

# What's New in Maptek Vulcan 10

Vulcan 10 heralds a new era in software delivery and user experience for Maptek customers. This release introduces the Maptek Workbench as an integrated platform for accessing all of our products and services.

## Overview

**Vulcan 10** includes new tools and enhancements that allow users to add value to technical data. Highlights of the release include new automated pit designer, variogram analysis, RBF and uncertainty options in implicit modelling, and large block model display.

**Automated Pit Designer** enables engineers to quickly iterate designs to generate the most economical pit design.

**Vulcan Data Analyser** brings 14 different menu items into a new streamlined interface for interpreting geological data in the lead up to grade estimation.

**Processing power and performance** are enhanced through support for multi-threading. Hundreds of **enhancements** have been made to tools and workflows for improving geological modelling, grade estimation, mine design and planning.

The **Maptek Workbench** delivers a new customisable interface combining workflow tools with Maptek applications.

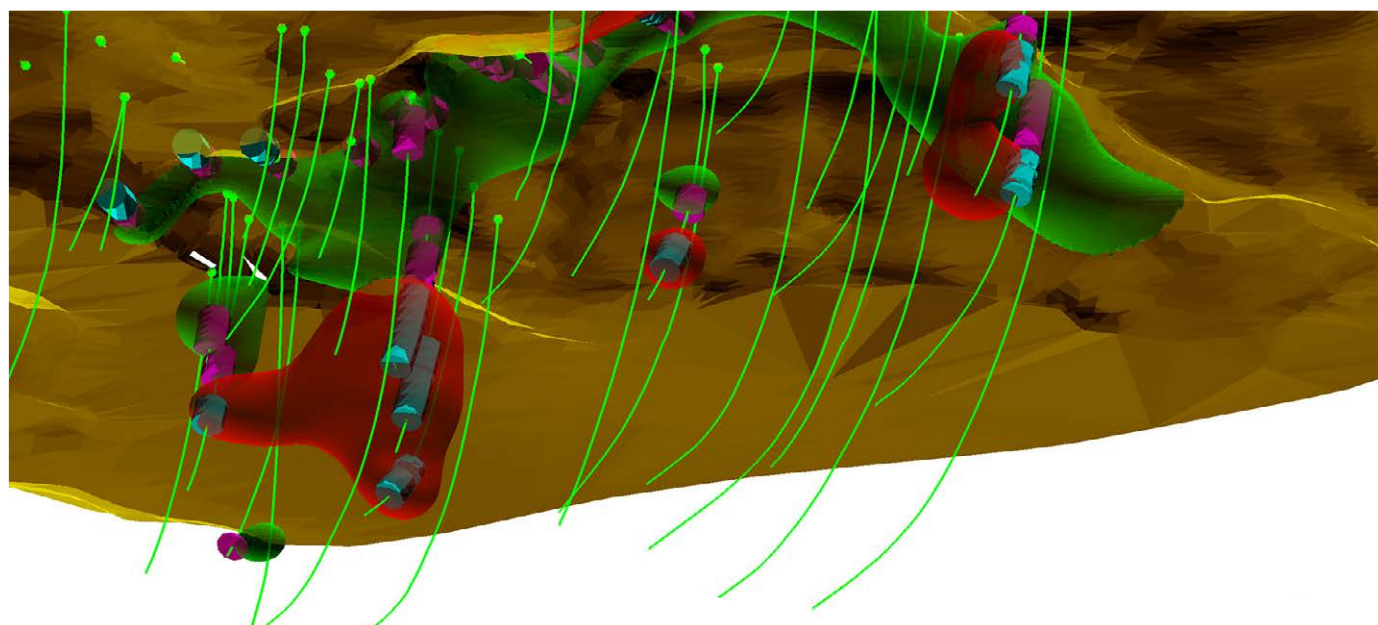
Customers who have purchased Vulcan Modeller licences (excluding prepaid) will also receive a free trial licence for **Maptek Eureka** drillhole tools.

