

AGL Loy Yang Mine Rehabilitation Cost Model

AGL Loy Yang Mine – 2015 Rehabilitation Costing

Introduction / Brief:

This rehabilitation costing model has been prepared to reflect the rehabilitation liability of AGL Loy Yang Mine over the life of the project.

Key inputs include:

- WOL Mine Plan and Work Plan variation;
- Total area of the Mine;
- Exposed areas – Bottom and Batter surface areas;
- Area currently covered, but not to final rehabilitation profile;
- Area rehabilitated to final;
- Area required for water storage;
- Current operating area;
- Area reserved for internal overburden dump material placement;
- Area reserved for Stacker Relocation – TS4 / TS5;
- Area required for Infrastructure Corridors;
- Financial obligations - Bond level and Special Rehabilitation LYCA Reserve account;

The aim is to end up with a commercial model that reflects the expected rehabilitation liability over the WOL. Other considerations:

- Documentation and plans need to be in sync with the Work Plan Variation and current rehab plan.
- Model should be underpinned with a visual snapshot of the Mine detailing key development, operational and rehabilitated areas.
- A visual representation (2 or 3 drawings) of the typical batter concepts should be included showing infrastructure for ongoing maintenance (dewatering, drainage, etc.).
- Costing should be based on ~100 m linear section estimate.
- Model should tabulate the changes in liability from period to period including summary of what has been done (footprint of various categories as described above, key infrastructure changes).

General:

Rehabilitation Stage Plans have been prepared in line with the stages adopted in the recent Work Plan Variation submission prepared by AGL Loy Yang, with 2 additional stages shown:

- (i) A new “end of mining” plan (stage E) that shows the planned development at completion of mining, i.e. before final rehabilitation activities that cannot be undertaken until mining has ceased.
- (ii) An additional stage E- is added after stage D The stages are therefore:
 - A - 1997 (Stage Plan not prepared)
 - B - current (December 2014)
 - C - part way through block 2 pivoting clockwise
 - D - end of block 2 development
 - E- - part development into Block 3
 - E - end of mining
 - Final rehabilitation

Areas on the stage plans define:

- Mining operations
- Main transport corridor (conveyors, travel paths)
- Water and support infrastructure
- Interim rehabilitation (including overburden placement areas)
- Rehabilitated land

Important Notes

1. The cost model is based on staged plans which represent the shape of the development assuming ongoing operation with the exception of stage E. The stage plans do not represent a closure plan at these earlier stage points in the development. ie. In an early closure scenario, OB removal may cease in the order of 5 years ahead of final coal and the coal faces would then compress to achieve the desired 1 in 3 overall final shape.

If and when a planned closure timing is known, specific strategies to optimise the closure development would be implemented. By way of example, if the closure timing was near stage E-, an alternate development would be implemented to minimise the final batter rehabilitation length.

2. The rehabilitation from surface down to RL 0m is in line with studies undertaken on lake filling with various inputs and climate conditions. In this work RL 0m is a reasonable mid range position of final lake filling. See report, "AGL Loy Yang, Loy Yang Mine Rehabilitation, Mine Lake Water Balance Modelling, August 2015".

Important Notes (cont.)

3. Input cost rates are identified in the Rate sheet. Rates can be varied and or in some cases scenarios can be assessed. eg. placed OB thickness on shaped coal batter can be set in the Rate sheet and altered to create a new scenario, 1 m versus 0.5 m etc.
4. Remaining Liability is the cost modelled to complete all outstanding rehabilitation work to close the site with cessation of mining at the date. i.e. the liability at 2030 is based on the development at that date plus all remaining rehabilitation work not yet completed and the closure rehabilitation items.
5. Current Liability is the cost modelled to finalise all mined areas but not including the closure costs for that point in time.

