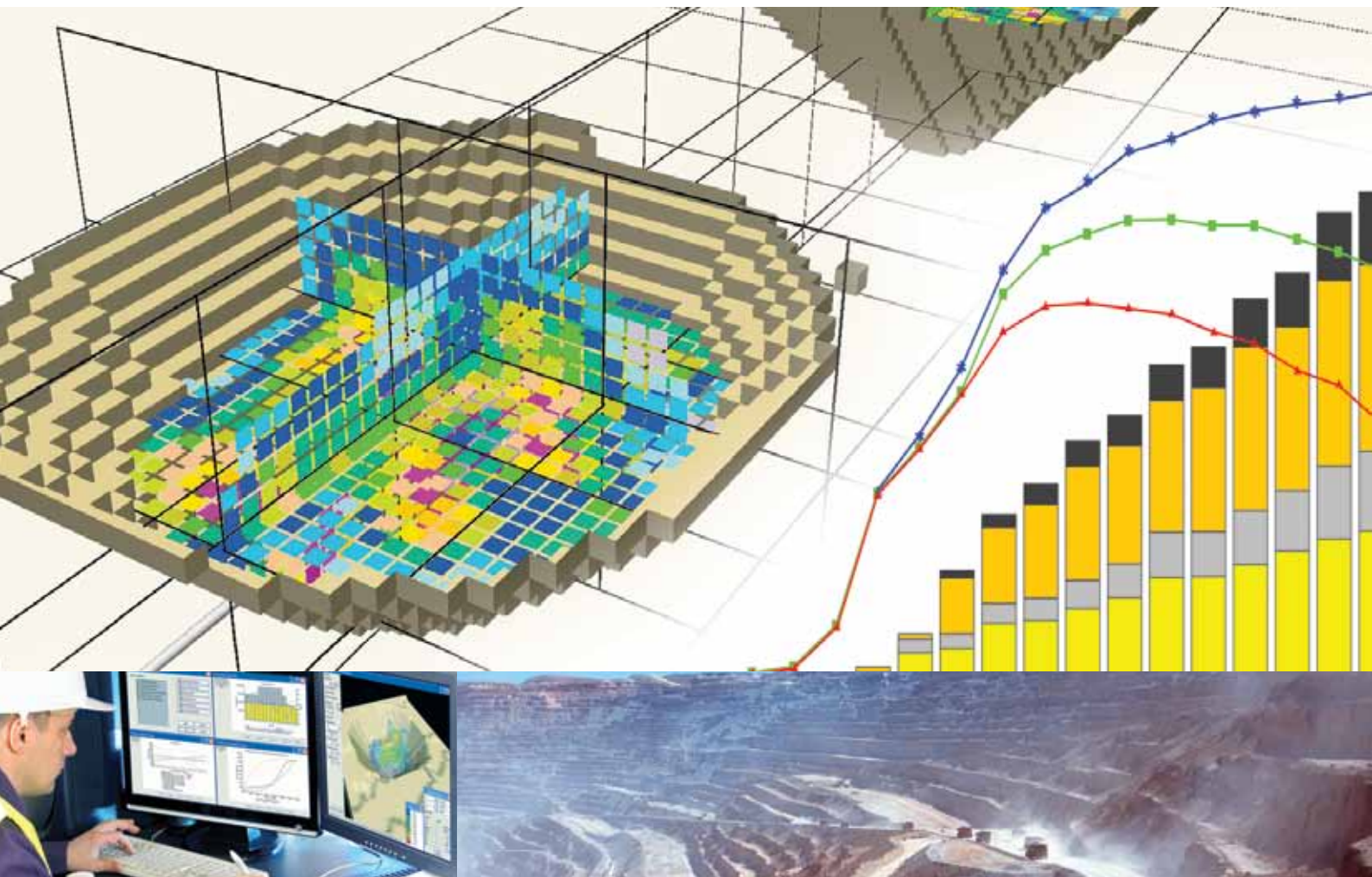# GEMCOM **WHITTLE**™

Strategic Mine Planning

Gemcom Whittle™ is the world's most trusted strategic mine planning software used to determine and optimise the economics of open pit mining projects.
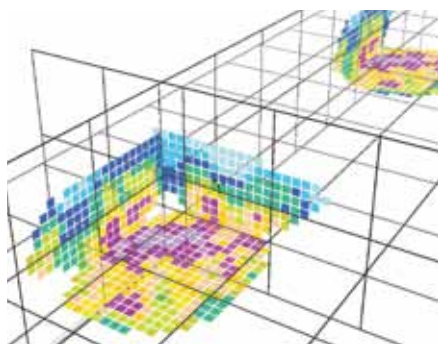
Benefits:

⤳ Understand the potential value of the deposit.

⤳ Establish the economic viability of the deposit and options for capital investment and development strategies.

⤳ Identify preferred development strategy, capital investment, expected NPV and optimal extraction sequence.

⤳ Analyse expected return on investment.

⤳ Determine strategic direction for the mine; cut-off grade and optimised cut-off grade; mining areas and extraction sequence per period; and development strategies for new mines and push backs.

GEMCOM

Trusted Results You Can Bank On

When exploration and mining companies need to evaluate the financial viability and the optimal mine strategy for a deposit, they turn to the industry leading strategic mine planning solution – Gemcom Whittle. Companies depend on Whittle to help them determine their investment strategy and to deliver robust mine plans that maximise profitability by taking into account real mining constraints. Delivering trusted results, the software is used in scoping, feasibility, life-of-mine scheduling, and in the ongoing re-evaluation of mine plans throughout the production phase.

Pit optimisation alone is not enough to unlock the full economic potential of your operation, Whittle provides mine optimisation, which enables significant increases in project value over and above pit optimisation. With Whittle, you have all the strategic mine planning capabilities you need to achieve mine optimisation: strategic scheduling; detailed cost, price and recovery modelling; stockpiles; multiple mines; blending and cut-off optimisation; and now simultaneous optimisation for creating the ultimate mine schedule. Whittle provides the ability to rapidly evaluate many alternatives to ensure that variations from the expected are considered and potential deposit value is uncovered.

