MIDDLEMOUNT COAL MINE
PROGRESSIVE REHABILITATION AND CLOSURE PLAN

October 2023
Document No. FMMP 003.18
Version 4.0

DOCUMENT CONTROL

Title of the Project	Middlemount Coal Mine
Document Title	Progressive Rehabilitation and Closure Plan
Document ID Number	FMMP 003.18
Tenure Number(s)	ML 70379, ML 700014, ML 700027 and ML 70417
EA Number	EPML00716913
EA Holder Name	Ribfield Pty Ltd and Middlemount Coal Pty Ltd
EA Holder Contact	Adam Heap
EA Holder Contact Details	(07) 4985 0059

VERSION HISTORY

Version	Description	Date of Submission
1	Draft for DES feedback and review	31 May 2022
2	Final	28 June 2022
3	Revised to address DES comments	27 February 2023
4	Final	12 October 2023

TABLE OF CONTENTS

1 COVER PAGE .....
2 TABLE OF CONTENTS .....
3 REHABILITATION PLANNING PART 1
3.1 PROJECT PLANNING 1
3.1.1 Project Description 1
3.1.2 Baseline Information 13
3.1.3 Designing for Closure 36
3.1.4 Rehabilitation/Improvement Planning 37
3.2 COMMUNITY CONSULTATION 50
3.2.1 Community Consultation Register 50
3.2.2 Community Consultation Plan 54
3.3 POST-MINING LAND USE 56
3.3.1 Community Consultation 58
3.3.2 Relevant Legislation, Plans and Strategies 58
3.4 NON-USE MANAGEMENT AREAS 60
3.4.1 Community Consultation 61
3.4.2 Relevant Legislation, Plans and Strategies 61
3.5 REHABILITATION AND MANAGEMENT METHODOLOGY 62
3.5.1 Rehabilitation and Management Milestones 62
3.5.2 Rehabilitation Area Commencement Dates 73
3.5.3 General Rehabilitation Practices 73
3.5.4 Tailings Storage Facilities 101
3.5.5 Voids 101
3.5.6 Underground Mining 105
3.5.7 Built Infrastructure 105
3.6 RISK ASSESSMENT 108
3.6.1 Risk Identification 108
3.6.2 Risk Evaluation and Treatment 108
3.6.3 Rehabilitation Trials and Studies 135
3.7 MONITORING AND MAINTENANCE 138
3.7.1 Milestone Monitoring 138
3.7.2 Rehabilitation Maintenance/Contingency 153
3.7.3 Reporting Requirements 157
3.7.4 Auditing 158
3.8 REFERENCES 160

TABLE OF CONTENTS

LIST OF TABLES

Table 1 Relevant Mining Tenements
Table 2 Overlapping Petroleum Tenements
Table 3 Approved Environmentally Relevant Activities
Table 4 Reconciliation of Sections 126C and 126D of the Environmental Protection Act
Table 5 Progressive Rehabilitation and Closure Plan – Checklist
Table 6 Ground-truthed Regional Ecosystems
Table 7 Matters of State Environmental Significance – Flora
Table 8 Matters of State Environmental Significance – Fauna
Table 9 Landholders (Lot and DP) within the Middlemount Coal Mine
Table 10 Relevant Mining Activities
Table 11 Progressive Rehabilitation Undertaken to Date
Table 12 Community Consultation Register
Table 13 Community Consultation Plan
Table 14 Post-mining Land Use Transition
Table 15 Rehabilitation Milestones and Criteria for Rehabilitation Areas
Table 16 Management Milestones and Criteria for Improvement Areas
Table 17 Rehabilitation Area Commencement Dates and Justification
Table 18 Estimated Soil Resources Available and Required
Table 19 Seasonal Preferences and Application Rates for Cover Crops
Table 20 Seed Quantities Required for Grasses and Cover Crops
Table 21 Candidate species suitable for inclusion in the revegetation seed mix
Table 22 Candidate species suitable for inclusion in the revegetation seed mix (RA8)
Table 23 Identified Ranked Rehabilitation Risks
Table 24 Identified Unranked Rehabilitation Risks
Table 25 Risk and Control Assessment Criteria
Table 26 Controls, Management and Mitigation Measures
Table 27 Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks
Table 28 Onsite Rehabilitation Trial Details
Table 29 Revegetation Phases
Table 30 Management Milestones for Rehabilitation Areas
Table 31 Management Milestones for Improvement Areas
Table 32 Monitoring Methods for Rehabilitation Milestones
Table 33 Rehabilitation Reference Sites

TABLE OF CONTENTS

LIST OF FIGURES

Figure 1 Regional Location
Figure 2 Approved General Arrangement
Figure 3 Schematic Geology Cross Section
Figure 4 Surface Water Features
Figure 5 Soil Unit Mapping
Figure 6 Ground-truthed Regional Ecosystem Mapping
Figure 7 Endangered and Of Concern Regional Ecosystems
Figure 8 Wetlands
Figure 9 Conservation Significant Species Records
Figure 10 Progressive Development and Rehabilitation (2023)
Figure 11 Progressive Development and Rehabilitation (2028)
Figure 12 Progressive Development and Rehabilitation (2032)
Figure 13 Progressive Development and Rehabilitation (2037)
Figure 14 Progressive Development and Rehabilitation (2044)
Figure 15 Progressive Development and Final Landform
Figure 16 PMLU and NUMAs
Figure 17 Rehabilitation and Improvement Areas
Figure 18 Hydrogeological Conceptual Model (South-west to North-east)
Figure 19 Conceptual GA Post-Mining Cross Section Locations
Figure 20 Conceptual Cross Sections A and B
Figure 21 Conceptual Cross Section C
Figure 22 Existing Rehabilitation Reference Sites

LIST OF ATTACHMENTS

Attachment 1 Progressive Rehabilitation and Closure Plan Schedule
Attachment 2 Environmental Authority EPML00716913
Attachment 3 Letter from Middlemount Coal Mine to the Department of Environment and Science (RE: Middlemount Coal Mine, EMPL00716913 – Retention of Water Structures). Dated 15 May 2020
Attachment 4 Middlemount Coal Mine Rehabilitation Monitoring Program 2021

TABLE OF CONTENTS

LIST OF APPENDICES

Appendix A Surface Water Assessment
Appendix B Groundwater Assessment
Appendix C Terrestrial Ecology Assessment
Appendix D Aquatic Ecology Assessment
Appendix E Mine Waste Management Plan
Appendix F Soil Resources Review
Appendix G Mining By-Products Management Plan
Appendix H Revegetation Management Plan
Appendix I PRCP Risk Assessment
Appendix J Landform Design and Stabilisation
Appendix K Middlemount Coal Mine Geotechnical – Final Void Study

LIST OF PLATES

Plate 1 Groundwater Level Hydrographs
Plate 2 Cover crop species present on 5 month old rehabilitation at the Middlemount Coal Mine.
Plate 3 Intermediate pasture with emerging Acacia species present at the Middlemount Coal Mine.
Plate 4 Table 5 and 6 from the Middlemount Coal Mine Geotechnical – Final Void Study

3 REHABILITATION PLANNING PART

3.1 PROJECT PLANNING

On 27 May 2021, the Queensland (QLD) Department of Environment and Science (DES), pursuant to section 754 of the *Environmental Protection Act 1994* (the EP Act), issued Ribfield Pty Ltd and Middlemount Coal Pty Ltd (MCPL) a Progressive Rehabilitation and Closure Plan Transition Notice (PRCP Transition Notice). The PRCP Transition Notice requires the preparation of a Progressive Rehabilitation and Closure (PRC) Plan for the Middlemount Coal Mine that satisfies the requirements of sections 126C and 126D of the EP Act by 30 June 2022.

The Middlemount Coal Mine is an existing open cut coal mine located approximately 90 kilometres (km) north-east of Emerald and approximately 3 km to the south-west of the Middlemount Township, QLD (Figure 1). MCPL owns and operates the Middlemount Coal Mine on behalf of the incorporated joint venture between Peabody Energy Australia Pty Ltd and Yancoal Australia Ltd.

In 2020, MCPL prepared and submitted a Major EA Amendment for the Middlemount Coal Mine Southern Extension Project (and associated Environmental Values Assessment [EVA]). The Southern Extension Project was approved in 2021. Figure 2 provides an overview of the approved layout of the Middlemount Coal Mine (i.e., including the Southern Extension Project). As part of the Southern Extension Project, MCPL defined the post-mining land uses (PMLUs) and non-use management areas (NUMAs) that would be achieved for the Middlemount Coal Mine.

In accordance with the *Guideline - Progressive rehabilitation and closure plans* (ESR/2019/4964) (DES, 2021) (the PRCP Guideline), the approved PMLUs, NUMAs and associated rehabilitation requirements (including outcomes for the land and associated criteria for achieving these outcomes) from the Southern Extension Project have been transitioned into this PRC Plan and the Progressive Rehabilitation Closure Plan Schedule (PRCP Schedule).

The objective of this PRC Plan is to provide a roadmap for progressive rehabilitation and closure of the Middlemount Coal Mine to achieve a safe, stable and non-polluting final landform which satisfies the requirements of sections 126C and 126D of the EP Act and other relevant legislation.

This PRC Plan and the associated PRCP Schedule supersede the existing *Rehabilitation Management Plan* (MCPL, 2012), *Rehabilitation Management Plan Addendum* (GT Environmental, 2018) and *Plan of Operations Middlemount Coal Mine* (1 April 2019 to 31 March 2021) (MCPL, 2019).

3.1.1 Project Description

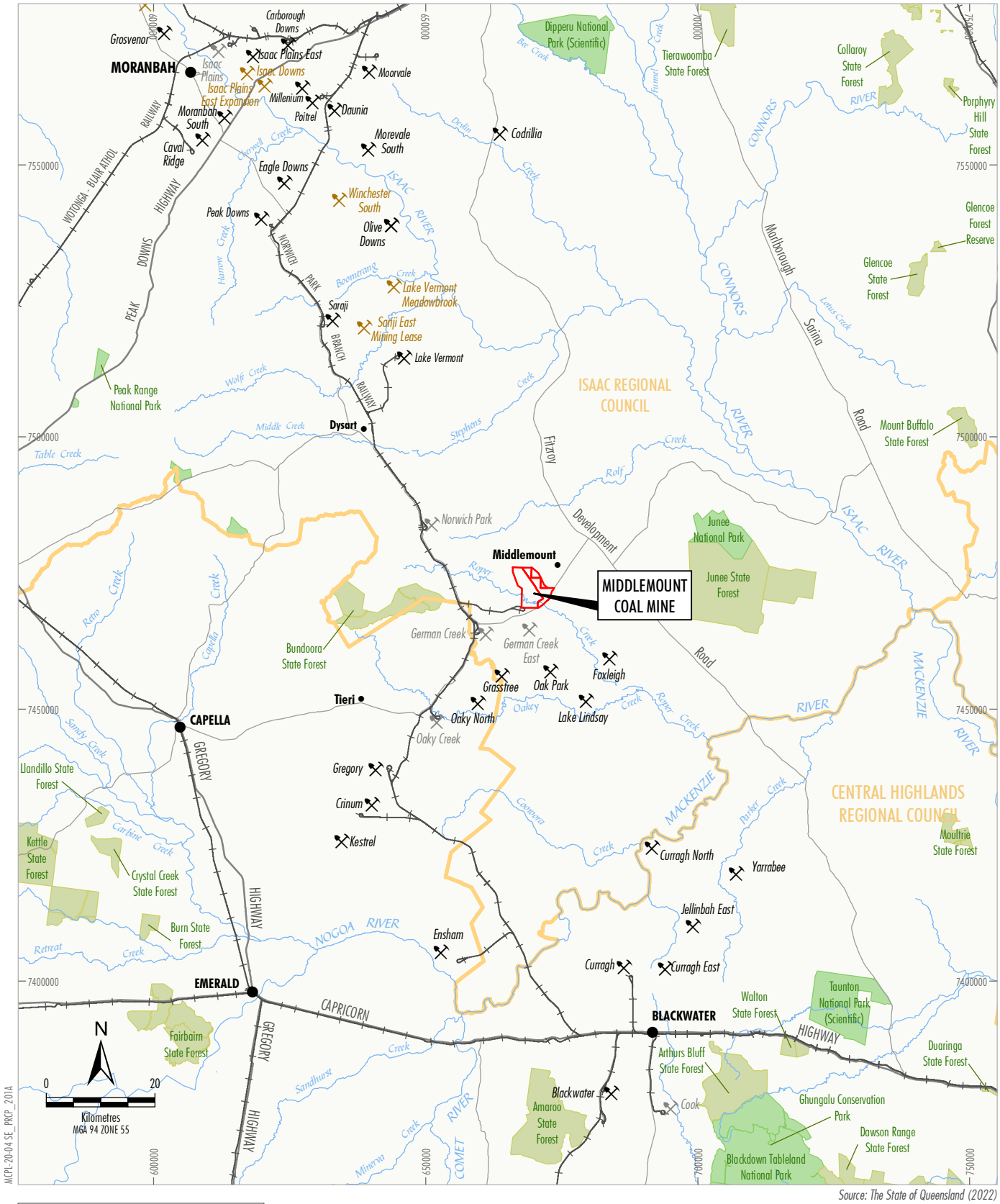
3.1.1.1 Type of Mining Operation

The Middlemount Coal Mine is an open cut coal mine, with truck and shovel operations.

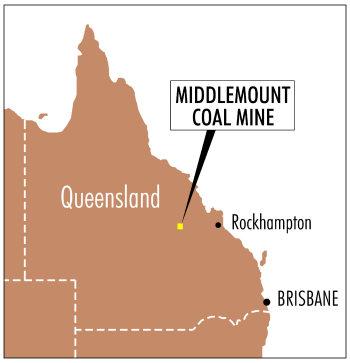
3.1.1.2 Duration of Mining Operations

The Middlemount Coal Mine has been operating for approximately 10 years, with full scale operations commencing in July 2011.

Operations are approved to continue until 2044.



