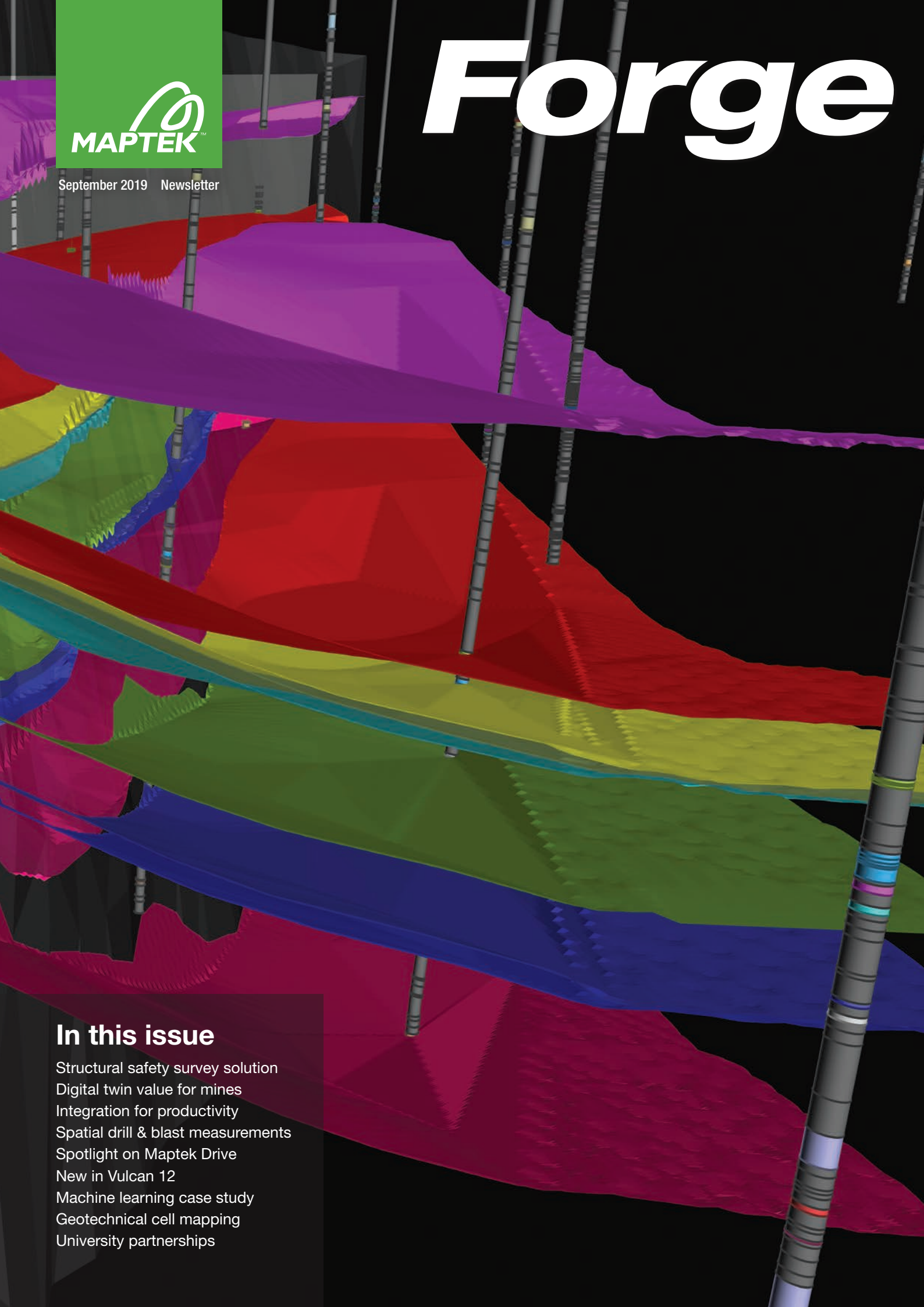
Forge

MAPTEK™

September 2019 Newsletter



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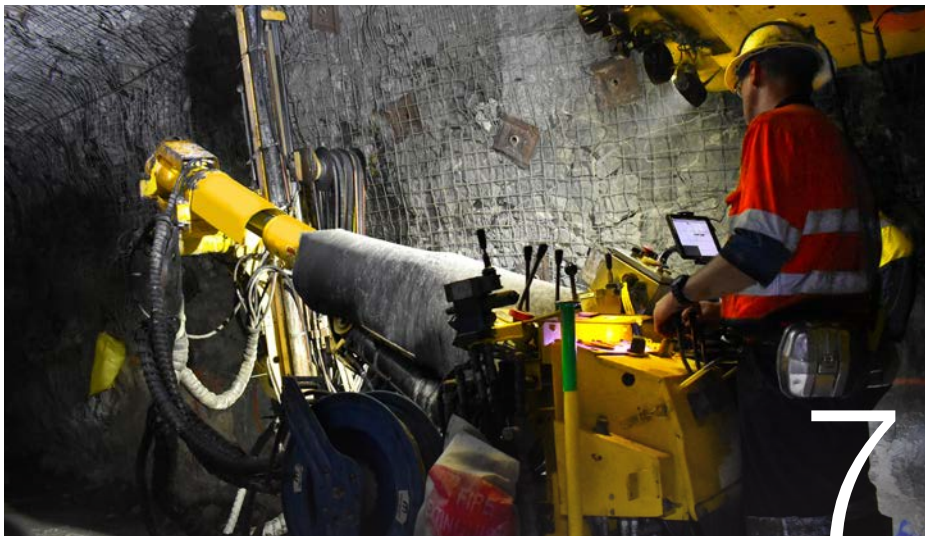
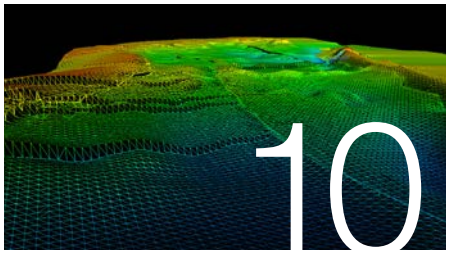
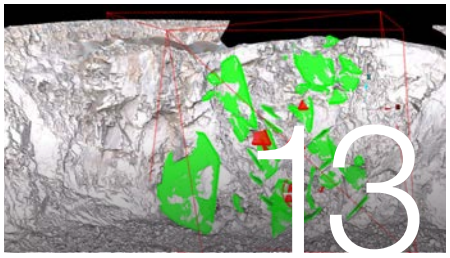
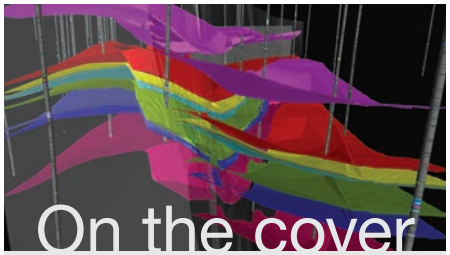








Integrated stratigraphic model created in Vulcan 12, showing throw and block-based faulting being applied in tandem

A full mining solution at your fingertips

It's no understatement that digitalisation has liberated mining professionals from the humdrum of daily tasks. Collecting, processing, modelling, analysing and reporting involve handling vast amounts of data, multiple times. Manual entry and transfer between formats can be a formidable challenge, let alone performing calculations on the data.

