ORB
by Polymathian

CASE STUDY

Significant increase in NPV for
Underground Metal Mining Operations

The Customer

The customer is one of the world's largest mining companies with operations in over 30 countries including world class iron ore, coal, copper and zinc assets with substantial operations in Australia.

ORB produced strategic mine plans resulting in a 30% increase in NPV compared to "leading" mining software tools

Mining Method
Stoping

Module
Strategic

Product
ORB - orb.polymathian.com

The Problem

The customer operates one of the world's largest underground metals stoping mines. Producing detailed and practical long-term mine plans for large stoping operations is an extraordinarily complex planning task.

There are over 80,000 individual tasks that need to be scheduled: 50,000 stoping related tasks and 30,000 development related tasks spanning a mine life exceeding 40 years, and hundreds of constraints that plans needs to conform to, including:

- ventilation restrictions
- waste, rock and paste fill production and fill capacity
- production and development drilling capacity
- production machinery constraints
- other production constraints
- mill tonnage and grade constraints
- resource category constraints

- task dependency and lag timing constraints

The customer was already using what is generally considered to be two of the leading mine planning and mine design tools on the market. These existing incumbent tools however do not include any sophisticated numerical optimisation techniques capable of automatically producing optimal solutions for problems of this scale and complexity.

Instead they offer either 'resource levelling algorithms' or simplistic 'manual dynamic scheduling algorithms' which essentially function as manual decision making aids. Producing solutions using these tools can be inordinately time consuming, trying to satisfy all constraints, whilst keeping up production tonnes to the mill is often impossible, and maximising value is a completely manual task.

Incumbent mine planning tools lack sophisticated optimisation capability

Existing tools only served as manual decision making aids.
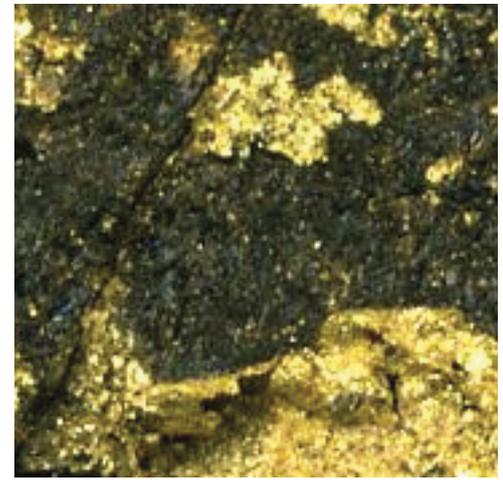
The Solution

After making a number of stope scheduling specific enhancements, Polymathian deployed the strategic mine planning module of ORB, a cloud-based mining optimisation decision support toolkit, to solve this extraordinarily large and complex planning problem. ORB is capable of automatically producing solutions without the need for any manual guidance that:

- are extraordinarily detailed, explicitly scheduling all 80,000 production and development tasks
- enforced more than 230 separate detailed planning constraints
- obeyed all precedence constraints and corresponding timing lags
- produce optimal solutions using an exact numerical optimisation technique
- maximises NPV

The Benefits

ORB has increased the NPV of the mine by more than 30% when compared to the best possible solutions produced by the incumbent mining software tools, an outstanding result for the client.

30%+

Increase to NPV over incumbent software tools

Optimal solutions now use exact numerical optimisation techniques

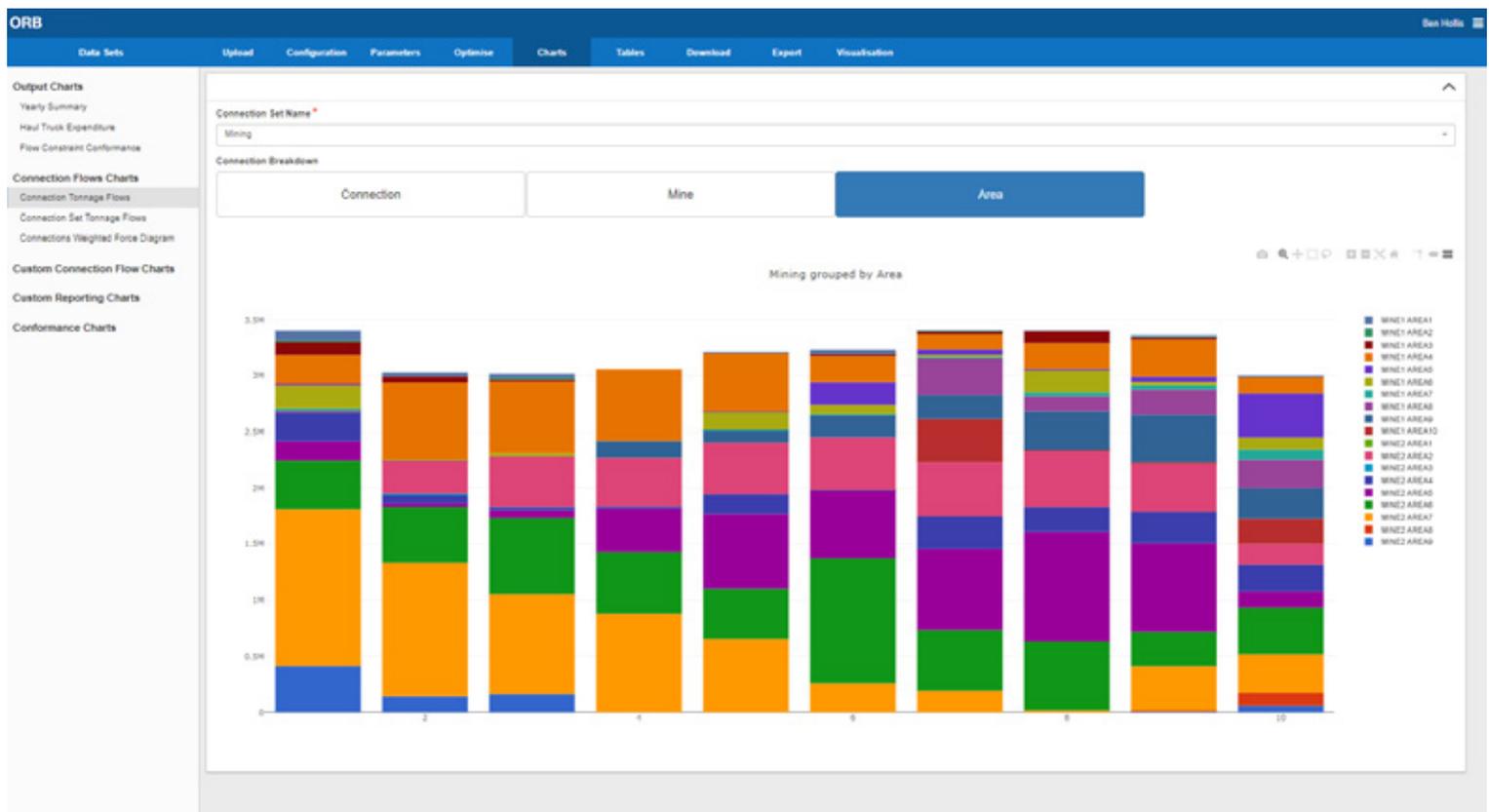Automatically produced solutions without the need for manual guidance

Figure 1. Sample output of mining tonnage by mine area

Design to delivery: 16 weeks

Scoping	Configuration	Implementation	Analysis
1 week	10 weeks	4 weeks	1 week

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