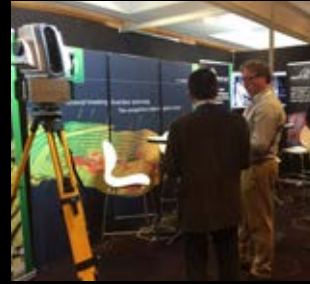


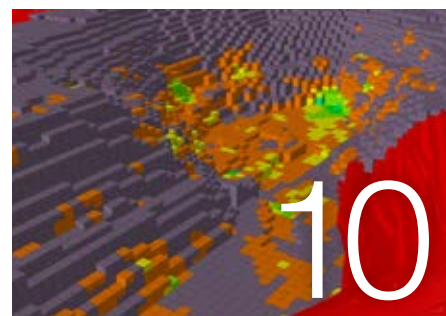
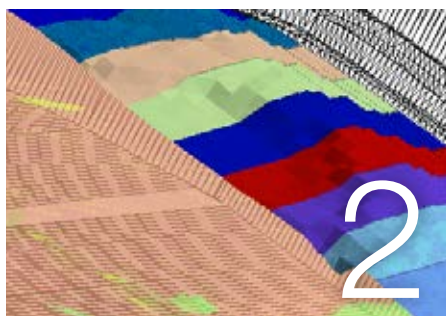
> In this issue

Vulcan 10 features preview
Redefining inventory control
Coal modelling case study
Geotechnical and CAD tools
Advances in reserves scheduling
Value add with live drilling data
Industry partnerships



Global Activities

Maptek training, tradeshow and masterclasses were held around the globe in recent months. See our events Calendar to find out where Maptek will appear next.



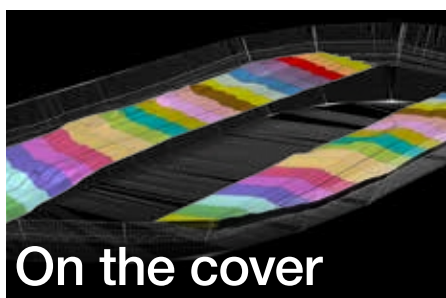
In this issue

Data driven mining intrinsically introduces a major challenge. How do operations digest all of the data that is collected throughout the mining lifecycle and turn it into profitable decision making information?

Quick turnaround is essential. There's only a narrow window for collecting, modelling and analysing data so it can be fed into the next planning cycle.

This is where effective solutions can have the most impact and help drive continual improvement.

Maptek systems are designed with integration and continuous operations in mind. Laser scan technology can be applied to survey and design conformance in the day and monitoring at night. Dynamic update of models, schedules and production plans gives operations confidence they are working off accurate, current data.



Scheduling blocks created from a pit solid, topography and horizon surfaces

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Vulcan 10 preview

Maptek™ Vulcan 10, set to be released in March 2016, includes new features and fresh interfaces to give users even more control over their data.

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Data Analyser

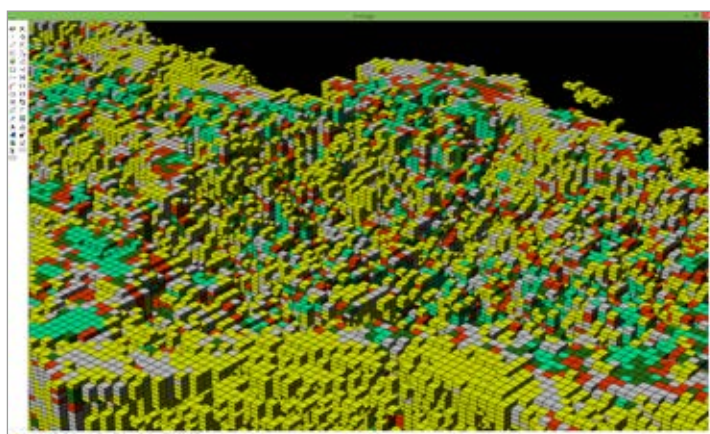
The new Maptek™ Vulcan™ Data Analyser presents a totally revamped tool for variogram analysis allowing users to gain a better understanding of their geological data.

With Data Analyser users can easily set up and apply filters and transformations to data. Processing is fast and changes to parameters are interactively displayed on the relevant charts.

The dynamic lag control feature greatly reduces the number of times variograms need to be calculated.

According to Vulcan Product Manager Eric Gonzalez, 'Removing trial and error in determining lag size saves time when creating a new model. This allows users to test multiple alternatives with confidence.'

Data Analyser integrates Vulcan unfolding tools, providing several new methods for handling structural and grade based anisotropy.



The new fan variogram 'compass' allows users to select multiple directions for correlation of samples.

Data Analyser also displays multiple models concurrently, so users can conduct real-time, side-by-side comparisons.

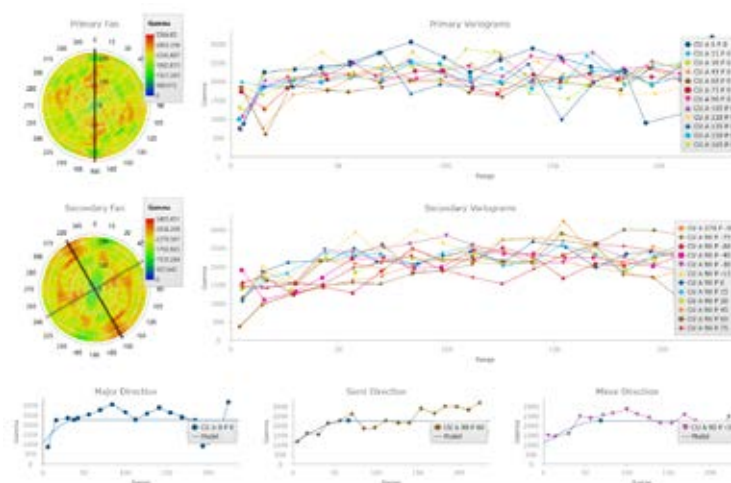
The new option replaces multiple steps with a streamlined workflow leading up to grade estimation. Data Analyser is fully integrated with existing Vulcan functionality and data types. High quality charts are easily output for incorporating into resource reports.

