



June 2019 Newsletter

# Forge

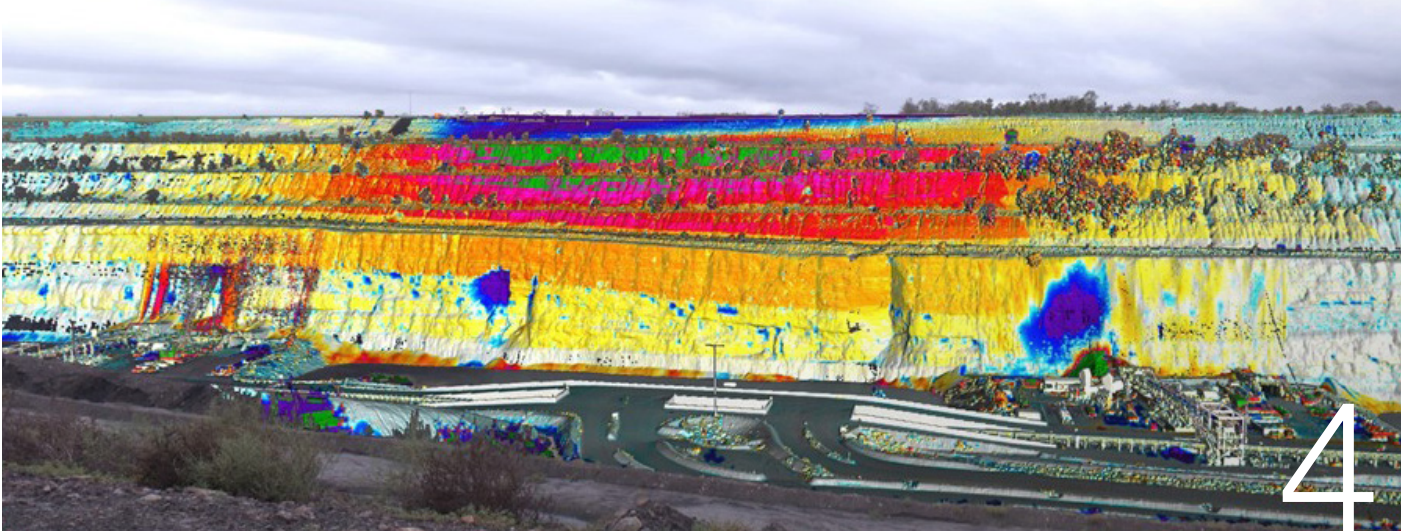
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See where you can connect with Maptek to find out more about our solutions at conferences and events during 2019

## Welcome to the June issue of our Forge newsletter



Production scheduling presents some of the most complex challenges faced by mining companies. Everyone has a story to tell about short term planning being out of sync with long term targets, or deviations to plan caused by mismatches in objectives between planning and execution.

In an industry first, Evolution Epoch will allow short term planners to control material flow, mining sequences, reporting, reserving and equipment allocation in a way that integrates scheduling across different time frames from strategic to short range planning.

Maptek is thrilled to be in the vanguard of this next generation approach, which presents a key opportunity for mining companies to radically change the way they evaluate, manage and drive improvement across their operations.

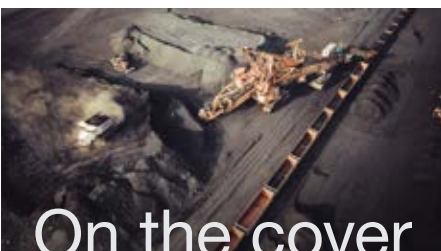
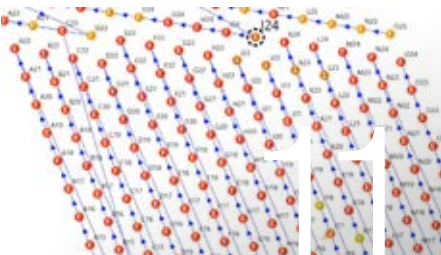
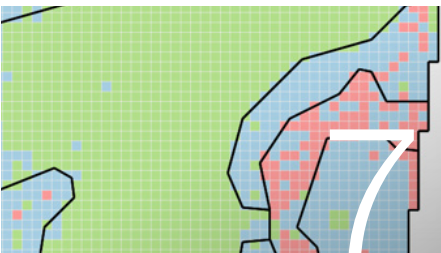
We are continuing to invest heavily in development of technologies to help you realise the maximum value of an orebody and continue to lead the global METS sector in delivery of working, practical solutions.

Recent examples include Maptek's drill and blast management and stability monitoring solutions – these are now proving their value around the world by supporting operational decision making to achieve optimal equipment allocation, safety and resource recovery.

These results are a testament to the dedication of our people, who remain our greatest strength. I am very proud to be working with such an excellent global team.