Vulcan 10 incorporating Maptek Workbench is available for download from a secure link in the Maptek Users Area.

Visit [users.maptek.com](https://users.maptek.com) to login or register with your corporate email for access. Current maintenance is a prerequisite for registration.

Download file size is approximately 1.6 GB. USB keys can be mailed if you have difficulty downloading files.

- Automated pit designer
- Vulcan data analyser
- Implicit modelling
- Grade control
- Uniform conditioning
- Large model display
- Fault modelling
- Split pit solids
- Cutting blocks
- Gantt scheduler
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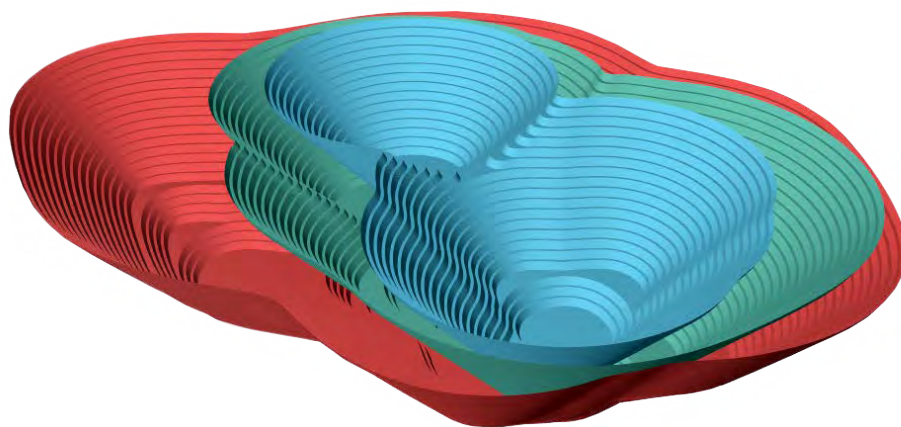
## Automated pit design

The new Automated Pit Designer automates the creation of mineable pit shells after the optimisation process has been completed. The Vulcan pit model becomes a key factor in dynamic planning, allowing mine engineers to work more efficiently.

Optimised block model results can be quickly transformed into realistic mine design contours. These contours serve as a base for further design work or to generate pit-by-pit graphs and long term schedules.

Design parameters such as batter angles, berm widths and pit slopes can vary by location and direction. Operating parameters such as minimum mining width and material digability are direct inputs which can be manipulated to create mine designs.

Designs can be updated as new drilling or mining data becomes available, or adapted to changing economics. Multiple scheduling options can be reviewed, and different design parameters can be evaluated for their impact on the plan.



## Variogram analysis

The new Vulcan Data Analyser integrates variogram analysis tools into a streamlined workflow in the lead up to grade estimation. Several new methods are provided for handling structural and grade based anisotropy, allowing users to gain a better understanding of their geological data.

Calculations are easily set up and fast to run. Changes to parameters are instantly reflected in onscreen charts. Dynamic lag control greatly reduces the number of times variograms need to be calculated and allows users to quickly test multiple alternatives.

The data analyser integrates Vulcan unfolding tools, providing several new methods for handling structural and grade based anisotropy. The new fan variogram compass allows selection of multiple directions for sample correlation.