Large block model display

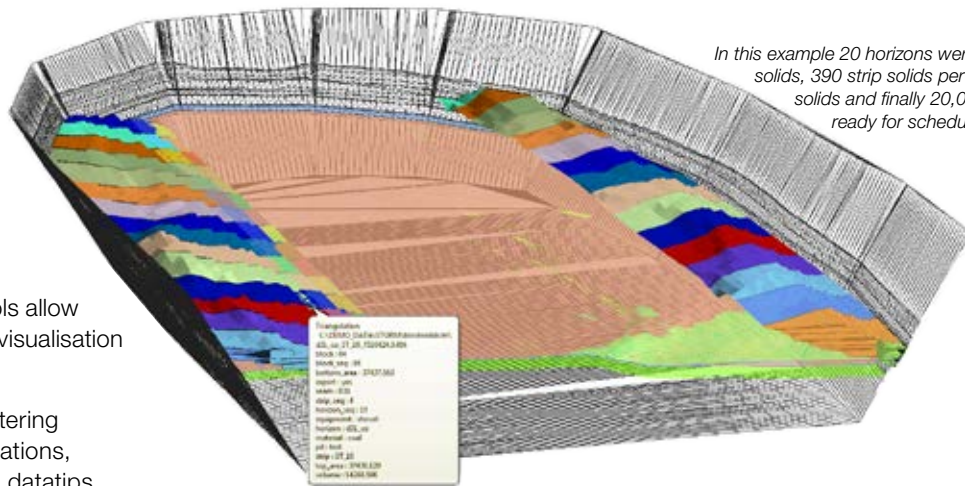
Visualising block models interactively in 3D is essential. Until now geologists have had to compromise when dealing with extremely large models. They were often forced to restrict the block model to a certain area or constrain it to a single geological domain.

Vulcan 10 allows users to visualise regular block models of hundreds of millions of blocks. Level-of-detail viewing means that as users zoom in they are presented with greater resolution and processing power is used only where necessary.

Slices can be displayed and users can toggle through sections on the screen.



New Data Analyser interface with fan diagrams, semivariograms and modelled variograms for major, semimajor and minor directions for a vein-style copper deposit.



In this example 20 horizons were split into 40 horizon solids, 390 strip solids per horizon, 8600 block solids and finally 20,000 bench solids ready for scheduling.

Dynamic display controls allow users to easily change visualisation parameters.

On-the-fly colouring, filtering by grade values, annotations, anisotropy vectors and datatips can all seamlessly modify the display.

'Users can now see their entire model. No time consuming workarounds. No compromise to resolution or data quality,' said Gonzalez.

Performance

A significant improvement in Vulcan 10 is the additional support for multi-threaded processors resulting in up to 10 times better performance over Vulcan 9.1.

Vulcan 10 allows larger models to be visualised and manipulated more effectively. Time is available for better analysis and considering different options. When users are in control of their data more effective decision making follows.

Splitting solids

A new Vulcan 10 addition to the Open Pit menu presents a workflow-based approach to creating scheduling solids.

Users are guided through a series of logical steps beginning with a full pit solid, topography and horizon surfaces.

The resultant product and waste solids are then split by strip lines containing information about batter angles and berm offsets, as well as block lines and bench levels.

At every stage of the splitting process triangulation solids are saved separately as they are created, and assigned names and physical attributes.

Existing grids or HARP models can be interrogated to assign quality and geotechnical attributes to the resulting solids.

Optimised, multi-threaded use of the Boolean engine quickly creates reliable solids with no loss of model fidelity, ensuring volumes match at every stage during splitting.

Coincident and stepped surfaces are easily handled. The new splitting option works on simple or complex geology. Additional features allow created solids to be clipped to a new topography and easy export of attributes in common formats.

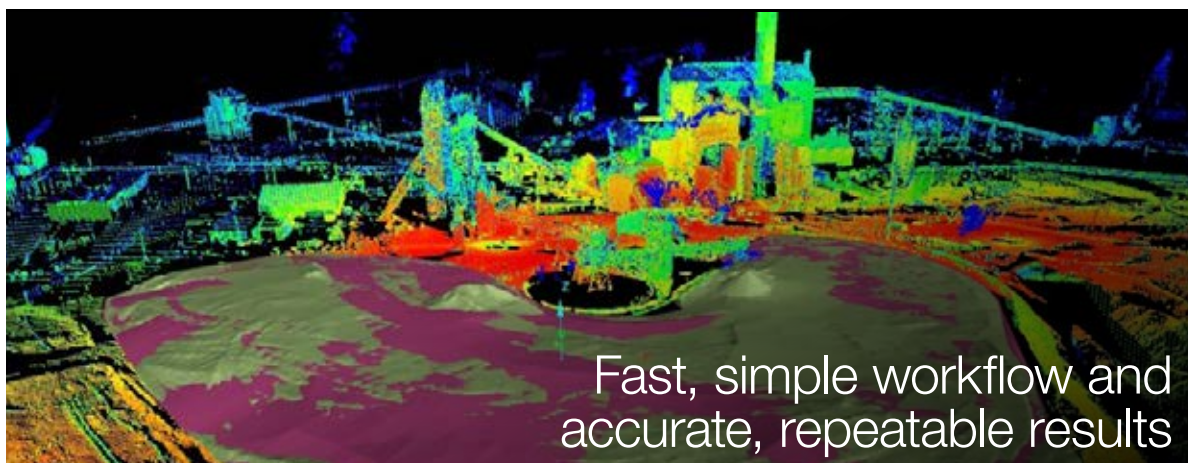
Visualisation at every stage allows continuous validation. Consistent results provide valid, closed solids, fully attributed and ready for scheduling in Vulcan Gantt Scheduler and Maptek Evolution.

