

Why use IRIS technology for Dam Safety?

The solutions provided by IRIS benefit at each stage of the life of a dam, from its design to monitoring its operation.

Feasibility: In areas of altered rock or alluvial deposits, electrical prospecting is highly relevant, alone or in combination with seismic. In this technique, the variations of electrical resistivity of the ground are used to deduce those of the lithology, alteration and alteration and fracturing. The measurements can be made in the form of boreholes, of electrical drags, resistivity panels or in 3D.

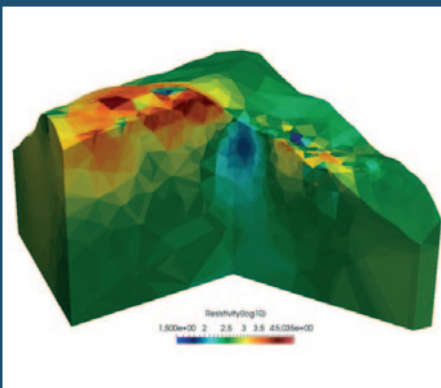
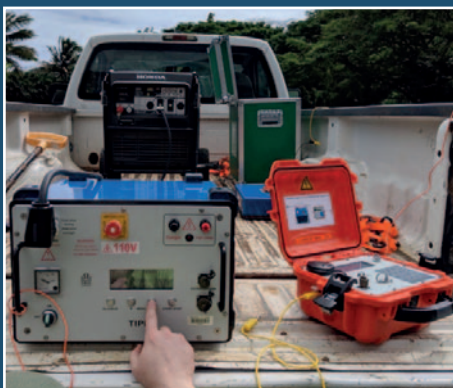
Design: Geophysics, and electrical methods, is widely used for the dimensioning of structures such as dams. The objectives under consideration aim to characterize the soil, rock and groundwater at dam potential sites. The targeted properties are the lithology and patterns of fracturing and weathering, in addition to fracture orientation, depth to bedrock, and fault location. Electrical methods are more cost effective to other geotechnical methods in that they can still be used to observe formation of voids or sinkholes.

Build: During infrastructure construction projects, knowledge of the subsoil is essential for the success of the project but also for the safety of the workers. Here also, the presence of cavities, sink holes or ground movement (landslides) must be considered. Electrical methods offer a low-cost investigation.

Working Life: Owners and Dam managers need to understand the dam structures internal integrity to locate points of failure in real time or with time acquired monitoring. Geophysical techniques have the ability to nonintrusively probe dams and detect the occurrence of anomalous seepages within their structure.

Resistivity Imaging

- *Multi-channel electrical resistivity imaging (2D and 3D) to define the internal integrity of dams and locate potential points of failure*
- *Monitoring dam seepage, water saturation, piping and leakage paths*
- *3 dimensional characterization and monitoring of dam slopes*
- *2D and 3D imaging of lateral dam slopes to prevail potential landslide risk of over topped dams*



The ERT, IP and SP methods are valuable for imaging the foundations of dams and delineating their seeping zones. IP has recently been applied to detect seepages in Earth dams by monitoring the change in the water content over time. SP method which is easy to set up and cost effective has a considerable potential for the detection of seepages in dams.

Electrical methods are particularly useful for surveying Earth dams. Earth dams play an indispensable role as they can be designed to store large volumes of water for domestic and industrial purposes such as supplying hydroelectric power stations. The most frequent causes of dam failure are related to the action of water resulting in overtopping, slope instability, seepage, and foundation failure.

The detection of seepage at the early stage of its development is essential for the safety of a water retaining structure as an embankment dam. ERT and SP monitoring has also been widely applied for solving environmental and engineering problems by studying the changes in the subsurface properties over time. SP changes are caused by water movements through the dam and resistivity changes reflect the changes in the electrical properties of the dam materials.

Measuring SP is a powerful and easy way to detect leakage and time series resistivity measurements provide valuable information about the changes in condition of the dam.