MAPTEK™

Forge

December 2023 Newsletter

In this issue

Welcome to our Forge newsletter December 2023

End-of-year reflections typically involve a summary of the achievements and status of ongoing initiatives. I'm pleased to report that during 2023 we have implemented several projects designed to improve customer experience.

I realised when considering these achievements that, rather than the projects themselves, it was the successful cross-team collaboration and wholehearted commitment to customer success within Maptek that was the most satisfying.

Stories in this issue follow the same arc, with many recording how changing an embedded approach has led to optimisation and efficiency gains.

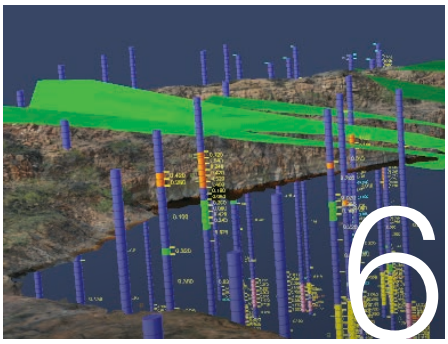
One customer in Mexico is exploiting the latest workflow and automation tools to optimise monthly resource estimation updates. Another in Australia has improved the process for modelling historic mapping and current geological data for a complex gold deposit. They report an improvement in workflow, automation and confidence in outputs, demonstrating the advantages of embracing innovation.

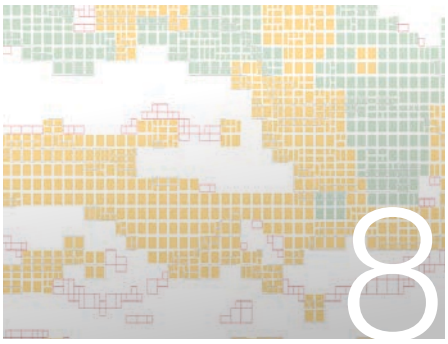
Looking for more copper was the trigger for an Australian mine to engage machine learning and cloud computing, with the AI generated model guiding in-fill drilling to successful results.

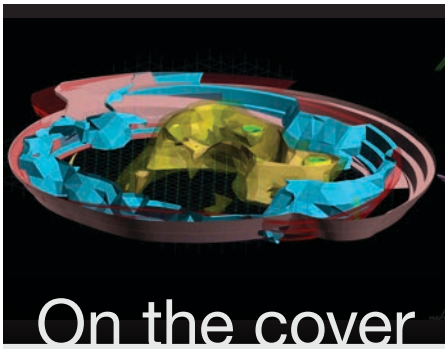
Maptek enjoys enduring partnerships with universities across the world. Articles in this issue cover an industry-driven software engineering course, winning mine design project work and a masterclass for final year students. The future of mining is looking very bright indeed!

Mining is a dynamic industry; if we can continue to collaborate to successfully navigate change in our organisations, we are well positioned for the year ahead. I hope you have a relaxing, enjoyable holiday season.

Eduardo Coloma
CEO





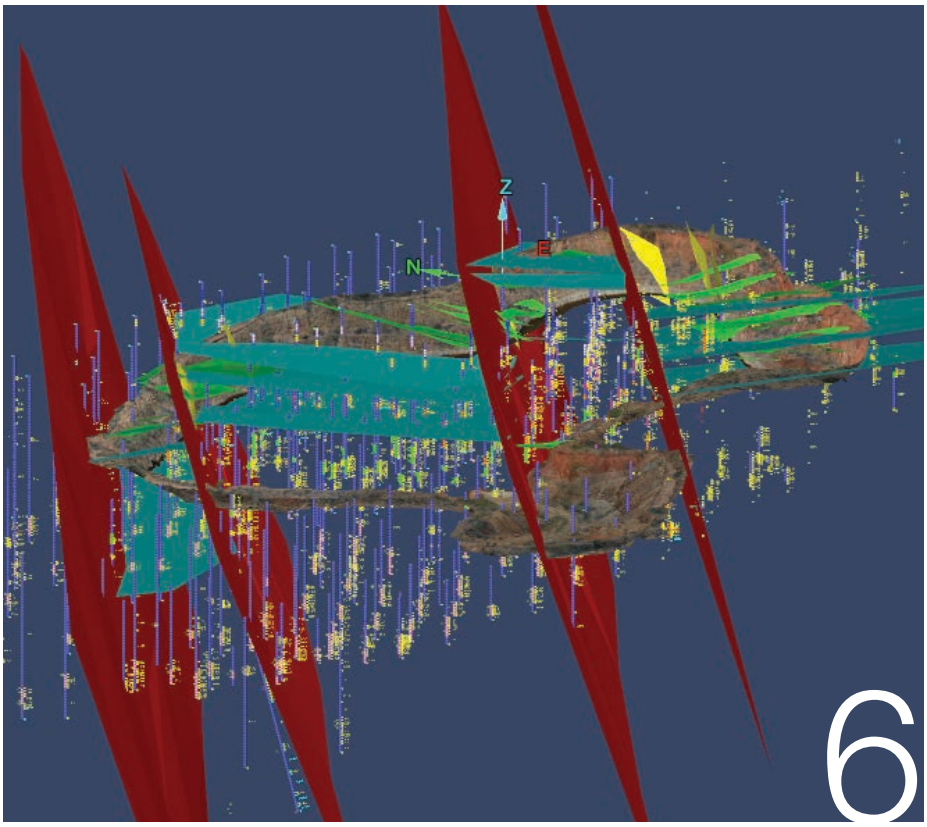


On the cover

Open pit design for a feasibility study prepared by University of Adelaide mining engineering students

Contact us: forge@maptek.com

Contents



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Optimising monthly resource estimation

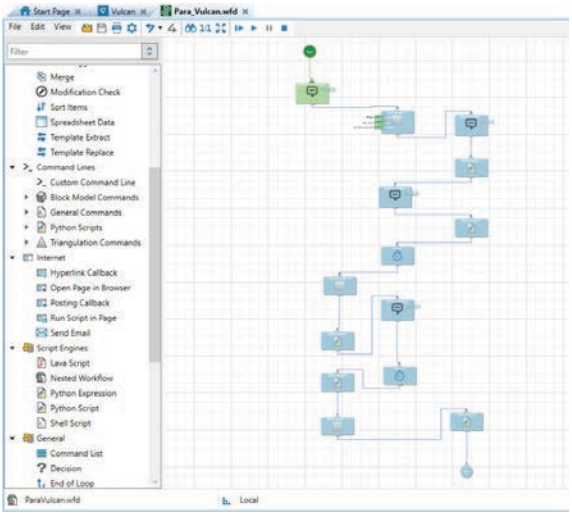
An underground metals mine in Mexico improved estimation of mineral resources through implementation of Maptek™ Vulcan workflow tools.