Vulcan 10 will be available in March 2016.

Precision data redefines inventory control

The need for tighter inventory control in challenging market conditions drives greater emphasis on the frequency, accuracy and visibility of reporting practices.

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Reliability and repeatability are the two factors at the heart of the most successful reporting and forecasting models.

Uncertainty in these areas impacts the entire organisation, from surveyor to CEO. All stakeholders must seek better ways to reduce costs without affecting services and supply.

Maptek™ I-Site™ laser scanning technology delivers streamlined 3D spatial solutions to tackle issues of accuracy, timeliness and integrity of reporting data.

I-Site provides smart tools to model on-hand stockpile volumes, generate production reports and develop demand forecasting estimates.

Reliable and repeatable workflows ensure models can be trusted for ongoing business intelligence.

Repeatability & reliability

Demand forecasting requires precise, current data for planning the most efficient business activities. That data is drawn upon for key decisions in resource allocation to maintain the desired inventory levels.

In any industry, inventory occupies a strategic position in the structure of working capital. As the largest component of current assets, effective management is vital.

Imagine sending product to the mill without knowing what capacity is available. If the stockpile makeup is unknown then you cannot accurately forecast demand for the plant, creating a risk for regulatory compliance.

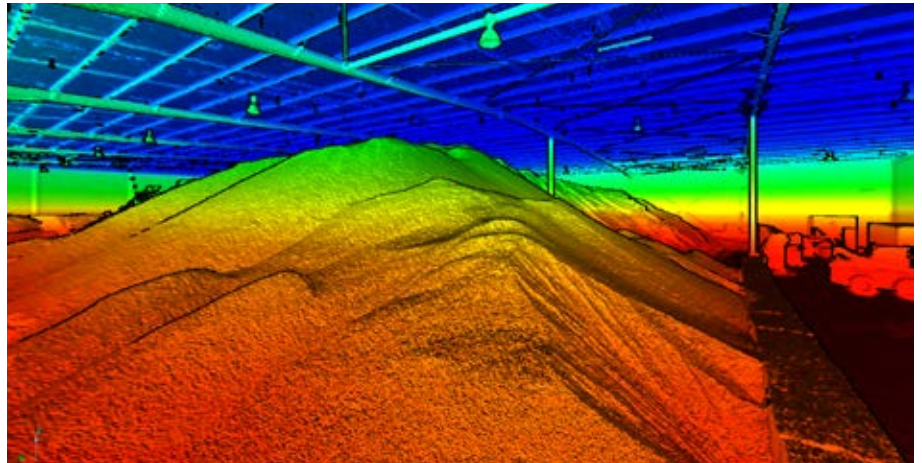
Airborne methods for collecting stockpile measurements are limited by weather and reflectivity of material, and cannot be applied in enclosed spaces.

Dozer-mounted GPS survey uses staggered points to determine month-end volumes. Comparison with the laser scanning method reveals gaps in data, including missing edges that cannot be safely reached by dozers.

I-Site laser scanners handle all survey tasks, with custom accessories and inbuilt workflows for unique environments and site-specific challenges.

I-Site software can handle point cloud data collected by all terrestrial and aerial systems. Seamless processing and reporting produces the most efficient, accurate and cost-effective results for stockpile modelling.

High-precision volumetric calculation is a Maptek core competency. Focusing on ease of use and high rate of data turnover, I-Site technology offers the best possible data and near real time field-to-finish results for ports, refineries, manufacturing facilities and mine sites.



I-Site users work comfortably and confidently, knowing their data can be relied upon for seamless, efficient stock and inventory management.

Auditability

Benefits of the Maptek laser scanning solution include transparent evaluation of the inventory for financial reporting and export duty, compliance with regulations and improved planning across the operation.

Mobile scanning delivers quick and accurate inventory measurements. I-Site laser scanners can be mounted on standard site vehicles to collect 3D data as the stockpiles are circumnavigated.

For outdoor stockpiles the I-Site Drive system uses a GPS receiver and inertial navigational system (INS) to georeference data to an exact location, standardising to the same coordinate system each time. This is a key benefit for auditing.

Scan data can also be collected at the same time for updating the status of pit surfaces and highwalls without slowing production.

Maptek solutions reduce the time for stockpile survey, enhance the safety of workers and deliver an incomparable level of surface detail.

Timely data allows decision makers to settle on targets, create plans and account for fluctuations in product.

A tighter turnaround for reporting and projection models flows through ground-level operations to quarterly statements and stock performances.

Demand forecasting can be a compelling driver for identifying the best ways to increase efficiency without decreasing value.

