Application of Geophysical Methods for Characterization and Monitoring of Properties Controlling Flow and Transport in the Vadose Zone at Hanford

E.L. Majer

S.S. Hubbard, K.H. Williams, J.E. Peterson

Critical Issues

- **Heterogeneity**
  - i. **Physical, chemical.**
  - ii. **Scale of importance.**

- **Scaling**

  Extrapolating/Interpolating from pore to field.

- **Integration**

  Interpret geophysical data in terms of flow and transport parameters.

Radar Scoping Studies
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(1.) Infiltration site, 6 lines (100 MHz., 200 MHz.).

(2.) Scission & Lu site, 8 lines (100 MHz., 400v + 1000v).

(3.) ILAW, 2 lines (100 MHz., 1000v).

(4.) Clastic Dyke, 5 lines (100 MHz., 200 MHz.).

(5.) FRC site, 2 lines (100 MHz., 1000v)

Conclusion: Penetration from 10 to 15 m at 100 MHz. Resolution ? 1/4 meter. 200 MHz. maximum for depth desired. Crosswell most useful for infiltration studies.

Current Candidates

(Assuming Geology Similar/Same as Site)
(Capture Different Scales of Heterogeneity, P&C)

(1.) Electrical
- Scaled Approach.
- Surface Radar, Crosswell Radar.
- Crosswell EM, ERT.

(2.) Seismic
- Surface Wave (MASW).
- Crosswell Seismic (P&S, 9c).

(3.) Couple/Deploy with C.P.T. & Core Studies.

(4.) Correlate with outcrop, logging and thermal IR.

(5.) Integrated analysis and time lapse changes.

Summary

(1.) Need to deploy methods that will sample different scales of properties.

(2.) Surface methods will be useful for broad scale and extrapolating to operational needs.

(3.) Borehole methods will be necessary to investigate smaller scale processes.

(4.) Will need to “over characterize” to investigate “physics” of processes, versus “operational” applications.

(5.) Must integrate with flow and transport models and experiments.