Source: The State of Queensland (2022)



LEGEND

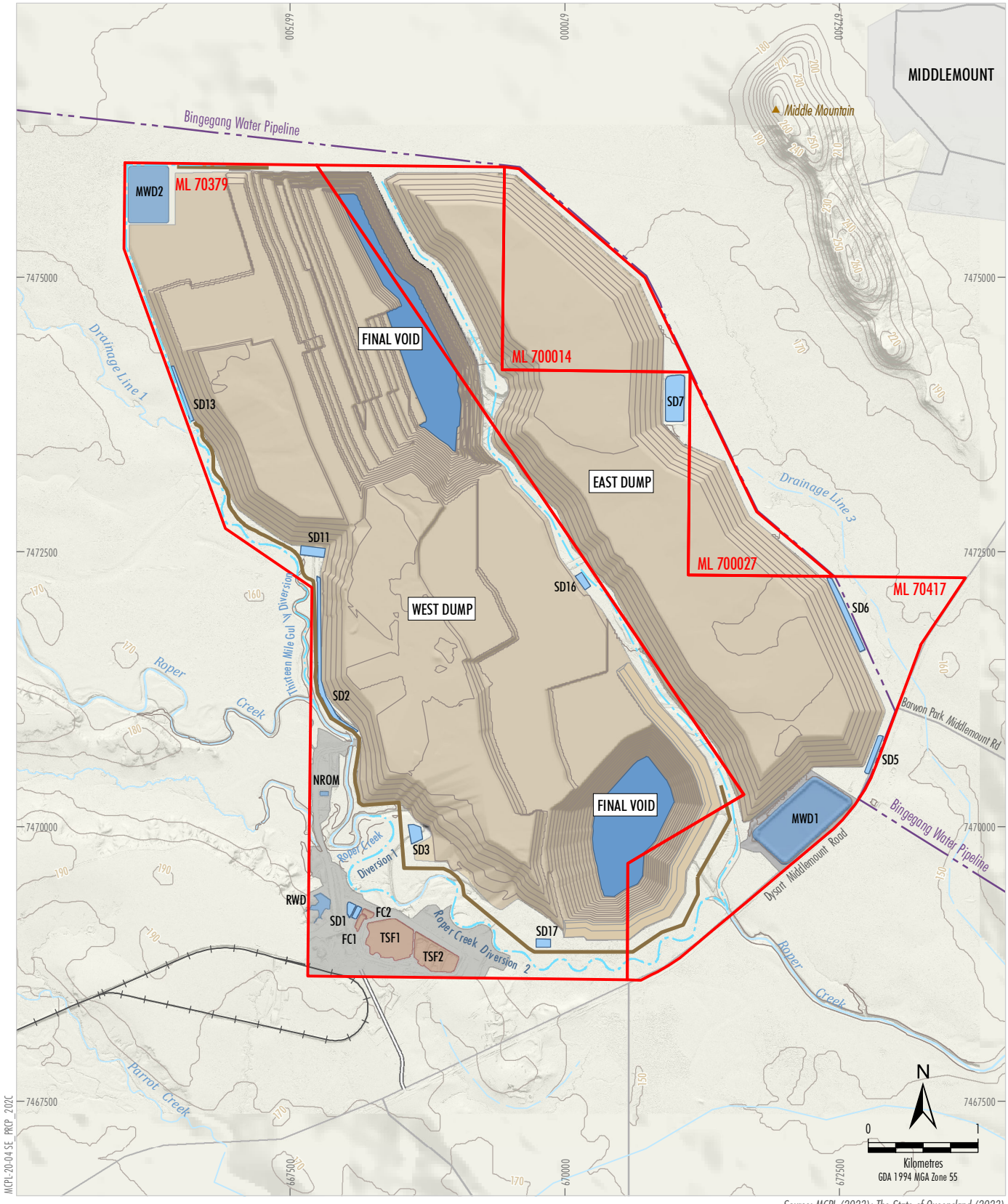
- National Park/Conservation Area
- State Forest
- LGA_Boundaries
- Railway
- Major Road
- Minor Road
- Major River
- Mining Lease Boundary
- Approved/Operating Coal Mine
- Proposed Coal Operation
- Under Care and Maintenance

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Regional Location

Figure 1



MCPL-20-04 SE_PRCP_202C

Source: MCPL (2023); The State of Queensland (2023)

LEGEND

- Mining Lease Boundary (ML)
- Mine Pit and Spoil
- Mine Infrastructure Area
- Tailings Storage Facility
- Sediment Dam
- Water Storage
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure
- Levee

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Project General Arrangement

Figure 2

3.1.1.3 Mining Tenements

Table 1 identifies the Middlemount Coal Mine tenements and their status, and identifies the overlapping Exploration Permit for Coal (EPC) tenure.

Table 1
Relevant Mining Tenements

Permit	Holder	Granted	Expiry	Area (hectare [ha])	Overlapping Mining Tenure
Mining Lease (ML) 70379	MCPL	10 September 2009	30 September 2031	2,128	EPC 855
ML 70417	MCPL	8 December 2011	30 September 2031	1,082	EPC 855
ML 700014	MCPL	6 January 2017	30 Sep 2031	197.5	-
ML 700027	MCPL	5 June 2019	30 Sep 2031	95.5	-

MCPL has an agreement in place with Foxleigh Coal for the overlapping EPC tenure.

In addition to an overlapping mining tenure, the Middlemount Coal Mine also has overlapping petroleum tenements (Table 2).

Table 2
Overlapping Petroleum Tenements

Petroleum Tenure	Holder	Granted	Expiry	Overlapping Mining Lease
ATP 1103	CH4 Pty Ltd	23 December 2010	31 December 2025	ML 70379, ML 70417, ML 700014, ML 700027
PCA 135	CH4	4 December 2014	3 December 2029	ML 70379, ML 70417, ML 700014
PCA 136	CH4	4 December 2014	3 December 2029	ML 70379, ML 70417, ML 700027
EPC 855	Foxleigh Coal Pty Ltd	20 October 2003	19 October 2022	ML 70379, ML 70417

3.1.1.4 Primary Mine Features and Infrastructure

The primary mine features and infrastructure associated with the Middlemount Coal Mine include:

- open cut truck and shovel mining operations at a mining rate of 5.7 million tonnes per annum run of mine (ROM) coal;
- processing of ROM coal at the CHPP;
- disposal of waste rock, comprising of overburden and interburden, in-pit or in out-of-pit waste rock emplacements as mining progresses;
- disposal of coarse coal reject material within in-pit waste emplacements;
- storage of fine coal reject material in existing tailings storage facility (TSF) cells;
- loading of product coal using rail loading infrastructure;
- transport of product coal via the existing rail system from the Middlemount Coal Mine to the Dalrymple Bay Coal Terminal, Abbot Point Port or Wiggins Island Coal Export Terminal for export;

- construction and operation of ancillary infrastructure in support of mining operations, including:
  - haul and access roads;
  - electricity supply and communications infrastructure; and
  - water management infrastructure.
- diversion of Roper Creek and Thirteen Mile Creek;
- development of soil stockpiles, laydown areas and borrow areas;
- 24-hour seven-days per week operations until 2044;
- peak operational workforce of over 500 personnel;
- ongoing exploration activities within mining tenements;
- other associated minor infrastructure, plant and activities, where required; and
- progressive rehabilitation, as well as ultimate rehabilitation of the entire Middlemount Coal Mine area once the site has been decommissioned.

3.1.1.5 Environmentally Relevant Activities

Environmentally Relevant Activities (ERAs) (defined under the EP Act) are activities that will, or have the potential to, release contaminants into the environment which may cause environmental harm.

In accordance with EA EPML00716913, the Middlemount Coal Mine is approved to conduct the ERAs described within Table 3 until 2044.

Table 3
Approved Environmentally Relevant Activities

Relevant Mining Lease	Environmentally Relevant Activity	Description
ML 70379 ML 70417 ML 700014 ML 700027	ERA 8	**Ancillary – Chemical Storage 3** Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c).
	ERA 13	**Schedule 3 – Mining Black Coal**
	ERA 15	**Ancillary – Fuel burning** Using fuel burning equipment that is capable of burning at least 500 kg of fuel in an hour.
	ERA 31	**Ancillary – Mineral processing 2** Processing, in a year, the following quantities of mineral products, other than coke (b) more than 100,000 t.
	ERA 63	**Ancillary – Sewage Treatment 1** Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of (a-i) 21 to 100 EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.

3.1.1.6 Relevant Legislation and Guidelines

Environmental Protection Act 1994

Table 4 provides a reconciliation of the relevant requirements of sections 126C (Requirements for PRC Plan) and 126D (Requirements for Proposed PRCP Schedule) of the EP Act and where they have been addressed in this PRC Plan.

Table 4
Reconciliation of Sections 126C and 126D of the Environmental Protection Act

Sections 126C and 126D of the EP Act	Section of this PRC Plan
Section 126C – Requirements for PRC Plan	
(1) A proposed PRC plan must	-
(a) be in the approved form; and	This PRC Plan
(b) describe the following –	-
(i) each resource tenure, including the area of each tenure, to which the application relates;	Section 3.1.1.3
(ii) the relevant activities to which the application relates;	Section 3.1.4.1
(iii) the likely duration of the relevant activities; and	Section 3.1.4.1
(c) include –	-
(i) a proposed PRCP schedule that complies with section 126D; and	Attachment 1
(ii) a detailed description, including maps, of how and where the relevant activities are to be carried out; and	Sections 3.1.3 and 3.1.4, Figures 10 to 15 and Attachment 1
(iii) details of the consultation undertaken by the applicant in developing the proposed PRC plan; and	Section 3.2.1
(iv) details of how the applicant will undertake ongoing consultation in relation to the rehabilitation to be carried out under the plan; and	Section 3.2.2
(d) state the extent to which each proposed post-mining land use for land, or non-use management area, identified in the proposed PRCP schedule for the plan is consistent with –	-
(i) the outcome of consultation with the community in developing the plan; and	Sections 3.3.1 and 3.4.1
(ii) any strategies or plans for the land of a local government, the State or the Commonwealth; and	Sections 3.3.2 and 3.4.2
(e) for each proposed post-mining land use for land, state the applicant's proposed methods or techniques for rehabilitating the land to a stable condition in a way that supports the rehabilitation milestones under the proposed PRCP schedule; and	Section 3.5
(f) identify the risks of a stable condition for land mentioned in paragraph (e) not being achieved, and how the applicant intends to manage or minimise the risks; and	Section 3.6
(g) for each proposed non-use management area, state the reasons the applicant considers the area can not be rehabilitated to a stable condition because of a matter mentioned in section 126D(2); and	NA[1]

Table 4 (continued)
Reconciliation of Sections 126C and 126D of the Environmental Protection Act

Sections 126C and 126D of the EP Act	Section of this PRC Plan
(h) for each matter mentioned in paragraph (g), include copies of reports or other evidence relied on by the applicant for each proposed non-use management area; and	NA[1]
(i) for each proposed non-use management area, state the applicant's proposed methodology for achieving best practice management of the area to support the management milestones under the proposed PRCP schedule for the area; and	Section 3.5
(j) include the other information the administering authority reasonably considers necessary to decide whether to approve the PRCP schedule for the plan.	This PRC Plan
(2) The matters mentioned in subsection (1), other than the matter mentioned in subsection (1)(c)(i), are the rehabilitation planning part of the proposed PRC Plan.	-
Section 126D – Requirements for proposed PRCP schedule	
(1) A proposed PRCP schedule must—	Attachment 1
(a) for the area of each resource tenure described in the PRC plan, state—	
(i) the proposed post-mining land use for the land; or	
(ii) that the applicant considers the land to be a non-use management area; and	
(b) for each proposed post-mining land use mentioned in paragraph (a)(i), state—	
(i) each rehabilitation milestone required to achieve a stable condition for the land; and	
(ii) when each rehabilitation milestone is to be achieved; and	
(c) for each non-use management area mentioned in paragraph (a)(ii), state—	
(i) each management milestone for the area; and	
(ii) when each management milestone is to be achieved; and	
(d) include maps showing the land mentioned in paragraphs (a), (b) and (c).	
(2) The PRCP schedule may state that land is a non-use management area only if—	NA[1]
(a) carrying out rehabilitation of the land would cause a greater risk of environmental harm than not carrying out the rehabilitation; or	NA[1]
(b) both of the following apply—	NA[1]
(i) the risk of environmental harm as a result of not carrying out rehabilitation of the land is confined to the area of the relevant resource tenure;	NA[1]
(ii) the applicant considers, having regard to each public interest consideration, that it is in the public interest for the land not to be rehabilitated to a stable condition.	NA[1]
(3) Despite subsection (2), if land the subject of the proposed PRCP schedule will contain a void situated wholly or partly in a flood plain, the schedule must provide for rehabilitation of the land to a stable condition.	NA[1, 2]
(4) For subsection (1)(b)(ii), the PRCP schedule must provide for each rehabilitation milestone to be achieved as soon as practicable after the land to which it relates becomes available for rehabilitation.	Section 3.5.1 and Attachment 1

Table 4 (continued)
Reconciliation of Sections 126C and 126D of the Environmental Protection Act

Sections 126C and 126D of the EP Act	Section of this PRC Plan
*(5) For subsection (4), land is **available for rehabilitation** if the land is not being mined, unless—*	Attachment 1
(1) the land is being used for operating infrastructure or machinery for mining, including, for example, a dam or water storage facility; or	
(2) the land is identified in the proposed PRCP schedule or the application for an environmental authority for relevant activities to which the schedule relates as containing a probable or proved ore reserve that is to be mined within 10 years after the land would otherwise have become available for rehabilitation; or	
(ba) the land is required for the mining of a probable or proved ore reserve mentioned in paragraph (b); or	
(3) the land contains permanent infrastructure identified in the proposed PRCP schedule as remaining on the land for a post-mining land use.	
…	

[1] In accordance with section 754(3) of the EP Act, MCPL is not required to comply with a requirement under section 126C(1)(g) or (h) or 126D(2) or (3) for the proposed PRCP Schedule for the plan in relation to land as an outcome for the land has been identified under a land outcome document (EA EPML00716913), and the outcome for the land is the same as, or substantially similar to, the outcome for the land if it were a NUMA under a PRCP Schedule.

[2] The Middlemount Coal Mine in accordance with EA EPML00716913 and section 126C(1)(i)) of the EP Act has pre-approved NUMA's and therefore Section 126D (3) does not apply to this PRCP.

Environmental Protection Regulation 2019

Schedule 8A of the *Environmental Protection Regulation 2019* (the EP Regulation) provides details of the objective assessment for particular PRCP Schedule decisions. The administering authority must consider whether the PRCP Schedule achieves each objective stated in Part 3 of Schedule 8A of the EP Regulation.

Based on the definitions provided in section 750 of the EP Act, the EA for the Middlemount Coal Mine (EA EPML00716913) is the land outcome document. Accordingly, section 213 of the EP Regulation outlines the following transitional provisions that apply:

(213) Carrying out PRCP objective assessment for particular PRCP schedule decision

(1) This section applies if, under section 754 of the Act, the administering authority has given a mining EA holder a notice requiring the holder to give the administering authority a proposed PRC plan.

(2) Schedule 8A, part 3, table 1 does not apply for conducting a PRCP objective assessment of the proposed PRCP schedule for the plan to the extent that—

(a) a land outcome document provides for an outcome for the land the subject of the proposed PRCP schedule; and

(b) the outcome for the land is the same as or substantially similar to the outcome for the land as if it were a post-mining land use or non-use management area under the plan.

(3) Also, the PRCP objective and PRCP performance outcomes stated in schedule 8A, part 3, table 2, entry for 'Rehabilitation Milestones' do not apply for conducting a PRCP objective assessment of the proposed PRCP schedule for the plan to the extent that—

(a) a land outcome document states criteria for achieving an outcome provided for in the document for land; and

(b) the same or substantially similar criteria are proposed in the plan for the outcome.

(4) In addition, the PRCP objective and PRCP performance outcomes stated in schedule 8A, part 3, table 3, entry for 'Management Milestones' do not apply for conducting a PRCP objective assessment of the proposed PRCP schedule for the plan to the extent that—

(a) a land outcome document states criteria for achieving an outcome provided for in the document for land; and

(b) the same or substantially similar criteria are proposed in the plan for the outcome.

…

Progressive Rehabilitation and Closure Plans Guideline

The PRCP Guideline assists applicants in developing a PRC Plan as part of a site-specific application for a new mining activity and for existing EA holders who will be required to develop a PRC Plan under section 754 of the EP Act.

The PRC Plan (the rehabilitation planning part) must meet the information requirements in sections 126C and 126D of the EP Act (unless otherwise stated) (Table 4) and must be written in accordance with the PRCP Guideline. The PRCP Schedule (Attachment 1) operates separately to the EA and contains milestones and conditions that relate to the completion of progressive rehabilitation and mine closure. Both the EA and the PRCP Schedule apply to the entire life of the mining activities, irrespective of when the underlying tenure expires. As per section 202E of the EP Act, where there is an inconsistency between an EA and a PRCP Schedule, the EA prevails to the extent of the inconsistency.

Section 126C(1)(a) of the EP Act requires that '*A PRC Plan must be in the approved form'.* The approved form for a PRC Plan is provided by the DES Application Form *Submission of a progressive rehabilitation and closure plan* (ESR/2019/4957) (herein referred to as the PRCP Application Form). Section 6 of the PRCP Application Form provides a checklist which has been reproduced in Table 5.