We hope you enjoy this issue and welcome feedback at [forge@maptek.com](mailto:forge@maptek.com)

**Peter Johnson**  
Managing Director



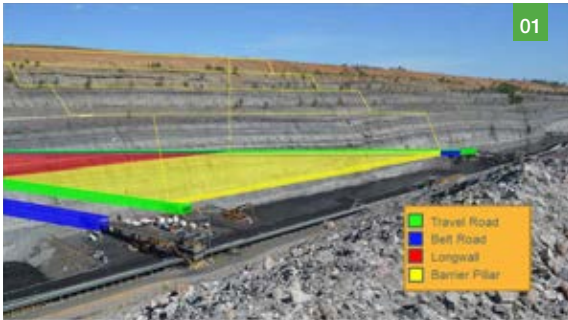
### On the cover

*Holistic solutions which combine orebody knowledge, mine planning data and live production feeds are driving long term value for mining operations*



# Highwall stability in longwall mining

The Broadmeadow coal mine in Central Queensland used Maptek™ Sentry monitoring to help predict highwall movement associated with longwall subsidence.



BHP Coal's Broadmeadow Mine is one of only a few punch longwall mines in Australia. This method makes use of abandoned open cut mine strips and drives gateroads directly into the seam at the base of the highwall, with no requirement for main entries. The longwall is then retreated towards the open cut and recovered just short of the highwall, leaving a safe barrier pillar.

Broadmeadow has mined 11 longwall panels by this method, from two adjacent open cut strips. Significant highwall movement was related to the effect of subsidence when longwalls approach their final position close to the open cut highwall. The operation wanted to understand the mechanism causing the movement and potentially be able to predict instability.

Mining of longwalls under or adjacent to large voids such as stream valleys, escarpments or cliffs is commonly associated with heavily vegetated or steep areas, where survey access is limited and interpretation of any surface movement data is complicated.

The punch longwall layout provides access to deploy radar and laser scanning technology. An unvegetated, evenly excavated open cut highwall creates a perfect configuration to study the effect of longwall subsidence on a steeply dipping surface.

## Background

Inclinometer monitoring adjacent to the Broadmeadow Mine LW11 panel during the start of the block confirmed that the direction of shear movement is toward the centre of the void created by the longwall panel.

Survey peg data indicated typical horizontal movement, with points drawn toward the goaf (collapsed rock above the void) as the longwall approaches and then moving in the opposite direction as the longwall passes underneath and the surface settles.

This traditional understanding led barrier pillar designers to believe that longwall subsidence would pull the highwall toward the goaf and into an even more stable position.

However, at Broadmeadow the observed highwall movement and associated ground deformation did not conform to either typical longwall subsidence profiles or highwall movement. Values far exceeded stability limits used in adjacent open cut mines, indicating the onset of failure.

This outward movement, while not affecting the global stability of the highwall, destabilised local areas around existing defects and geological structures.

## Monitoring

The Maptek™ Sentry system was trialled alongside a radar system on LW10 and used exclusively for LW11. Both systems enabled near continuous, real-time, sub-millimetre monitoring of a full 100 m high by 500 m wide highwall.

The Maptek laser system can scan the entire wall in six minutes, depending on the block size to be monitored.

An advantage of laser technology is that it is spatially referenced, allowing itinerant monitoring. The scanner can be shifted to a new location and maintain a correlation in the data before and after moving.

Both laser and radar techniques enabled real-time graphical display of total displacement and rate of wall movement. The supporting software provided real-time triggers or warnings of increasing rate of movement, and videos of displacement over time could be created.

High quality, accurate information was generated, and large-scale highwall displacement of up to 1000 mm was measured from a distance of 300 metres.

## Predicting instability

At Broadmeadow, an unprecedented magnitude and rate of movement was caused by the longwall effect (1000 mm total, with a rate up to 1.5 mm/hr over +6 weeks), and the rate was controlled by longwall retreat rather than ground failure.

Interpretation of the data requires the judgement of a geotechnical engineer to balance increased rate of movement with increased rate of longwall retreat. The ability to monitor and colour contour the entire highwall allowed identification of anomalous localised areas of movement to trigger additional protection measures.

## Protection measures

Punch longwall mining increases the risk of mine inundation due to the low elevation and wide catchment area. Large levees are constructed to protect the open pit from flooding by adjacent rivers.

Sumps constructed against the highwall between the headgate and tailgate portals control rainfall and rock hazards in the pit catchment. The sumps protect the working area from rockfall hazards between headgate and tailgate, but the portal areas remain exposed.

Access of personnel and materials through the portal entries requires more stabilisation on this part of the wall. The highwall is rehabilitated with rockbolts and draped with rockfall mesh. Substantial reinforced concrete portals are installed out to 15 m from the highwall to allow covered access.

A 10 m exclusion zone is enforced adjacent to the portals, and a 2 m high rock bund creates a catch drain for local rockfalls. This is standard for all punch longwall portal accesses and is independent of the study results.

## Design considerations

Forward movement of the highwall is theorised to be primarily caused by the subsiding ground; as the strata lies down behind the longwall, a massive forward push occurs. This is normally confined by hundreds of metres of solid ground, but when adjacent to an open cut void or stream valley, the longwall shoves the bedded ground forward like a stacked deck of cards.

The maximum movement is near the surface and decreases downward due to leverage and frictional resistance from the weight of overburden and proximity to the subsidence trough.

Underground planning engineers seek to optimise barrier pillar widths, but traditional design methods may not account for highwall stability. While the global highwall stability was maintained at Broadmeadow, localised failures remobilising along joints or faults can be triggered around pre-existing geological structures, cling-ons or blast cracking.