By choosing Whittle, you are aligning with the industry leader: the world's top open pit mines use the software because it delivers results they can bank on. For over 25 years, Whittle customers have extracted maximum value from their deposits by using trusted mine planning processes to optimise and plan open pit mines.

Whittle Benefits

| PROJECT PHASE	BENEFITS
Exploration	– Understand the potential value of the deposit. – Target areas for future drilling.
Scoping	– Establish the economic viability of the deposit and options for capital investment and development strategies. – Examine sensitivities and assign resources accordingly for future studies.
Pre-feasibility, Feasibility	– Identify preferred development strategy, capital investment, expected NPV and optimal extraction sequence. – Calculate sensitivities to develop risk reduction strategy. – Ascertain final reserve statement for the deposit.
Bankable Feasibility Study	– Analyse expected return on investment. – Analyse sensitivities and investment risk. – Consider multiple scenarios for reducing risk.
Production	– Determine strategic direction for the mine; cut-off grade and optimised cut-off grade; mining areas and extraction sequence per period; and development strategies for new mines and push backs. – Re-evaluate mine plans in response to changing conditions. – Calculation of annual reserve statement.

Whittle: Solutions Tailored for Your Needs

As a Whittle customer, you can select the features that are right for your needs. You can extend Whittle by adding new modules as your needs grow.

Standard Whittle Features

Companies involved in scoping, feasibility, planning and production depend on Whittle's standard features to drive decision-making. That is because Whittle comes with the essential tools for making mine strategy decisions including: capital investment required; economic viability of the deposit; the size and shape of the final pit; and understanding key sensitivities of the mine plan such as the affect of costs and metallurgical recoveries. You can also re-evaluate your mine plan at anytime in response to changing economic conditions.

