Ground Penetrating Radar (GPR)

GPR is one of the most advanced underground utility locating techniques when combined with electromagnetic locating. 2D scans and 3D data acquisition are both available. GPR is used for the location and survey of conductive and non-conductive subsurface utilities and structures. It is the ideal way to locate:

- Fibre optic cables;
- Forensics; and
- Fuel tanks;
- Nylon gas;
- Road and pavement inspections;
- Sewer and storm water.
- Underground storage tanks;
- Underground structures;
- VC water mains and services;
- Voids and cavities

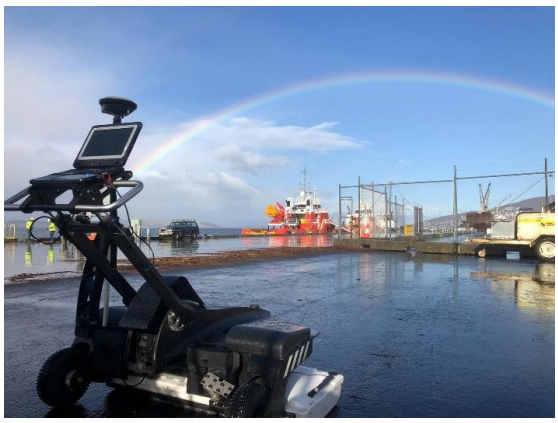

Figure 1- IDS Georadar's Stream C GPR

Stream C GPR

The Stream C is the compact array solution for real-time 3D mapping of underground utilities and features. Thanks to the increased level of accuracy provided by a massive antenna array, Stream C can detect pipes and cables automatically.

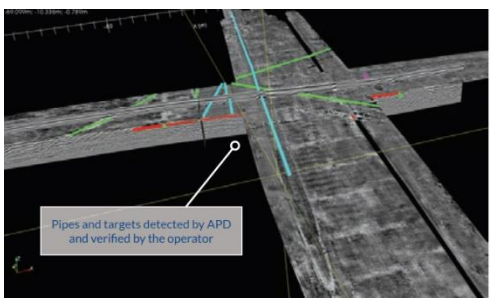

Figure 2-3D Pipes & targets detected and verified

- Massive array of 34 antennas in two polarisations: this enables an accurate 3D reconstruction of the underground utility network to be created in a single scan with a very high-quality dense dataset to allow pipes to be detected that may be missed by traditional 2D radar.

- High Productivity: Rapid, full 3D mapping by surveying in one direction only due to dual polarised antennas. Stream C provides a unique solution not available from traditional 2D radar systems. It is estimated that 75% savings in time of data acquisition can be achieved in a 3D survey compared to conventional 2D GPR surveys

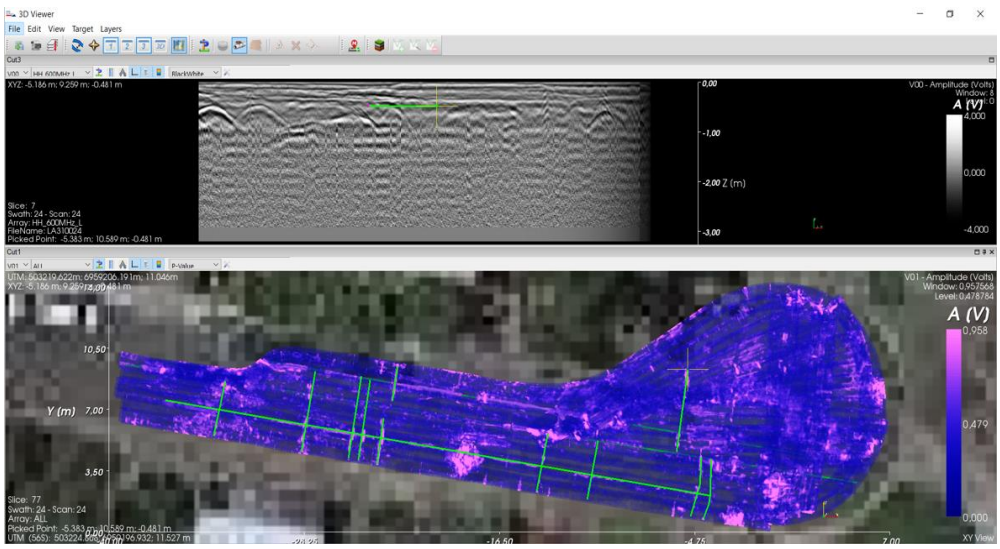

Figure 3-Pipes & targets detected with Stream C GPR shown on georeferenced tomography

Underground Void Detection

A void detection survey using Ground Penetrating Radar (GPR) is a low risk method to scan an area of ground and determine the location and extents of underground voids, sinkholes and subsidence. This can form part of a risk reduction process to check the integrity of the ground before moving or using heavy equipment and cranes, or to determine the extents of potential underground voids and subsidence to aid in remediation planning.

