

User Guide for Estimated Rehabilitation Cost Calculator for Mining



Prepared by: Regional and Regulation Support, Department of Environment and Science

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Version	Effective date	Description of changes
1.00	1 April 2019	This User guide has been prepared to support the use of the Mining Estimated Rehabilitation Cost Calculator.
2.00	1 October 2020	Amended to reflect minor changes made to the ERC Calculator as part of the Minor Update 2020.
3.00	1 October 2022	Updated to reflect changes made during 2021/22 ERC Calculator major review.

Contents

Contents	iii
List of Tables	v
List of Figures.....	v
List of Appendices.....	vi
Acronyms, Initialisms and Abbreviations	vi
1 Introduction	1
1.1 Purpose of document.....	1
1.2 Purpose of Calculator	1
1.3 Key changes made during the 2021 review	1
2 Process of Estimated Rehabilitation Cost creation.....	2
3 General use principles	5
3.1 General concepts.....	5
3.2 Colour coding and notation.....	5
3.3 Quantity entry	6
3.4 Comment entries	8
3.5 Default quantities	8
3.6 How to enter an Alternate Rate	8
3.7 Navigation, search, and information	9
3.8 Drop-down menus	10
3.9 Other (User Entered)	10
3.10 Show/hide rows	11
3.11 Freeze Panes	12
3.12 Security.....	12
4 Sheets.....	13
4.1 General	13
4.2 Contents sheet.....	14
4.3 Registration sheet.....	14
4.4 Subrates sheet.....	15
4.5 Table of Values.....	15
4.6 Summary sheet (including Project Multipliers)	15
4.6.1 Sheet description.....	15
4.6.2 Project Management Multiplier	16
4.6.3 Environmental Maintenance and Monitoring Multiplier	16
4.7 User Input Sheets (including map ID).....	17
4.7.1 Default Rates and User defined Cost Build-up	18
4.7.2 Eligible Mining Activities User Input Sheet	19
4.7.3 Exploration User Input Sheet	20
4.7.4 Infrastructure User Input Sheet	21

4.7.5	Process and Heavy Equipment User Input Sheet.....	21
4.7.6	Water Storage User Input Sheet.....	22
4.7.7	Water Treatment and Pumping User Input Sheet.....	23
4.7.8	Overburden Dumps Piles User Input Sheet.....	24
4.7.9	Heap Leach Pads User Input Sheet.....	25
4.7.10	Tailings Storage Facilities User Input Sheet.....	26
4.7.11	Pits User Input Sheet.....	27
4.7.12	Underground Mines User Input Sheet.....	28
4.7.13	Ports User Input Sheet.....	28
4.7.14	Investigation, Contamination, Scrap, Waste Levy User Input Sheet.....	29
4.7.15	General Land Rehabilitation.....	31
4.7.16	Mobilisation/Demobilisation and Additional User Items User Input Sheet.....	33
4.7.17	User Input Sheet.....	34
4.8	Quantity Summary.....	35
4.9	Waste Levy Register.....	35
4.10	Capping Alerts sheet.....	35
4.11	Lists sheet.....	36
5	Information on rates.....	37
5.1	Bottom-up, first principles calculation method.....	37
5.2	Labour Costs.....	37
5.3	Equipment costs.....	38
5.4	Productivity.....	38
5.5	Scope and unit rates.....	38
5.6	Alternate Rates.....	39
5.7	Contractor rate inclusions.....	39
6	Focus items.....	40
6.1	Capping of waste rock dumps, heap leach pads and tailings storage facilities.....	40
6.2	Seeding options.....	42
6.3	Haulage distances.....	43
6.4	Fleets and mobilisation.....	43
7	Worked examples.....	47
7.1	Seismic easements.....	47
7.2	User defined roads in Infrastructure User Input Sheet.....	48
7.3	Default Rates for waste rock dumps.....	51
7.4	User defined rates for waste rock dumps, overburden dumps, spoil piles and stockpiles.....	52
7.5	Pits – Safety bund.....	58
7.6	Pits – Benches and high wall drill and blast, and doze to make safe.....	59
7.7	Other components of pit rehabilitation.....	61
8	Glossary.....	62

List of Tables

Table 1. Colour coding of cells
Table 2. Sheets
Table 3. Exploration User Input Sheet information
Table 4. Risk category characteristics
Table 5. Capping engineering cost and default minimum thicknesses
Table 6. Fleet sizes for various activities
Table 7. Equipment included in mobilisation
Table 8. Definitions
Table A-1. Exploration User Input Sheet
Table A-2. Infrastructure User Input Sheet
Table A-3. Process Equipment
Table A-4. Water Storage
Table A-5. Water Treatment and Pumping
Table A-6. Overburden Dumps Piles User Input Sheet
Table A-7. Heap Leach Pad User Input Sheet
Table A-8. Tailings Storage Facilities User Input Sheet
Table A-9. Pits User Input Sheet
Table A-10. Underground Mines User Input Sheet
Table A-11. Ports User Input Sheet
Table A-12. Investigation, Contamination, Scrap, Waste Levy User Input Sheet
Table A-13. General Land Rehabilitation User Input Sheet
Table A-14. Mobilisation/Demobilisation and Additional User Items

List of Figures

Figure 1. Colour code key	6
Figure 2. Example of justification for Alternate Rate Cells in User Input Sheets	6
Figure 3. Example of pop-up message	6
Figure 4. Example of units in adjacent column	6
Figure 5. Example of units in row	7
Figure 6. Example of User Entered quantities	7
Figure 7. Example of User Entered thickness	7
Figure 8. Alternate Rate Cells	8
Figure 9. Examples of Hyperlinks (Top - in Contents sheet, Middle - Infrastructure to Contents, Bottom - in 'Access Roads' table in Infrastructure sheet)	9
Figure 10. Example of hover text in Heap Leach Pads User Input Sheet	10
Figure 11. Example of drop-down menu	10
Figure 12. Example of User Entered items area	11
Figure 13. Additional Items table in the Mobilisation and User sheet	11
Figure 14. Filters to show/hide rows. Top – Summary sheet. Bottom – Quantity Summary sheet	12
Figure 15. Example of Freeze Panes indicator lines	12
Figure 16. Contents sheet	14
Figure 17. Registration sheet	15
Figure 18. Justification for User Entered multipliers	16
Figure 19. Example of header rows in User Input Sheets	18
Figure 20. Map ID	18
Figure 21. Example of rolled-up Default Rates in Tailings Storage Facilities	19
Figure 22. Example of User Input table in Tailings Storage Facilities	19
Figure 23. Eligible Mining Activities entries	20
Figure 24. Hyperlinks in Infrastructure User Input Sheet	21
Figure 25. Water treatment and transfer Alternate Rates	24
Figure 26. Waste Rock Dumps, Overburden, Piles header	25
Figure 27. Alternate Rate entry in the 'Basic Pit Information' table of Pits	27

Figure 28. Pits details.....	27
Figure 29. Alternate Rates for User Entered details for an underground mine	28
Figure 30. Alternate Rate entry in for an underground mine	28
Figure 31. Ports default table	29
Figure 32. Default Rates for investigation costs with Alternate Rate option	29
Figure 33. Preliminary site investigation entry	30
Figure 34. Intrusive site investigations—User Inputs.....	30
Figure 35. Land investigation input cells showing proportion of one-off costs	31
Figure 36. Land investigation input cells showing options for defining the area.....	31
Figure 37. Long distance haul of amendments.....	32
Figure 38. User amendment rate	33
Figure 39. Mobilisation and Demobilisation Default Rates	33
Figure 40. Mobilisation and Demobilisation example	34
Figure 41. Mobilisation and Demobilisation—Small projects.....	34
Figure 42. Additional Items Table	34
Figure 43. User Input Sheet	35
Figure 44. Example of data collated in Quantity Summary sheet.....	35
Figure 45. Inputs to Table of Values (Build-up of unit rates)	37
Figure 46. Capping Alert sheet, User justification for capping alert.....	42
Figure 47. Pasture and native entries	43

List of Appendices

Appendix A User Input Sheets Options, Inputs, Defaults and Calculated Quantities

Acronyms, Initialisms and Abbreviations

DES	Department of Environment and Science
EA	Environmental Authority
ERC	Estimated Rehabilitation Cost
h	hour
ha	hectare
HLP	Heap Leach Pad
m	metre
m ²	square metre
m ³	cubic metre
PAF	potentially acid forming
TOV	Table of Values
TSF	Tailings Storage Facility
WRD	Waste Rock Dump

1 Introduction

This document is a User Guide for the Estimated Rehabilitation Cost (ERC) Calculator (Calculator) for mining activities in Queensland. The Calculator commenced on 1 April 2019, replacing the Financial Assurance Calculator. A major revision of the 2019 Calculator was undertaken in 2021.

1.1 Purpose of document

The intended audience for this document is anyone who will prepare or review an ERC calculation.

This document includes:

- Description of changes made to the Calculator in the 2021 review.
- Explanation of how to use the revised Calculator.
- Description of the architecture of the Calculator including the various sheets.
- Explanation of cost rates and how they are constructed.
- Worked examples.

Definitions of specific words and phrases used throughout this User Guide are listed in the section.

1.2 Purpose of Calculator

The purpose of the Calculator is to provide a tool to calculate the ERC as required by the *Environmental Protection Act 1994* (EP Act). The Calculator provides a consistent approach to estimating the cost to the Queensland Government to decommission, rehabilitate and close a mining operation.

The ERC Calculator should be used to capture the maximum potential amount of liability to the State for the period the Environmental Authority (EA) holder has applied for. Therefore, EA holders should ensure the maximum potential liability is entered into the Calculator, including where minor infrastructure modifications may need to be made during construction.

1.3 Key changes made during the 2021 review

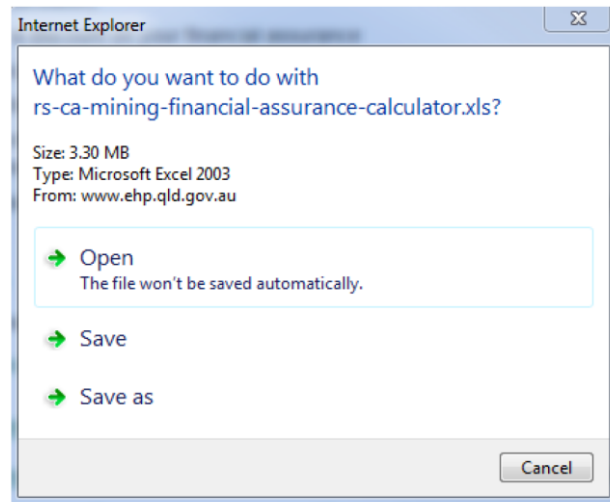
Changes made during the 2021 review include:

- Removal of macros to improve functionality and stability.
- User Input Sheets have been added for the following activities:
 - General Land Rehabilitation
 - Water Storage
 - Water Treatment and Pumping
 - Ports
 - Investigation, Contamination, Scrap, Waste Levy.
- The following sheets (further detailed in the **Sheets** section) have been added for reference and to provide greater transparency for rates, defaults and Calculator assumptions. These are:
 - Subrates
 - Capping Alerts.
- A Waste Register has been added to itemise quantities multiplied by the Waste Levy.
- Rates have been reviewed, updated, and made consistent across the mining and petroleum and gas Calculators.

2 Process of Estimated Rehabilitation Cost creation

The User is recommended to follow these steps to create an ERC for a mining activity:

1. Download the Calculator. The Calculator is available on the Queensland Government's Business Queensland website at: [Financial assurance for resource activities | Business Queensland](#).
2. Click on the hyperlink to the Mining Calculator and a pop-up window like the one below will appear (this will look different depending on the internet browser used) and click 'Open' (or similar depending on the internet browser).



3. Another window like the one below may pop-up but is unlikely as all macros have been removed from this version. If this window does pop-up, click 'Allow' and the Calculator will open in Excel™.



4. Save the file as a new name preferably in the format *Company Site ERC Date* (e.g. Coal International Big Pit ERC 10Jan22). By downloading the Calculator, the User agrees to the terms and conditions. The terms and conditions can be found in the Terms and Conditions sheet which is the left-most of the sheets in the Calculator.
5. Either go direct or navigate via the Contents sheet to the Registration sheet.
6. Enter the required details to the Registration sheet (see below).

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Mining ERC Calculator

Registration		Contents
<i>The Terms and Conditions should be read before using this calculator.</i>		Terms and Conditions of Use
Environmental Authority Ref:	<input type="text"/>	EA Holder:
Tenure:	<input type="text"/>	Site Name:
Last ERC Decision Date:	<input type="text"/>	Current ERC Amount: \$ <input type="text" value="-"/>
Site Contact:	<input type="text"/>	Position:
Site Address:	<input type="text"/>	Phone:
	<input type="text"/>	Email:
Name of Assessor:	<input type="text"/>	Name of Authorised Person:
Title:	<input type="text"/>	Title:
Date:	<input type="text"/>	Date:
Waste Levy (select)	<p style="color: red; font-size: small;">Select from dropdown (must not be left blank)</p> <input type="text"/>	Further user comment on waste levy application:
		<p><i>The most common reason for the Waste Levy not applying is that the site is not in a Waste Levy zone.</i></p>
Below this line for the Department's use only		
Name of Department Reviewer:	<input type="text"/>	Name of Department Manager:
Title:	<input type="text"/>	Title:
Date:	<input type="text"/>	Date:

7. Either go direct or navigate via the Contents sheet to the User Input Sheet you wish to populate.
8. In the User Input Sheets, enter quantities to Input cells and select options from the drop-down menus as required.
9. Continue populating the User Input Sheets applicable to the site.
10. Review the Summary sheet for the rolled-up totals.

Mining ERC Calculator		Filter - de-select zero to reduce the rows to only structural rows and rows with values			1
Contents		Summary			
\$ Total ERC					
Use and Notes					
Summarises the total costs from each Input Sheet and adds the multipliers of project management, maintenance and monitoring, and contingency. The User can change the project management and maintenance and monitoring multipliers in this Sheet. See notes to the right for conditions under which that can occur.					
Item	Quantity	Unit	Average Rate	Total Cost	
1. Eligible Mining Activities					
Total	0	Items	\$0	\$	-
					\$ -
2. Exploration					
Seismic, Grid-Lines, Minor Tracks (by length)	0.00	km	\$0	\$	-
Seismic, Grid-Lines, Minor Tracks (by area)	0.00	ha	\$0	\$	-

11. If site-specific Project Management and/or Environmental Maintenance and Monitoring values are justified, enter these into the cells in the Summary sheet and provide an explanation in the space provided in the Summary sheet.

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Total before Project Overheads and Contingency			\$	-	
Project Overheads and Contingency					
Project Management		10%	\$	-	
Environmental Maintenance and Monitoring		5%	\$	-	
Contingency		10%	\$	-	
Total Estimated Rehabilitation Cost for the Site (excluding GST)				\$	-

The contingency is to cover reasonable unknowns that can't be quantified at the time of the estimate. The contingency cannot be changed.

Alternate Project Management Rate Justification:

Notes: The project management cost reflects the costs to government to project manage, schedule or oversee the required works. The project management multiplier can be changed by the user but comprehensive justification must be provided in the box to the left and supporting information that is likely to include evidence of a third-party calculation.

(Overwrite this text to add justification)

Alternate Maintenance and Monitoring Rate Justification:

Notes: The maintenance and monitoring cost reflects the cost to government to do ongoing maintenance and monitoring required of rehabilitation works. It is recommended that 5% of the total rehabilitation liability be added to account for maintenance and monitoring costs. In some circumstances it may be appropriate to determine actual maintenance and monitoring costs rather than applying 5%. An example is where maintenance and monitoring costs are likely to account for more than 5% of the total rehabilitation liability for the site, for instance where rehabilitation on a site has been substantially completed, but not progressively certified. The project maintenance and monitoring multiplier can be changed by the user but comprehensive justification must be provided in the box to the left and supporting information that is likely to include evidence of a third-party calculation.

(Overwrite this text to add justification)

12. Review the quantities in the Quantity Summary sheet to ensure they are correct.

Mining ERC Calculator

Contents	Quantity Summary
\$	Total ERC
<p>Use and Notes Information only, no user inputs are required. This sheet summarises quantities entered throughout the calculator and can serve as a ready reference to ensure quantities are as the User intended.</p>	

Item	Value	Unit
Exploration		
Seismic, Grid-Lines, Minor Tracks (by length)	0	km
Seismic, Grid-Lines, Minor Tracks (by length) - rehabilitation length	0	km
Seismic, Grid-Lines, Minor Tracks (by area)	0	ha
Seismic, Grid-Lines, Minor Tracks (by area) - rehabilitation area	0	ha

Filter (retain blanks)

3 General use principles

3.1 General concepts

The following general concepts apply to the Calculators:

- Quantities only need to be entered in one table. For example, when using rolled-up rates for roads, the same road quantities do not need to be entered to the User Quantities table. In a quantity-based table (e.g. number of dams) the area does not also need to be entered in the area-based table).
- The rates generally include activities reasonably anticipated to be required to rehabilitate items. Specifically, decommissioning, demolition, removal, disposal / storage, and rehabilitation of land ('grade and seed') are included unless stated.
- User tables allow entry of site-specific quantities and the inclusion of non-standard items such as long-distance haul of growth media and amendment to soil. In general, the intent is that the Default Rates will cover most scenarios and the User build-up should only be necessary if there is a clear requirement. For example, it is known that highly sodic soil will require amendment with a higher gypsum application rate or when growth media will require carting from more than 10 km.
- Rates in arid environments do not include growth media and seeding because it is difficult to generate vegetation in these areas and the natural state in arid environments does not include vegetation (e.g. Channel Country in South West Queensland).

3.2 Colour coding and notation

Table 1 describes the colour coding and notation used throughout the Calculator. All cells except green and yellow are locked to the User. The colour code key is shown as **Figure 1** and is in the Contents sheet.

Table 1. Colour coding of cells

Colour	Use
Green	Cells to which the User can input values or text, select options from drop-down menus and click on hyperlinks to access other sheets or areas within a sheet.
Yellow	Reserved for User Entered Alternate Rates. If an Alternate Rate is entered, the yellow rate cell turns pink with red font to inform the department. If an Alternate Rate is entered, the User must provide an explanation in the corresponding 'Justification for Alternate Rate' cells (see Figure 2 for an example).
Purple cells	Reserved for Default Rates sourced from the Table of Values (TOV).
Hatched cells	Structural block-out cells indicating no active part in the Calculator.
White cells	Calculated quantities and fixed text that the User cannot change.
Pink with Red 'E'	Occurs in the Input sheets where dozers are used. The 'E' indicates a push length incompatible with the selected dozer. This will create an error in the cost calculation and the User must select a bigger dozer or shorter push length.
*	Used in the User Input Sheets to denote where a pop-up message is available (see Figure 3).

Colour Code Key







User Input Cells	
User Input - Alternate Rates / justification	
Locked cell - Default Rates	
Locked cells - blanks	
Locked cell - calculations or text	
Incompatible dozer push length rate selected	
* denotes pop_up message in cell	

Figure 1. Colour code key

Default Rate	Alternative Rate (\$/unit)	Total Cost (\$)	Justification for Alternate Rate
\$ 38,500.00		\$ -	
\$ 11,000.00		\$ -	
No alert		\$ -	
No alert		\$ -	

Figure 2. Example of justification for Alternate Rate Cells in User Input Sheets

Areas	Rehabilitation of slope/batter areas (ha)*	Average doze thickness slope areas (m)*

Enter the area of slopes / battered areas to be rehabilitated.

Figure 3. Example of pop-up message

3.3 Quantity entry

The User enters quantities into the green cells. The units of each quantity are shown in either the adjacent column (**Figure 4**) or the top row of the table (**Figure 5**).

Tracks and Roads (by length)		
Type	Length	Unit
Track, Earthen, No replace, 3 m wide, Pasture		km
Track, Earthen, No replace, 3 m wide, Native		km

Figure 4. Example of units in adjacent column

REMOVAL OF COVER			
Length of Road surface covering to be removed or ripped (if earthen) (km)	User Thickness of surface covering (mm)	Surface covering thickness used in calculations (mm)	Volume of surface covering to remove (m3)
-		0	-
-		150	-

Figure 5. Example of units in row

The order of entry in the User Input Sheets is left to right and some cells must be entered to properly calculate a cost. In the example in

Figure 6 the total footprint area of a Tailings Storage Facility (TSF), embankment, and footprint area must be entered to calculate a cost. The **Sheets**

section and the tables in **Appendix A** contain information on key entries.

Tailings Storage Facilities (User)		TSF DIMENSIONS AND DETAILS		TSF EMBANKMENT ROCK COVER DIMENSIONS				
#	Name	Total Footprint area of TSF (ha)	Risk Category (select from dropdown)	Embankment Area (ha)	User Input Thickness of Rock Cover for Embankments (m)	Thickness of Rock cover for Embankment used in Calculations (m)*	User Embankment Rock Cover Volume (m3)*	Rock armour volume used in calculations (m3)*
1	Test TSF	10.00	Select from dropdown High Risk	1.00		TSF Capping Values 1.50		15,000.00
2			High Risk			1.50		-
3			High Risk			1.50		-
4			High Risk			1.50		-

Figure 6. Example of User Entered quantities

The Calculator is set-up to allow as much flexibility as practical, allowing several ways to input quantities. An example of this is the volume of surface covering to remove (Figure 7). If the User enters a value to the 'User Thickness of surface covering', the Calculator uses this in preference to the default thickness of surface covering. If the User does not enter thickness of surface covering, the Calculator multiplies the default thickness (in this example 150 mm) by the length of road surface covering to be removed or ripped to obtain the volume of surface covering to remove (m³).

REMOVAL OF COVER			
Length of Road surface covering to be removed or ripped (if earthen) (km)	User Thickness of surface covering (mm)	Surface covering thickness used in calculations (mm)	Volume of surface covering to remove (m3)
-		150	-

Figure 7. Example of User Entered thickness

A second example is the inclusion of 'by length' and 'by area' tables which allows the User to enter the quantities for an item using the length (e.g. of a track) in combination with either a default or User Entered width or the area directly. The User only inputs quantities for a specific item into one of the tables though both tables can be used for different items. Examples of 'by length' and 'by area' are tracks and haul roads.

A third example is the inclusion of ‘by #’ and ‘by area’ tables which allows the User to enter the quantities for an item using number of a specific category (e.g. number of permanent camps of capacity <= 20 people) or the area of the item. The User only inputs quantities for a specific item into one of the tables though both tables can be used for different items. Examples of ‘by number’ and ‘by area’ are camps and ponds / dams.

The scope for each TOV rate is shown in the TOV sheet. ‘Camps by area’ is atypical in that the rate includes the decommissioning, demolition, and removal of buildings and infrastructure and an allowance for the land space between and surrounding modules.

3.4 Comment entries

The Calculator includes the following space for User comments:

- *All User Input Sheets*—There are ‘User Notes’ spaces at the top of each sheet for information that will support assumptions and assist department review.
- *Pit details*—At the end of the ‘Basic Pit Details’ table (Explanation for Pit Area Derivation) in the User Input Sheet ‘10. Pits’, the User must describe how the pit area was calculated. The User can also enter general notes about the pits in these cells.
- *Capping Alerts*—User must justify capping thicknesses less than defaults if used.
- *Summary*—Justification for use of alternate Project Management and / or Environmental Maintenance and Monitoring costs.
- *Registration*—User must explain why the Waste Levy does not apply to the sites if this is selected.

The User is encouraged to provide succinct and specific information to assist the department to understand the intent and assumptions underpinning the User’s entries.

3.5 Default quantities

The Calculator has some cells which include default quantities used in the absence of a User entry. If a User enters a quantity where a default is present, the Calculator uses the User entry instead of the default.

Default Rates are taken from the TOV or the Subrates sheet.

3.6 How to enter an Alternate Rate

Alternate Rates are entered to the yellow cells in the User Input Sheets (**Figure 8**). Alternate Rates must have the same unit as the Default Rates, otherwise they should be listed as an additional item in the rows provided (see **Other (User Entered)**

section for further information).

Tailings Storage Facilities (Defaults)								
#	Name	Area (ha)	Risk Category	TOV #	Default Rate (\$/ha)	Alternate Rate (\$/ha)	Total Cost (\$)	Alternate Rate Justification
			Select from dropdown					
1		18.00	High Risk	#9.01	\$ 200,511.79		\$ 3,609,212.22	
2		12.00	Medium Risk Low Perm	#9.02	\$ 144,378.88	\$90,000.00	\$ 1,089,000.00	
3		42.00	Medium Risk	#9.03	\$ 114,038.28		\$ 4,789,607.76	
4		15.00	Low Risk	#9.04	\$ 75,254.54	\$200,000.00	\$ 3,000,000.00	
c			View From Grid	#9.05	\$ 22,181.68			

Figure 8. Alternate Rate Cells

If an Alternate Rate is entered, the Calculator uses the Alternate Rate over the Default Rate. The Alternate Rate cell turns red (as shown in **Figure 8**) as does the corresponding ‘Alternate Rate Justification’ cell. If the User enters an Alternate Rate, the User must provide justification against the relevant item in the space provided. Alternate Rates, including third party quotes, entered to the ERC

Calculator must meet the requirements in the *Estimated rehabilitation cost under the Environmental Protection Act 1994* guideline (ESR/2018/4425).

3.7 Navigation, search, and information

Hyperlinks in the Contents sheet are used to access sheets within the Calculator, the 'Contents' hyperlink in the sheets can be used to return to the Contents sheet at any time. Other hyperlinks are used to access the User Input Sheets, or return to the top of the worksheet (**Figure 9**).