Cerro Los Gatos Mine is a mechanised underground operation about 120 km south of Chihuahua city in the Mexican silver belt. The Los Gatos District consists of 14 mineralised zones, with Cerro Los Gatos classed as an epithermal polymetallic deposit with low to intermediate sulphidation.

The Geology and Exploration team uses Maptek™ Vulcan™ for monthly resource estimation updates with information from channel and drillhole samples. The team seeks continuous improvement in optimising processes.

'Vulcan is very well suited for this important stage of the mining operation – the intuitive interface and versatile tools help us optimise all estimation processes for short and long-term modelling,' said José Antonio Mamani Vilca, Senior Mineral Resources Geologist.

Los Gatos has highly variable silver grades, very common in polymetallic deposits. The team strives to accurately define the mineralised zones, deploying Vulcan for exploratory data analysis of channel and drillhole samples from the start. This provides an overview perspective of the data.



> Monthly short-term updates are now automated using Workflows for Vulcan combined with Python scripting.

Implementing workflows and incorporating scripting using open source codes in the Pygeostat libraries has provided a greater understanding of channel sampling and drillhole data through univariate and multivariate analysis.

The Workflow Editor streamlines and reduces time for the estimation process. With the steps 'preset', only the new channel information is entered before the automation is run.

Current workflows comprise:

- Channel data import
- Block model definition generation
- Short-term model estimation
- Drillhole data import
- Long-term model estimation
- Mineral resources classification
- Hybrid model generation (channels+drillholes)

Each workflow provides control at every stage; the output is reviewed for quality control and once approved, the next workflow is run, until all seven are complete.

The automated approach is proving very effective, helping to shorten processing time for the volume of channel sampling data received. Based on this success, the team decided to integrate Python scripting through the Pygeostat libraries available to Vulcan users.

This enabled univariate and multivariate statistical analysis of all channel sampling and drillhole data, as well as generation of histograms, QQPLOT and PPLOT in seconds.

'It is important for resource geologists to generate statistical visuals at each stage of the resource estimation process to ensure good results,' Mamani said.

'We always look to innovate, and this successful implementation has shown we are on the right path.'

Resource estimates are reconciled monthly against extracted material. Power BI tools generate dashboards that allow Los Gatos to identify possible short or long-term deviations from the resource model.

The outcome of combining workflow tools with scripting and reducing processing time has been groundbreaking.

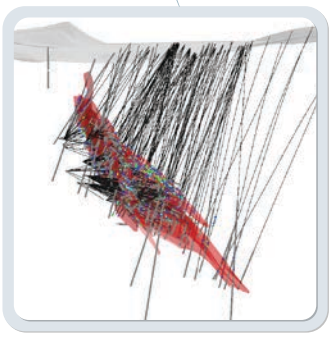
> The new approach has enabled significant time savings of 40%, justifying the vision of continuous improvement without sacrificing quality.

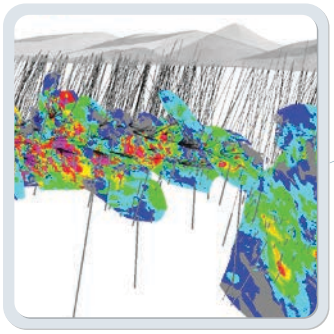
The ultimate benefit is maintaining control over quality and optimising the routines that estimation geologists use daily or monthly.

'This approach has expanded our expectations of the potential for resource estimation using scripting,' concluded Mamani.

Cerro Los Gatos is carrying out tests to implement Python SDK in Vulcan and will continue to explore various other options for future integration into their processes.

Thanks to
José Antonio Mamani Vilca
Senior Mineral Resources Geologist
Cerro Los Gatos Mine