Various controls are suggested if mining is within 300 m of an open pit:

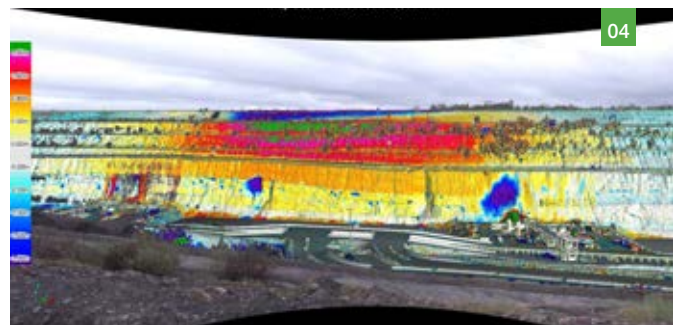
- > Scan and map highwalls prior to planning portal locations and longwall stop positions to identify all potential structures that could be affected and put specific controls in place.

01 Punch longwall layout showing highwall and low wall, with gateroad access at base of highwall

02 View down a Broadmeadow pit

03 Maptek 8820 laser scanner used with Sentry monitoring system in early 2017

04 LW11 highwall total movement as a composite of scans taken every 13 minutes over three months



- > Allow space on catch benches and portal pads for adequate bunding against the slope toes to manage pit slope failures.
- > Ensure that infrastructure placement on highwall benches and pads allows for potential ground movement, with concrete portal entries set further off the highwall.
- > Cater for access and restricted access to catch benches.
- > Catch drains should be accessible and regularly cleared to maintain capacity.

The punch longwall layout and the open cut slope stability monitoring technology provide a near-perfect scenario for monitoring the effect of highwall movement due to an approaching longwall, where subsidence will push ground forward when adjacent to a void.

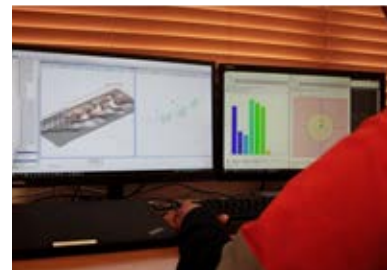
Barrier pillar sizes in punch longwalls can be minimised with an understanding of the mechanism, appropriate design and deliberate controls. Additional controls can be very effective for working in close proximity to a highwall or void.

*Thanks to BHP Coal Broadmeadow Mine*

*Edited extract of paper by Matt Martin, Dan Payne, Bob Coutts and Dan Lynch, presented at ICGCM 2018*

# Digitalisation of drill & blast

Barrick Pueblo Viejo has improved day-to-day operations and provided greater business intelligence for future mining excellence through implementing Maptek™ BlastLogic™.



Innovation through digitalisation and technology is a key focus for Barrick. This is strongly evident at its Pueblo Viejo operation, an open pit gold mine in the Dominican Republic, particularly in the drill & blast department.

The Maptek™ blast design and reconciliation solution, that includes BlastLogic™ and Vulcan™ Drilling Designer, has given Pueblo Viejo a single platform to manage its drill & blast process from design to performance measurement. Integrated tracking of vibration, fragmentation, performance, cost and inventory of each blast facilitates continuous improvement from blast to blast and informs future planning.

'Digitalisation is key to continuous improvement. Automating data generation enables innovation around operational processes that optimise the business', said Alejandro Rosario, Senior Drill & Blast Engineer at Barrick Pueblo Viejo.

Direct benefits include increased drilling accuracy, efficient back analysis, enhanced online data management, cost savings for explosives, and a faster and easier improvement process.

'As results of each blast are fed back automatically, we spend less time figuring out what we need to change in our designs. This enables us to apply improvements in real time', said Rosario.

Prior to the implementation of BlastLogic, blast data existed in multiple silos. All machinery collected and compiled drill information, but a lot of blast data was

recorded by hand and kept separate from the drill data. Accessing the disparate data was difficult and analysis was time-consuming.

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The BlastLogic database now contains all related drill & blast data, enabling faster, easier, more effective analysis.

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Importantly, digitalisation enables benchmarking so that the effect of changes can be measured. For example, with all drill data integrated to blasting results, improvements in accurate charge placement are easily realised, delivering better fragmentation. Blasting can be performed with smarter and safer sequences.

Real-time feedback of an electronic detonator misfire allows immediate identification of issues and avoids unexpected outcomes. Accuracy is critical for safety in dealing with explosives.

The administration of tasks and resources has also been enhanced, data analysis time has been reduced, and business intelligence can be applied to reduce costs and time spent. This has been achieved by substantially shifting the amount of engineering time from data entry, formatting, reporting and meetings to planning, compliance and improvement.

Access to digital drill & blast data allows easier communication of accurate information between departments. Data integration has provided:

- > Detailed control of drill & blast KPIs (daily, weekly, monthly, etc.), with parameters such as total metres drilled, re-drilling, over-drilling, penetration rate, powder factor, fragmentation, total explosive usage, tonnage removed.
- > The ability to audit contractors and the overall blasting process.
- > Synchronisation of drill & blast tasks into a single platform, with pattern design, charge plan, tie-up design, drilling, QA/QC, observations, fragmentation and vibration control.
- > Data and process transparency, including online access for managers and an increased ability to check indicators.
- > Correlation of data in 3D for simple analysis and summary dashboards to track technical, economic and operational opportunities for drill & blast. For example, drill depth and collar accuracy, redrills, over/under drilling and associated costs.

