Bridge Inspection: Locating the correct areas to drill safely into asphalt

Overview

- Ten Thije were contracted to identify safe areas to drill without hitting critical elements of a bridge in Utrechyt.
- Profometer and Proceq GP8100 were used to inspect any reinforcement and indicate the right areas to drill.
- The team achieved correct positioning with no damages and with minor traffic interruption.

Contractors very frequently face the dilemma of where to drill in concrete or in pavement, often times without having an indication where the critical elements of the structure lie. This blind guess can be very dangerous for construction and the people who use the infrastructure, as one wrong hit can compromise the structural stability. This is even more important when drilling needs to be done on bridges or tunnels.

Ground Penetrating Radar (GPR) is an excellent tool to locate rebars, post tension cables and conduits inside concrete. However, traditional GPR systems, are not suitable for large areas since it takes too long to scan with accuracy, and time on the field is high cost.

Bridge inspection challenge

The municipality of Utrecht wanted to redesign a road containing a small bridge, where some light poles had to be moved. Screening Eagle's customer, Ten Thije, was contracted to check whether the new locations for the light poles contained prestressing reinforcement.

Side view of the bridge and drawings with indications of GPR data collection

The new indicated locations for the light poles, however, were either hard to reach and inspect, too close, or on the elevated sidewalk.

The indicated position for the light poles

Ten Thije, decided to make an area scan on the asphalt road and corelate the GPR measurements with historical drawings and the beams that were visible under the bridge. All the locations had GPS coordinates.

Solution

The Proceq GP8100 GPR incorporates six antennas in line, thus it covers a wider area with a single pass. An example to understand how the GP8100 limits the time spent on field, is that a typical GPR requires around 10-15 minutes to collect data of a 1mX1m area. Then you must save your data, export these to your computer for some basic processing and then, manually, draw targets on the concrete surface. The whole procedure can take up to 30 minutes depending on your experience.

Scanning this area with the GP8100, you only need six passes for a full 3D picture of the same area, the data is automatically processed by the application and instantaneously you get data in augmented reality visualization on the surface. It takes less than five minutes for the whole procedure even if you are a new GPR user.

But speed, in the case of the GP8100, does not mean compromising data quality. Antennas are spaced every 5cm, which means that in a single pass you cover 30cm width and your resolution is as high as a 5cm spacing can give. Data quality and speed come hand in hand, raising the certainty level required by a coring and drilling professional on the site.

Conventional pulse systems can penetrate down to 40-50cm while the GP8100, powered by the SFCW technology, can go as deep as 80cm in concrete/asphalt. Data quality, speed of data collection and depth penetration make the GP8100 a unique proposal for this type of jobs.

Results

Ten Thije needed to detect spots that could be used for safely drilling holes in asphalt and installing the new light poles. The engineer initially inspected the area with a Profometer, to get a quick overview of the area as they wanted more detail and depth in their investigation, then moved soon to a GP8100 to scan the area.