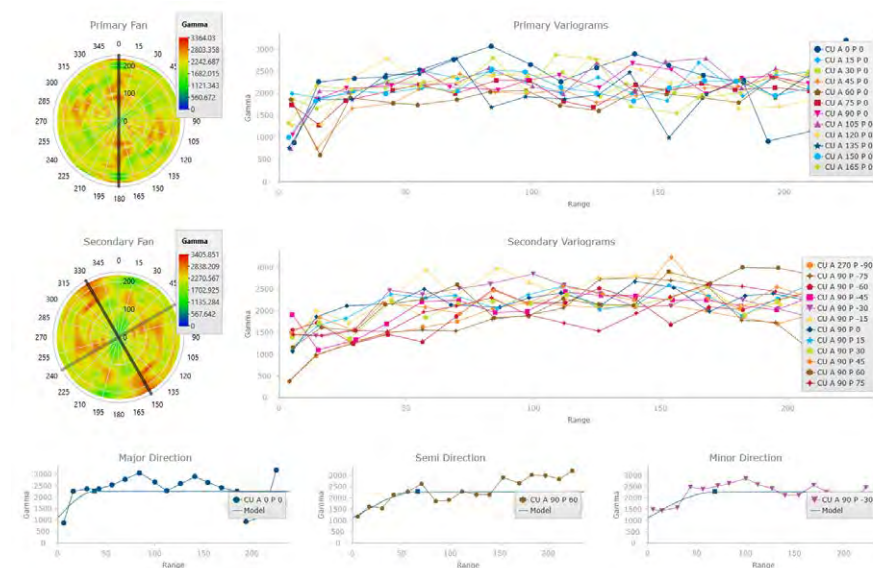
Displaying multiple models concurrently allows users to conduct real-time comparisons. High quality charts are easily output for resource reporting.

## Implicit modelling

Implicit Modelling in Vulcan 10 includes a new radial basis function (RBF) option. Domains with shared or independent structural trends can be defined and modelled together in a single run. Enhanced smoothing ensures that drillhole data is accurately honoured.

Several new methods are available to create local anisotropies for implicit modelling, grade estimation and simulation, ensuring the grade estimation matches the complex folded structures.

Vulcan 10 implicit modelling also gains uncertainty modelling, allowing multiple orebody models to be automatically generated from drillhole datasets. Applying financial information allows mining viability to be quickly assessed for different scenarios.





## Grade control

Grade Control is the first application written in the new Maptek Workbench framework, resulting in more robust data management and streamlined workflow.

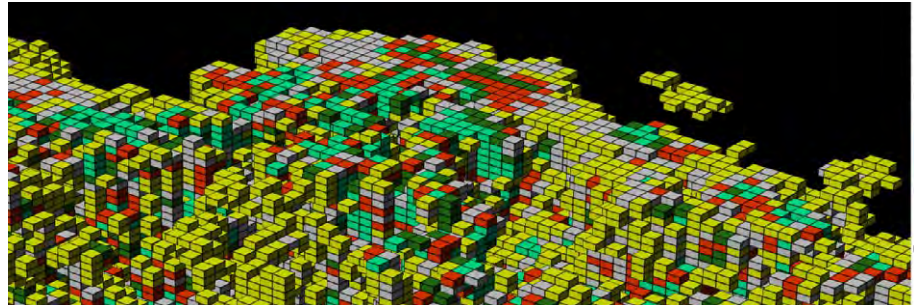
Improvements focus on database setup and maintainability. New menu modality greys out toolbar menus and icons to direct users through the grade control process. Automatic bench plan output extracts and labels grade blocks with required attributes. Validation checks ensure that data types are not mixed. Errors in specification file setup are flagged, and subsequent menu items remain disabled until issues are resolved.

Key setup fields are automatically pre-populated from the source database. Data types are explicitly enforced in the calculation rules phase, and logs record how each grade block was calculated, enabling better auditing. Scripts to run conditions with pre-defined syntax, attributes and variables are easy to set up and edit.

Blast solids can be generated from surfaces or levels if blast solids are not provided with grade control output.

Audit trails show changes through log files which record the last user to create, modify or delete blast files, block boundaries, block out and reconciliation files, and record weight assignment rules used to calculate block out values. Other upgrades include:

- Separate rule configuration and display avoids change to assignment rules without due process.
- Using the drillhole database as the source is no longer required in Isis database setup.
- Display of plotted data is improved.



## Uniform conditioning

Uniform Conditioning is a useful resource modelling technique when data is sparse and widely spaced with respect to the selective mining unit (SMU). It helps resolve the tension between creating a resource model that produces accurate, well informed local estimates and a model that predicts global resources and produces reliable grade-tonnage values.

