APPLICATION NOTE

GEOVision geophysical services

GEOPHYSICS AND DAMS

The Project

There are many circumstances where geophysical services are useful for dam builders and dam owners. These include:

New Dams

- Evaluate foundation materials (soil and rock) and assist engineers to design foundations and structures (borehole velocity surveys, refraction, reflection, SASW)
- Locate and evaluate fault structures and zones near a proposed dam that are potential sources of earthquakes (refraction, reflection)

Existing Dams

- Evaluate the materials (strength properties) in existing dams to see if they match design expectations. This includes borehole measurements in foundations, impact echo and hardness measurements of concrete to test strength, and so on (borehole geophysics, impact echo, SASW)
- Test and see if drains are working properly (see below, utilize refraction, borehole geophysics)
- Look for slip zones (like fault offsets) in embankment dams that would indicate earthquake damage or zones of incipient failure (reflection, refraction, boreholes)
- Locate cavities, washouts (GPR, resistivity)
- Locate seepage zones (resistivity, TDEM)
- Evaluate concrete and rebar deterioration (GPR, impact echo)
- Locate and evaluate fault structures and zones near an existing dam that are potential sources of earthquake energy (refraction, reflection)

The Objective and Scope of Work

The principal objective of a geophysical investigation is usually to measure material properties, and locate structural features. Accuracy is often critical, and every effort is made to provide the highest resolution available, both for depth and extents. Modern survey methods utilize GPS satellite accuracy. Borehole methods, such as the OYO P-S Suspension method, can deliver depth resolutions better than .5m.

Usually it is best to utilize more than one geophysical method. The reason is that one method may not work at a particular site due to soil conditions or other factors. Also, multiple methods will provide confirmation and quality assurance of results. Typical methods used by GEOVision include:

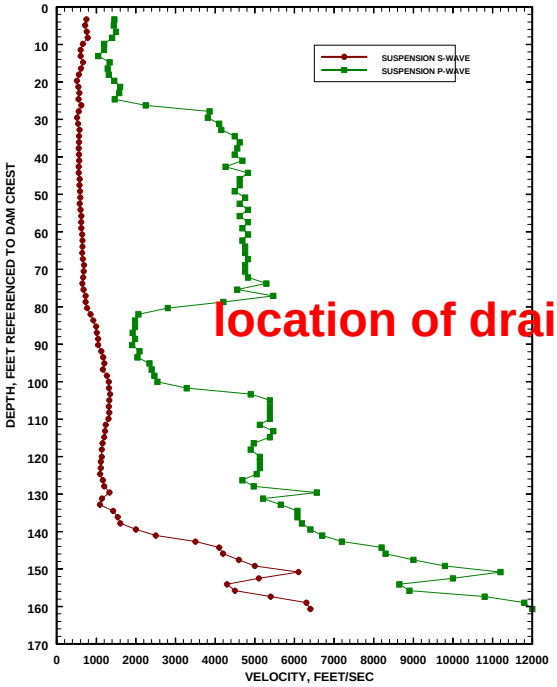
- Seismic Refraction and Reflection, and Spectral Analysis of Surface Waves (SASW)
- Borehole methods, including P-S Suspension, Crosshole, and Downhole
- Ground-penetrating radar (GPR)
- Sonic method, such as crosshole sonic, and Impact Echo

Key Benefits
The important benefits of geophysical surveys are:

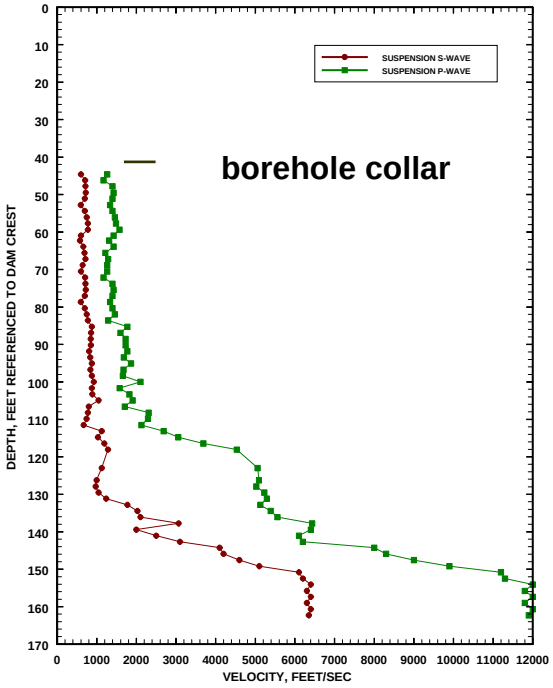
- Dam safety decisions based on ground truth are always better
- Non-invasive (except for boreholes where needed)
- Accurate location and characterization of hidden anomalies and buried structures

Example
The images below illustrate a typical project. The purpose of this project was to measure the velocity characteristics of the foundation below an embankment dam. The results showed not only the velocity structure, but also the location of a drain in the dam.

AT CREST



ON DOWNSTREAM FACE



drainage zone clearly located!