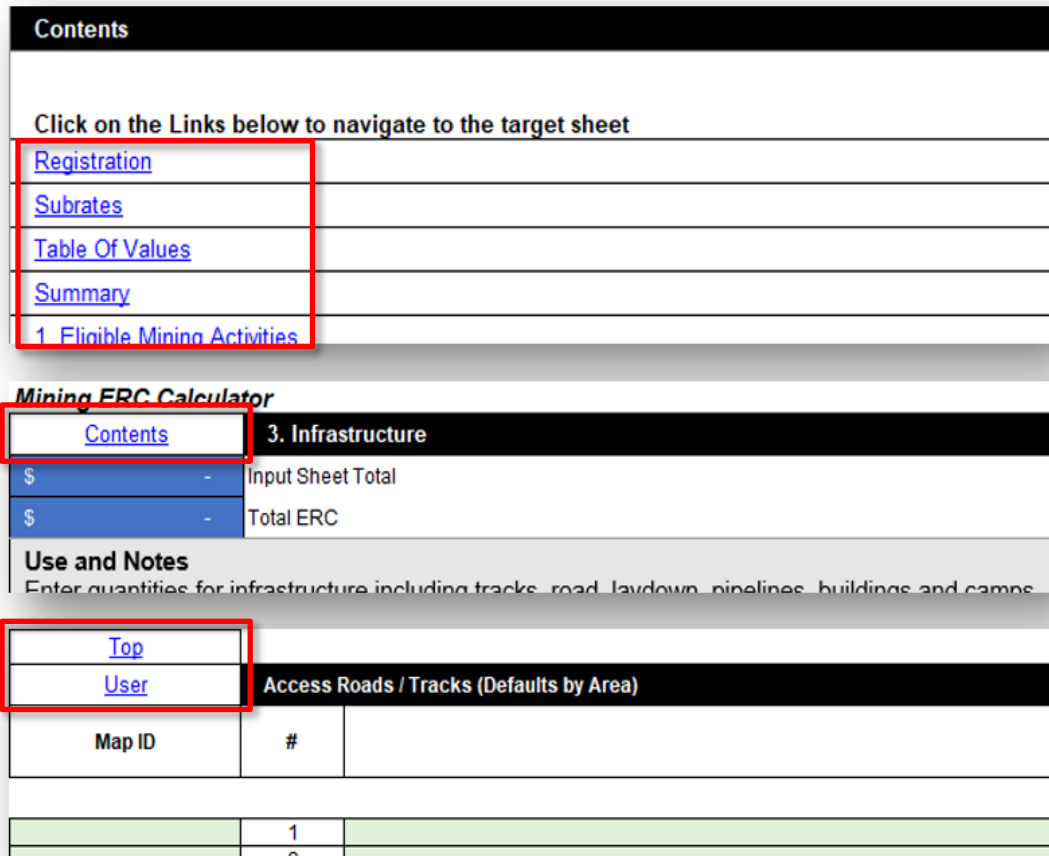


Figure 9. Examples of Hyperlinks (Top - in Contents sheet, Middle - Infrastructure to Contents, Bottom – in 'Access Roads' table in Infrastructure sheet)

Hover text is included in specific cells to provide additional information that is not necessarily apparent from the heading. The hover text is viewed by the User clicking in the target cell. Hover text cells are indicated by an '*' in the title). Not all cells have hover text (**Figure 10**).

HLP ROCK ARMOUR FOR STABILITY				
User Slope Rock Armour Cover Thickness (m)*	Thickness of Rock for Slope Layer used in Calculations (m)*	User Slope Rock Armour Cover Volume (m3)*	Rock armour volume used in calculations (m3)*	Haulage Distance for Slope Rock Armour (m)
HLP Capping Values				
	1.00			>2500 m to <=3000 m
	1.00			>2500 m to <=3000 m
	1.00			>2500 m to <=3000 m
	1.00			>2500 m to <=3000 m
	1.00			>2500 m to <=3000 m
	1.00			>2500 m to <=3000 m
	1.00			>2500 m to <=3000 m
	1.00			>2500 m to <=3000 m
	1.00			>2500 m to <=3000 m

If no user volume is entered the volume is calculated using the area and thickness.

Figure 10. Example of hover text in Heap Leach Pads User Input Sheet

Users can search each sheet using the standard Excel™ search function (Ctrl F and then entering the search term).

3.8 Drop-down menus

Drop-down menus allow selection from a range of items such as surface covering. Drop-down menus are indicated by red text (Figure 11), are in green cells, and allow selection of:

1. Risk category (e.g. for waste rock dump, heap leach pad, or tailings storage facility)
2. Haul distance (e.g. to cart rock for armour)
3. Fleet size (e.g. dozer size)
4. Slope angle (e.g. for re-profiled waste rock dump surface)
5. Surface covering type (e.g. rock)
6. Soil amendment type
7. Seed type
8. Regulated or non-regulated dam.

Long Distance Carting of Amendments				
#	Name of Area	Area to Amend	Amendment Treatment	Amendment Material
		ha	Select from Dropdown	
1			Gypsum Normal Soil	psum
2			Gypsum Normal Soil	psum
3			Gypsum Sodic Soil	psum Recycled
4			Gypsum Recycled Normal Soil	psum Recycled
5			Gypsum Recycled Sodic Soil	psum
6			Biosolids, MSW, Manure	psum
7			Hay Mulch / Sugar Cane	psum
8			Fertiliser	Fertiliser
9			Fertiliser	Fertiliser
10			No Amend	No Amend

Figure 11. Example of drop-down menu

3.9 Other (User Entered)

Where appropriate, rows are included in Users Input Sheets to allow User Entered items. These are items that are not included in the Calculator and that the User must define specifically. In this case the User must enter a description of the rate, the unit of the quantity if a default unit is not added (e.g. km), the rate (e.g. cost per kilometre) and explanation for the rate. An example is shown in Figure 12.

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Access Roads / Tracks (Defaults by Area)									
#	Activity	Quantity	Unit	TOV#	Default Rate	Alternative Rate (\$/unit)	Total Cost	Justification for Alternate Rate	
1	Track, Pasture, Earthen, No replace		ha	#3.21	\$ 2,055.66		\$ -		
2	Track, Native, Earthen, No replace		ha	#3.22	\$ 4,596.66		\$ -		
3	Track, Arid, Earthen, No replace		ha	#3.23	\$ 400.16		\$ -		
4	Track, Pasture, Rock, No replace		ha	#3.24	\$ 8,224.88		\$ -		
5	Track, Native, Rock, No replace		ha	#3.25	\$ 10,765.88		\$ -		
6	Track, Arid, Rock, No replace		ha	#3.26	\$ 6,569.38		\$ -		
8			ha			No alert	\$ -		
9			ha			No alert	\$ -		
10			ha			No alert	\$ -		

Figure 12. Example of User Entered items area

The User can enter a line item in this area and use a rate from the TOV. For example, if a fence is required around a waste rock dump, the User can reference the TOV rate here and enter the specific quantity (in this case the length of fence).

The Mobilisation and User sheet includes bulk rows allowing the User to add and define items that are not available in the rest of the Calculator (**Figure 13**).

Additional Items						
#	User Description	Qty	Unit	Rate	Total	Comments
1					\$ -	
2					\$ -	
3					\$ -	
4					\$ -	
5					\$ -	
6					\$ -	
7					\$ -	
8					\$ -	
9					\$ -	
10					\$ -	
11					\$ -	
12					\$ -	

Figure 13. Additional Items table in the Mobilisation and User sheet

3.10 Show/hide rows

The Summary and Quantity Summary sheets include a filter that allows hiding of rows that do not have entries (**Figure 14**). In the previous version of the Calculator this was achieved by a button powered by a macro. To filter out rows the User clicks in the arrow for the filter then de-selects the zero entry.

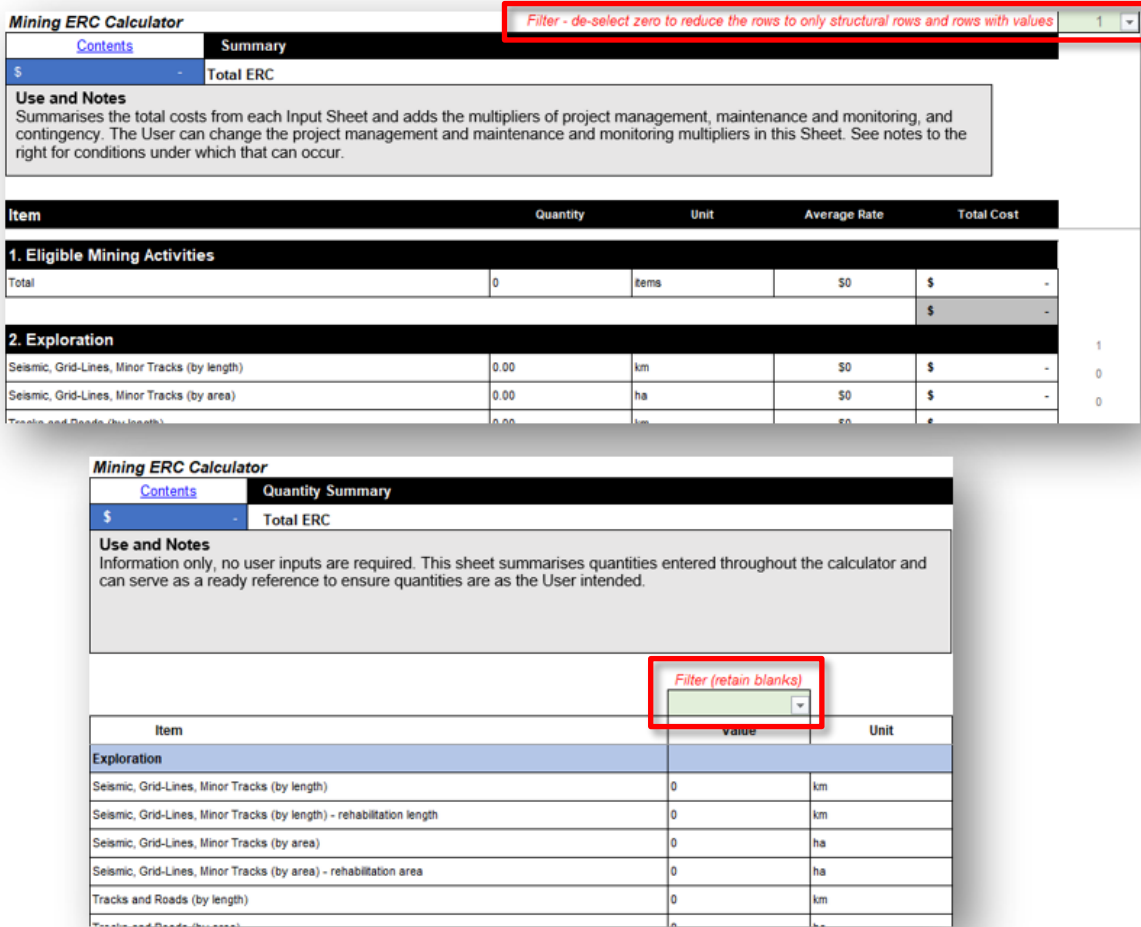


Figure 14. Filters to show/hide rows. Top – Summary sheet. Bottom – Quantity Summary sheet

3.11 Freeze Panes

The standard Freeze Panes function works in the Calculator so the User can freeze or unfreeze columns and rows to assist viewing and use. By default, the Freeze Panes are set to retain the sheet header rows and the ID and Name/Type columns. These are indicated by a grey line through the sheet (see **Figure 15**) and can be changed to suit User requirements.

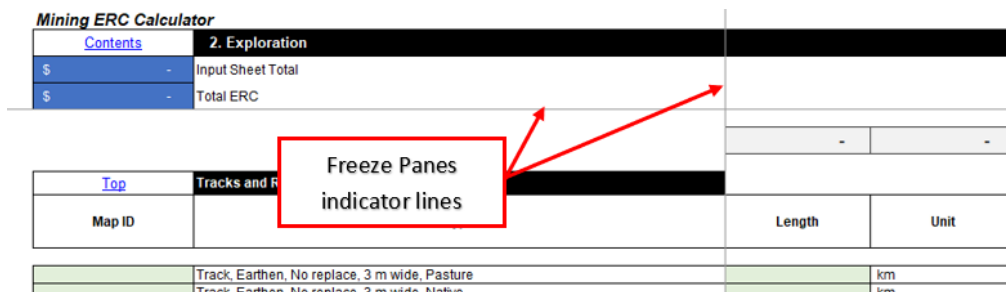


Figure 15. Example of Freeze Panes indicator lines

3.12 Security

To prevent inadvertent changing of formulas, text and processes, the Calculator is locked with only green and yellow cells available for User entry.

4 Sheets

4.1 General

Table 2 lists the sheets in the Calculator with a description of the intended use. Further detail on each User Input Sheet is provided in the next subsections.

Table 2. Sheets

Sheet name	Type of sheet	Attributes, purpose and use
Terms and Conditions (Terms-con)	Information	The terms and conditions under which the Calculator can be used. The User must review the terms and conditions prior to use. By using the Calculator, the User accepts the terms and conditions.
CONTENTS	Navigation	Lists the sheets available to the User.
Registration	User input	For entry of details defining the site, regulatory reference, previous ERC, key personnel, and department review details.
Subrates	Reference	Contains key sub-rates used to build the TOV sheet. The sub-rates cannot be altered by the User.
Table of Values (TOV)	Reference	Lists all the rolled-up unit rates used in the Calculator with description of the intended use and items included in the rate (scope).
Summary	Review	Shows the rolled-up total cost for each domain and the multipliers for Environmental Maintenance and Monitoring, Project Management and Contingency.
1. Eligible Mining Activities	User input	Allows User Entered quantities for eligible mining activities.
2. Exploration	User input	Allows User Entered quantities for activities typically part of exploration.
3. Infrastructure	User input	Allows User Entered quantities for infrastructure.
4. Process and Heavy Equipment	User input	Allows User Entered quantities for process and heavy (draglines) equipment.
5. Water Storage	User input	Allows User Entered quantities for water storage structures.
6. Water Treatment and Pumping	User input	Allows User Entered quantities pumping and treatment of water.
7. Waste Rock Dumps, Overburden Dumps, Spoil Piles and Stockpiles	User input	Allows User Entered quantities for waste rock dumps, overburden piles and topsoil stockpiles.
8. Heap Leach Pads	User input	Allows User Entered quantities for heap leach pads.
9. Tailings Storage Facilities	User input	Allows User Entered quantities for tailings storage facilities.
10. Pits	User input	Allows User Entered quantities for pits.
11. Underground Mines	User input	Allows User Entered quantities for underground mines.
12. Ports	User input	Allows User Entered quantities for ports.
13. Investigation Contamination Levy	User input	Allows User Entered quantities for a variety of activities associated with investigation and clean-up of sites (e.g. Land investigations and treatment of hydrocarbon contaminated soils). Also reports the quantities of waste to which a Waste Levy may apply.

Sheet name	Type of sheet	Attributes, purpose and use
14. General Land Rehabilitation	User input	Allows User Entered quantities for rehabilitation that is not captured in other sheets (e.g. land rehab for process equipment is captured in that sheet).
15. Mobilisation / Demobilisation and Additional User items	User input	Allows User Entered quantities for mobilisation/demobilisation and User-specified activities.
User Input Sheet	User input	Allows the User to enter disturbance quantities or undertake calculations. The values entered in this sheet are not linked through the workbook.
Quantity Summary (Qty Summary)	Review	Shows rolled-up quantities such as volume of soil to be pushed, and rehabilitation footprints.
Waste Levy Register (Waste Register)	User input / reference	Reports the quantities of waste that may be subject to a Waste Levy.
Capping Alerts	Review / User input	This provides the User and the department with an easy reference for details in the Waste Rock Dump, Heap Leach Pads, and Tailings Storage Facilities Input sheets – where capping thicknesses are less than expected.
Lists	Reference	This is a functional sheet used to make other sheets work.

4.2 Contents sheet

The Contents sheet (**Figure 16**) is the primary navigation sheet for the Calculator and allows quick access to the User Input Sheets and Summary sheets. The mode of transport is hyperlinks which the User clicks on to access the target element.

Mining ERC Calculator

Contents

Click on the Links below to navigate to the target sheet

Terms and Conditions of Use
Registration
Subrates
Table Of Values
Summary
1. Eligible Mining Activities
2. Exploration
3. Infrastructure
4. Process and Heavy Equipment
5. Water Storage
6. Water Treatment and Pumping
7. Waste Rock Dumps, Overburden Dumps, Spoil Piles and Stockpiles
8. Heap Leach Pads
9. Tailings Storage Facilities, Rejects, Slimes, Slimes Storage Facilities
10. Pits
11. Underground Mines
12. Ports
13. Investigation, Contamination and Scrap Levy
14. General Land Rehabilitation
15. Mobilisation / Demobilisation and Additional User Items
Quantity Summary
Waste Levy Register
Capping Alerts
Lists

Figure 16. Contents sheet

4.3 Registration sheet

The Registration sheet is where the User enters:

- EA # and lease details.
- Name and location of the site.

- Personnel and contact details of the site contact.
- The date of the last ERC decision and the amount of ERC last decided by the department. The amount of ERC last decided is used in the Summary sheet to show the difference between that amount and the newly proposed ERC amount.
- Whether or not the Waste Levy applies.
- Details of the people who prepared and approved the ERC, where relevant.

The space below (as per the heading) is for the department’s use (**Figure 17**).

Mining ERC Calculator

Registration

The Terms and Conditions should be read before using this calculator.

[Contents](#)
[Terms and Conditions of Use](#)

Environmental Authority Ref: EA Holder:

Tenure: Site Name:

Last ERC Decision Date: Current ERC Amount: \$ -

Site Contact: Position:

Site Address: Phone:

Email:

Name of Assessor: Name of Authorised Person:

Title: Title:

Date: Date:

Waste Levy (select) Further user comment on waste levy application:

Select from dropdown (must not be left blank)

The most common reason for the Waste Levy not applying is that the site is not in a Waste Levy zone.

Below this line for the Department's use only

Name of Department Reviewer: Name of Department Manager:

Title: Title:

Date: Date:

Figure 17. Registration sheet

4.4 Subrates sheet

Contains the rates used to build the Table of Values sheet. Includes the unit prices for earthmoving (e.g. cost per cubic metre to push soil 20 m using a D8 dozer), land amendments purchase price (e.g. gypsum) and gate fees and levy for waste. The values in this sheet cannot be changed by the User and are included to improve transparency of the rolled-up unit rates.

4.5 Table of Values

The TOV lists the rolled-up unit rates used in the Calculator with description of the intended use and items included in the rate (scope).

4.6 Summary sheet (including Project Multipliers)

4.6.1 Sheet description

The Summary sheet reports the rolled-up total cost for each domain and the multipliers for Environmental Maintenance and Monitoring, Project Management, and Contingency. The only User inputs available in this sheet are site-specific Project Management and Environmental Maintenance

and Monitoring percentage multipliers. If the User enters site-specific values for these items, justification must be added to the space provided in the Summary sheet (**Figure 18**).

Total before Project Overheads and Contingency				\$	-
Project Overheads and Contingency					
Project Management			10%	\$	-
Environmental Maintenance and Monitoring			5%	\$	-
Contingency			10%	\$	-
Total Estimated Rehabilitation Cost for the Site (excluding GST)				\$	-

The contingency is to cover reasonable unknowns that can't be quantified at the time of the estimate. The contingency cannot be changed.

Alternate Project Management Rate Justification:

Notes: The project management cost reflects the costs to government to project manage, schedule or oversee the required works. The project management multiplier can be changed by the user but comprehensive justification must be provided in the box to the left and supporting information that is likely to include evidence of a third-party calculation.

(Overwrite this text to add justification)

Alternate Maintenance and Monitoring Rate Justification:

Notes: The maintenance and monitoring cost reflects the cost to government to do ongoing maintenance and monitoring required of rehabilitation works. It is recommended that 5% of the total rehabilitation liability be added to account for maintenance and monitoring costs. In some circumstances it may be appropriate to determine actual maintenance and monitoring costs rather than applying 5%. An example is where maintenance and monitoring costs are likely to account for more than 5% of the total rehabilitation liability for the site, for instance where rehabilitation on a site has been substantially completed, but not progressively certified. The project maintenance and monitoring multiplier can be changed by the user but comprehensive justification must be provided in the box to the left and supporting information that is likely to include evidence of a third-party calculation.

(Overwrite this text to add justification)

Figure 18. Justification for User Entered multipliers

4.6.2 Project Management Multiplier

The Calculator includes a default multiplier for Project Management costs, which amounts to 10% of the total ERC from the domains. The Project Management multiplier reflects the cost to government to execute a rehabilitation program for a mine and includes:

- Health and safety and overall work plans.
- Identifying and obtaining permits.
- Procurement of contractors and consultants and ongoing contract management.
- Ongoing management of the project including scheduling, expenditure tracking and forecasting, internal communication, and on-site supervision.
- Stakeholder (including landowner, community, municipal government and regulators, media) management.
- Consulting and legal costs associated with the above items.

The User can enter a site-specific Project Management multiplier on the Summary sheet. If the 10% default value is not used, quotes must be attached to the ERC application and the User must provide justification in the space provided in the Registration sheet. If a User enters a site-specific Project Management multiplier, the Calculator applies this value instead of the default.

4.6.3 Environmental Maintenance and Monitoring Multiplier

The Calculator includes a default multiplier for Environmental Maintenance and Monitoring costs, which amounts to 5% of the total ERC from the domains.

The Environmental Maintenance and Monitoring multiplier reflects the costs to government to undertake the following:

- Post-closure maintenance activities:

- Minor repair of rehabilitated features eroded by surface water run-off and high intensity rainfall events.
- Revegetation campaigns to rehabilitate areas where vegetation is damaged from drought, fire, animals and/or infertile seed.
- Weed management.
- Repair of minor subsidence due to poor backfill operations.
- Fence and signage repairs.

- Post-closure monitoring activities:
 - Environmental, revegetation and erosion monitoring and assessment.
 - Ground and surface water monitoring and drainage assessment.
 - Erosion and surface drainage assessments and inspections across all closure areas.
 - Subsidence and ground movement assessments associated with underground mining.
 - Engineering, geotechnical and compliance inspections and assessment, surveys and reporting on the performance of the open pits, underground openings and tailings storage facilities.
 - Weed mapping and assessment surveys.
 - Feral animal assessment and control.
 - Independent contamination auditing and assessment.
 - Satellite imagery for rehabilitation analysis and reporting purposes.
 - Preparation of annual environmental reporting and monitoring reporting requirements and data management and control.
 - Mobilisation and demobilisation of the monitoring and inspection teams.

The User can enter a site-specific Environmental Maintenance and Monitoring multiplier in the Summary sheet. If the 5% default value is not used, quotes must be attached to the ERC application and the User must provide justification in the space provided in the Summary sheet. If a User enters a site-specific Environmental Maintenance and Monitoring multiplier, the Calculator applies this value instead of the default.

4.7 User Input Sheets (including map ID)

There are fifteen User Input Sheets (see **Table 2**) allowing User inputs. The User Input Sheets comprise rolled-up rates in single lines and user-defined input tables that build up the activity to calculate the total cost for the element.

The User Input Sheets are filled out left to right and only information relevant to the particular element needs to be entered. Generally, dimension inputs need to be entered to allow calculation. Where defaults are listed, and no information is entered by the User, a default value will be used in the calculation.

The structure of each User Input Sheet is similar with header rows providing the domain name, hyperlink back to Contents, the total cost for the individual sheet, the total ERC for the site, Use and Notes box providing the User with instruction in the use of the sheet, and a User Notes box for the User to add notes. An example is shown in **Figure 19**. The Use and Notes and User Notes boxes are not frozen in the default setting, but the User can reset where the Freeze Panes occur.

Mining ERC Calculator	
2. Exploration	
5	Input Sheet Total
5	Total ERC
<p>Use and Notes Enter quantities for exploration activities including seismic corridors, grid-lines, minor tracks, drillholes and small water structures. For seismic, the User may choose to enter the total length of 2D and 3D seismic in one line.</p> <p>*owned by a third party* means the infrastructure / facility is owned by a third party and they would remove it. The only liability for the EA holder in these cases is the land rehabilitation, only if the individual line length are not known.</p>	
<p>User Notes (Overwrite the text below to add User Notes) Enter any information that will support assumptions and assist department review.</p>	

Figure 19. Example of header rows in User Input Sheets

Each User Input Sheet includes a column on the left-hand side of the table for each activity to allow the entry of a map ID (Figure 20). The map ID allows the User to enter one or more comma separated ID numbers that correspond to a company-specific GIS (Geographic Information System) or other referencing system. A map ID must be entered where spatial data is provided which aligns with the line item of the Calculator. The DES form *Application for a decision on the estimated rehabilitation cost* (ESR/2018/4426) dictates where spatial information must or may be provided.

User	Access Roads / Tracks (Defaults by length)		
Map ID	#		Activit
	1		Track, Earther
	2		Track, Earther
	3		Track, Earther
	4		Track, Earther
	5		Track, Earther
	6		Track, Earther
	7		Track, Rock, M
	8		Track, Rock, M
	9		Track, Rock, M

Figure 20. Map ID

Some User Input Sheets (e.g. Process Equipment) include spare rows to allow the User to enter items that are not included elsewhere (see **Other (User Entered)**

section for more detail).