Resource Estimation

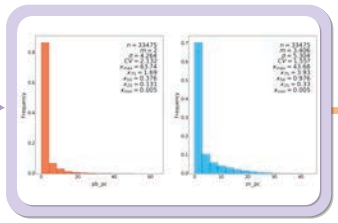
Create Block Model

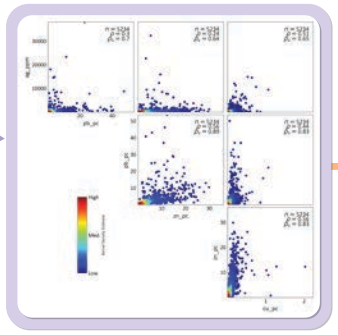
Multivariate Statistics

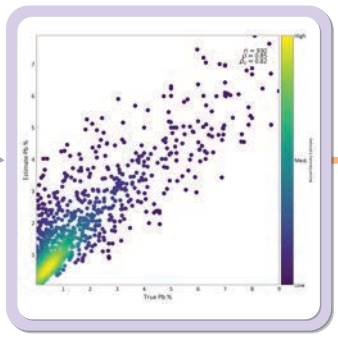
Scatter Plot Creation

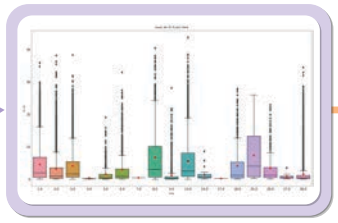
Estimation Validation

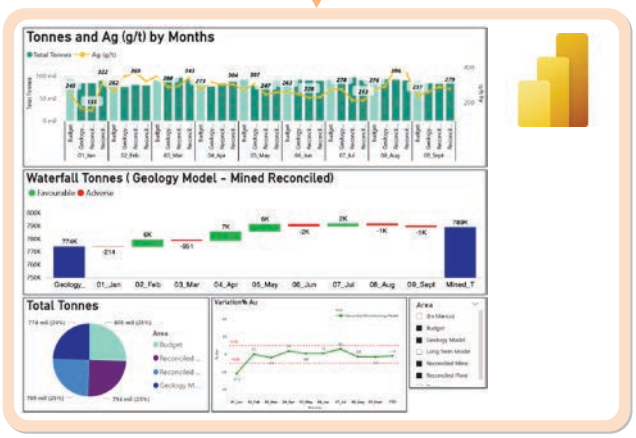
Final Output





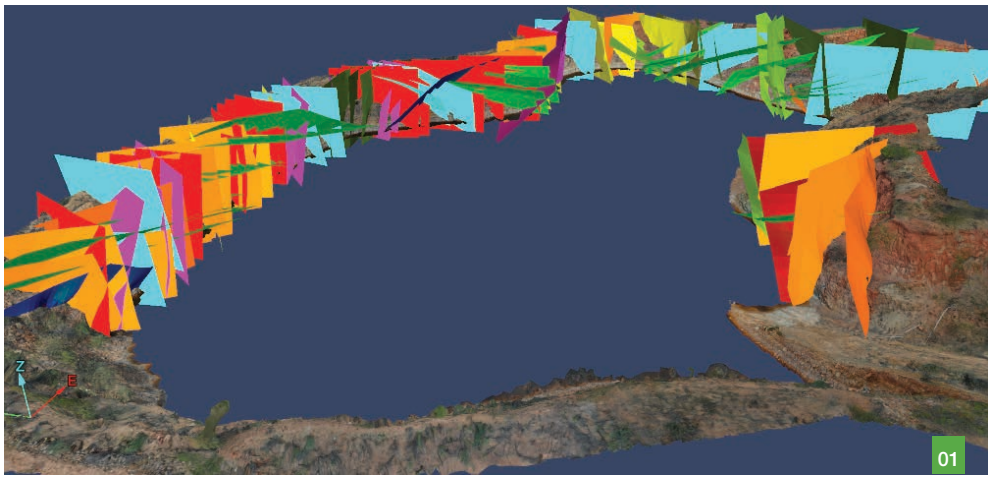






Seeing patterns in geology structures

An engineering geologist outlines the challenges of revisiting a gold deposit and how Maptek™ modelling tools were applied to control the complexity.



When Controlling Complexity was announced as the theme for the 2023 Maptek Geology Challenge, Caroline Burden was already dealing with a fascinating dataset at Jubilee Metals Ltd Croydon Project.

The initial objective of completing structural mapping snowballed into creating a geological model in what proved to be a winning move for the Engineering Geologist with GMEK.

The area had been mined since the turn of the 20th century and included an open pit that had been exposed to the elements for the past 40 years. Gold mineralisation worked from quartz veins is exposed in the current pit void.

The available drilling dataset included RC sample sets with different support lengths and limited lithology records. Records also included intersections with historic underground workings.

Dealing with 10-20m long assay intervals and highly variable lithology records was challenging enough. Adding the weathered open pit, about to re-enter production, made structural mapping even harder.

'Previously we processed data by manually flagging drillholes with different veins, assessed the model results and repeated,' Burden said.

Maptek™ DomainMCF allowed Burden to observe the 3D trends of grade distribution to visualise patterns and add subsurface thrusts and faults that align with the structural mapping. This helped to incorporate additional domains for fault blocks and folding to refine the veining in the models.

'I could really see where those structures were possible in the subsurface. Bringing the drillholes, the ATV data with structures picked, and the mapped data together within Vulcan GeologyCore helped to refine and place the structures that inherently controlled the mineralisation,' Burden noted.

DomainMCF also helped assess structural relationships in the subsurface.

Unsurprisingly, Burden found these relationships aligned with the mapped features present, highlighting the value of structural mapping and the insights revealed for geological modelling and controlling complexity.

Mapping the numerous structures seemed chaotic at first, but it was an important starting point given that rocks are a product of the material composition and the events they've been subjected to.

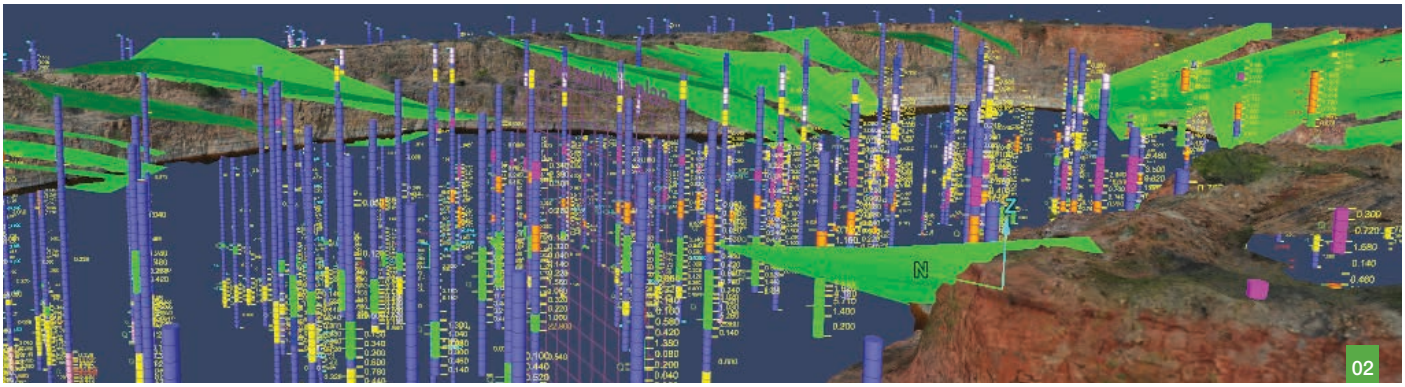
Patterns emerge

Maptek™ PointModeller was useful in handling registration using matching point pairs with existing ground control points on the photogrammetry-based dataset. After mapping the entire wall, patterns started to emerge.

A refined view of those structures alongside the drillholes flagged by interpreted domains of regions associated with higher grade reveals how the structures influence the grade concentration (fig 2).

Mapping established a complete picture and also helped to interpret thrust faults on either side of a clearly visible central fault that divided the main pit.