Inventory control and demand forecasting

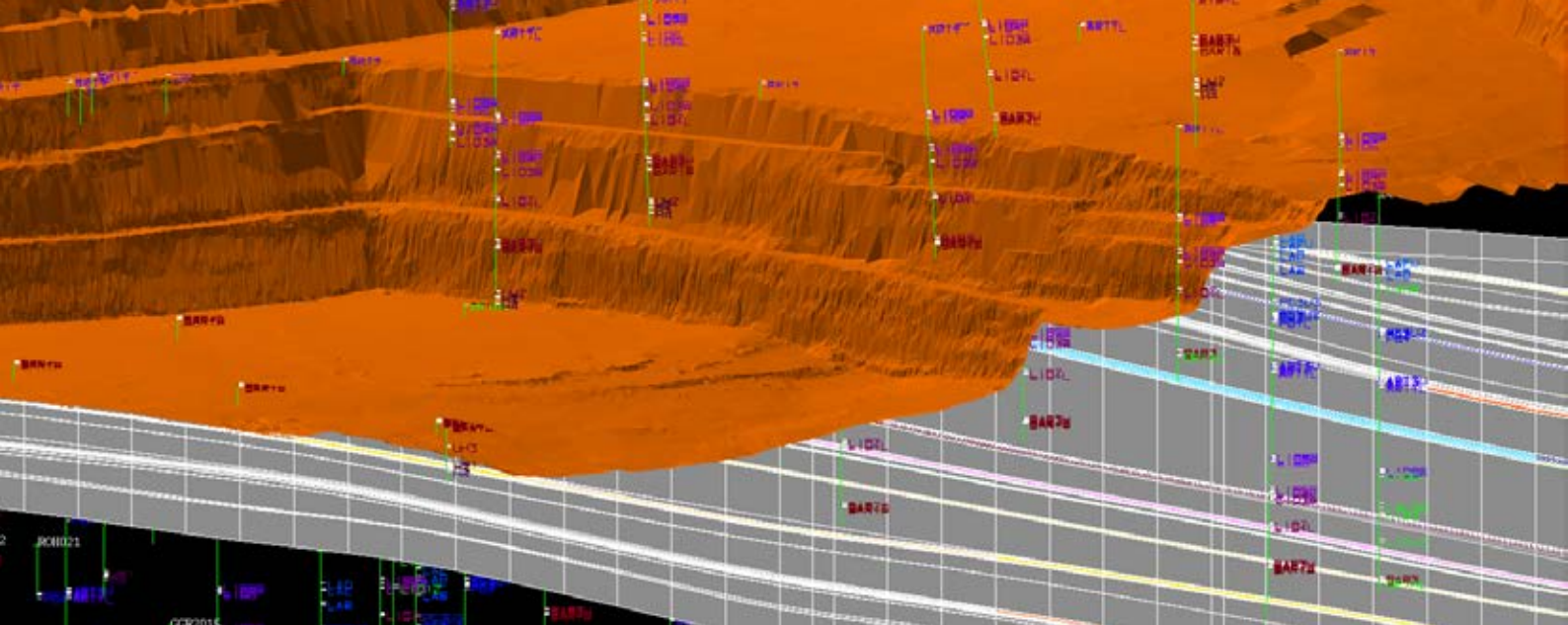
Effective inventory control and demand forecasting provide strategic opportunities to lower costs across the production period.

The twin aims of demand forecasting are to minimise disruption in the production schedule for lack of raw materials and to keep down capital investment in inventory.

Excessive inventory levels consume business funds, which then cannot be used for other purposes.

Operational costs, such as the cost of product shortage, handling fees, recording and inspection increase with volume.

Low levels of inventory may result in frequent interruption to the production schedule, leading to under-utilisation of capacity and negative impact on delivering product to customers.



Ongoing improvements to mine planning

A coal mine in Australia discovered the benefits of HARP modelling for run of mine compositing and product tonnage calculations.

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Glencore's Glendell coal mine, located at Ravensworth in the Upper Hunter Valley region of New South Wales, is a large open cut mine that produced 3.86 million tonnes of saleable coal in 2014.

Glendell is an excavator and truck operation targeting the seams of the Whittingham coal measures. Approximately 150 coal plies range in thickness from tens of centimetres to several metres. Many small waste partings occur between the coal plies.

The challenge

The site geologist presented Maptek™ with the challenge of finding a quick and flexible method for evaluating potential run of mine (ROM) working sections, while calculating yield weighted product tonnages for different moisture bases.

Moreover, a 'black box' approach was to be avoided, and all results needed to be checked visually and statistically prior to use.

Additional requirements included replicating the current output in a way that was easy for all stakeholders to use and providing a more rapid, visual method of finding potential target areas.

The current output was too complicated to incorporate into reserve calculations. However, a ROM HARP model generated in Maptek™ Vulcan™ is easily reserved against pit shell solids.

The solution would involve ROM HARP reserve output (including qualities) being created for logistics, coal handling and preparation plant personnel on a weekly basis for forecasting.

Conducting the process entirely within Vulcan eliminates risk associated with data import and export.

As well as weekly forecasting reserves, end of month, quarterly and annual reconciliations could be handled more simply. Errors in initial assumptions were able to be resolved quickly and easily.

HARP to the rescue

A Vulcan stratigraphic block model or HARP model proved to be the ideal approach. It was easily built from the available resource model without loss of geological fidelity and allowed creation and storage of the large number of variables required for the final output.

Additionally, a HARP model, like any Vulcan block model, can act as a large 3D spreadsheet, allowing scriptable calculations to be performed on any numeric or text type variable.

ROM HARP capabilities allow a simple specification-based set of rules for:

- > coal and waste quality compositing;
- > loss, dilution and recovery incorporation; and
- > seam combination.

It was crucial to create an output HARP model representing what is actually mined in the pit, while also allowing all of the input parameters to be supplied as constants or existing HARP model variables.

The method

The procedure was encompassed in a single script, run from a Vulcan command shell. Run time for the production model was around 20 minutes.

The first step was to add variables to the input HARP model to calculate and store loss and dilution parameters as a proportion of the resultant working section thicknesses. This required a precalculation run of the ROM HARP model thicknesses.

The first pass output HARP model contained yield values calculated at 6% moisture using supplied regression equations for each of the 150 plies.

The final ROM HARP process was then run. It included all of the relevant weighting rules for quality and mining parameters as well as the ROM parameters themselves (minimum mineable thickness, minimum separable parting and product to waste ratio).

This resulted in the output ROM HARP model.