Solving this challenge was one of Maptek's aspirations in the 1980s – to transform the manual logging of borehole data by geologists into a computerised process.

Building on this forerunner to Vulcan, Maptek set about helping mining engineers, scheduling teams and surveyors to become more efficient and effective.

Almost 40 years on, Vulcan continues to evolve, with new geological modelling options, design and engineering capability and enhanced performance.

Today we deliver enterprise level systems that interact and integrate with production, fleet management and operational processes.

Mining is a fast changing industry and we regularly look to establish alliances with other leading providers. These collaborations are proving to be valuable investments that benefit customers and improve industry standards.

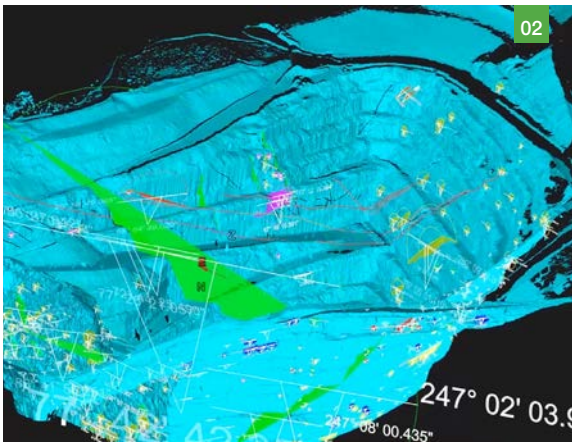
Maptek continues to lead innovation in the industry and is delivering a broader range of technology products than ever before.

We hope you enjoy this issue and welcome feedback at forge@maptek.com

Peter Johnson
Managing Director

Survey solution for structural safety

Maptek™ mine measurement systems are providing invaluable insight into the structural safety of a mine and in guiding planning around repurposing the site.



Maptek™ Sentry combines laser scan data with dedicated software to track and analyse surface movement over time. Hillgrove Resources has been integral in the development of Sentry, trialling it since 2013 at the Kanmantoo Copper Mine in the Adelaide Hills of South Australia.

The technology was integral in facilitating an aggressive steep walled mining approach to maximise ore recovery.

The 3D spatial data collected through Sentry stability monitoring and regular 3D laser scanning has been used to generate a full digital terrain model of the site.

Sentry is designed to allow sites to monitor and react to certain risks in open pit and underground mining operations, including slope failure, tailings or infrastructure displacement and rockfalls.

Alarms can be set to alert operations when movement reaches specified thresholds, facilitating decisions about whether it is safe for mining to continue or if an exclusion zone is required.

In addition to the live field data being crucial to operational safety, huge value lies in the ability to back-analyse the 3D spatial data collected by Sentry to refine a monitoring program.

More than monitoring

At Kanmantoo the Sentry data was shared with the survey team so there was no need for them to go into the field to capture survey data of the areas already covered.

This constant stream of survey data from multiple locations around the main pit was analysed in Maptek™ PointStudio™ alongside the survey team's regular scans.

The Sentry data informs where the survey team needs to scan at a higher resolution or from different angles. Each Sentry scan can be used in PointStudio for any of the software's deliverables such as geological mapping and analysis of geotechnical structures.

Hillgrove Resources' former Geotechnician, Justine Chambers, who now works for Maptek, says the geotechnical mapping data was pulled into stereonets and run through PointStudio kinematic analysis.

'That shows all potential failure mechanisms and where they can occur,' Chambers says.

'There's so much you can do with the data, and it all started from Sentry monitoring of walls with hi-res scans.'

'Every month we looked at how much walls may have moved, and any hotspots that we needed to be aware of or keep people away from, and set up alarms and monitor more closely.'

'The great advantage of the Sentry software and PointStudio is that we were able to pick up rockfalls down to only 30-50cm in size.'

> 'This approach has allowed us to tie historical scans from multiple positions into a single long-term monitoring project and to look at mine-life dilation.'

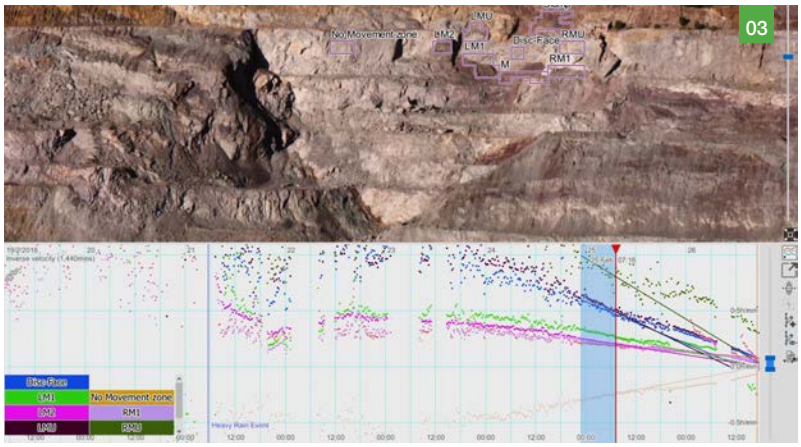
In addition this dilation has been directly related to remotely mapped surface structures that have controlled the dilation.

01 Aerial photo of the steep walled Giant Pit

02 Kinematic analysis conducted in PointStudio

03 Sentry live field data guides safety programs

04 Sentry set up to monitor the western wall of the Giant Pit



Sharing knowledge

The structural mapping data is being used in the design of a potential underground stoping operation beneath the current pit, which may be undertaken by Hillgrove Resources.

The Maptek mine measurement data informed various feasibility studies by independent consultant Mining One about the change of use to an underground operation.

For instance, Mining One has carried out 3D stress analyses for the open pit and now the underground work. The remote structural mapping was used to build the FLAC (Fast Lagrangian Analysis of Continua) model by incorporating the major structures and joint sets.

The open pit 3D stress analysis was then calibrated using the long-term dilation data from the Sentry monitoring. Various stoping options are now being analysed in the underground model to select the best configuration to ensure stable conditions.

The data may also be used to assess the development and operation of a pumped hydroelectric energy scheme (PHES) facility using the open cut mine's Giant Pit as the lower pond.

The existing slope monitoring data may be transferred to the new owner to continue with long term slope monitoring of the pit walls which will form the lower pond.

The Maptek data of the pit would improve the lower pond detail and assist in design of the underground facilities. The existing wall monitoring data can also be used in setting up the long-term slope monitoring program.

Maptek Mine Measurement Product Manager James Howarth says the benefit of the digital model is sharing the collective knowledge of experienced Hillgrove employees.

'Different site uses or mining methods require different sets of expertise,' Howarth says.

'This structural information would provide a baseline to create safety plans for working in the pit and developing drives. The key win would be that we're informing people about the geology and structures so they can develop their tunnels and caverns safely.'

Continual learning

Reflecting on the years of collaboration between Maptek and Hillgrove Resources, Howarth says the Kanmantoo open pit completion scans are the 'icing on the cake'.