Rosario concluded, 'We ultimately chose BlastLogic for more than just the software capabilities. Along with the technology, we have access to a phenomenal support team helping us customise the platform specifically for our operations. We are paying for more than a fixed solution, one that can grow with our needs and is backed by excellent customer service.'

*Thanks to Alejandro Rosario  
Senior Drill & Blast Engineer  
Barrick Pueblo Viejo Mine*



# Grade control optimiser

Maptek™ has been working with a customer to develop a tool to design optimal grade control polygons and reduce time spent on repetitive manual tasks.

Early trials of Maptek™ Vulcan™ Grade Control Optimiser (GCO) for designing optimal grade control polygons have achieved increased economic value of up to 12%.

However, the true value of adopting this innovation is yet to be fully realised as engineers are freed from the repetitive task of manually drawing grade control polygons to spend more time on analysis.

GCO automatically defines grade control polygons that optimise material classification and minimise dilution.

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The optimisation can be guided by economic value or classification variables to improve the grade control process while maximising value.

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Maptek has been working with a customer in North America to develop the tool at established open pit sites. The grade control polygons range in size from 10,000 to 200,000 tons.

The sites have completed extensive side by side comparisons where polygons have been manually engineered and then GCO was used, before the results were compared in terms of value.

Improvements recorded have been in the order of 1 to 12%.

The manual process of drawing polygons and designating which materials go to which process, for example mill or dump, is a tedious job for production engineers.

It can be unrealistic and extremely time-consuming to expect an individual to create thousands of different polygons for optimisation.

GCO quickly generates multiple options to optimise value and has been found to create higher-value options. This is sometimes because it creates or destroys 'islands' that engineers did not think of or have the time to create.

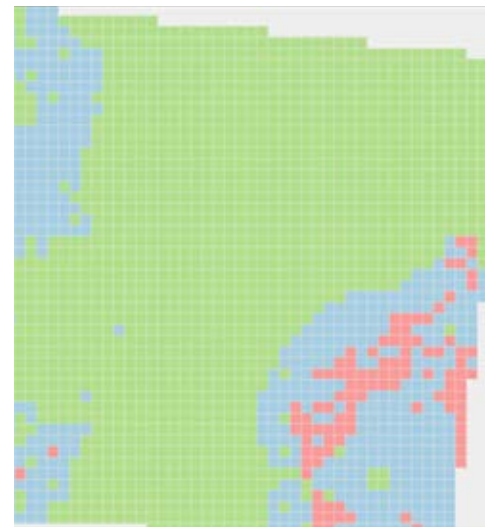
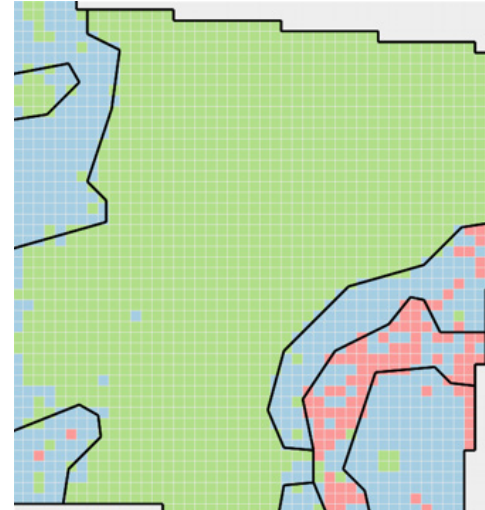
The scriptable nature of the tool enables operations to perform tasks such as evaluating the past six months of polygons overnight so the next day an engineer can generate a spreadsheet for analysis.

This innovation represents a major change to traditional workflow, from performing a task manually to doing it with the click of a button.

The best use of GCO is proving to be when a geologist or mining engineer works in conjunction with the tool.

After running the optimiser, the engineer views the polygons, realises there are other constraints or aspects that need to be considered and manually adapts the result.

Grade Control Optimiser reduces the time spent on the repetitive aspects of grade control and allows the experts to dedicate more time to applying their expertise and delivering the best possible results.



*Grade Control Optimiser turns a block-based solution into actual mineable polygons*

# Tightening control over scheduling

A tight relationship between orebody knowledge, mine plans and schedules allows operations to analyse deviations and take corrective action at the right time.

Planning engineers who understand that strategic and tactical planning have different objectives and require different environments will be able to apply Maptek's scheduling solution to obtain the best value from mining their deposits.

## Industry challenge

For a long time the weak point has been the connection between orebody knowledge and the activities and processes conducted to realise the economic benefits of that orebody. We all recognise these scenarios:

- > Planning engineers working with scheduling solutions that take a siloed view of the overall success of a mining operation.
- > Mine schedules that target results that may look good in one context but have no bearing on the long term economic success of a mine.
- > Parametric mining and economic value models that are based heavily on assumptions and with little or no bearing on actual performance in the mine or processing plant.
- > Optimisation of factors that are meaningless to the overall success of the mine.

