

Ground Penetrating Radar for Mining

Ground-penetrating radar (GPR) is a well-established technology that has earned its place as the go-to technology for many sub-surface imaging applications. No other geophysical method comes close to GPR's ease of deployment, nor the amount of ground that an operator can cover in a typical day. Workers can quickly and efficiently collect quality high-resolution data, which often facilitates immediate on-site decision making. GPR technology offers significant benefits to application areas such as archaeology or utility detection and mapping. Which, in many cases, has positively changed work processes with improvement in workflows.

GPR use in mining and mineral exploration is also well documented but perhaps with less fanfare than other industries. Regardless, the use of GPR is gaining traction as mining and exploration operators look to extend the benefits to such areas as:

- Mineral exploration
- Quarry evaluations and expansion planning
- Tunnel hazard detection and structural mapping

User Case

An excellent example of how GPR can assist in quarry expansion planning comes from the north of Sweden. A company producing ballast material from quarry operations sought to meet an increase in demand by expanding its hard rock quarry by approx. 6-hectares. To receive approval from the local county's administrative board, they were required to produce an environmental impact statement to include an assessment of moraine cover.

An estimate by the client puts the depth of the cover of the



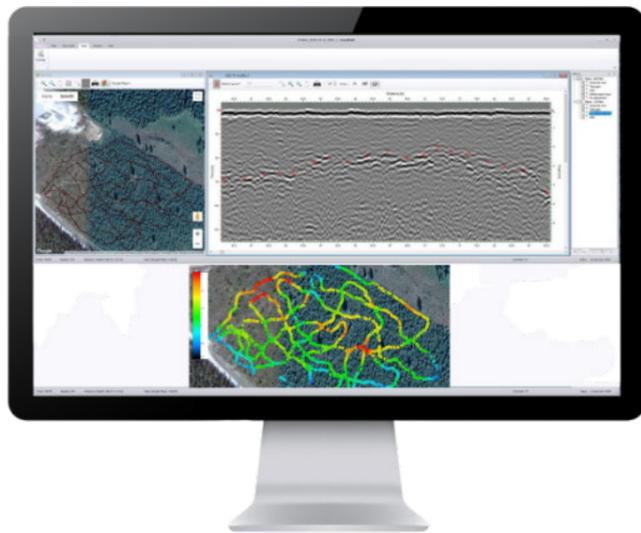
moraine within the expansion area at approximately one to five meters. However, the client sought help from GPR to survey the site and validate their estimation. The terrain in

question is very rugged, consisting of uneven rock-strewn surfaces amongst the dense newly planted forest, making for challenging survey conditions.

To meet these challenges and achieve their objective, the client settled on a GPR solution from Swedish brand ImpulseRadar. After consulting with the team at ImpulseRadar, the client chose the CrossOver CO1760 as the GPR system of choice. "ImpulseRadar is unique in the GPR industry, as our entire product line utilizes state-of-the-art real-time sampling (RTS), and our CrossOver series is the World's first range of true dual-channel GPR systems. They operate via a wireless Android-driven interface, making them ideal for even challenging work environments," says Brian Wright, Director of Business Development, ImpulseRadar.

Despite the challenging terrain, the CO1760 was a convenient solution, allowing the collection of GPR measurements with relative ease. Even with a distribution of radar profiles over the survey area to a length of approx.—3,700 m. The lower frequency of the 170 MHz channel was an excellent compromise of depth penetration versus resolution requirements while minimizing the backscatter effect to map the shallower rock levels. The user interface's moving map function proved particularly useful in navigating the areas where the forest was denser.

Results – In this case, GPR helped validate the clients earlier assessment of moraine cover. The successful completion of the environmental impact statement, including calculating the moraine volume, made the planned expansion possible.



Interpretations made using ImpulseRadar's CrossPoint visualization software with interpretation exports in DXF and KMZ formats.

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