'The final digital terrain model will be useful for Maptek, Hillgrove and any new owners to continue investigations into structural mapping and analysis of long-term pit dilation,' he says.

The history of survey and monitoring at Kanmantoo and analysis of data collected also provides Maptek with key findings that can be applied to ongoing development of software and hardware systems.

Thanks to
Hillgrove Resources

Digital twin value for mine performance

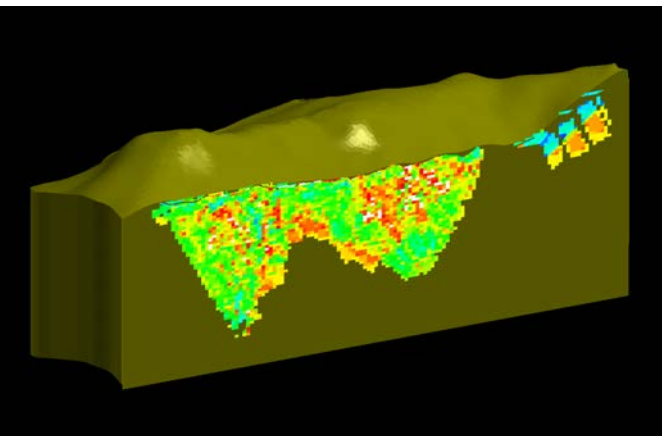
Solutions integration between Maptek and PETRA is further unlocking the potential of digital twin models for mine value chain optimisation to improve performance.

The agreement between Maptek™ and PETRA is providing industry with valuable results. The integrated technology has for example enabled PanAust to identify and visualise areas of poor recovery where petrographic and geochemical studies were not definitive.

The Maptek–PETRA solutions range from geometallurgical and dig rate modelling and visualisation, to drill and blast and processing plant optimisation and simulation. Combining deep domain expertise from across the whole value chain presents the industry with holistic optimisation.

PETRA's MAXTA solution creates a digital twin of the entire mining value chain. The machine learning approach brings many benefits to an operation.

Digital twin simulation enables engineers to virtually adjust 'levers' showing future scenarios around mine planning, blasting, metallurgy and process control to guide the best performance going forward. MAXTA mathematical optimisation automatically identifies which levers gave the best performance.



Engineers can conduct risk analysis, cost improvement studies, 'what if' simulations and scenario analysis. They can also show justification for resource allocation and develop strategies for the amelioration of negative events such as breakdowns.

Maptek Vulcan™ modelling and mine planning software has been helping mining companies to add value to their orebody and operational data for four decades. The recognition that production and operational data is a critical piece of the mine data landscape made integration of Vulcan and MAXTA a natural fit.

A Python application runs inside Vulcan to connect to MAXTA and populate block models with digital twin learnings from MAXTA.

> Planning can be based on better information, which in turn makes the digital twin models more relevant as they are connected to geological models and mine planning.

Importantly, this integration unleashes the capacity of MAXTA by utilising the most advanced, complex machine learning models and feeding information back into familiar workflows.

PETRA CEO, Dr Penny Stewart says *speed to value* is another key advantage of the integration.

'It's a breakthrough for mining because it provides a seamless way of integrating what's actually been going on in your mine for the last few years and using that to dynamically update your mine planning process,' adds Stewart.

'That has never really been *productionised* before.'

Stewart explains that MAXTA digital twin models are deployed into the production environment either in real-time or through the Vulcan digital twin integration that enables mine planners or geologists to seamlessly update the block model.

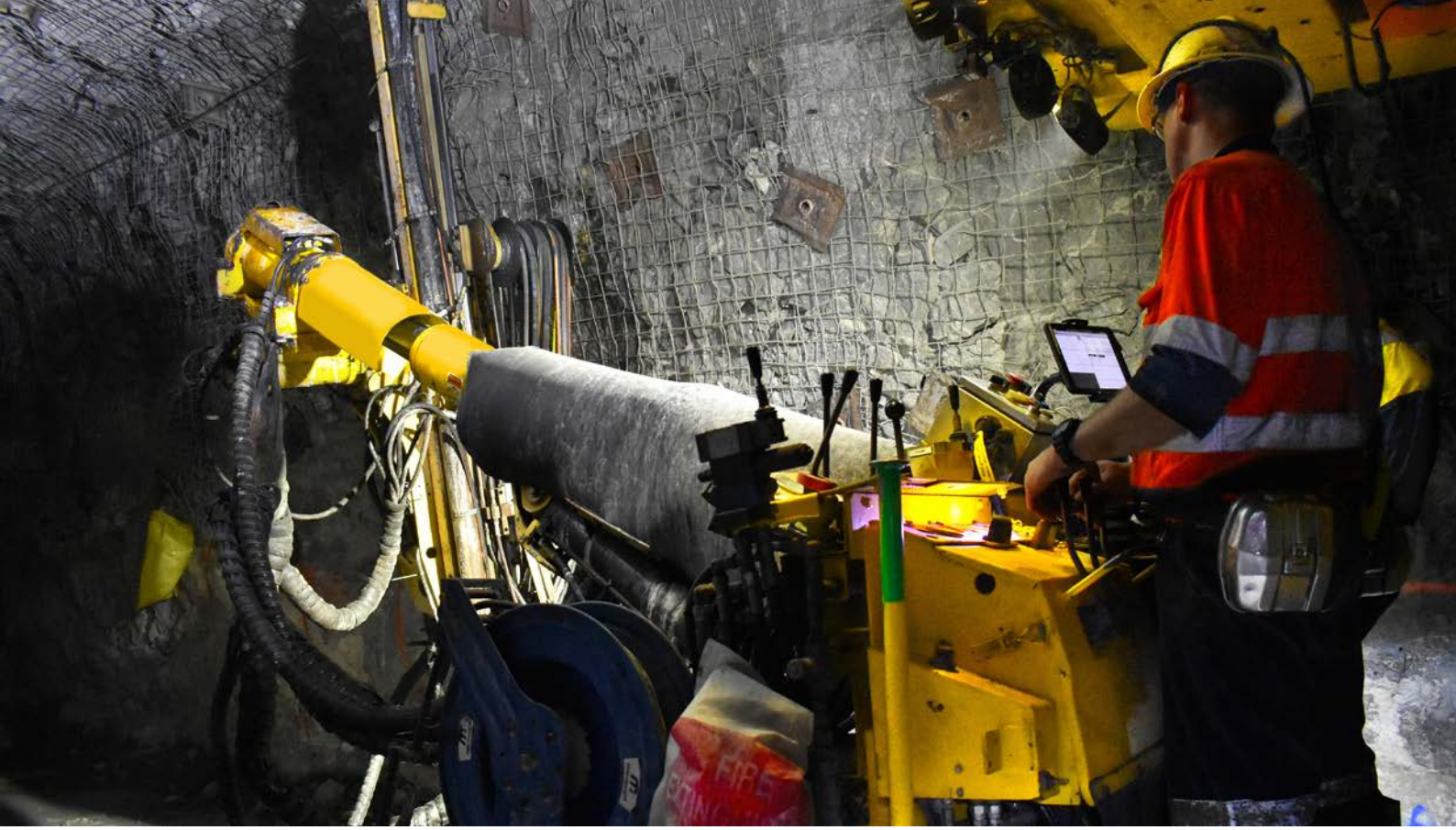
'What's really different is how this links the mine and the mill as part of day-to-day operations, productionising the ability of mines to feed back what they've learnt into their mine planning process.'