This PRC Plan has been structured to be consistent with the requirements outlined in Appendix 1 of the PRCP Application Form. The structure of this PRC Plan is summarised below:

Section 3.1: Provides an overview of the objective of this PRC Plan, details of relevant legislation and an introduction to the Middlemount Coal Mine, including site location details and a description of the Middlemount Coal Mine.

Section 3.2: Provides information on stakeholder consultation, including a community consultation register and community consultation plan.

Section 3.3: Describes the justification for the PMLU and details of each nominated PMLU.

Section 3.4: Describes the justification for the NUMA and details of each nominated NUMA.

Section 3.5: Includes information describing how the proposed rehabilitation and management methodologies have been developed and will be implemented.

Section 3.6: Provides details of the risk assessment undertaken to identify the risk of a stable condition for land not being achieved and also provides a risk treatment plan outlining how the risks will be managed or minimised.

Section 3.7: Provides a monitoring and maintenance program that identifies and describes the monitoring systems that will be undertaken to demonstrate a milestone and milestone criteria have been achieved.

Section 3.8: Lists the references cited in this PRC Plan.

Table 5
Progressive Rehabilitation and Closure Plan – Checklist

PRC Plan Requirement[1]	Requirement Met? (Yes/NA)	Relevant Section Number	Justification[2]
Project Description			
Describe the following:	-	-	-
• each resource tenure, including the area of each tenure to which the application relates;	Yes	Section 3.1.1.3	-
• the relevant activities to which the application relates;	Yes	Section 3.1.4.1	-
• the likely duration of the relevant activities.	Yes	Section 3.1.4.1	-
Include a detailed description, including maps, of how and where the relevant activities are to be carried out.	Yes	Sections 3.1.3 and 3.1.4, Figures 10 to 15 and Attachment 1	-
Consultation			
Include details of the consultation undertaken by the applicant in developing the proposed PRC plan.	Yes	Section 3.2.1	-
Include details of how the applicant will undertake ongoing consultation in relation to the rehabilitation to be carried out under the plan.	Yes	Section 3.2.2	-
PMLU			
State the extent to which each proposed PMLU identified in the proposed PRCP schedule for the plan is consistent with the outcome of consultation with the community in developing the PRC plan.	Yes	Section 3.3.1 and Attachments 1 and 2	The PMLU identified in the PRCP Schedule is compatible with existing surrounding land uses, would enable a productive land use for the site, and is consistent with EA EPML00716913.
State the extent to which each proposed PMLU identified in the proposed PRCP schedule for the plan is consistent with any strategies or plans for the land of a local government, the State or the Commonwealth.	Yes	Section 3.3.2 and Attachments 1 and 2	

Table 5 (Continued)
Progressive Rehabilitation and Closure Plan – Checklist

PRC Plan Requirement[1]	Requirement Met? (Yes/NA)	Relevant Section Number	Justification[2]
NUMA[3]			
State the extent to which each proposed NUMA identified in the PRCP schedule for the plan is consistent with the outcome of consultation with the community in developing the PRC plan.	Yes	Section 3.4.1 and Attachments 1 and 2	The NUMAs identified in the PRCP Schedule are consistent with EA EPML00716913.
State the extent to which each NUMA identified in the PRCP schedule for the plan is consistent with any strategies or plans for the land of a local government, the State or the Commonwealth.	Yes	Section 3.4.2 and Attachments 1 and 2	
For each proposed NUMA, state the reasons the applicant considers the area cannot be rehabilitated to a stable condition because of a matter mentioned in section 126D(2).	NA	Attachments 1 and 2	
For each matter mentioned in the requirement above, include copies of reports or other evidence relied on by the proponent for each proposed NUMA.	NA	Attachments 1 and 2	
Rehabilitation and Management Methodology[4]			
For each PMLU, state the applicant's proposed methods or techniques for rehabilitating the land to a stable condition in a way that supports the rehabilitation milestones under the proposed PRCP schedule.	Yes	Section 3.5.1	-
For each NUMA, state the applicant's proposed methodology for achieving best practice management of the area to support the management milestones under the proposed PRCP schedule for the area.	Yes	Section 3.5.1	-
Risk Assessment			
Identify the risks of a stable condition for land described as a PMLU not being achieved, and how the applicant intends to manage or minimise the risks.	Yes	Section 3.6	-
PRCP Guideline			
Include any other information prescribed by the administering authority in the PRCP Guideline.	Yes	This PRC Plan	-
Include the spatial information required in the PRCP Guideline.	Yes	Section 3.1.3 and Figures 10 to 15	-
Other Information			
Include the other information the administering authority reasonably considers necessary to decide whether to approve the PRCP schedule.	Yes	This PRC Plan	-

Table 5 (Continued)
Progressive Rehabilitation and Closure Plan – Checklist

PRC Plan Requirement[1]	Requirement Met? (Yes/NA)	Relevant Section Number	Justification[2]
PRCP Schedule[5]			
Include a PRCP schedule prepared using the *PRCP schedule template* (ESR/2019/5103).	Yes	Attachment 1	-
Include maps showing all of the land mentioned in the PRCP schedule, as it relates to being progressively rehabilitated.	Yes	Section 3.1.3 and Figures 10 to 17	-

1 As per the requirements of *Submission of a Progressive Rehabilitation and Closure Plan* (ESR/2019/4957).

2 Justification must be provided for any requirements for which the response is Not Applicable (NA).

3 Note for Transitional PRC plans: The holder is not required to comply with the requirements under section 126C(1)(g) or (h) or 126D(2) or (3) for the proposed PRCP schedule for the plan in relation to land if a land outcome document identifies the outcome for the land as the same, or substantially similar to, the outcome for the land if it were a NUMA.

4 Note: section 3.5 of the PRCP Guideline outlines the range of information that must be included as appendices to the rehabilitation planning part of the PRC plan.

5 The proposed PRCP schedule must comply with section 126D of the EP Act, and be written in accordance with the PRCP Guideline. The administering authority will assess the proposed PRCP schedule in conjunction with the rehabilitation planning part of the PRC plan and other application documents, and decide whether to approve the proposed PRCP schedule, with or without conditions, or refuse the proposed PRCP schedule.

3.1.2 Baseline Information

In 2020, MCPL completed the *Middlemount Coal Mine Southern Extension Project Environmental Values Assessment* (MCPL, 2020a). Studies undertaken for the EVA that are relevant to this PRC Plan include:

- Surface Water Assessment (WRM Water & Environment [WRM], 2020) (Appendix A).
- Groundwater Assessment (Australasian Groundwater and Environmental Consultants Pty Ltd [AGE], 2020) (Appendix B).
- Terrestrial Ecology Assessment (Biodiversity Australia, 2020) (Appendix C).
- Aquatic Ecology Assessment (DPM Envirosciences, 2020) (Appendix D).

To further support the studies undertaken for the EVA and to address the requirements of the PRCP Guideline, a contemporary Mine Waste Geochemical Characterisation (Geo-Environmental Management Pty Ltd [GEM], 2021) and a laboratory rock armour investigation (Landloch Pty Ltd, 2019) was undertaken.

3.1.2.1 Site Topography

The natural topography of the Middlemount Coal Mine is relatively flat, with an elevation ranging from approximately 160 to 170 metres (m) Australian Height Datum (AHD). Approximately 1.5 km to the east of the Middlemount Coal Mine, Middle Mountain rises to an elevation of approximately 280 m AHD (Figure 2) (MCPL, 2020a).

Overall, topography of the region is gently undulating. The local terrain is predominantly non-remnant vegetation and cleared land, with patches (varying in size) of remnant vegetation (MCPL, 2020a).

3.1.2.2 Climate

The Middlemount Coal Mine site has a sub-humid and semi-arid climate, with hot and wet summers, and cool and dry winters. The average daily minimum and maximum temperatures at Emerald Airport (located approximately 90 km south-west of the Middlemount Coal Mine) range between approximately 9 degrees Celsius (°C) (in July) and 35°C (in January).

The average monthly rainfall at the Middlemount Coal Mine exhibits distinctly wet (October to March) and dry (April to September) seasons during the year, with a dry season average low of 16 millimetres (mm) in September and a wet season high of 110 mm in January (BOM, 2021). The wet season average monthly rainfalls (41 mm to 110 mm) are significantly higher than the equivalent dry season average monthly rainfalls (16 mm to 34 mm) (BOM, 2021). The recorded mean annual rainfall at Booroondarra (located approximately 15 km west of the Middlemount Coal Mine) over the 91-year period is approximately 633 mm (BOM, 2021).

The average annual evaporation at Clermont Post Office (approximately 100 km west of the Middlemount Coal Mine) is 2,000 mm to 2,400 mm, which is greater than three times the average annual rainfall. The evaporation rate is high throughout the year, with the highest evaporation rates occurring in the months between October and March. Evaporation rates are typically much higher than rainfall in all months.

Although understanding of climate change has improved markedly over the past several decades, climate change projections are still subject to uncertainties such as (Commonwealth Scientific and Industrial Research Organisation [CSIRO], 2015):

> *…scenario uncertainty, due to the uncertain future emissions and concentrations of greenhouse gases and aerosols; response uncertainty, resulting from limitations in our understanding of the climate system and its representation in climate models; and natural variability uncertainty, the uncertainty stemming from unperturbed variability in the climate system.*

In Australia, the climate is projected to become warmer and drier.

Climate change may result in changes to rainfall patterns, runoff patterns and river flow. Based on the *Climate Change Projections for the east coast cluster* (CSIRO, 2015) the following changes are predicted at the Middlemount Coal Mine from 2090 onwards based on the RCP8.5 results:

- 80 percent (%) of climate change models predicted that annual rainfall would change by between -25 % (reduce by approximately 158 mm) and 14 % (increase by approximately 89 mm); and
- 80 % of climate change models predicted that annual evapotranspiration would change by between 9 % (increase by approximately 190 mm) and 18 % (increase by approximately 400 mm).

The potential implications of climate change to the residual void water balance and on design flood levels were considered in the Middlemount Coal Mine Southern Extension Project EVA (MCPL, 2020a).

3.1.2.3 Geological Setting

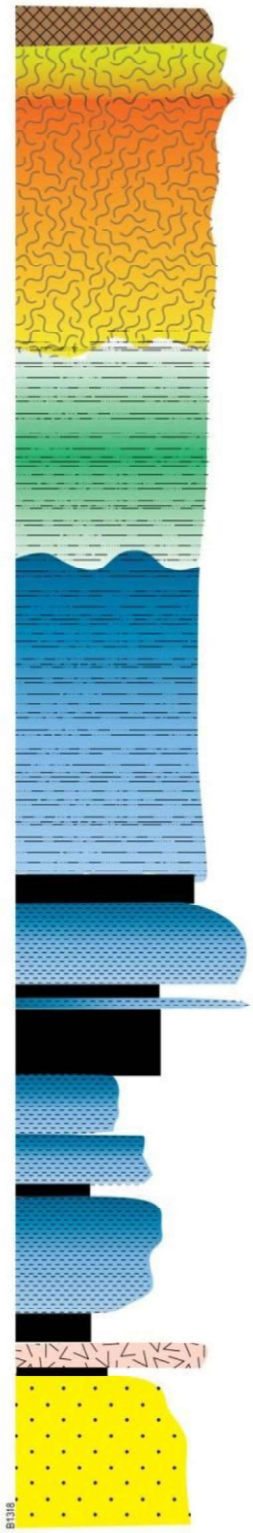
The coal resource at the Middlemount Coal Mine is located within the Permian age Rangal Coal Measures of the Bowen Basin. The Rangal Coal Measures form a relatively narrow (approximately 3 km wide) structure, striking from the north-northwest to south-southeast within and adjacent to the Middlemount Coal Mine tenements. In the locality, a veneer of more recent Tertiary geology and Quaternary geology typically overlies the Bowen Basin strata.

The target coal seams are the Middlemount and Pisces coal seams of the Rangal Coal Measures. These coal seams dip to the east-northeast at between 3 and 7 degrees (°), where they are truncated by the Jellinbah Fault, mapped to be generally coincident with the north-eastern boundary of ML 70379.

The main stratigraphic units occurring within the Middlemount Coal Mine and immediate surrounds, from youngest to oldest, including corresponding hydrogeological systems, are (Figure 3):

- Quaternary – Alluvial aquifer consisting of localised stream channel deposits and associated flood plain deposits.
- Tertiary – Duaringa Formation, consisting of thick, clay-rich laterite sourced from highly weathered Permian sandstones and siltstones, and occasional basalt. The Duaringa Formation is, at best, a low-yielding aquifer that would more commonly be regarded as an aquitard.
- Permian – Inter/overburden is predominantly sandstone, siltstone and mudstone. Coal seams (principally the Middlemount and Pisces Seams) for low to moderate yielding aquifers confined by inter/overburden units.

The physical and chemical properties of each of the above hydrogeological systems (where available) are described in the following subsections and are discussed further in Appendix B.



Soil

Quaternary – alluvium

Tertiary – mottled orange, brown clays, clayey sand and sand.
Upward fining and locally lateritised.

Tertiary – unconsolidated to poorly consolidated sandstone, mudstone

Base of Tertiary (20 m – 35 m)

Permian – Rangal Coal Measures, interbedded sandstone and mudstone

Base of weathering (35 m – 45 m)

Roper Seam (usually 1 – 2 m in thickness)

Mudstone and siltstone with thin sandstone lenses

Middlemount Upper Seam – predominantly dull coal (usually <0.5 m thick)

Middlemount Lower Seam (approximately 4 m thickness)

Mudstone and tuffaceous claystone

Tralee Seam – only present in parts of the deposit (usually <0.5 m in thickness)

Pisces Upper Seam
Yarabee Tuff – Mudstone and tuff bands
Pisces Lower Seam – generally thin (<30 cm) and poorly developed

Fort Cooper Coal Measures/Burngrove Formation

B1318

MCPL-20-04_SE_PRCP_001A

Source: MCPL (2022)

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Indicative Stratigraphy
of the Middlemount Coal Mine

Figure 3

Quaternary Sediments

The Quaternary alluvium is estimated to have a highly variable range of hydraulic conductivity values owing to its variable lithology of sand, clay, and occasional gravel bands. The sandy to gravelly creek beds are expected to have higher values of hydraulic conductivity compared to the floodplain deposits, because the latter would be expected to have a more clayey nature.

Where saturated, recharge to the alluvium would occur either:

- via direct rainfall on to the alluvium; or
- via seepage through the stream bed, when the creeks are flowing.

Stream gauging data for Roper Creek indicates surface water flow dissipates quickly after flow events. Therefore, recharge from stream flow would occur over short time periods as the water infiltrates relatively rapidly into the alluvium. When saturated, the groundwater flow in the Quaternary alluvium would expected to be generally from north-west to south-east, following the regional topography and drainage network.

In the vicinity of the Middlemount Coal Mine, discharge could occur from the alluvium via seepage to the underlying Tertiary sediments. However, this would only occur in areas where the alluvium is saturated and a downward vertical hydraulic gradient to the underlying strata occurs.

The Quaternary alluvium is not targeted by landholders in the vicinity of the Middlemount Coal Mine as a groundwater supply, which supports the general understanding that the Quaternary alluvium is not a productive aquifer within and surrounding the Project area (Section 3.1.2.5).

Tertiary Sediments

Tertiary sediments of the Duaringa Formation cover large areas of the Middlemount Coal Mine MLs and surrounds. The Duaringa Formation consists of deeply weathered mudstone, sandstone, pebbly sandstone/conglomerate and siltstone, gravel, and some interbedded shale and basalt. This formation unconformably overlies the Permian coal measures.

Recharge to the Tertiary Formation occurs via direct infiltration from rainfall in areas where the unit crops out and via seepage from the overlying Quaternary where present and saturated. However, recharge is expected to be low due to the predominately clayey nature of the formation.