Rehabilitation Treatment on Batters

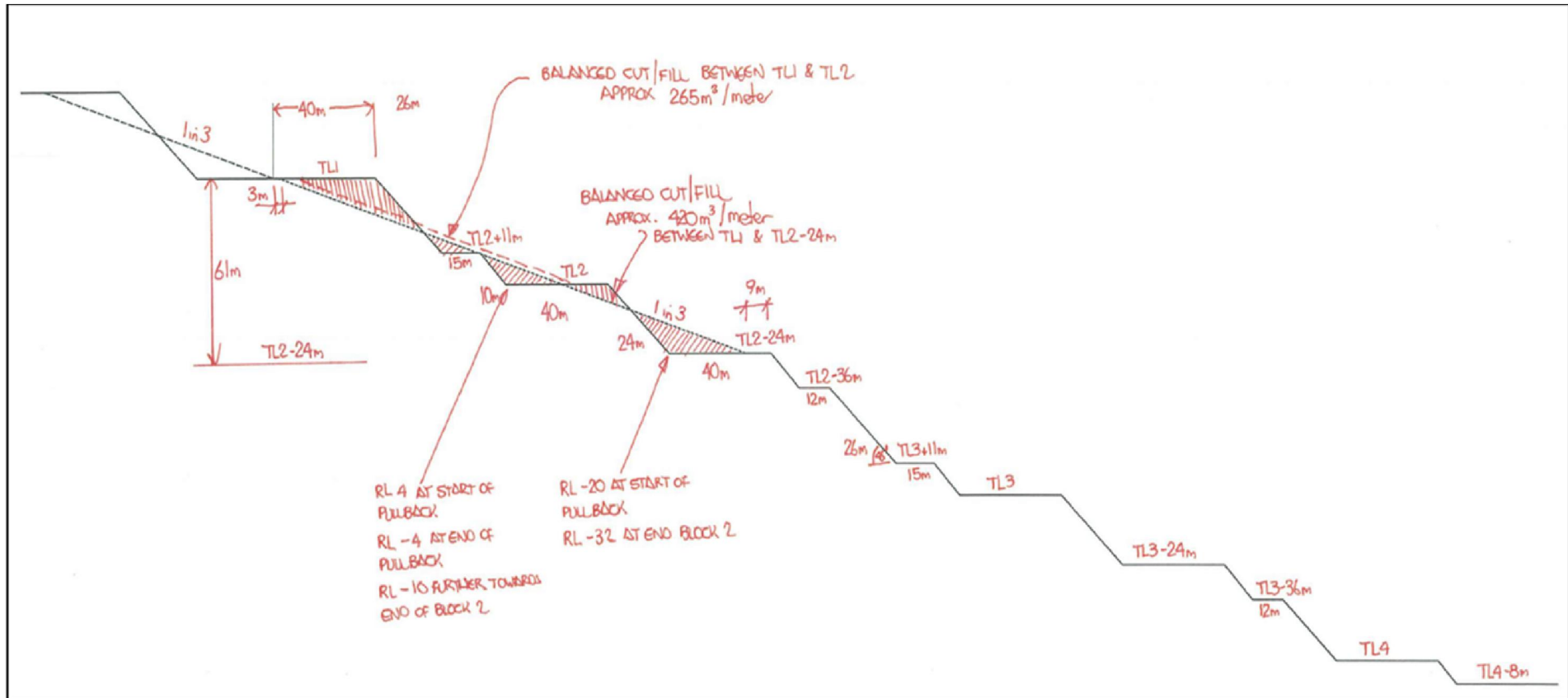
General

A maximum 1 in 3 batter slope has been adopted for final rehabilitation of mine batters above RL 0. A 1 m thick covering of clay has been applied for the 1 in 3 slope on exposed coal areas for fire protection and rehabilitation purposes. All batters are topsoiled and grassed. No detailed consideration has been given to the availability of suitable clay for capping and the availability of suitable topsoil. Topsoil alternatives could be explored to promote growth.

Where possible, balanced cut and fill has been adopted, however there are substantial areas of existing worked out batters where balancing of earthworks is not possible and accordingly there is an excess of cut over fill volumes. An opportunity exists to reduce the amount of cut (and therefore reduce earthworks costs, and the ultimate mine footprint) by extending the fill onto the top of the future internal overburden dump, however this would mean deferring much of this work until the internal dump has reached its maximum height adjacent to these batters late in the life of the mine, and this is highly unlikely to be acceptable to the regulator.

Earthworks volumes to achieve a 1 in 3 slope above TL1 (i.e. in the overburden face) have been calculated separately from those below TL1, which are generally in coal as a different cost rate for these 2 activities would apply. Also, the 1 m clay cover is not applied to the cut and fill earthworks above TL1, as these areas would not leave exposed coal after reshaping and suitable quantities of clay material is available.

Figure 1 - Generic Rehabilitation Profile



Southern and Western Batters, Block 1

Due to the location of the fire service ring main pipeline near the mine crest on the western batters, little rehabilitation reshaping of the batters has been undertaken to date. However, due to the wider benches generally on these batters, the overall batter slope is presently no greater than 1 in 3, and therefore cut and fill earthworks to achieve individual batter slopes not exceeding 1 in 3 can be carried out with little excess cut or fill. Major infrastructure including FS, and dewatering mains may require relocation to allow reshaping to be undertaken in some areas.

Northern Batters, Block 1 and first part of Block 2

Above TL1, these batters have previously been reshaped to a 1 in 3 profile and grassed. The overall batter profile above RL 0 is generally about 1 in 3 for the first 2 km from the western batters, which means that the existing 1 in 3 rehabilitated batters above TL1 do not generally need to be disturbed. Cut and fill earthworks would be contained below TL1.

Beyond this point, and as far east as the current working faces, the current overall batter slope is steeper than 1 in 3, which means that the rehabilitation earthworks will disturb all of the existing batters above RL 0, including the previously rehabilitated batters above TL1, resulting in excess cut over fill earthworks.

Block 2 - Northern Batters (Block 2 - yet to be excavated) and Eastern Batters

A design profile for these batters has been adopted that provides for an overall batter slope of 1 in 3, thereby providing for a balance of cut and fill earthworks to achieve a maximum slope of 1 in 3 on any individual batter, as well as minimising earthworks volumes to achieve this. This design profile is shown in figure 1.

Block 3 (Eastern and Southern Batters).

The same design profile as described above for the eastern section of the northern batters has been adopted for this area. Due to the geology of the coal seams in Block 3, the grading of the mine floor in this area is relatively high, leaving a shallower lake than for Block 2.

Topsoil

Topsoil is currently won from ahead of the mining operation for use in rehabilitating areas no longer required for mining. Due to the significant quantity of topsoil required for rehabilitation of the top of the external overburden dump in the 2020's a shortfall will occur from this time. Opportunities for utilising 'artificial' topsoil, or some other replacement material, needs to be investigated.