The next application will be dynamic mine scheduling. This will be made possible by bringing together the optimisation engines from Maptek Evolution mine scheduling solution and PETRA's prediction and simulation algorithms.

Blast design optimisation will also be performed by PETRA's MAXTA digital twin models dynamically linked to Maptek BlastLogic™ to enable optimised loading, crushing and grinding performance.

The MAXTA blast design simulation models can be created and updated using site specific blast performance detail by connection to BlastLogic historical drill and blast design data.

This partnership between Maptek and PETRA signifies a ground-breaking advance in understanding of performance and processes for the mining industry, with the future looking strong.



Integration for accuracy and productivity

Maptek™ has partnered with drill and blast technology provider Minnovare to deliver streamlined drill & blast solutions to underground miners.

A project recently completed for an Australian gold miner is a great example of how collaboration between technology providers can result in better outcomes for mining companies.

Linking Maptek™ Vulcan™ design and modelling software with Minnovare's new Production Optimiser system for underground production drilling streamlines the connection between design and as-built for more accurate outcomes.

Ring design data, including images, can now be exported from Vulcan and easily uploaded directly to Minnovare CORE – the Production Optimiser software interface – through scripting provided by Maptek.

The Vulcan–Production Optimiser combination helps ensure that drilling follows design. It also reduces the need for re-work, as feedback on accuracy and compliance is available to both the rig operator and the technical engineering team using Vulcan.

Production Optimiser combines advanced rig alignment hardware with innovative drill data capture software, substantially reducing blasthole deviation and average rig setup times.

This leads to optimum charge patterns and blasts, with a host of flow-on productivity benefits for an operation, including improved ore recovery, reduced average dilution and a faster stope cycle time.

Maptek has 40 years experience in developing technology and systems that solve the daily challenges for global mining companies.

Investment in people motivated by excellence, innovation and continual improvement allows delivery of systems that help integrate and streamline mining processes into a single source of technical data to inform decision making.

This includes the scripting that bridged the gap between Vulcan and Production Optimiser.

Minnovare developed the Production Optimiser, which was released in June 2018, in close collaboration with leading Australian gold miners, Gold Fields and Evolution Mining.

Since its release the new technology has been taken up rapidly within industry, with leaders such as Northern Star Resources signing an official Collaboration Agreement with Minnovare in August 2018.

> Analysis that Minnovare has conducted of in-hole survey data proves that circumstances prior to drilling account for up to 70% of blasthole deviation.

This was contrary to the prevailing industry perception that in-hole deviation was the primary contributor.

Spatial measurements for drill & blast

Integrated Maptek™ technology is breaking new ground in drill & blast performance and reconciliation.

Georeferenced spatial data imported into Maptek™ BlastLogic™ drill & blast management solution delivers greater understanding of blast execution and results, enabling future blasts to be refined and optimised to reduce costs and increase safety and productivity.

For example, using the Fragmentation Analysis tool in Maptek PointStudio™ with BlastLogic delivers greater post-blast performance visualisation. This tool takes laser scan data and segments it by automatically identifying individual rock pieces, providing a breakdown of the size of each particle.

Fragmentation information is vital as it affects dig rates, crusher throughput and general efficiency in the mine to mill process.

Any spatial data can be fed into BlastLogic and associated with the blast holes using the spatial measurement tools, for use in downstream processes such as reporting.

Generating heatmaps showing results of blasts in relation to blast parameters such as design and execution information assists with blast analysis and improvement.

> Displaying the information in such a clear visual manner gives engineers a true picture of the results of the blast.

Engineers can investigate the areas where the fragmentation differed from what was expected in planning.

Issues can be identified, such as waterlogged or underloaded areas and resultant choking of the blast, along with areas where the blast was impacted by differing geology, bad or incomplete drilling, or free facing.

Results can guide future blast preparation and execution.

Other indicators of blast performance such as blast heave or cratering can also be brought into BlastLogic as spatial data and associated with the drillholes.

Maptek Specialist Mining Engineer Rahul Suhane says this capability is causing a buzz in the industry.

'It really is groundbreaking,' Suhane says. 'Whenever I visit sites and show engineers these spatial measurement tools they're really excited by the potential.'

'Previously this information was only presented as a series of numbers and often when the average is taken everything looks OK. You can't pinpoint areas where the blast wasn't optimal and therefore don't learn about what you're doing right and what's going wrong.'

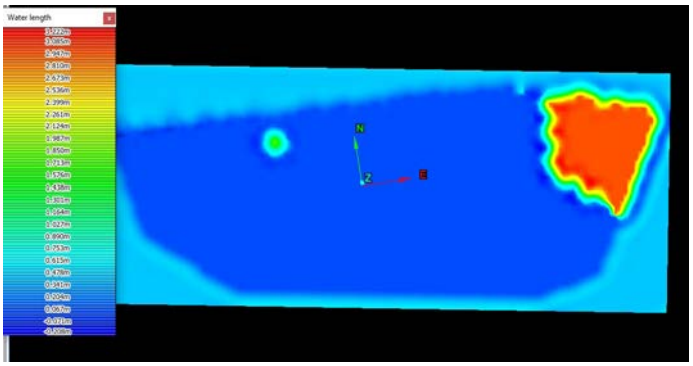
'Using this spatial data allows sites to get to the root cause of any issues in a particular blast.'

Suhane says this analysis may lead to sites improving their practices by taking steps such as modifying charging algorithms in BlastLogic to ensure water-based explosive is always chosen in areas prone to dynamic or static water.

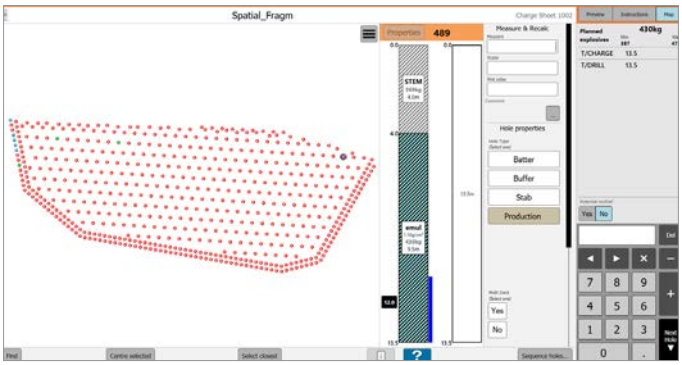
Post-blast back-break data from PointStudio can be fed into BlastLogic as a spatial data to aid geotechnical analysis and to ensure repeatability of successful blasts.

BlastLogic charge algorithms and tie up processes, along with vibration and fragmentation modelling, help optimise charge designs.

BlastLogic's ability to directly interface with supported drill navigation systems allows import of as-drilled data to validate drilling information against design.