4.7.1 Default Rates and User defined Cost Build-up

All the sheets except for Eligible Mining Activities, Exploration and Process Equipment allow flexibility to build site-specific costs via the Input Tables or use rolled-up Default Rates. It is the User’s decision as to which option to use and will be determined by how much information is available for the specific element (e.g. specific capping design for a Waste Rock Dump). The method to calculate the cost of the element is the same for the default and User defined cases but in the User defined option, the User has more flexibility to match the specific design/approach for the site. The User is also able to provide an Alternate Rate for the whole activity and where this occurs it must be supported by a third-party quote that meets the requirements set out in the ERC guideline (ESR/2018/4425).

All material volume rates in the Calculator are calculated using loose cubic metres (LCM). Users should enter all cubic meter quantities in LCM.

For an individual element (e.g. waste rock dump), the User uses only one of the tables; if the User enters quantities for an element (e.g. for ‘Waste Rock Dump A’) in a Default Rate table they do not need to enter quantities for that element (‘Waste Rock Dump A’ in this example) to the User defined table.

The following have Default Rates and User defined tables:

- Infrastructure—access roads / tracks (by length), mine haul roads (by length), access roads / tracks (by area), mine haul roads / tracks (by area), laydown yards, pipelines.

- Water Storage—water structures including process water storage, raw water storage, evaporation and other unlined water storage, other (e.g. weirs).
- Overburden Dumps Piles—waste rock dumps, overburden piles, topsoil stockpiles.
- Heap Leach Pads.
- Tailings Storage Facilities.
- Pits—safety bund, benches and highwall drill and blast, low wall shaping, backfill open pit and open pit ramp backfill.
- Ports.

The User defined cost build-up tables aim to break-down the rehabilitation activity into practical steps, for example:

- Bulk earthmoving and re-profiling.
- Working layer for cap.
- Capillary break for cap.
- Low permeability layer for cap.
- Top layer.
- Topsoil and revegetation.
- Engineering and testing.

The default rolled-up rates (e.g. cost per unit area for a tailings storage facility) are built using the bottom-up, first principles method described in the **Bottom-up, first principles calculation method** section.

An example of rolled-up Default Rates is shown in Error! Reference source not found. and an example of a User defined table is shown in **Figure 22**.

User		Tailings Storage Facilities (Defaults)				Default Rate (\$/ha)	Alternate Rate (\$/ha)	Total Cost (\$)
Map ID	#	Name	Area (ha)	Risk Category	TOV #			
				Select from dropdown				
	1			High Risk	#9.01	\$ 200,511.79		\$ -
	2			Medium Risk Low Perm	#9.02	\$ 144,378.88		\$ -
	3			Medium Risk	#9.03	\$ 114,038.28		\$ -
	4			Low Risk	#9.04	\$ 75,254.54		\$ -
	5			Very Low Risk	#9.05	\$ 23,181.48		\$ -

Figure 21. Example of rolled-up Default Rates in Tailings Storage Facilities

Top		Tailings Storage Facilities (User)		TSF DIMENSIONS AND DETAILS		TSF EMBANKMENT ROCK COVER DIMENSIONS		
Map ID	#	Name	Total Footprint area of TSF (ha)	Risk Category (select from dropdown)	Embankment Area (ha)	User Input Thickness of Rock Cover for Embankments (m)	Thickness of Rock cover for Embankment used in Calculations (m)*	User Embankment Rock Cover Volume (m3)*
				Select from dropdown			TSF Capping Values	
	1			High Risk			1.50	
	2			High Risk			1.50	
	3			High Risk			1.50	
	4			High Risk			1.50	

Figure 22. Example of User Input table in Tailings Storage Facilities

4.7.2 Eligible Mining Activities User Input Sheet

As per the ERC guideline (ESR/2018/4425), ‘Certain resource activities (mining claims, exploration permits, mineral development licences and mining leases) are authorised with standard conditions if they satisfy the eligibility criteria for the relevant ERA standard’ under the EP Act. The relevant ERA Standards are prescribed under the Environmental Protection Regulation 2019.

The Eligible Mining Activities sheet can be used to calculate the ERC for an eligible mining activity on **a mining lease only**. If the User’s EA was applied for via a variation EA application, and the User chooses to use the Calculator, this sheet is to be used only to calculate the elements of the activity that comply with the standard conditions and eligibility criteria for the mining activity. Any elements which are the subject of the variation(s) are to be entered into the other relevant User Input Sheets.

This sheet requires only a map ID entry (if relevant) and the input of quantities next to the appropriate line. If Alternate Rates are justifiable (see **Alternate Rates**

section for requirements) they can be entered to the yellow cells with an explanation entered into the corresponding 'Justification for Alternate Rate' cells (see **Figure 23**). Any other information to assist the department should be entered in the 'User Notes' section at the top of the sheet.

The scope and key assumptions for each Default Rate are included in the scope and key assumptions column in the TOV sheet.

Mobilisation and demobilisation are not included in the Default Rates for this sheet so the User must either enter a '1' into the 'Mobilisation & Demobilisation – Small Projects' line in the Summary sheet (this is only available for small projects with a pre-mobilisation and multipliers total cost < \$1,000,000); or use the Default Rate(s) in the Mobilisation and User sheet; or supply a third-party quote.

Map ID	ITEM	SCOPE AND KEY ASSUMPTIONS	QUANTITY	TOV#	DEFAULT RATE	ALTERNATE RATE	UNIT	TOTAL COST (\$)	Justification for Alternate Rate
Exploration	Exploration disturbance (includes costans, sumps and general disturbance)	Backfill costans/sumps with removed material (to 15m). Rp. No allowance for seed. Add any area to be seeded to rates #1.31 and #1.32.		#101	\$ 2.7		m ²	\$ -	
	Exploration drill holes	Cap and seal open bore holes. No allowance for seed. Add any area to be seeded to rates #1.03 and #1.04.		#102	\$ 236.2		hole	\$ -	
	Seeding of drill holes in pasture	Allowance for purchase of pasture seed and hand casting.		#103	\$ 22.0		hole	\$ -	
	Seeding of drill holes in native	Allowance for purchase of native seed and hand casting.		#104	\$ 24.5		hole	\$ -	

Figure 23. Eligible Mining Activities entries

4.7.3 Exploration User Input Sheet

The Exploration User Input Sheet includes tables for activities typical to the Exploration phase of a mining project, including seismic surveys, drill-holes, roads and tracks, small water structures and disturbances from contractor-owned infrastructure and equipment such as camps and water treatment plants.

The User enters quantities to the line representing their disturbance. Most of the lines are self-explanatory and further information is provided in **Table 3**.

Table 3. Exploration User Input Sheet information

Disturbance type	Information
Seismic, grid-lines, minor tracks (by length or area)	The User enters the length or area of easement in each land type (native, pasture, arid). The Calculator multiplies the User Entered length by a default 5% to calculate the length of easement to be rehabilitated. The User can override this default by directly entering the easement length to be rehabilitated. The length to be rehabilitated is multiplied by the rate for pasture, native, or arid to obtain a total cost for that disturbance. A worked example is shown in the Seismic easements section.
Tracks and roads	Options for the tracks and roads are shown in Table A-1 . The remove rock and replace option would be used where the track or road is to be retained but where either the road surface is contaminated, or the quality of the surface is insufficient to support future use. Tables are available for entry by length coupled with default or User Entered width and by area.
Drillholes and sumps	The User enters the total number of drillholes and sumps in each category. There are three types of treatments – plugging, backfill with cuttings, and grouting. Plugging is installation of a surface plug only, backfill with cuttings does not include grout, and the grout options include backfilling and

Disturbance type	Information
	placement of grout. The User determines the appropriate option based on site-specific requirements.
Water structures	The User enters the total surface area (the crest area) for each category. Selections for lined and unlined water structures are available.
Camps and water treatment plants	For exploration activities, it is assumed the facilities are owned by third-party contractors and that they bear the cost of removing the facilities. The only liability for the EA holder in these cases is rehabilitation of the land (grade and seed). In cases where the EA holder owns the facilities, entries must be made to the appropriate User Input Sheet (e.g. Infrastructure for Camps) or a specific rate added to one of the 'Other (User Entered)' rows.

Table A-1 of Appendix A shows further details for the Exploration User Input Sheet.

4.7.4 Infrastructure User Input Sheet

The Infrastructure User Input Sheet includes disturbances relating to access and transport (e.g. roads, overpasses, and rail loading facilities), storage and staging (e.g. laydown), buildings and structures (e.g. camps and communications towers), pipelines, power distribution and waste management (landfills and sewage treatment plants).

Tables are also included for fencing, and miscellaneous concrete / bitumen pads not associated with infrastructure or equipment. Costs for concrete associated with infrastructure and equipment are included on those rates and consequently the User does not need to add a line to the miscellaneous concrete pads table for such items. This is a general rule throughout the Calculator - rolled-up rates generally include all tasks reasonably expected to be associated with an activity. Consequently, entries do not need to be made for items such as fencing, small ancillary and tanks for larger facilities as these small items are assumed included. These tables are for discrete, isolated items clearly not associated with other facilities (e.g. a remote vehicle wash-down or refuelling station).

Due to the length of this User Input Sheet, the header section of this sheet includes a quick access table with hyperlinks to the relevant sections (Error! Reference source not found.4).

Links to Default Values:	Tracks	Mine Haul Roads	Laydown	Borrow Pits	Pipelines
	Camps	Lattice Structures	Power Distribution	Hardstand	Rail Infrastructure
	Landfills	Rehabilitation	Fencing	Small Ancillary	Tanks

User Notes (Overwrite the text below to add User Notes)

Figure 24. Hyperlinks in Infrastructure User Input Sheet

Table A-2 of Appendix A shows the details for the Infrastructure User Input Sheet. A worked example for a User defined Road is shown in the User defined roads in Infrastructure User Input Sheet

section.

For small mining operations and where camps are designed for a few people only (<=5) and comprise simple infrastructure (e.g. not a dedicated mess), the User can either enter Alternate Rates; use rate #3.66 (small portable structures); or use rate #3.102 (small temporary camp by area). For a camp comprising a caravan and one or two tents, one entry of rate #3.66 is likely sufficient. For larger (but still simple and small), rate #3.102 is likely more appropriate.

4.7.5 Process and Heavy Equipment User Input Sheet

The Process and Heavy Equipment User Input Sheet requires only the input of quantities next to the appropriate line. If Alternate Rates are justifiable, they can be entered to the yellow cells with an explanation entered in the corresponding 'Justification for Alternate Rate' cell.

The Calculator includes line items for three sizes of draglines:

- Dismantle and remove dragline up to 2,000 t
- Dismantle and remove dragline > 2,000 t to 5,000 t
- Dismantle and remove dragline > 5,000 t

The processing equipment footprints table below the rates table allows the User to list out any areas requiring any of the following:

- Remove concrete pads & footings (<=0.3 m thickness) and dumping in void
- Remove concrete pads & footings (>0.3 m thickness) and dumping in void
- Crush concrete to make road aggregate - 75 mm
- Crush concrete to make road aggregate - 50 mm
- Crush concrete to make road aggregate - 30 mm
- Remove bitumen (aprons, sealed areas) for dumping in a void on-site
- Remove bitumen (airstrip) for dumping in a void on-site
- Rehabilitation of infrastructure footprints.

The totals in the processing equipment footprints table are reported to the rates table in column F ('Quantity (footprints table)'). The User can also enter quantities for these items directly to the rates table. Use of the processing equipment footprints table is optional and is intended to provide clarity on any items that require the rehabilitation activities listed above. It is stressed again that concrete removal (for example) is included in the Process Equipment rates so the items listed above are only used for items that are not covered by the process equipment list of rates. An example is an old isolated concrete slab that no longer has any equipment associated with it but must still be removed.

Table A-3 of **Appendix A** shows the details for the Process Equipment User Input Sheet

4.7.6 Water Storage User Input Sheet

The Water Storage User Input Sheet is used to calculate costs to decommission and rehabilitate water storage structures. The sheet allows three options for rates which can be used singly or in combination. If the User enters a specific item in one table, it does not then need to be added in the other tables. The three options are:

- By category and capacity—the User enters the number of water structures in each size and type (process, raw, evaporation) category. The User also selects the land type and the combination of category, size, and land determine the Default Rate. The category selection determines whether the dam/pond is lined – process and raw water dams are assumed lined and evaporation dams assumed unlined.
- By area—the User enters the total surface area (the crest area) for each category. Selections for lined and unlined water structures are available.
- User build—the User creates a rate for a dam or group of dams using their own specific inputs which include:
 - Details (type, size). Note: the size input does not feature in any of the calculations. It is required to provide the department an indication as to the cost relative to the Default Rates.
 - Water (pumping)
 - Liner
 - Wall push in
 - Sediment removal
 - Growth media
 - Land investigation
 - Fleet selection.

If the User build is used, it is recommended the User provide the department with information to support the entries (e.g. a dam register and/or drawings).

The 'Top of Water Structure Area (ha)' and '# of structures in this category (each row)' entries are required to make the calculation valid. Each row calculates the cost of one dam with the characteristics (e.g. crest area, wall height) entered to that row and the total cost for the number of dams in that row is calculated in the far-right column.

The 'Wall Height (above ground surface) (m)', 'Wall width at top (m)', and 'Slope (1 in X)' entries are also required to make the calculation valid unless the User enters a site-specific wall area. All other entries will use defaults (e.g. 0.5 m sediment thickness) if the User does not enter site-specific quantities. If the User enters a site-specific liner area that is less than the crest area, a 'Liner Warning' will be shown, and the User must either change the quantity or provide an explanation.

Typically land investigations will be required for process and raw water dams and not for evaporation dams. If an investigation is required, the User must enter a value to 'Share (Fraction of Upfront cost)'. The User can select how much of the upfront (one-off cost for work plans etc) is apportioned to the dam or group of dams. For example, if the upfront costs will be shared by two dams enter 0.5. The User is encouraged to provide explanations for the quantities entered for 'Share (Fraction of Upfront cost)'. For example, if several small dams (e.g. 5 X 2 ML) are located adjacent to each other, a 1 entry may be appropriate.

The default assumptions for water structures are listed under 'Scope and Key Assumptions to TOV' in the TOV against the relevant number.

Table A-4 of Appendix A shows the details for the Water Storage User Input Sheet

4.7.7 Water Treatment and Pumping User Input Sheet

The Water Treatment and Pumping User Input Sheet is used to calculate costs for pumping and treatment of water.

The options for water treatment and pumping are:

- Water pH adjustment—assumes the use of neutralisers to adjust low pH. There are two pH adjustment options – one for initial pH of 4.5 or greater and one for pH of 5.5 or greater. Both options assume the water pH is adjusted to circum-neutral.
- Water salt removal—assumes the use of reverse osmosis equipment to remove salt.
- Water organics removal—assumes the use of an oil / water separator and activated carbon to remove oil and dissolved petroleum hydrocarbons (and other adsorbable organics).
- Naturally evaporate water in pond—natural removal of water by solar energy. The net evaporation in Queensland is high. The rate allows for a technician visiting the site periodically to monitor water levels. The rate is by dam/pond and assumes a time period to set a rate.
- Evaporate water with evaporators—enhanced evaporation of water by an atomizer. The rate allows for power and a technician visiting the site periodically to monitor water levels and maintain equipment. The rate is by dam/pond and assumes a time period to set a rate.
- Mobilisation of reverse osmosis unit—to account for the costs of mobilising and demobilising a reverse osmosis unit to the site. If treatment by reverse osmosis is included, this rate should be used or a justification provided for its omission.
- Salt disposal—load and transport – generally, if reverse osmosis is used, an allowance for salt load and haul should be included. It is recommended the User provide calculations to support their inputs.
- Salt disposal—gate fee - the waste facility charge for salt. If treatment by reverse osmosis is included, this rate should be used and the same mass that is used for salt load and haul unless a justification for an alternate approach is provided.
- Water pumping / transfer—for any pumping not included in other User Input Sheets. Pumping and treatment requirements for Pits can be included in the User Input Sheet for Pits. Pumping of water from dams and ponds can be entered to the User build for water structures but treatment is not included, and the Default Rates do not include pumping or treatment of water.

- Dewatering plant decommissioning—for decommissioning of company owned dewatering plant. The entry is by capacity of the system. If multiple systems are present, the User can enter the sum (e.g. two X 1 ML/day plant would require an entry of 2).
- Removal of evaporation fans and/or other water transfer and management infrastructure.
- Water management establishment, engineering, operations and maintenance. In general, if any of the options above are selected, this rate should also be used unless the User can justify its omission. Alternate Rates can be provided.

Water management scenarios will vary from site to site depending on the mine type and degree of processing undertaken. The User should provide sufficient information to support the:

- Determination of the volume of water to be pumped.
- Selection of water treatment options which will be informed by water quality results and an understanding of the mine processes.

The User can enter an Alternate Rate for the water management area as shown in **Figure 25**, justification must be included in the 'Justification for Alternate Rate' section at the end of the table.

TOV#:	<i>Enter justification</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>
	#6.01	#6.02	#6.03	#6.04	#6.05	#6.06	#6.07
Rate	\$1,912	\$2,419	\$2,716	\$2,027	\$5,291	\$53,740	\$48,000
Alternate Rate	\$10.00						
	ML	ML	ML	ML	Dam	Dam	lump
Water Management establishment, engineering, O&M	Water pH 5.5 Adjustment	Water pH 4.5 Adjustment	Water Salt Removal	Water Organics Removal	Naturally Evaporate Water in Pond	Evaporate Water with Evaporators	Mobilisation of Reverse Osmosis Unit
ML	\$	\$	\$	\$	\$	\$	\$

Figure 25. Water treatment and transfer Alternate Rates

A separate table is included for the field elements associated with dewatering systems. this table accounts for dewatering pumps, piping, tanks / dams / ponds (used specifically for dewatering), and generators. if plant is owned by the company, the entry is made to the water treatment and transfer table.

Table A-5 of **Appendix A** shows the details for the Water Treatment User Input Sheet.

4.7.8 Overburden Dumps Piles User Input Sheet

The Overburden Dumps Piles User Input Sheet is used to calculate costs for rehabilitating waste rock dumps, overburden piles, and growth media stockpiles.

Two cost options are available in this sheet depending on the information the User has for the specific item:

1. Default, rolled-up rates that use unit rates and sub-activities to generate a single rate value (\$/ha); or
2. User defined table. These tables allow the User to enter site-specific details of the structure and use the unit rates to generate a single rehabilitation value.

The User can enter quantities into both tables for different structures. The User does not enter details into both tables for the same structure. In each sheet, the sum of the default and User defined entries is shown at the top. The total ERC is also shown for reference (**Figure 26**).

The method to calculate the cost of the structure is the same for the default and User defined cases but in the User defined option, the User has more flexibility to match the specific design/approach for the site.

Mining ERC Calculator	
Contents	7. Waste Rock Dumps, Overburden Dumps, Spoil Piles and Stockpiles
\$ 823,820.37	Input Sheet Total
\$ 7,311,503.61	Total ERC
Use and Notes	
Enter quantities for waste rock dumps, spoil piles and stockpiles. For the default table, the Us	

Figure 26. Waste Rock Dumps, Overburden, Piles header

The Default Rates for rehabilitation of waste rock dumps (#7.01, #7.02, #7.03, #7.04 and #7.05 in the TOV) are based on the chemical properties (e.g. presence, or likely presence, of reactive materials) and physical properties (e.g. shear strength limiting the plant selection for material placement) of the waste. The User must select the category with the properties most closely matching the specific waste rock dump.

While there is a default thickness for the capping and low permeability layers, the User can enter alternate thicknesses. However, where these are less than the defaults, additional justification must be provided in the Capping Alerts sheet.

Supporting information must be attached to the ERC application to satisfactorily demonstrate to the department why a particular capping rate has been applied. Information requirements in relation to capping are outlined in the ERC guideline (ESR/2018/4425).

Further discussion on capping is included in the Error! Reference source not found. section and a worked example is included in the **Default Rates for waste rock dumps**

section. **Table A-6 of Appendix A** shows the available selections, defaults and calculated quantities for the Overburden Dumps Piles User Input Sheet.

4.7.9 Heap Leach Pads User Input Sheet

The Heap Leach Pad User Input Sheet is used to calculate costs for rehabilitating heap leach pads. Two cost options are available in this sheet depending on the information the User has for the specific item:

1. Default, rolled-up rates that use unit rates and sub-activities to generate a single rate value (\$/ha); or
2. User defined table. These tables allow the User to enter site-specific details of the structure and use the unit rates to generate a single rehabilitation value.

The User can enter quantities into both tables for different structures. The User does not enter details into both tables for the same structure. In each sheet, the sum of the default and User defined entries is shown at the top. The total ERC is also shown for reference.

The method to calculate the cost of the structure is the same for the default and User defined cases but in the User defined option, the User has more flexibility to match the specific design/approach for the site.

The Default Rates for rehabilitation of heap leach pads (#8.01, #8.02, #8.03, #8.04 and #8.05 in the TOV) are based on the chemical properties (e.g. presence, or likely presence, of reactive materials) and physical properties (e.g. shear strength limiting the plant selection for material placement) of the waste. The User must select the category with the properties most closely matching the specific pad.

While there is a default thickness for the capping and low permeability layers, the User can enter alternate thicknesses. However, where these are less than the defaults, additional justification must be provided in the Capping Alerts sheet.

Supporting information must be attached to the ERC application to satisfactorily demonstrate to the department why a particular capping rate has been applied. Information requirements in relation to capping are outlined in the ERC guideline (ESR/2018/4425).

Further discussion on capping is included in Error! Reference source not found.section and a worked example is included in **Default Rates for waste rock dumps**

section (note this is for a waste rock dump but the concepts are similar). **Table A-7 of Appendix A** shows the available selections, defaults and calculated quantities for the Heap Leach Pads User Input Sheet.

4.7.10 Tailings Storage Facilities User Input Sheet

The Tailings Storage Facilities User Input Sheet is used to calculate costs for rehabilitating tailings storage facilities. Two cost options are available in this sheet depending on the information the User has for the specific item:

1. Default, rolled-up rates that use unit rates and sub-activities to generate a single rate value (\$/ha); or
2. User defined table. These tables allow the User to enter site-specific details of the structure and use the unit rates to generate a single rehabilitation value.

The User can enter quantities into both tables for different structures. The User does not enter details into both tables for the same structure. In each sheet, the sum of the default and User defined entries is shown at the top. The total ERC is also shown for reference.

The method to calculate the cost of the structure is the same for the default and User defined cases but in the User defined option, the User has more flexibility to match the specific design/approach for the site.

The Default Rates for rehabilitation of tailings storage facilities (#9.01, #9.02, #9.03, #9.04 and #9.05 in the TOV) are based on the chemical properties (e.g. presence, or likely presence, of reactive materials) and physical properties (e.g. shear strength limiting the plant selection for material placement) of the waste. The User must select the category with the properties most closely matching the specific tailings storage facility.

While there is a default thickness for the capping and low permeability layers, the User can enter alternate thicknesses. However, where these are less than the defaults, additional justification must be provided in the Capping Alerts sheet.

Supporting information must be attached to the ERC application to satisfactorily demonstrate to the department why a particular capping rate has been applied. Information requirements in relation to capping are outlined in the ERC guideline (ESR/2018/4425).

Further discussion on capping is included in Error! Reference source not found.section and a worked example is included in **Default Rates for waste rock dumps**

section (note this is for a waste rock dump but the concepts are similar). **Table A-8 of Appendix A** shows the available selections, defaults and calculated quantities for the Tailings Storage Facilities User Input Sheet.

4.7.12 Underground Mines User Input Sheet

In the Underground Mines User Input Sheet, the User enters details in the first table and the costs are calculated in the second table. The sheet includes:

- Termination of services.
- Ventilation shafts. Treatments are backfill, plug or cover. The number of ventilation shafts must be entered and the total depth (m) if backfill is the selected treatment.
- Hoisting shafts. Treatments are backfill, plug or cover. The number of hoisting shafts must be entered and the total depth (m) if backfill is the selected treatment.
- Adits (<2m in diameter) with options for covering and sealing. The User enters the number to be treated by each method.
- Declines/drifts. The User enters the number of these.
- Drifts/declines with conveyors. The User enters the number of these.
- Small (historical) shafts proposed for closure. The User enters the number of these.
- Repair damaged land including subsidence.

An Alternate Rate can be entered for each of the above categories (**Figure 29**) and also for the mine as a whole at the end of the cost table (**Figure 30**). Where an Alternate Rate is entered, justification must be provided against the relevant line item in the TOV sheet.

TOV#:	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No Alert</i>	<i>No A</i>
	#11.13	#11.01	#11.02	#11.03	#11.04	#11.05	#11.06	#11.
Rate	\$38,500	\$27,500	\$1,200,000	\$1,016	\$7,700	\$28,279	\$301,857	\$135,
Alternate Rate:								

Figure 29. Alternate Rates for User Entered details for an underground mine

TOTAL FOR MINE	Alternate Rate	RATE FOR MINE	Justification for Alternate Rates
\$ -		\$ -	
\$ -		\$ -	

Figure 30. Alternate Rate entry in for an underground mine

Table A-10 of Appendix A shows the details for the Underground Mines sheet.

4.7.13 Ports User Input Sheet

This sheet allows the User to enter quantities for marine facilities. The User can elect to use the rolled-up Default Rates or use the 'User build' table to enter the rehabilitation specific to their site. The choice is dependent on the information the User has for the specific element.

If the User elects to use the defaults table, they enter the quantity and select a type from the drop-down lists and costs will be calculated based on the Default Rates for the specified type (**Figure 31**).

If Alternate Rates are used the User must provide justification in the 'Justification for Unit Rates' cells.

