Gannett Fleming
Quantum Geophysics

Excellence Delivered ***As Promised***

Seepage Detection

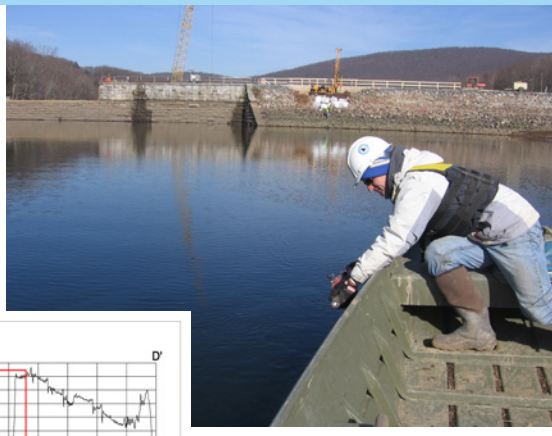
In spite of advances made in the fields of geotechnical engineering, it is not possible to have a completely leak-proof structure. Earth and rockfill dams are designed to operate under steady state seepage. However, irregular seepage can threaten the integrity of these dams. Many dams and reservoirs suffer from seepage problems that can cause piping or related problems. Under extreme conditions, seepage pathways and related features can weaken the structure. Any excessive and unplanned seepage may lead to the failure of a dam, especially in unconsolidated or fractured terrains.

Gannett Fleming's Quantum Geophysics Division (Quantum) uses the self potential (SP) method to identify seepage. SP is especially useful in locating seepage through earthen water retention structures such as dams, dikes, reservoir floors, unstable landslide areas, and canals and levees. Because of the ionic property of water, moving water creates a small electrical current that can be detected using porous pot electrodes and a high-impedance volt meter. Water moving through or into an area causes an increase in SP, which is referred to as a high SP anomaly. As water flow increases, so will the SP response. Conversely, water leaving an area, such as through the bottom of a reservoir, causes a decrease in SP or a low SP anomaly.

Unlike other methods, such as ground conductivity and electrical resistivity, SP is the only method that responds to flowing water.

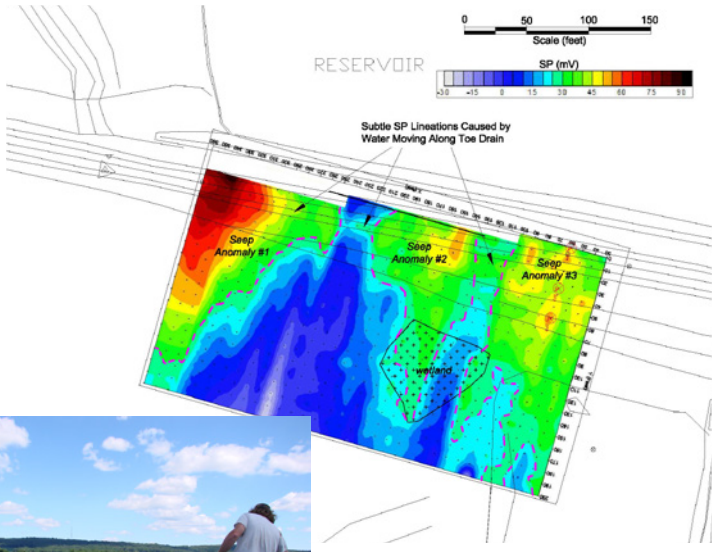
Other Applications:

- Map geothermal resources
- Map underground fires
- Identify mineral resources
- Determine preferential flow paths.



Deploying SP probe into the reservoir at Nesbitt Dam.

SP profile indicating seepage in reservoir.



SP contour map of seepage anomalies (above).

Making SP measurements on an earthen dam (left).

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