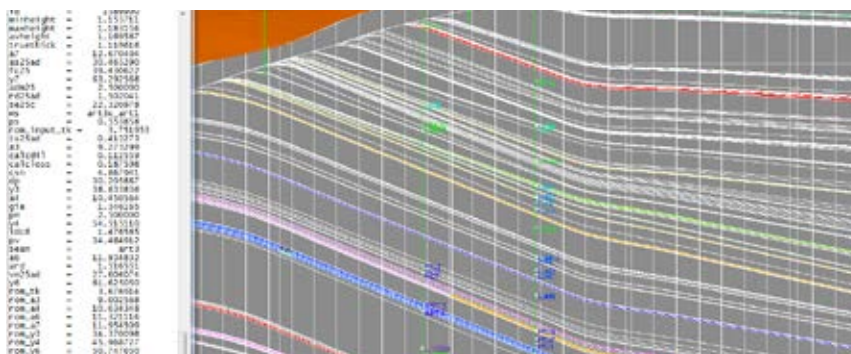
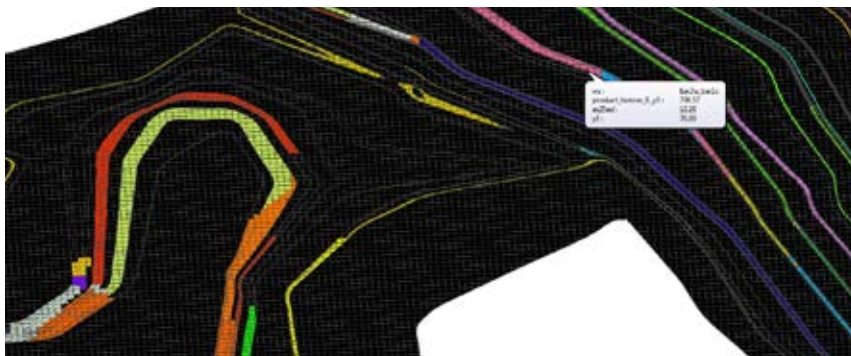
A further script then evaluated the available data based on 9% product moisture and calculated the product tonnages within each block based on these new yield values.

This product tonnage was reported alongside the required working section weighted qualities. This will now form the input for ongoing planning processes at Glendell mine.

The solution is encapsulated within a single script. 'What if' scenarios can be run simply by changing parameters for mining or weighting.

Vulcan HARP modelling allows operations to easily run reserves. Visualisation and validation of results gives everyone involved confidence in the mine planning process.

*Thanks to
Daniel Saunders, Geologist
Glendell Coal Mine*

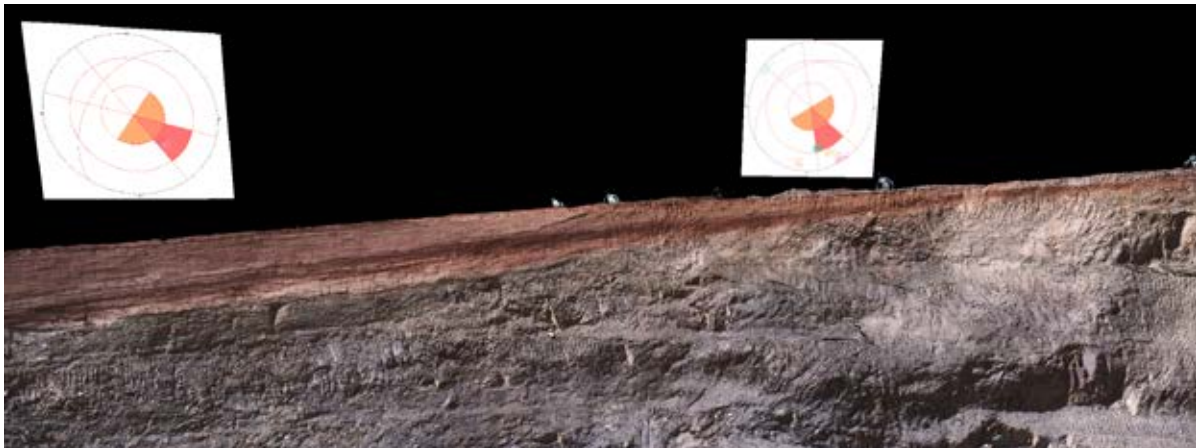


A simple scripted solution applying HARP modelling adds value to the overall mine planning process.

Analysing structures and surfaces

Geotechnical experts will welcome enhancements to tools for analysing structures and surfaces in the upgraded Maptek™ I-Site™ geotechnical module.

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Streamlined geotechnical analysis, enhanced modelling and new CAD tools will be delivered in Maptek™ I-Site™ Studio 6 later this year. New right-mouse menu functionality makes for smarter, faster workflows overall.

The release marks 15 years since Maptek began developing unique spatial modelling software which works directly on 3D scan data.

Preserving all of the important detail for modelling and analysis gives users confidence that results are an accurate spatial snapshot of a site.

Geotechnical tools

Survey data plays a vital role in identifying areas of structural weakness that can affect mine planning and operational decisions.

The interactive stereonet is linked directly to the 3D scan view. Users can highlight and view areas of concern in the stereonet and on the laser scan simultaneously. Plane and intersection creation helps with structural analysis.

A new option outputs spacing between sets of discontinuities for statistical modelling. Creating solids from discontinuities helps determine wedge shape, size and volume. Dynamic adjustment of discontinuities extends shapes to assess their potential impact elsewhere in the pit.

New 'waviness' analysis produces a histogram of variations in apparent dip. Standard deviation can be derived to report on stability analysis. Automated cell mapping includes user-defined cells for structural mapping, statistical analysis and reporting.

A new geological modelling menu splits a surface based on geological domains and CAD boundaries.