Ports (and other Marine Facilities) - Defaults									
#	Facility Name	Qty	Type	TOV #	Default Rate (\$/ha)	Unit	Alternate Rate (\$/unit)	Total cost (\$)	Justification for Alternate Rate
Select from dropdown									
1			Jetty	#12.01	\$ 937.36	m		\$0.00	
2			Wharf	#12.02	\$ 108.22	m2		\$0.00	
3			Dolphins	#12.03	\$ 200,000.00	item		\$0.00	
4			Reclaimer	#12.04	\$ 750,000.00	item		\$0.00	
5			Shiploaders	#12.05	\$ 375,000.00	item		\$0.00	
6			Conveyor on jetty	#12.06	\$ 370.00	m		\$0.00	
7			Conveyor on land	#12.07	\$ 241.48	m		\$0.00	

Figure 31. Ports default table

Alternatively, the User can use the User build table to cost out their facility in more detail. There are several places where Alternate Rates can be entered. The User must provide a justification in the cells provided at the very end of the table.

The 'Export Capacity' entry does not feed into the calculations and is to provide the User and the department with an indication of size of the facility being costed.

This sheet includes a table that allows the User to enter a range of quantities for their facility. The values entered to this table do not feed into any of the calculations and are to allow transparent calculation of quantities. Data entry into this table is optional.

Table A-11 of Appendix A shows the details for the Ports sheet.

4.7.14 Investigation, Contamination, Scrap, Waste Levy User Input Sheet

This sheet includes Default Rates and space for Alternate Rates for contaminated land investigations and treatment and disposal of contaminated material and scrap. The rolled-up rates for facilities and infrastructure includes land investigation where one would be expected (e.g. process dam) and allows for soil and scrap associated with demolition of process plant and draglines. The land investigation, contamination and scrap removal tables in the Investigation, Contamination, Scrap, Waste Levy sheet are for isolated areas not associated with such facilities. The rolled-up rates do not allow for any known significant contamination that may be present on the site and tables (e.g. soil bioremediation) in this sheet can be used to account for such occurrences.

The 'Disposal to Off-site Facility - Waste Levy' table captures quantities from the Waste Register sheet if the Waste Levy is applicable to the site. The Waste Levy is now different for the metro and regional zones and the table multiplies by the rate associated with the User selection in Registration. The User does not have to enter quantities to this table but can add an area name description (optional).

The Default Rates (**Figure 32**) for investigation must be considered for any project that:

- Produces one or more hazardous contaminants in a concentration with the potential to cause serious or material environmental harm and a person, animal or other part of the environment may become exposed to the hazardous contaminant(s).
- Includes notifiable activities; and/or has contaminated land on the environmental management register (EMR) or contaminated land register (CLR).

	No Alert	No Alert	No Alert
TOV#:	#13.01	#13.02	#13.03
Rate	\$16,149.96	\$35,075.58	\$3,964.53
Alternate Rate:			
Unit:	Cluster	lump	ha
for calculations (ha)	Preliminary site investigation (Phase 1 investigation)	Land investigation one-off costs	Land investigation per unit area costs

Figure 32. Default Rates for investigation costs with Alternate Rate option

Preliminary site investigation (Phase 1)

The preliminary site investigation unit rate is a one-off cost. A preliminary site investigation in the context of mine closure is typically a part of planning activities and aims to identify areas of known, suspected or reasonably probable contamination resulting from the mine operations. The preliminary site investigation comprises a review of the site setting, site history, operational history (including any

accidents and incidents), hazardous liquids and solids storage schedules and sources of potential impacts and receptors.

To apply a cost for a preliminary site investigation, the User inputs the proportion of one-off cost to apply to each area, the number of investigations needed in the 'Preliminary Site Investigations' entry, together with the relevant dimensions to allow the investigation area and cost to be calculated (**Figure 32**).

Lead Investigation											Unit		
#	Name of Area	User Notes	Proportion of One-off Costs (typ. 1)*	Preliminary Site Investigations	Width (m)	Length (m)	Diameter (m)	User Area (ha)	Calculated Area (ha)	Area for calculation (ha)	Preliminary site investigation (Phase 1 investigations)	Lead investigation one-off costs	Lead investigation per unit area costs
1	Withdrawn area	Example user notes	1.0	10							10.0000	\$0.00	\$0.00
2											10.0000	\$0.00	\$0.00
3											10.0000	\$0.00	\$0.00

Proportion of One-off Costs (typ. 1)*	Preliminary Site Investigations	Width (m)	Preliminary site investigation (Phase 1 investigation)	Land investigation one-off costs	Land investigation per unit area costs
	#	m			
	1.0			\$16,149.96	\$0.00
				\$0.00	\$0.00
				\$0.00	\$0.00

Figure 33. Preliminary site investigation entry

The 'Proportion of One-off Costs' field is the multiplier on the one-off costs for investigations. This value is typically set to 1 but can be less if it is reasonable to assume several areas will be investigated during the same mobilisation.

Site investigations (intrusive)

An intrusive site investigation would be targeted and may not be required for all contaminated or preliminary investigation areas. The intrusive investigation rate should be applied considering risk, site history, past incidents, and the planned rehabilitation program. An intrusive investigation should be considered if a site has contaminated land on the EMR or CLR, and if scalping and disposal of contaminated material is not accounted for in key areas with potential for contamination (e.g. process areas, maintenance yards, go lines).

The cost of intrusive site investigations is based on Default Rates and is calculated using 'proportion of one-off costs (typ.1)' and the dimensions of the site. The User must add entries for **both** to cost an intrusive site investigation (**Figure 34**). The entry made in the 'Proportion of One-off Costs (typ. 1)' column must be made as a decimal (e.g. 50% must be entered as 0.5). These entries trigger the calculation of both the 'Land investigation one-off cost' and the 'Land investigation per unit area costs' fields. These fields are explained in more detail below.

Lead Investigation											Unit		
#	Name of Area	User Notes	Proportion of One-off Costs (typ. 1)*	Preliminary Site Investigations	Width (m)	Length (m)	Diameter (m)	User Area (ha)	Calculated Area (ha)	Area for calculation (ha)	Preliminary site investigation (Phase 1 investigations)	Lead investigation one-off costs	Lead investigation per unit area costs
1	Withdrawn area		0.5	10	100.00	20.00			0.00	0.00	10.0000	\$35,075.58	\$792.91
2											10.0000	\$0.00	\$0.00
3											10.0000	\$0.00	\$0.00

Proportion of One-off Costs (typ. 1)*	Preliminary Site Investigations	Width (m)	Length (m)	Diameter (m)	Preliminary site investigation (Phase 1 investigation)	Land investigation one-off costs	Land investigation per unit area costs
	#	m	m	m			
1.0	1.0	100.00	20.00			\$35,075.58	\$792.91
						\$0.00	\$0.00
						\$0.00	\$0.00

Figure 34. Intrusive site investigations—User Inputs

1. Land investigation one-off cost

The approach to estimating costs for site investigations recognizes that most investigations of this nature comprise a single campaign (one mobilisation) taking in multiple areas. The one-off cost allows for planning and preparation, ongoing project management, health and safety plans, work plans and reporting. A combination of the factors outlined above (risk, rehabilitation program, site history and grouping and relative proximity of infrastructure) must be considered in determining the number of one-off costs to apply. Examples of areas that may individually comprise one campaign are:

- Service facility area—fuel or chemical stores, workshop, vehicle washdown, sewage treatment.
- Processing plant—ore and product storage, mine waste storage and disposal rail load out.
- Remote pit facilities—vehicle re-fuel, sewage treatment, secondary workshop, chemical storage.

The User should enter a 1 for the one-off entry demonstrating that the areas described in the line will be investigated in one campaign¹ (Figure 35).

The User can enter a fraction of 1 if they want to list individual areas that will be investigation in one campaign (Figure 35).

Land Investigation				
#	Name of Area	User Notes	Proportion of One-off Costs (typ. 1) [*]	Preliminary Site Investigations
<i>Enter name of area below</i>				
1	Washdown area	Example user notes	0.5	1.0
2	Vehicle service area	Example user notes	0.5	1.0
3	Processing area	Example user notes	1.0	1.0

Figure 35. Land investigation input cells showing proportion of one-off costs

2. Site investigation - by area cost

The 'by area' rate accounts for activities undertaken on-site. The rate includes costs for field staff to collect soil samples, sampling equipment and consumables and laboratory analytical costs.

The User can describe the area for a land investigation by entering width and length or diameter or the area (Figure 36). This recognizes that Users will have different quantity types. Some Users may use GIS that outputs area and others may measure length and width off a plan. In this example, the hierarchy is 'User Area (ha)', then 'Width' and 'Length', and then Diameter. If both length and width and diameter are added, the Calculator uses length and width and ignores diameter. The 'Calculated Area' column shows the calculation of area based on the User Entered dimensions and if a value is entered directly to the 'User Area (ha)' column, the 'Area for calculations' column will default to that entry (see Error! Reference source not found. for examples).

The per area rate is applied only to the area to be investigated. For example, a tank farm within a processing facility – in this case only the tank farm area is entered.

Name of Area	Proportion of One-off Costs (typ. 1) [*]	Preliminary Site Investigations	Width (m)	Length (m)	Diameter (m)	User Area (ha)	Calculated Area (ha)	Area for calculations (ha)
<i>Enter name of area below</i>								
Washdown area	0.5	1.0	100.00	20.00			0.20	0.20
Vehicle service area	0.5	1.0				0.05	-	0.05
Processing area	1.0	1.0			300.00		7.07	7.07

Figure 36. Land investigation input cells showing options for defining the area

Table A-12 of Appendix A shows the details for the Investigation, Contamination, Scrap, Waste Levy User Input Sheet.

4.7.15 General Land Rehabilitation

The General Land Rehabilitation sheet accounts for activities associated with land rehabilitation that are not captured elsewhere in the Calculator and can be used for buffer / fire safety areas. The

¹ These areas were termed 'cluster' in the Financial Assurance Calculator.

Default Rates and User input tables in the other sheets include land rehabilitation including the footprint of facilities and access directly associated with facilities², so the General Land Rehabilitation sheet does not need to capture such activities for these items. For example, the Default Rates for waste rock dumps includes grade and seed, and the User input table has entries for soil amendment and long-distance haul of materials (if required), so the General Land Rehabilitation sheet is not used for these items. Rather, the General Land Rehabilitation sheet is used for miscellaneous land areas that are not included in the other User Input Sheets. An example may be a rehabilitated pit that is known to require further land rehabilitation. This sheet can be used for all areas requiring any of the following:

- Land rehabilitation and repair of subsidence and land management
- Natural drainage and diversions
- General grade and rip
- General doze and rip
- Miscellaneous soil amelioration and seeding
- Bores
- Long distance carting of amendments
- Long distance carting of growth media
- Long distance carting of clay

There are separate tables for each of the above categories and each requires a variety of User inputs to allow the areas or volumes of material to be calculated, before this is multiplied by the Default Rates to give total cost.

Users may enter Alternative Rates and where this is done, justification for the proposed rate must be included in the space provided at the end of each table.

The long distance haul tables are for carting of materials from greater than 6 km of the intended use area for items not covered by the other User Input Sheets. The distance is selected from the drop-down menu (e.g. Error! Reference source not found.) which has increments extending up to 200 km (one-way). The User enters the mass of material required and this is multiplied by the distance and Default Rate to obtain the total cost for that area. The purchase price is separate to the transport cost, and this is shown in the adjacent column.

Long Distance Carting of Amendments									
#	Name of Area	Area to Amend	Amendment Treatment	Amendment Material	Default Amendment Rate	User Amendment Rate	Amendment Rate used in Calculations	Mass to Apply	Long Distance Haul of Amendment Treatment
		ha	Select from Dropdown		t/ha	t/ha	t/ha	t	km Select
1		100.00	Gypsum Normal Soil	Gypsum	2.50		2.50	250.00	150 to 200 km
2		100.00	Gypsum Sodic Soil	Gypsum	10.00		10.00	1000.00	20 to 25 km

Figure 37. Long distance haul of amendments

In the example below, the User can also specify an amendment rate (tonnes per hectare) of each amendment (**Figure 38**). If a User enters a site-specific rate they must provide justification to the department.

² Long / extended access roads are not included in facilities but can be included in the tracks and roads tables in the Infrastructure sheet

Long Distance Carting of Amendments									
#	Name of Area	Area to Amend	Amendment Treatment	Amendment Material	Default Amendment Rate	User Amendment Rate	Amendment Rate used in Calculations	Mass to Apply	Long Distance Haul of Amendment Treatment
		ha	Select from Dropdown		t/ha	t/ha	t/ha	t	km Select
1		100.00	Gypsum Normal Soil	Gypsum	2.50	5.00	5.00	500.00	150 to 200 km
2		100.00	Gypsum Sodic Soil	Gypsum	10.00	5.00	5.00	500.00	20 to 25 km

Figure 38. User amendment rate

Table A-13 of Appendix A shows the details for the General Land Rehabilitation User Input Sheet.

4.7.16 Mobilisation/Demobilisation and Additional User Items User Input Sheet

The Mobilisation and User Input Sheet allows entries for mobilisation/demobilisation and any additional site-specific items that do not have a space elsewhere in the Calculator.

Mobilisation and demobilisation is the process of transporting earthmoving machinery to the site for the rehabilitation work and transporting the machinery back to the supply centre. Typically, the supply centre for earthmoving equipment is a major centre such as Brisbane or Rockhampton. The mobilisation/demobilisation costs reflect the effort required for safe transport of earthmoving equipment which typically includes floats and convoys.

The Calculator includes mobilisation / demobilisation rates for small, medium, large, and truck/shovel fleets and in distance ranges of <=150 km, >150 km and <=500 km, > 500 km and <=1000 km and > 1000 km (Figure 39). The Default Rates allow for transport both ways and therefore the User should use the one-way distance (from supply centre to source) when determining the appropriate line to select. The Default Rates includes costs for utility and service vehicles to support the earthmoving equipment.

Mobilisation and Demobilisation			
TOV#	Description	Qty	Default Rate
#15.01	Mobilisation & Demobilisation - Small Fleet (<= 150 km)		\$ 130,000.00
#15.02	Mobilisation & Demobilisation - Small Fleet (> 150 km and <= 500 km)		\$ 238,500.00
#15.03	Mobilisation & Demobilisation - Small Fleet (> 500 km and <= 1000 km)		\$ 451,000.00
#15.04	Mobilisation & Demobilisation - Small Fleet (> 1000 km)		\$ 555,000.00
#15.05	Mobilisation & Demobilisation - Medium Fleet (<=150 km)		\$ 191,000.00
#15.06	Mobilisation & Demobilisation - Medium Fleet (> 150 km and <= 500 km)		\$ 350,000.00
#15.07	Mobilisation & Demobilisation - Medium Fleet (> 500 km and <= 1000 km)		\$ 661,500.00
#15.08	Mobilisation & Demobilisation - Medium Fleet (> 1000 km)		\$ 814,000.00
#15.09	Mobilisation & Demobilisation - Large Fleet (<= 150 km)		\$ 208,000.00
#15.10	Mobilisation & Demobilisation - Large Fleet (> 150 km and <= 500 km)		\$ 381,000.00
#15.11	Mobilisation & Demobilisation - Large Fleet (> 500 km and <= 1000 km)		\$ 720,500.00
#15.12	Mobilisation & Demobilisation - Large Fleet (> 1000 km)		\$ 887,000.00
#15.13	Mobilisation & Demobilisation - Truck/Shovel Fleet (<= 150 km)		\$ 275,000.00
#15.14	Mobilisation & Demobilisation - Truck/Shovel (> 150 km and <= 500 km)		\$ 483,500.00
#15.15	Mobilisation & Demobilisation - Truck/Shovel (> 500 km and <= 1000 km)		\$ 924,000.00
#15.16	Mobilisation & Demobilisation - Truck/Shovel Fleet (> 1000 km)		\$ 1,156,000.00

0

Figure 39. Mobilisation and Demobilisation Default Rates

The number of mobilisation / demobilisation units entered is dependent on the activities selected throughout the Calculator. Typically, the expectation is for only one entry with the fleet size reflecting the predominant size used through the calculation. For large projects, two entries may be required, for example a small fleet is sourced from a local centre and a large fleet is sourced from a major centre. The User should justify the distance and fleet size selected in the User Notes section of the Mobilisation and User sheet. Irrespective, at least one of these rates must be applied once for every submitted ERC. Error! Reference source not found. shows a typical example (with only one unit entered). This sheet requires only the input of quantities next to the appropriate line. If Alternate Rates are justifiable, they can be entered to the yellow cells with an explanation in the 'Justification for Alternate Rate' section of each line.

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Mobilisation and Demobilisation						
TOV#	Description	Qty	Default Rate	Alternate Rate	Total	Justification for Alternate Rate
#15.01	Mobilisation & Demobilisation - Small Fleet (<= 150 km)		\$ 130,000.00		\$ -	
#15.02	Mobilisation & Demobilisation - Small Fleet (> 150 km and <= 500 km)		\$ 238,500.00		\$ -	
#15.03	Mobilisation & Demobilisation - Small Fleet (> 500 km and <= 1000 km)	1	\$ 451,000.00		\$ 451,000.00	
#15.04	Mobilisation & Demobilisation - Small Fleet (> 1000 km)		\$ 555,000.00		\$ -	
#15.05	Mobilisation & Demobilisation - Medium Fleet (<=150 km)		\$ 191,000.00		\$ -	
#15.06	Mobilisation & Demobilisation - Medium Fleet (> 150 km and <= 500 km)		\$ 350,000.00		\$ -	
#15.07	Mobilisation & Demobilisation - Medium Fleet (> 500 km and <= 1000 km)		\$ 661,500.00		\$ -	
#15.08	Mobilisation & Demobilisation - Medium Fleet (> 1000 km)		\$ 814,000.00		\$ -	
#15.09	Mobilisation & Demobilisation - Large Fleet (<= 150 km)		\$ 208,000.00		\$ -	
#15.10	Mobilisation & Demobilisation - Large Fleet (> 150 km and <= 500 km)		\$ 381,000.00		\$ -	
#15.11	Mobilisation & Demobilisation - Large Fleet (> 500 km and <= 1000 km)		\$ 720,500.00		\$ -	
#15.12	Mobilisation & Demobilisation - Large Fleet (> 1000 km)		\$ 887,000.00		\$ -	
#15.13	Mobilisation & Demobilisation - Truck/Shovel Fleet (<= 150 km)		\$ 275,000.00		\$ -	
#15.14	Mobilisation & Demobilisation - Truck/Shovel (> 150 km and <= 500 km)		\$ 483,500.00		\$ -	
#15.15	Mobilisation & Demobilisation - Truck/Shovel (> 500 km and <= 1000 km)		\$ 924,000.00		\$ -	
#15.16	Mobilisation & Demobilisation - Truck/Shovel Fleet (> 1000 km)		\$ 1,156,000.00		\$ -	
		1			\$ 451,000.00	

Figure 40. Mobilisation and Demobilisation example

For small projects (total ERC < \$1,000,000 before mobilisation costs), the User may choose to apply mobilisation and demobilisation costs by using the 10% flat rate option contained on the Summary sheet. The User can choose this option by entering a '1' into the line 'Mobilisation & Demobilisation – small projects' (Figure 41) in the Summary sheet. Using this function will apply mobilisation and demobilisation costs of 10% of the pre-mobilisation and multipliers amount. If using this approach, the User should not enter quantities into the Mobilisation sheet.

15. Mobilisation / Demobilisation and Additional User Items				
Mobilisation & Demobilisation - Small Fleet	0		mobes	\$0 \$ -
Mobilisation & Demobilisation - Medium Fleet	0		mobes	\$0 \$ -
Mobilisation & Demobilisation - Large Fleet	0		mobes	\$0 \$ -
Mobilisation & Demobilisation - Truck/Shovel Fleet	0		mobes	\$0 \$ -
Mobilisation & Demobilisation - Small Projects			mobes	\$0 \$ -
<i>If total ERC is < A\$1M before PM, M&M, contingency and mobe, user can elect to select items (10% applied as mobe)</i>				
				\$ -

Figure 41. Mobilisation and Demobilisation—Small projects

The Additional Items table allows space for the User to enter items which do not have a place elsewhere in the Calculator. The costs calculated in the Additional Items table will contribute to the total cost and flow through to the Summary sheet. All items entered to this table need to be justified in the 'Comments' space provided at the end of the table (Figure 42).

Additional Items						
#	User Description	Qty	Unit	Rate	Total	Comments
1					\$ -	
2					\$ -	
3					\$ -	
4					\$ -	
5					\$ -	
6					\$ -	
7					\$ -	
8					\$ -	

Figure 42. Additional Items Table

Table A-14 of Appendix A shows the details for the Mobilisation/Demobilisation and Additional User Items User Input Sheet

4.7.17 User Input Sheet

The User Input Sheet allows for Users to enter free text data, which may include granular disturbance quantities and other miscellaneous supporting information (Figure 43).

The values entered to this sheet are **not** linked through the workbook, and the User must ensure all disturbance values are separately entered into the relevant sheets.

This sheet and the associated 'User Notes' box can be used to communicate to the department where and why any disturbance areas are different between the ERC and the Progressive Rehabilitation and Closure Plan or EA.

for some dozers. If a User selects an incompatible dozer an error 'E' will be reported in the associated rate. The User must select a larger dozer or reduce the push length.

4.11 Lists sheet

Lookup formulas, drop-down menus and pre-populated fields are used throughout the Calculator. The Lists sheet is a simple, unformatted location where the lists required to make the Calculator work are stored. The Lists sheet is locked and there is no User input required as it is for functional purposes only.

5 Information on rates

5.1 Bottom-up, first principles calculation method

The unit rates for an activity are constructed using ‘bottom-up, first-principles’ whereby costs for relatively complex activities are built starting from basic singular values such as cost (\$) per hour for machinery hour and productivity of that machinery. The build of unit rates is illustrated in

Figure 45.

The bottom-up, first principles method is generally:

- A scope for an activity is defined.
- Productivity values are used to estimate the time an activity may take.
- The time is multiplied by an hourly rate (encompassing labour and equipment rates) to obtain a cost for that activity.

Labour costs, equipment costs and productivity rates are the most fundamental values (base rates) underpinning the unit rates and these are discussed further below.

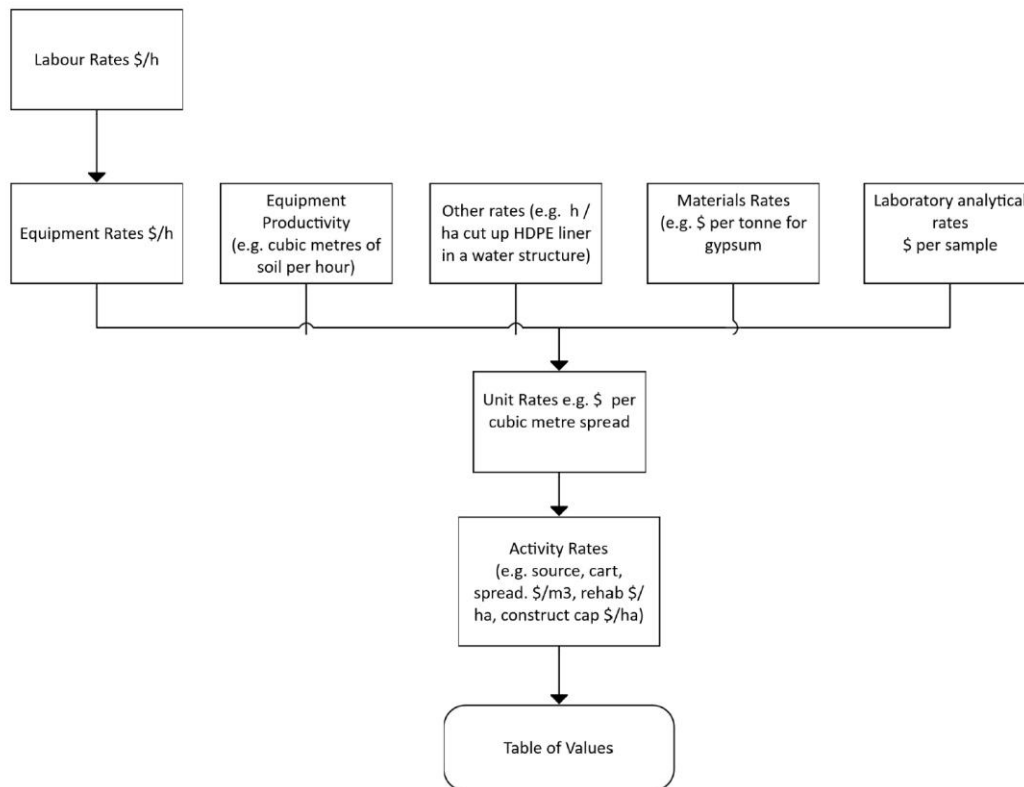


Figure 45. Inputs to Table of Values (Build-up of unit rates)

5.2 Labour Costs

The Labour costs (e.g. cost per hour for equipment operator) are calculated by adding the following allowance to a base rate:

- Annual leave
- Long service leave
- Paid notice

- Severance/retrenchment
- Payroll tax
- Workers' compensation
- Superannuation
- Profit
- Operating hour proportion.

5.3 Equipment costs

The Equipment costs (e.g. cost per hour for an excavator) are built assuming:

- The capital (ownership) cost of new equipment is depreciated over a much longer life within the Calculator than what it is likely for used equipment.
- The new equipment would be depreciated (and used) over several contracts by a typical earthmoving contractor unless they are long term contracts.
- Operating time of 3,723 hours per year for closure works.

The new equipment ownership (depreciation) rates per hour are anticipated to be similar to depreciation rates a contractor would apply to a standard earthmoving contract based on the typical age of used equipment proposed for the contract.