Uniform conditioning allows validation of recoverable reserves, mitigating the risk of overestimating or underestimating grade and amount of ore.

In Vulcan 10, uniform conditioning is available alongside Inverse Distance, Simple, Ordinary and Indicator Kriging estimation methods. Setting up uniform conditioning estimation is similar to setting a kriging plan, requiring panel definitions and localisation strategy.

Vulcan allows both regular and irregular panel definitions, for example using a set of 3D solids or a block model variable. In this way the panel shapes match the orebody and domain shape. Corrected panel scale distributions can be assigned to the SMU blocks using different localisation strategies that best fit the orebody.

Uniform conditioning includes multi-threaded execution, batch mode running and options to output additional variables that are part of the estimation process.

## Large model display

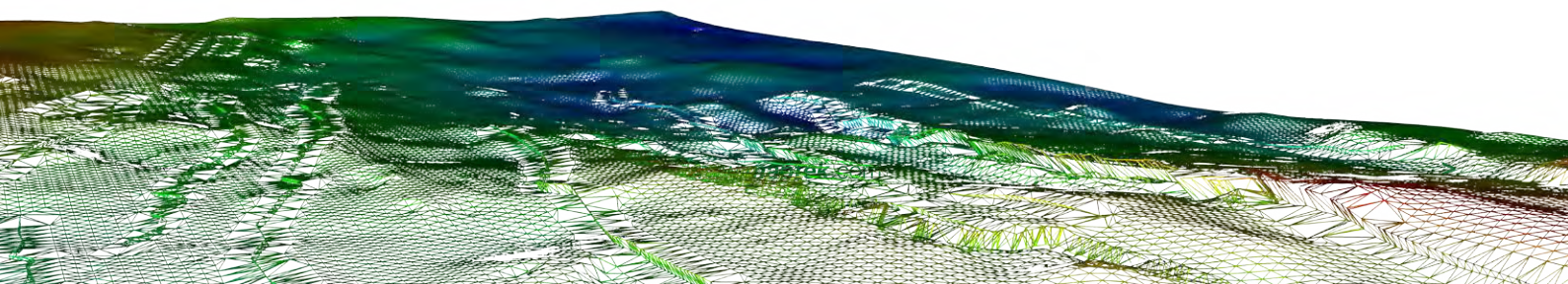
Vulcan 10 allows 3D visualisation of regular block models containing hundreds of millions of blocks. Level-of-detail viewing allows greater resolution on zooming, and processing power is used only where necessary. Geologists no longer need to compromise when handling extremely large models in 3D.

Slices can be displayed and sections toggled through on screen. Dynamic display controls allow easy adjustment of visualisation parameters. On-the-fly colouring, filtering by grade values, annotations, anisotropy vectors and datatips can all seamlessly modify the display.

## Fault modelling

A new Stratigraphic Fault Modelling method complements the existing 'blocks' method in Vulcan. Users can create reverse and normal faulted stratigraphic models using defined dip and throw, without requiring solid triangulation fault domains. The new modelling approach works on strings or fault surfaces as input.

Output from all stratigraphic options has been improved. Data points can be directly incorporated from drillholes or CAD inputs into gridded output via triangulated hybrid surfaces.



