

## CASE STUDY

### Carbon14 Mine Scheduler and Carbon Economics

#### Title – Evaluation of Different Options for a New Mine

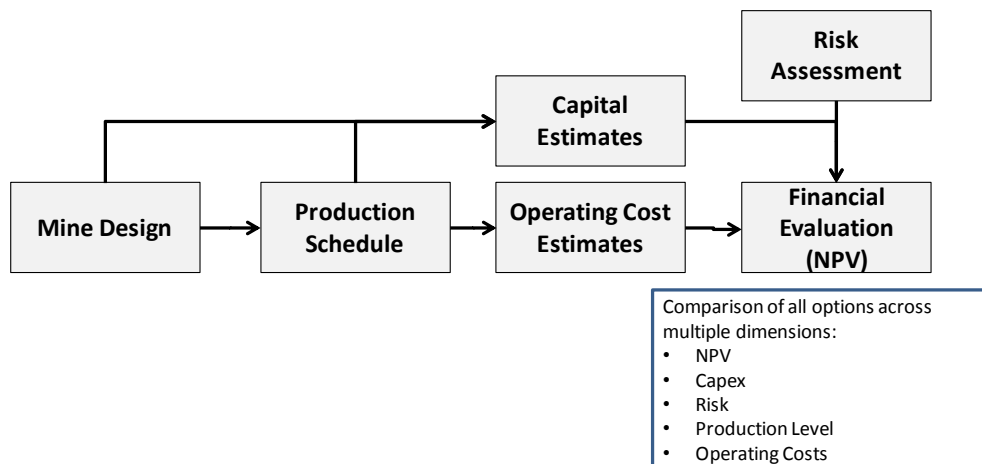
##### **Overview**

A large new platinum JV project has been under investigation for the past 5 years to assess the most appropriate mine design and mining method for the ore body which would result in an optimal NPV. The previous feasibility study had been rejected by the JV as there was concern that not all possible options had been properly investigated. The project team was tasked with identifying all appropriate options and assess these via an option study.

##### **Business Challenge**

The capital project team identified 21 different options requiring investigation. These options considered 10 different access methods and 4 different mining methods which are summarised in the tables “Access Methods” and “Mining Methods”.

Each of the 21 options required a mine design, a valid production schedule and the associated economics in order to facilitate a comparison on project NPV. This process is detailed in the figure below.



The 10 access permutations considered in the options are detailed below.

	<b>Access Methods</b>									
<b>Option</b>	<b>Footwall Decline With Dog Leg</b>	<b>Straight Footwall Decline</b>	<b>Single Secondary Footwall decline</b>	<b>Two Secondary Footwall declines</b>	<b>Vertical Shaft</b>	<b>On-reef decline</b>	<b>Extend from existing decline</b>	<b>Approach from current mining area</b>	<b>Addits from re-habilitated Open cast mine</b>	<b>Open Cast Section</b>
1	x									
2	x									x
3						x				
4		x								
5		x				x			x	
6						x				
7		x				x				
8								x		
9							x			
10				x			x			
11			x				x			
12					x					
13			x					x		
14			x				x			
15			x							
16			x				x			
17			x				x			
18					x			x		
19					x					
20					x			x		
21					x					

The options also considered the following permutations of 4 mining methods.

	<b>Mining Methods</b>			
<b>Option</b>	<b>Conventional Breast</b>	<b>Opencast</b>	<b>Board &amp; Pillar</b>	<b>Conventional stope, conveyor HL tramming</b>
1	x			
2		x		
3				x
4	x			
5	x			
6			x	
7	x		x	
8	x			
9	x			
10	x			
11	x			
12	x			
13	x			
14	x			
15	x			
16	x			
17	x			
18	x			
19	x			
20	x			
21	x			

## Approach Taken

The access method and mining method permutations resulted in 21 options requiring a mine design, a production schedule, operating costs, capital expenditure and project NPV.