A heatmap showing the water length measurements made using the BlastLogic Tablet and visualised spatially in the desktop application



The BlastLogic Tablet interface allows users to adjust charge plans dynamically to account for changes to hole characteristics such as water

The BlastLogic Tablet application is able to work offline and sites with good network connectivity reap the benefits of near-live data. The tablet assists with better execution of charge plans by facilitating capture of the hole characteristics such as dipping, water length and temperature information, as well as updating the charge plans based on these characteristics.

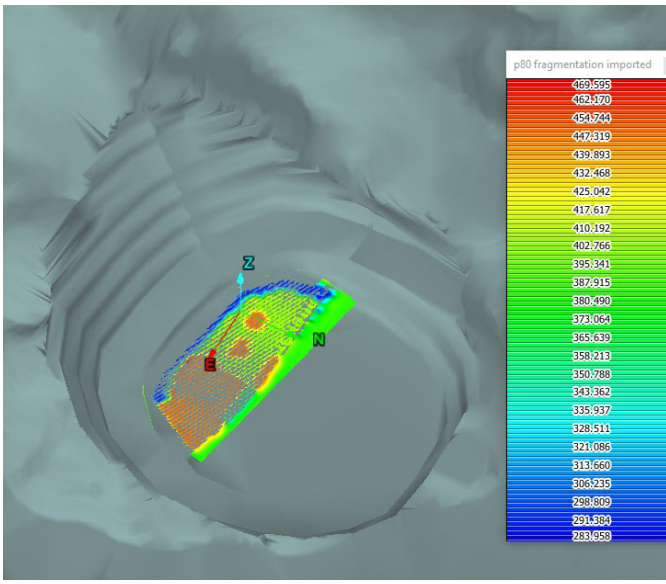
In the upcoming BlastLogic 3, this capability has been extended to capture any custom site information per hole to update charges on the tablet.

Maptek continuously invests in research and development to raise industry standards. BlastLogic 3 is set to be delivered on the Maptek Workbench giving greater data integration with Vulcan, including live data editing.

Any changes to blast and CAD data shared between Vulcan and BlastLogic are simultaneously updated, allowing Vulcan drill designs to benefit from BlastLogic's charging, tie-up and blast modelling tools and simplifying the drill & blast design iteration process.

Industry-leading design tools, integration with third-party systems and digitalisation of drill & blast processes is helping global miners to reduce costs and improve productivity.

Optimal drill & blast design and safe blast execution can ensure value is not left in the ground.



Heatmaps created using imported spatial data can be correlated against topography (red = oversize, green = good fragmentation, blue = over-fragmentation)

PRODUCT SPOTLIGHT

Maptek Drive

The latest mobile mapping solution from Maptek™ provides greater precision in continuous vehicle-mounted 3D spatial data capture.

Maptek™ Drive was first released in early 2015, allowing survey crews to safely acquire geospatially correct 3D point cloud data with a Maptek laser scanner mounted on a moving vehicle.

The latest system is designed specifically for the smaller, faster, lighter R3 laser scanner series.

A new generation Inertial Navigation System raises the sensor attitude angular accuracy by 100%, improving data quality and usability.

The IP67-rated unit has improved constellation options for greater GPS connectivity and more directional mounting options for extra flexibility in data capture.

Captured data is displayed live on the scanner controller so surveyors can instantly assess black spots and areas that need more detailed scanning. Real world data can be compared to design in the field.

The new Drive system delivers a higher degree of accuracy while maintaining the speed of data acquisition and operation from the safety of a vehicle. Sites can also use the laser scanner for tripod scanning and stability monitoring using Maptek Sentry.

What's new in Vulcan 12

Maptek™ recently launched Vulcan 12 and Workbench 3 alongside the new Maptek Account licensing and communications platform.

Enhanced usability in geology tools

A new **Coal Washability** menu includes a modern interface for easier setup and operation, new ways of interacting with data and database formatting. Users can optimise on product rather than simple factors like tonnage, and generate grid models for scheduling in Maptek Evolution.

Stratigraphic geologists can now specify hard boundaries when setting up aggregation routines, saving considerable time to produce results. Specifying stop points and excluding seams from aggregation, without also being excluded from the final model, reduces the need to run the ROM process multiple times and amalgamate results. New dual faulting helps build more accurate models within a smaller domain.

Advanced Reserves Weight by Yield can be used at any site with variable recoveries. Reserve reports can be run directly from the model without the need for Excel manipulation.

Drillhole Assistant allows direct editing of drillhole survey information. **Samples** databases can now be loaded directly into Vulcan using drag-and-drop.

The Vulcan **Geostatistics** toolbox has been enhanced with Global Kriging (simple and ordinary) and Multi-Gaussian simulation options.

Vulcan Data Analyser enhancements include box plots, log normal probability plots, correlation and covariance matrices, alongside full 3D fan variography, back transforms and interface improvements.

Improved workflows in engineering and design

Mining Block Generation saves time with a simple, repeatable approach to preparing mining blocks for scheduling with Evolution. Vulcan 12 includes support for projects with multiple pits or separate pit shapes and automates attributing to solids, such as tonnage or grade.

New **Triangulation** tools allow users to expand solids or surfaces to interrogate exclusion zones and areas of influence for risk assessment. Multiple surfaces or solids can be used to automatically update or adjust topography surfaces or pit shells.

Pit Splitter breaks multiple seams and benches into blocks to match a mine design. Enhancements include the ability to handle horizontal benches and easier preparation of information for scheduling.

A new **Compliance** tool allows mine planners to quickly produce end of period reconciliation reports with minimal post processing.

Variable Mining Widths allows users to specify different parting and mining thicknesses for different seams. Customisation of the final model without multiple runs of the ROM process saves time.

Interactive Block Planner simplifies the workflow for scheduling, short and mid term planning. Sending reserves direct to an Excel file improves speed and flexibility. Planners can run different iterations of a schedule and quickly see the results.

Enhanced tools for underground

Removal of **Overlapping Material in Centerlines** in Vulcan Gantt Scheduler reduces manual design for underground scheduling. Operations can spend less time on CAD work and data preparation, and focus on producing quality long range or life of mine schedules.

Third-party underground design tools **Stope Optimiser** and **SOT** have also been upgraded to newer versions.