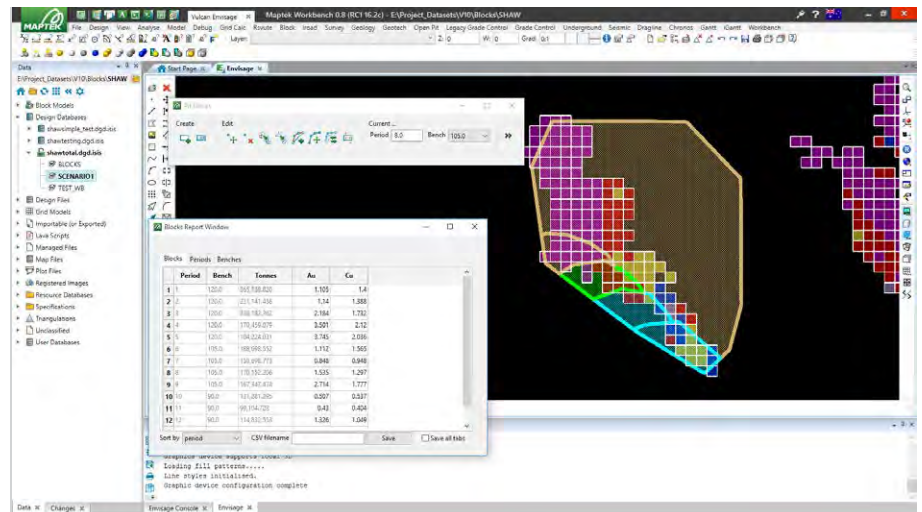
## Split pit solids

A new open pit menu item in Vulcan 10 streamlines creation of valid scheduling blocks. Visual cues at all stages aid validation, and fast processing ensures timely results. The workflow incorporates 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.

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 splitting stage.

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

The resulting valid closed solids are fully attributed and ready for scheduling in Vulcan Gantt Scheduler and Maptek Evolution.



## Cutting blocks

Vulcan 10 introduces a new tool to create scheduling blocks by interactively cutting bench polygons into period-based cut polygons. Target tonnage is reserved against a block model as cuts are made.

The reserves are defined by a schedule of cut polygons, then accumulated and sub-totalled by bench, material type, grade and period in a report displayed as tabbed views. Each schedule reserve view can be exported for inclusion in formatted Microsoft® Excel reports.

The optimised targeting algorithm makes this an ideal tool for short term planning.

The graphical approach allows users to show the mining blocks for the next few periods through a set of user-definable visual attributes. Cut block polygons can be interactively modified, and shared point-pairs moved as one to maintain common block boundaries.

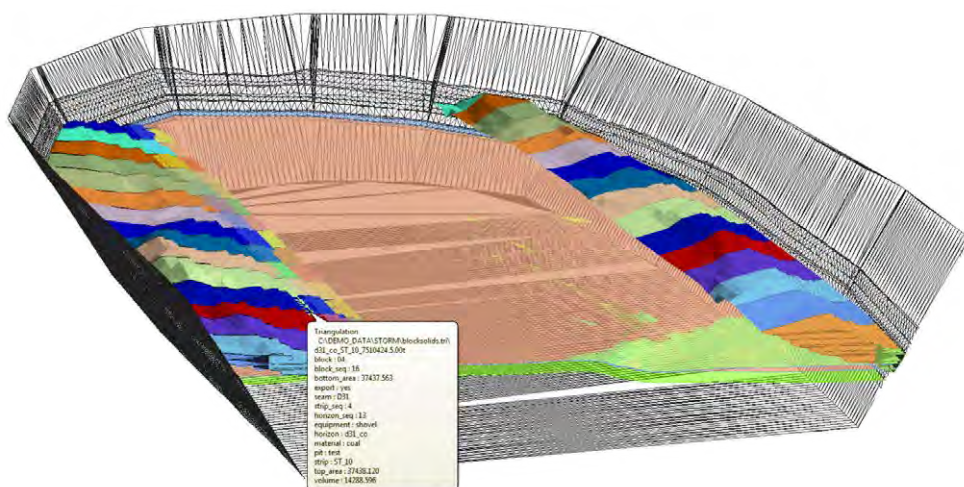
The new tool features easy specification setup and parameter recall. The option works with polygons and triangulations, and benches can be automatically defined from design layers.

Custom views of generated bench cut polygons allow display of scheduled cuts on the benches above and below, as well as periods forward and back. This flexibility allows for instant recognition of the scheduled mining sequence.