The next challenge was placing these major structures within the subsurface model. Visualising the grade trends using a DomainMCF model of the gold grade highlighted predicted patterns in the data.



The modelling accounted for inherent characteristics of the dataset, including uneven sample intervals, gaps in the data and potential contamination around existing workings. This allowed the placement of additional thrust and normal faults using recent televiewer data to assist in defining these structures (fig 3).

With thrust and normal faults in position, Burden switched to the new Fault Modeller tool in Vulcan GeologyCore to slice the model extents into different fault block domains.

The model area also includes a synclinal fold. Fault block domains and folding were written to drillholes and included as domain fields to influence the model trends. The final DomainMCF model was dramatically different to the original, showing how important it is to observe the structures.

Bonus evidence supporting the model inputs was sourced from regional studies that summarised the major deformation events.

Observing the structures present in the pit walls revealed the important geological events.

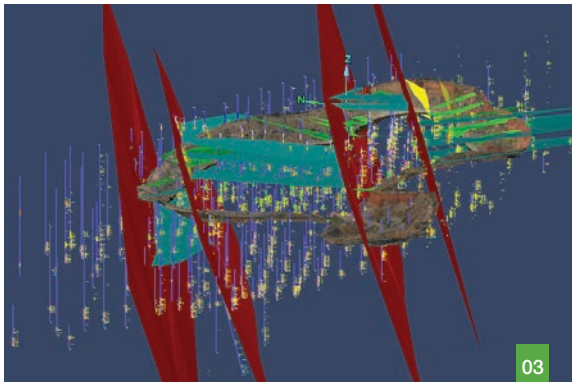
Burden's primary takeaway is to place value on what you see.

'If you can first observe all the features and their relationships using all the available data sources, you are more likely to understand the controls to the complex picture in front of you,' Burden concluded.

Ultimately, this holistic approach can save time and provide valuable insights for further assessments.

Burden plans to use the GMEK DomainMCF hours from her Geology Challenge win to continue to develop exciting new approaches to geotechnical modelling.

Thanks to
Caroline Burden
Engineering Geologist, GMEK



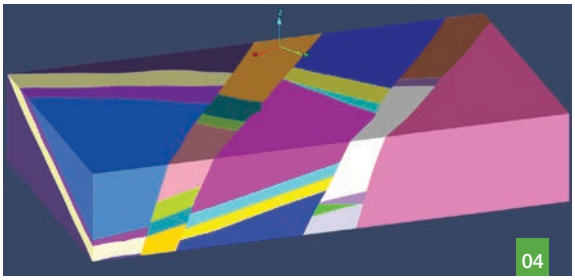


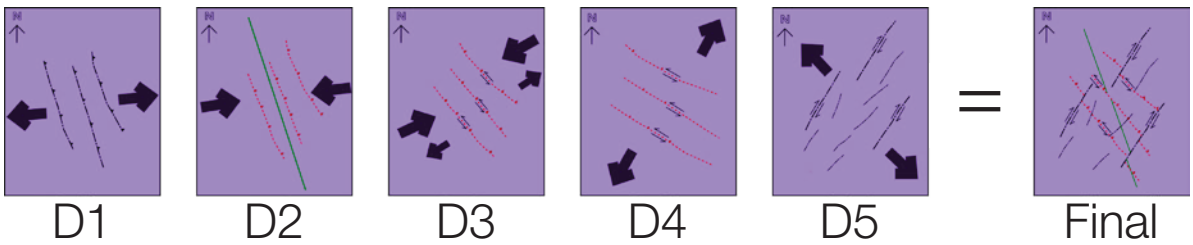
Fig 1: Pit with the structural mapping, showing highly complex structure

Fig 2: Starting dataset for the Geology Challenge, drillholes flagged with eight grade domains shown with structure Set 1 visible

Fig 3: Faults (red) and thrusts (blue) shown alongside the drillholes, pit and structural mapping for Sets 1 and 4

Fig 4: Fault blocks spanning the bdf extents modelled using Fault Manager as solids that were used to flag drillholes in the Domain Manager

Five deformation events sourced from regional studies. Black lines are normal faults, red lines are thrust faults and green lines are fold hinges. Arrows indicate stress directions and movement where present on fault lines. Final summarises the key events seen in the study area.



Accounting for loss and dilution

A solution for estimating loss and dilution that takes into account product recovery, material handling costs and minimum mining unit proves effective for complex projects.

Traditional approaches to predicting ore loss and planned dilution in open pit mining work well for broad planning, but more advanced techniques can be beneficial when working with challenging deposits such as narrow vein and disseminated orebodies.

Best practice requires engineers to consider recoverable metal, extraction costs, and the minimum selective mining unit (SMU).

Common methods include:

Standard loss and dilution factors based on metal grades, not accounting for variations in mineral dissemination. Often applied at the pre-feasibility stage or for high level studies, in practice this approach often underestimates actual loss and dilution.

Reblocking the resource model to match the SMU. This conservative method provides more localised estimates that better reflect variability within the mineralised material, but overestimate loss and dilution in areas of complex mineralisation.

Manually defining SMU compliant ore/waste boundaries by reviewing grades on each mining bench/flitch. While effective, this is a subjective, repetitive process that does not always take into consideration the optimal grade cut-off.

Maptek™ customers have identified a need for user-friendly solutions that streamline and standardise the process for predicting ore loss and dilution, while enhancing accuracy for complex deposits. Planners also want to be able to rapidly generate multiple scenarios for equipment trade-off studies, especially when assessing the impact of bulk or selective mining.

A unique approach to tackle these challenges harnesses the capability of Vulcan™ Grade Control Optimiser. This specialised tool was initially designed to optimise material categorisation within individual blasts as part of the production grade control process. It then became evident that its use could expand to cover entire mining projects.

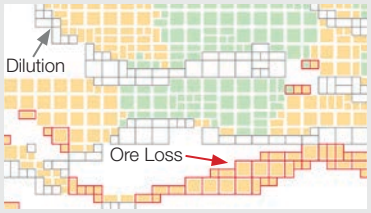
Grade Control Optimiser is batch run on individual mining benches or flitches, with the results supporting decision making in strategic and medium-term loss/dilution studies.