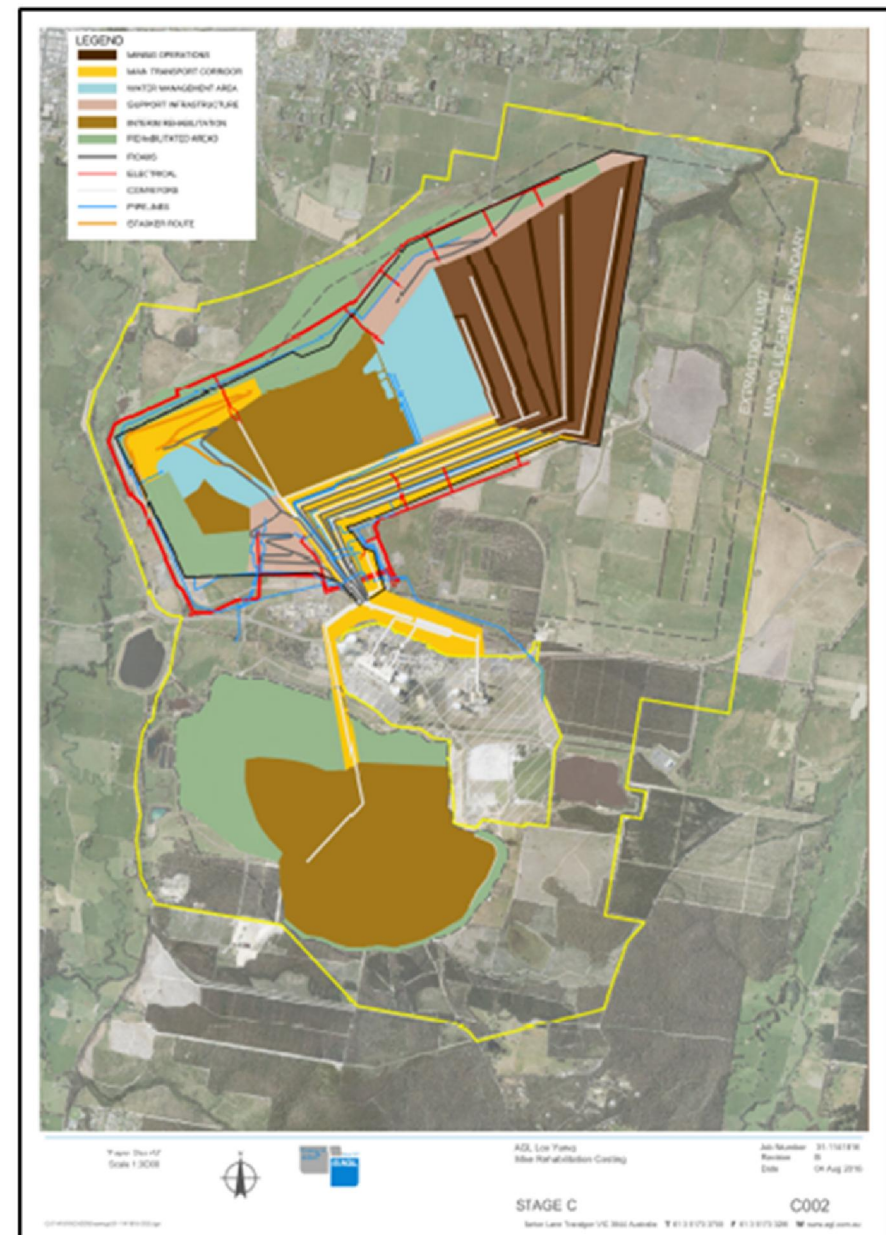
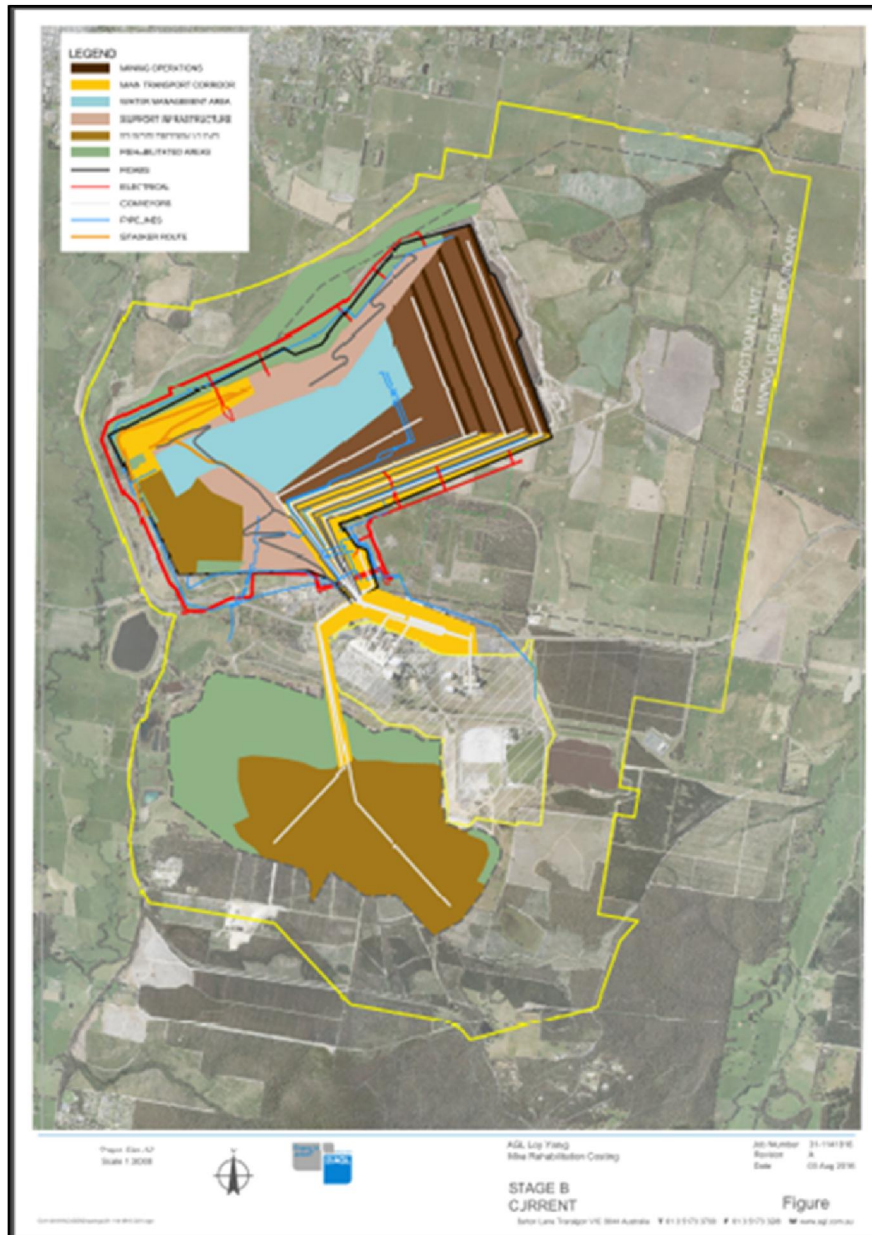
Costing Spreadsheet