Many solutions claiming to provide enterprise wide planning and scheduling capabilities simply do not. A Gantt chart is not a mine planning and scheduling solution, it is a tool to help sequence and plan tasks.

Mine planning without reference to the geological model is not able to ensure that the economic value of an operation is maximised over the long term.

Ignoring downstream comminution or beneficiation processes that may be heavily influenced by mining decisions or geological factors is leaving value on the table.

## Maptek solution

With the release of Evolution 6 Maptek™ will deliver the most comprehensive and advanced set of mine scheduling and optimisation tools to date.

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This will radically change the way mining companies are able to evaluate, manage and drive improvement across their operations.

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This paradigm shift is made possible by significant technology research, development and investment over many years.

Short interval control and short term planning decisions need to be made quickly and with knowledge of the impact that changes may have on the future of the mine. This may mean the next shift, the next month or in five years time.

It may seem unlikely at the time that short term schedule decisions can impact longer term performance of a mine.

However, many real world examples of resource sterilisation, geotechnical risk, inefficient energy use or poor processing plant performance have been caused as a result of short term planning decisions. It is the embodiment in mining of the butterfly effect.

## Introducing Epoch

At the short term and execution stages a new level of detail, flexibility and visibility is required for managing day-to-day and in-shift schedules.

This is handled by Evolution Epoch, available alongside new functionality in Origin and Strategy as part of Evolution 6.

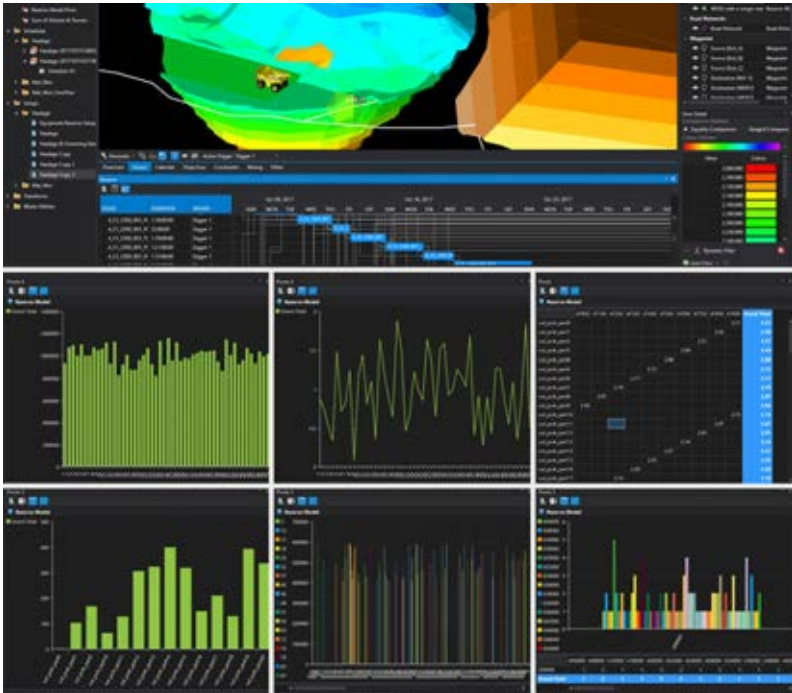
Using Epoch, short term planners will be able to:

- > Sequence and schedule individual equipment, tasks, crews and locations.
- > Apply rules and task sets and precedences.
- > Deal with the variability and uncertainty in some mining situations and the need to avoid ambiguity.
- > Ensure that all production engineers and crews know what is planned, what decisions have been taken and the impact on the rest of the mine.

An interactive Gantt chart linked to a 3D graphical view of the mine shows equipment, task and location for all mine resources.

Short term planners and production managers can visualise what is planned and can control the schedule.





Connecting Evolution Epoch to the live production control and management systems within a mine will enable real time comparison of the plan in the Gantt and graphical environment.

This will also allow the Evolution genetic mine optimisation algorithm to conduct reactive evaluation of the impact of delays or deviation from plans, supporting control room decisions that are both connected to and respect long term value optimisation.

## Paradigm shift

The traditional ways of scheduling are now irrelevant and outdated.

Closing the loop between short term scheduling and execution, while providing real time feedback to planning and production supervisors regarding deviations and actual progress is a significant opportunity for industry.

Maptek understands the pressures inherent in production scheduling and has created a life of mine scheduling solution that works at the finest levels of short term planning and optimises across all time horizons to maximise orebody value. This is done quickly and neatly via an efficient user interface.

In collaboration with PETRA Data Science and application of their MAXTA digital twin models, this solution can be extended to include processing stages and product recovery/yield. This will, for the first time, enable the entire mining value chain to be modelled and managed properly.

## Live dashboards

Evolution Epoch is integrated with the orebody as well as the mine plan, and can be shared within the mine and displayed on dynamic dashboards.

So what? Dashboards are in every production office. The difference is that the short term schedule determined in Epoch is built around achieving the long term maximum value for the mine and the orebody.

Epoch incorporates all of the typical benefits of schedule management tools, such as task sequencing, mining rules setup, resource and equipment models with the integration of a graphical view of the mine, **and** it also targets the longer term objectives of the mine.