The unique structure of projects in Whittle promotes the analysis of

Block model showing copper grades.
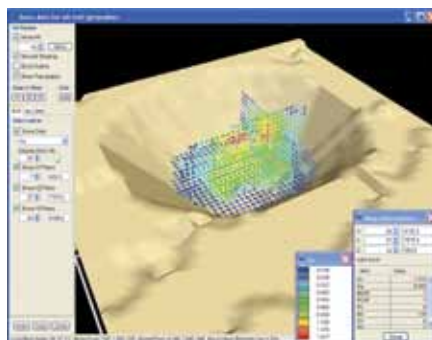
3D viewer enables validation of results and querying of individual block attributes.
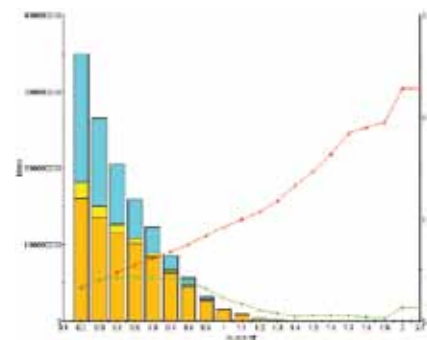
Maximise NPV across your operations.

"Whittle helped us extend our bench across the orebody and come up with new cash flows. We have increased our ore reserves by more than 1.2 million tonnes in six months, and we expect extra years of production from the Youga mine."

— Samuel Takyi, Senior Mine Planning Engineer, Etruscan Resources Inc.

alternatives to attain the best possible strategy for your mine. Whittle projects are easy to manage as you are guided through key planning functions, from pit optimisation through life-of-mine scheduling, to sensitivity analysis and final NPV calculations. While the software's features are easy to use, they can model even the most complex scenarios.

Whittle's standard feature set includes the following four modules:

- **Foundation –** Provides essential functionality for pit optimisation and benchmark scheduling, including: model import; reblocking functionality; slope modelling; best and worst case schedules and visualisation; reporting; and export of results.

- **Multi-Analysis –** Unique ability to organise multiple analyses within a single project, saving time, promoting repeatability of processes and ensuring all information is easily accessible.

- **Multi-Element –** Enables the incorporation of up to 30 elements that can be used for modelling physical, economic or geological factors.

- **Advanced Analysis –** Easy to use graphs and templates facilitate extensive analysis of sensitivities and risk.

Additional Whittle Capabilities

Life-of-Mine Scheduling Modules

When determining project life, ultimate pit size and extraction strategy, mining companies use NPV as a key project indicator and decision making tool. To accurately calculate NPV, realistic mine schedules need to be developed. Whittle's life-of-mine scheduling modules provide practical push back creation and automated scheduling routines, as well as multi-mine capabilities where required to model realistic deposit scenarios.
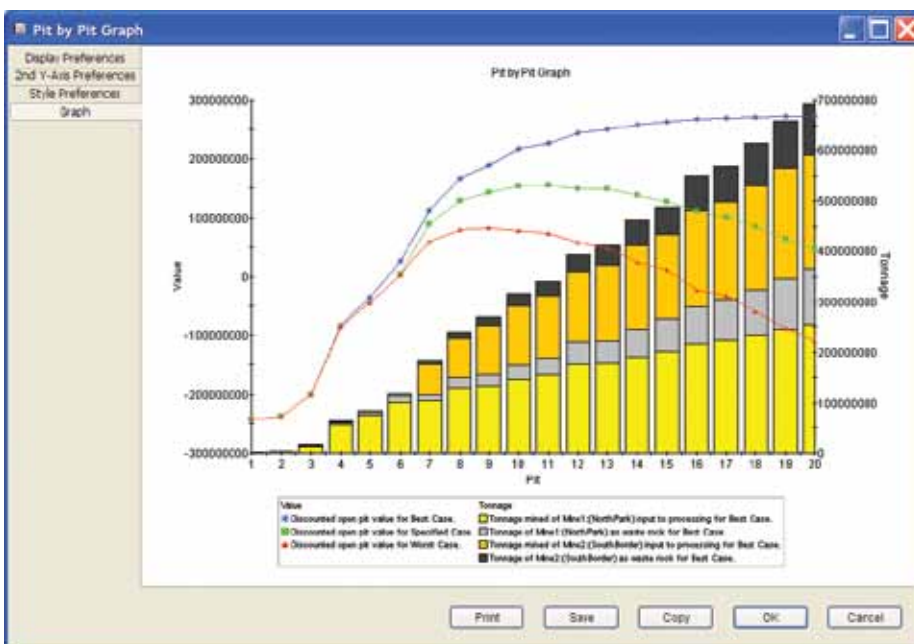
- **Milawa Algorithm –** Automatically schedules up to 10 push backs to target maximum NPV or balance ore and waste production.