Permian Sediments

The Permian strata includes coal seams interbedded with less permeable rock units such as sandstone, siltstone, and mudstones that are typically ‘tight’ and low yielding.

Recharge of the Permian coal measures occurs in areas where they sub-crop beneath the Tertiary cover. The coal seams all sub-crop within the western portions of the Middlemount Coal Mine MLs.

Private landholder bores do not commonly access the Permian aquifer due to the increased depth to water bearing strata and the typically high salinity of the contained water.

3.1.2.4 Site Hydrology and Fluvial Networks

The Middlemount Coal Mine is located within the Roper Creek catchment, within the Mackenzie River sub-basin of the greater Fitzroy Basin. The Middlemount Coal Mine lies within the area of the *Water Plan (Fitzroy Basin) 2011* (within the Upper Mackenzie Sub-catchment).

Local drainage in the vicinity of the Middlemount Coal Mine includes (Figure 4):

- Roper Creek and its approved (but not fully constructed) diversions;
- the Thirteen Mile Gully Diversion (including associated upstream drainage features, namely Drainage Lines 1 and 2) which diverts the upstream sub-catchments of Thirteen Mile Gully to Roper Creek; and
- an unnamed tributary of Roper Creek (designated 'Drainage Line 3') located immediately east of the Middlemount Coal Mine, which joins Roper Creek approximately 4.2 km downstream of Dysart Middlemount Road (Figure 4).

Roper Creek is an ephemeral watercourse that flows for short time periods following rainfall. The catchment commences about 35 km to the west of the Middlemount Coal Mine. Roper Creek flows into the Mackenzie River some 40 km to the south-east of the Middlemount Coal Mine.

The total catchment area of Roper Creek to the downstream boundary of the Middlemount Coal Mine tenements, including the Thirteen Mile Gully catchment, is approximately 389 square km (km^2).

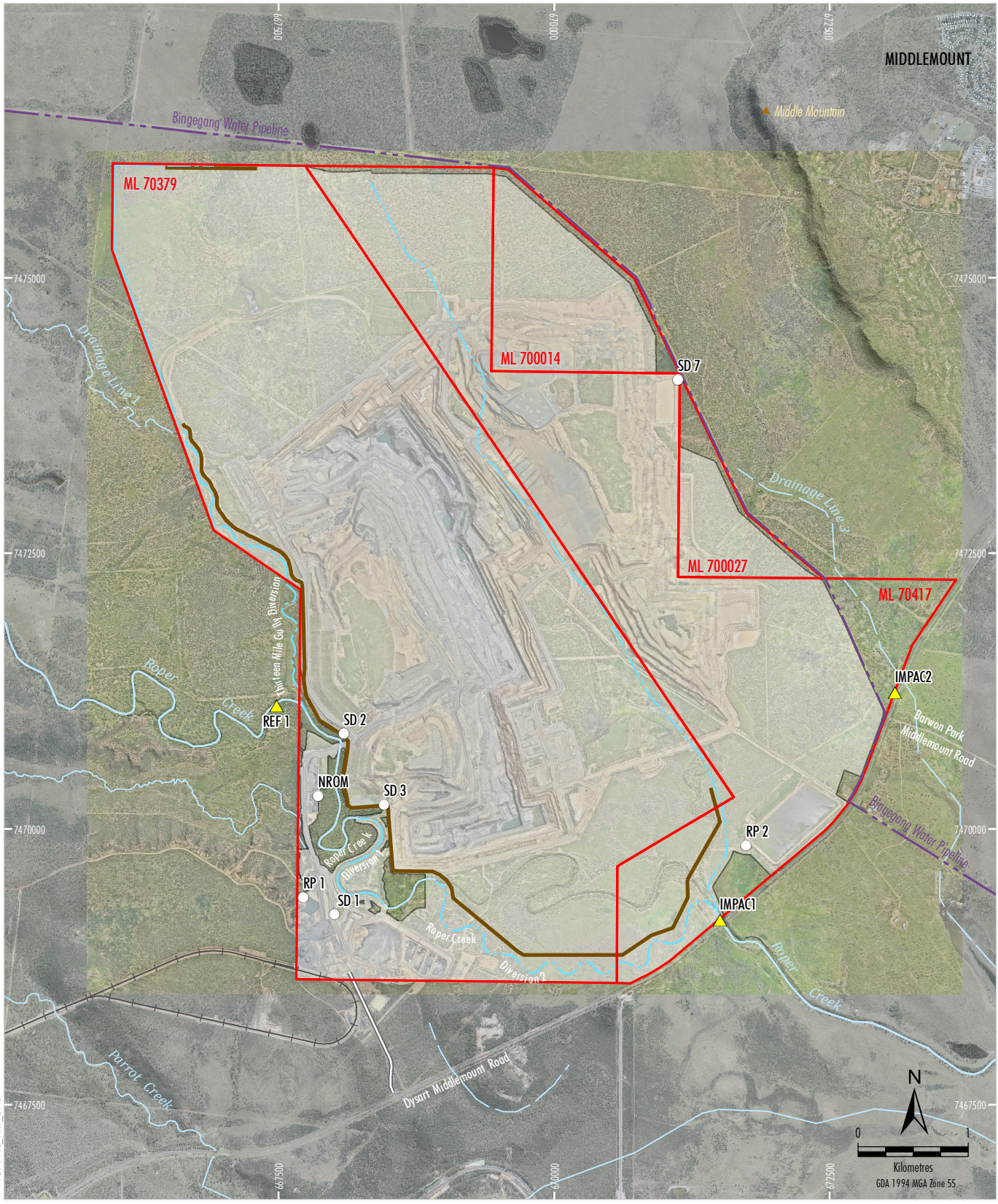
The upstream sub-catchments of Thirteen Mile Gully were diverted along the western boundary of ML 70379 in late 2014. The Thirteen Mile Gully Diversion is authorised under a Water Licence (No. 608025) under the QLD *Water Act 2000* (the Water Act) and two Development Permits under the QLD *Planning Act 2016* (the Planning Act). The existing Thirteen Mile Gully Diversion is shown on Figure 4.

Upstream of the diversion, the sub-catchments of Thirteen Mile Gully drain via two drainage features; Drainage Line 1 (to the north-west) and Drainage Line 2 (to the north) (Figure 4). The former Department of Natural Resources and Mines (DNRM) confirmed that these drainage lines are not watercourses, but rather drainage features defined under the Water Act that facilitate overland flow (DNRM, 2017).

A small portion of Thirteen Mile Gully (approximately 1 km) remains in its pre-mining location (within ML 70417) to the south-east of the Middlemount Coal Mine, which drains south to Roper Creek (Figure 4).

No water resource developments, such as dams or major irrigation infrastructure, are located within the Roper Creek catchment.

Extensive groundwater modelling was undertaken for the Southern Extension Project EVA (MCPL, 2020a) as well as for the Surface Water Assessment (WRM Water, 2020) and Groundwater Impact Assessment (AGE, 2020), to assess the likely long-term water level behaviour of the final voids within the Middlemount Coal Mine. The 0.1 % annual exceedance probability (AEP) design flood model was used to assess the immunity of the residual voids under final landform conditions. Residual void modelling indicated that the final landform void structures are stable and remain as long-term groundwater sinks with the ability to prevent floodwater overflow in a 0.1 % AEP event. It is noted that the work undertaken for the Southern Extension Project EVA refines the QLD Floodplain Assessment Overlay.



LEGEND

- Mining Lease Boundary (ML)
- Approved Disturbance Footprint
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure
- Levee
- Surface Water Reference Site
- Surface Water Release Point

Source: MCPL (2022); The State of Queensland (2022) Orthophoto Mosaic: 2021, 2015

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

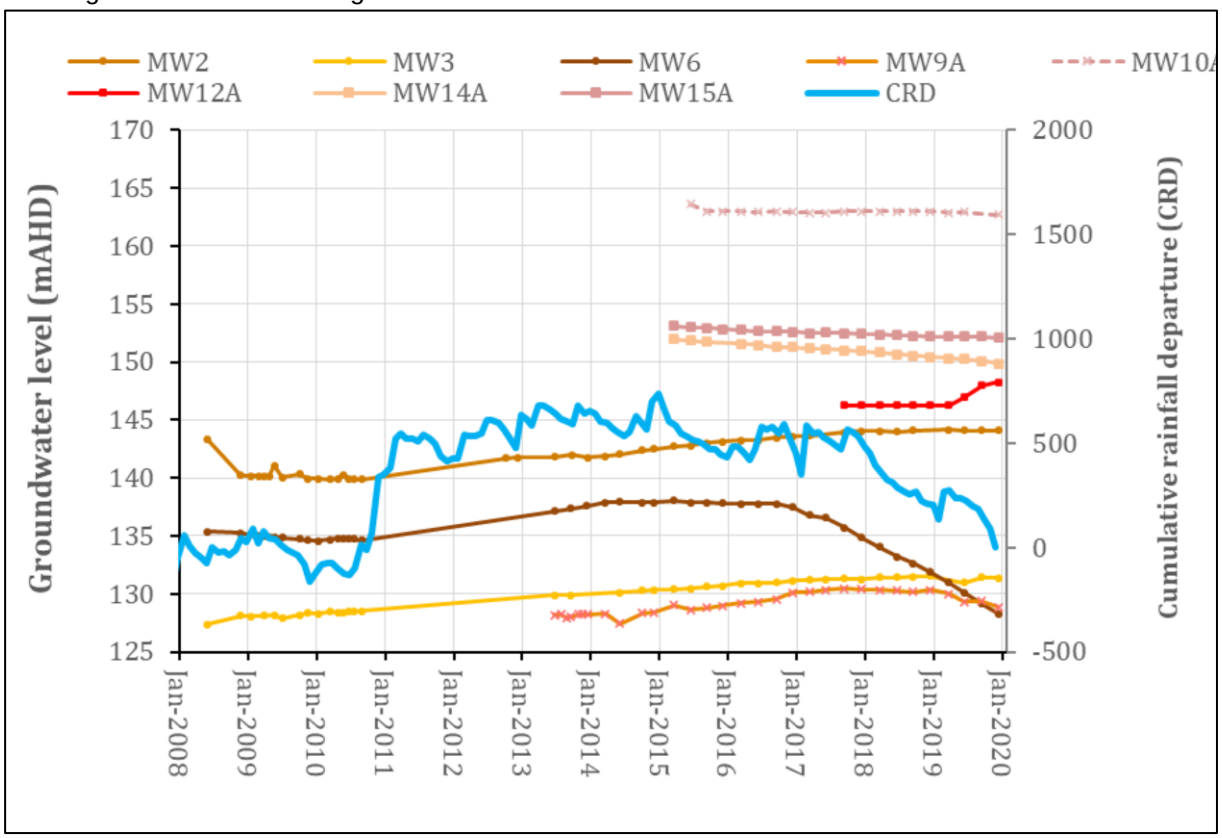
Surface Water Features

Figure 4

3.1.2.5 Groundwater Levels and Properties

Groundwater Levels

Groundwater level data has been collected from the groundwater monitoring bores within the vicinity of the Middlemount Coal Mine from 2008 to present. Plate 1 presents the groundwater level hydrograph for the groundwater monitoring bores.



Source: Figure 6.3 in AGE (2020).

Plate 1 - Groundwater Level Hydrographs

Groundwater levels are between 164.6 m AHD (MW10A) in the north to 127.4 m AHD (MW9A) adjacent to Roper Creek. Depth to water in the monitoring bores ranges from 7.7 m below ground level (mbgl) (MW14A) to 28.9 mbgl (MW9A), with an average depth of 17.3 mbgl.

Groundwater Quality

A review of groundwater quality samples taken between May 2013 and December 2019 was completed by AGE (2020) for the Middlemount Coal Mine Southern Extension EVA.

The review indicated that groundwater in the Tertiary aquifers is brackish to saline, with average electrical conductivity of 19,500 microSiemens per centimetre (mS/cm). On this basis, the groundwater is generally unsuitable for livestock watering. In regard to dissolved metals, selenium and mercury were detected, though levels were below the livestock watering and drinking water guidelines (AGE, 2020). The average concentration of iron was found to exceed the 80th percentile water quality objectives for shallow aquifers (AGE, 2020). Similarly, the average levels of sodium, calcium, magnesium, chloride and sulfate exceed the 80th percentile water quality objectives for shallow aquifers, with the maximum sulfate levels exceeding the stock watering guideline (AGE, 2020).

Bore Census

A bore census (4T Consultants, 2017) was conducted in a study area covering approximately 457 km² across six privately-owned properties, the Middlemount Landfill and the Middlemount Jockey Club (the bore census area). The bore census sought to identify and validate the presence of groundwater bores/features within the bore census area.

The bore census identified that there is limited groundwater use of brackish to saline groundwater in the locality.

The bore census indicated a total of five landholder water supply bores which were across two of the six privately-owned properties within the study area. All five identified water supply bores are located in excess of 5 km from the Middlemount Coal Mine and are located at depths of more than 30 mgbl.

The bore census also confirmed three groundwater monitoring bores located at the Middlemount Landfill established for the landfill operation. All three monitoring bores were dry when assessed for the bore census (4T Consultants, 2017).

3.1.2.6 Soil Types, Properties and Productivity

Soil Types and Properties

Soil types at the Middlemount Coal Mine (within ML 70379, 70417, 700014 and 700027) were described by Parsons Brinkerhoff (2010b). Based on the soil mapping presented in Parsons Brinkerhoff (2010a), six soil units have been identified at the Middlemount Coal Mine (Figure 5):

- Yellow Duplex – sandy loam or sand soils on the flat plains away from drainage lines and on very gently inclined slopes with neutral to moderate acidity, very low salinity and very low organic carbon content.
- Grey-Brown Duplex – sandy to clay loam soils on the flat plains and on the very gently inclined slopes with neutral to slight acidity, very low salinity and low organic carbon content. The subsoils of Grey-Brown Duplex soils are saline.
- Brown Uniform Clay – sandy clay with high clay content that is mildly to moderately alkaline and very low salinity.
- Alluvial Soils – clay loam soils along drainage features with very low salinity and medium organic carbon content.
- Red Lithosol – clay sandy loam to clay loam soils with neutral to strong acidity and very low salinity.
- Warwick – sandy clay to clay (high clay content) with neutral to very strong acidity and very low salinity.

The Yellow Duplex and Grey-Brown Duplex soils have moderate alkalinity, sodicity within the subsoils and are moderately to highly dispersive. The Brown Uniform Clay has poor workability when wet and the Red Lithosol and Warwick soils have negligible to slight potential for dispersion. The Alluvial soils are neutral, have very low salinity and are considered to have a negligible potential for dispersion (Parsons Brinkerhoff, 2010b).

Parsons Brinkerhoff (2010b) concluded that there is a low to negligible risk of acid mine drainage from the overburden at the Middlemount Coal Mine.