Planners are now fully able to selectively evaluate the short term plan quickly and easily to best meet their objectives using the resources and equipment available on the day and react to changes mid shift.

This adds value by retaining connection to the long term business plan for the orebody through the geology and optimised mine plan.

As mid term plans are updated, optimised and adjusted, new short term planning is aligned and targeted to achieve these new plans. They are all working from the same data as an integrated planning solution.

## Decision support

Maptek is developing functionality to enable simultaneous long term scheduling and short interval control. Short term planners will be able to immediately evaluate the impact of short term decisions on longer term mining performance, operating in a decision support environment that has never before been possible.

# Maptek and PETRA Data Science

Mining companies will be able, for the first time, to use all of their historical performance and resource metadata for dynamic optimisation.

Maptek™ and PETRA Data Science have established a partnership that will enable seamless value chain optimisation and simulation from resource models through to metal produced.

PETRA's suite of highly scalable and platform agnostic algorithms are successfully deployed by mining companies around the world. These prediction algorithms prevent unplanned downtime and enable process optimisation by predicting process variables in real-time.

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Digital twins for value chain optimisation ingest millions of tonnes of ore data to predict and simulate plant performance using machine learning.

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Applications include drill & blast simulation, geometallurgical prediction, and process control simulation and optimisation. Machine learning models are readily deployed across the value chain from mine planning right through to advanced process control.

PETRA's Managing Director, Penny Stewart will continue to drive the growth and development of PETRA solutions, with Maptek Managing Director, Peter Johnson appointed to the PETRA Advisory Board.

'I see Maptek as the go to company for spatial data in mining. Whether you are looking at their 3D virtual environments for geological modelling and mine optimisation, or long-range laser scanners for 3D mapping and monitoring, every aspect is custom built for mining,' said Stewart.

'Any true digital twin in mining needs to consider geology. Our partnership provides PETRA with easy access to upstream geological data for value chain optimisation, and enables Maptek to extend schedule optimisation downstream of the mine.'

'For the first time, miners will be able to play forward the mine schedule into the processing plant.'

The integrated technology offerings of PETRA and Maptek cover solutions from geological modelling to plant and process optimisation and simulation. Combining deep domain expertise from across the whole value chain offers the industry a practical alternative to the common practice of siloed optimisation.

Maptek Evolution mine schedule optimisation will be dynamically linked to PETRA's latest digital twin performance models, including metal produced, grade, quality, recovery and throughput. Dynamic mine scheduling is made possible by bringing together Maptek optimisation engines and PETRA's prediction and simulation algorithms.

Maptek BlastLogic™ blast design optimisation will benefit from dynamic links to PETRA digital twin models for loading, crushing and grinding. And PETRA MAXTA digital twin blast design simulation will benefit from connection to BlastLogic historical drill and blast design data.

Johnson said that Maptek's goal to enable customers to realise greater value from the available mine data requires consideration of a context far beyond the orebody model and mine plan.

'We need to empower our customers to relate the performance and characteristics of processes and equipment far downstream from geology or planning assumptions and understand the relationships better.'

'PETRA has a proven capability to create prediction and optimisation algorithms for miners through the innovative application of their data science expertise and experience in the real world,' Johnson added.

Stewart acknowledged Maptek's reputation for maintaining substantial investment in software and hardware for spatial data.

'I feel honoured that Maptek has chosen to partner with us, and the whole PETRA team is excited by what this partnership will achieve for the mining industry!'

The investment and ongoing partnership will build business improvement into the mining cycle by leveraging the technology of both companies.





# Improving drill & blast workflow

Collaboration between Maptek™ and Sasol is improving drill & blast workflow and outcomes through better validation of field data.

Maptek™ Africa has integrated Sasol's IBIS bulk explosive truck control system with the Maptek BlastLogic™ drill & blast system. Sasol is an integrated energy and chemicals company based in Sandton, South Africa. Sasol's commercial explosives products and opencast services are employed by Southern Africa's leading mining houses.

The integration has enabled the BlastLogic Tablet, which dynamically updates drill & blast plans in the field, to communicate directly with IBIS to control explosives loading.

The charge plan from the BlastLogic Tablet is pushed to the IBIS-controlled Smart MMU (Mobile Manufacturing Unit) specifying the exact amount of explosive that needs to be pumped into each hole in the drill & blast plan in real time in the field.

In an environment where a slip of the finger can waste time, be costly and potentially dangerous, this integration removes the need for manual data entry – saving time, preserving data integrity and increasing safety.

