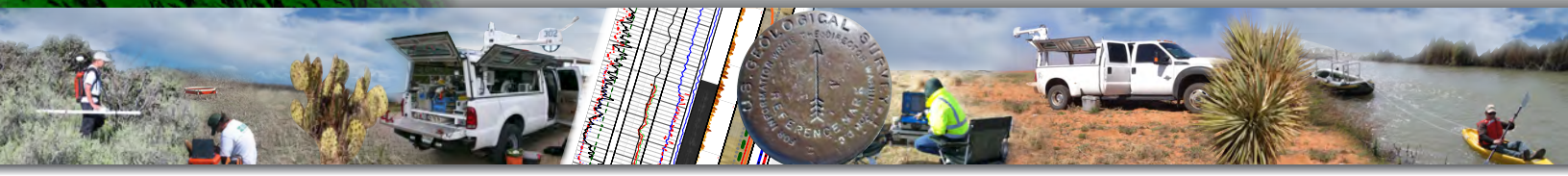
Texas Water Science Center Geophysics

Capabilities, Methods, and Applications



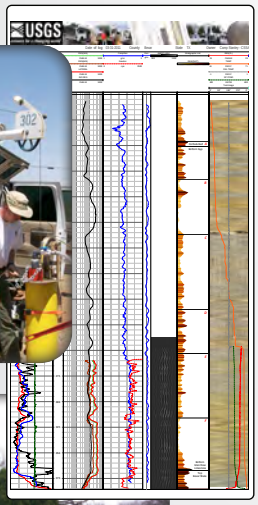
Borehole and Surface Geophysics

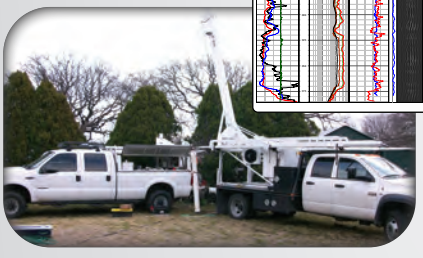
The United States Geological Survey (USGS) Texas Water Science Center (WSC) collects, processes, and analyzes borehole and surface geophysical data to address local scale studies and to incorporate, with data from other disciplines, broader regional and national-scale studies. Texas WSC has a full suite of geophysical tools capable of collecting a wide range of geophysical parameters using multiple methods. This information sheet outlines the capabilities, methods, and applications of geophysical data used by the Texas WSC.

Borehole Geophysical Capabilities

- Study design
- Data collection, processing, and interpretation
- Borehole geophysical logging
- Simultaneously running multiple geophysical logging units
- Hydraulic property calculation and analysis
- Acoustic processing and analysis
- Conceptual-model development
- Nuclear logging and analysis
- Groundwater/surface-water interaction
- Freshwater/saline-water transition zone delineation
- Fracture analysis

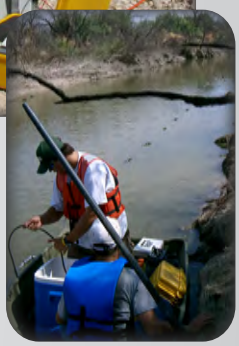
- Electromagnetic Flowmeter
- Heat-Pulse Flowmeter
- Acoustic Televiewer
- Compensated Density
- Single Point Resistance
- Optical Televiewer
- Casing Collar Locator
- Normal Resistivity
- Electromagnetic Induction
- Neutron - Porosity
- Guard Resistivity
- Fluid Resistivity
- Full Wave Sonic
- Fluid Conductivity
- Temperature
- Porosity
- Natural Gamma
- Pressure
- Caliper





Surface Geophysical Capabilities

- Study design
- Data collection, processing, and interpretation
- Non-intrusive data collection
- Leakage potential along canals and streams
- Groundwater/surface-water interaction
- Freshwater/saline-water transition zone delineation
- Conceptual model development
- Near-surface fracture development
- Hydrostratigraphic characterization
- Near-surface fracture and void detection



- Self-Potential
- Magnetometer
- Induced Polarization
- Direct-Current Resistivity
- Ground-Penetrating Radar
- Magnetic Resonance Sounding
- Time-Domain Electromagnetics
- Capacitively Coupled Resistivity
- Frequency Domain Electromagnetics
- Waterborne Direct-Current Resistivity

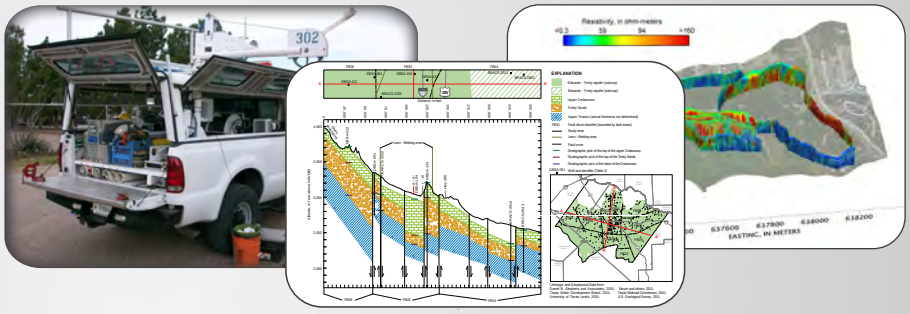
Geophysical Applications

Hydrostratigraphic Characterization and Mapping

Borehole and Surface Geophysical data
Interpretation of borehole and surface geophysical data together improves the ability to accurately interpret the data at a local scale and identify thin hydrostratigraphic units. Once hydrostratigraphic units and physical properties of the units have been interpreted, additional analyses can be made at the study site such as fluid or plume movement, water storage, saline-water intrusion, and groundwater/ surface-water interaction.