The costing of the rehabilitation is set out in the accompanying spreadsheet. The land disturbed by mining within the mining licence area has been divided into "areas" for rehabilitation based on the timing of disturbance and rehabilitation, and the type of remediation required.

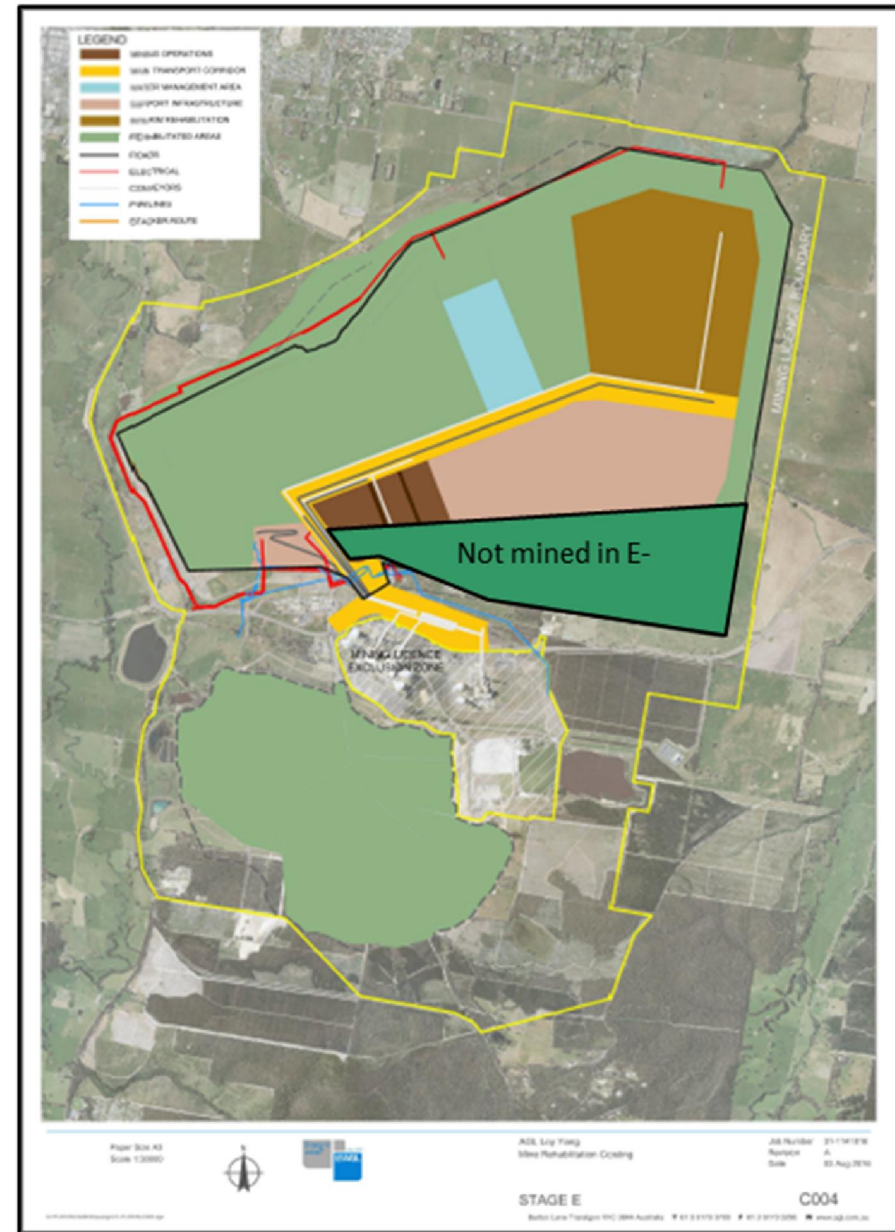
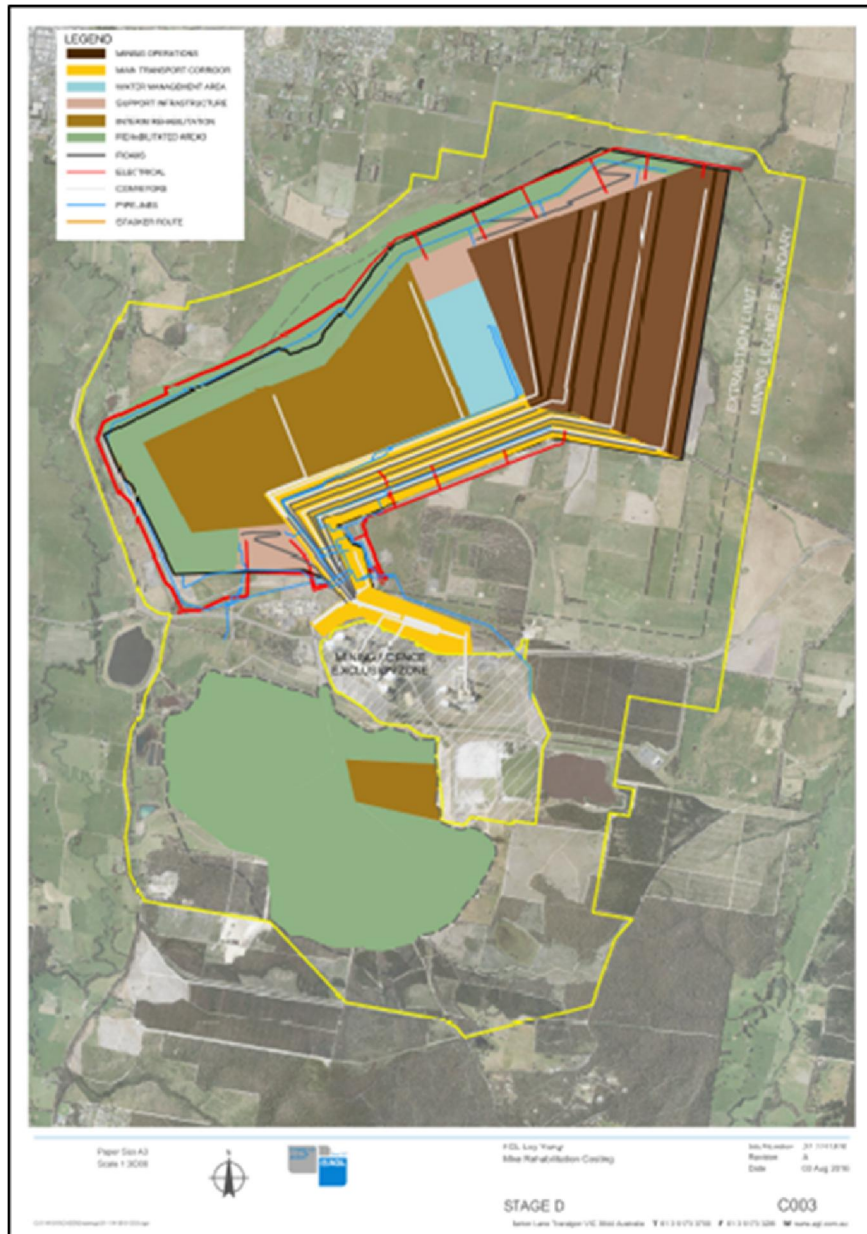
Each "area" has a dedicated worksheet containing a cost schedule which includes the outstanding liability at each of the abovementioned stages of the mining operation. Worksheets A1 to A8 cover the mine batters, worksheet A12 is the mine floor in Block 3, worksheets A13 to A15 cover the external dump, worksheets A16 to A18 the internal dump, while worksheets A19 to A28 cover miscellaneous items such as remnant hardstand areas, removal of plant, structures and buildings, development of a lake in the mine void, and land disposal & leasing.

Unit rates for all rehabilitation activities are provided in one worksheet, so that any modification to rates is easily applied across the whole of the cost model.