Causes of Underground Voids

Shallow voiding can be caused by several reasons including:

- Sinkholes (the causes of which can be geological or manmade such as broken water pipes, old sewers, buried basements, and disused mine shafts which have been compromised).
- Material washout due to underground water movement which carries some material with it (typical in coastal promenades and car parks, masonry arch structures and docks & retaining walls).
- Natural subsidence in which the ground itself is moving and settling over time.

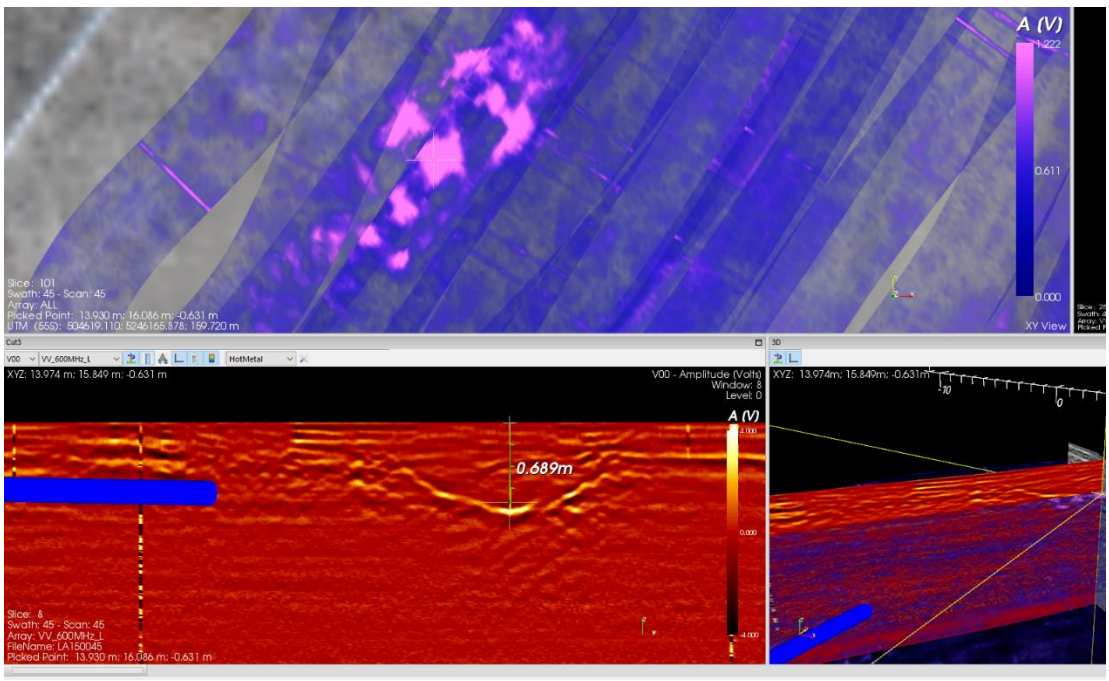

Figure 4-GPR Slice data showing subsidence under pavement

Subsidence will be visible from the surface in the form of dipping ground in soft layers and cracks in harder materials. However, in cases when the surface is firm and supports its own weight the material beneath can subside until a significant void has developed underneath the surface layer with no visible warning signs. The surface may then break when heavy loads are applied or, if the void reaches a size in which it can no longer support its own weight, it will collapse on its own.

Voiding can usually be remedied by first exposing and fixing the source (if that is possible), and then pumping material into the void until it is filled. A GPR void detection survey is the ideal method to determine the extents of the problem.

Why Use GPR For Underground Void Detection Surveys

GPR is a fully non-destructive and non-intrusive technology (NDT), it is relatively light weight equipment which can be used to scan areas of any size and it does not cause any damage to the surface being surveyed. A void detection survey using GPR is a cost-effective way to scan large areas safely.