Performance and user experience

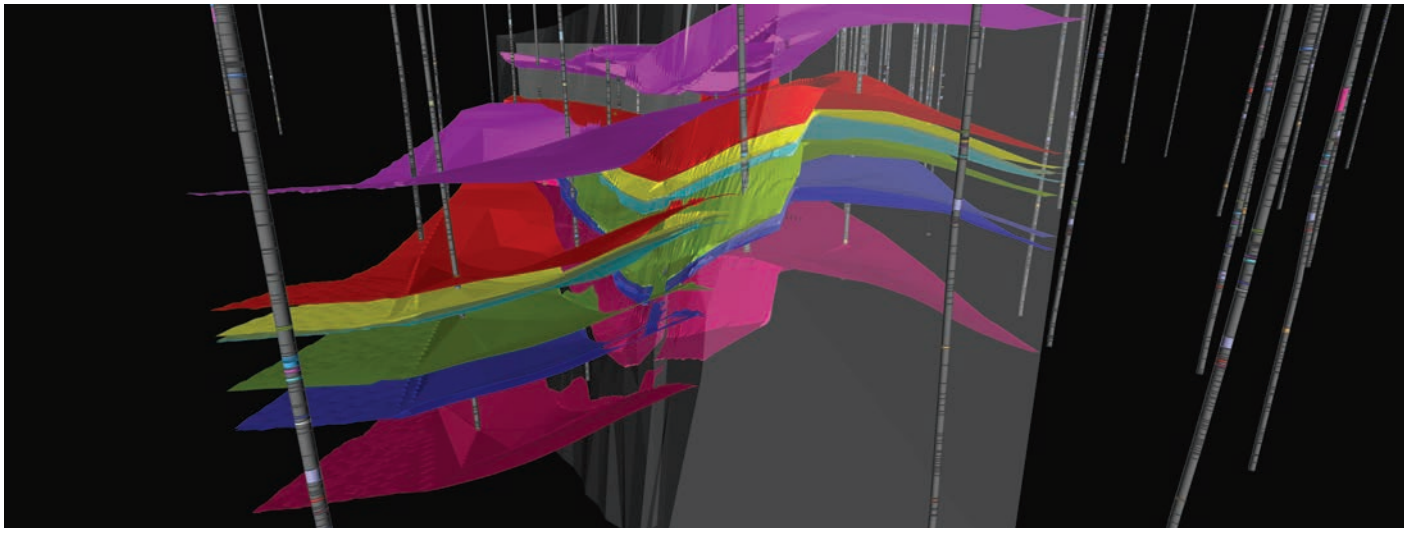
Python Macro Functionality builds on existing Lava options and allows Vulcan users to write and modify macros using Python.

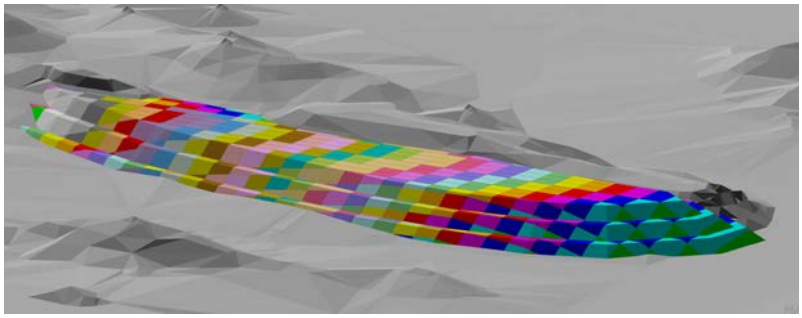
Vulcan users will notice significant speed improvements in **Design Database** object selection.

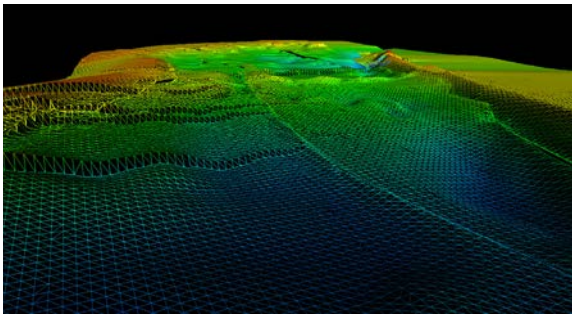
New **Import/Export** options include KML and KMZ file formats for interacting with Google Earth and other packages, and STL file format to support 3D printing.

Users will notice improvements to the **Workflow Editor**, which helps automate multi-step tasks. Workflows are easier to set up, visualise and run.

Request Support from the **Maptek Workbench** features self-service case management, larger file attachments and software usage information for prompt resolution.







Maptek Account

Maptek Account provides a dedicated service for customer licensing, software deployment and communication.

'Miners are looking to standardise providers and interfaces across operations to streamline their business. Maptek Account directly targets those initiatives,' says Maptek Managing Director Peter Johnson.

While existing licensing methods will remain available for the near future, Maptek Account offers greater flexibility.

'Flexible licensing enhances customer experience, providing easier access to Maptek software applications and secure options for offline use,' adds Johnson. 'We can also deliver higher quality technical support.'

Used in conjunction with the Maptek Workbench, Maptek Account improves the software installation process. Users can view downloadable applications and click to install.

Maptek Account Advantages

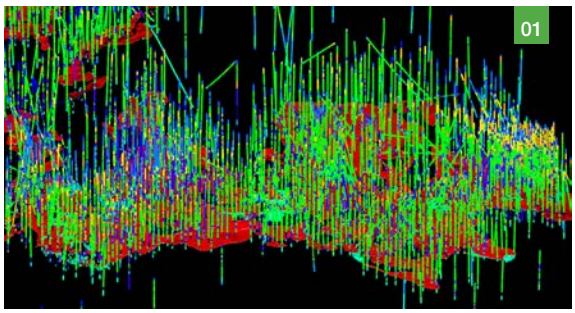
- Faster software deployment
- Flexible licensing, offline borrowing and fail-safe modes
- Automated communications for technical support

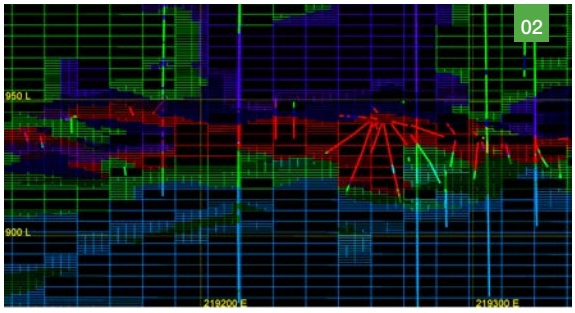
Find out more at www.maptek.com/account

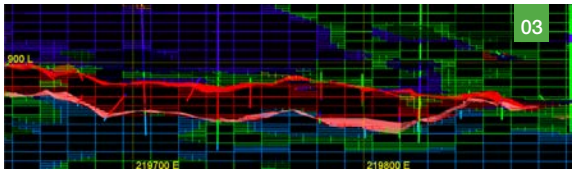
Machine learning case study

A new Maptek™ geological domain modelling process employing machine learning has delivered accurate shapes and volumes in much shorter time.

The Lisheen Mine, located in the Irish midlands in County Tipperary was featured in Maptek Forge in December 2001. The carbonate hosted zinc-lead mine was in full operation at the time using Maptek™ Vulcan™ software for underground survey, geological modelling, variography, resource estimation and mine planning.







01 Perspective view of surface and underground drilling at Lisheen with massive sulphide ore shown in red

02 Slice through resource model of a massive sulphide zone (red) showing drillhole samples and the geological domain boundaries generated by machine learning (red blocks)

03 Close correlation between manual wireframe (red = upper surface, pink = lower surface) compared with red blocks in the ore zone determined by machine learning

The mine came into production in September 1999 and produced an average of approximately 160,000 tonnes per annum of contained zinc in concentrate and 25,000 tonnes per annum of contained lead in concentrate.

The mine was exhausted of ore in 2015 and this retrospective compares the geological modelling used during mining, with modelling using the new generation Maptek machine learning service.