Soil Productivity

The Middlemount Coal Mine was assessed for suitability for dry-land cropping and beef cattle grazing on improved pasture land uses (Parsons Brinckerhoff, 2010b) and assigned land suitability classes as outlined in the *Guidelines for Agricultural Land Evaluation in Queensland* (Department of Science, Information Technology and Innovation [DSITI] and DNRM, 2015). The five-class system is based on physical and chemical limiting factors applied directly to specific uses, as described below (DSITI and DNRM, 2015):

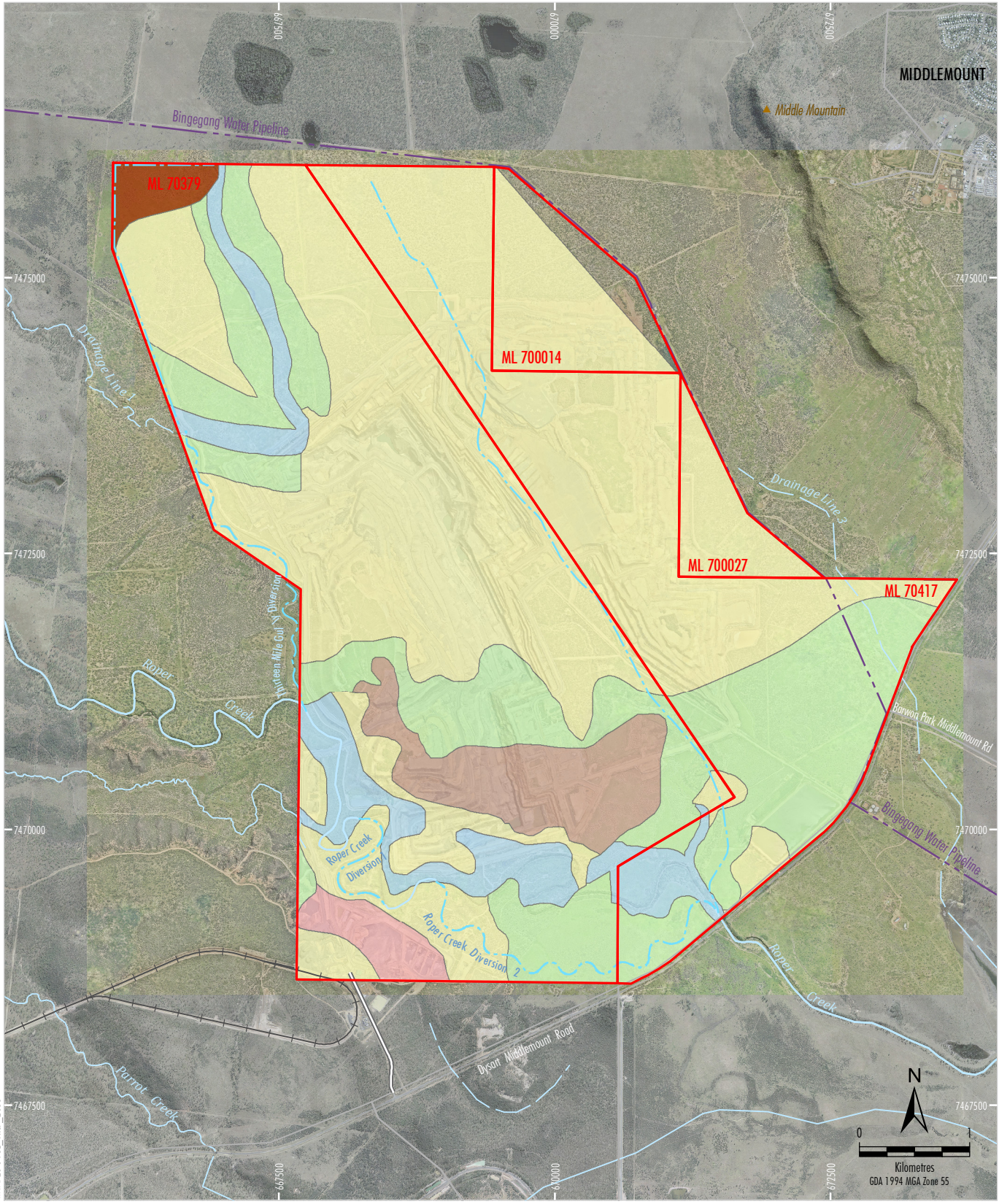
- Class 1 – Suitable land with negligible limitations and is highly productive requiring only simple management practices to maintain economic production.
- Class 2 – Suitable land with minor limitations which either constrain production or require more than the simple management practices of class 1 land to maintain economic production.
- Class 3 – Suitable land with moderate limitations that either further constrain production, or require more than those management practices of class 2 land to maintain economic production.
- Class 4 – Unsuitable land with severe limitations that the sustainable use of the land in the proposed manner is precluded. In some circumstances, the limitations may be surmountable with changes to knowledge, economics or technology.
- Class 5 – Unsuitable land with extreme limitations that preclude any possibility of successful sustained use of the land in the proposed manner.

The land suitability classification identifies limitations of the different soil types present and identifies suitable uses. Land suitability class is determined by the highest-ranking limiting factor or a combination of a number of factors. In this survey, the main limiting factors which determined low-density beef cattle grazing suitability class include:

- plant available water capacity;
- water erosion;
- nutrient deficiency;
- salinity; and
- soil physical factors.

Table G2 of EA EMPL00716913 specifies the post-mining land use of low density beef cattle grazing with native ecosystem, including the recreation of REs. Recreating REs is beneficial for restoring ecological communities and can be applied as an effective post-mining land use. However, the challenge with recreating REs as suggested by the EA, is the ability to provide a compatible soil structure and composition to allow for the establishment and longevity of these vegetation communities.

Based on the results from the Middlemount Coal Project, Stage 2 Geology, Soils and Land Resource Assessment (Parsons Brinckerhoff, 2010b), the pre-mining land use suitability for the Middlemount Coal Mine comprise classes between Class 2 and Class 4 for both dry land cropping and cattle grazing land uses, with the majority of the Middlemount Coal Mine classified as Class 3 for beef cattle grazing and Class 4 for dry land cropping. It is recognised that the wider Middlemount Coal Mine may contain small areas of Class 5 land.



LEGEND

- Mining Lease Boundary (ML)
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure

Soil Type

- Alluvial Soils
- Brown Uniform Clay
- Grey-brown Duplex
- Red Lithosol
- Warwick Soils
- Yellow Duplex

Source: MCPL (2022); The State of Queensland (2022) Orthophoto Mosaic: 2021, 2015

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Soil Unit Mapping

Figure 5

Acid Sulphate Soils

The *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines* (Department of Science, Information Technology, Innovation and the Arts, 2014) states that Acid Sulphate Soils (ASS) are coastal soils and sediments containing iron sulphides (predominately pyrite) which occur naturally over extensive area of low-lying coastal land, commonly below 5 m AHD.

The natural topography is relatively flat, with an elevation ranging from approximately 160 to 170 m AHD. In addition, soil investigations undertaken for the *Middlemount Coal Project Stage 2 Geology, Soils and Land Resource Assessment* (Parsons Brinckerhoff, 2010b) indicated that the topsoil over majority of the Middlemount Coal Mine naturally has low salinity, low organic matter, low nutrient content and neutral to slightly acidic pH. Overburden materials and subsoils were mildly alkaline to very strongly alkaline (pH values above 7.6).

In terms of overburden acid production potential, Parson Brinckerhoff (2010b) undertook overburden assessments for the Middlemount Coal Mine Stage 2 EIS and concluded that selected overburden samples have near zero or negative net acid producing potential in the range of 0.8 to 122-kilogram (kg) H_2SO_4 per tonne (H_2SO_4/t). In addition, net acid generation results of overburden samples indicated that when exposed to oxidising conditions the spoil material does not generate acid and/or the generated acid will be neutralised by other materials present.

Contaminated Land

Lot 3, SP282156 and Lot 2, SP248577, which partially overlap the Middlemount Coal Mine, are listed on the Environmental Management Register (EMR) (DES, 2018) as having livestock dips or spray races. However, plans of these lots indicate that the Middlemount Coal Mine is not likely to disturb areas where evidence of contamination or historical contaminating activities occur as the closest record (a dip site) located approximately 2 km west of the Middlemount Coal Mine (DES, 2018).

Lot 5, SP210524 which partially overlaps the Middlemount Coal Mine, is listed on the EMR as having a livestock dip or spray race. A review of aerial photography, historical registered plans and conversations with land-owners show that the cattle dips associated with these lots are not located within the Middlemount Coal Mine (Parsons Brinkerhoff, 2010b).

Lot 11, TT443, which also partially overlaps the Middlemount Coal Mine, is listed on the EMR as having mine wastes related to (DES, 2018):

- storing hazardous mine or exploration wastes, (e.g. tailings dams, overburden or waste rock dumps containing hazardous contaminants); or
- exploring for, mining, or processing minerals in a way that exposes faces or releases groundwater containing hazardous contaminants.

During site inspections carried out by MCPL, no mine wastes were identified in the portion of Lot 11, TT443 which overlap the Middlemount Coal Mine.

3.1.2.7 Land Stability

The pre-mining land use at the Middlemount Coal Mine is predominantly low-density cattle grazing on native vegetation. The stability and level of degradation of the existing site is consistent with other similar land uses in the area.

The waterways in the vicinity of the Middlemount Coal Mine (including Roper Creek and Thirteen Mile Gully) are ephemeral, experiencing flow only following sustained or intense rainfall in the catchment. Bank stability is generally good, with greater than 50 % of the stream banks covered with vegetation (Appendix D).

There is some potential for erosion within the system during extreme flooding. Riparian zone widths range from 10-35 m throughout the Middlemount Coal Mine (Appendix D).

3.1.2.8 Vegetation Communities and Ecological Data

The Middlemount Coal Mine is located in the Isaac-Comet Downs subregion of the Brigalow Belt North Bioregion. This bioregion extends from Townsville in QLD to the south of Dubbo in central-western New South Wales (NSW).

The closest protected area is Junee National Park which is located approximately 30 km to the east of the Middlemount Coal Mine. Bundoora State Forest is located approximately 25 km to the south-west of the Middlemount Coal Mine.

Clearing for cattle grazing in the region has been extensive, and, as such, the Middlemount Coal Mine contains cleared areas that are currently grazed or have been grazed in the past. Cattle grazing has also resulted in the establishment of fences and stock dams within the Middlemount Coal Mine (Appendix C).

Due to past and ongoing agricultural activities (e.g., clearing, grazing, logging and thinning), it is estimated that approximately 1,876 ha and 1,626 ha of the Middlemount Coal Mine was previously comprised of remnant vegetation and regrowth vegetation (non-remnant) (i.e., prior to mining activities).

The terrestrial flora and fauna in the vicinity of the Middlemount Coal Mine and surrounds have been subject to multiple studies since 2009. Field surveys were undertaken by Parsons Brinkerhoff (2010a) for the Middlemount Coal Mine Stage 2 Project during November 2009 and February/March 2010.

These surveys have since been supplemented by surveys over the existing offset areas undertaken by Ecology and Heritage Partners (2012) in July and August 2012, and across the Middlemount Coal Mine area and adjacent offset areas by Naturecall Environmental (Naturecall) (2014a; 2015a).

Biodiversity Australia (2018a) undertook flora and fauna surveys in the Western Extension Project area and surrounds, with additional surveys conducted in 2020 for the Southern Extension Project (Biodiversity Australia, 2020).

Naturecall (2013; 2014b; 2015b; 2016; 2017) and Biodiversity Australia (2018b; 2019) have also conducted annual monitoring in the existing MCPL offset areas to the west of the Middlemount Coal Mine, which provides additional information on the likely occurrence of flora and fauna within the Middlemount Coal Mine.

Flora surveys were conducted in accordance with the QLD Herbarium vegetation survey methods described in Neldner *et al.* (2020). Survey techniques included a combination of secondary and quaternary surveys, ground-truthing of regional ecosystems (REs), identification of threatened ecological communities under the Commonwealth *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act), targeted searches for conservation significant species listed under the QLD *Nature Conservation Act 1992* (NC Act) and EPBC Act, and random meanders. Terrestrial habitat quality data was also collected in accordance with the *Guide to Determining Terrestrial Habitat Quality Version 1.3* (DES, 2020a).

Fauna surveys were conducted in consideration of the relevant QLD and Commonwealth survey guidelines (Eyre *et al.*, 2018; Department of Sustainability, Environment, Water, Populations and Communities [DSEWPaC], 2011a, 2011b, 2011c; Department of the Environment, Water, Heritage and the Arts [DEWHA], 2010a, 2010b; Department of the Environment [DotE], 2014). Survey methods included spotlighting, microbat call recording and analysis, herpetofauna surveys, diurnal bird surveys, passive infrared camera stations, koala surveys and scat, track and secondary evidence searches (Appendix C).

Targeted searches for threatened fauna species listed under the NC Act and EPBC Act were also conducted (Appendix C).

Endangered and Of Concern Regional Ecosystems

A total of 18 individual REs have been recorded within ML 70379, ML 70417, ML 700027 and ML 700014 and progressively refined through successive surveys since 2010 (undertaken for the Middlemount Coal Project Stage 2 [Parsons Brinckerhoff, 2010a], Western Extension Project [Biodiversity Australia, 2018a] and Southern Extension Project [Biodiversity Australia, 2020]) (Table 6; Figure 6). Ground-truthed REs are generally represented by Eucalypt woodlands and small patches of Acacia dominated woodlands.

The most dominant RE is *Eucalyptus populnea +/- E.melanophloia +/- Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces (RE 11.5.3) encompassing approximately 1,118 ha of the Middlemount Coal Mine.

Of the 18 REs identified, three[1] have a conservation status of 'Endangered' and six have a conservation status of 'Of Concern' under the *Vegetation Management Act 1999* (VM Act) (Table 6, Figure 7).

Conservation Significant Flora Species

Two 'Near Threatened' (under the NC Act) species of plant (*Cerbera dumicola* and *Desmodium macrocarpum*) were located during surveys undertaken by Parsons Brinckerhoff (2010a) for the Middlemount Coal Project Stage 2.

No additional threatened flora species were recording during the field surveys undertaken by Biodiversity Australia for the Western Extension (Biodiversity Australia, 2018a) and Southern Extension (Biodiversity Australia, 2020).

[1] Areas of RE 11.3.1, 11.3.1b, 11.4.9 (which conform to *Acacia hypophylla* Dominant and Co-dominant Threatened Ecological Community [Brigalow TEC] and areas of RE 11.3.21 (which conform to Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin) are listed under the EPBC as 'Endangered'.

