

Applications

- ✓ Hydrogeological investigations (e.g. groundwater flow determination, contaminant transportation)
- ✓ Leak detection in reservoirs and dams
- ✓ Landfill delineation
- ✓ Geothermal surveys
- ✓ Locating massive sulphide ore bodies

Basic Theory

Self potentials (SP) are measurements of the difference in natural electrical potentials between two points on the ground surface. The natural electric currents responsible for these potentials may be generated by a number of different sources including groundwater flow, mineral deposits and chemical diffusion.

The magnitude of self potentials can vary from less than a millivolt to over one volt, and the polarity of the potential is a diagnostic factor in the interpretation of SP anomalies. Although there are many sources of self potentials, the common factor among them is groundwater. The potentials are typically generated by the flow of water, or by the involvement of water in natural chemical reactions.

Data collection and presentation

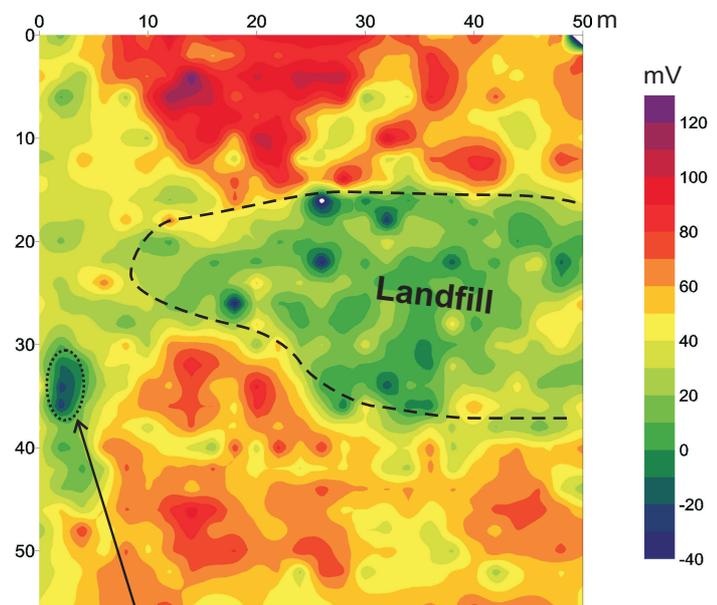
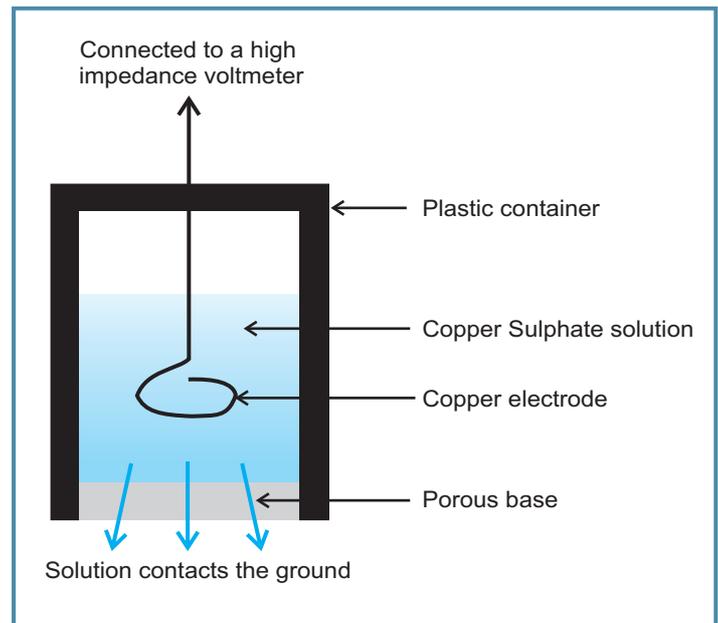
Measurements of self potentials are made with two non-polarisable porous-pot electrodes connected to a high impedance voltmeter. Traditional metal stakes, as used in resistivity surveying, cannot be used as they generate their own potential when they are inserted into the ground. Data is collected along a survey line (SP profiling) or across a grid to produce a contour map of self potentials. The data requires little processing as most interpretations are based on qualitative analysis of profile shape, polarity and amplitude.

Data Example

SP survey over a landfill to identify a leachate breach

Self potential measurements can be used to identify the movement of electrical charge associated with the flow of contaminants in the sub-surface.

In the example to the **right**, the technique was used to identify the possible presence of a breach in the liner, and the resulting escape of leachate fluids from the landfill interior to the surrounding ground and groundwater.



Anomalous negative region (evidence for possible breach in liner and subsequent flow of leachate)