The Lisheen mine lease area includes a total of 2700 surface and 4670 underground drillholes (see Figure 1). Drilling was predominantly diamond drill core and was logged in detail by mine geologists. Rock types were classified into 50 different codes during logging and these were used for subsequent domain modelling.

It is not recorded how long it took to generate the wireframes to represent these geological codes. It would be safe to assume that many weeks were required to model the complex interaction of some of these units.

Maptek has developed a new geological domain modelling process using machine learning, which is especially suited to large volumes of data. The Lisheen mine lease data was entered into the machine learning engine for processing along with dimensions for the resultant block model, into which domains are directly written.

No other geological interpretations, aside from the rock codes in the drill base were used for processing. A parent block size of 12x12x4m was used with subcell sizes down to 3x3x1m for the subhorizontal orebodies.

After 50 minutes processing, the resource block model was complete, flagged with domains generated for all 50 rock codes.

> The recorded difference in the ore volumes between methods was only 4%, and the new approach was much faster.

The block model was validated visually using cross sections and long sections comparing drill codes and the block geology codes. These compared very favourably as can be seen in Figure 2.

Following the comparison of the machine learning domains with the original drill codes, a check against the manual wireframes generated during mine operation was conducted. This also showed a very close match as can be seen in Figure 3.

A volumetric comparison was then made between the mine resource model using manual wireframes to flag geological domains and the model built using machine learning.

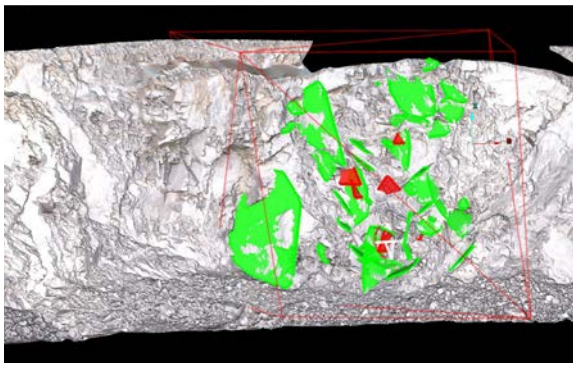
In summary there was only 4% difference in the ore volumes between methods, which is a very favourable comparison.

The machine learning model built from the interpreted codes in the drillhole database, without further geological intervention, has been able to replicate accurately the geological domain shapes and volumes.

Thanks to Minerals Ireland for access to the Lisheen mine data

Digital geotechnical cell mapping

Maptek™ PointStudio™ CAD-based visualisation and digitisation tools have digitally replicated conventional cell mapping at a mine in Arizona.



Maptek™ spatial technology has proven its benefits over conventional cell mapping techniques during a comparison at Freeport McMoRan - Bagdad Mine.

Bagdad is an open-pit copper and molybdenum mining complex about 100 miles northwest of Phoenix, Arizona. The Bagdad operation consists of a 75,000 metric ton-per-day concentrator, an SX/EW plant that can produce up to 32 million pounds per year of copper cathode from solution generated by low-grade stockpile leaching, and a pressure–leach plant to process molybdenum concentrate.

Cell mapping is a systematic field technique used to collect geological data, with an emphasis on measuring and recording rock fabric data from highwalls for geotechnical analysis.

Highwalls are divided into cells of equal dimension from a defined height and width, and structural features within the cells are grouped into sets that share similar orientations, allowing for complete geological sampling.

Freeport McMoRan used Maptek terrestrial LiDAR and PointStudio™ geotechnical cell mapping tools to compare conventional cell mapping techniques with the digital method.

The comparison showed that Maptek 3D laser scanners and PointStudio software can provide more accurate and consistent cell mapping data, delivered through a far safer workflow.

The digital method involves taking high-resolution 3D laser scans and photographs of the highwall and analysing the data using PointStudio.

Interpretation is based on simultaneously examining the 3D surfaces and photographs to get a comprehensive understanding of the highwall.

'The scan produces a really detailed point cloud with a point spacing of about one inch, essentially replicating the highwall relief as you see it in the field,' 3D Geological/ Reserves Modeler at Freeport McMoRan, Josh Cobb explained.

The structural features – such as discontinuities, fractures and faults – are generated and recorded in a digital version of the traditional cell mapping data sheet.

The conventional in-field method takes two people about 15 to 20 minutes to measure out and spray the boundaries for a 10-cell run.

The digital method takes a similar time but can be done from the safety and comfort of an office by a single person using PointStudio.

Simple polyline traces of crest and toes are created manually in the software and then the cells are generated automatically based on input information. Cell mean face orientations can be automatically calculated based on the selection of three points and the data can be exported as a CSV file.

Stereonet plot comparisons show that both methods identify main sets, the data statistics are similar, and the digital method virtually replicates the experience of sighting with a Brunton compass.

'You get similar data with greater accuracy and consistency using the digital method, and the process becomes quicker and more efficient over time and experience with the software,' said Cobb.

> Workers no longer need to spend significant time within close proximity of the highwall.

Extreme heat, cold or rain can limit highwall access and also create hazardous environments, with the risk of heat exhaustion and potentially dangerous driving conditions within a pit.

'The digital method removes those elements from the equation,' commented Cobb.

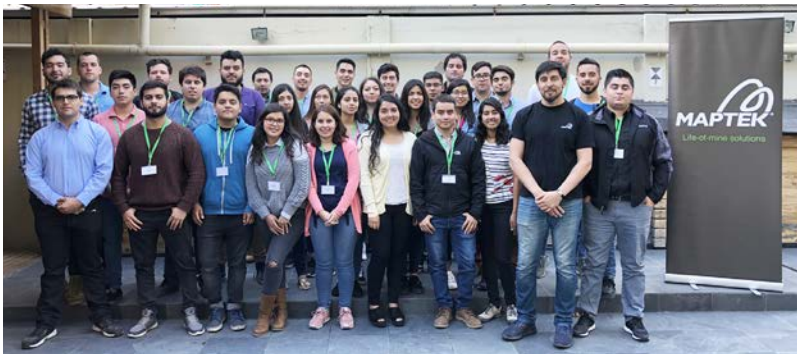
'You only need one person for the digital method, as opposed to two for the conventional method, and the only time you really need to go down into the pit is to take pictures of the highwall.'

Digital cell mapping has proved to produce accurate and consistent results for geotechnical analysis.

Thanks to
Josh Cobb
3D Geological/Reserves Modeler
Freeport McMoRan, Bagdad Mine

University partnerships

The Maptek™ office in Chile supports training of the next generation of professionals in the mining industry.



Master class

Thirteen students in their final year of the Civil Engineering in Mines degree at Pedro de Valdivia University participated in a Master Class at the Maptek™ office in Viña del Mar in May 2019.

Master Classes give the university the chance to train students preparing for mining associated careers in the technology widely used in the industry.

The main focus was to train them to use Vulcan Optimisation and Open Pit Design tools. Students gain everything from basic knowledge to advanced topics allowing them to improve their skills and promote their professional development.

Students are motivated to learn and show high interest in class participation as they recognise the importance that Maptek has in the mining industry and the benefit of Vulcan know-how for their professional training.