The solution can quickly identify areas of ore loss and diluting blocks and store the results within a single block model. Predetermined minimum mining width (or SMU), destination specific material handling costs, and destination specific product recoveries can be considered as part of the process.

Beyond classifying blocks as ore or waste, the output also identifies the most profitable processing destination. It assesses the net value of each block by assuming it can be sent to each specified destination before determining the most profitable and mineable option that complies with the initial SMU constraint.

> Customers who have embraced this approach report that it is user-friendly and offers greater transparency for auditing.

The results obtained from Grade Control Optimiser based loss and dilution studies can seamlessly integrate into subsequent activities, including pushback design, production scheduling and reconciliation studies.



Optimal destination for blocks (orange = heap leach; green = CiL; white = waste) along with the proposed recategorisation to comply with minimum mining width (grey = dilutant material; red = ore loss)

Comparison of the optimal material destination on a single flitch. Original resource model (top), traditional reblocking approach (middle) and GCO result (bottom). Colours represent optimal ore destination (orange = heap leach; green = CiL)

Using AI to find more copper

Maptek™ machine learning application DomainMCF helped a South Australian miner plan infill drilling for its copper project to the north east of Adelaide.

Mutooroo is a high grade open pit and underground copper-cobalt-gold project located 40 minutes from Broken Hill.

The host rocks at Mutooroo are high grade metamorphics with sulphide mineralisation lying in a shear zone either within amphibolite or at the gneiss contact. The Mutooroo copper-cobalt ore is a coarse grained, massive sulphide comprising pyrrhotite, chalcopyrite, pyrite and barren quartz.

The current resource at Mutooroo is defined by 300 drillholes, including some diamond drillholes drilled by Broken Hill South Limited in the 1960s. Samples used for resource estimation came from diamond drill core and reverse circulation drilling. Exploration data analysis, variography, block model creation, grade estimation and block model reporting were completed using Maptek™ Vulcan™ software.

> Havilah Resources has used Vulcan for over 20 years.

The stated sulphide mineral resource at Mutooroo totals 13.1 million tonnes of 1.5% copper and 0.16% cobalt, with 0.2g/t gold. There is also a small oxide resource overlying the main orebody.

Finding copper

The forecast global supply shortfall for copper provided justification for further exploration to extend known resources. With the recent upsurge in the accessibility of artificial intelligence (AI), Havilah Resources applied the method to target downdip extensions to their copper-cobalt mineralisation.

The Mutooroo drillhole data and topographic surface information were uploaded to the Maptek DomainMCF application and a model was generated within the region defined by the extents of the resource block model. The resulting 3D lithological model shows the complex interaction between the host amphibolite and the sulphide vein lenses.

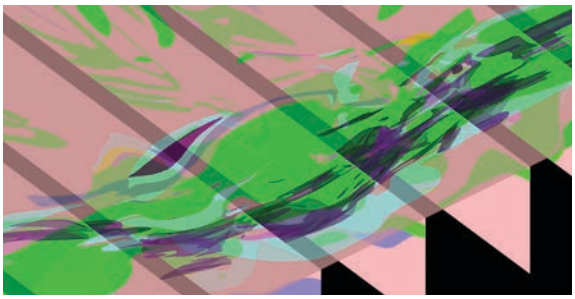
The next step was to model the copper mineralisation in more detail. Within the database, an indicator was established for samples grading more than 1000 ppm copper.

This copper indicator was then modelled using the DomainMCF cloud compute service. The machine learning application analysed the copper indicators and their spatial distribution in 3D and provided projections for potential extensions to mineralisation. Solid wireframes of the DomainMCF copper indicator were generated in Vulcan.

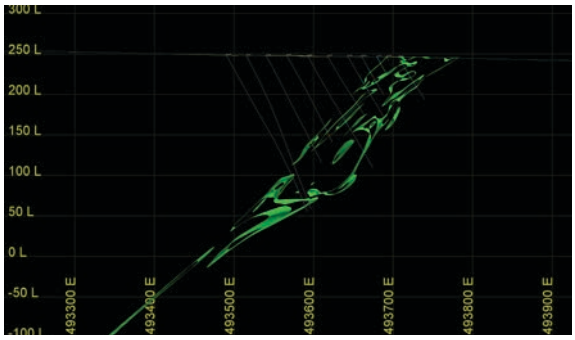
New drillholes were planned to target the AI-generated extensions to mineralisation. Late in 2023, a drill program commenced and at the time of writing the first four holes had successfully intersected copper-cobalt mineralisation close to the depths indicated by the AI model. Drilling continues, with the DomainMCF model updated as preliminary results are confirmed using pXRF results.

The machine learning model can be refreshed in minutes and so the geological/mineralised model is always up to date with the latest results.

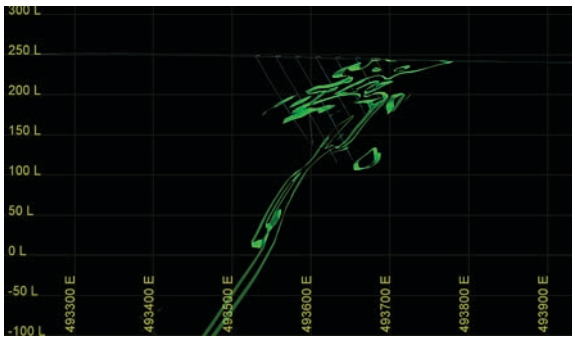
Thanks to
Chris Giles, Technical Director
Havilah Resources



Perspective view of cross sections with domain interpretations made by DomainMCF, ore lenses in purple, amphibolite in green



Cross sections of the 1000 ppm copper indicator model created by DomainMCF showing untested potential extensions at depth



Controlling complexity

The third Maptek™ Geology Challenge saw some innovative techniques applied to solve a wide range of problems using DomainMCF.

Now in its third year, the Maptek™ Geology Challenge provides participants with access to Vulcan GeologyCore and DomainMCF software to conduct their own project on a given theme.

The 2023 winner was Caroline Burden, Engineering Geologist from GMEK, who assessed subsurface structural relationships and mapping data for a complex metals deposit.

> Free computing time with Maptek machine learning engine DomainMCF was the incentive to try a more data-driven modelling approach.