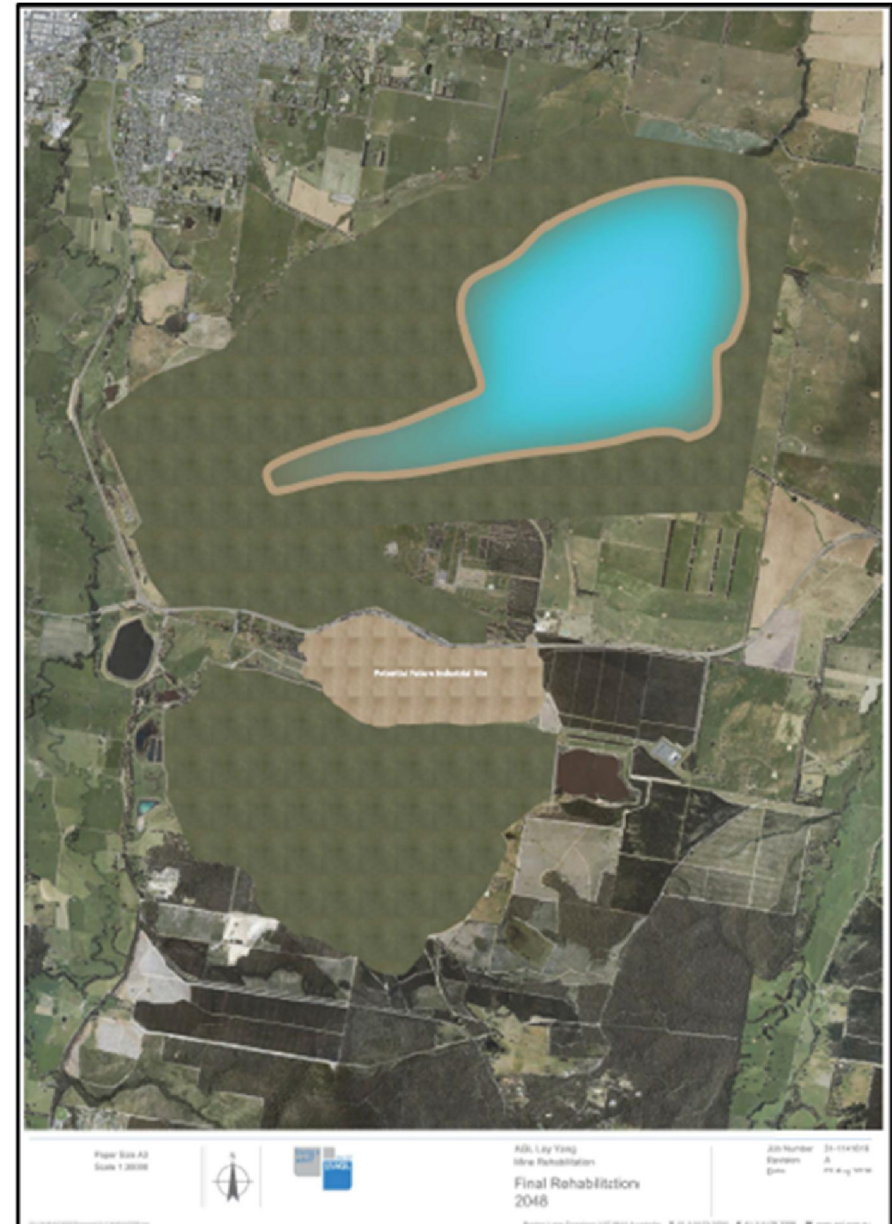
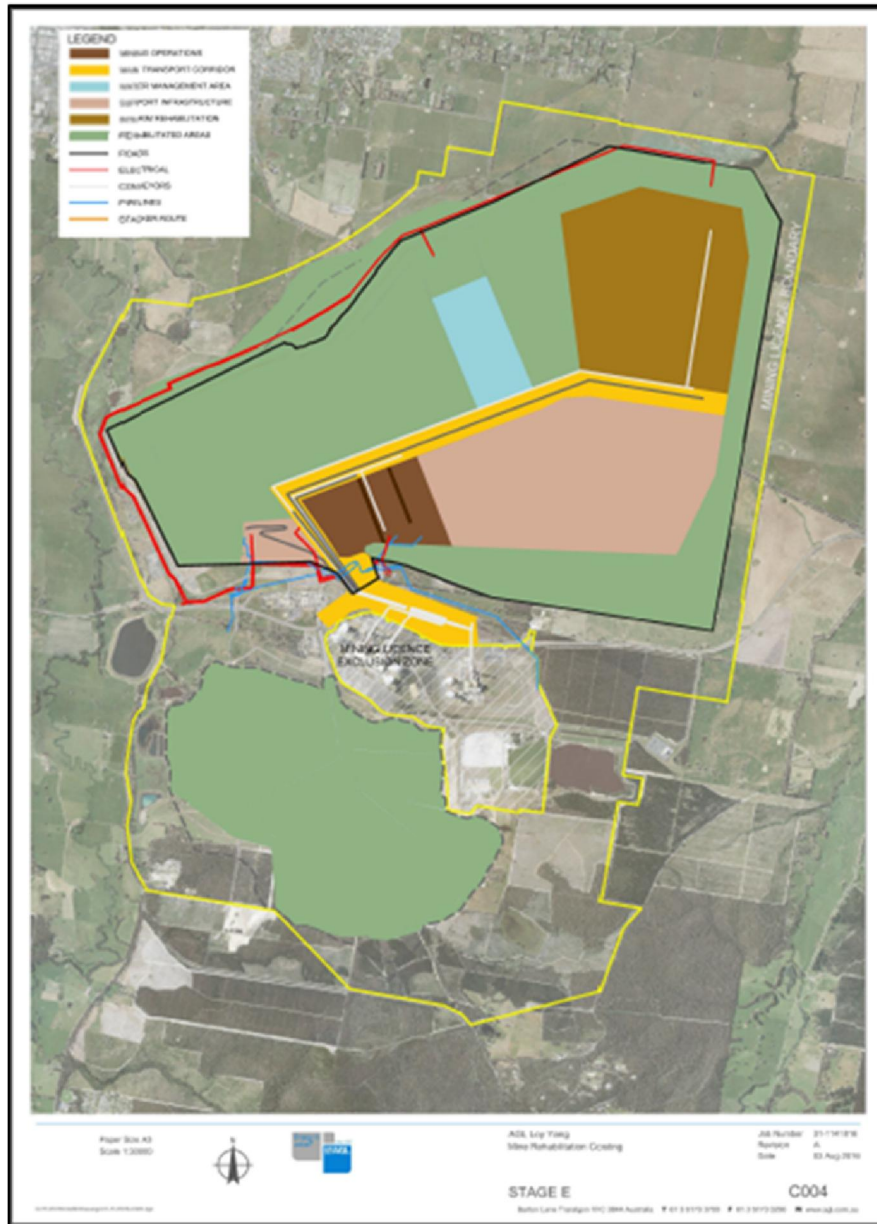
Development Stages B, C



Development Stages D, E-



Development Stages E, Final



Nominal Stage Timings

Development is in stages and the timings of the stages is determined by the coal utilisation rate. Four example timings are shown below. The cost model is currently set up with a 30 Mtpa coal usage rate. The duration of the final stage is set manually and is currently set at 10 years.

