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ELECTRICAL IMAGING

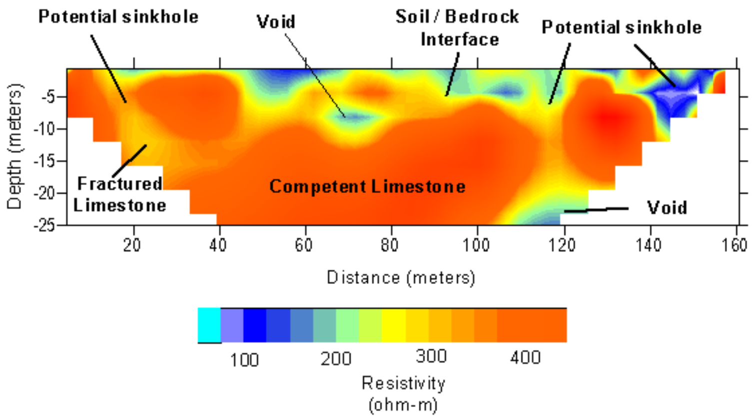

Figure 1: Electrical imaging traverse indicating top of rock, voids, and potential sinkhole areas.

Electrical imaging can provide information on distinct subsurface boundaries and conditions which can indicate soil or bedrock lithology changes. Science Applications International Corporation (SAIC) provides electrical imaging services to clients across the United States. SAIC uses electrical imaging to map the lateral and vertical limits of waste pits and landfills; identify the location of preferential groundwater flow paths in sand and gravel channels and bedrock fractures; map top of bedrock; and identify potential sinkhole, void, and cavern locations.

Data Collection

SAIC utilizes an automatic multielectrode switching system which passes an electrical current along multiple paths at various depths and measures the resulting associated voltages. The number of electrodes for a typical imaging survey ranges from 28 to 106 electrodes. The electrical imaging system utilizes two arrays of multi-core cables which extend outward in opposite directions from the centrally located switching unit and resistivity meter. Resistivity measurements are recorded from all possible combinations between two electrodes. As the spacings increase, the resistivity meter measures at greater depths and increasing volumes of ground. Data can be collected with a variety of electrode arrays, but the dipole-dipole electrode arrangement is used most often because of its increased resolution.

Data Reduction

Interpretation of the raw imaging (apparent resistivity) data without reduction would provide a product very

Applications

- ✔ **Bedrock Fracture and Fault Identification**
- ✔ **Void/Cavern Detection**
- ✔ **Sand and Gravel Mapping**
- ✔ **Waste Pit/Trench Mapping**
- ✔ **Bedrock/Soil Stratigraphy Mapping**
- ✔ **Landfill Delineation and Characterization**
- ✔ **Plume Delineation**
- ✔ **Sinkhole and Collapse Feature Characterization**
- ✔ **Top of Bedrock Mapping**

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Science Applications International Corporation similar to electromagnetic (EM) methods (e.g., the interpretation would only be qualitative). Inversion of the data to true resistivities provides a more unique or quantitative interpretation of the data. SAIC uses resistivity inversion processing software to produce a two-dimensional resistivity model based on the apparent resistivity data.

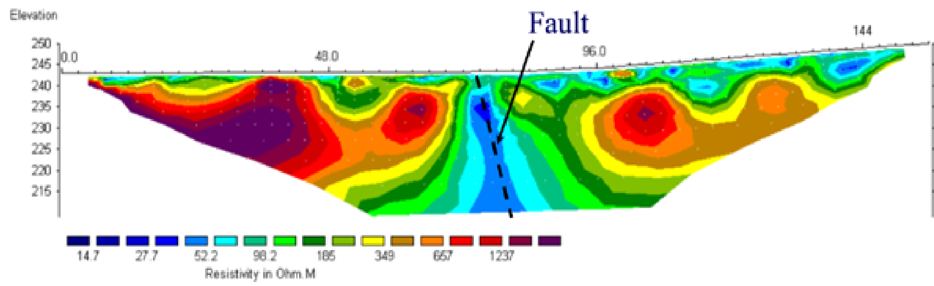

Figure 2: Electrical imaging traverse which identified the location of a bedrock fault which was believed to be a preferential flow path for groundwater transport.

Data Interpretation

Following the data collection and data processing, the EI electrostratigraphy information is used to interpret the potential gross stratigraphy under a study area. Dry materials have higher resistivity than similar wet materials because moisture increases their ability to conduct electricity. This resistivity change, if indicated in the observed electrostratigraphy, can represent water table depths. Beneath the water table, silt and clay-free sands and gravels will have a much higher resistivity than silts or clays under similar moisture conditions due to finer-grained materials acting as better conductors. In bedrock, more competent bedrock with less fracturing typically has a higher resistivity than fractured, less-competent bedrock. Also, very low resistivities could indicate conductive fluids (plumes) or very conductive clays.

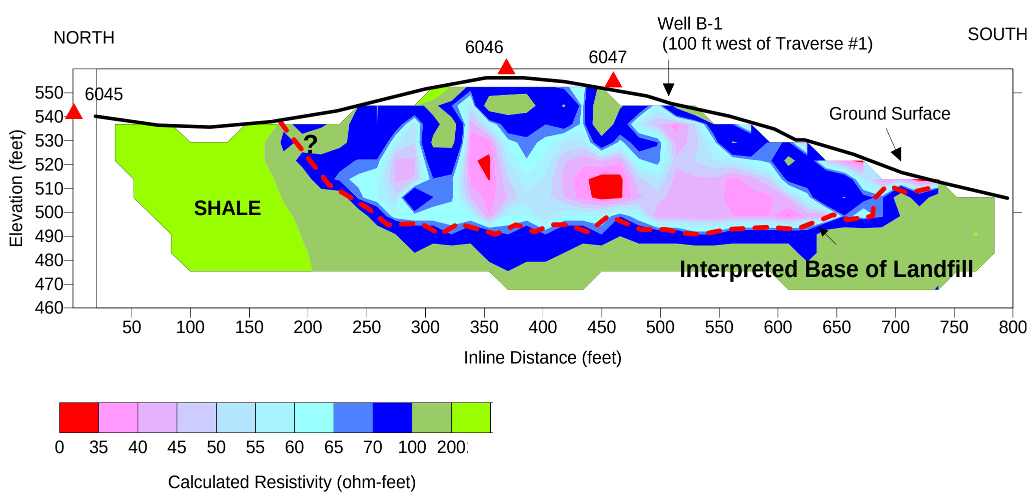

Figure 3: Electrical imaging traverse indicating the location of the constructed landfill boundary with bedrock.

Center of Geophysical Excellence

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