Understanding shear zones

Maptek™ I-Site™ laser scanning was conducted to extract detailed geotechnical information on shear zones within a quarry in southeastern Victoria.

In 2016 AECOM contracted Maptek™ to undertake laser scanning of a Holcim (Australia) Pty Ltd quarry in Victoria for a geotechnical study. Holcim operates several hard rock, sand and gravel quarries in Australia to extract materials for the manufacture of construction materials.

The task was to scan the entire quarry and extract detailed geotechnical information such as geological features and discontinuities for kinematic analysis.

The Maptek™ I-Site™ 8820 laser scanner was set up on a tripod. As the data was registered using the on-board GPS, each setup involved collecting a 360° lower resolution scan and a defined window at a far higher resolution.

A total of 34 scans in four hours acquired 53 million 3D spatially accurate points.

The higher resolution data provides the detail for geotechnical extraction, with 87mm point spacing at 100m.

Geotechnical analysis

Before extracting any discontinuities the major visible shear zones were mapped. I-Site Studio software allows the user to extend discontinuities to visualise intersections across a pit or quarry.

The image right shows these shears and how they line up in comparison to a magnetic survey. I-Site Studio easily renders the magnetic survey image over the laser scan data for interpretation of mapped shears compared to magnetic anomalies.

Shear zones can be easily identified in the scan data and digitised in 3D to define the extents.

The software automatically extracts common discontinuity sets from the scan data, which can be plotted onto a stereonet for kinematic analysis.

While the stereonet plot provides better understanding of the shears, generating a rose diagram helps to understand their major persistence.
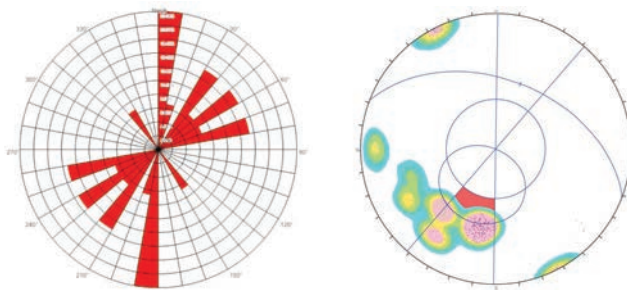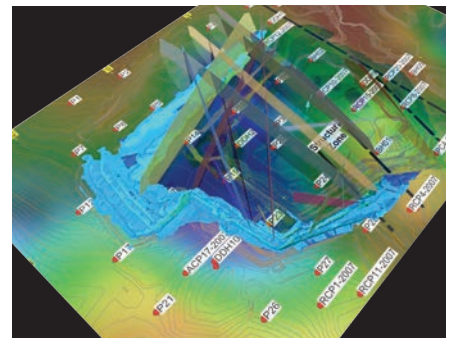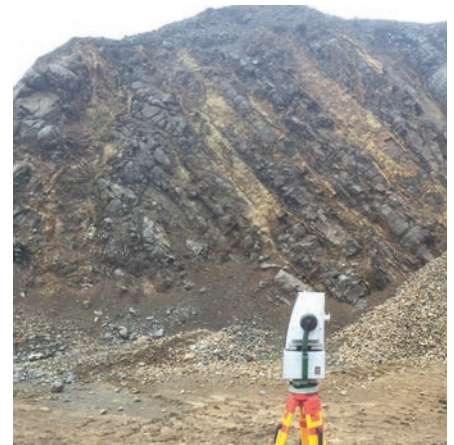
Expertise is needed to extract the discontinuities correctly, avoiding bias from the basalt columns. Once accurate data is extracted, it can be exported as Maptek™ Vulcan™ surfaces or images in ireg format. Geotechnical information can be exported in Vulcan-compatible formats for further analysis.

Thanks to
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