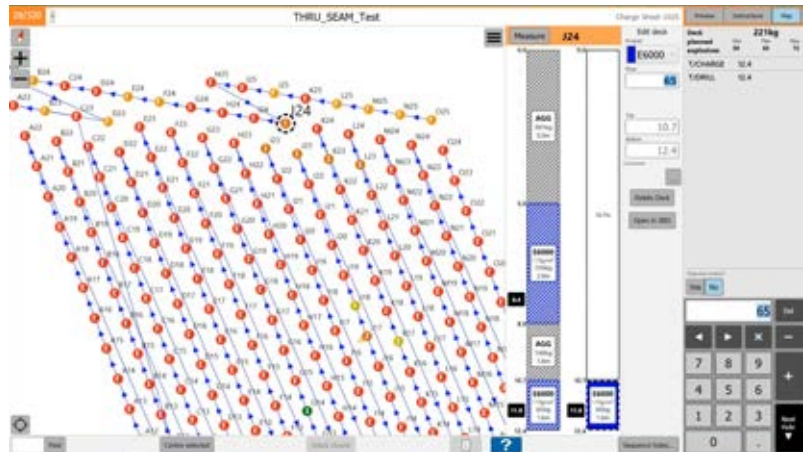
Operators' jobs are made easier by removing the need to manually enter data but they are still able to use their judgement to override the automated figure based on environmental changes.

If there is a variation to the amount of explosive this information is automatically updated in BlastLogic.

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Operators are safer and have more time to pump explosives and analyse what's happening.

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The auditable and trackable process provides a simplified workflow and information is populated and generated on the fly.

Incorporating the Smart MMU information is industry-leading and consolidates BlastLogic's role as a single source of truth for drill & blast management.

BlastLogic allows the entire drill & blast process to be collated in one place so the information can be analysed and opportunities for improvement can be identified.

Developers from Maptek and Sasol worked together to develop a data sharing format and progressed through collaborative testing to ensure a robust solution.

Controlled testing has been successfully completed and the integrated solution will be available to the first clients in June 2019.

Maptek will continue to explore further integration and collaboration with partners such as Sasol.

## Why use BlastLogic?

BlastLogic is a flexible drill and blast system designed to work in the demanding production environment. Access to data is immediate and universal across users, simplifying and accelerating routine tasks.

- > Data sharing – instantly capture, analyse and share data at critical stages in the drill and blast process
- > Safety – greater control for over-pressure, vibration and air blast
- > Reduce costs – optimise and track explosives use, achieve optimum material size for efficient processing
- > Increase productivity – achieve greater than 9% production gain for shovels, reduce commodity loss by up to 20%
- > Continuous improvement – catalogue blasts and trends over time, correlate data and look for nuances
- > Local technical support – experienced mine survey and geotechnical professionals

# Human-agent collectives

Mining companies must leverage a new relationship between humans and computers. Maptek™ Leader of Strategic Innovation, Chris Green discusses the benefits.



Individuals are energetically pursuing new techniques and technologies within their specific domains of expertise. But does this add up to an organisational strategy that will help in an environment where savings are becoming harder to attain and where quality and productivity are always under pressure to improve?

Innovative mining leaders are increasingly looking to advanced technologies related to artificial intelligence (AI) for answers. Indeed, the field of AI and machine learning is beginning to reshape the mining sector in planning and operations. Maptek™ has become an established leader in this area.

Real success comes from more than just adopting the latest technologies. An organisational culture must interleave humans and computers in profoundly new ways.

Leading computer scientist, Nicholas Jennings has been key within the science of Human-Agent Collectives (HAC) in which humans and software agents collaborate in a seamless manner. He says that the focus to date has been on systems where all the agents are either software or hardware.

Jennings sees that 'it is both necessary and beneficial to involve humans, working as

active information gatherers and information processors, in concert with autonomous software agents'.

This has implications for mining companies with their vast array of resources. Operations need management and paradoxically management also needs the ability to run autonomously. Via HAC, mines can discover opportunities themselves, such as where the behaviour of a system depends not on its individual parts but on their relationships.

Real-time optimisation through grade control, short-term scheduling and reconciliation needs management to analyse data and react against destructive patterns and established procedures. This can lead to positive emergent ways of solving problems and developing new techniques.

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Dated linear techniques for data analysis need to be replaced by agents with non-linear approaches to problem solving, using advanced deep learning techniques.

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An example of enhanced human-computer learning is digital twinning where a virtual model is fed real-time data from the field. Scenarios can be quickly tested, and operations and production can be optimised. Pre-testing decisions on people and assets in a replica system leads to better outcomes.

HAC can uncover three hidden opportunities. First, a growing history allows a mine to learn about itself. Second, intelligent agents trawling through all live operational and stored historical data can look for variations. Third, collaborative negotiation can occur among and between agents and humans.

HAC promises mining companies, small and large, improvements in yields, speed and efficiency. Maptek believes HAC can make a big impact. The requirement is to:

- > Understand how to provide flexible autonomy that allows agents to sometimes take autonomous actions, while at other times being guided by closer human involvement.
- > Discover how groups of agents and humans can exhibit agile teaming to achieve joint goals, disbanding once the cooperative action has been successful.
- > Elaborate the principles of incentive engineering in which rewards are designed so that the actions taken encourage socially desirable outcomes.
- > Design an accountable information infrastructure that allows the veracity and accuracy of seamlessly blended human and agent decisions, sensor data and crowd generated content to be confirmed and audited.

These are not entirely new areas. However, the HAC context introduces additional complexity and brings new elements to the fore. According to Jennings, 'centralised control is no longer possible. The volume, variety and pace of information and services has become too great'.

Change is inevitable. Mining companies will need to embrace this to survive in our extremely competitive environment.



# New global role drives technology value

Maptek™ has appointed North American-based Mining Engineer, Jesse Oldham to the new position of Global Product Market Manager.

