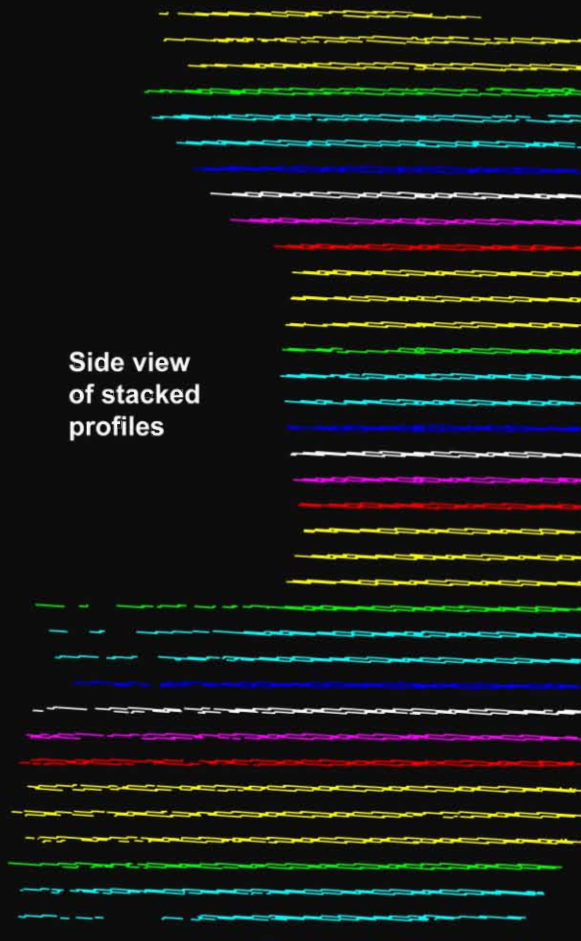


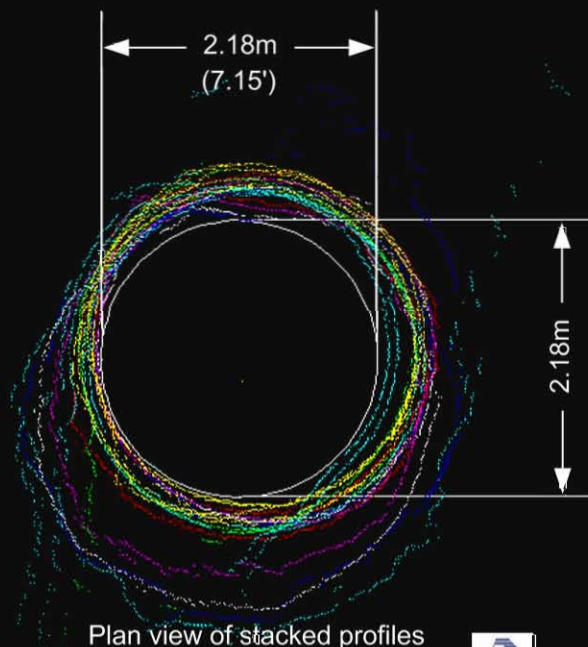
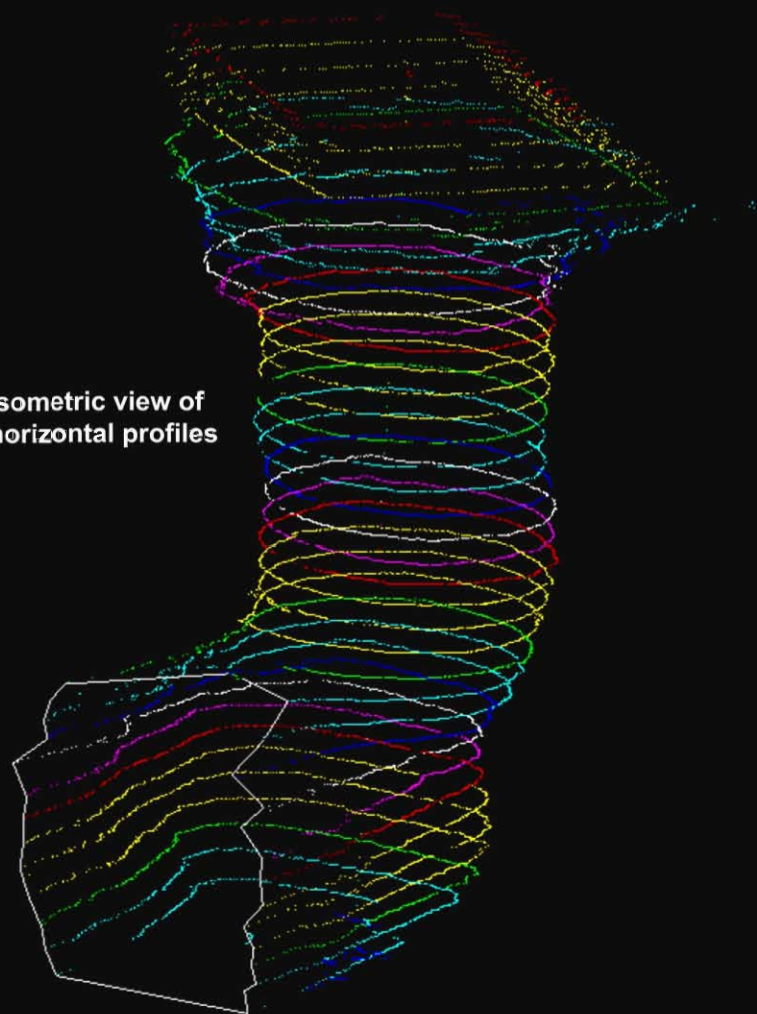