The kinematic analysis tool has been dramatically overhauled. The user simply drags and drops a discontinuity onto the kinematic analysis slope orientation fields to automatically display failure zones.

A new stereonet viewer is fully customisable for background colour, point and line size. Users can display tangent planes as great circles and specify an xyz location as it is populated on the stereonet.

CAD geometry

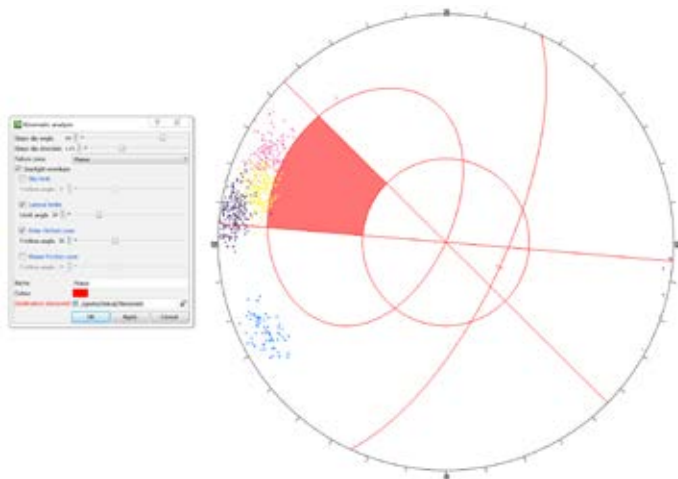
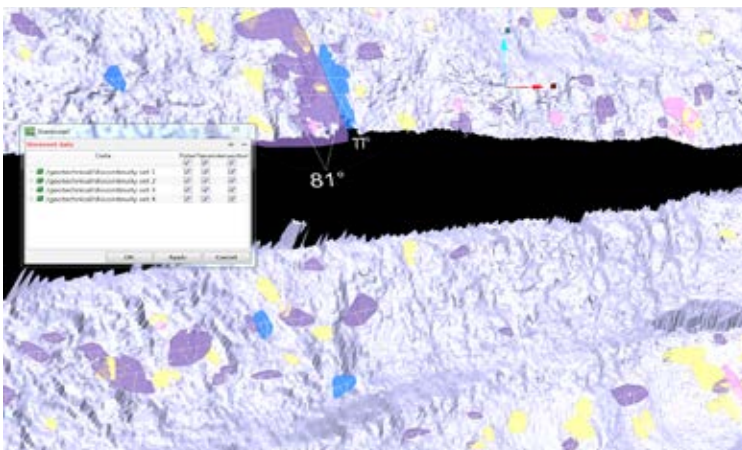
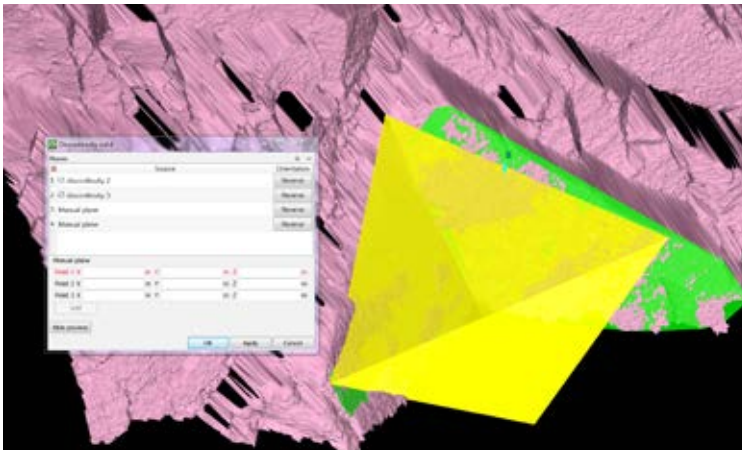
New CAD functionality for creating geometrical shapes from complex 3D point cloud data streamlines tasks like drafting of haul roads and ROM pad layouts.

A new action plane can be added to views to easily create 2D features in their accurate location.

Improved 3D line creation and offset tools allow users to create simple 3D geometry with control over length, bearing and grade. Tasks like projecting a stockpile toe at a known RL or adding points on a ramp at a known grade are simpler than ever.

Snapping tools and a better graphical indication of relationships to neighbouring geometry enhance the overall CAD experience.

I-Site Studio 6 is due for release in December 2015.



NOW Deploy your scanner 24/7

Use your I-Site laser scanner for typical survey during the day and monitoring at night. The Sentry laser-based system tracks surface movements at night and **now** works underground. Monitor development headings and stopes and work safe. Use your laser scanner 24/7 and pay off your investment sooner.