Stage Name	Total Coal Volume from stage B	Coal Volume in Stage	End of Stage Dates Based on Annual Coal Volume				Insert average annual rate
			Mtpa	Mtpa	Mtpa	Mtpa	
			30	27	25	20	
B	0	0	2015	2015	2015	2015	
C	199	199	2022	2022	2023	2025	
D1	482	283	2031	2033	2034	2039	
Part E	982	500	2048	2051	2054	2064	
E	1369	387	2061	2066	2070	2083	
F	0	0	2071	2076	2080	2093	10

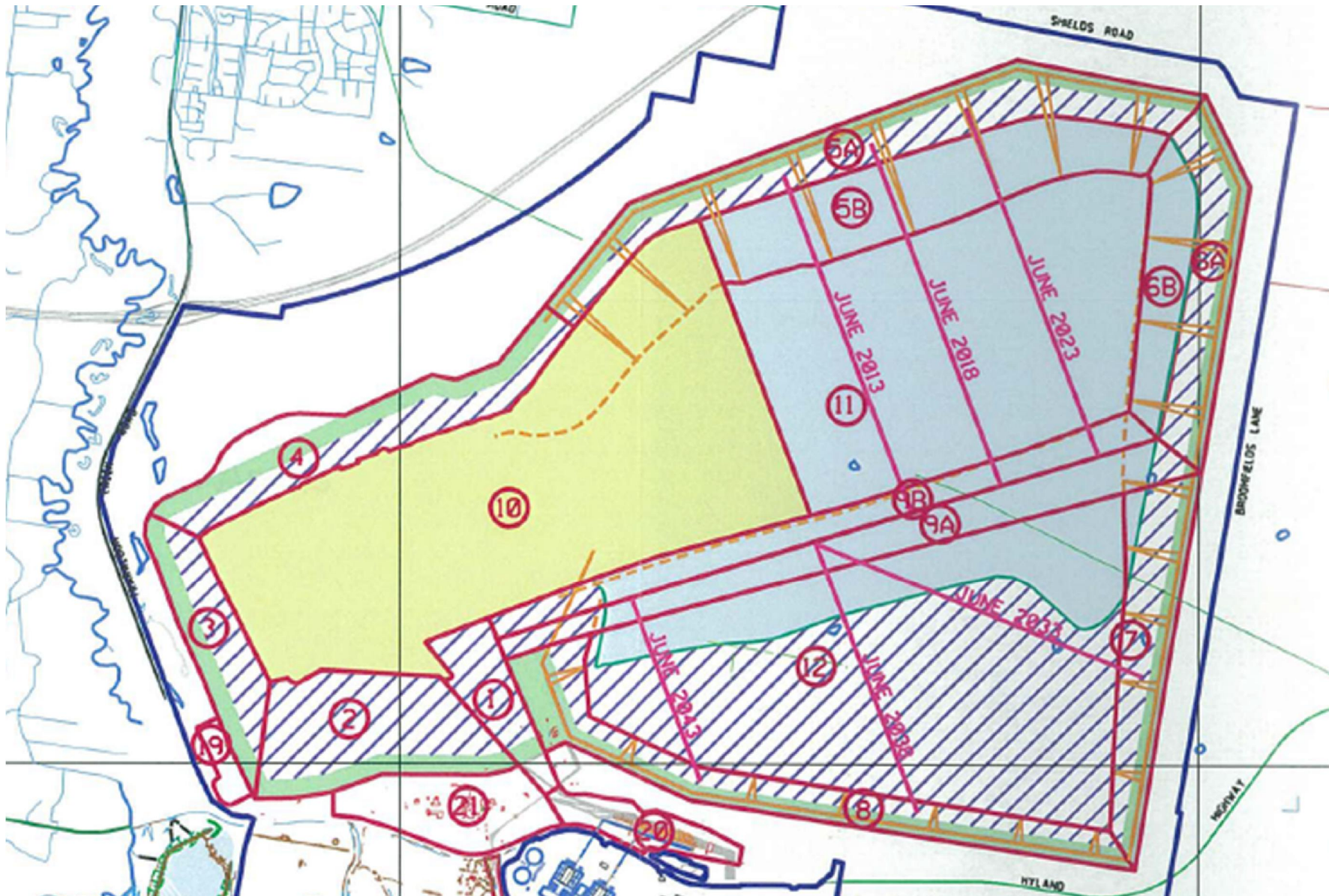
Instructions

Select annual volume scenario (eg. 30 Mtpa) and input dates generated in 'Summary WOL' rows 2 and 3.

If desired create a new annual scenario.