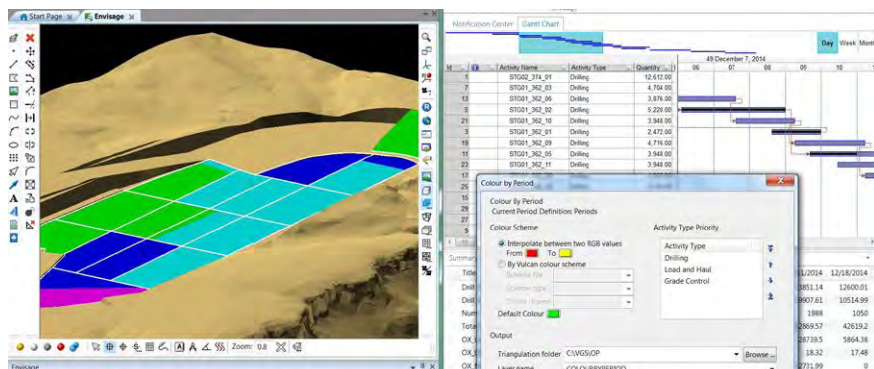
The new cutting blocks option uses Vulcan templated attributes to store metadata (block, waste tonnage) with scheduling objects for easily labelling of cut polygons by bench.

Usability and on screen validation are key features. When merging or moving points the changes appear in real time and are reflected instantly in reserves and reported breakdown.

This new Vulcan tool saves time and improves productivity for short term planning. It can also be applied to long term planning exercises.







## Gantt scheduler

Short term underground scheduling is brought into the Maptek Workbench to deliver interactive graphics and design in one application.

The new tools handle resource levelling, project planning and analysis; nesting and schedule subsets and manual scheduling; and optimisation and constraints.

Numerous enhancements resulting from customer feedback have been included:

- Colour by schedule attributes.
- Update schedule with 'percent completion' information from a text file to generate quick reserves.
- Script user-defined solutions to incorporate into workflows.
- Export to .xml file for external viewing.
- Apply multiple filters.
- Target levelling option.
- Usability upgrades to Gantt grid.

## Power & performance

Vulcan 10 delivers additional support for multi-threaded processors for up to 10 times better performance over Vulcan 9.1.

A new block scripting engine processes larger scripts and completes calculations 10 to 1000 times faster. Block slicing has received a speed upgrade, running 3 to 5 times faster in Vulcan 10.

Implicit modelling speed is also increased. Many calculations can be carried out via GPU for accelerated computation, or with a CPU estimation process optimised for modelling. The new accelerated code also supports trend models.

GPU acceleration in grade estimation allows estimations for some parameters to be completed faster.

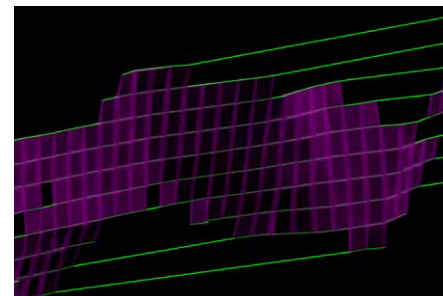
Block model attribute importing uses an intelligent process to assign values into block models several times faster.

Vulcan 10 also features a new threaded sequential Gaussian simulation module which effectively uses multi-core CPUs to accelerate simulations.

## Enhancements

### Level Designer

Vulcan Level Designer includes support for longitudinal stoping, upgrades to fine tune outputs and the ability to apply a primitive.



### 3D Geological Sculpting

Solid objects can now be modified in freehand mode, including pinching, smoothing and cutting of solids, to better represent the geological interpretation.