Table 6
Ground-truthed Regional Ecosystems

Regional Ecosystem	Short Description	VM Act Status
11.3.1 (BVG 25a)	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plain	Endangered
11.3.1b* (BVG 25a)	*Acacia harpophylla* and/or *Casuarina cristata* open forest.	Endangered
11.3.2 (BVG 17a)	*Eucalyptus populnea* woodland on alluvial plains.	Of Concern
11.3.2b (BVG 17a)	*Eucalyptus camaldulensis* (sometimes *E. populnea* and or *E. tereticornis)* woodland on drainage depressions.	Of Concern
11.3.2c (BVG 17a)	*Eucalyptus populnea* woodlands on floodplains.	Of Concern
11.3.2/11.3.4 (BVG 17a/16c)	*Eucalyptus populnea* woodland on alluvial plains/*Eucalyptus tereticornis* and/or *Eucalyptus* spp. woodland on alluvial plains.	Of Concern
11.3.7 (BVG 9e)	*Corymbia* spp. open woodland on alluvial plains	Least Concern
11.3.21 (BVG 30a)	*Dichanthium sericeum* and/or *Astrebla* spp. grassland on alluvial plains. Cracking clay soils.	Of Concern^
11.3.25 (BVG 16a)	*Eucalyptus tereticornis* or *E.camaldulensis* woodland fringing drainage lines.	Least Concern
11.3.25e (BVG 16a)	*Eucalyptus camaldulensis*, *E. tereticornis* woodland fringing larger, permanent water courses.	Least Concern
11.3.27d (BVG 34a)	*Eucalyptus camaldulensis* and/or *E. tereticornis woodland.*	Least Concern
11.4.9 (BVG 25a)	*Acacia harpophylla* shrubby woodland with *Terminalia oblongata* on Cainozoic clay plains.	Endangered
11.5.3 (BVG 17a)	*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* woodland on Cainozoic sand plains and/or remnant surfaces.	Least Concern
11.5.3b (BVG 17a)	*Eucalyptus populnea* woodland on closed depressions.	Least Concern
11.5.9d (BVG 10a)	*Corymbia citriodora* and/or *E. crebra* woodland	Least Concern
11.5.18 (BVG 29b)	*Micromyrtus capricornia* open shrubland on Cainozoic sand plains and/or remnant surfaces.	Of Concern
11.7.1 (BVG 25a)	*Acacia harpophylla* and/or *Casuarina cristata* and *Eucalyptus thozetiana* or *E. microcarpa* woodland on lower scarp slopes on Cainozoic lateritic duricrust.	Least Concern
11.7.2 (BVG 24a)	*Acacia* spp. woodland on Cainozoic lateritic duricrust. Scarp retreat zone.	Least Concern
11.7.4 (BVG 12a)	*Eucalyptus decorticans* and/or *Eucalyptus* spp., *Corymbia* spp., *Acacia* spp., *Lysicarpus angustifolius* woodland on Cainozoic lateritic duricrust	Least Concern

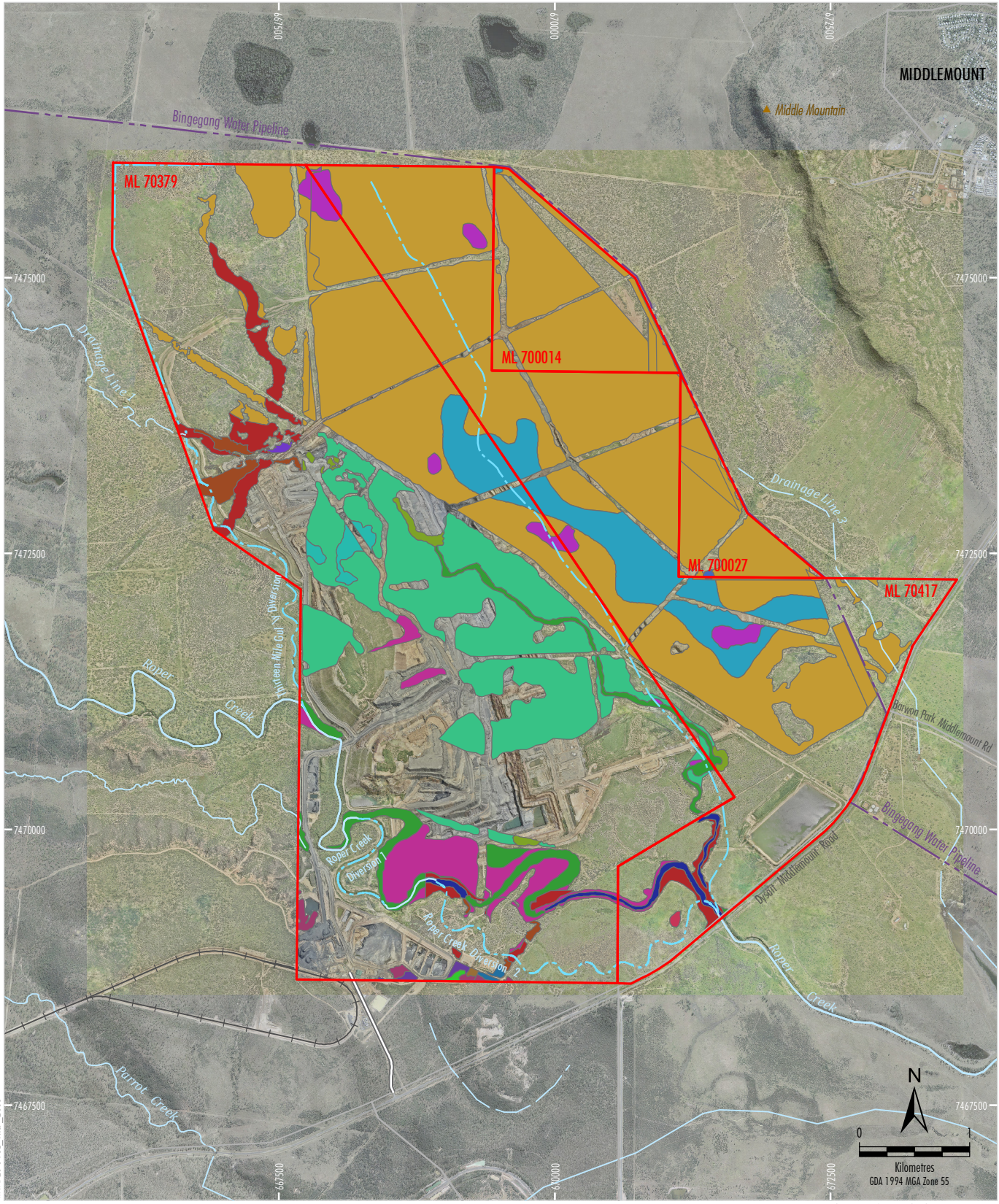
* Listed as Brigalow *(Acacia harpophylla* Dominant and Co-dominant*)* Threatened Ecological Community under the EPBC Act.

^ Current *Vegetation Management Act* status

BVG = Broad Vegetation Group.

VM Act = *Vegetation Management Act 1999*.

After: Parsons Brinckerhoff (2010a), Naturecall (2016) and Biodiversity Australia (2018a; 2020)



LEGEND

- Mining Lease Boundary (ML)
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure

Ground-truthed Regional Ecosystems

- 11.3.1
- 11.3.1b
- 11.3.2
- 11.3.2/11.3.4
- 11.3.21
- 11.3.25
- 11.3.25e
- 11.3.27d
- 11.3.2b
- 11.3.2c
- 11.3.7
- 11.4.9
- 11.5.18
- 11.5.3
- 11.5.3b
- 11.5.9d
- 11.7.1
- 11.7.2
- 11.7.4

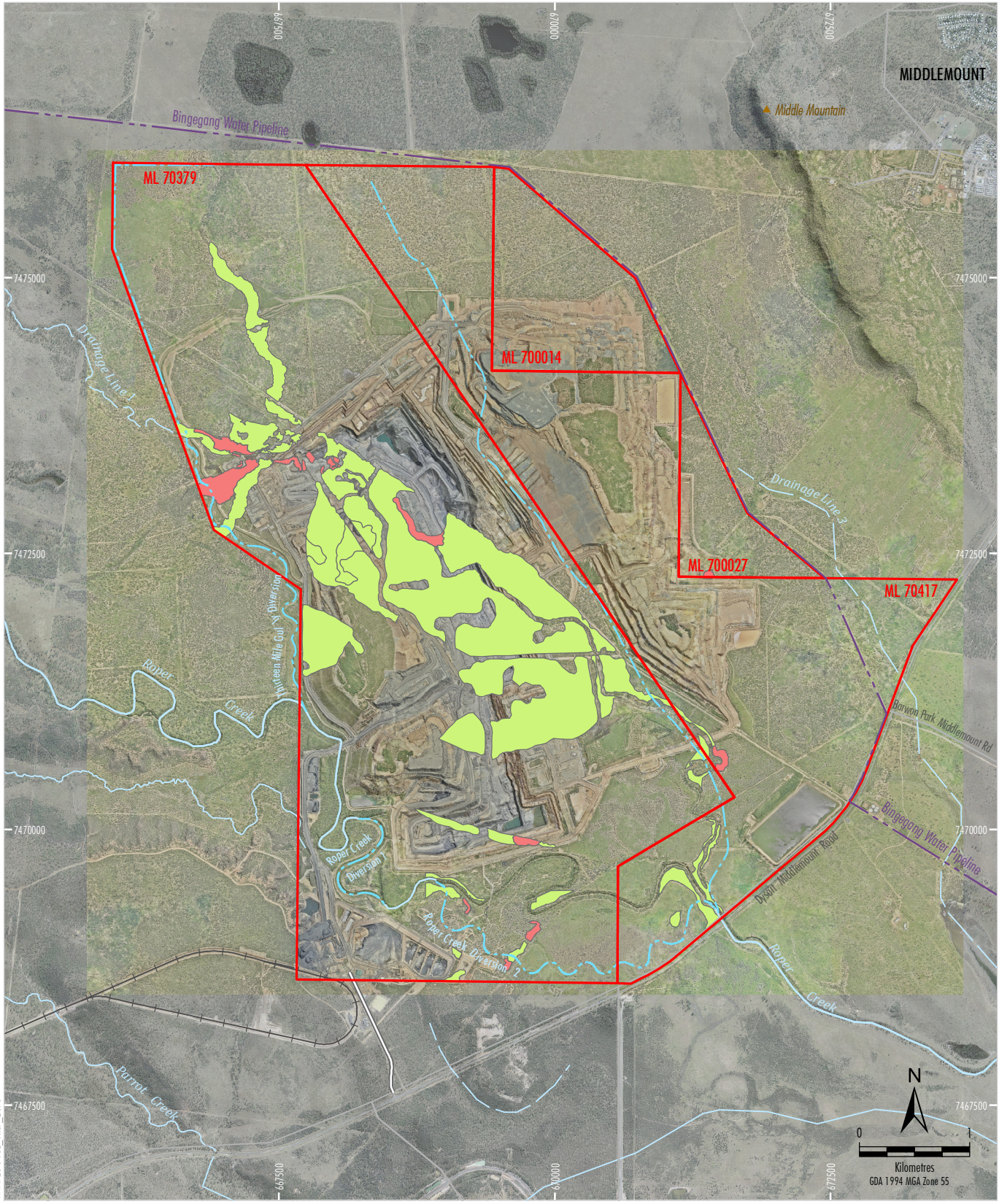
Source: MCPL (2022); The State of Queensland (2022); Biodiversity Australia (2018; 2020); Parsons Brinkerhoff (2014); Naturecall (2016)
Orthophoto Mosaic: 2021, 2015

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Ground-truthed Regional Ecosystem Mapping

Figure 6



Source: MCPL (2022); The State of Queensland (2022) Orthophoto Mosaic: 2021, 2015

LEGEND

- Mining Lease Boundary (ML)
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure

Nature Conservation Act Listing Status

- Endangered Regional Ecosystem
- Of concern Regional Ecosystem

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Endangered and Of Concern Regional Ecosystems

Figure 7

Aquatic Flora

Wet season aquatic ecology surveys were previously undertaken at nine locations within the Middlemount Coal Mine area by FRC Environmental over the periods 7 to 11 December 2009 and 22 to 26 February 2010 (FRC Environmental, 2010). Supplementary aquatic ecology surveys were undertaken at five locations by DPM Enviros ciences (2020) over the periods 14 to 16 October 2019 (a dry season survey aligning with the AusRivAS 'early wet' sampling season of October to December) and 18 to 21 February 2020.

Survey techniques implemented by DPM Enviros ciences (2020) included a combination of AusRivAS protocols to establish descriptions of aquatic habitats and macroinvertebrate communities; presence/absence surveys for aquatic plants (macrophytes); and assessment of aquatic habitat attributes, measurement of in-situ physico chemical water quality, fish survey, turtle survey, and ground truthing mapped lacustrine waterbodies. DPM Enviros ciences (2020) identified one habitat type within the Middlemount Coal Mine area, Riverine Habitat.

Lacustrine and Palustrine Wetlands

Five palustrine wetlands associated with RE 11.3.2d (freshwater wetlands) were ground-truthed by Parsons Brinckerhoff in 2010 as part of the Middlemount Coal Mine Stage 2 EIS (Parsons Brinkerhoff, 2010a) (Figure 8).

Riverine Habitats

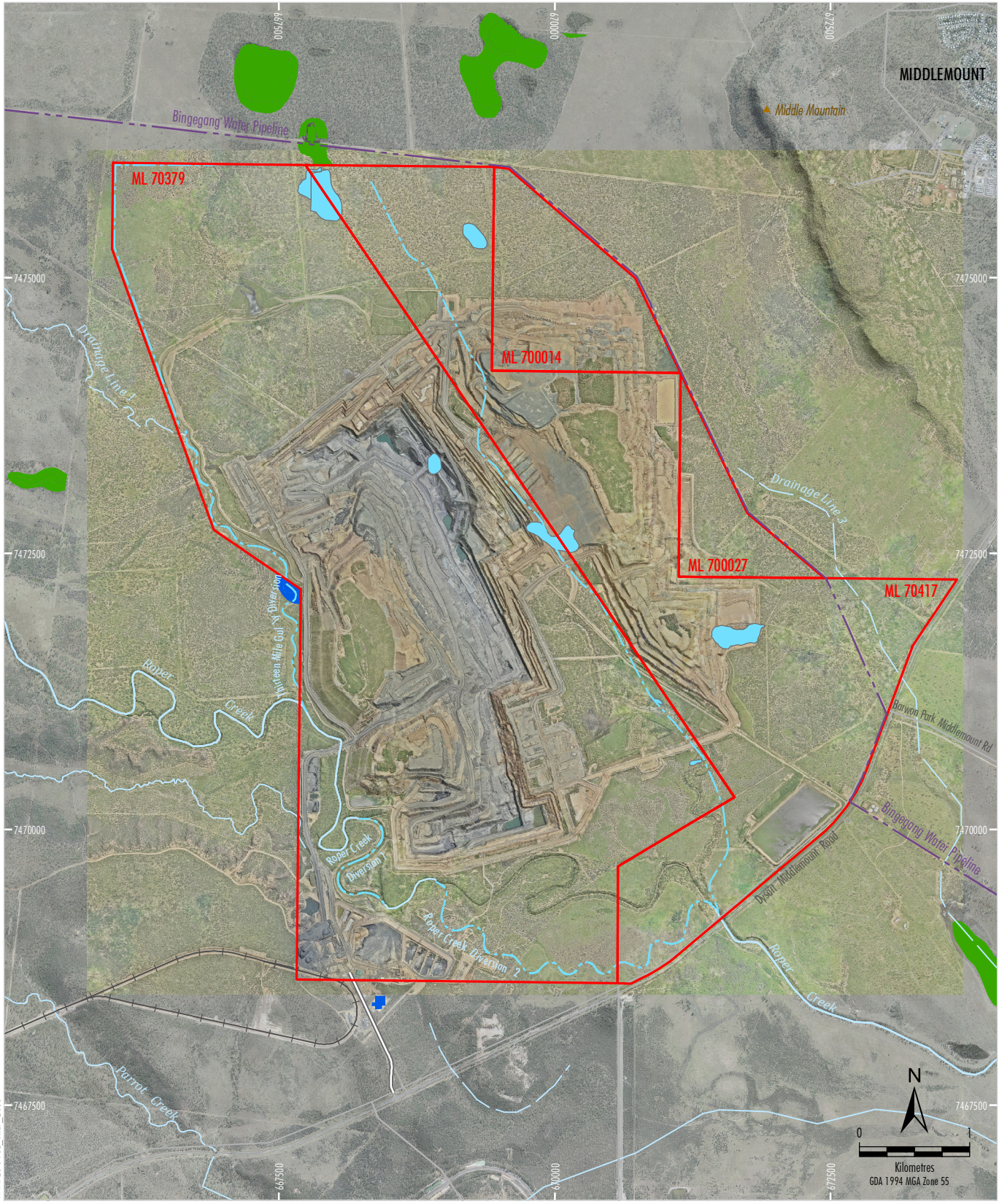
All waterways in the Middlemount Coal Mine area are ephemeral (Appendix D). DPM Enviros ciences (Appendix D) describes that the waterways in the Middlemount Coal Mine area provide only marginal aquatic habitat, with habitat assessment scores of 'poor' or 'fair'. Notwithstanding these habitat assessment scores, Roper Creek was attributed an aquatic value rating of moderate due to its importance as a regional conduit for fish passage.

Groundwater Dependent Ecosystems – Terrestrial Vegetation

Regionally, groundwater flow within the underlying aquifers is towards the south-east of the Middlemount Coal Mine. Groundwater levels are generally in excess of 25 mbgl and separated from surface waters, limiting potential to support Groundwater Dependent Ecosystems (GDEs). There are no surface expressions of these deep confined aquifers within the Middlemount Coal Mine or surrounds that would support GDEs (Appendix B).