Manually input stage F duration(assumed ~10 years)

Mine Area Naming's for Cost Model



How the Model is Set Up – Example Areas Expenditure & Liability

AGL LOY YANG MINE
WHOLE OF LIFE BUDGET PROVISION
FOR MINE REHABILITATION

Period Start Year	2015	2016	2023	2032	2049	2062	Estimated Dates Only
Period End Year	2015	2022	2031	2048	2061	2072	
Period Duration	0	7	9	17	13	11	

SUMMARY SHEET

Area No.	Area Description	Area Ha.	End Use		Stage B	Stage C	Stage D1	Stage E-	Stage E	Stage Final	Total
A1	Mine Outlet area	33	Grassed batters At end of mine life	Total Per Stage Cost	0	0	0	0	0	3,866,200	3,866,200
Area required for operation until mine closure Liability exists now to rehabilitate this area				Remaining Liability	3,866,200	3,866,200	3,866,200	3,866,200	3,866,200	0	
A3A	Western Batters Block 1	37	Grassed 1:3 Overburden Batter to TL1 Batters trimmed to 1:3 from TL1 to RL0, clay capping on exposed coal	Total Per Stage Cost	0	7,236,773	2,412,258	0	0	0	9,649,030
Area accessible in the current period/stage Area not available until the next stage Current liability				Remaining Liability	9,649,030	2,412,258	0	0	0	0	
A9A	Southern Batters Block 2 Stage D2	31	Grassed 1:3 Overburden Batter to TL1 Batters trimmed to 1:3 from TL1 to RL0, clay capping on exposed coal	Total Per Stage Cost	0	0	0	0	0	0	0
Area is exposed and would only be rehabilitated in the case of early closure while still in Block 2. No costs planned currently to be incurred. This liability disappears when the operation transfers into Block 3. ie. The rehab liability exists on different faces.				Remaining Liability	0	7,725,446	15,450,893	0	0	0	

Expenditure and Liability Summary

Example areas shown only, Totals are complete

**AGL LOY YANG MINE
WHOLE OF LIFE BUDGET
PROVISION FOR MINE
REHABILITATION
SUMMARY SHEET**

				Period Start Year	2015	2016	2023	2032	2049	2062	Estimated
				Period End Year	2015	2022	2031	2048	2061	2072	Dates Only
				Period Duration	0	7	9	17	13	11	
Area No.	Area Description	Area Ha.	End Use		Stage B	Stage C	Stage D1	Stage E-	Stage E	Stage Final	Total
A1	Mine Outlet area	33	Grassed batters At end of mine life	Total Per Stage Cost Remaining Liability	0 3,866,200	0 3,866,200	0 3,866,200	0 3,866,200	0 3,866,200	3,866,200 0	3,866,200
A3A	Western Batters Block 1	37	Grassed 1:3 Overburden Batter to TL1 Batters trimmed to 1:3 from TL1 to RL0, clay capping on exposed coal	Total Per Stage Cost Remaining Liability	0 9,649,030	7,236,773 2,412,258	2,412,258 0	0 0	0 0	0 0	9,649,030
A9A	Southern Batters Block 2 Stage D2	31	Grassed 1:3 Overburden Batter to TL1 Batters trimmed to 1:3 from TL1 to RL0, clay capping on exposed coal	Total Per Stage Cost Remaining Liability	0 0	0 7,725,446	0 15,450,893	0 0	0 0	0 0	0
A14	External Overburden Dump Stage C to D	203	Topsoiled and grassed	Total Per Stage Cost Remaining Liability	0 6,566,300	0 13,132,600	13,132,600 0	0 0	0 0	0 0	13,132,600
20	Removal of Raw Coal Bunker, Conveyors & Crushers	25	Landscaped and grassed	Total Per Stage Cost Remaining Liability	0 12,291,431	0 12,291,431	0 12,291,431	0 12,291,431	0 12,291,431	12,291,431 0	12,291,431
22	Remove Plant	0	Recycle where possible	Total Per Stage Cost Remaining Liability	0 4,316,460	0 4,316,460	0 4,316,460	0 4,316,460	0 4,316,460	4,316,460 0	4,316,460
25	Shoreline Treatment	14	Edge of lake	Total Per Stage Cost Remaining Liability	0 4,197,000	0 5,036,400	0 6,295,500	0 7,554,600	0 8,394,000	8,394,000 0	8,394,000
27	Lake Filling	1140	Lake	Total Per Stage Cost Remaining Liability	0 2,000,000	0 2,400,000	0 3,000,000	0 3,600,000	0 4,000,000	4,000,000 0	4,000,000
A28A	Rehabilitated Land or unmined farming land use for agistment	3000	Lease to farmers for grazing	Total Per Stage Cost	0	-2,625,000	-2,700,000	-3,825,000	-1,950,000	-15,400,000	-22,675,000
A28B		316	Prime land sales	Remaining Liability	0	0	-979,200	-1,958,400	-3,537,600	-4,454,400	-8,971,200
100			Period Expenditure		0	28,105,527	49,429,291	25,608,253	38,828,055	56,219,236	198,190,362
200			Annual Average Expenditure			4,015,075	5,492,143	1,506,368	2,986,773	5,110,840	
300			Period Income			-2,625,000	-3,679,200	-5,783,400	-5,487,600	-19,854,400	-31,646,200
400			Annual Average Lease Income			-375,000	-300,000	-225,000	-150,000	-1,400,000	
500			Current Liability (Excluding Closure Items) by Period		83,715,330	73,345,219	35,546,284	42,323,311	21,611,145	0	
600			Annual Average Change in Current Liability			-1,481,444	-4,199,882	398,649	-1,593,243	-1,964,650	
700			Remaining Liability for Closure at End of life by Stage		111,976,421	102,845,710	66,905,875	67,594,931	49,801,580	0	
800			Annual Average Change in Closure Liability			-1,304,387	-3,993,315	40,533	-1,368,719	-4,527,416	

Expenditure and Liability Graph

Based on 30 Mtpa