The following depreciation periods for new equipment are used in the Calculator rates:

- Dozers 35,000 hours
- Graders 55,000 hours
- Excavators 54,000 hours
- Front end loaders (FEL) 35,000 hours
- Haul trucks 75,000 hours.

The Equipment costs are calculated by adding the following allowance to a base rate:

- Rolled-up labour cost as described above.
- Fuel is a set price per litre. The fuel cost per hour is calculated using fuel consumption rates from the Caterpillar™ manual.
- Preventative maintenance and wear.
- Contractor profit and administration of 16%.

5.4 Productivity

Productivity (e.g. cubic metres of soil a dozer can push over a specific length range) defines the performance capability of a machine or equipment and is used to estimate the time an activity may take so that an hourly rate can be applied to obtain a cost for that activity. Productivity rates are generally sourced from the Caterpillar™ earthmoving manual.

5.5 Scope and unit rates

The scope for a unit rate is the sequence of events or activities (which can be thought of as sub-activities) required to be undertaken to complete an Activity. For example, sourcing rock to fill a void comprises loading the rock, transporting the rock, and placing the rock. Each activity has a unit rate, and these are summed to obtain the unit rate for the activity.

Depending on the complexity of the activity, unit rates are either a rate in the TOV (or Default Rate) directly or are combined with other unit rates to form a rate in the TOV. Instructions on appropriate application of each rate in the TOV are included in the 'Use' and 'Scope and Key Assumptions' columns in the TOV sheet.

The scope for each activity was developed by engineers with mine closure and engineering cost estimation experience ranging from 20 to over 35 years. The base costs (e.g. cost per hour for an excavator) are based on contemporary third-party rates.

5.6 Alternate Rates

Users must review all Default Rates and ensure they are applicable to their site conditions. If not, they can specify an Alternate Rate and insert this rate into the Calculator. Alternate Rates and additional items include third-party quotes or contracted rates.

Third-party quotes or contracted rates used in the Calculator must meet the requirements in the ERC guideline (ESR/2018/4425).

Users must provide justification for any Alternate Rates or additional items provided in the Calculator.

5.7 Contractor rate inclusions

The contractor rates (e.g. \$/h for an excavator) that form the basis of the unit rates include built-in allowances for:

- Health and safety plans and personnel protective equipment.
- Passenger vehicles / utilities for crew, support staff (e.g. fitters) and supervisors.
- Service vehicles for fuelling, oiling and greasing primary machinery.
- Ancillary equipment such as power generators, air compressors and hoses, lighting units.
- Signage and fencing.
- Consumables including fuel, oils and greases, other consumables.
- Maintenance personnel and tools.
- Temporary accommodation camps, workshops, offices and stores and equipment and consumables therein.

6 Focus items

6.1 Capping of waste rock dumps, heap leach pads and tailings storage facilities

Both the default and User defined options for waste structures consider the following capping features:

- A working rock layer over the waste to provide a stable surface for the cap. Note: a working layer is not required for waste rock dumps or heap leach pads.
- Capillary break layer to mitigate salt uptake into the vegetation surface.
- Low permeability layer (typically clay) to prevent infiltration of surface water into the waste.
- Growth media (typically topsoil) and vegetation.

The key entry for review by the department is the 'Risk Category' selected by the User, which should reflect the risk the element poses to the environment. The User should provide notes to inform the department of the rationale behind the selection and **Table 4** provides a guide for the characteristics of waste rock, heap leach and tailings for each category.

All waste structures containing potentially acid forming (PAF) materials should be considered high risk. Medium risk should relate to other issues, e.g. salinity / sodic materials that might impact on end land use / vegetation covers or seepage issues (TSF) that may impact on the external environment. The capillary breaks and 1.0 m or greater rock covers included in the Calculator (**Table 5**) are assumed to control those issues.

An option to include a low permeability layer on a medium risk facility is included for those circumstances where the operator considers it necessary. However, where it is used, the operator must demonstrate that none of the high-risk triggers are met.

Table 4. Risk category characteristics

Risk category	Waste rock dumps	Heap leach pads	Tailings storage facilities
High Select this category if the waste structure has one or more of the following characteristics:	Potentially acid forming waste rock materials (PAF). Other highly reactive materials including (acid rock drainage (ARD) / acid mine drainage (AMD) / neutral mine drainage (NMD)). Observed contaminated seepage (PAF) capable of causing environmental harm.	Potentially acid forming heap leach materials (PAF). Other highly reactive materials including (ARD/AMD/NMD). Observed contaminated seepage (PAF) capable of causing environmental harm.	Potentially acid forming tailings materials (PAF). Other highly reactive materials including (ARD/AMD/NMD). Poor consolidation and low shear strength tails materials. Requiring composite liners (e.g. HDPE) Embankments > 30 metres high. Observed contaminated seepage (PAF) capable of causing environmental harm.
Medium with low permeability layer	Waste rock material that could adversely impact on the proposed end land use and/or vegetation function if salinity or materials are exposed, e.g., hypersaline / sodic materials, highly dispersive clay materials. Significant (non-PAF) seepage capable of causing environmental harm.	Heap leach materials that could adversely impact on the proposed end land use and/or vegetation eco-function if salinity or materials are exposed, e.g., hypersaline / sodic materials, highly dispersive clay materials. Significant (non-PAF) seepage capable of causing environmental harm.	Tailings materials that could impact on the proposed end land use and/or vegetation eco-function if salinity or materials are exposed, e.g., hypersaline / sodic materials, highly dispersive clay materials. Low strength consolidated tailings embankments 15 to 30 m high.

Risk category	Waste rock dumps	Heap leach pads	Tailings storage facilities
	Located in high rainfall area.	Located in high rainfall area.	Significant (non-PAF) seepage capable of causing environmental harm. Located in high rainfall area.
Medium	Waste rock material that could adversely impact on the proposed end land use and/or vegetation function if salinity or materials are exposed, e.g., hypersaline / sodic materials, highly dispersive clay materials. Seepage (non-PAF) capable of causing environmental harm.	Heap leach materials that could adversely impact on the proposed end land use and/or vegetation eco-function if salinity or materials are exposed, e.g., hypersaline / sodic materials, highly dispersive clay materials. Seepage (non-PAF) capable of causing environmental harm.	Tailing's materials that could impact on the proposed end land use and/or vegetation eco-function if salinity or materials are exposed, e.g., hypersaline / sodic materials, highly dispersive clay materials. Low strength consolidated tailings embankments 15 to 30 m high. Seepage (non-PAF) capable of causing environmental harm.
Low	Waste rock material that may have some impact on the proposed end land use and/or vegetation cover Minor (non-PAF) seepage.	Heap leach material that may have some impact on the proposed end land use and/or vegetation cover Minor (non-PAF) seepage.	Moderate strength consolidated tailings. Tailing's material that may have some impact on the proposed end land use and/or vegetation cover. Embankments less than 15 m high. Minor (non-PAF) seepage.
Very low	Benign waste rock materials Minor (non-PAF) seepage.	Benign heap leach materials Minor (non-PAF) seepage.	No likely impacts on the proposed end land use and/or vegetation covers. Moderate strength consolidated tailings Embankments less than 15 m high. Minor (non-PAF) seepage.

An allowance for engineering and design of waste rock dumps, heap leach pads and tailings storage facilities is included in the default and User defined rates. The very low risk category includes only costs for supervision/survey. The low risk includes costs for supervision and limited engineering to confirm the absence of hazards in the material.

The engineering costs and default minimum thicknesses of each cap item are shown in **Table 5**.

Table 5. Capping engineering cost and default minimum thicknesses

Risk category	Waste rock dumps	Heap leach pads	Tailings storage facilities
High	Engineering \$2,000/ha Working layer 0 m Capillary break 0.6 m Low permeability layer 0.5 m Top Rock Layer 1.5 m	Engineering \$2,000/ha Working layer 0 m Capillary break 0.6 m Low permeability layer 0.5 m Top Rock Layer 1.5 m	Engineering \$2,000/ha Working layer 0.5 m Capillary break 0.6 m Low permeability layer 0.5 m Top Rock Layer 1.5 m
Medium	Engineering \$2,000/ha Working layer 0 m Capillary break 0.3 m Low permeability layer 0 m	Engineering \$2,000/ha Working layer 0 m Capillary break 0.3 m Low permeability layer 0 m	Engineering \$2,000/ha Working layer 0.5 m Capillary break 0.3 m Low permeability layer 0 m

Risk category	Waste rock dumps	Heap leach pads	Tailings storage facilities
	Top Rock Layer 1.0 m	Top Rock Layer 1.0 m	Top Rock Layer 1.0 m
Low	Engineering \$1,500/ha Working layer 0 m Capillary break 0 m Low permeability layer 0 m Top Rock Layer 0.5 m	Engineering \$1,500/ha Working layer 0 m Capillary break 0 m Low permeability layer 0 m Top Rock Layer 0.5 m	Engineering \$1,500/ha Working layer 0 m Capillary break 0 m Low permeability layer 0 m Top Rock Layer 1 m
Very low	Supervision / survey \$500/ha Working layer 0 m Capillary break 0 m Low permeability layer 0 m Top Rock Layer 0 m	Supervision / survey \$500/ha Working layer 0 m Capillary break 0 m Low permeability layer 0 m Top Rock Layer 0 m	Supervision / survey \$500/ha Working layer 0 m Capillary break 0 m Low permeability layer 0 m Top Rock Layer 0 m

The default thickness for growth media is 0.15 m for all cases.

A worked example illustrating how to calculate the cost of capping of a waste rock dump using the default and User defined options is shown in the **Worked examples**

The worked examples below provide an overview of the concepts used throughout the Calculator. The training modules provide further examples of use.

section.

The User can enter capping thicknesses less than those defined in **Table 5**. However, where this occurs, the item is picked up by the Capping Alert sheet and the User must provide justification for their proposed rate in the Capping Alert sheet (**Figure 46**).

Figure 46. Capping Alert sheet, User justification for capping alert

6.2 Seeding options

There are three options for revegetation (seeding) – pasture, native and arid. Arid can be selected for areas meeting the definition (**Table 8**). Pasture should be used where the land will be returned to agricultural use. Native should be used where the land will be returned to bushland, forest, or similar.

Arid should only be used where activities are in regions where the land is desert. The costs associated with arid do not include growth media or seeding as the land is assumed to remain desert.

The rolled-up rates generally include seeding. If seeding is not included, it is specifically stated in the rate scope.

The General Land Rehabilitation sheet includes additional rows to cover re-vegetation of land not covered by the other sheets. Such occurrences are likely rare and may include land where preliminary work (e.g. clearing) for an activity was undertaken but the activity did not go ahead. If an area covers both native and pasture land, the User must input values to both columns (**Figure 47**).

Direct seeding / fertiliser (pasture grass species)	Direct seeding / fertiliser (native tree/shrub/grass species)
ha	ha

Figure 47. Pasture and native entries

6.3 Haulage distances

Haulage distances are the one-way distance to/from a source of material (e.g. gypsum) or to an end-use / disposal location (e.g. void for rock placement).

6.4 Fleets and mobilisation

The User can select from a range of fleet sizes for various activities through the User Input Sheets. The selection is made from a drop-down menu. The fleet size selected depends on the activity being undertaken and the quantity of material to be moved and **Table 6** provides an indication of the types of activities for different fleet sizes. Some activities are limited in the fleet size selection. For example, truck/shovel is not an option for tailings storage facility rehabilitation due to the potential softness of the tailings.

For larger projects, economies of scale can be realised by using larger fleets because the productivity of larger equipment outpaces the increase in unit cost.

Table 6. Fleet sizes for various activities

Fleet size	Typical composition	Activities
Small	740C Articulated Dump Trucks (ADT) 980M Loader 14M Grader 19kL Water truck X 1 30kL Water truck D8 Dozer Dozer D10 Dozer 374 Excavator 14M Grader D65 Blast hole drill rig Service truck Light vehicles	Load, haul and spread topsoil and other growth media materials. Load, haul and dump bitumen, stabilised materials, demolition rubble and concrete. Load, haul, dump spread fill (small scale) - waste rock landforms, spoil piles, roadways, contaminated soil footprints, ponds, dams, shallow voids, in-pit and other tailings storage facilities and other fill areas – volumes of materials up to 1.0M m ³ . Excavate, load, haul, dump and spread water storage sediment and silt
Medium	740C ADT 777G Truck PC 1250 Excavator 16M Grader 777 Water Truck 19kL Water truck	Load, haul, dump spread fill (medium scale) - waste rock landforms, spoil piles, roadways, contaminated soil footprints, ponds, dams, shallow voids, in-pit and other tailings storage facilities and other fill areas – volumes of materials up to 5.0M m ³ .

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Fleet size	Typical composition	Activities
	D10T Dozer D11 Dozer PC1250 Excavator 16M Grader 14M Grader 992 FEL 980 FEL D65 Blast hole drill rig Service truck Light vehicles	
Large	740C ADT 793F Truck EX2500 Excavator 16M Grader 14M Grader 785D Water truck 19kL Water truck D11T Dozer D10 Dozer 992 FEL 980 FEL D65 Blast hole drill rig Service truck Light vehicles	Load, haul, dump spread bulk material including fill - waste rock landforms, spoil piles, roadways, contaminated soil footprints, ponds, dams, shallow voids, in-pit and other tailings storage facilities and other fill areas – volumes of materials up to 10M m ³ .
Truck/shovel	740C ADT 797F Truck CAT 6090 Hydraulic shovel 16M Grader 785D Water truck 777 Water truck 19kL Water truck D11T Dozer D10 Dozer 16M Grader 14M Grader 992 FEL 980 FEL D65 Blast hole drill rig Service truck Light vehicles	Source, load, haul, dump spread overburden for pit backfill and recontouring – waste rock landforms, spoil piles, stockpiles, run of mine pads, heap leach piles, tailings storage facilities - source local material, cart and spread to cap and/or cover.
Small dozers	D6R or D7R	Push / rip lengths <= 100 m. Clear vegetation. Low height waste dumps and spoil dumps, tailings storage facility embankment slope re-profiling and shaping.
Medium dozers	D8R	Push / rip lengths <= 250 m. Clear vegetation. Waste dump, spoil dump, tailings storage facility embankment slope re-profiling and shaping.

Fleet size	Typical composition	Activities
		Shape and doze to establish drainage, spread cover / topsoil / rock mulch layer slopes and flats. Capping of waste rock dumps, heap leach pads and tailings storage facilities.
Large dozer	D9R, D10T or D11T	Bulk Push / rip lengths <= 500 m. Waste dump, spoil dump, tailings storage facility embankment slope re-profiling and shaping. Shape and doze to establish drainage, spread cover/topsoil/rock mulch layer slopes and flats. Capping of waste rock dumps, heap leach pads and tailings storage facilities.
Small grader	12M	Rip/grade to match fleet activities.
Medium grader	14M	Rip/grade to match fleet activities.
Large grader	16M	Rip/grade to match fleet activities.

The Default Rates for mobilisation are based on round trip (mobilisation and demobilisation) with the selection categories based on the one-way distance from the source of most of the equipment to the site. The selection categories for distance are <= 150 km, >150 to <= 500 km, >500 to <= 1000 km, and > 1000 km. In practice, equipment may come from several sources with lighter equipment typically easier to source close to the site. However, the User makes a judgement based on the average distance from which equipment will be sourced. As an example, if the source of equipment is deemed to be a major centre located 280 km from the site, the User selects the > 150 to 500 km category as this is the one-way distance from the source of equipment to the site.

For each distance category there are fleet size selections – small, medium, large and truck/shovel. The fleet size composition is dictated by the size and number of equipment. In practice, the fleet make-up may comprise equipment from various sizes. However, the User selects a fleet size based on an assessment of what will reasonably be required to rehabilitate the site. The appropriate fleet size will be informed by entries for fleet sizes in the User Input Sheets with reference to **Table 6**. If a User makes extensive use of the large or truck/shovel fleets in their calculations, the corresponding mobilisation category should be selected.

Table 7 shows the number of each equipment type allowed for in the mobilisation costs. As can be seen, there is a large array of equipment included and this is why the intent is that only one mobilisation quantity is required in the ERC calculation.

Table 7. Equipment included in mobilisation

Item	Indicative model	Small	Medium	Large	Truck/shovel
Haul truck	Cat 740C (ADT)	3	3	3	3
Haul truck	Cat 793	0	0	4	0
Haul truck	Cat 777	0	3	0	0
Haul truck	Cat 797	0	0	0	4
Water truck	Cat 777	0	2	0	1
Water truck	Cat 785	0	0	2	2
Water truck	19 kL	1	1	1	1
Water truck	30 kL	1	0	0	0
Dozer	Cat D8	1	0	0	0
Dozer	Cat D9	3	0	0	0
Dozer	Cat D10	1	2	2	1

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Item	Indicative model	Small	Medium	Large	Truck/ shovel
Dozer	Cat D11	0	2	2	2
Shovel	Cat 6090	0	0	0	1
Excavator	Cat 374	1	0	0	0
Excavator	PC1250	0	1	0	0
Excavator	EX2500	0	0	1	0
Grader	14M	2	1	1	1
Grader	16M	0	1	1	1
Front end loader	Cat 980	1	1	1	1
Front end loader	Cat 992	0	1	1	1
Drill rig	Atlas Copco D65	1	1	1	1
Service truck		2	3	4	4
Light vehicles		10	10	12	12
Other ancillary		10	10	12	12
	Total #	37	42	48	48

7 Worked examples

The worked examples below provide an overview of the concepts used throughout the Calculator. The training modules provide further examples of use.

7.1 Seismic easements

To calculate the cost for rehabilitation of seismic easements, the User has the option to use either the (by length) or (by area) tables in the Exploration User Input Sheet. Within the table, rehabilitation is split by land type. There are line items for pasture, native and arid land. Whichever table is used, the following steps should be completed:

1. Enter the length or area of easement in each land type (pasture, native, and/or arid).

Seismic, Grid-Lines, Minor Tracks (by length)		5%				
Map ID	Land type	Total Length	Rehab Length - Default	Rehab Length - User Entered*	Rehab Length Used	Unit
	Seismic corridor, grid-lines, minor tracks rehabilitation in pasture land	10.00	0.50		0.50	km
	Seismic corridor, grid-lines, minor tracks rehabilitation in native land	5.00	0.25		0.25	km
	Seismic corridor, grid-lines, minor tracks rehabilitation in arid land	-	-		-	km

2. The Calculator multiplies the User Entered length by a default 5% to calculate the length of easement to be rehabilitated. If the User determines 5% is not correct for the site, the User enters the easement length to be rehabilitated. The screen shot below shows the calculated 0.5 km length over-written by the User Entered 1.0 km.

Seismic, Grid-Lines, Minor Tracks (by length)		5%				
Map ID	Land type	Total Length	Rehab Length - Default	Rehab Length - User Entered*	Rehab Length Used	Unit
	Seismic corridor, grid-lines, minor tracks rehabilitation in pasture land	10.00	0.50	1.00	1.00	km
	Seismic corridor, grid-lines, minor tracks rehabilitation in native land	5.00	0.25		0.25	km
	Seismic corridor, grid-lines, minor tracks rehabilitation in arid land	-	-		-	km

3. The length is multiplied by the rate for pasture, native, or arid land to obtain a total cost for that disturbance.

Rehab Length Used	Unit	TOV#	Default Rate	Alternate Rate (\$/unit)	Total
1.00	km	#2.01	\$ 1,006.18		\$ 1,006.18
0.25	km	#2.02	\$ 1,895.53		\$ 473.88
-	km	#2.03	\$ 426.76		\$ -

4. The total easement length (15 km in this example) and the total length to be rehabilitated (1.25 km in this example) are reported as below.

Total Length	Rehab Length - Default	Rehab Length - User Entered*	Rehab Length Used	Unit
10.00	0.50	1.00	1.00	km
5.00	0.25		0.25	km
-	-		-	km
-	-		-	km
15.00	0.75	1.00	1.25	km

- The total cost for each individual disturbance and total for all the seismic disturbances are reported as shown below.

TOV#	Default Rate	Alternate Rate (\$/unit)	Total
#2.01	\$ 1,006.18		\$ 1,006.18
#2.02	\$ 1,895.53		\$ 473.88
#2.03	\$ 426.76		\$ -
	No alert		\$ -
	No alert		\$ -
			\$ 1,480.06

- If required, the User can enter an Alternate Rate and provide justification in the 'Justification for Alternate Rate' box which will turn pink.

TOV#	Default Rate	Alternate Rate (\$/unit)	Total	Justification for Alternate Rate
#2.01	\$ 1,006.18	\$157.00	\$ 157.00	
#2.02	\$ 1,895.53		\$ 473.88	
#2.03	\$ 426.76		\$ -	

- As with the other User Input Sheets, the User can enter site-specific entries at the bottom of the table.

Seismic, Grid-Lines, Minor Tracks (by length)		5%							
Land type	Total Length	Rehab Length - Default	Rehab Length - User Entered*	Rehab Length Used	Unit	TOV#	Default Rate	Alternate Rate (\$/unit)	Total
Seismic corridor, grid-lines, minor tracks rehabilitation in pasture land	10.00	0.50	1.00	1.00	km	#2.01	\$ 1,006.18	\$157.00	\$ 157.00
Seismic corridor, grid-lines, minor tracks rehabilitation in native land	5.00	0.25		0.25	km	#2.02	\$ 1,895.53		\$ 473.88
Seismic for area X	10.00	0.50		0.50	km			No alert	\$380.00

7.2 User defined roads in Infrastructure User Input Sheet

To calculate the cost for rehabilitation of a road, the User should follow the steps below.

- Enter the name of the road (or group of roads) and the length of the road (or total length of the group of roads). Enter the width of the road or leave this cell blank. If the User leaves the cell blank, the default quantity (6.0 m in this example) is used in the calculation.

Top		Access Roads / Tracks (User defined by length)			ROAD DIMENSIONS AND COVER	
Map ID	#	Road / Track Name		Road/Track Width (m)	Total Length (km)	
	1					
	2					
	3					

- Select the surface covering of the road from the drop-down menu. The total length defaults to the next column 'Length of Road surface covering to be removed or ripped', though the User can enter a site-specific length with justification.

ROAD DIMENSIONS AND COVER			REMOVAL OF COVER
Road/Track Width (m)	Total Length (km)	Type of Surface Covering	Length of Road surface covering to be removed or ripped (if earthen) (km)
		Select from dropdown	
		Earthen	-
		Earthen	-
		Gravel	-
		Rock	-
		Bitumen	-
		Earthen	-

- The User can enter a thickness for the surface covering or accept the defaults (by leaving the cells blank). The defaults reference the surface covering selected in the previous step. The Calculator calculates the volume of material to remove (900 m³ for the gravel road in the example below).

Total Length (km)	Type of Surface Covering	Length of Road surface covering to be removed or ripped (if earthen) (km)	User Thickness of surface covering (mm)	Surface covering thickness used in calculations (mm)	Volume of surface covering to remove (m3)
	Select from dropdown				
1.00	Earthen	1.00		0	-
1.00	Gravel	1.00		150	900.00
1.00	Rock	1.00		150	900.00
1.00	Bitumen	1.00		150	900.00

- The next section for replacement of surface covering is optional and the User should only enter information if required. Examples of where this may occur are
 - the road was to be retained but contaminated material had to be removed or
 - the road was earthen but the agreement with the landowner is to install a hardstand road.

If no value is entered, the default length of surface covering to replace is 0 km. The User must enter a value if material is to be replaced (first line in the example below). A default thickness will be used to calculate the volume of cover to be replaced unless the User specifies an alternate thickness.

REPLACEMENT OF COVER (IF APPLICABLE)			GROWTH MEDIA AND VEGETATION	
Length of road to replace rock (km)	Thickness of rock to replace (mm)	Volume of rock to replace (m3)	Length of track / bare road to rip, grade, seed (km)	Area of track / bare road to rip, grade, seed (ha)
1.00		900,000.00	-	-
		-	1.00	0.60

- Grade and seed are calculated in a similar manner to other domains. The default area to seed is the total length by the width of the road. However, the User may enter a site-specific growth media thickness or growth media volume and/or a site-specific area for seeding. The default seed type is 100% pasture, but the User can alter this by reducing the percentage. If the User

User Guide for Estimated Rehabilitation Cost Calculator for Mining

leaves the 'Proportion Native Land' cell blank, the default setting will add 'Proportion Arid Land' to make up 100%. In the example below, line one shows 100% pasture land, line two shows 80% pasture and the 20% arid land and line three shows 80% pasture and 20% native land.

GROWTH MEDIA AND VEGETATION										
Length of track / bare road to rip, grade, seed (km)	Area of track / bare road to rip, grade, seed (ha)	Area for topsoil (ha)	User Growth Media Thickness (mm)	User growth media volume (m3)	Growth media volume used in calculations (m3)	Area of seeding required (ha)	Proportion Pasture Land (%)	Proportion Native Land (%)	Proportion Arid Land (%)	Alert (if land types do not equal 100%)
1.00	0.60	0.60			900.00	0.60	100%		0%	No Alert
1.00	0.60	0.60			900.00	0.60	80%		20%	No Alert
1.00	0.60	0.60			900.00	0.60	80%	20%	0%	No Alert

6. From the drop-down menus, the User selects the fleet size and haul distance for the following:
 - a) Removed surface material
 - b) Return rock
 - c) Growth media.