The new role will see Oldham work closely with Maptek™ product managers to better connect value across our product lines.

After graduating from the University of Utah with a Bachelor degree in Mining Engineering, Oldham joined the Maptek technical services team in Denver where he provided Vulcan customers with training and technical support.

At the same time, he consulted to numerous North American operations, concentrating on underground mine design and stope optimisation projects. This sparked an interest in the product development aspects of the business, and Oldham stepped into a Vulcan project leader position.

Oldham later gained additional exposure to the application of technology in mining beyond mine planning and geological modelling.

'I had always focused on the mine planning side of things and the role of technology as it relates to those activities and processes. The opportunity to explore outside the mine planning space enabled me to better appreciate the value of technology in operational areas such as blasting, monitoring and data collection,' reflected Oldham.

'I became excited about exploring solutions and combinations of solutions across the mining and processing cycles. There is so much extra value and productivity that can be gained through a holistic view of mining operations.'

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Value is a term that comes up a lot in conversation with Oldham.

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As Product Market Manager for North America, he applied his experience to understanding the value that Maptek provides across product lines so he could align this with industry productivity objectives.

'Maptek is in a great position to execute on delivering that value. We have great solutions and a great client base to help drive industry take-up of new technology.'

There has been a discernible shift in attitudes to technology since Oldham began his mining career.

'Adoption of technology introduces change and that introduces a large change management component. Understanding and communicating value to the stakeholders increases buy-in and alignment across a site and company wide.'

'Maptek helps our customers to better drive change within their own business and achieve the results they are after.'

Oldham believes the workforce is also radically different in terms of their relationship with technology.

'Many of today's mining professionals don't know life without technology and they expect a higher level of enablement from it.'



This is where Oldham's new role intersects with industry needs.

'We are engaging in value based conversations with our global market. Maintaining a holistic view of mining processes will ensure that our solutions improve overall operational productivity,' Oldham concluded.

Maptek is focused on working with customers to help identify efficiency gains at their sites and aid them in adopting new technologies to improve their business.

# Computer science awards

High achievers from the University of Adelaide awarded the Maptek™ Prize in Computer Science are also given exciting opportunities to develop their careers.

Maptek™ Chief Technology Officer Simon Ratcliffe presented Justin Lee with the Maptek prize at the recent University of Adelaide awards night. This is awarded to the highest achieving second-year student from the School of Computer Science in the previous year.

Justin will undertake a paid internship at Maptek at the end of this year to further develop his career, as part of the prize.

'I'm really honoured to win. It means that I can actually put my skills to the test, meet new people, learn and observe a real company doing real work. Just being offered the chance to work with real world applications makes me feel very lucky to undertake this internship,' Justin said.

Simon said celebrations such as the awards night were a great reminder of what it means to be excellent and to strive for the best possible results.

'It's a privilege to meet these top students, to gain an understanding of their aspirations and make available opportunities to develop their skills and experience in industry,' he said.

'The enthusiasm from the students is palpable and it recharges my enthusiasm too!'

'Maptek is held in high regard in computer science and software engineering as a place to be technically challenged and to break new ground on interesting, economically relevant problems.'

Maptek Software Engineer Abdul 'Mohsi' Jawaid, previous winner of the Maptek prize, was recognised with the Australian Computer Society Award for highest achieving third-year student.

'Winning the Maptek prize last year led to my position as a full-time Software Engineer on the Eureka team. Just a week into the internship I knew that I wanted to stay at Maptek and build my career here,' Mohsi said.

Fellow Maptek Software Engineer Dallas McNeil, who also became a full-time Maptek employee following an internship last year, received the Executive Dean's Award for achieving a 90% or higher coursework average.

'It was extremely rewarding to receive the award as I strived to study high-level courses throughout the year,' Dallas said.

'I advise others to push their bounds and pursue learning in challenging areas. The internship opportunity has flourished into a permanent position and is a huge kickstart to my professional career, allowing me to grow in so many ways.'

Maptek has a strong history of supporting the next generation of computer scientists, engineers and geologists and provides software and training to universities across the globe.

Learn more about Maptek university partnerships:  
[www.maptek.com/university/](http://www.maptek.com/university/)



Simon Ratcliffe with (L-R) Justin Lee, Mohsi Jawaid and Dallas McNeil





## Global activities



## Maptek Calendar

### 2019

#### June 18

Copper to the World  
Adelaide, SA, Australia

#### June 19

ElG Geotechnical Day  
Stratford-upon-Avon, UK

#### June 19

Australian Mining Leaders Forum 2019  
London, UK

#### August 20-22

XIX Maptek Users Conference 2019  
Centro de Convenciones  
Viña del Mar, Chile

#### September 16-20

Perumin 2019  
Arequipa, Perú - Booth 755 - 754

#### October 22-25

XXXIII Convención Internacional  
de Minería  
Acapulco, Mexico – Booth 428

#### November 25-26

International Mining Geology  
Perth, WA, Australia

#### 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

#### May 3-5

CIM  
Vancouver, British Columbia, Canada

#### May 12-14

International Symposium on Slope  
Stability in Open Pit Mining and Civil  
Engineering  
Perth, WA, Australia





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