- **Push Back 50 –** Extends the Milawa Algorithm's capabilities to support up to 50 push backs during scheduling.

- **NPV Practical Push Backs –** Realises potential value with push backs that target NPV and mining width. Also includes:

- **Push Back Chooser –** Automatically selects the set of maximum NPV push backs for a specified ultimate pit, based solely on NPV.

- **Mining Width –** Adjusts user-defined pitshells or final pit to accommodate minimum mining width requirements.

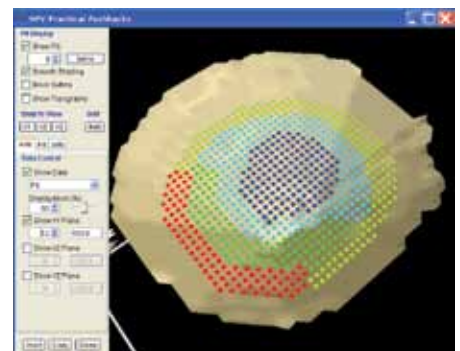- **Multi-Mine –** Supports scheduling from multiple mines.

Simultaneous Optimisation

Simultaneous Optimisation is the latest advancement in strategic mine planning. It facilitates multiple optimisation mechanisms in a single step. The resulting mine schedule returns higher NPV for the project by leveraging the interdependency between those mechanisms.

- **Simultaneous Optimisation –** Optimises mine schedule, cut-off grade, stockpiles, and optionally blending, in a single step.

- **Blending –** Optional enhancement to the simultaneous optimisation module for final product or process input blend constraints.

Create NPV practical push backs in a single step.

Pit-by-pit graph shows increasing ore and waste tonnages for different final pit options, along with expected NPV for different schedules.
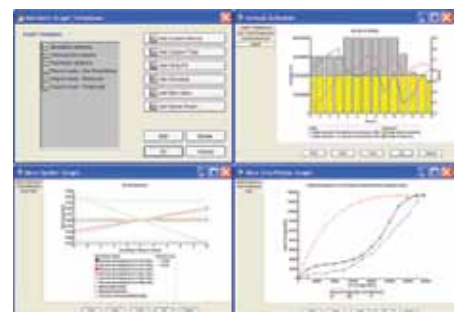
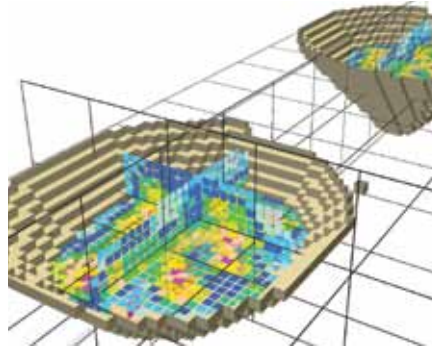

Standard graphs and templates promote analysis.