FLEET SELECTIONS					
Haul distance for removed surface material (m)	Fleet Size for Removed Surface Material	Haul Distance for return rock (m)	Fleet Size for Returned Rock	Haul Distance for Growth Media (m)	Fleet Size for Growth Media
Select from dropdown	Select from dropdown	Select from dropdown	Select from dropdown	Select from dropdown	Select from dropdown
>2500 m to <=3000 m	Small Fleet 1	>2500 m to <=3000 m	Small Fleet 3	>2500 m to <=3000 m	Small Fleet 1
>2500 m to <=3000 m	Small Fleet 1	>2500 m to <=3000 m	Small Fleet 3	>2500 m to <=3000 m	Small Fleet 1
>2500 m to <=3000 m	Small Fleet 1	>2500 m to <=3000 m	Small Fleet 3	>2500 m to <=3000 m	Small Fleet 1

7. The Calculator multiplies the appropriate Default Rate for haulage by the volume to haul to calculate the total cost for removal. The User may also enter an Alternate Rate for 'Rip Road and Grade' and provide justification in the corresponding 'Justification for Unit Rates' cell at the end of the table.

	<i>No Alert</i>
TOV#:	#3.134
Rate	\$400.16
Alternate Rate	[Empty Cell]
Unit:	(ha)

BTOTALS		
Cost to remove surface covering (\$)	Cost to rip road / track and grade and replace growth media / seed for adjacent feature	Cost for Growth if required to be imported from away
1 226 €	240 €	

- The Calculator uses the Default Rates for seeding of pasture and native areas, however the User may also enter an Alternate Rate and must provide justification in the corresponding 'Justification for Alternate Rates' cell at the end of the table.

	Rate #	Default Rate	Alternate Rate	
Pasture	#14.40	\$ 1,655.50		No Alert
Native	#14.41	\$ 4,196.50		No Alert

	(ha)			
Growth Media to be imported from further away		Cost to replace rock (\$)	Cost for Seeding (\$)	Total Cost (\$)
	4,326	\$ -	\$ 993	\$ 9,884.96
	4,326	\$ -	\$ 795	\$ 9,686.30

- The Calculator sums all the totals described above to calculate the total cost for the line item.

SUBTOTALS						
Cost to remove surface covering (\$)	Cost to rip road / track and grade and replace growth media / seed for adjacent feature	Cost for Growth Media if required to be imported from further away	Cost to replace rock (\$)	Cost for Seeding (\$)	Total Cost (\$)	Justification for Alternate Rates
\$ 4,326	\$ 240	\$ 4,326	\$ -	\$ 993	\$ 9,884.96	
\$ 4,326	\$ 240	\$ 4,326	\$ -	\$ 795	\$ 9,686.30	

7.3 Default Rates for waste rock dumps

To calculate the cost for capping a waste rock dump using the Default Rate option, follow the steps below. The process for waste rock dumps is similar for heap leach pads and tailings storage facilities.

- Enter the name or identifying reference for the element (e.g. Waste Rock Dump East) into the 'Waste Rock Dump Name' column.
- Enter the total footprint area (ha) of the element into the 'Area (ha)' column.
- Select the 'Risk Category' from the drop-down menu.

The selected risk category references a 'Default Rate (\$/ha)' from the TOV. This is multiplied by the total footprint area to calculate the total cost for the element.

Waste Rock Dumps (Defaults)								
#	Waste Rock Dump Name	Area (ha)	Risk Category*	TOV #	Default Rate (\$/ha)	Alternate Rate (\$/ha)	Total cost for WRD (\$)	Alternate Rate Justification
1	Waste rock dump east	0.50	High Risk	#7.01	\$ 167,262.75		\$ 83,631.38	

- If required, the User can enter an Alternate Rate in the yellow 'Alternate Rate (\$/ha)' column. In this event, the Calculator uses the Alternate Rate over the Default Rate and the Alternate Rate cell turns red (see below) to alert the department.

If the User enters an Alternate Rate, the User must provide justification in the corresponding 'Alternate Rate Justification' cell at the end of the table.

Default Rate (\$/ha)	Alternate Rate (\$/ha)	Total cost for WRD (\$)	Alternate Rate Justification
\$ 167,262.75	\$50,000.00	\$ 25,000.00	

7.4 User defined rates for waste rock dumps, overburden dumps, spoil piles and stockpiles

To calculate the cost for capping a waste rock dump using the User defined rates option, follow the below steps:

Dimensions

1. Enter the name or identifying reference for the element (e.g. Waste Rock Dump East).
2. Enter the total footprint area (ha) of the element.
3. select the risk category from the drop-down menu.
4. Enter the flat area (ha) of the element (defaults to the total footprint area).
5. Enter the average doze thickness for soil to push during re-shaping of flat area.
6. Enter the sloped area (ha) of the element.
7. Enter the average doze thickness for soil to push during re-shaping of sloped area.
8. Enter the ramps area (ha) of the element.

Waste Rock Dumps (User)		WASTE ROCK DUMP DIMENSIONS AND DETAILS						
#	Name	Total Footprint area of WRD (ha)*	Risk Category (select from dropdown)	Rehabilitation of flat areas (tops, benches, berms etc) area (ha)*	Average doze thickness flat areas (m)*	Rehabilitation of slope/batter areas (ha)*	Average doze thickness slope areas (m)*	Rehabilitation of WRD access ramps (ha)*
			Select from dropdown					
1			High Risk	-				
2			High Risk	-				
3			High Risk	-				

Re-shape and doze

9. Select the target slope angle for the re-profiled surface. This selection determines which push rate to apply.
10. The User can enter the volume of material to push (for the flat and the slopes) if they have this information, otherwise that cell is left blank and the calculation accepted.
11. The Calculator then multiplies the unit rates by the quantities to calculate the total cost for re-shaping of the flat and sloped (including ramps) areas.

WASTE ROCK DUMP RESHAPE AND DOZE						
Reprofiled slope angle*	User entered volume to push on flat surfaces (m3)*	Volume to push on flat surfaces used in calculations (m3)	User volume to push slopes (m3)*	Volume to push slopes used in calculations (m3)	Reshape Length of Dozer Push	Fleet for Reshape
Select from dropdown					Select from dropdown	Select from dropdown
>8.5<=14 degrees		-		-	> 100m to <= 125m push	D6R Dozer
>8.5<=14 degrees		-		-	> 100m to <= 125m push	D6R Dozer
>8.5<=14 degrees		-		-	> 100m to <= 125m push	D6R Dozer

12. The User must then select length of push and fleet required. If the selected dozer is too small for the length of push, a 'Dozer too small' message will appear in the rate column, and an 'E' for error will show in the cost column as seen below. This will also cause a value error for the User Input Sheet total and be reflected as an error in the Capping Alerts sheet.

Reshape Length of Dozer Push	Fleet for Reshape	Flat Areas Unit Rate (\$/m3)	Slope Areas Unit Rate (\$/Ha)	Cost for Dozer Push All Areas (\$)
Select from dropdown	Select from dropdown	Subrates Table 2	Subrates Table 3	
> 450m to <= 500m push	D6R Dozer	Dozer too small	\$ 8,905	E
> 100m to <= 125m push	D6R Dozer	\$ 1.92	\$ 8,905	\$ -
> 100m to <= 125m push	D6R Dozer	\$ 1.92	\$ 8,905	\$ -

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Rock armouring

- 13. The User can enter the thickness and volume of rock armour for the slopes or accept the default (1.0 m in the example below).
- 14. The User must select a haulage distance and fleet size or accept the defaults.
- 15. The Calculator then multiplies the unit rates by the quantities to calculate the total cost for rock armouring of the slopes.

WASTE ROCK DUMP ROCK ARMOUR FOR STABILITY							
User Slope Rock Armour Cover Thickness (m)*	Thickness of Rock for Slope Layer used in Calculations (m)*	User Slope Rock Armour Cover Volume (m3)*	Rock armour volume used in calculations (m3)*	Haulage Distance for Slope Rock Armour (m)	Fleet for Rock Armour on Slopes	Rock Armour for Stability Unit Rate (\$/m3)	Cost for Rock Armour (\$)
ODP Capping Values				Select from dropdown	Select from dropdown	Subrates Table 1	
	1.00		-	>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ -
	1.00		-	>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ -
	1.00		-	>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ -

Capillary break layer

- 16. The User can enter the area of the surface to be treated but generally the default is the total footprint or flat area depending on the element.

WASTE ROCK DUMP CAPILLARY BREAK LAYERS							
WRD Surface area to install capillary layer (ha)	Default Capillary Break Layer Thickness (m)	User Input Thickness of Capillary Break Layer (m)*	Thickness of Capillary Break Layer used in Calculations (m)*	User Input Volume of Capillary Break Layer (m3)*	Volume for Capillary Break Layer used in Calculations (m3)*	Source and prepare Capillary Break Layer Material Rate (m3)	Source and prepare Capillary Break Layer Material (\$)
ODP Capping Values						Subrates Table 5	
-	0.60		0.60		-	\$ 4.71	\$ -
-	0.60		0.60		-	\$ 4.71	\$ -
-	0.60		0.60		-	\$ 4.71	\$ -

- 17. The User can enter the thickness of the layer or accept the default (see Table 5). If the User proposes a capping layer thickness that is less than that of the default minimum thickness, the cell is highlighted red and a reference appears in the Capping Alerts sheet. The User is required to enter a justification for the proposed capping thickness against the relevant line item in the Capping Alerts sheet.

Slope Rock Armour Layer less than Department's expected minimum	Ramps Rock Armour Layer less than Department's expected minimum	Working Cover Rock Layer less than Department's expected minimum	Capillary Break Layer less than Department's expected minimum	Low Permeability Layer less than Department's expected minimum	Top Rock Layer less than Department's expected minimum	Growth Media Layer less than Department's expected minimum	Alternate Rate for Engineering Added
User Slope Rock Armour Cover Thickness (m)*	N/A	N/A	User Input Thickness of Capillary Break Layer (m)*	User Input Thickness of Low Permeability (Clay) Layers (m)*	User Input Thickness of Rock Cover Layer (m)*	User Growth Media Thickness (m)	User Alternate Rate for Engineering (\$/ha)
No Alert			No Alert	No Alert	No Alert	No Alert	No Alert
No Alert			No Alert	No Alert	No Alert	No Alert	No Alert
No Alert			No Alert	No Alert	No Alert	No Alert	No Alert

- 18. The User can enter the volume of material to be used for the capping layer (if they have this information), otherwise that cell is left blank and the calculated volume accepted.
- 19. The User can select haulage distance, fleet size, length of push and dozer size, or accept the default selections. If the selected dozer is too small for the length of push, a 'Dozer too small' message will appear in the rate column, and an 'E' for error will show in the cost column as seen below. This will also cause a value error for the User Input Sheet total and be reflected as an error in the Capping Alerts sheet.

Haulage Distance for Capillary Break layer (m)	Fleet for Capillary Break	Capillary Break Unit Rate (\$/m3)	Cost for source, load haul and dump capillary break layer (\$)	Length of Dozer Push Capillary Break Layers (m)	Dozer	Dozer Push Capillary Break Unit Rate (\$/m3)	Cost for Dozer Push Capillary Break Layers (\$)	Total Cost for Capillary Break layers (\$)
Select from dropdown	Select from dropdown	Subrates Table 1		Select from dropdown	Select from dropdown	Subrates Table 2		
>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ -	> 350m to <= 400m push	D6R Dozer	Dozer too small	E	#VALUE!
>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ -	> 100m to <= 125m push	D6R Dozer	\$ 1.92	\$ -	\$ -
>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ -	> 100m to <= 125m push	D6R Dozer	\$ 1.92	\$ -	\$ -

20. The Calculator then multiplies the unit rates by the quantities to calculate the total cost for sourcing, placing, and compacting the low permeability materials.
21. The User can enter the volume of material to be used for the layers (if they have this information), otherwise that cell is left blank and the calculation accepted.

Low permeability layer

22. The User can enter the area of the surface to be capped but generally the default is the total footprint or flat area depending on the element.
23. The User can enter the thickness of low permeability layer or accept the default (see **Table 5**). If the User proposes a capping layer thickness that is less than that of the default minimum thickness, the cell is highlighted red and a reference appears in the Capping Alerts sheet. The User is required to enter a justification for the proposed capping thickness against the relevant line item in the Capping Alerts sheet.
24. The User can enter the volume of material to be used for the low permeability layer (if they have this information), otherwise that cell is left blank and the calculation accepted.
25. The Calculator then multiplies the unit rates by the quantities to calculate the total cost for sourcing, placing and compacting the low permeability materials.
26. The User can also specify if the material is locally sourced, or if it is hauled long distance and how far.

WASTE ROCK DUMP LOW PERMEABILITY CLAY LAYERS									
WRD Surface area (ha)	Default Low Permeability Layer Thickness (m)	User Input Thickness of Low Permeability (Clay) Layers (m)*	Thickness of Low Permeability Layer used in Calculations (m)*	User Input Volume of Low Permeability Layer (m3)	Volume Used in Calculations for Low Permeability Layer (m3)	Low Permeability Unit Rate (\$/ha)	Source, prepare, place and compact Low Permeability Layer Material (\$)	Source for Low Permeability Capping	Distance return for low permeability capping (km)
-	0.50		0.50		-	\$ 8.09	\$ -	Local	50 to 60 km
-	0.50		0.50		-	\$ 8.09	\$ -	Local	50 to 60 km
-	0.50		0.50		-	\$ 8.09	\$ -	Local	50 to 60 km

27. The User may also enter an Alternate Rate for the supply and delivery of material shown below. If so, the User must include a justification for the Alternate Rate in the space provided at the end of the table.

User Clay Delivered to Site (\$/m3)*	Long Haul Low Permeability Layers (\$)	Total Cost for Low Permeability layers (\$)
\$150.00	\$ -	\$ -
	\$ -	\$ -
	\$ -	\$ -

Top rock layer

28. The User can enter the area of the surface to be capped but generally the default is the total footprint or flat area depending on the element.
29. The User can enter the thickness of top rock layer or accept the default (see **Table 5**). If the User proposes a capping layer thickness that is less than that of the default minimum thickness, the cell is highlighted red and a reference appears in the Capping Alerts sheet. The User is required to enter a justification for the proposed capping thickness against the relevant line item in the Capping Alerts sheet.

30. The User can enter the volume of material to be used for the top rock layer (if they have this information), otherwise that cell is left blank and the calculation accepted.

WASTE ROCK DUMP TOP ROCK COVER LAYER					
WRD Surface area (ha)	Default Rock Cover Layer Thickness (m)	User Input Thickness of Rock Cover Layer (m)*	Thickness of Rock Layer used in Calculations (m)*	User Input Volume of Rock Cover Layer (m3)*	Volume Used in Calculations for Rock Cover Layer (m3)
ODP Capping Values					
-	1.50		1.50		-
-	1.50		1.50		-
-	1.50		1.50		-

31. The User can select haulage distance, fleet size, length of push and dozer size, or accept the default selections. If the selected dozer is too small for the length of push, a 'Dozer too small' message will appear in the rate column, and an 'E' for error will show in the cost column as seen below. This will also cause a value error for the User Input Sheet total and be reflected as an error in the Capping Alerts sheet.

Haulage Distance for Rock Cover layer (m)	Fleet for Load and Haul Rock Cover	Load and Haul Top Rock Layer Unit Rate (\$/m3)	Cost for source, load haul and dump rock cover layer (\$)	Length of Dozer Push Rock Cover Layers (m)	Fleet for Top Rock Push	Dozer Push Top Rock Layer Unit Rate (\$/m3)	Cost for Dozer Push Rock Cover Layers (\$)	Total Cost for Rock Cover layers (\$)
Select from dropdown	Select from dropdown	Subrates Table 1		Select from dropdown	Select from dropdown	Subrates Table 2		
>2500 m to <=3000 m	Small Fleet 3	\$ 4.81	\$ -	>300m to <= 350m push	D6R Dozer	Dozer too small	E	#VALUE!
>2500 m to <=3000 m	Small Fleet 3	\$ 4.81	\$ -	>100m to <= 125m push	D6R Dozer	\$ 1.92	\$ -	\$ -
>2500 m to <=3000 m	Small Fleet 3	\$ 4.81	\$ -	>100m to <= 125m push	D6R Dozer	\$ 1.92	\$ -	\$ -

Additional capping

32. Typically, the build-up described above is sufficient for a cap cost estimate. If additional or replacement materials are required, they are entered in the cells shown below. A company may elect to replace the low-permeability clay layer with a geosynthetic clay liner that would likely also need geofabric (typically two) and a geomembrane. The Calculator sums these additional capping layers as shown below.

WASTE ROCK DUMP ADDITIONAL CAPPING					
Geofabric area (m2)	Geofabric Rate (\$/m2)	Geosynthetic clay liner (m2)	Geosynthetic clay liner rate (\$/m2)	Geo-membrane (m2)	Geo-membrane (\$/m2)
Subrates Table 5					
	\$ 2.20		\$ 13.20		\$ 14.30
	\$ 2.20		\$ 13.20		\$ 14.30
	\$ 2.20		\$ 13.20		\$ 14.30

Drains and water management

33. Drainage is typically required on the finished cap to ensure surface water drains off the cap. The User enters the area to drain in the cell shown below. The Calculator multiplies the area required to drain by the unit rate to calculate the total for drainage.

WASTE ROCK DUMP DRAINS AND WATER MANAGEMENT				
Major Drains and Drop Structure footprint on dump (ha)*	Major drains and drop structures on dump (\$)	Major drains and drop structures on dump (\$)	Water Management Earthworks On Dump (\$)	Water Management Earthworks On Dump (\$)*
Subrates Table 6				
	\$ 21,235	\$ -	\$ 2,885	\$ -
	\$ 21,235	\$ -	\$ 2,885	\$ -
	\$ 21,235	\$ -	\$ 2,885	\$ -

Growth media / amendments / vegetation

- 34. The User can enter the thickness of growth media or accept the default (0.15 m in the example below).
- 35. The User can enter the volume of material to be used for growth media (if they have this information), otherwise the cell is left blank and the calculation accepted.

WASTE ROCK DUMP GROWTH MEDIA / AMENDMENTS / VEGETATION			
Default Growth Media Thickness (m)	User Growth Media Thickness (m)	User growth media volume (m3)*	Growth media volume used in calculations (m3)
ODP Capping Values			
0.15			-
0.15			-
0.15			-

- 36. Continue entering the information for growth media including haulage distance, fleet size, source (local or long distance) and return distance. If 'Local' is selected for growth media source, the entries relating to long distance haul are ignored and vice versa. The User may also enter an Alternate Rate for the supply and delivery of growth media. If so, the User must include a justification for the Alternate Rate in the space provided at the end of the table.

Haulage Distance for Growth Media (m)*	Fleet for Load and Haul Growth Media*	Growth Media Load and Haul (\$/m3)	Growth Media (\$)	Source for Growth Media	Distance return for growth media (km)	Growth Media Long Haul Unit Rate (Excludes purchase) (\$/m3-km)	Purchase Growth Media not sourced locally (\$/m3)	User Growth Media Delivered to Site (\$/m3)*	Long Haul growth media (\$)	Cost for Growth Media (\$)
Select from dropdown	Select from dropdown	Subrates Table 1		Select from dropdown	Select from dropdown	Subrates Table 9	Subrates Table 8			
>2500 m to <=3000 m	Small Fleet 1	\$ 4.81	\$ -	Local	50 to 60 km	\$ -	\$ -	\$ -	\$ -	\$ -
>2500 m to <=3000 m	Small Fleet 1	\$ 4.81	\$ -	Local	50 to 60 km	\$ -	\$ -	\$ -	\$ -	\$ -
>2500 m to <=3000 m	Small Fleet 1	\$ 4.81	\$ -	Local	50 to 60 km	\$ -	\$ -	\$ -	\$ -	\$ -

- 37. Enter the area for each soil amendment required and select from the drop-down menus the treatment required for each amendment area (the default is 'No Amend'). If an Alternate Rate is entered, the User must include a justification for the Alternate Rate in the space provided at the end of the table. 'Amendment 1' is shown below and there are three amendments available for each item in the event a mix of amendments is required.

1st Soil Amendment area (ha)	Amendment 1 for soil*	TOV Rate #	Amend 1 Supply and Deliver (\$/ha)	User Delivered Amendment 1 (\$/ha delivered)
Select from dropdown				
	No Amend	N/A	\$ -	
	No Amend	N/A	\$ -	
	No Amend	N/A	\$ -	

Re-vegetation

- 38. The area to be seeded defaults to the sum of the flat and sloped areas of the element.
- 39. Enter the proportion of pasture land. The default value is 100%. Where this is changed by the User to a lesser percentage, the Calculator adds the relevant percentage to arid land (row two)

in the example below). Where native land is required, the User must manually enter the percentage in this column (row three in the example below).

Proportion Pasture Land (%)	Proportion Native Land (%)	Proportion Arid Land (%)
100%		0%
80%		20%
80%	20%	0%

40. The Calculator uses the Default Rates for seeding of pasture and native areas, however the User may also enter an Alternate Rate and provide justification in the space provided at the end of the table.

	No Alert	No Alert
TOV#	#14.40	#14.41
TOV Rate	\$ 1,656	\$ 4,197
Alternate Rate		
Unit	ha	ha

Land types do equal 100%	Seeding Pasture (\$/ha)	Seeding Native (\$/ha)
No Alert	\$ -	\$ -
No Alert	\$ -	\$ -
No Alert	\$ -	\$ -

Permeability testing, engineering, and other activities

41. The User can enter an area for permeability testing if required and the number of test points per hectare.
42. The User may enter an Alternate Rate for engineering cost and provide justification in the space provided at the end of the table.
43. The User may enter a rate for 'User Other Activities'. This allows the User to input costs associated with activities not specifically included within the sheet. The User is encouraged to add explanation of other activities either in the header row User Notes box or the 'Justification for Alternate Rate' cell at the end of each row.

WASTE ROCK DUMP PERMEABILITY TESTING, ENGINEERING, AND OTHER ACTIVITIES						
Area for Permeability Testing (ha)	User Number of points per ha	Permeability Testing by area (\$)	Engineering (\$/ha)	User Alternate Rate for Engineering (\$/ha)	Engineering (\$)	User Other Activities (\$)
-		\$ -	2,850		\$ -	
-		\$ -	2,850		\$ -	
-		\$ -	2,850		\$ -	

Total cost for element

- The Calculator sums all the totals described above to calculate the total cost for the element (a waste rock dump in this case) and divides by the total footprint to display the cost per hectare.

Total Cost for WRD (\$)	Cost per Unit Area (\$/ha)
\$ -	\$ -
\$ -	\$ -
\$ -	\$ -

7.5 Pits – Safety bund

To calculate the cost for installing a safety bund around a pit, follow the steps below.

- The User enters the name of the pit and the safety bund length. For this treatment, the open pit void area is used only to calculate the cost per unit area.

BASIC PIT DETAILS				SAFETY BUND
Map ID	#	Name	Open Pit Void Surface Area (ha)*	Safety Bund (or highwall) length (m)
Enter name of pit below				
	1	Pit 1		
	2	Pit 2		
	3	Pit 3		

- In the next table, the User can enter dimensions for the safety bund (second line in the example below) or accept the defaults by leaving the cells blank (first line in the example below). The Calculator calculates the specific volume (per unit length) and multiplies by the total length of the bund to obtain the total volume of soil or rock required. A default of 15% is allowed for rock swell. The Calculator multiplies the bund dimensions by a Default Rate to obtain the cost for surface preparation.

Default:	2.5	5.0	2.0	15%	
SAFETY BUND DIMENSIONS AND QUANTITIES					
Safety Bund Length* (m)	Bund Height (m)*	Bund Base Width* (m)	Bund Top Width* (m)	Bund Volume (m3/m length)	Volume of bund (m3)
4.00				9.13	36.50
4.00	1.00	4.00	1.00	2.58	10.30

- From the drop-down menu, the User can select the construction method for the safety bund. If excavate and place is selected, the length of the bund is multiplied by the Default Rate to obtain this cost.
- If haul and place is selected, the User either accepts the 4 km default by selecting N in the 'User Input Haulage Distance' (as in the first line below) or specifies the distance (see next step).
- If the User selects haul and place and selects Y to 'User Input Haulage Distance', they must select the distance to the source of the rock for bund construction and the size of the fleet to load, transport and place the rock. The Calculator multiplies the appropriate Default Rate by the bund volume to obtain the cost to construct the safety bund by haul and place with User Entered distance to the source of the rock.

User Guide for Estimated Rehabilitation Cost Calculator for Mining

SAFETY BUND CONSTRUCTION								
Safety Bund Construction Method*	Default Excavate and Place	User input Haulage Distance*	Default Haul and Place (4km haul)	Haulage Distance for Safety Bund Rock* (m)	Fleet Size	Load and Haul Rate (\$/m3)	Cost for Safety Bund Rock with User Haulage Distance	Total Cost for Safety Bund Construction / Fencing
Select from dropdown				Select from dropdown	Select from dropdown	Subrates Table 1		
Haul and Place	\$ -	N	\$ 191	>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ -	\$ 197
Haul and Place	\$ -	Y	\$ -	>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ 65	\$ 70

- The User can enter Alternate Rates for both excavate and place and haul and place cost per metre. If an Alternate Rate is entered, the User must include a justification in the 'Justification for Alternate Rates' section at the end of the table.

No Alert		No Alert	
TOV#:	#10.02	TOV#:	#10.03
Rate	\$24	Rate	\$48
Alternate Rate		Alternate Rate	
Unit:	m	Unit:	m

SAFETY BUND CONSTRUCTION				
Safety Bund Construction Method*	Default Excavate and Place	User input Haulage Distance*	Default Haul and Place (4km haul)	Haulage Distance for Safety Bund Rock* (m)
Select from dropdown				Select from dropdown
Haul and Place	\$ -	N	\$ 191	>2500 m to <=3000 m

- The User may enter standard 'Fencing and signage' length, 'High Wall Security Fencing and signage' length if required, but these can be left blank, and the calculation accepted. If an Alternate Rate is entered, the User must include a justification in the 'Justification for Alternate Rate' section at the end of the table.