# Hydroelectric Dam Shaft Measurement Project

Side view  
of stacked  
profiles



Isometric view of  
horizontal profiles



An MS 1000 and High Resolution Scanning Sonar Head, with a narrow conical beam, were used to profile a vertically drilled shaft. The purpose of the survey was to determine the maximum liner size that could be inserted inside the structure to prevent rock from calving off the shaft wall and passing through a hydroelectric turbine.

The head was mounted in a cage and co-located with an altimeter as shown on the page 2 of this application note. Horizontal profiles taken a 1' (30.38cm) increments showed irregularities in the vertical alignment of the shaft.

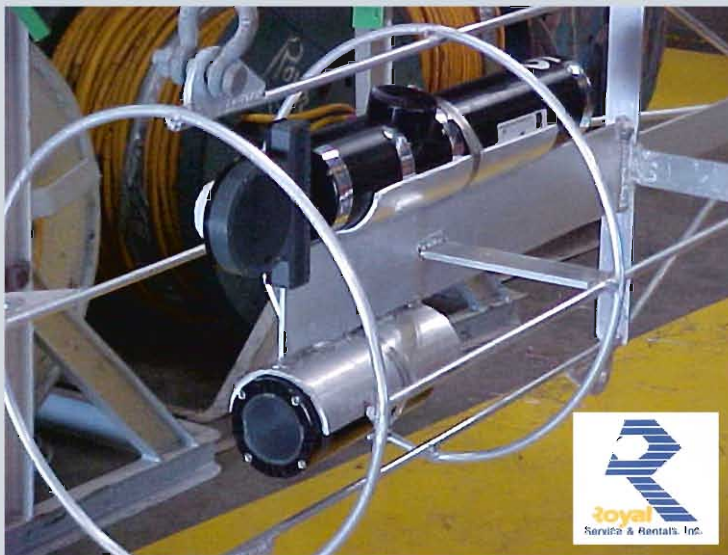
The digitally overlaid profile scans allowed engineers to measure the shaft diameter and design the liner.



## Equipment configuration to complete vertical rock shaft survey:

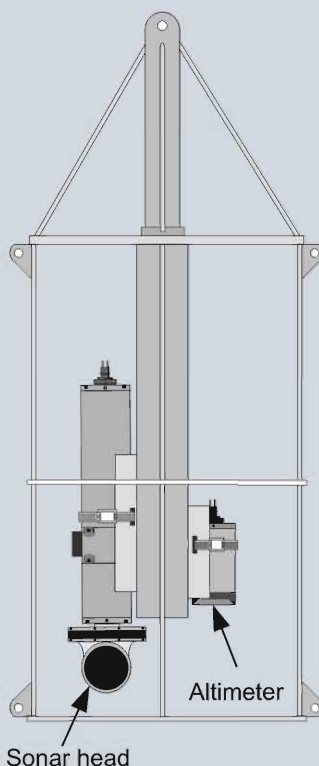
- MS 1000 PC-based Sonar Software
- MS 1000 Interface Unit with 28VDC and 56VDC outputs
- 675 kHz High Resolution Scanning Sonar Head with Fan/Cone transducer
- 675 kHz altimeter (configured for MS 1000 software operation)
- Kevlar Cable with connector terminations for the sonar and altimeter
- Custom deployment cage (shown below)

Horizontally suspended deployment cage with mounted sonar head and altimeter



### Additional information:

- The MS 1000 program allows the user to operate and display multiple sonar image windows. For this project, the scanning sonar and altimeter were operated simultaneously.
- The altimeter was powered from the MS 1000 interface Unit's 28VDC supply and the scanning sonar head connected to the 56VDC output.



### Deployment cage:

For this project, a custom deployment cage was fabricated by the sonar contractor. Made of aluminum, it was designed to mount both the high resolution 675 kHz scanning sonar head (fitted with a fan/cone transducer) and a 675 kHz altimeter. Mounting tabs allowed the cage to be suspended vertically or horizontally. To collect the horizontal profiles the contractor deployed the cage vertically using two lines to eliminate rotation.

An altimeter was mounted in the cage to verify the distance from the bottom of the shaft to each horizontal profile.