

GROUND-PENETRATING RADAR



Figure 1: GPR with a 500-MHz antenna.

Ground-Penetrating Radar (GPR) is useful in locating and identifying features buried below grade level (bgl). GPR is commonly used to determine the location and size of underground storage tanks (USTs) or to determine the presence of buried drums and landfilled areas for environmental projects, or the depth to various soil rock strata for geologic or hydrogeologic investigations.

GPR systems produce cross-sectional images of subsurface features by transmitting discrete radar pulses into the subsurface and recording the echoes or reflections from interfaces between materials with differing dielectric properties. In principle, GPR is entirely analogous to a medical sonogram or ultrasound, except that GPR uses electromagnetic (radar) energy rather than acoustic (sound) energy and is therefore sensitive to electrical (dielectric) properties (as opposed

to ultrasound, which is sensitive to densities).

Equipment

SAIC utilizes Model SIR-2 or SIR2000 GPR systems manufactured by Geophysical Survey Systems, Inc., of New Hampshire. GPR uses high-frequency electromagnetic pulses generated by an antenna to investigate the subsurface. The pulse frequency (typically 80 to 1,000 megahertz [MHz]) is chosen based upon the size and depth of the target being investigated and the expected soil type and properties.

Data Collection

The transmission antenna may be the same as the receiving antenna (monostatic) or they may be different (bistatic). GPR surveys are commonly conducted by pulling the antenna(s) along the ground surface or may be towed by a vehicle for high-productivity surveys.

Applications

- ✓ **Underground Storage Tank Mapping**
- ✓ **Asphalt Thickness**
- ✓ **Utility Mapping**
- ✓ **Highway Assessment**
- ✓ **Waste Pit/Trench Delineation**
- ✓ **Non-Destructive Testing**
- ✓ **Sinkhole/Collapse Feature Characterization**
- ✓ **Lake Bottom and Creek Bed Studies**
- ✓ **Rebar and Conduit Mapping**
- ✓ **Structural Assessments**
- ✓ **Grave Detection**
- ✓ **Contamination Plume Delineation**

Geophysical Services
Tel 800-944-6778



Figure 2: GPR/GPS survey to map depth of settling pond.

Integration with Global Positioning System

SAIC is proud to offer innovative solutions to meet the needs of its clients. With the increased use of global positioning system (GPS) technology in digital geophysical mapping, SAIC has applied this technique to GPR

surveys. GPR/GPS integration is useful on projects where in-line positioning is difficult to track using traditional GPR mapping methods. SAIC has applied GPS/GPR techniques to lagoon surveys where in-line tracking would be difficult to document using other data acquisition techniques.

Data Processing

For visual inspection of the data, distinct cross-sectional images can be plotted by assigning a color scale to the amplitudes of reflected pulses. Since both high-amplitude reflections and low-amplitude reflections are displayed, it is possible to determine not just the depth to a particular reflector, but the amplitude of the reflection.

Other Geophysical Services:

- ✓ Utility Locating
- ✓ Surface Seismic
- ✓ Resistivity
- ✓ Electromagnetic Terrain Conductivity
- ✓ Borehole Logging/Video
- ✓ Transient Electromagnetic
- ✓ Gravity
- ✓ Magnetic
- ✓ Spontaneous Potential

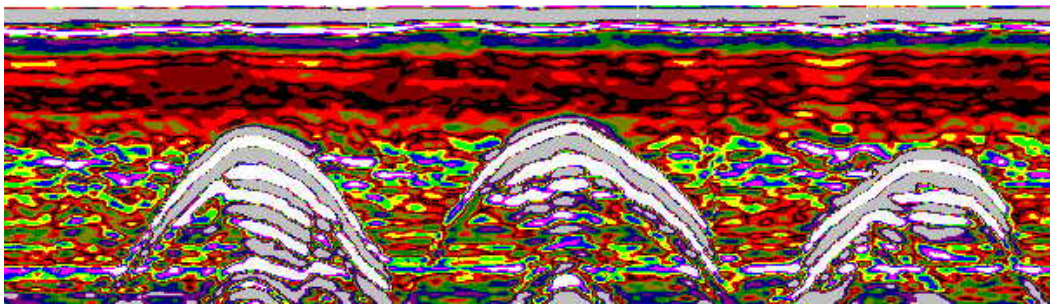


Figure 3: GPR profile example depicting three adjacent USTs.

Center of Geophysical Excellence

Service offered through:



6310 Allentown Boulevard
 Harrisburg, PA 17112
 (717) 901-8100 Office
 (717) 901-8101 Fax

**Additional
 locations in
 all major
 U.S. cities.**

www.quality-geophysics.com