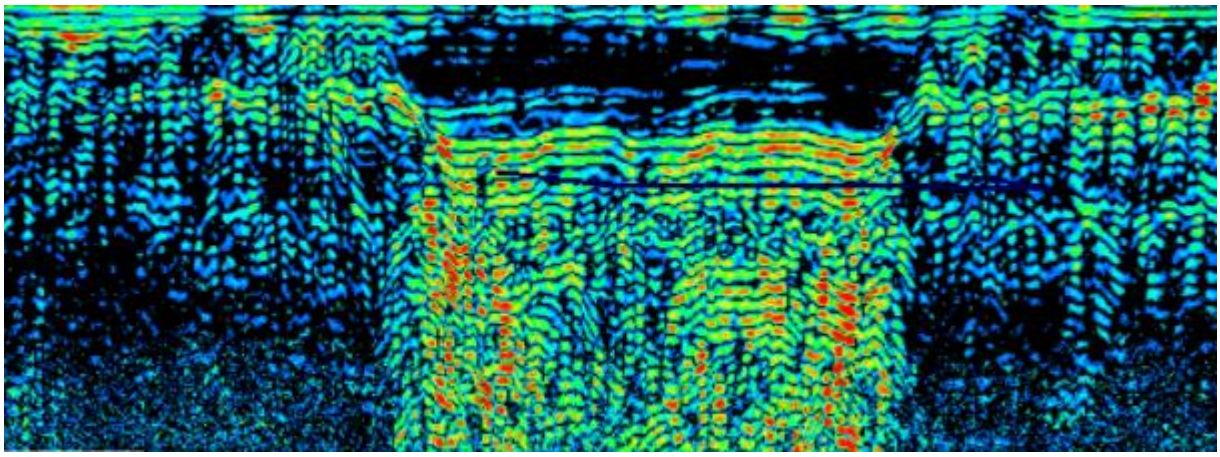

Figure 5-Subsidence beneath reinforced concrete layer

Detecting sinkholes, underground voids and subsidence using GPR

Ground Penetrating Radar works by transmitting an electromagnetic signal into the ground and recording reflections. In GPR, reflections are caused by any change in the below surface environment. GPR is therefor able to detect most types of underground features including sinkholes, voids and subsidence (provided the voids are large enough to be detected within the resolution and penetration capabilities of the GPR being used).

How a GPR survey to detect sinkholes, voids and subsidence is performed

A GPR survey to detect underground voids is usually performed using the Stream C GPR or C-Thrue Concrete Scanner. Parallel lines of GPR data are collected. Each line represents a vertical cross section through the ground at that specific location, these lines of data are saved for office-based processing and interpretation.

In the office the data is loaded into our advanced GPR post processing and imaging software, by compiling the vertical cross sections together a 3D picture is formed. Using this 3D image underground features such as voids, sinkholes and subsidence can be detected and tracked from scan to scan to produce a CAD drawing.