Burden brought drillholes, ATV data with structures picked, and mapped data into Vulcan GeologyCore to help refine and place the structures that controlled mineralisation.

DomainMCF also helped assess structural relationships in the subsurface, which were aligned with the mapped features present in the wall, highlighting the value of structural mapping for geological modelling and controlling complexity.

'It's ideal for models to be largely data driven, but we also want to allow for some statistical fuzziness. Machine learning used in conjunction with the structural data was key in developing a more complete model, which is what we're really hoping for!' Burden said.

Second place was awarded to Anthony Bottrill, Principal Resource Geologist at InterGEO Resource Consulting, who also relished the ability to easily combine data types to rapidly generate a first pass 3D geochemical model using multi-element data.

'I was expecting to understand geological controls within the known data extents, what I didn't expect was that DomainMCF would present plausible extrapolation outside of the data extents,' Bottrill said.

'This ultimately gave me a better grasp of the relationship between two adjacent deposits and identified a target exploration zone for the main feeder structure to the system at depth.'

He noted that while there are many tools for analysing multi-element data, typically these are applied at the sample level (aspatial), because analysis in the 3D environment involves a lot of preparation and applied assumptions.

'The combination of Maptek geology tools allowed me to focus on the interpretation and think about the deposit controls spatially – this is where I believe the true value lies for a modelling geologist,' Bottrill said.

Evelyn Charlesworth, Water Resource Scientist at Kōmanawa Solutions took third prize for a project to better interpret coastal heterogeneity. The juxtaposition viewing slider allowed easy comparison of geological models created from different datasets.

Maptek convenor, Senior Geologist Richard Jackson noted that the 2023 entries ranged across multiple commodity types and for resource geology and engineering geology applications.

'We saw some truly innovative techniques used to solve a wide range of problems,' Jackson said.

The winning submissions exceeded Maptek expectations in using DomainMCF to control the complexity in their models. Burden plans to use the DomainMCF hours to continue to develop exciting new approaches to geotechnical modelling.

The theme for the 2024 Geology Challenge will be announced in July.

Automation at your fingertips

Open source tools that extend software functionality, incorporate scripting and streamline workflows help Maptek™ customers to optimise site processes.

Automation and workflow tools are enabled for all Maptek™ software applications. No coding expertise is necessary to take advantage of Python-enabled SDK and API toolkits that extend and streamline software functionality. Multiple ready-made workflows are also available for customers at no cost.

Maptek Global Strategy Manager, James Mackenzie is keen to emphasise the vast potential for streamlining site processes and reducing manual data handling.

'If a site has an issue, and I guarantee every site does, then we can help solve it,' Mackenzie said.

'Updating spatial data manually is risky. Anyone who has had to enter coordinates into a spreadsheet or transfer volumes from one software to another and got a number wrong is aware of the consequences,' Mackenzie said.

'We are all in the habit of sticking to what we know. The downside is missing out on the benefits of faster, smarter ways of working.'

Once a customer has outlined their goal, getting started is as simple as checking out a Maptek Extend licence when logged in to Maptek Account. The licence enables access to the open source tools and the Workflow Editor hosted on the Maptek Workbench.

Online resources include tutorials and how-to videos, with Maptek technical support staff on hand to help. Python training courses are also available for customers who want to dive deeper into the scripting possibilities.

The Workflow Editor operates across Maptek applications. A workflow is presented as a flow chart that can be run at the click of a button or triggered by an action.

Workflows may be set up on a server machine with access to the Maptek Extend licence. They can be activated by files arriving in a particular folder, or set to run at a specified time.

'You don't need to be in the room or online at your desk, the task is completed to your specification,' added Mackenzie.

Maptek workflows are designed for drag and drop, with visual cues to associate data files and connectors, embed scripts and ensure valid processes. More robust than traditional macros, workflows are reliable across software versions and are easier to troubleshoot.

Open access SDKs and APIs enable customers to bring data into the Maptek environment or push it downstream/upstream, leveraging external libraries to optimise processes across teams, sites and operations.

Applications

- Convert file types to move data between software packages
- Remove headers and bad lines in CSV files
- Interrogate existing objects to create a database legend
- Check that digging is within specified tolerance to design
- Generate custom reports from a mine schedule or block model
- Create a surface for drill and blast design

Streamlining of laborious processes allows users to focus on aspects of their role where they can add the most value to the technical data.

One customer reported that a Maptek workflow cut a task runtime from many hours to 10 minutes. Setting up automations to run overnight is another benefit, with computational intensive tasks leveraging available cloud bandwidth and results ready for the next working day.

Mackenzie pointed to an enhanced workflows tool in the pipeline, featuring improved user experience and tighter integrations with Maptek and third party software.

'We've combined current customer feedback on the existing tool with in-house development roadmap ideas to future-proof automations,' Mackenzie said.

A new Maptek automation environment will make automation easier, more approachable, more powerful, and more adaptable. It will operate seamlessly for customers using desktop applications as well as cloud computing in a truly revolutionary way to support future styles of working.

This development, anticipated for release in early 2024, along with easily accessed, flexible subscription packages and the online, self-service Maptek Store are designed to change the way mining is done, forever.

Refreshing skills and relationships

Geology and mining engineering staff in the Maptek™ North America team challenge themselves with monthly skills training to enable better customer service.

For the past several years geologists and engineers in the Maptek North America team have participated in internal workshops to fine-tune technical knowledge and improve communication skills.

Maptek Technical Services Manager & Training Program Lead, Maureen Moore said that the refresher training educates staff on new software features and the best way to pass that knowledge on.

'Our goal is to be resourceful and agile to help customers solve their challenges,' Moore said. 'Working on our soft skills helps us be more effective in transferring the technical aspects of a task to both internal and external customers.'

During 2023, training was divided into bootcamps by discipline, with an individual capstone project as another option. Staff applied Maptek tools to new datasets to evaluate the potential for open pit and underground training datasets.

The groups meet once a quarter before taking on a new topic. Recently, technical staff from all locations across Maptek in North America gathered in the Golden, Colorado office.

Senior Technical Services Geologist, Anne Gauer has enjoyed all aspects of the training, with new insights into customer needs.