Special Modules

Whittle's special modules build on the life-of-mine scheduling modules to allow extra value to be realised using techniques for blending, stockpile and cut-off optimisation, and block value calculations.
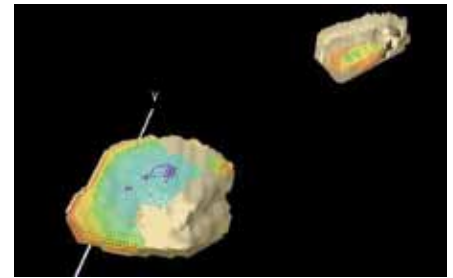
Blending – Blends scheduled material to final product or process input constraints. In conjunction with the Simultaneous Optimisation module, allows the simultaneous optimisation of the mining schedule, final product or process input blend constraints, stockpiles and cut-offs for the mine.

Stockpiles and cut-offs – Optimises cut-off strategy and stockpile utilisation for standard life-of-mine schedules.
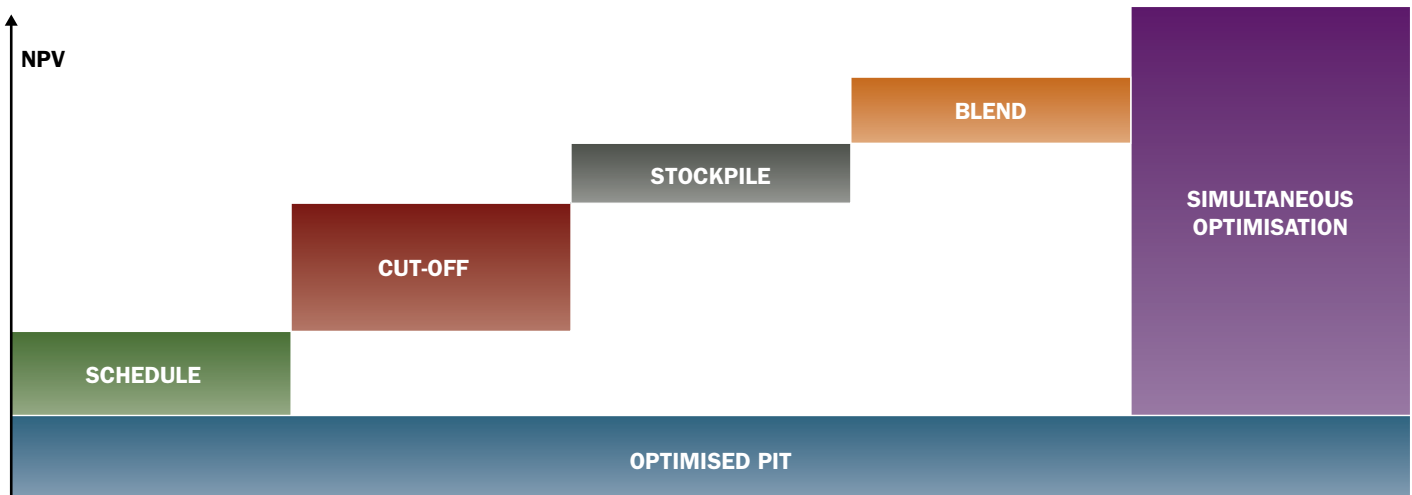
Value Expressions – Enhances the stockpiles and cut-offs module to work with parcel revenues and supports multiple methods for calculating block values and parcel revenues.

Maximise NPV at multi-mine operations with the Multi-Mine module.

Multiple pit schedule visualisation showing copper grades with the Multi-Mine module.

Simultaneous Optimisation achieves greater overall NPV in a single step than multiple optimisation mechanisms applied sequentially.

Learn more about Gemcom Whittle: download customer case studies, product videos and a trial version by visiting www.gemcomsoftware.com/whittle. You can also contact us at whittle@gemcomsoftware.com for more information.

gemcomsoftware.com

When mining companies seek to increase mine productivity, they turn to Gemcom for technology and services. The Company is home to world-renowned mining solutions like GEMS, Surpac, Minex, Whittle, and InSite, and to industry thought leaders who are pushing the boundaries of what's possible in mining.

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