NEW Versatile laser scanners

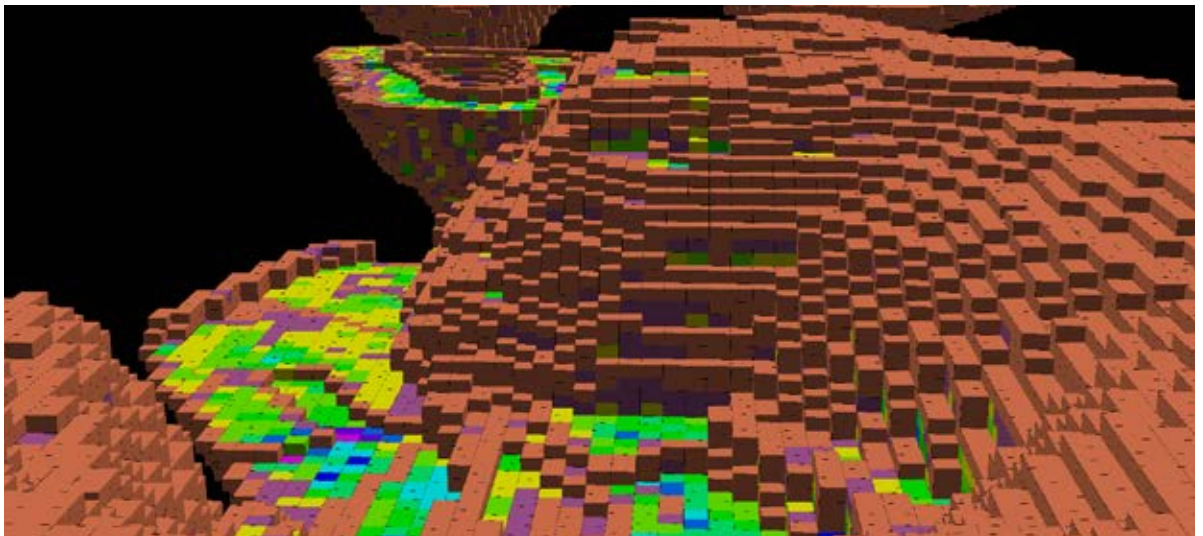
Get all of your survey reporting done safely with one laser scanner. Fast accurate cavity surveys. Seamless underground drive and tunnel mapping. Stockpile volume pickups. All with the **new** versatile I-Site 8200 laser scanner. Features include new 3-point resection for backsighting and compatibility with Drive and Sentry.

NEXT Advanced software tools

Next on the agenda for I-Site Studio is addressing discontinuity solid modelling, stability analysis and stereonet tools for geotechnical analysis. New geological modelling options. Upgraded CAD tools for creating geometric shapes. Right-click shortcuts and interactive viewing of 3D data further enhance the user experience. Look for I-Site Studio 6 in December 2015.

Reserving the Maptek way

Maptek™ Evolution challenges the paradigm that reserving is onerous and requires high levels of programming expertise to generate reliable results.



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Converting a mineral resource into an ore reserve requires geological expertise. In the past it has also required programming skills and patience while scenarios are running.

The transition from resource to reserve is defined by increasing geological knowledge and confidence. Even with the best information, assumptions must be made around mining method, metallurgy, legal, economic, social and environmental conditions. All of these could affect projections.

Spreadsheet-based products with optimisation engines using techniques like linear programming, dynamic or mixed integer linear programming, were traditionally used for reserving. Setting up and generating results was incredibly time consuming.

Maptek™ Evolution challenges the tradition. It uses an evolutionary algorithm which delivers the best optimised schedules as well as the best user experience.

Strategic planning requires mining engineers with requisite management experience and knowledge of scheduling software to prepare and run the reserving process. In most instances a senior mining engineer must define strategies and make decisions.

The Evolution solution

Evolution open pit planning tools work off a single dataset to generate strategic scheduling, medium and long term planning across the life of an operation.

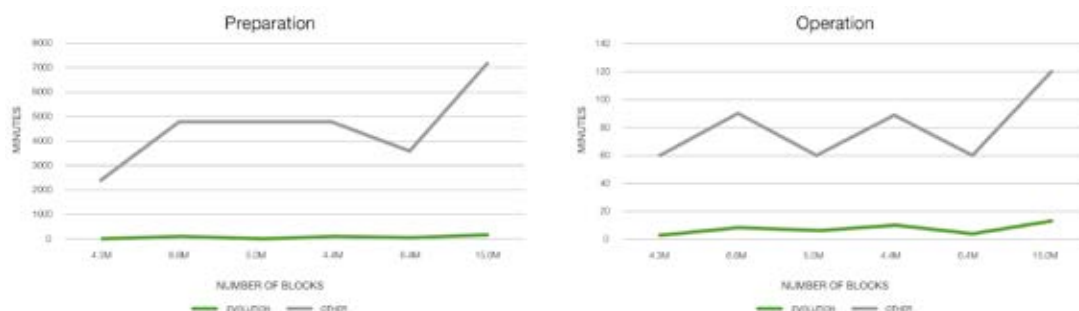
Engineers can be confident that the cutoff grade optimiser approach maximises project NPV.

A single interface minimises file management and the schedules produced are auditable. Features include dynamic generation of production schedules, automatic route calculations and cycle times, and integrated waste haulage.

A South American study compared Evolution to traditional methods of strategic planning in medium to large mines. It showed that Evolution increases productivity by 50 to 120 times in preparation and processing, and by 10 to 20 times in generating operational scenarios.

Evolution saves substantial planning and processing time across the entire scheduling process.

The Evolution interface presents an intuitive, sequential workflow. Errors due to data manipulation are reduced dramatically.



Blocks	Block size	Phases	TPA	Processes/Sites		Productivity increase	
(million)	(metres)		(million)	Plants	Waste	Evolution:Other	
						SETUP	RUN
4.3	10 x 10 x 10	10	32	1	1	53:1	20:1
6.6	20 x 20 x 15	11	170	2	1	96:1	13:1
5.0	15 x 15 x 15	12	80	2	1	106:1	12:1
4.4	15 x 15 x 16	8	280	2	3	96:1	10:1
6.4	15 x 15 x 15	7	75	2	1	80:1	15:1
15.0	20 x 20 x 15	30	400	4	1	120:1	10:1

Panels are populated by user-familiar parameters such as block models, mining and processing cost, recoveries, prices and mine or process capacity. Data is entered and processed without the need for any programming.

Mining companies welcome this approach. They can employ mining engineers for their knowledge of mine planning concepts, rather than their skills with a specific software tool.

Evolution workflows streamline the mine planning process and allow senior engineers to focus on training graduates in good mine planning practice.

Time savings

Before Evolution, preliminary economic assessments could take weeks or months, with added time to define the operational reserves model or operational phases.

An experienced software user had to work alongside decision making staff who did not typically use the software.