'Working on datasets for different deposit types and geometries tested my technical skills. Brain-storming the most effective way to teach those concepts reinforced best practice,' Gauer said.

Project Geologist, Nolan Trenchik found that conversations while working through different topics helped solidify the concepts.

'The Train the Trainers session was a really great team learning environment. I also enjoyed the geology workshop, where we were given the tools and an objective to work toward,' Trenchik said.

For the future, Trenchik said a cross-team training session would help improve skills, build connections and fill knowledge gaps.

'Geologists and engineers could help each other with topics and skills that aren't part of their background,' said Trenchik.

'I would be able to support clients better and ask the right questions when I need support!' he added.

Onboarding

It is often assumed that technical staff have learned all of the skills they need during their education or previous roles. However, everyone can benefit from upskilling.

Maptek technical staff have access to comprehensive tools to explore, characterise and interpret mining data. The refresher training builds on this so that they are better prepared to provide guidance when customers need it.

'Staff must be able to recommend which tools to use and how to apply them to make robust decisions in real time,' Moore said.

Mentoring and a continuous education mindset are the best approaches for individuals and teams to check the understanding and retention of concepts.

> Thoughtful onboarding and nurturing of early career technical staff is critical to a long and sustainable pipeline of talent for the industry.

Learning how to communicate effectively while working remotely has contributed to how people learn, apply and retain new skills.

'During Covid-19 we got better at distance learning and continue to do so,' added Moore.

The benefits have flowed through to customer service, with several staff reporting that the sessions broadened their expertise for helping with technical support calls and training.

Moore is eager to explore whether similar skills refreshers would help early career professionals, and if so, how partnering with industry could help to deliver it.

Winning strategy for mine design

Final year mining engineering students from the University of Adelaide win the Maptek™ Mine Design Prize with their pre-feasibility report for a copper-gold deposit.

Playing to each others' strengths was key to success for the students from the University of Adelaide who were recently awarded the 2023 Maptek™ Mine Design prize.

Feibby Kareth, Lucas Ellis, Marcus Romeo and Yvonne Zheng received a trophy and cash prize for the best fourth-year mine design report, using a given dataset and Maptek™ Vulcan™ software.

Teams were required to conduct a pre-feasibility study on a copper-gold deposit, generating conceptual open pit and underground mine designs including mining method and appropriate mining equipment.

The winning study reported an open pit design split into three roughly equal sized pushbacks to stage development throughout the mine life. Block caving was chosen as the underground mining method, and geotechnical and ventilation calculations were completed to demonstrate the stability and safety of the underground operation.

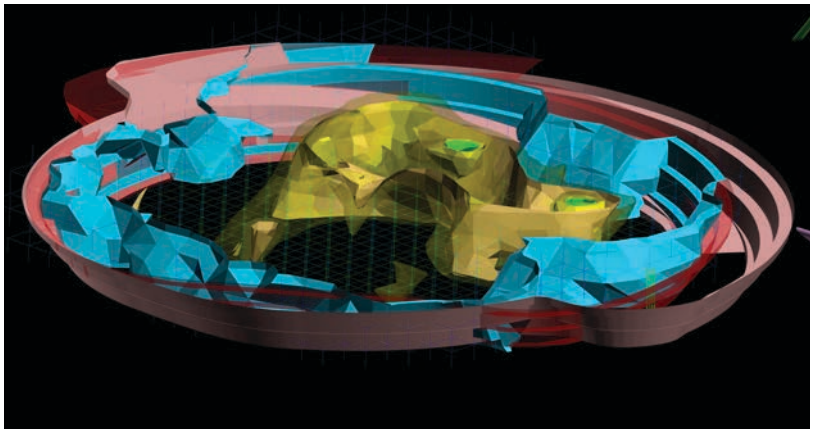
Estimates of the capital expense and operating costs during mine life, along with internal rate of financial return, were determined based on the principles taught during the semester.

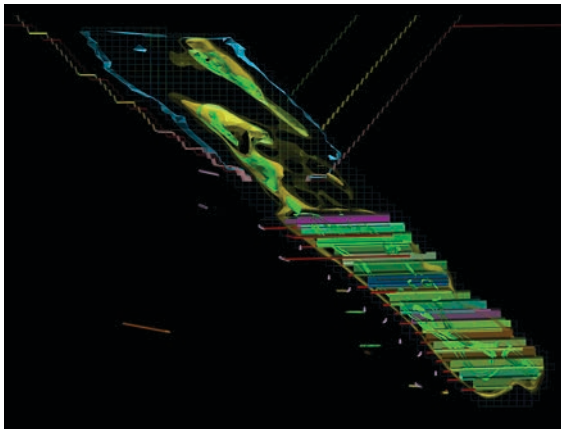
Maptek Senior Technical Solutions Specialist, Steve Sullivan said the winners demonstrated the ability to work as a team.

'The project scope was beyond the means of any single person. Dividing the tasks based on their strengths and then integrating the results into the final report was the differentiator that made them stand out from their peers,' said Sullivan.

Maptek staff taught five weeks of mine design during the final university semester and helped judge the student reports alongside lecturer Dr Chaoshui Xu.

Steve Sullivan (Maptek), students Lucas Ellis, Marcus Romeo, Feibby Kareth, Yvonne Zheng, Dr Chaoshui Xu (University of Adelaide) and Luke Victor (Maptek)





Software engineers meet the world

Maptek™ has collaborated with the University of Adelaide to connect students with industry experience within the classroom.

An ongoing relationship with the University of Adelaide has spawned a successful collaboration for industry, with Maptek and other providers leading a new Software Engineering in Industry course.

During 2023, third-year software engineering students heard from industry experts. Topics covered software process, modern architectures, teams and leadership, and reflected the personal experience of the software professionals.

'We were thrilled when the faculty determined that a subject run exclusively by industry partners would yield real-world lessons for students without having to leave the classroom. From this, Software Engineering in Industry was born,' said Global Strategy Development Manager, Will Reid.

> This connection allows students to see how their studies will translate into the day-to-day experience of a professional career.

'We hope students graduate with a sense of what their first days will be like once they enter the workforce. Ultimately, we're sending them out better prepared to make a difference!' Reid added.