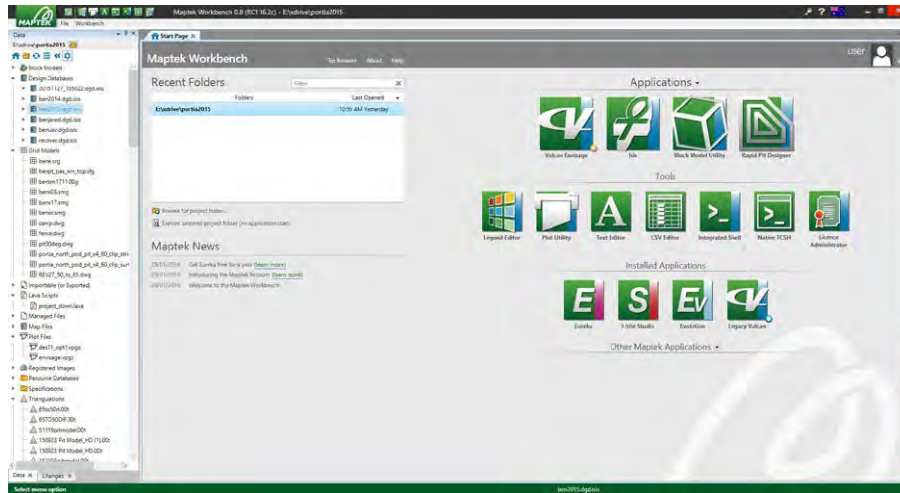
### Vein Modelling

Vulcan 10 contains new options based on grid modelling methods for steeply dipping vein deposits. Rather than calculate separate surfaces for each hanging wall and footwall, a single plane is used to pick the vein which has the most data and fit a surface through it.

### Property editor

Users can conduct a wide range of queries such as length and area of polygons, and change a polyline from open to closed. Triangulations are validated quickly, and surface area and volume can be generated. Users can change between solid shade and wireframe triangulations, and access properties with one click. The intersection of any CAD object with the current section can be displayed, and section widths can be used to apply a defined front width and back width to the object while in section view.

## Workbench



The Maptek Workbench introduces a new architectural backbone for all Maptek products, with improved workflows and data sharing, the ability to establish user roles and permissions, and access to additional applications.

The flexible new interface is particularly useful in a multi-screen environment. Any window can be detached from the Workbench and moved with associated icons to the desired working location. A tabbed approach allows easy access to everyday apps such as csv, t-shell and text editors to support design and modelling tasks.

For example, an Envisage design window and the Isis database can be docked side by side. Drillholes can be interactively interrogated, with changes recorded in a log that creates a session audit trail.

The Workbench interface is customisable from the very first screen, and includes tips and inbuilt help. Vulcan 10 in the Workbench introduces a new option for defining workflows that access different menu options.

The new command list function can incorporate any application within Vulcan or run from Vulcan, in a single workflow. Users can add pauses, tips and prompts. This facilitates training and documentation of standard approaches to shared tasks. Users can still set up hotkeys, history lists and custom toolbars for their preferred mode of working with Vulcan.

New functionality in Vulcan Explorer allows users to easily manage working files through searches and thumbnail views, saving time when working with hundreds of thousands of files. Multi-language support in the Workbench interface and Vulcan 10 extends from menu options to layer names and plot file output.

The Workbench provides access to licence configuration and operating system details to help guide technical support, and a memory performance dashboard. It also provides a flexible environment for development, testing and delivering new functionality.

## Eureka free trial

This release includes a free trial of core drillhole viewing and exploration tools in Maptek Eureka for Vulcan Modeller users. Eureka usage will be matched to Vulcan licences.

Eureka provides an interactive 3D environment for visualisation and modelling of exploration data including drilling, geophysical survey, seismic survey, GIS data, maps and other imagery.

Users can import and view data, model grids and triangulations, calculate volumes of surface and solid models, and convert datasets between coordinate systems. Drillhole tools include interval filtering, automatic geophysical trace association, drillhole correlations and interactive drillhole editing.

Eureka core and drillhole tool will be free for Vulcan users running an eligible Vulcan QuarryModeller, MineModeller, GeoModeller or GeostatModeller licence. The free trial period expires on 30 June 2017.