Preparing the economic model alone, with consideration of crushing, flotation, leaching, ore exposure, pushback ratio, sink rate and geometric constraints could take 2-3 weeks.

Generating production plans for a period with cash flow, production, and cutoff optimisation could take several hours to days to resolve.

Weeks of preparation and daily optimisation runs produced a unique scenario for evaluation. Any subsequent adjustments meant days of further processing.

Conclusion

The old paradigm has been overturned. Senior mine planning engineers can easily set up the reserving process in Evolution. They can quickly deploy alternative planning scenarios, even when parameters are constantly changing.

Valuable mine planning time can now be spent analysing scheduling scenarios.

Now Maptek has the solution for a process which has traditionally been difficult and expensive. Operations using Evolution can find a substantial improvement in productivity.

A study showed that Evolution is up to 120 times more efficient across scheduling setup, and up to 20 times faster for running scenarios.

Integrated blast solution improves yield

Maptek™ BlastLogic™ provides live access to drill navigation data as well as analysis tools for improving recovery, lowering contamination and costs.

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Many mines struggle with drill and blast data. With 50 or more data points per hole and thousands of holes fired each week, the volume of data can build up fast. The most fundamental of this information is the location of the drillhole.

Blasting is all about putting the correct amount of energy (explosives) into the correct location (drillhole). If the hole location is wrong it is impossible to get the energy where you want it.

Recognising the importance of accurate drilling, many mines have installed GPS navigation on their drilling fleets. GPS drilling helps operators pinpoint exactly where to drill and also reduces the need for surveyors to mark out blast patterns.

GPS systems provide drillers with other valuable information like depth, angle and bearing of drillholes in a pattern. These are the inputs to most navigation systems.

GPS systems are capable of much more than simply telling the driller what to do. They collect and store as-drilled data. This information

conveys which holes were drilled as well as basic location data like xyz coordinates, angle etc.

GPS systems can also be used to track hardness down the hole with surprising accuracy. Unfortunately, many operations are not using this valuable information. The problem they face is that as-drilled information is not easy to access.

Common challenges with drill navigation outputs are:

- > lack of understanding of the data available and how to access it quickly and easily;
- > inadequate time to retrieve and analyse as-drilled data; and
- > lack of trust due to incorrect or missing data from the navigation system.

Automated import

Mine operations can derive maximum value from their drilling systems by managing the blast information in Maptek™ BlastLogic™.

A direct interface with leading OEM drill navigation systems allows automated live import of as-built drillhole data for analysis.

BlastLogic drill validation tools automatically retrieve data which allows users to take full advantage of as-drilled information.

Data can be viewed in various visual and tabular formats to help turn it into usable information. The image above compares designed holes with as-drilled locations, showing greatest variance close to the highwall berm.

Daily drill progress can be checked on the fly to suggest improvements. Patterns like excessive re-drilling can be identified and best practice performance can be encouraged. Custom drilling properties can be recorded with statistical reporting on factors such as drill bit and drill rod usage.

Through BlastLogic, engineers can instantly update the charge plan and initiation design to the as-built drillholes and track the accurate placement of charge. Post-blast reporting and analysis tools enable mines to advance future designs and processes relevant to the geology and conditions on the ground.

Industry partnerships

The Australasian Institute of Mining and Metallurgy (AusIMM) offers an assistance program for unemployed and underemployed members.

Maptek™ is running a free Introduction to Vulcan course at the Maptek Adelaide office in collaboration with the AusIMM.

Participant Jurgen Schusterbauer said that the training was great because it keeps people in contact with the industry and maintains their skill base.

'The Vulcan refresher course has provided us with numerous operational skills, such as working with drillholes and Boolean operations, which are essential in exploration,' Jurgen said.

Fellow participant Alan Nisbet has worked in the mining industry but not as a geologist. He had seen Vulcan in action and jumped at the chance to learn it himself.

'I wanted to learn Vulcan because it gives me greater flexibility in the jobs market. Training alongside geologists provides value for me beyond the theory.'

Vulcan skills are prized by the industry and enhance job prospects.

Maptek Managing Director and chief executive of global operations Peter Johnson said it was a pleasure to provide assistance for the program.

'AusIMM continues to serve the mining industry in Australia through encouragement and development of professional skills.'

'The knowledge gained by attendees will benefit individuals as well as industry by helping members to become more productive.'

'Maptek's contribution to this program further demonstrates our long-standing commitment to support mining and geology education,' concluded Johnson.

Similar courses have been run in Maptek offices in other regions.



Maptek Calendar

2015

September 21-25

Perumin Extemin
Arequipa, Peru - Booths 278 & 279

October 7-8

Québec Mining Exploration Association
Montreal, Quebec - Booth 324

October 7-8

SME & Dreyer Conference
Lakeland, Florida - Booth CC

October 7-9

7th Bowen Basin Geology Group Symposium
Brisbane, Queensland - Booth 37

October 7-10

XXXI International Mining Convention
Acapulco, México - Booths 1529A & 1531A

October 14-16

XVII South American Maptek Users Conference
Viña del Mar, Chile

November 3-5

Fennoscandian Exploration and Mining
Levi, Finland

November 17-18

NewGenGold 2015
Perth, Western Australia

2016

January 25-28

Association of Mineral Exploration
Vancouver, British Columbia - Booth 902

January 31-February 3

International Society of Explosives Engineers
Las Vegas, Nevada - Booth 1407

February 21-24

SME
Phoenix, Arizona - Booth 1221

March 6-9

PDAC
Toronto, Ontario - Booth 1039

April 13-15

XI Conferencia Internacional de Minería
Chihuahua, México - Booth 167

April 26-28

Euromine Expo 2016
Skelleftea, Sweden

April 26-28

Mining World Russia 2016
Moscow, Russia

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