No Alert		No Alert	
TOV#:	#10.05 + #10.06	TOV#:	#10.04 + #10.06
Rate	\$16,995	Rate	\$225
Alternate Rate		Alternate Rate	
Unit:	m	Unit:	m

FENCING AND SIGNAGE				
User Input Standard Fencing and signage length (km)	User Input High Wall Security Fencing and signage length (m)	Fencing and signage	High Wall Security Fencing and signage	Fencing and signage Costs (\$)
0.00		\$ 82	\$ -	\$ 82
0.00		\$ 82	\$ -	\$ 82

7.6 Pits – Benches and high wall drill and blast, and doze to make safe

- To calculate costs for drill and blast and doze activities to make safe the User may enter values in the 'Basic Pit Information' table for:
 - Highwall / bench areas for blasting and
 - Volume requiring bulk push
 - Bench volume to blast
 - Highwall volume to blast

HIGHWALL ACTIVITIES			
Highwall / bench area requiring blasting (ha)	Highwall / bench volume requiring bulk push (m3)	Benches Volume to Blast (m3)	Highwall Volume to Blast (m3)

User Guide for Estimated Rehabilitation Cost Calculator for Mining

- Then in the 'Benches and High Wall Drill and Blast and Doze to Make Safe' table, the User can select the slope angle, length of push and dozer size required from the drop-down menus.

DOZE AND SHAPE HIGHWALL / BENCH TO MAKE SAFE							
Highwall / bench volume requiring bulk push (m3)	Reprofiled slope angle*	Length of Dozer Push for Highwall / Benches Growth Media*	Dozer	Dozer Push Unit Rate (\$/m3)	Dozer bulk push cost	Reprofile Unit Rate (\$/ha)	Doze and Shape to proposed highwall/bench slope angle (\$)
	Select from dropdown	Select from dropdown	Select from dropdown	Subrates Table 2		Subrates Table 3	
-	>8.5<=14 degrees	> 100m to <= 125m push	D6R Dozer	\$ 1.92	\$ -	\$ 8,905	\$ -
-	>8.5<=14 degrees	> 100m to <= 125m push	D6R Dozer	\$ 1.92	\$ -	\$ 8,905	\$ -

- The User may provide an Alternate Rate for 'Drill and Blasting Cost' and a justification against the 'Justification for Alternate Rate' space at the end of the table.

<i>No Alert</i>	
TOV#:	#10.01
Rate	\$1.92
Alternate Rate	
Unit:	m3
DOZE AND SH	
Highwall / bench volume to blast (m3)	Drill and Blasting Cost (\$)
-	\$ -
-	\$ -

- The User can enter the thickness of growth media or accept the default. The User can enter the volume of material to be used for growth media (if they have this information), otherwise the cell is left blank and the calculation accepted.

GROWTH MEDIA, AMENDMENTS, VEGETATION						
User Growth Media Thickness (mm)	User growth media volume (m3)*	Growth media volume used in calculations (m3)	Haulage Distance for Highwall / Benches Growth Media (m)*	Fleet*	Growth media Load and haul Rate Unit Rate (\$/m3)	Growth Media (\$)
		-	>1000 m to <=1500 m	Large Fleet	\$ 2.44	\$ -
		-	>2500 m to <=3000 m	Small Fleet 3	\$ 6.27	\$ -

- Enter the area for each soil amendment required and select from the drop-down menus the treatment required for each amendment area. Only the first of the three available amendments is shown below. A User can enter an Alternate Rate for each amendment and provide a justification for the Alternate Rate in the space provided at the end of the table.

1st Soil Amendment area (ha)	Amendment 1 for soil*	Amend 1 Supply and Deliver TOV#	Amend 1 Supply and Deliver (\$/ha)	User Delivered Amendment 1 (\$/ha delivered)
	Select from dropdown			
	No Amend	N/A	\$ -	
	No Amend	N/A	\$ -	

Re-vegetation

- The User must enter the total area to be seeded for the flat and sloped areas of the element.
- Enter the proportion of pasture land. The default value is 100%. Where this is amended by the User to a lesser percentage, the Calculator adds the relevant percentage to arid land (row one in the example below). Where native land is required, the User must manually enter the

User Guide for Estimated Rehabilitation Cost Calculator for Mining

percentage in this column (row 2 in the example below). An error will appear in the alert column if the percentages do not add up to 100%.

Area of seeding required (ha)	Proportion Pasture Land (%)	Proportion Native Land (%)	Proportion Arid Land (%)	Alert (if land types do not equal 100%)
	80%		20%	No Alert
	80%	20%	0%	No Alert

- The Calculator uses the Default Rates for seeding of pasture and native areas, however the User may also enter an Alternate Rate and provide justification in the corresponding 'Justification for Unit Rates' cell at the end of the table.

	No Alert	No Alert
TOV#	#14.40	#14.41
TOV Rate	\$ 1,656	\$ 4,197
Alternate Rate		
Unit	ha	ha

Land types do not equal 100%	Seeding Pasture (\$/ha)	Seeding Native (\$/ha)
No Alert	\$ -	\$ -
No Alert	\$ -	\$ -
No Alert	\$ -	\$ -

7.7 Other components of pit rehabilitation

- A similar build-up of costs and cost elements are used to create unit costs for the other components of pit rehabilitation, namely:
 - Low wall shape / load and haul / doze to make safe
 - Backfill with waste rock
 - Open pit ramp backfill.
- The User enters data into the relevant cells and the Calculator multiplies these by the default or User supplied values to provide costs for each individual component.
- The Calculator sums the individual items to obtain the total costs.

8 Glossary

Table 8 shows the terms referenced throughout this document and their specific definitions for the purposes of the ERC Calculators.

Table 8. Definitions

Word	Definition
Activity	A general term applied to simple and singular items such as excavating soil, and more involved, multi-faceted items such as capping a tailings storage facility.
Alternate Rate	A site-specific rate entered by the User which overrides the Default Rate (see the Alternate Rates section for requirements).
Arid	Arid environments are desert where vegetation is absent (e.g. Channel Country in South West Queensland).
Benign	Benign waste material is material that is geochemically stable (non-acid forming) and suitable for rehabilitation purposes with low risk of generating any environmental harm.
Bottom-up, first principles cost method	The process of building rolled-up costs for relatively complex, multi-faceted activities using basic singular values for plant, equipment and labour and productivity (e.g. cubic metres of soil excavated per hour) to estimate the time to complete an activity.
Calculator	The Excel™ workbook that calculates the ERC for the site.
Department	Refers to the Queensland Department of Environment and Science.
Default Rate	A standard (default) cost rate for an activity in the Calculator.
Domain	Discrete operational areas within a site, usually with unique function and purpose and therefore similar geophysical characteristics. Domains could include: <ul style="list-style-type: none"> • Infrastructure • Underground workings (e.g. adits and shafts) • Tailings storage facilities • Overburden and waste rock dumps • Water management • Pits.
Eligible mining activities	Mining activities that comply with the eligibility criteria in effect for the activity.
Process equipment	Equipment used in the mine operations to transport and stack (e.g. conveyor, stacker), store (e.g. silo) and prepare (e.g. coal handling preparation plant) raw and processed materials.
Productivity	The performance capability of a machine or equipment. For example, the volume of soil an excavator can move per unit time.
Rolled-up	With respect to unit cost rates rolled-up means a single value generated from smaller activities and cost rates. Bottom-up, first principles are used to generate rolled-up rates.
Sheet	The individual worksheet within the Calculator.
User	The applicant or holder of an EA and the individual who prepares the ERC.

Appendix A User Input Sheets options, inputs, defaults and calculated quantities

Table A-1. Exploration User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Seismic surveys, grid-lines and minor tracks (by length)	Easement in native, pasture or arid land.	Total easement length (km) and the length of easement requiring rehabilitation is required.	If no rehabilitation length is entered, the calculation assumes a default of 5% of the total length. This approach recognizes that the disturbance to land caused by such activities is minor.	None
Seismic surveys, grid-lines and minor tracks (by area)	Easement in native, pasture or arid land.	Total easement area (ha) and the area of easement requiring rehabilitation is required.	If no rehabilitation area is entered, the calculation assumes a default of 5% of the total area. This approach recognizes that the disturbance to land caused by such activities is minor.	None
Tracks and roads (by length)	<ul style="list-style-type: none"> Track (earthen) - rip, grade and re-seed (3m wide in native, pasture or arid land). Track (earthen) - rip, grade and re-seed (6m wide in native, pasture or arid land). 	Total length (km).	None	None
Tracks and roads (by area)	<ul style="list-style-type: none"> Track (earthen) - rip, grade and re-seed (native). Track (earthen) - rip, grade and re-seed (pasture). Track (earthen) - rip, grade and re-seed (arid). 	Total area (ha).	None	None
Drill-holes and sumps	<ul style="list-style-type: none"> Water supply / monitoring bore hole plugging. Exploration bore hole plugging. Water supply bore hole backfilling with cuttings. Monitoring bore hole backfilling with cuttings. Exploration bore hole backfilling with cuttings. Water supply bore hole grouting. Monitoring bore hole grouting. Water reinjection bore hole grouting. Exploration bore hole grouting (coal / mineral sands / large impact drilling). Exploration bore hole grouting (metalliferous / low impact drilling). Exploration sumps. 	Number of drill-holes / sumps.	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
Water structures by area	<ul style="list-style-type: none"> Lined and unlined ponds with ranges 0 to <=1 ML, >1 to <=2.5ML, >3.5 to <=7.5ML, >7.5 to <=10ML, >10 to <= 20ML, >20 to <=50ML, >50 to <=100ML. 	Total crest area of ponds in category.	None	None
Camps and water treatment plants	<ul style="list-style-type: none"> Grade and seed land (pasture) on which infrastructure and equipment not owned by the company. Grade and seed land (native) on which infrastructure and equipment not owned by the company. Grade and seed land (arid) on which infrastructure and equipment not owned by the company. 	Disturbance area (ha).	None	None

Table A-2. Infrastructure User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Disconnect major services to facility	<ul style="list-style-type: none"> Disconnect and terminate all services (water, electricity, gas etc. at point of attachment to site). Disconnect and terminate services at remote areas (i.e. pump stations, remote workshops, sewage treatment plant, etc.). 	Quantity	None	None
Access roads and tracks (defaults by length)	<ul style="list-style-type: none"> Track (earthen) - 3m width on pasture, native or arid land. Track (earthen) - 6m width on pasture, native or arid land. Track (gravel/crushed rock) - 3m width on pasture, native or arid land. Track (gravel/crushed rock) - 6m width on pasture, native or arid land. Track (gravel/crushed rock) - remove rock and replace (3m width). Track (gravel/crushed rock) - remove rock and replace (6m width). 	Length (km)	None	None
Access roads and tracks (defaults by area)	<ul style="list-style-type: none"> Track (earthen) – no replace in pasture, native or arid land. Track (gravel/crushed rock) – no replace in pasture, native or arid land. 	Area (ha)	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
	<ul style="list-style-type: none"> Track (gravel/crushed rock) - remove rock and replace. 			
Access track (User defined by length)	<ul style="list-style-type: none"> Road dimensions and surface cover (earthen, rock, gravel, bitumen). Removal of cover. Replace cover. Grade and seed (area and type of seed (pasture, native or arid)). Fleet selection and haul distances for surface covering disposal, return rock and growth media transport. 	<ul style="list-style-type: none"> Key input is the length of road (km). If only the length is input a cost will be calculated using the defaults settings. Width of the track or road. Length of road to be ripped (if earthen) or surface to be removed (if gravel, rock or bitumen). Thickness of surface covering. Length of road that will be re-surfaced. The thickness of surface material that will be replaced. Area of re-seeding required. The default calculation assumes the entire length and width will be re-seeded. 	<p>The default calculation assumes the entire length of the road is ripped (earthen) or surface removed (rock) and graded and seeded.</p> <p>Width of road = 6 m</p> <p>Thickness of surface covering to be removed = 150 mm</p> <p>Length of surface to be replaced = 0 km</p> <p>Thickness of surface covering to be replaced (if User enters a length) = 150 mm</p> <p>Growth media thickness = 150 mm</p>	<p>Volume of surface covering removed (m³)</p> <p>Volume of surface covering replaced (m³)</p> <p>Area of track to rip grade and seed (ha)</p> <p>Area requiring growth media and seed (ha)</p> <p>Growth media volume (m³)</p>
Access track (User defined by area)	<ul style="list-style-type: none"> Road dimensions and surface cover (earthen, rock, gravel, bitumen). Removal of cover. Replace cover. Grade and seed (area and type of seed (pasture, native or arid)). Fleet selection and haul distances for surface covering disposal, return rock and growth media transport. 	<ul style="list-style-type: none"> Key input is the area of road (ha). If only the area is input a cost will be calculated using the defaults settings. Width of the track or road. Length of road to be ripped (if earthen) or surface to be removed (if gravel, rock or bitumen). Thickness of surface covering. Length of road that will be re-surfaced. The thickness of surface material that will be replaced. Area of re-seeding required. The default calculation assumes the entire length and width will be re-seeded. 	<p>The default calculation assumes the entire area of the road is ripped (earthen) or surface removed (rock) and graded and seeded.</p> <p>Thickness of surface covering to be removed = 150 mm</p> <p>Length of surface to be replaced = 0 km</p> <p>Thickness of surface covering to be replaced (if User enters a length) = 150 mm</p> <p>Growth media thickness = 150 mm</p>	<p>Volume of surface covering removed (m³)</p> <p>Volume of surface covering replaced (m³)</p> <p>Area of track to rip grade and seed (ha)</p> <p>Area requiring growth media and seed (ha)</p> <p>Growth media volume (m³)</p>

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
Road and watercourse overpass	<ul style="list-style-type: none"> Remove road overpass. Remove course overpass. 	Quantity	None	None
Mine haul roads (defaults by length)	<ul style="list-style-type: none"> Haul road – earthen (no replace) 25m width in pasture, native or arid land. Haul road – rock (no replace) 25m width in pasture, native or arid land. Haul road (rock) - remove contaminated surface only, 25m width in pasture, native or arid land. 	Length (km)	25m width	None
Mine haul roads (User defined by length). This option allows the User to design their own road with intent to represent those on the site	<ul style="list-style-type: none"> Road dimensions and surface cover (earthen, rock, gravel, bitumen). Removal of cover. Replace cover. Grade and seed (area and type of seed (pasture, native or arid). Fleet selection and haul distances for surface covering disposal, return rock and growth media transport. 	<ul style="list-style-type: none"> Key input is the length of road (km). If only the length is input a cost will be calculated using the defaults settings. Width of haul road. Length of road to be ripped (if earthen) or surface to be removed (if gravel, rock or bitumen). Thickness of surface covering. Length of road that will be re-surfaced. The thickness of surface material that will be replaced. Area of re-seeding required. The default calculation assumes the entire length and width will be re-seeded. 	<p>The default calculation assumes the entire length of the road is ripped (earthen) or surface removed (rock) and graded and seeded.</p> <p>Width of road = 25 m</p> <p>Thickness of surface covering to be removed = 500 mm</p> <p>Length of surface to be replaced = 0 km</p> <p>Thickness of surface covering to be replaced (if User enters a length) = 150</p>	<p>Volume of surface covering removed (m³)</p> <p>Volume of surface covering replaced (m³)</p> <p>Length of track to rip grade and seed (km)</p> <p>Area of track to rip grade and seed (ha)</p> <p>Area requiring growth media and seed (ha)</p> <p>Growth media volume (m³)</p>
Mine haul roads (defaults by area)	<ul style="list-style-type: none"> Haul road – earthen (no replace) in pasture, native or arid land. Haul road – rock (no replace) in pasture, native or arid land. Haul road (rock) - remove contaminated surface only, in pasture, native or arid land. 	Area (ha)	None	None
Mine haul roads (User defined by area). This option allows the User to design their own road with intent to	<ul style="list-style-type: none"> Road dimensions and surface cover (earthen, rock, gravel, bitumen). Removal of cover. Replace cover. Grade and seed (area and type of seed (pasture, native or arid). 	<ul style="list-style-type: none"> Key input is the area of haul road (ha). If only the area is input a cost will be calculated using the defaults settings. Width of road. 	<p>The default calculation assumes the entire length of the road is ripped (earthen) or surface removed (rock) and graded and seeded.</p>	<p>Volume of surface covering removed (m³)</p> <p>Volume of surface covering to replace (m³)</p>

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
represent those on the site	<ul style="list-style-type: none"> Fleet selection and haul distances for surface covering disposal, return rock and growth media transport. 	<ul style="list-style-type: none"> Length of road to be ripped (if earthen) or surface to be removed (if gravel, rock or bitumen). Thickness of surface covering. Length of road that will be re-surfaced. The thickness of surface material that will be replaced. Area of re-seeding required. The default calculation assumes the entire length and width will be re-seeded. 	<p>Thickness of surface covering to be removed = 500 mm</p> <p>Length of surface to be replaced = 0 km</p> <p>Thickness of surface covering to be replaced (if User enters a length) = 150 mm</p> <p>Growth media thickness = 150 mm</p>	<p>Length of track to rip grade and seed (km)</p> <p>Area of track to rip grade and seed (ha)</p> <p>Area requiring growth media and seed (ha)</p> <p>Growth media volume (m³)</p>
Laydown yards (defaults)	<ul style="list-style-type: none"> Earthen, no replace in pasture, native or arid land. Gravel / crushed rock, no replace in pasture, native or arid land. 	Area of laydown yard (ha)	None	None
Laydown yards (User defined). This option allows the User to design their own laydown yard with intent to represent those on the site	<ul style="list-style-type: none"> Surface covering (earthen, rock, gravel, waste rock). Distance to haul removed surface material for disposal (typically a void on-site). Ranges from < 200 m to > 6 km. Type of seed (native or pasture). 	<ul style="list-style-type: none"> Key input is the laydown area (ha). If only the area is input a cost will be calculated using the defaults settings. Area to be ripped (if earthen) or surface to be removed (if gravel, rock or bitumen). Thickness of surface covering (or accept default). Area of re-seeding required. The default calculation assumes the entire length and width will be re-seeded. 	<p>The default calculation assumes the entire area of the laydown is ripped (earthen) or surface removed (rock) and graded and seeded.</p> <p>Thickness of surface covering to be removed = 150 mm</p> <p>Growth media thickness = 150 mm</p>	<p>Volume of surface covering removed (m³)</p> <p>Area requiring rehabilitation (ha)</p>
Borrow pits	<ul style="list-style-type: none"> Borrow pit in pasture, native or arid land. 	Area of borrow pit (ha).	None	None
Pipelines	<ul style="list-style-type: none"> Plastic Pipe 0-0.15 m diameter buried. Plastic Pipe 0.15 – 0.25 m diameter buried. Plastic Pipe 0.25 – 0.5m diameter buried. Plastic Pipe 0.5m – 1.0 m diameter. buried. Plastic Pipe 0-0.15 m diameter aboveground. Plastic Pipe 0.15 – 0.25 m diameter aboveground. Plastic Pipe 0.25 – 0.5m diameter aboveground. 	<ul style="list-style-type: none"> Liquid (tailings, water or ash). Length of pipe (m). Flush (Y/N). # Cut and caps. Pipeline to be removed. Area for growth media. Growth media thickness. Growth media volume. Width of re-seed area. 	<p>Cut and caps = 2</p> <p>Growth media thickness = 150 mm</p> <p>Easement width = 1 m</p>	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
	<ul style="list-style-type: none"> Plastic pipe 0.5m – 1.0 m diameter aboveground. 	<ul style="list-style-type: none"> % pasture / native land (for re-seeding). Haulage distance. Fleet size. 		
Camps (by capacity)	<ul style="list-style-type: none"> Temporary and permanent camps with capacity ranges <20 to <=5000 persons. 	Number of camps in each category.	None	None
Camps (by area)	<ul style="list-style-type: none"> Small temporary camp (<=50 persons). Large temporary camp (>50 persons). Small permanent camp (<=50 persons). Large permanent camp (>50 persons). 	Area (m2)	None	None
Buildings by area	<ul style="list-style-type: none"> Small, brick wall, steel roof, concrete floor, 1 floors. Large, brick wall, steel roof, concrete floor, 1 floors. Large, steel wall, steel roof, concrete floor, 1 floors. Small, steel wall, steel roof, concrete floor, 1 floors. Large, steel wall, steel roof, concrete floor, 2 floors. 	Ground floor area (m2)	None	None
Buildings portable	<ul style="list-style-type: none"> Portable 	Quantity	None	None
Lattice structures	<ul style="list-style-type: none"> Communications tower 	Quantity	None	None
Power distribution	<ul style="list-style-type: none"> Overhead powerlines (steel towers). Overhead powerlines (wooden poles). Overhead powerlines (concrete pole) Substation. Switchyard. 	<ul style="list-style-type: none"> Length of distribution lines using each type of pole (km). Area of substation or switchyard (m2). 	None	None
Power generation (User entered)	<ul style="list-style-type: none"> User entry 	Quantity	None	None
Concrete and bitumen hardstand including airstrip (not associated with buildings, processing facilities) ¹	<ul style="list-style-type: none"> Remove bitumen (aprons, sealed areas) for dumping in void on-site. Remove bitumen (airstrip) for dumping in void on-site. Remove concrete pads & footings (<=0.3 m thickness) and dumping in void. 	<ul style="list-style-type: none"> Area (m²) to be removed. Mass (t) to be crushed. 	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
	<ul style="list-style-type: none"> Remove concrete pads & footings >0.3 m thickness) and dumping in void. Crush concrete to make road aggregate (75mm, 50mm or 30mm). 			
Rail infrastructure	<ul style="list-style-type: none"> Remove rail loop and spur, ballast etc. Collapse, cut and remove rail loading bins. Remove train loading facilities. Remove rail overpass. 	<ul style="list-style-type: none"> Length (m). Quantity rail loading bins. Area (m2) train loading facilities. Quantity rail overpass to be removed. 	None	None
Landfills	<ul style="list-style-type: none"> Landfill. 	Area of landfill (m ²)	None	None
Sewage treatment plants	<ul style="list-style-type: none"> Sewage treatment plants. 	Capacity of plant (kL/day)	None	None
Rehabilitation of areas not covered above or process equipment	<ul style="list-style-type: none"> Rehabilitation of infrastructure footprints. 	Area (m ²)	None	None
Fencing	<ul style="list-style-type: none"> Remove fence (cyclone/wire fence). Construct no-climb stock fence around rehabilitated areas. Construct standard stock fence around rehabilitated areas. 	Length (m)	None	None
Small ancillary (washdown, water filling, oil/water separator)	<ul style="list-style-type: none"> Water treatment plant (company owned). Light vehicle wash down. Heavy vehicle wash down. Water filling station. Fuel filling station. Oil/water separator. 	<ul style="list-style-type: none"> Capacity (ML/day) Area (m2) Area (m2) Quantity Quantity Area (m2) 	None	None
Tanks	<ul style="list-style-type: none"> Vertical, steel, open top, earth, single skin, lined, 0.14 ml – 17ml. Concrete ring, steel, open top, earth, single skin, lined, 4 kl – 12kl. Horizontal, steel, closed top, skid, single skin, not lined, 1.2 kl – 110 kl. Vertical, steel, closed top, steel, single skin, not lined, 100 kl – 300 kl. Panel, concrete, open top, earth, single skin, lined, 1.2 kl – 50 kl. 	<ul style="list-style-type: none"> Construction type Capacity 	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
	<ul style="list-style-type: none"> • Rainwater, plastic, closed top, plastic, single skin, not lined, 1.5 kl – 18.2 kl. 			

Notes:

1. This activity allows for concrete pads that are not included in another rate. All facilities, buildings and camps include concrete pads in the rate and therefore an entry to this table is not required.

Table A-3. Process Equipment

Activity	Options	Inputs	Defaults	Calculated quantities
Process and heavy equipment	<ul style="list-style-type: none"> • Demolish and remove: <ul style="list-style-type: none"> ○ Processing plant ○ Stackers ○ Conveyors and gantries ○ Tunnel ○ Silo/bin/hopper ○ Above ground tanks ○ Underground tanks • Small and large pump set. • Dismantle dragline (<=2,000 t, >2,000 to <=5,000 t, >5,000t). • Remove bitumen. • Remove and crush concrete. • Rehabilitation of footprints. 	Quantity	None	None
Processing equipment footprints	<ul style="list-style-type: none"> • Processing equipment footprints. 	<ul style="list-style-type: none"> • Remove concrete pads & footings (<=0.3 m thickness) and dumping in void (m2). • Remove concrete pads & footings (>0.3 m thickness) and dumping in void (m2). • Crush concrete to make road aggregate - 75 mm (t). • Crush concrete to make road aggregate - 50 mm (t). • Crush concrete to make road aggregate - 30 mm (t). • Remove bitumen (aprons, sealed areas) for dumping in a void on-site (m2). • Remove bitumen (airstrip) for dumping in a void on-site (m2) • Rehabilitation of infrastructure footprints (m2). 	None	None

Table A-4. Water Storage

Activity	Options	Inputs	Defaults	Calculated quantities
Water storage defaults by category and capacity	<ul style="list-style-type: none"> • Clean water small dams/sediment control structures retained after closure. • Clean water small mine/quarry dams/sediment control structures retained after closure. • Water structure type – based on contents, capacity and land type (pasture, native, arid). • Size range up to 5,000 ML. 	<ul style="list-style-type: none"> • Pond name. • Size (capacity) (ML). • Quantity. 	None	None
Water storage defaults by area	<ul style="list-style-type: none"> • Lined and unlined ponds with ranges 0 to <=1 ML, >1 to <=2.5ML, >3.5 to <=7.5ML, >7.5 to <=10ML, >10 to <=20ML, >20 to <=50ML, >50 to <=100ML. 	Pond name and quantity.	None	None
Water structures User	<ul style="list-style-type: none"> • Land type (pasture, native or arid). • Lined/unlined. • Haulage distance for silt (m). Ranges <=200m to > 6,000m. • Fleet size (small, medium or large) for silt removal. • Dozer push distance (<=20m to <=500m). • Dozer type (D6 to D11). • Haulage distance for growth media <=200m to > 6,000m. 	<ul style="list-style-type: none"> • Name, type and size of structure. • Surface area. • Liner area. • Wall height, width at top (m) and slope. 	Multiplier on crest area for line area = 1.2 Sediment thickness = 0.5 m Growth media thickness = 0.15 m	Wall width at base Area of wall Length of bund walls Sediment volume Growth media area Growth media volume Area to investigate

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
	<ul style="list-style-type: none"> Fleet size (small, medium or large) for growth media. 			

