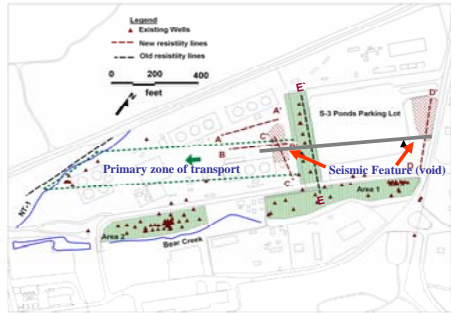


# Geophysical Characterization and Monitoring at the DOE FRC, Oak Ridge 2002-2005

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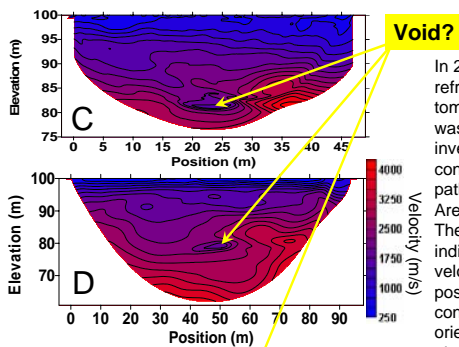


## Areas 3, 4 and 5 Resistivity and Seismic

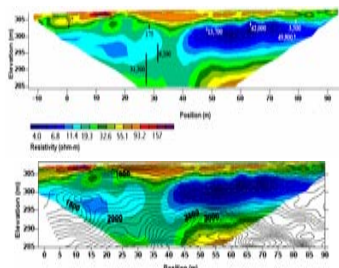
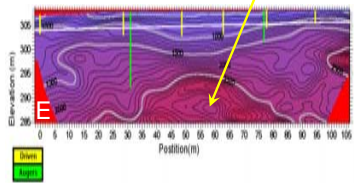


Time lapse EM logs, Area 3

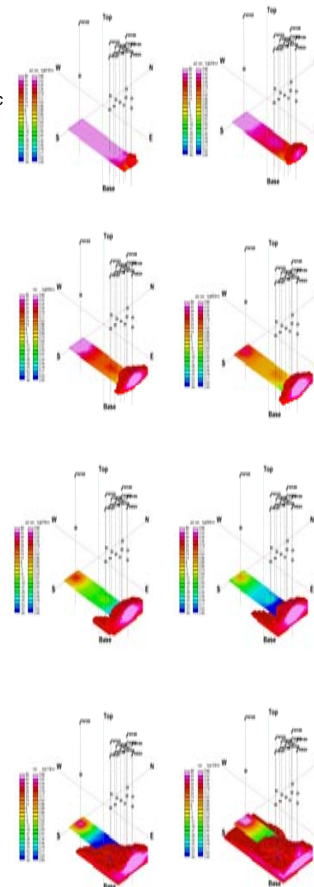
Ten wells were logged repetitively over a one-week period with an EM-39 borehole conductivity logger to monitor the movement through time of a dilute KCl solution. The solution was injected in well 24 and displaced highly conductive nitrate rich fluids. The logs showed a steady increase in the zone of increased resistivity as conductive fluids were displaced near the injection well. The resistivity pattern agreed with the flow direction and dip of the geological strata.



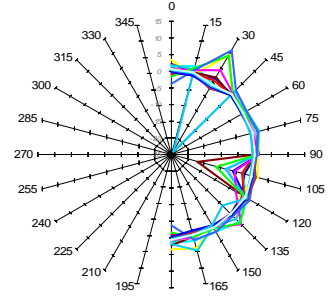
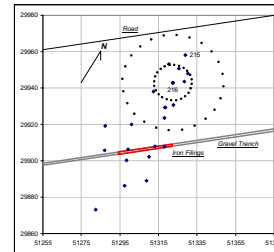
In 2004, seismic refraction tomography was used to investigate contaminant pathways near Areas 1 and 3. The data indicate a low velocity zone, possibly a conduit, oriented along geologic strike.



Seismic refraction tomography and Multi-electrode resistivity have been used to define the nitrate plume and geologic setting at Area 3. These data have been shown to correlate well with well logs and depths of refusal.



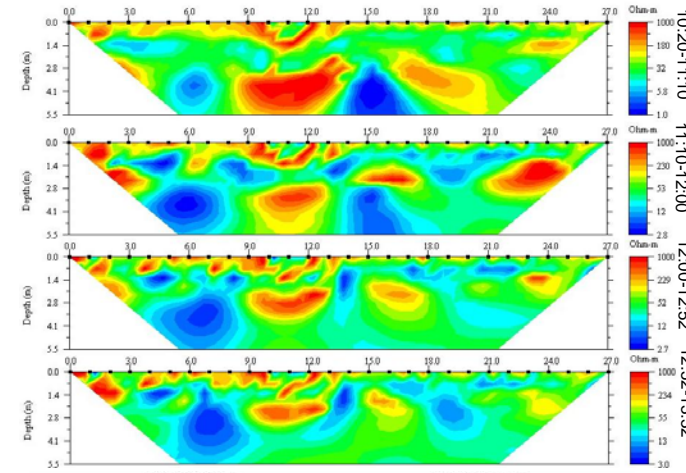
## Area 2 Resistivity



2004 Time-lapse Azimuthal Resistivity

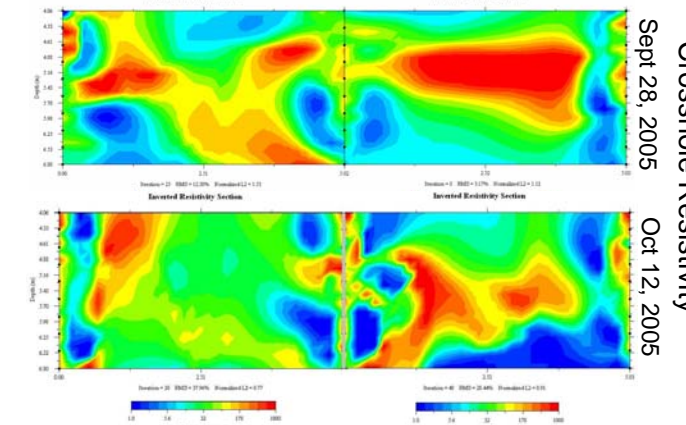
To define the preferential flow direction, azimuthal resistivity data were measured repeatedly over a 5-day period during a flow test. Bromide was injected at ~400 mg/L at a rate of 0.5 L/min for 24 hours followed by 24h at 3 L/min. Two significant flow directions became apparent.

## 2005 Bromide-Ethanol Injection (Sept. 28 – present)



Surface Resistivity (taken Oct 12, 2005)

Surface resistivity results from consecutive collection before, during and after a one hour injection test that was started at 11:15, or just after the data for the second profile started to be collected.



Crosshole Resistivity (taken Sept 28, 2005 and Oct 12, 2005)

Crosshole resistivity results from September 28<sup>th</sup>, the first day of injection and October 12.