Desktop mapping of potential GDEs throughout QLD (Bureau of Meteorology [BoM], 2020) indicated that areas of terrestrial vegetation and aquatic ecosystems in the Middlemount Coal Mine and surrounds had potential to be GDEs (mapped as low potential terrestrial GDE).

Based on the findings of site surveys, it has been established that aquatic GDEs are unlikely to occur in the Middlemount Coal Mine or surrounds (Appendix D).



LEGEND

- Mining Lease Boundary (ML)
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure
- Ground-truthed Wetlands

Government Mapped Wetlands

- Lacustrine
- Palustrine

Source: MCPL (2022); The State of Queensland (2022)
Orthophoto Mosaic: 2021, 2015

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Wetlands

Figure 8

Environmentally Sensitive Areas

The Environmentally Sensitive Areas (ESA) mapping tool (DEHP, 2014a) does not identify any Category A or C ESAs within the Middlemount Coal Mine. However, as described above, three 'Endangered' REs, constituting Category B ESAs, were ground-truthed by Parsons Brinckerhoff (2010a) and Biodiversity Australia (2018a) (i.e., RE 11.3.1, RE 11.3.1b and RE 11.4.9).

Matters of State Environmental Significance

Matters of State Environmental Significance (MSES) are defined under Schedule 2 of the Environmental Offsets Regulation 2009 and include REs listed as 'Endangered' and 'Of Concern' under the VM Act and Connectivity Areas (i.e. non-remnant vegetation, Regional Ecosystems which intersect mapped wetlands and waterways etc.) (Table 7).

Table 7
Matters of State Environmental Significance – Flora

Matters of State Environmental Significance			Relevance to the Middlemount Coal Mine
Regulated Vegetation	'Endangered' or 'of concern' regional ecosystems[1]	RE 11.3.1, 11.3.1b 'Endangered'	Approximately 22.5 ha of remnant RE 11.3.1 and 11.3.1b occurs in the west and south of the Middlemount Coal Mine (Figure 7)
		RE 11.4.9 'Endangered'	RE 11.4.9 constitutes a small patch (approximately 0.5 ha) of vegetation to the east of the Middlemount Coal Mine.
		RE 11.3.2, 11.3.2b, 11.3.2c 'Of Concern'	RE 11.3.2 occurs to the west and south of the Middlemount Coal Mine. RE 11.3.2b was recorded to the south adjacent Roper Creek Diversion 2, and RE 11.3.2c occurs within the centre of the Middlemount Coal Mine. All three RE encompasses a combined area of approximately 384 ha.
		RE 11.3.2/11.3.4 'Of Concern'	RE 11.3.2/11.3.4 occurs as small patches (approximately 1.5 ha) to the south and west of the Middlemount Coal Mine.
		RE 11.5.18 'Of Concern'	RE 11.5.18 occurs as a single patch (approximately 1.2 ha) of open shrubland to the south of the Middlemount Coal Mine.
		RE 11.3.21 'Of Concern'	RE 11.3.21 occurs as small patches (approximately 11 ha) to the west of the Middlemount Coal Mine.
	Regional ecosystems within mapped vegetation management wetlands		The Middlemount Coal Mine does not contain any mapped vegetation management wetlands.
	Regional ecosystems within the defined distance of a vegetation management watercourse		RE 11.3.2 and 11.3.25, 11.3.25e occur along Roper Creek and associated Diversion 1 and 2.
Connectivity Areas			The *Landscape Fragmentation and Connectivity Tool* (DES, 2020b) was applied to the Middlemount Coal Mine and concluded that the Middlemount Coal Mine exceeded the threshold for an impact on connectivity and fragmentation (MCPL, 2020a).
Wetlands and Watercourses			No wetlands or watercourses of high ecological significance were recorded within the Middlemount Coal Mine.
Designated Precinct in a Strategic Environmental Area			The Middlemount Coal Mine is not in a designated precinct in a strategic environmental area.

Table 7 (continued)
Matters of State Environmental Significance – Flora

Matters of State Environmental Significance	Relevance to the Middlemount Coal Mine
Protected Areas	There are no protected areas in the Middlemount Coal Mine.
Highly Protected Zones of State Marine Parks	There are no State marine parks in the Middlemount Coal Mine.
Marine Plants	Marine plants do not occur in the Middlemount Coal Mine.
Legally Secured Offset Areas	There are no legally secured offset areas located within the Middlemount Coal Mine.

Source: Appendices C and D.

Matters of National Environmental Significance

Patches of RE 11.3.1, RE 11.3.1b and RE 11.4.9 within the Middlemount Coal Mine ML's were assessed as part of the Western and Southern Extension Projects against the relevant threshold criteria for Brigalow (*Acacia harpophylla* dominant and co-dominant). Following assessment, approximately 26 ha were determined to meet the requirements of Brigalow TEC. Brigalow TEC is listed as 'Endangered' under EPBC Act and constitutes a Matter of National Environmental Significance (MNES).

3.1.2.9 Fauna Presence and Populations

Terrestrial Fauna Habitat

Due to past and ongoing agricultural activities, the Middlemount Coal Mine area predominantly consists of non-remnant regrowth vegetation and cleared land. Patches of remnant vegetation, most of which likely was disturbed by previous land use practices, are present within the largely disturbed landscape.

Biodiversity Australia (2020) concluded that the southern portion of the Middlemount Coal Mine provides small patches of suitable habitat for the *Denisonia maculate* (Ornamental Snake) in the form of Brigalow habitats with gilgai and drainage depressions providing habitat for preferred prey species (i.e. frogs).

Given that a number of targeted surveys undertaken by Biodiversity Australia (2020) and other consultants since 2010 have not detected this species within the Southern Extension, it is considered to be a low to fair chance of occurrence within the potential habitat in Middlemount Coal Mine. Removal of a relatively small extent of potential habitat for the Southern Extension while a negative impact, was concluded to unlikely lead to a long-term decrease in the local population.

Most of the regrowth comprises of the dominant species, which occurred prior to the clearing and fast-growing species like exotic grasses.

Broad fauna habitats identified at the Middlemount Coal Mine include (Parsons Brinckerhoff 2010a, Naturecall, 2014, Biodiversity Australia 2018 and 2020a):

- Eucalypt woodland/forest.
- Riparian Eucalypt woodland.
- Acacia harpophylla woodland/forest.
- Acacia shirleyi forest.
- Regrowth vegetation.
- Wetlands (natural/artificial).

- Brigalow forest.
- Lancewood forest.
- Micromyrtus shrubland.
- Cleared grassland.

Conservation Significant Fauna Species Listed under the NC Act

Fauna surveys have recorded four listed threatened fauna species under the NC Act at the Middlemount Coal Mine (Figure 9):

- Squatter Pigeon (southern) (*Geophaps scripta scripta*) – Vulnerable (EPCB Act), Threatened (NC Act);
- Ornamental Snake (*Denisonia maculata*) – Vulnerable (EPCB Act), Vulnerable (NC Act);
- Koala (*Phascolarctos cinereus*) – Vulnerable (EPBC Act), Threatened (NC Act); and,
- Greater Glider (*Petauroides Volans*) - Vulnerable (EPBC Act), Vulnerable (NC Act).

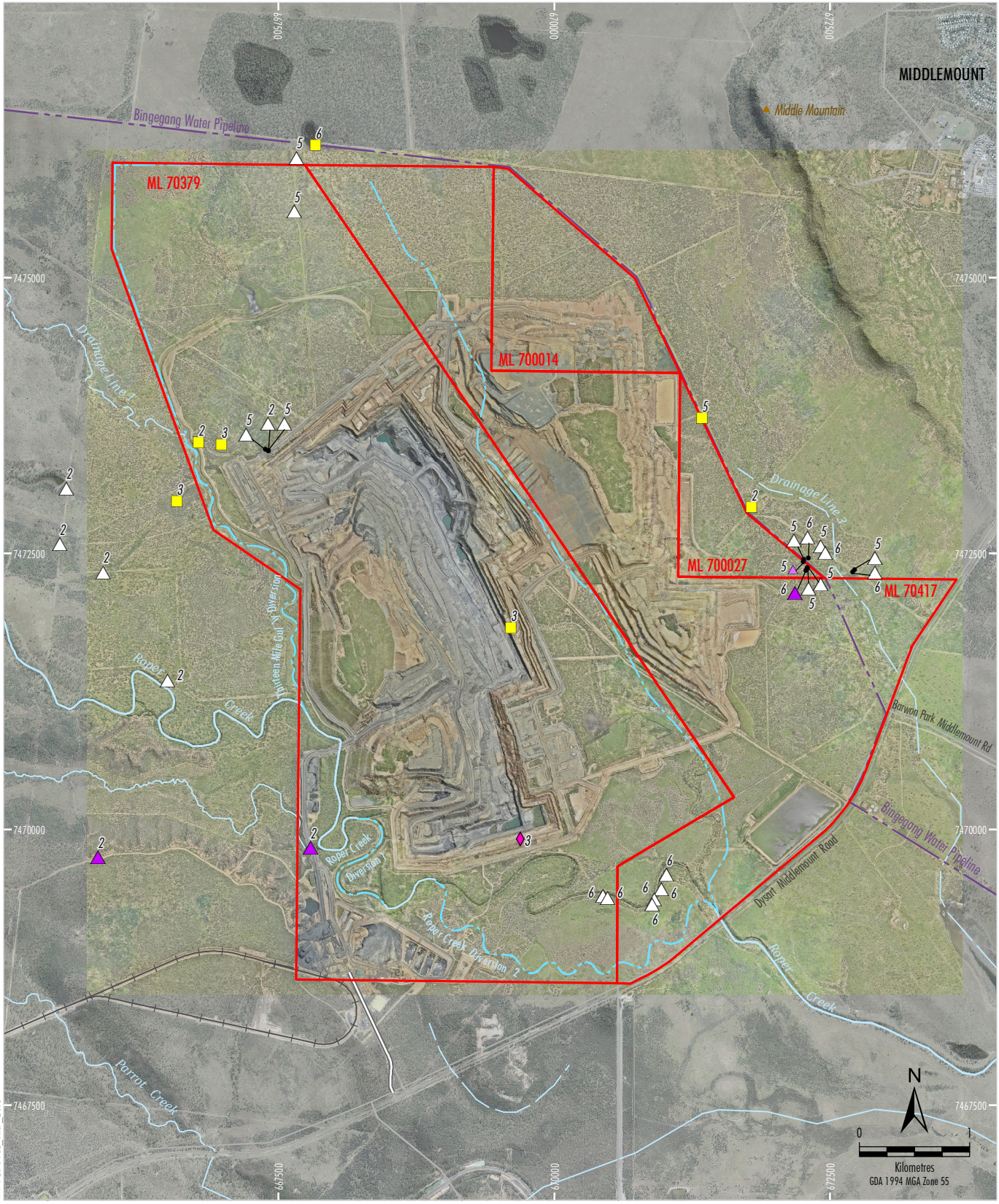
Matters of State Environmental Significance

Two species which constitute MSES were recorded during field surveys at the Middlemount Coal Mine undertaken by Parsons Brinckerhoff (2010a), the Ornamental Snake and Squatter Pigeon. During fauna surveys undertaken by Biodiversity Australia for the Western Extension Project (Biodiversity Australia, 2018a) and Southern Extension Project (Biodiversity Australia (2020), the Greater Glider and the Koala were additional species recorded that constitute MSES (Table 8). The Echidna was also recorded which is a Special Least Concern species.

Table 8
Matters of State Environmental Significance – Fauna

Matters of State Environmental Significance		Relevance to the Middlemount Coal Mine Area
Protected Wildlife Habitat[1]	Ornamental Snake	Small area of potential habitat within the Middlemount Coal Mine area.
	Greater Glider	Multiple recordings of the Greater Glider in the Middlemount Coal Mine area.
	Koala	The Koala has had few recordings within the project area, however primary food resources for this species are associated with riparian vegetation.
	Squatter Pigeon (Southern)	Squatter Pigeon is present in Middlemount Coal Mine area.
Regulated Vegetation	*Acacia harpophylla* and/or *Casuarina cristata* open forest on alluvial plains	This vegetation is present in the Middlemount Coal Mine area.
	Eucalyptus populnea woodland on alluvial plains	
	Remnant vegetation within 5m of the defining bank of Roper Creek	
	Riparian vegetation	
Waterways Providing for Fish Passage		During the wet season Roper Creek is considered a waterway for fish. Roper Creek and Thirteen Mile Gully diversion channels are expected to maintain the waterways for fish passage during the mining stage.

Source: Appendices C and D.



LEGEND

- Mining Lease Boundary (ML)
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure

Conservation Significant Species Records

- Squatter Pigeon (Southern)
- Ornamental Snake
- Greater Glider
- Koala
- Koala Scats

Reference:
2 Naturecall Environmental (2014)
3 Parsons Brinkerhoff (2010)
5 Naturecall Environmental (2017)
6 Biodiversity Australia (2020)

Source: MCPL (2022); The State of Queensland (2022)
Orthophoto Mosaic: 2021, 2015

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Conservation Significant Species Records

Figure 9

Matters of National Environmental Significance

Two species (Ornamental Snake and Squatter Pigeon) were recorded by Parsons Brinckerhoff (2010a) during the Middlemount Coal Project Stage 2 surveys. Additional MNES recorded during the Western and Southern Extension surveys (Biodiversity Australia, 2018a; 2020) included the Ornamental Snake, Squatter Pigeon, Greater Glider and Koala. The Echidna was recorded outside the Western and Southern study areas and is not listed as a MNES.

On the 21 December 2017, MCPL lodged a referral for the Western Extension with the Department of Environment and Energy (DEE) to determine whether the Western Extension needed formal assessment and approval under the EPBC Act. An action requires approval under the EPBC Act if the action is likely to have a significant impact on MNES. On 8 February 2018, a delegate of the Commonwealth Minister declared the Western Extension to be a 'Controlled Action' for the purposes of the EPBC Act, with the following controlling provisions:

- Listed threatened species and communities (sections 18 and 18A).
- A water resource, in relation to coal seam gas development and large coal mining development (sections 24D and 24E).

In addition, on 20 May 2021, MCPL lodged a referral for the Southern Extension with the Department of Agriculture, Water and the Environment (DAWE) to determine whether the Southern Extension needed formal assessment and approval under the EPBC Act. On 17 June 2021, a delegate of the Commonwealth Minister declared the Southern Extension to be a "Controlled Action" for the purposes of the EPBC Act, with the following controlling provisions:

- Listed threatened species and communities (sections 18 and 18A).
- A water resource (sections 24D and 24E).

3.1.2.10 Pre-mining Land Use

Major land use within the entire region is primarily known for agricultural, forestry and fishery activities and coal mining. The pre-mining land use of the project site is agriculture (grazing and cropping) and coal mining.

In addition, the Middlemount Coal Mine area has been identified as having key resource and coal/mineral resource attributes. No Strategic Cropping Land (SCL) is mapped within, or in the vicinity of the Project (DNRME, 2020).

3.1.2.11 Underlying Landholders

Tenements

As described in section 3.1.1.3, four Mining Leases exist within the Middlemount Coal Mine, ML 70379, ML 70417, ML 700014 and ML 700027 all of which are held by MCPL.

Several overlapping Petroleum tenures exist within the Middlemount Coal Mine, including, one overlapping EPC tenure, EPC 855 held by Foxleigh Coal, two PCA's, PCA 135 and PCA 136 both held by CH4 Pty Ltd and one ATP tenure, ATP 1103, also held by CH4 Pty Ltd.