Table A-5. Water Treatment and Pumping

Activity	Options	Inputs	Defaults	Calculated quantities
Water treatment and transfer	<ul style="list-style-type: none"> Water pH 5.5 adjustment. Water pH 4.5 adjustment. Water salt removal. Water organics removal. Naturally evaporate water in pond. Evaporate water with evaporators. Mobilisation of reverse osmosis unit. Salt disposal - load and transport. Salt disposal - gate fee. Water pumping / transfer. Removal of evaporation fans and/or other water transfer and management infrastructure. Dewatering plant decommissioning. Water management establishment, engineering, O&M. 	<ul style="list-style-type: none"> Area name. Water volumes (ML). Evaporation (# of ponds/dams). Salt mass (t). Equipment (# fans and ML/day for dewatering plant). Management (ML total water). 	None	None
Dewatering	<ul style="list-style-type: none"> Piping above ground diameter ranges 0 to <=0.15 m, >0.15 to 	<ul style="list-style-type: none"> Area name. # of downwell pumps. Pipe length (m). 	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
	<p><=0.25m, >0.25 to <=0.5m, >0.5 to <=1m.</p> <ul style="list-style-type: none"> • Tanks - vertical, steel, open top, earth, single skin, lined, 0.14 ML – 17 ML. • Tanks - concrete ring, steel, open top, earth, single skin, lined, 4 kL – 12 kL. • Tanks - horizontal, steel, closed top, skid, single skin, not lined, 1.2 kL – 110 kL. • Tanks - vertical, steel, closed top, steel, single skin, not lined, 100 kL – 300 kL. • Tanks - panel, concrete, open top, earth, single skin, lined, 1.2 kL – 50 kL. • Tanks - rainwater, plastic, closed top, plastic, single skin, not lined, 1.5 kL – 18.2 kL. • Ponds and dams with size range up to 5,000 ML. 	<ul style="list-style-type: none"> • # of tanks. • # of ponds/dams. • # of diesel generators. 		

Table A-6. Overburden Dumps Piles User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Waste rock dumps (defaults)	<ul style="list-style-type: none"> • High risk. • Medium risk with low permeability layer. • Medium risk. • Low risk. • Very low risk. 	Number of waste rock dumps in each category	None	None
Waste rock dumps (User defined). This option allows the user to design their own waste rock dumps with intent to represent those on the site	<ul style="list-style-type: none"> • High risk. • Medium risk with low permeability layer. • Medium risk. • Low risk. • Very low risk. <p>Selection of risk category determines the capping design. For higher risk caps, the expected minimum thicknesses are identified and where lower values are input, it is flagged in the Capping Alerts sheet.</p> <ul style="list-style-type: none"> • Re-profiled slope angle (<=2.8° to > 17.5°). • Length of dozer push (< 20 m to <= 500 m) for earthmoving components. • Dozer size (D6 to D11). • Haulage distances for rock for armouring of slopes, capillary break materials, top rock cover, growth media. Ranges from < 200 m to > 6 km. • Fleet size (small, medium, large or truck/shovel) for hauling rock for amour and capillary break materials, top rock layer, growth media. Ranges from < 200 m to > 6 km. • Amendment of top soil (no amend, lime, gypsum, biosolids). • Type of seed (native or pasture). • Long haul sourcing of growth media, lime or clay (click to go to Miscellaneous Activities User Input Sheet). 	<p>Key inputs are:</p> <ul style="list-style-type: none"> • Area of total footprint, flat, slope, ramps (ha) and to cap (ha) (or accept calculation default to total footprint). • Average doze thickness for pushing on flat and slope (m). • Volume of material to push on flat and slopes, of rock to place, or capillary break materials, of low permeability layer materials, of growth media, of top rock layer. • Thickness of rock armour to place on slope, thickness of capillary break layer, of low permeability layer, of topsoil layer (m). • Area of additional capping materials (geosynthetic clay liner (GCL), geofabric, geomembrane) (ha). These are optional and in certain instances may replace other layers (e.g. GCL replacing low permeability clay layer). • Area for drainage (ha). • Area for growth media and amendment (ha). • Area of re-seeding (ha). • Number of geotech holes per hectare (or accept default). • Other activities. 	<p>See Table 5 for capping defaults by risk category. Growth media thickness 0.15 m</p> <p>User has ability to input alternate thicknesses, but where less than default, will be flagged in Capping Alerts sheet.</p>	<p>Volume of material to push on flat and slopes (m³)</p> <p>Volume of rock armour to push on flat and slopes (m³)</p> <p>Volume of material used in capillary break layer (m³)</p> <p>Volume of material used in low permeability layer (m³)</p> <p>Volume of materials used in top rock layer (m³)</p> <p>Volume of growth media (m³)</p> <p>Area requiring re-seed (ha)</p>

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
<p>Overburden dumps and spoil piles (User defined). This option allows the user to design their own dumps and piles with intent to represent those on the site.</p>	<ul style="list-style-type: none"> • Re-profiled slope angle (<= 2.8° to > 17.5°). • Length of dozer push (< 20 m to <= 500 m) for earthmoving components. • Dozer size (d6 to d11). • Haulage distances for rock for armouring of slopes, top rock cover, growth media. Ranges from < 200 m to > 6 km. • Fleet size (small, medium, large or truck/shovel) for hauling rock for amour and top rock layer, growth media. Ranges from < 200 m to > 6 km. • Amendment of growth media (no amend, lime, gypsum, biosolids). • Type of seed (native or pasture). • Long haul sourcing of topsoil, lime or clay. 	<p>Key inputs are:</p> <ul style="list-style-type: none"> • Area of total footprint, flat, slope, ramps (ha) and for top rock cover (ha) (or accept calculation default to flat area). • Average doze thickness for pushing on flat and slope (m). • Volume of material to push on flat and slopes, of rock to place, of growth media, of top rock layer (or accept calculation). • Thickness of rock armour to place on slope, thickness of topsoil layer (m) • Area for drainage (ha). • Area for growth media amendment (ha). • Area of re-seeding required (ha). 	<p>See Table 5 for capping defaults by risk category. Growth media thickness 0.15 m</p>	<p>Volume of material to push on flat and slopes (m³) Volume of rock armour to push on flat and slopes (m³) Volume of materials used in top rock layer (m³) Volume of grow media (m³) Area requiring re-seed (ha)</p>
<p>Growth media stockpile (user-defined). This option allows the user to design their own stockpiles and piles with intent to represent those on the site.</p>	<ul style="list-style-type: none"> • Length of dozer push (< 20 m to <= 500 m). • Fleet (dozer size) (d6 to d11). • Haulage distance for growth media. Ranges from < 200 m to > 6 km. • Type of seed (native or pasture). • Sourcing of growth media (long distance or local). • Distance return for growth media (5 to 10 km, to 200 to 250 km). • Amendment of growth media (no amend, lime, gypsum, biosolids). 	<p>Key inputs are:</p> <ul style="list-style-type: none"> • Area of total footprint, flat (ha). • Average doze thickness for pushing (m). • Volume of material to push on flat and of growth media (or accept calculation). • Area for growth media amendment (ha). • Area of re-seeding required (ha). 	<p>Thickness of growth media (0.15 m)</p>	<p>Volume of material to push (m³) Volume of growth media (m³) Area requiring re-seed (ha)</p>

Table A-7. Heap Leach Pad User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Heap leach pads (defaults)	<ul style="list-style-type: none"> • High risk. • Medium risk with low permeability layer. • Medium risk. • Low risk. • Very low risk. 	Number of heap leach pads in each category.	None	None
Heap leach pads (user defined). This option allows the user to design their own heap leach pads with intent to represent those on the site.	<ul style="list-style-type: none"> • High risk. • Medium risk with low permeability layer. • Medium risk. • Low risk. • Very low risk. • Selection of risk category determines the capping design. For high risk caps, the expected minimum thicknesses are identified and where lower values are input, it is flagged in the 'capping alerts' sheet. Re-profiled slope angle for embankments and ramps ($\leq 2.8^\circ$ to $> 17.5^\circ$). • Length of dozer push (< 20 m to ≤ 500 m) for earthmoving components. • Haulage distances for rock for armouring of slopes, working layer, capillary break materials, top rock cover, growth media. Ranges from < 200 m to > 6 km. • Fleet size (small, medium or large and dozer sizes) for hauling rock for amour and capillary break materials, top rock layer, growth media. Ranges from < 200 m to > 6 km. • Amendment of growth media (no amend, lime, gypsum, biosolids). • Type of seed (native or pasture). • Long haul sourcing of topsoil, lime or clay. 	<p>Key inputs are:</p> <ul style="list-style-type: none"> • Area of total footprint, embankment and ramps (ha) and to cap (ha) (or accept calculation default to total footprint). • Volume of rock to place on embankment, of capillary break materials, of low permeability layer materials, of growth media, of top rock layer (or accept calculation). • Thickness of rock armour to place on embankment and ramps, of rock working layer, of capillary break layer, of low permeability layer, of top rock layer, of topsoil layer (m) (or accept defaults). • Area (ha) and thickness (m) of pile for flushing. • Area of additional capping materials (gcl, geofabric, geomembrane) (ha). These are optional and in certain instances may replace other layers (e.g. Gcl replacing low permeability clay layer). • Area for drainage (ha). • Area for growth media amendment. • Area of re-seeding required. • Number of geotech holes per hectare (or accept default). • Other activities. 	See Table 5 for capping defaults by risk category. Growth media thickness 0.15 m	<p>Volume of rock armour for embankment and ramps (m³)</p> <p>Volume of material used in working layer (m³)</p> <p>Volume of material used in capillary break layer (m³)</p> <p>Volume of material used in low permeability layer (m³)</p> <p>Volume of materials used in top rock layer (m³)</p> <p>Volume of pile to be flushed (m³)</p> <p>Volume of growth media (m³)</p> <p>Area requiring re-seed (ha)</p>

Table A-8. Tailings Storage Facilities User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Tailings storage facilities (defaults)	<ul style="list-style-type: none"> • High risk. • Medium risk with low permeability layer. • Medium risk. • Low risk. • Very low risk. 	Number of tailings storage facilities in each category.	None	None
Tailings storage facilities (user defined). This option allows the user to design their own tailings storage facilities with intent to represent those on the site.	<ul style="list-style-type: none"> • High risk. • Medium risk with low permeability layer. • Medium risk. • Low risk. • Very low risk. • Selection of risk category determines the capping design. For high risk caps, the expected minimum thicknesses are identified and where lower values are input, it is flagged in the 'capping alerts' sheet. Re-profiled slope angle for embankments and ramps (<=2.8° to > 17.5°). • Length of dozer push (< 20 m to <=500 m) for earthmoving components. • Haulage distances for rock for armouring of slopes, working layer, capillary break materials, top rock cover, growth media. Ranges from < 200 m to > 6 km. • Fleet size (small, medium or large and dozer sizes) for hauling rock for amour and capillary break materials, top rock layer, growth media. Ranges from < 200 m to > 6 km. • Amendment of growth media (no amend, lime, gypsum, biosolids). • Type of seed (native or pasture). • Long haul sourcing of topsoil, lime or clay. 	<p>Key inputs are:</p> <ul style="list-style-type: none"> • Area of total footprint, embankment and ramps (ha) and to cap (ha) (or accept calculation default to total footprint). • Volume of rock to place on embankment, of capillary break materials, of low permeability layer materials, of growth media, of top rock layer (or accept calculation). • Thickness of rock armour to place on embankment and ramps, of rock working layer, of capillary break layer, of low permeability layer, of top rock layer, of topsoil layer (m) (or accept defaults). • Area of additional capping materials (gcl, geofabric, geomembrane) (ha). These are optional and in certain instances may replace other layers (e.g. Gcl replacing low permeability clay layer). • Area for drainage (ha). • Area for growth media amendment (ha). • Area of re-seeding required (ha). • Number of geotech holes per hectare (or accept default). • Other activities. 	See Table 5 for capping defaults by risk category. Growth media thickness 0.15 m	<ul style="list-style-type: none"> Volume of rock armour for embankment and ramps (m³) Volume of material used in working layer (m³) Volume of material used in capillary break layer (m³) Volume of material used in low permeability layer (m³) Volume of materials used in top rock layer (m³) Volume of growth media (m³) Area requiring re-seed (ha)

Table A-9. Pits User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Basic pit information	None	Name of the pit Area of the pit (ha) Details for the required treatment(s) for that pit. Available treatments are: <ul style="list-style-type: none"> • Safety bund length (m). • Highwall / bench blasting area (ha), volume to bulk push (m3), volume of highwall to blast (m3), volume of benches to blast (m3). • Low wall area to make safe (ha), volume to bulk push (m3), volume to load and haul (m3). • Open pit backfill volume (m3). • Open pit ramp volume (m3). 	None	None
Safety bund, fencing and signs	<ul style="list-style-type: none"> • Safety bund details construction method – excavate and place or haul and place. • User input haulage distance – Y or N, if Y is selected the User then selects the rock haulage distance (ranges <= 200 m to > 6,000 m). If N is selected, the default is taken. • Fleet size for rock haulage (small, medium, large). 	<ul style="list-style-type: none"> • Bund height, width at base and width at top (m) (or accept defaults). • Standard fencing length and signs (m) (or accept default). • High wall security fencing length and signs (m). 	Bund height (2.5 m), width at base (5.0 m) and width at top (2.0 m) Construction method default is haul and place If haul and place is selected, haul distance = 4 km Standard fencing length = 1.2 X safety bund length	Bund volume per unit length (m ³ /m), bund volume (m ³)
Benches and highwall drill and blast and doze to make safe	<ul style="list-style-type: none"> • Re-profiled slope angle (<= 2.8° to > 17.5°). • Length of dozer push (ranges <= 20 m to <= 500 m). • Dozer size (D6 to D11). • Soil amendment type (various) • Haulage distance for growth media. 	<ul style="list-style-type: none"> • Highwall / benches volume to bulk push (m3) (or accept calculation). • Growth media thickness (m) (or accept default). • Growth media volume (m3) (or accept calculation). 	Growth media thickness = 0.15 m	Highwall / benches volume to bulk push (m ³) Growth media volume (m ³)

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
	<ul style="list-style-type: none"> Fleet size for growth media haulage (small, medium, large or truck/shovel for rock). Proportion of native / pasture land. 			
Low walk shaping / Load and haul to make safe	<ul style="list-style-type: none"> Re-profiled slope angle (<= 2.8° to > 17.5°). Length of dozer push (ranges <= 20 m to <= 500 m). Dozer size (D6 to D11). Haulage distance for low wall material (ranges <= 200 m to > 6,000 m). Fleet size for low wall material haulage (small, medium, large). Haulage distance for growth media (ranges <= 200 m to > 6,000 m). Fleet size for growth media (small, medium, large). Type of seed (native or pasture). 	<ul style="list-style-type: none"> Bulk volume to push (m3) (or accept calculation). Volume to load and haul (m3) (or accept calculation). Growth media thickness (m) (or accept default). Growth media volume (m3) (or accept calculation). 	Growth media thickness = 0.15 m	Growth media volume (m ³)
Backfill open pit with waste rock	<ul style="list-style-type: none"> Haulage distance for rock and growth media (ranges <= 200 m to > 6,000 m). Fleet size for rock and growth media haulage (small, medium, large). Length of dozer push (ranges <= 20 m to <= 500 m). Dozer size (D6 to D11). Proportion of native/pasture land. 	<ul style="list-style-type: none"> Growth media thickness (m) (or accept default). Growth media volume (m3) (or accept calculation). 	Growth media thickness = 0.15 m	Growth media volume (m ³)
Open pit ramp backfill (used for coal mines)	<ul style="list-style-type: none"> Length of dozer push for contaminated material and backfill (ranges <= 20 m to <= 500 m). Dozer size. Haulage distance for contaminated material, backfill and growth media (ranges <= 200 m to > 6,000 m). Fleet size for contaminated material, backfill and growth media haulage (small, medium, large or truck/shovel for ramp fill material). Type of seed (native or pasture). 	<ul style="list-style-type: none"> Average ramp depth, average roadway width, average ramp length (m). Number of ramps in-pit. Volume of backfill (m3) (or accept calculation). Ramp average roadway contaminated material thickness (m) (or accept default). Ramp volume of contaminated material (m3) (or accept calculation). Growth media thickness (m) (or accept default). Growth media volume (m3) (or accept calculation). 	Ramp average roadway contaminated material thickness = 0.5 m Growth media thickness = 0.15 m	<ul style="list-style-type: none"> Volume of backfill (m3). Ramp volume of contaminated material (m3). Growth media volume (m3).

Table A-10. Underground Mines User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Underground mines	<ul style="list-style-type: none"> Backfill, plug or cover ventilation shafts. Backfill hoisting shafts or cover with steel plate. 	<ul style="list-style-type: none"> Name of the mine. Terminate services (#). # and total depth (m) of ventilation shafts. # and total depth (m) of hoisting shafts. # of small adits. # of declines and drifts and conveyors. # of historical shafts. Area for land rehabilitation / subsidence repair. 	None	None

Table A-11. Ports User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Ports (and other marine facilities) - defaults	<ul style="list-style-type: none"> Jetty. Wharf. Dolphins. Reclaimer. Shiploaders. Conveyor on jetty. Conveyor on land. 	<ul style="list-style-type: none"> Name of facility. Length of jetties and conveyors (m). Area of wharf (m2). # of dolphins, reclaimers and shiploaders. 	None	None
Ports (and other marine facilities) – User build	<ul style="list-style-type: none"> Distance to haul gravel – ranges from <= 200 m to > 6 km). Buildings and camps as for Infrastructure. Tanks and piping as for Infrastructure. Ponds / dams as for Water Storage. Soil amendments as for waste structures. Source for growth media (local or long distance) and distance for long distance. Fleet size for growth media. 	<ul style="list-style-type: none"> Name of facility. Export capacity (Mt per year). Total land area (ha). Wharf area (ha). Concrete area of wharf (ha) and jetty (m2). Concrete thickness of wharf and jetty (m). Asphalt surface (m2). Gravel surface (m2). # of dolphins, wharf and jetty shiploaders, stockpile loaders, reclaimers, portable buildings, camps, tanks and ponds. 	Concrete thickness wharf (0.15 m) and jetty (0.5 m) Asphalt thickness (0.50 m) Gravel thickness (0.50 m) Thickness of growth media (150 mm)	Volume of wharf and jetty concrete to remove (m3) Volume of wharf asphalt to remove (m3) Volume of wharf gravel to remove (m3) Volume of growth media (m3)

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
		<ul style="list-style-type: none"> Length of jetty and land conveyors, rail, and pipe (m). # of rail loading bins. Buildings, Rail facility, substation and switchyard area (m²). Area to rip, grade, add growth media, amend, seed (ha). Thickness of growth media (mm). Proportion of seed to native and pasture. 		

Table A-12. Investigation, Contamination, Scrap, Waste Levy User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Land investigation	None	<ul style="list-style-type: none"> Name of area. Proportion of One-off Costs. Preliminary Site Investigations (#). Width and length (m) or diameter (m) or area (ha) of land to be investigated. 	None	Area to be investigated (ha)
Remove material from footprint of process facility / stockpile area / roads and dump in void on-site from footprint of the process facility (leach pads) / stockpile area (ROM product) / roads and dump in a void on-site or to tailings (e.g. sludge)	<ul style="list-style-type: none"> Distance to void with ranges from <= 200 m to > 5 km. Fleet for load and haul. 	<ul style="list-style-type: none"> Name of area. Rip up and push material (m³). 	None	None
Remove scrap	<ul style="list-style-type: none"> Remove and bury on-site or dispose off-site. 	<ul style="list-style-type: none"> Name of area. 	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
		<ul style="list-style-type: none"> Mass of scrap (t). 		
Disposal to off-site facility	<ul style="list-style-type: none"> Asbestos (ACM). Asbestos in soil. Low level petroleum hydrocarbons in soil. High level petroleum hydrocarbons in soil. Low level inorganics in soil. High level inorganics in soil. Sludge. General Waste. Construction/building waste. Regulated waste (e.g. tires and belts). 	<ul style="list-style-type: none"> Name of area. Mass of waste (t). 	None	None
Disposal to off-site facility - Waste Levy	None	Name of area.	None	None
Soil bioremediation	<ul style="list-style-type: none"> Volume ranges <=100m³, >100 to <=500 m³, > 500 m³. 	<ul style="list-style-type: none"> Name of area. Mass of soil (t). 	None	None

Table A-13. General Land Rehabilitation User Input Sheet

Activity	Options	Inputs	Defaults	Calculated quantities
Land rehabilitation and repair of subsidence and land management	<ul style="list-style-type: none"> Maintenance of rehabilitated areas. Existing rehabilitation repair – minor. Existing rehabilitation repair – moderate. Existing rehabilitation repair – major. Existing rehabilitation repair - total failure of intended landform. Rehabilitation of miscellaneous footprints. Land management of undisturbed areas (e.g., weed management, feral animal control, erosion and sediment control works). Pest management on buffer lands, non-disturbed, and rehabilitated areas. Subsidence in third-party land. 	Area for land rehabilitation / subsidence repair (ha).	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
Natural drainage and diversions	<ul style="list-style-type: none"> Engineered cut-through drain (6m wide) riprap lined (100 mm thick) based on catchment size of subsidence using D10 dozer. Maintenance of water course diversion (major structure). Maintenance of water course diversion (minor structure). Installation of rock armouring. Minor drainage line (non-watercourse) realignments. 	<ul style="list-style-type: none"> Area for rip rap (ha) and/or rock armour (m²). Length of water course / drainage re-alignment (m). 	None	None
General grade and rip	<ul style="list-style-type: none"> 12M, 14M, 16M graders. 	Area to grade and reshape (ha).	None	None
General doze and rip	<ul style="list-style-type: none"> D6 to D11 dozer. 	Area to doze, rip, reshape (ha).	None	None
Miscellaneous soil amelioration and seeding	<ul style="list-style-type: none"> Planting mature trees (>15 cm). Planting tube stock (<=15 cm). Hydro-seeding with mulch and bitumen tack. Gypsum normal soil. Gypsum sodic soil. Gypsum recycled normal soil. Gypsum recycled sodic soil. Lime. Biosolids. MSW. Manure. Hay mulch / sugar cane. Direct seeding / fertiliser (pasture grass species). Direct seeding/fertiliser (native tree/shrub/grass species). Fertiliser. 	<ul style="list-style-type: none"> Name of area. # of trees and stock. Area to hydroseed (m²). Area to amend and/or fertilise (ha). 	None	None
Bores	<ul style="list-style-type: none"> Water supply / monitoring bore hole plugging. Exploration bore hole plugging. Water supply bore hole backfilling with cuttings. 	# of bores and sumps.	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
	<ul style="list-style-type: none"> Monitoring bore hole backfilling with cuttings bore hole backfilling with cuttings. Water supply bore hole grouting. Monitoring bore hole grouting. Water reinjection bore hole grouting. Exploration bore hole grouting (coal / mineral sands / large impact drilling). Exploration bore hole grouting (metalliferous / low impact drilling). Exploration sumps. 			
Long distance carting of amendments	<ul style="list-style-type: none"> Long distance haul up to 250 km. Amendment type as per waste structures. 	<ul style="list-style-type: none"> Name of area. Area to amend (ha). Amendment rate (t/ha). Mass of amendment (t). 	Amendment rate per material (see subrates table 9)	Mass of amendment (t)
Purchase, load, haul, place growth media	<ul style="list-style-type: none"> Long distance haul up to 250 km. Fleet size. 	<ul style="list-style-type: none"> Name of area. Volume of growth media (m3). 	None	None
Long distance carting of clay	<ul style="list-style-type: none"> Long distance haul up to 250 km. 	<ul style="list-style-type: none"> Name of area. Area (ha) and thickness (m) to cap. 	Clay density 1.8 t/m3	Mass of capping material

Table A-14. Mobilisation/Demobilisation and Additional User Items

Activity	Options	Inputs	Defaults	Calculated quantities
Mobilisation and demobilisation	<ul style="list-style-type: none"> Small fleet (<= 150 km, > 150 km and <= 500 km, 500 km and <= 1000 km, > 1000 km). Medium fleet (<= 150 km, > 150 km and <= 500 km, 500 km and <= 1000 km, > 1000 km). Large fleet (<= 150 km, > 150 km and <= 500 km, 500 km and <= 1000 km, > 1000 km). Truck/shovel fleet (<= 150 km, > 150 km and <= 500 km, 500 km and <= 1000 km, > 1000 km). 	Number of mobilisations.	None	None

User Guide for Estimated Rehabilitation Cost Calculator for Mining

Activity	Options	Inputs	Defaults	Calculated quantities
Additional items	None	Quantities	None	None