Reid and Head of Experimentation and Technology, Simon Ratcliffe also mentored students in client-facing projects for the Software Engineer Project course. Their gamified design and implementation challenge for block model compression quickly attracted high interest, chosen by 130 out of 450 students. The 12 teams were expanded to 16 after the first spots filled in 20 minutes!

Teams were required to develop and upload a .exe file or a Python script to a verification service on a website. The program had to take uncompressed data on standard input and produce compressed output data with no loss.

Projects were judged on processing and compression performance. Teams could enter as many times as they wished to enable experimentation with different techniques without losing their place on the leaderboard.

Almost 3000 tests were submitted, which is the equivalent of nearly 30 days of continuous testing.

Throughout the competition, Maptek and post-doctoral students hosted 'client meetings' to promote effective presentation skills.

Maptek then invited several teams to pitch their ideas, followed by networking where informal awards were made to teams and individuals.

Five excellent presentations were delivered, with questions flying between rivals once their secrets were shared. Maptek supported the competition infrastructure for a week after results were announced, allowing teams to experiment further.

'After several days, one team shared statistics showing that combining their best method with that from another could further build on one of the compression records set,' Ratcliffe said.

The Maptek approach enhances the development of coding skills alongside individual and team work. While the projects are formally assessed and contribute to grades, undergraduates also learn important lessons from working on projects that deliver client-facing results.

Industry upskilling and talent development are the ultimate benefits of Maptek's close collaboration with universities.

University links advance learning

Mining engineering students in Peru benefit from an ongoing university partnerships with Maptek™, improving career prospects and industry outcomes.

Senior level students at the National University of San Marcos gain familiarity with technologies used in the mining industry thanks to a partnership with Maptek.

In September 2023, Maptek hosted a Master Class, sharing the latest tools for designing surface mines with 30 students in the final units of their Mining Engineering degree at the university in Lima.

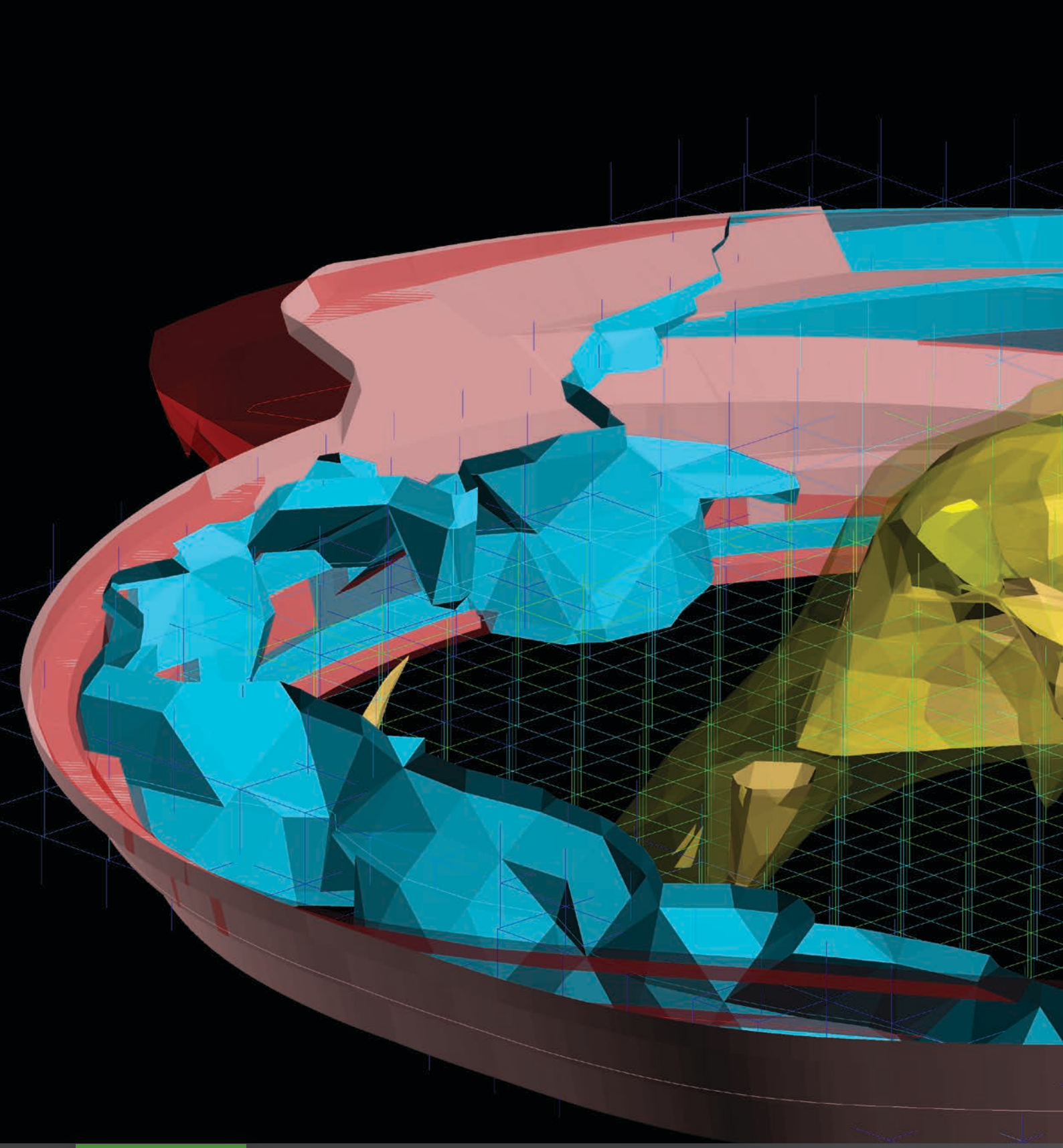
David Melgar, Professor of Mining Engineering thanked Maptek for the opportunity to see innovative solutions in action.

‘The students and I were very surprised by the agility of Vulcan to process information quickly and easily to generate multiple open pit designs,’ Melgar said.

‘Importing a block model was really fast, with no need to make multiple configurations.'

'The automatic open pit designer was really impressive, greatly shortening the time it takes to carry out this important operation during project development.’

The university looks forward to continuing the relationship with Maptek, which improves career prospects for mining engineers as they enter the industry.



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