Ground Penetrating Radar Services

Engineering Client Success

A ground penetrating radar (GPR) investigation is one of a number of geophysical techniques used to obtain subsurface data and information. Its ease of field operation makes it possible to survey larger areas quickly and more efficiently than other standard geotechnical techniques such as gravity surveys, seismic testing, electrical resistivity, and magnetic studies. The survey results and interpretations are especially useful when combined with drilling and well log information.

The GPR instrument functions under the principle of electromagnetic impulse and reflection variations similar to conventional echo sounders and marine depth instruments. The technique is most effectively used for determining locations and approximate depths of subsurface structures, including older basement or concrete structures, buried pipes and cables, old sewer systems (concrete or brick) and tunnels, and buried storage tanks and drums. Other successful applications include pavement thickness determinations and reinforcing bar locations as well as bedrock depth studies and subsurface material changes in unconsolidated sediments.

The instrument consists of a transportable field electromagnetic impulse transmitter and receiver, which emits impulses that are reflected back to the receiver. The returned impulse-variations are presented as hyperbolic patterns, caused by the reflection changes, and are displayed graphically on a strip chart. This provides paper documentation and gives a continuous record of the subsurface under the track of the antenna.

The signal is simultaneously displayed on a color monitor where variations in amplitude of the signal can be color enhanced. The data can also be recorded for in-house processing. This allows us to further enhance subtle differences in subsurface electrical properties, as indicated by amplitude of signal, and can highlight subsurface interfaces.

Unfortunately, as with all other geophysical subsurface investigations, GPR studies do have some limitations. Although subsurface structures can be shown to exist using the GPR, one still cannot identify the structure. For example, sewer pipes, large underground cables, and some void spaces can display similar and undifferentiable impulse reflections. In addition, some structures or subsurface strata can sufficiently mask features lying at greater depths. However, the advantages of GPR far outweigh the possible limitations. These valuable analyses can also provide a much more useful map or cross sectional view of strata and structures than can be determined by the sole use of drilling logs.

A selection of different impulse frequency ranges is possible with the GPR, each providing different depth analyses and qualities. If shallow (less than 20 feet) investigations are required, a frequency range can be chosen to give a more complete and precise survey for the specific depth that is desired. GPR surveys may not be ideally suited for all subsurface investigations; each project necessitates an individualized feasibility assessment.

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