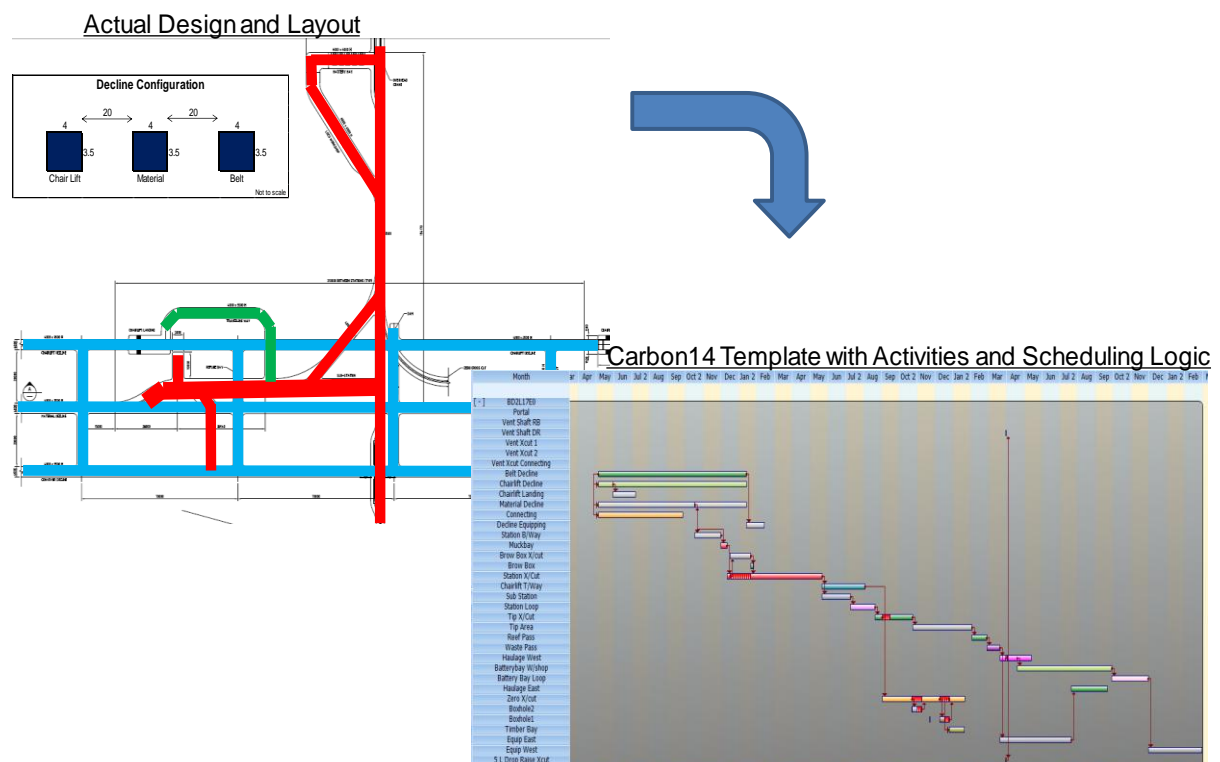
The JV required this work to be completed in 3 months and therefore the project team decided to utilise the Carbon14 Mine Scheduler and Carbon Economics solutions. This would allow all 21 options to be scheduled and costed within the tight timeframe.

The Carbon14 Mine Scheduler allowed for the building of the standard templates or objects containing the mine layout, design and scheduling logic such as the standard barrel cluster. These templates could then be assembled to represent the overall option being investigated.

The rules based scheduling allowed for the rapid generation of a valid production schedule for each option with different iterations of varying production ramp up and mining efficiency assumptions.

Carbon Economics also utilises the inherent template based approach allowing for the labour and cost rules to be configured for a half level or barrel which are then replicated to represent the overall mine structure for each option under consideration.

## Decline / Station Lay-out Template



From the standard templates created, each option was rapidly assembled with the relevant option-specific parameters and a production schedule was produced inclusive of all economics and a project NPV.

