

Geophysical Applications

Locating Abandoned Wells

Abandoned, improperly plugged wells are potential conduits for migration of fluids from deep pressurized or frac zones in the subsurface to shallow zones or groundwater aquifers. Direct excavation to find historic wellbores is impractical over large areas, so abandoned well searches depend heavily on non-invasive geophysical techniques. These include methods for locating wells by searching historical records and reconnaissance of the area, and methods that detect physical properties of wellbores and well materials. A properly plugged well will provide an adequate seal against migration. However, an improperly plugged wellbore may contain debris that may compromise the sealing qualities of drilling mud and grout left in the tubing, or for very old wells, well casing may be missing altogether.



Site investigations for abandoned wells use geophysical techniques that sense the physical properties of wellbores, casing materials, and impacts of fluids migrating from the wellbore. Many well-related materials that may be targeted in a site investigation or geophysical survey for abandoned wells. Well construction material, including casings, well head or joints, and concrete abandonment plugs, are fairly easily located using geophysical methods such as magnetometer or electromagnetic (EM) methods. Under ideal conditions, the void of a well bore can be identified using ground penetrating radar (GPR).

More subtle indications of a well may exist. These conditions are anomalous in the sense that they create a contrast in physical or electrochemical properties that is beyond natural variation in the subsurface. This type of target may be the only indication left of the presence of an old well if part or all of the well casing has been removed, and the borehole was improperly plugged. These would be considered indirect geophysical targets that are a direct consequence of the presence of a well. Detection of anomalous conditions related to wells will depend upon subtle contrasts in subsurface properties of the material in or near the wellbore versus surrounding material.



Geophysics provides a non-destructive, non-intrusive assessment of site conditions. Geophysics can be performed in areas of sensitive environmental conditions such as wetlands. A geophysical assessment can be much more cost effective than a haphazard excavation program and an uncertain restoration.