Internship program

The Maptek™ Internship Program in January and February 2019 attracted 32 senior year Civil Engineering in Mines students. Participating universities included University of Santo Tomás, University of Viña del Mar, Pontifical Catholic University of Valparaiso and Andrés Bello National University.

The focus was primarily on Design and Planning, in both open pit and underground mining.

The benefit to students lies in learning software that is leading-edge in the mining market, and moreover learning to use it to the standard of a professional user.

Students also had the opportunity to develop a project under the same demands and standards that they will face in the workplace.

The program gives work experience to local students in the Valparaiso region, decentralising opportunities usually available in Santiago. Maptek provides internships to those students who have shown a real interest in continual learning.

Learn more about Maptek university partnerships: www.maptek.com/university

Training courses

Maptek™ values training of students and empowering universities to turn out skilled mining professionals.

Mine design

Maptek™ Africa is proud of the ongoing partnership with the Department of Mining Engineering at the University of Pretoria. Students are expected to use Vulcan to design a mine for their final-year project.

Maptek Africa Technical Services Department has created a gold-copper deposit block model for the University. The block model challenges the students to plan a feasible mine, which will enhance technical skills in their professional mining careers.

The five-day Mine Design training course was presented over a five-week period.

Both Open Pit and Underground Mine Design training is offered. The open pit course allows students to use relevant tools to design pit benches, berms, dumps and haul roads. The underground course teaches the design of centerlines, cross cuts, declines and ramps.

Train the trainer

In July 2019, Maptek Edinburgh office welcomed university professionals from across Europe for our first Train the Trainer workshop.

These workshops are designed to give university professors and researchers up-to-date knowledge and skills in Maptek products, which they can then pass on to their students.

Maptek provides product licences and training to universities across the world. It's a commitment and investment that we are proud of. Students who become competent in using industry standard software have a better chance of hitting the ground running once they enter the mining profession.

During the three-day workshop participants learnt the best ways to use Vulcan for resource estimation, geological modelling and mine design.

The focus for PointStudio was on manipulating and filtering LIDAR data for geological mapping, mine design conformance reporting and geotechnical analysis.

We were pleased to receive glowing feedback from attendees and hope to run Train the Trainer workshops regularly.

Take a look at our online and classroom training courses:
www.maptek.com/training

Maptek Calendar

2019

September 16-20
Perumin 2019
Arequipa, Perú – Booth 755 - 754

September 18-20
Mining Metals Central Asia
Almaty, Kazakhstan

October 22-25
XXXIII Convención Internacional de Minería
Acapulco, Mexico – Booth 428

October 23-24
XPLOR
Montréal, Quebec, Canada – Booth 218

October 29-31
CEBIT Australia
Sydney, NSW, Australia – Booth D35

November 7-8
ISEE Australia Annual Conference
Brisbane, QLD, Australia

November 12-13
NewGenGold 2019
Perth, WA, Australia

November 19-20
Future Mining
Sydney, NSW, Australia

November 25-26
International Mining Geology
Perth, WA, Australia – Booth 40

December 8-9
SME Arizona
Tucson, Arizona, USA

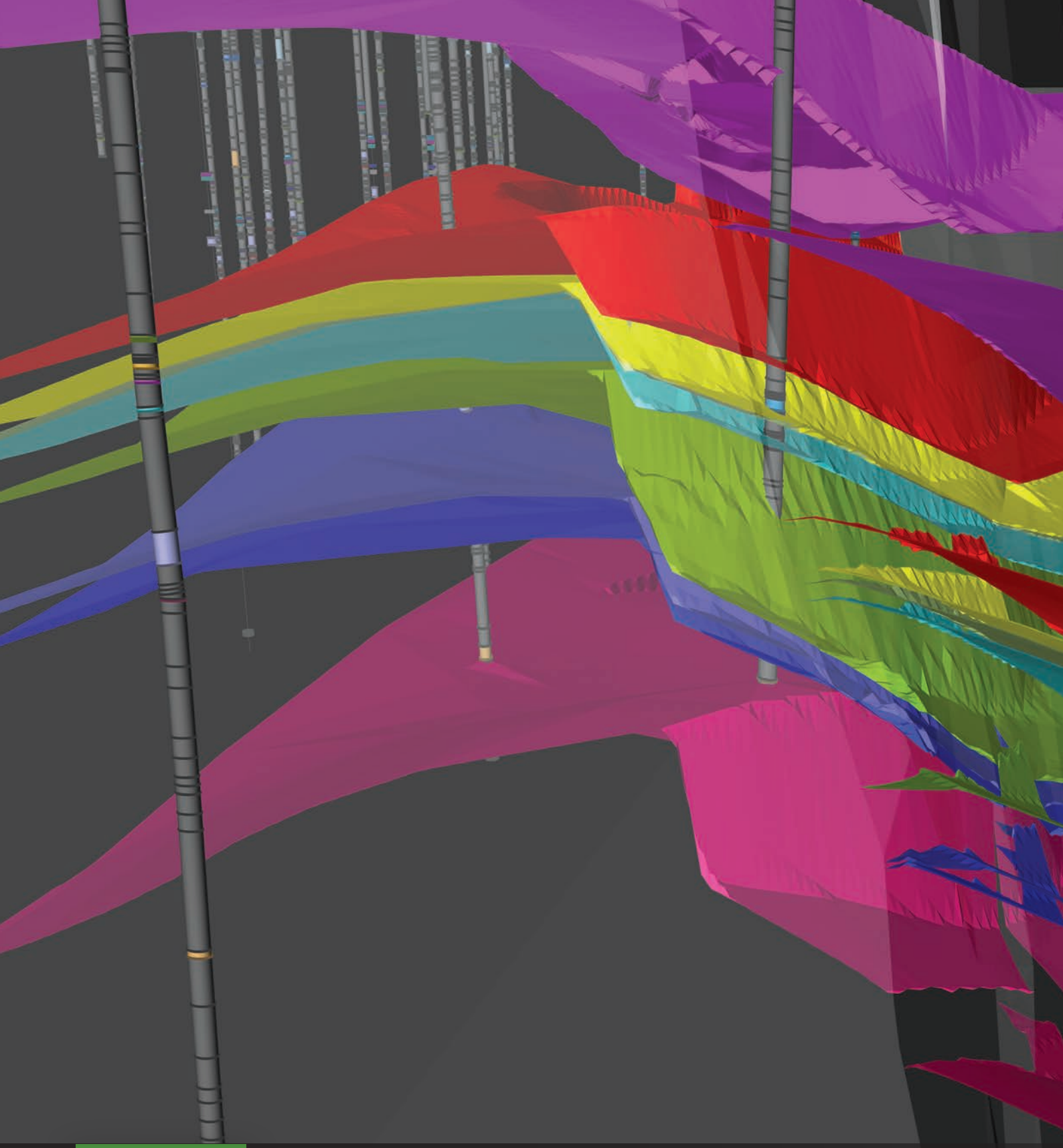
2020

January 20-23
AME Roundup
Vancouver, British Columbia, Canada

January 26-29
ISEE
Denver, Colorado, USA

February 23-26
SME
Phoenix, Arizona, USA

March 1-4
PDAC
Toronto, Ontario, Canada



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