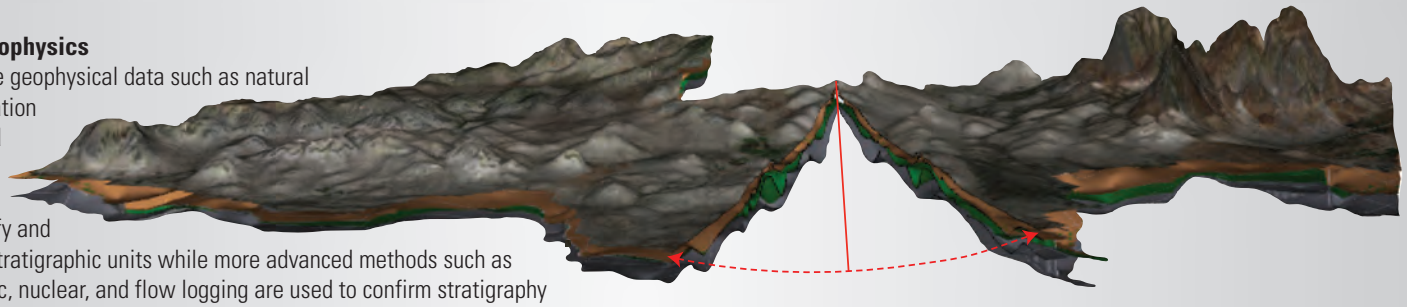
Related USGS Reports
http://pubs.usgs.gov/sir/2007/5203/
http://pubs.usgs.gov/sir/2008/5181/
http://pubs.er.usgs.gov/publication/sir20075143

Borehole Geophysics | Stratigraphic Unit Interpretation | Surface Geophysics



Conceptual Model Development of Fresh and Brackish Water Resources

Borehole Geophysics
Basic borehole geophysical data such as natural gamma, formation resistivity, and caliper are commonly used to identify and characterize stratigraphic units while more advanced methods such as full wave sonic, nuclear, and flow logging are used to confirm stratigraphy and assess physical and hydraulic properties.



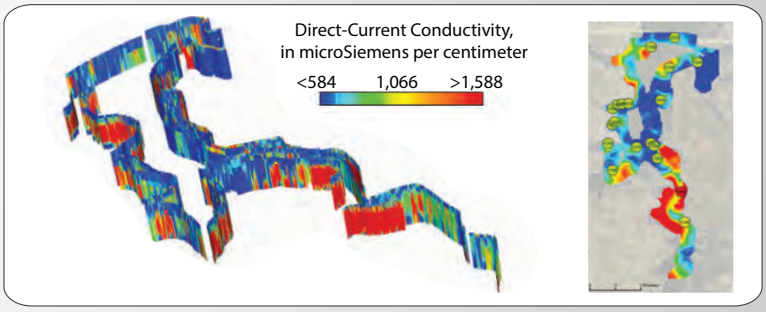
Surface Geophysics
Multiple surface geophysical techniques such as direct-current resistivity, time-domain electromagnetics, and frequency domain electromagnetics to can be used to create resistivity profiles of the subsurface. These resistivity profiles are used to pick bed boundaries and identify stratigraphy as well as assess physical properties of the stratigraphic units where boreholes are not available.

Related USGS Reports
http://pubs.er.usgs.gov/publication/ds678
http://pubs.er.usgs.gov/publication/sir20125124
http://pubs.er.usgs.gov/publication/sir20135228

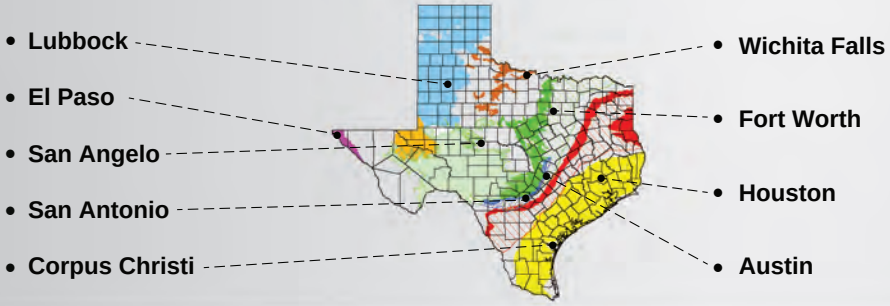
Saline-Water Intrusion

Water-Borne Direct-Current Resistivity
Water-borne direct-current resistivity methods are used to survey a lake, canal, or river to provide resistivity measurements of the subsurface. These resistivity values can be processed and analyzed to indicate areas of saline-water intrusion. Borehole geophysical logs and additional surface geophysical data can be used along with the water-borne direct-current resistivity data to further assess the saline-water intrusions and to help identify the source of the saline-water.

Related USGS Reports
http://pubs.usgs.gov/sir/2012/5285/
http://pubs.usgs.gov/sir/2007/5244/
http://pubs.usgs.gov/sir/2010/5122/



USGS Texas Water Science Center Locations



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