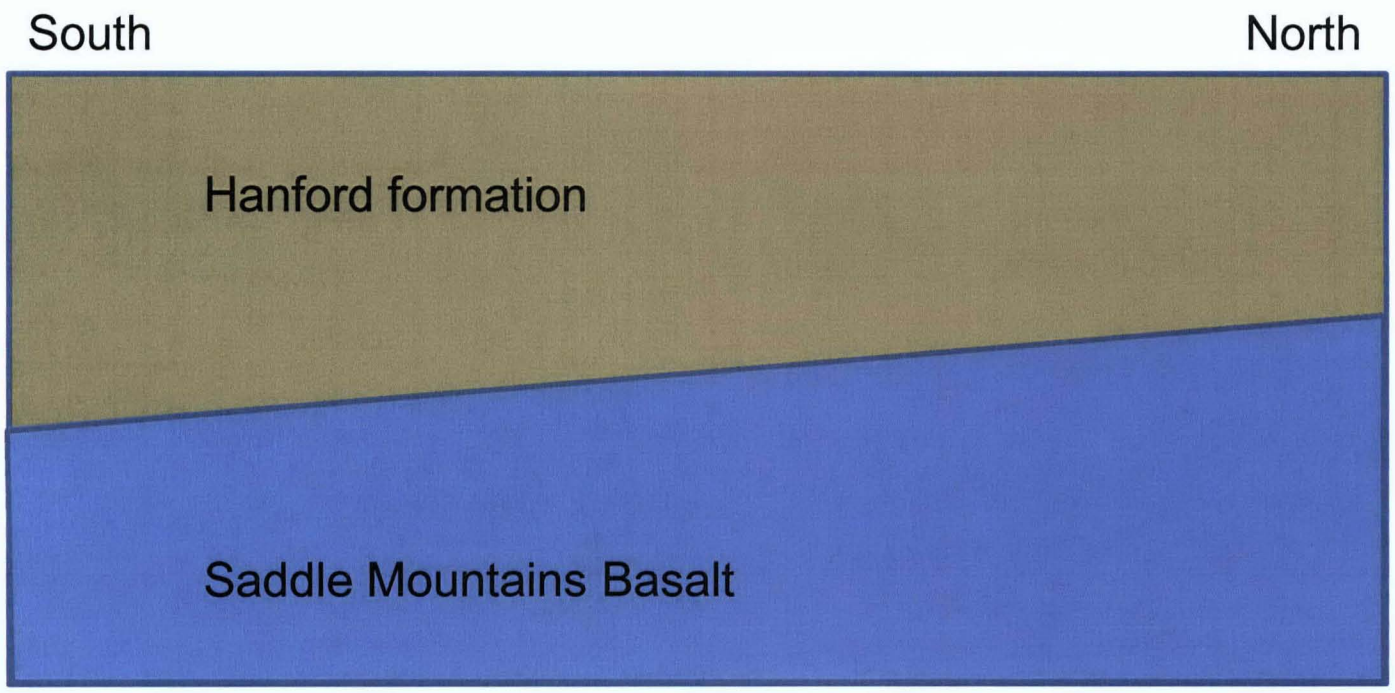
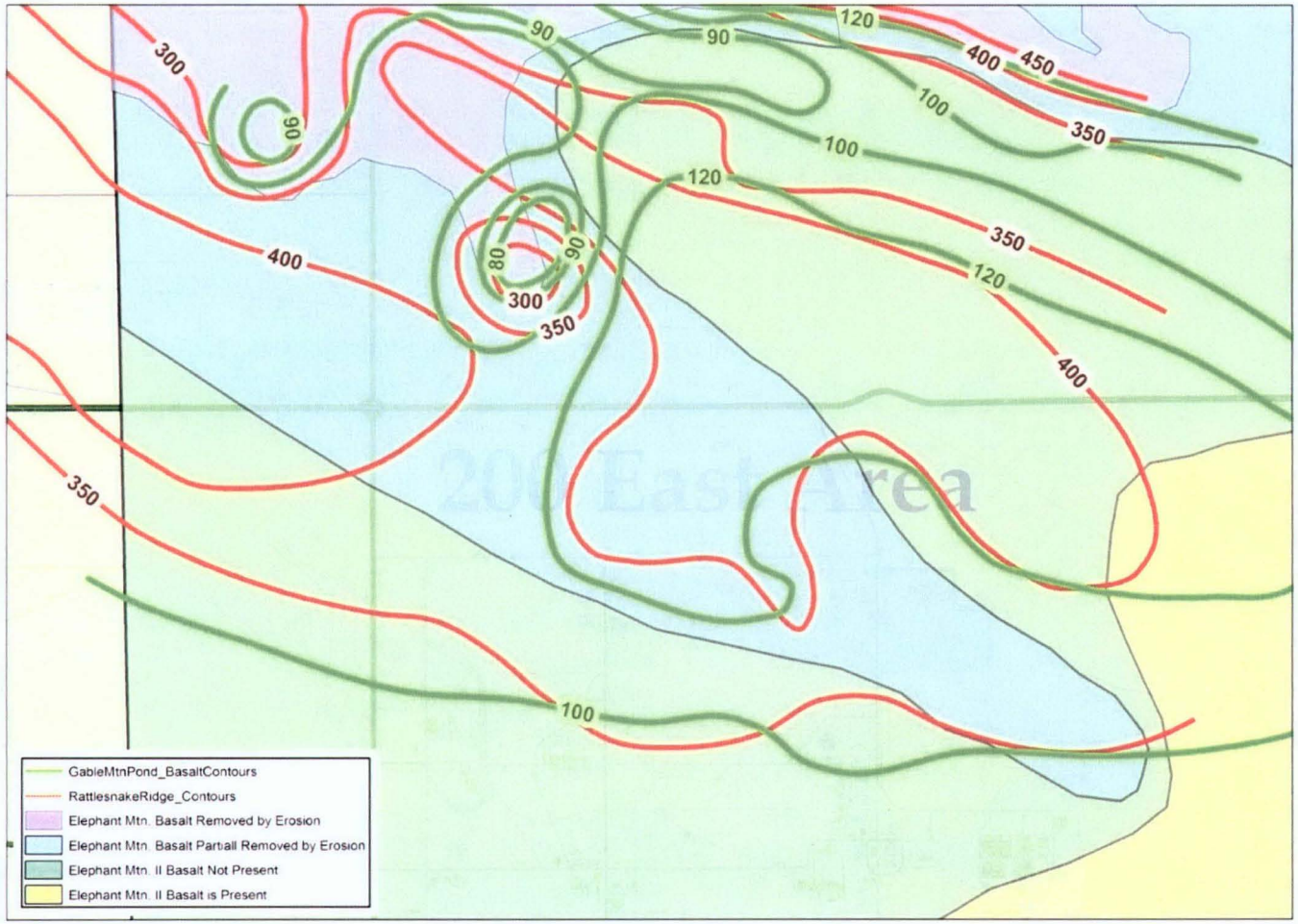
Basalt Surface: Dipping South



