

# CASE STUDY

PROJECT  
Structural GPR Survey (Void Mapping)

RESOURCES  
GPR - UTSI GroundVue 3  
with 8 x 1GHz Antenna Array

Trimble SX10 Scanning Total Station



The laser scanning data was processed and a point cloud produced. This data was used to position the GPR data and allow for a topographic base map to be extracted to give context to the survey results. The point cloud data was also to be used to aid subsequent design and restoration planning.

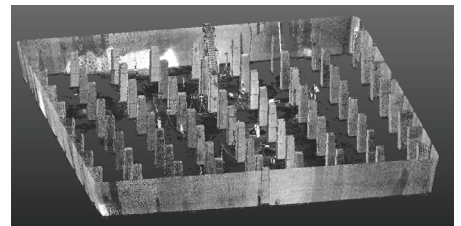


Figure 2: Laser Scanning Point Cloud Showing Structural Columns



Figure 3: Cross Section of Reservoir Detailing Roof Structure and Ground Level

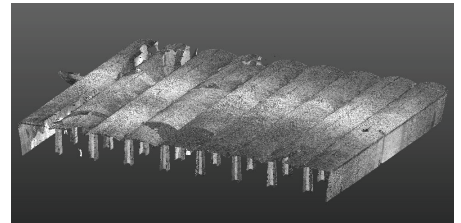


Figure 4: Roof Structure with Ground Level Removed

## STRUCTURAL GPR SURVEY (VOID MAPPING) - SERVICE RESERVOIR

Service reservoirs are a key part of the water distribution network and store fully treated water close to the point of distribution.

Service reservoirs have four main functions:

1. To balance the fluctuating demand from the water distribution system
2. To give a suitable pressure for the water distribution system
3. Provide a supply during failure or shutdown of treatment plants, pumps or trunk mains
4. Provide a reserve of water to meet fire and other emergency demands

The service reservoir in question was of early Victorian construction and consisted of a single compartment. It was constructed below surface level and had lines of columns supporting brick vaulted ceilings. Only a small access building is visible from the surface.

The reservoir had developed a significant leak and had been fully drained to allow our structural radar survey to take place. The reservoir was to remain empty until subsequent remedial works and general ongoing maintenance had taken place.

LandScope proposed to survey the base slab of the reservoir using a high frequency GPR array. The array consisted of 8 antennas centred on a frequency of 1GHz. The 1GHz frequency was selected to provide a high resolution data set whilst being able to penetrate through the concrete slab and into the natural ground below. The eight antenna system allowed for rapid data collection over a significant survey area in a single site shift.

The main objective of the survey was to locate any significant voiding or water pathways that may be allowing water to escape.

The site works were completed within one shift and included GPR data collection and laser scanning of the internal chamber.



Figure 1: Trimble SX10 Laser Scanning of Reservoir

Both the ground penetrating radar (GPR) and laser scanning data were taken back to the office for post processing and registration respectively.

The GPR data was filtered and post processed by LandScope's team of geophysicists. The GPR data interpretation was added to the base map produced from the laser scanning survey. The GPR successfully located a number of substantial void features within the reservoir floor slab (Figure 5 below).

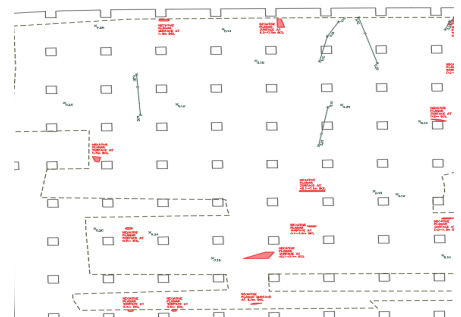


Figure 5: Interpretive AutoCAD Drawing Detailing Locations of Potential Void Features / Water Pathways