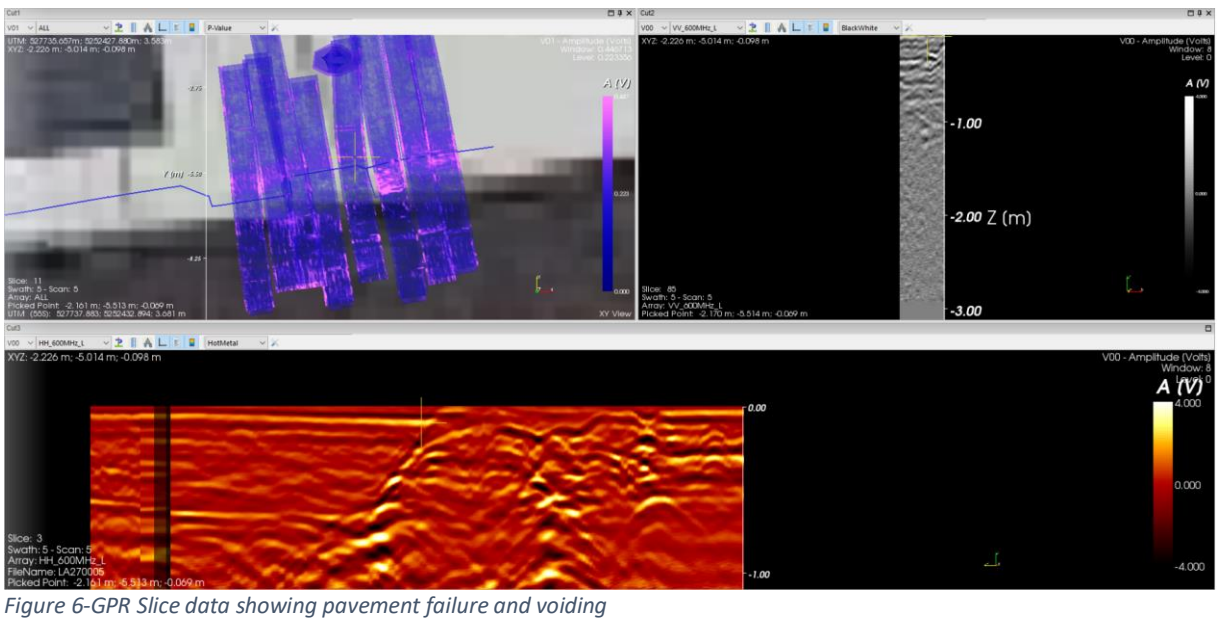

Figure 6-GPR Slice data showing pavement failure and voiding

Sinkhole, underground void detection and subsidence survey deliverables

The results from a GPR survey of underground voids and subsidence will usually take the form of CAD drawings and/or a report. The final output may vary depending on the best way to represent the information.

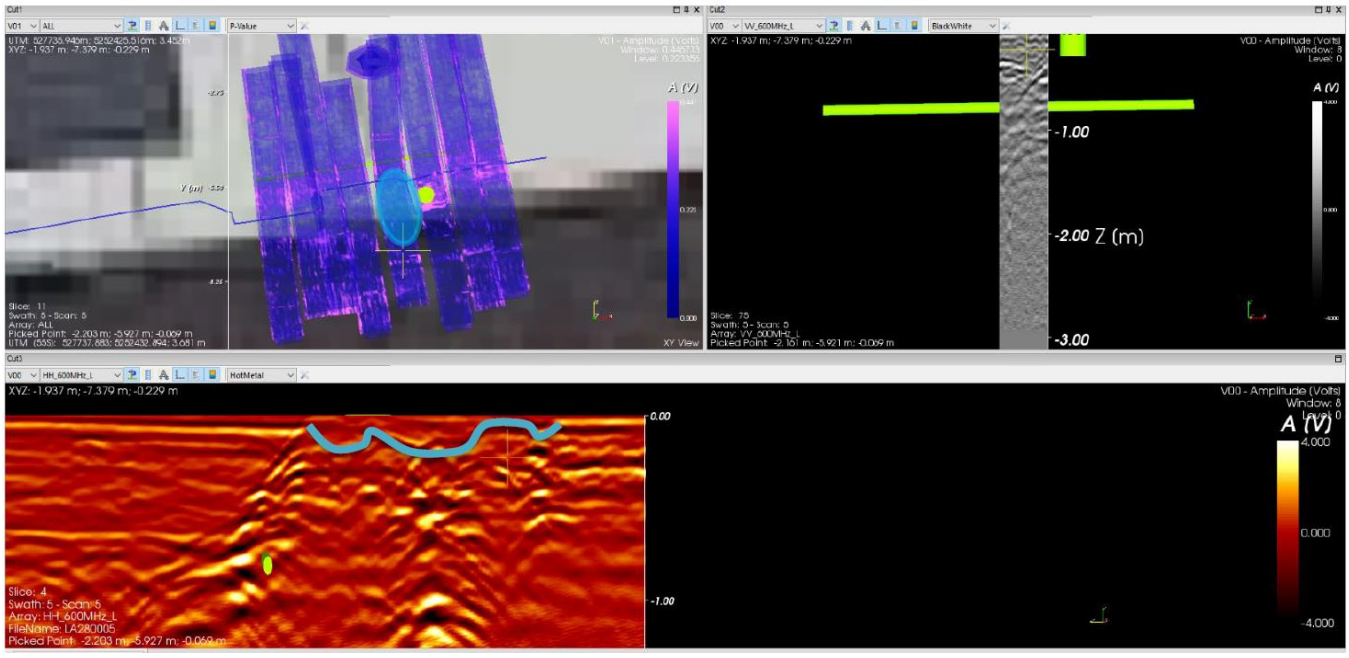

Figure 7-GPR Slice data showing pavement failure and voiding

If there are any further queries regarding our GPR capability or other Spatial services, please do not hesitate to contact me.

Regards

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