Basalt Surface: Analogues

Drumheller Channels near Othello, Washington

BWIP Information



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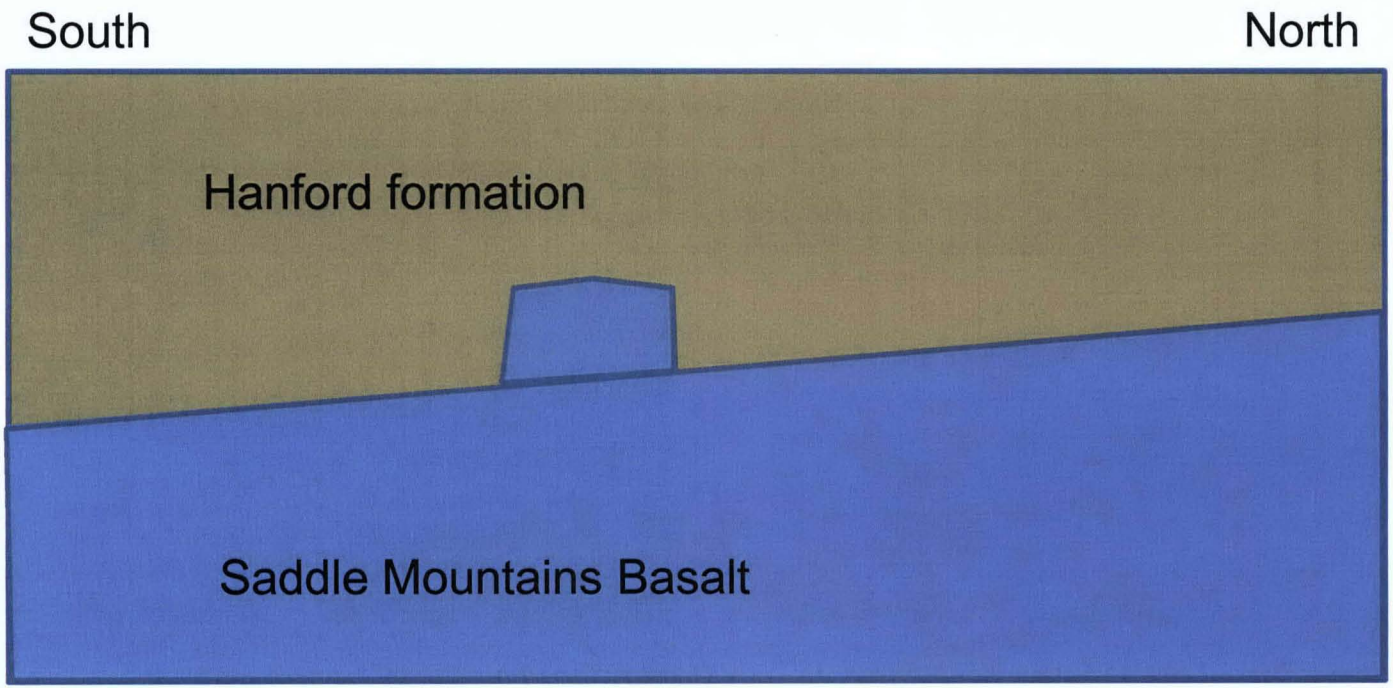
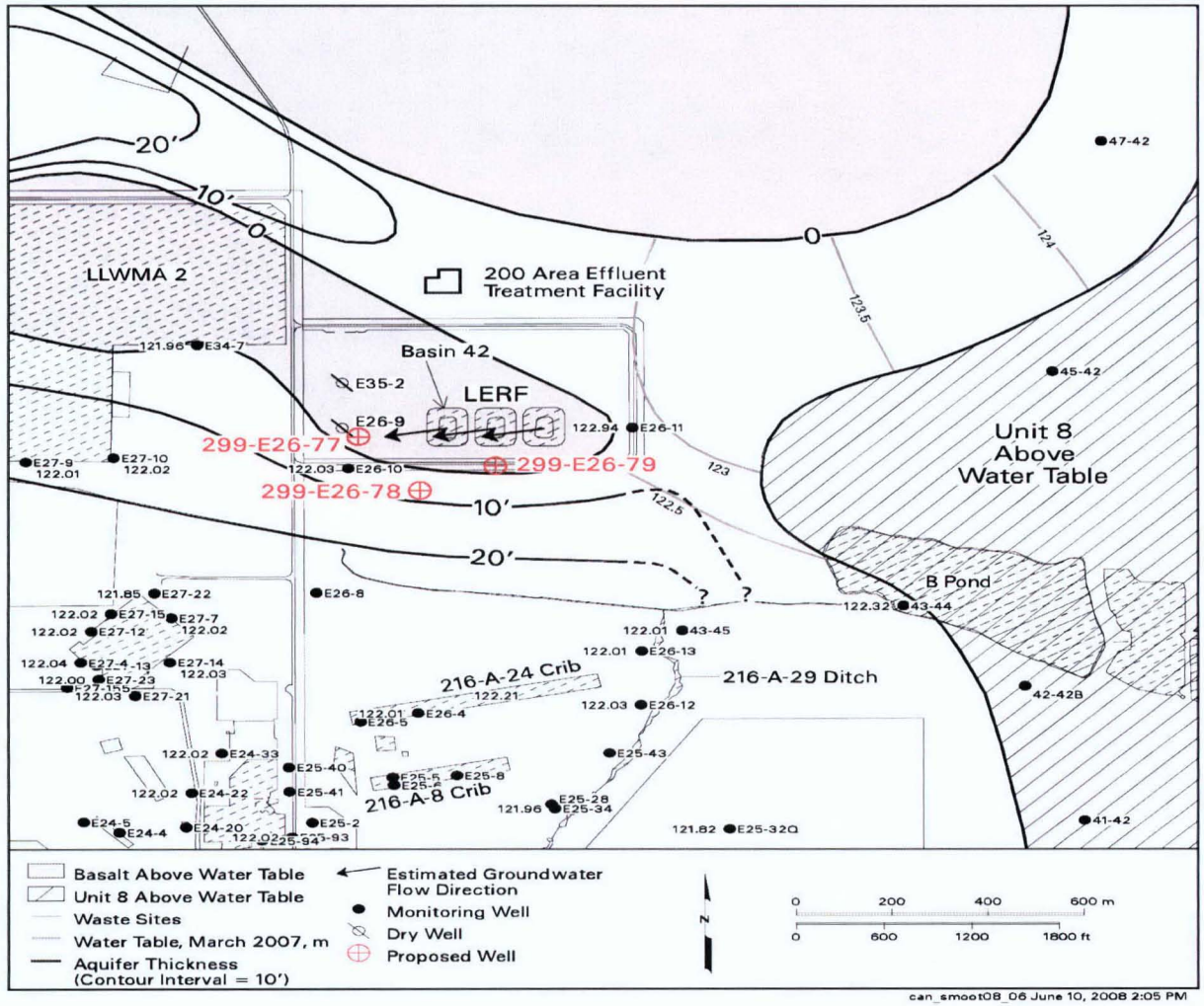
Basalt Surface: Erosional Remnant



Drilled Some New Wells



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Well Summary

- 299-E26-77 and 299-E26-79, not 299-E26-78
  - 6 - 8 gallons per minute
  - Slug tests
  - Hydraulic conductivity of 10 - 20 meters per day
  - Basic chemistry similar
  - Need:
    - Long-term pump test
    - Tracer test

Conclusions

- LERF at an interesting location where water table intersects zone of geologic interest
- Able to extend definition of unconfined aquifer to include uppermost flow top of Elephant Mountain Member, Saddle Mountains Basalt
- Reestablishing RCRA permit at LERF