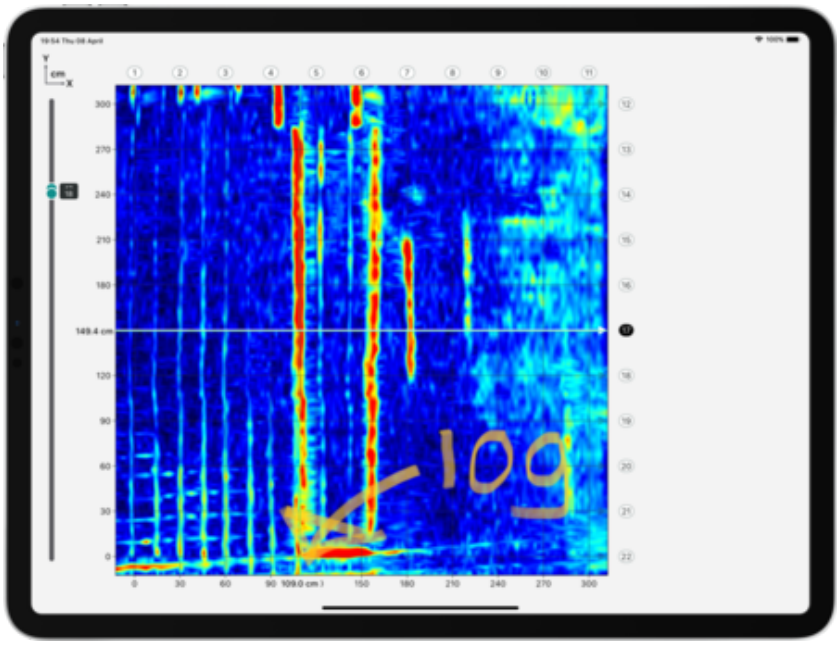
Using the Profometer on the bridge

The crucial part of an investigation over a bridge is the limited time you have to work on the site. Limiting the traffic or closing the bridge usually costs money to the bridge administrator and so GPR is a convenient method as it collects data fast, without causing any damage to the bridge.

Traffic is a concern when working on bridges

The GP8100 uses Stepped Frequency Continuous Wave (SFCW) technology that offers a large bandwidth (0.4-6 GHz), useful for applications that require both excellent resolution and depth penetration. In this case, the useful information comes from the high end of the bandwidth, as rebars are relatively small and shallow.

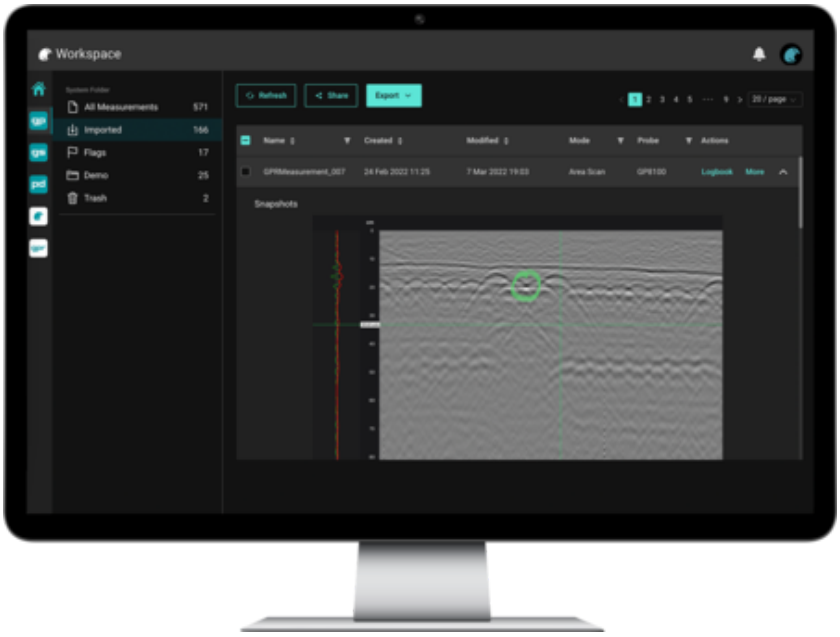
As seen below it was possible to detect clean areas for drills and to project the data on the area of interest.



Area scan data collected with a GP8100

The GP8100 connects wirelessly to an iPad, making it a safer and easier option – no cables to trip over or get caught around. Furthermore, the iPad app is extremely intuitive so inexperienced operators can easily collect data. The data is all stored securely on the cloud and can be accessed by any member of the team no matter where he/she is located, offering unmatched flexibility.

Any user with a Screening Eagle account can now have access to Workspace. Users can collaborate, manage, and share the bridge inspection records from anywhere at any time, by simply signing in with their Screening Eagle ID. Organized, structured and easy-to-access measurement data is the key to better, faster collaboration, insights and predictions. Workspace provides an end-to-end solution - from measurement record collection and analysis to reporting and informed decision making to protect the built world.



Screenshot from Workspace. Data can be viewed and shared with any of your collaborators.

Workspace is very useful for non-experienced users as well who want to share their data with experienced colleagues sitting at the office. They can get their view in a matter of minutes and proceed with the drills without leaving the site.

See more real case studies and application notes about inspections on bridges, concrete and roads with GPR in our Tech Hub.