**Results**

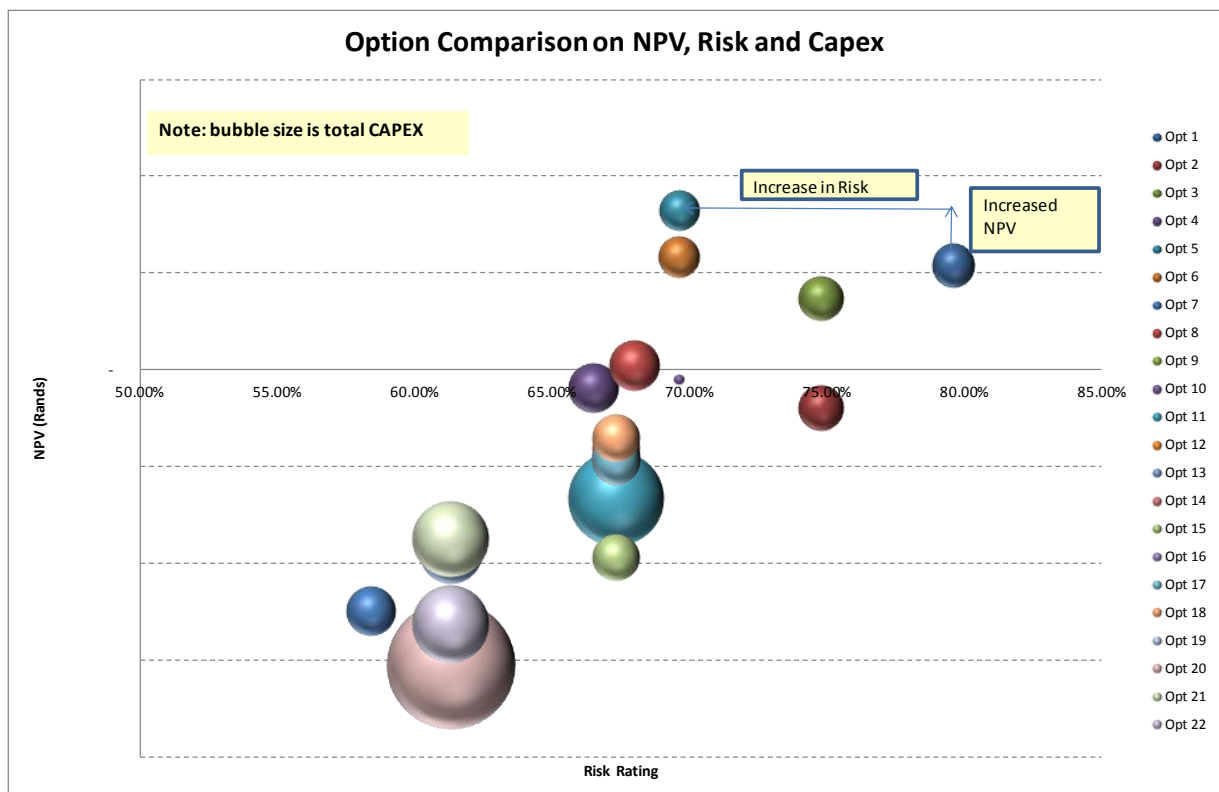
All the options and option iterations were completed within a 10 week period with focus on production schedule and mine layout optimisation.

For each option a full production schedule was produced per mining activity, the operating costs were calculated using activity based costing, an infrastructure capital expenditure estimate was determined, the development capital requirements costed, with an overall project NPV.

A risk assessment was completed to ascertain the technical risk of each option to be used in the ranking criteria.

The options were then compared across multiple dimensions such as NPV, risk, capital required, production level and operating costs.

Below is an example of such an analysis comparing the options by risk, NPV and capital.



**Conclusion**

This options study was completed in an unprecedented 10 weeks and a recommendation was put through to the JV to take 3 of the options to the next study phase of pre-feasibility.

The technical review committee commented that this option study had been done at a very high level of accuracy and that certain elements were almost at feasibility level. The Carbon14 Mine Scheduler and Carbon Economics solution made it possible for this project to be undertaken in a very short timeframe and to a very high level of accuracy.