Native Title Claims/Applications

There are two Native Title claimants within the Middlemount Coal Mine area:

- Barada Barna People – who have an active registered native title claim (Queensland QC08/11 QUD380/08)

- Barada Barana, Kanalbara & Yetimarla People #4 (BBKY #4) – who have a finalised (dismissed) native title claim (Queensland QC01/25 QUD6023/01).

Landholders

Table 9 below identifies the Lots on Plan which intersect the Middlemount Coal Mine. The majority of the Middlemount Coal Mine is located on freehold land owned by Middlemount Coal Pty Ltd. A small portion of the Middlemount Coal Mine is located on Lot 11, TT443, which is owned by Anglo Coal Pty Ltd.

Table 9
Landholders (Lot and DP) within the Middlemount Coal Mine

Lot/Plan	Reference Number	Tenure
2/SP248577	50896228	Middlemount Coal Pty Ltd
3/SP282156	51052854	Middlemount Coal Pty Ltd
5/SP210524	50716193	Middlemount Coal Pty Ltd
11/TT443	40075759	Anglo Coal (Capcoal Management) Pty Ltd

3.1.3 Designing for Closure

The Middlemount Coal Mine rehabilitation strategy will aim on establishing non-polluting, safe, stable, and able to support a self-sustaining PMLU. The Middlemount Coal Mine has been designed to:

- Be rehabilitated to a safe final landform to humans and wildlife:
  - A safety bund wall will be constructed out of competent rock and/or fencing with a minimum height of 2 m, a minimum base width of 4 m and be located at least 10 m beyond the area potentially affected by any instability of the pit edge.
  - Fencing will be installed to limit human and livestock access to residual void management areas.
  - Appropriate signing will be placed every 100 m of the perimeter of the void.
- Have a non-polluting final landform:
  - Water level in each residual void will not cause environmental harm to the surrounding environment.
  - Both residual voids will remain as long-term groundwater sinks to the surrounding groundwater environment, preventing the flow of hyper saline final void water out of the voids.
- Ensure that the final landform is stable:
  - In-pit and out-of-pit waste rock emplacements will be contoured to an angle of less than (<) 18.5% and will utilise rock mulch to achieve greater stability if greater than (>) 16 % at minimum application rate of 0.5 m.
  - Residual void highwalls would be treated (e.g. benched or blasted) so that they are geotechnically stable.
- Able to sustain a PLMU:
  - The areas proposed to be disturbed by the Project would be rehabilitated to sustain native ecosystem, consistent with EA EPML00716913.
  - Rehabilitation towards the PMLU of native ecosystem at the Middlemount Coal Mine is undertaken progressively within two years of areas becoming available within the operational land.

3.1.4 Rehabilitation/Improvement Planning

Consistent with EA EPML00716913, the approved PMLU of the Middlemount Coal Mine is low density beef cattle grazing with native ecosystem. As part of the PRC Plan, MCPL is proposing to transition the approved EA PMLU into the PRC Plan PMLU (Section 3.5).

Condition G9 of the EA EPML00716913 (reproduced below) provides the overall rehabilitation objective for the Middlemount Coal Mine:

> *All areas significantly disturbed by mining activities must be rehabilitated to a safe, stable and non-polluting landform, with a self-sustaining vegetation cover (except for the residual voids), in accordance with:*
>
> - *Table G1: Landform Design Criteria;*
> - *Table G2: Final Land Use and Rehabilitation Approval Schedule;*
> - *Table G3: Residual Void Design;*
> - *Table G4: Rehabilitation Schedule;*
> - *Attachment C: Final Landform;*
> - *Attachment F: Rehabilitation Requirements; and*
> - *As otherwise detailed in Condition G21.*

Further detail on the approved PMLU and NUMAs for the Middlemount Coal Mine is provided in Sections 3.3 and 3.4.

Mine planning is a structured process that takes into account a range of key variables that may influence a potential mining operation and its viability. Aspects that are considered within the mining process includes safety, resource recovery, geotechnical constraints, management of potential environmental impacts (e.g. noise, air quality, water, coal rejects), community issues, risks to the operation, mining methods and rates, equipment requirements and economics (i.e capital and operating costs).

To facilitate rehabilitation at the Middlemount Coal Mine, progressive rehabilitation has been undertaken at different areas across the Middlemount Coal Mine. Progressive rehabilitation is undertaken on land that is able to be actively rehabilitated, with relative mining activities ceasing within the area. The progressive development of the Middlemount Coal Mine is evident on Figures 10 to 15.

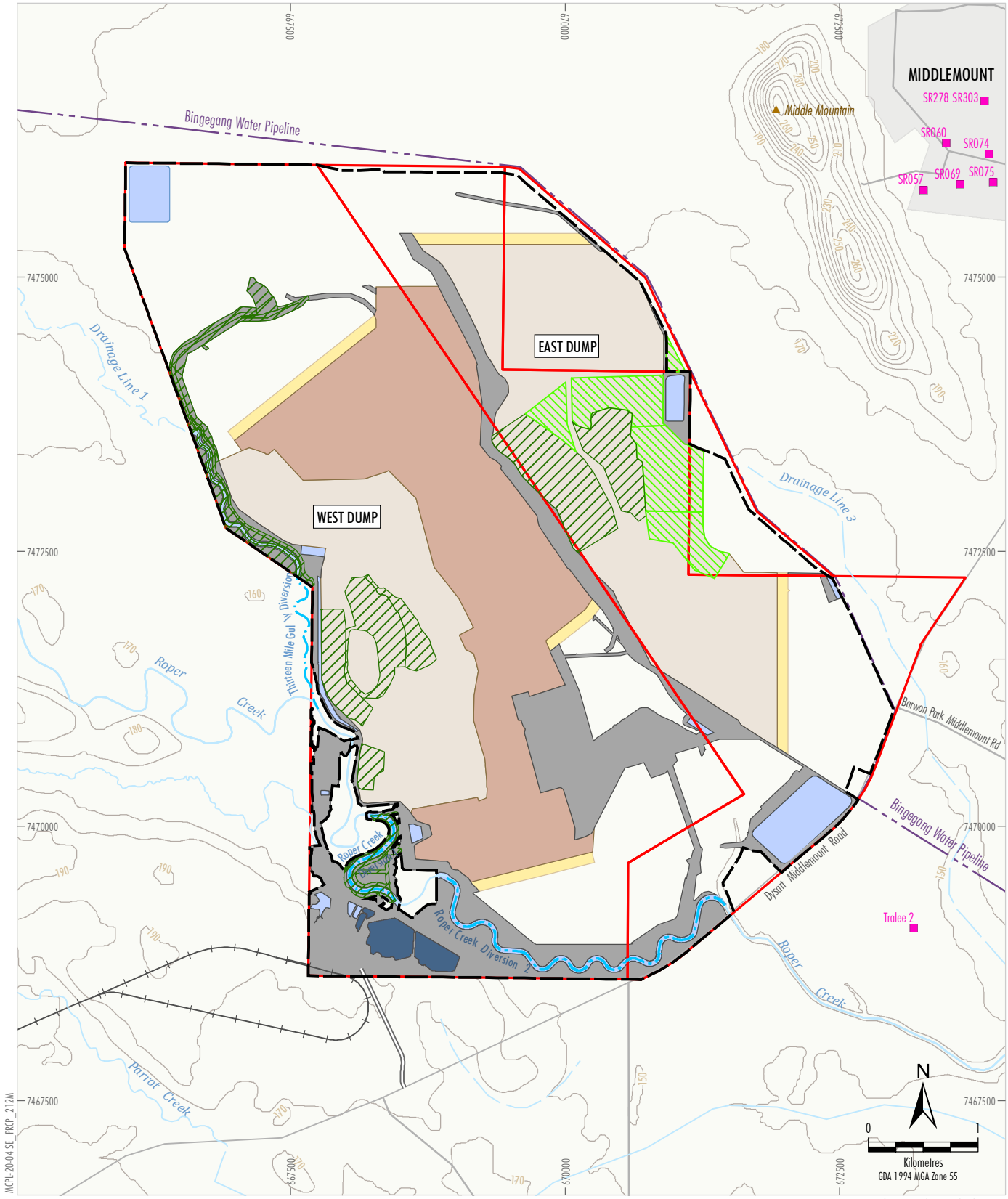
3.1.4.1 Relevant Activities

The PMLU is shown on Figure 16. For the purpose of this PRC Plan, MCPL has defined Rehabilitation Areas and Improvement Areas as outlined on Figure 17. These areas are based upon the progressive development and rehabilitation plans provided within Figures 10 to 14, and the approved final landform in Figure 15. Progressive stage plans will continue to be developed at regular intervals to inform rehabilitation and operational activities over the life of the Middlemount Coal Mine.

Table 10 provides details of the relevant activities (i.e predicted duration, size/extent and ability to progressively rehabilitate during the activity) that will be undertaken at each of the Rehabilitation Areas and Improvement Areas throughout the life of the Middlemount Coal Mine.

Table 10
Relevant Mining Activities

Area	Relevant Activity	Size (ha)	Date of Activity Commencement	Date of Activity Completion	Able to Progressively Rehabilitate?
Rehabilitation Areas					
RA1	Waste Rock Emplacement (slope <16%)	752	10/12/2023	2044	Yes
RA2	Waste Rock Emplacement – Existing Rehabilitation (slopes ≤33%)	52	10/12/2023	2049	Yes
RA3	Waste Rock Emplacement (Flat/Undulating)	1,209	10/12/2023	2046	Yes
RA4	Tailings Storage Facility	23	10/12/2044	2052	Yes
RA5	Infrastructure Area	382	10/12/2023	2057	Yes
RA6	Water Management Infrastructure (Mine Water Dams)	57	10/12/2044	2053	No (Section 3.5.7)
RA7	Water Management Infrastructure (Sediment Dams)	23	10/12/2044	2053	No (Section 3.5.7)
RA8	Water Diversions	58	10/12/2023	2043	No (Section 3.5.7)
RA9	Waste Rock Emplacement Existing Rehabilitation (slope <16%)	78	Already Commenced	2032	Yes
RA10	Waste Rock Emplacement Existing Rehabilitation (Flat/Undulating)	151	Already Commenced	2032	Yes
Improvement Areas					
IA1	Final Residual Void	358	10/12/2044	2049	No
IA2	Final Residual Void	163	10/12/2044	2049	No



Source: MCPL (2023); The State of Queensland (2023)

LEGEND

- Mining Lease Boundary (ML)
- Approved Disturbance Footprint
- Middlemount Rail Spur and Loop
- Diversion Structure
- Sensitive Receiver

Project Domains

- Topsoil Stripping
- Open Cut Mining Area
- Waste Rock Emplacement
- Infrastructure Area #
- Tailings Storage Facility
- Water Management

Rehabilitation Domains

- Indicative Area Available for Rehabilitation *
- Active Rehabilitation Area **

Infrastructure Area includes the coal handling and preparation plant, coal stockpiles, administration buildings, rail loop, rail load-out infrastructure, haul roads, bunding, hardstands, minor water management infrastructure, access tracks, topsoil stockpiles, explosives magazine, power reticulation, temporary offices, other ancillary works (e.g. exploration activities) and construction disturbance.

* Areas considered "Available for Rehabilitation" are indicative only based on estimated rates of rehabilitation. The location of rehabilitation undertaken in a given year may vary although the total areas would remain consistent with the PRCP Schedule.

** Areas considered "Active Rehabilitation" are those in which rehabilitation has commenced.

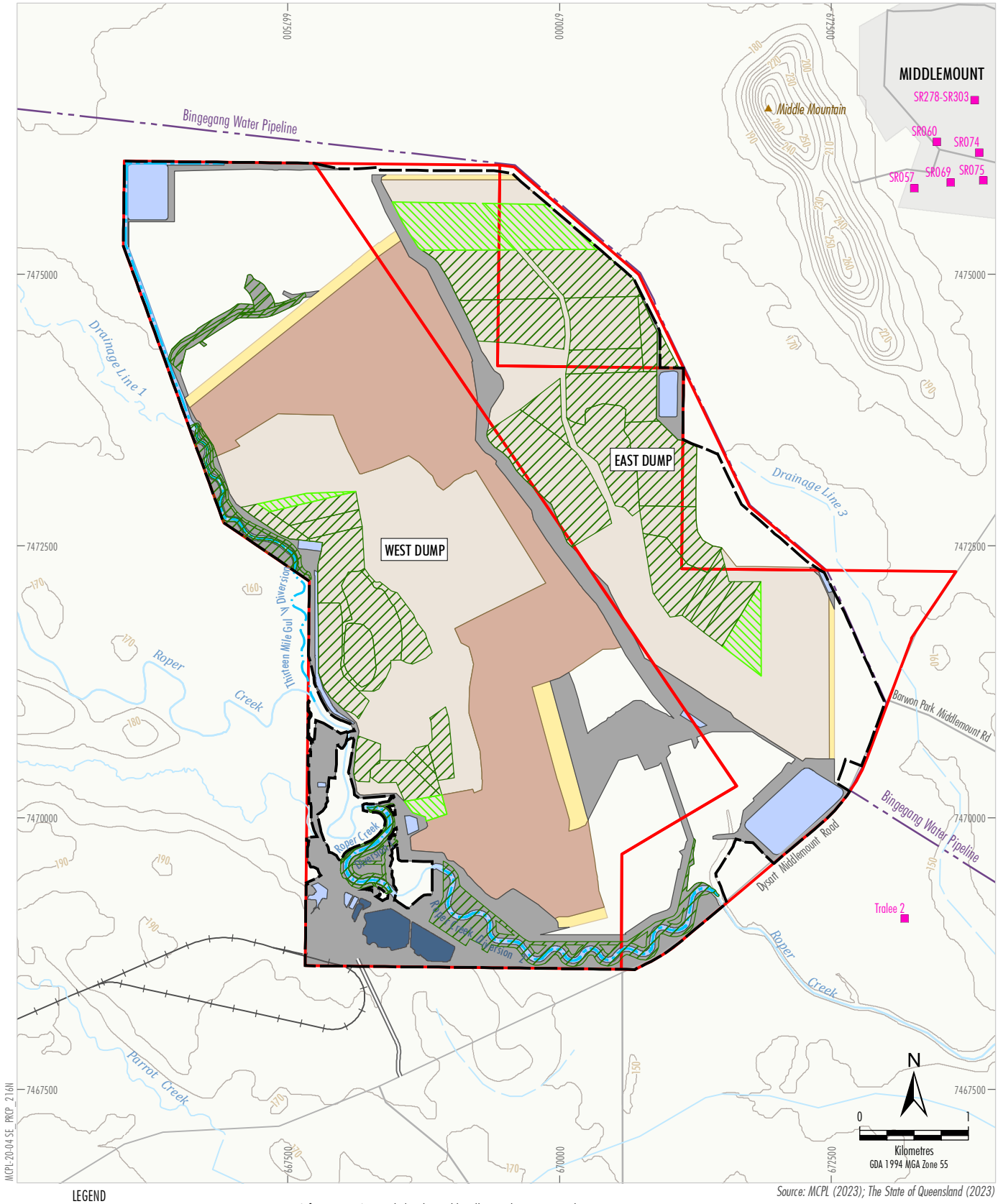
MCPL-20-04 SE_PRCP_212M

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Progressive Development and Rehabilitation 2023

Figure 10



Source: MCPL (2023); The State of Queensland (2023)

LEGEND

- Mining Lease Boundary (ML)
- Approved Disturbance Footprint
- Middlemount Rail Spur and Loop
- Diversion Structure
- Sensitive Receiver

Project Domains

- Topsoil Stripping
- Open Cut Mining Area
- Waste Rock Emplacement
- Infrastructure Area #
- Tailings Storage Facility
- Water Management

Rehabilitation Domains

- Indicative Area Available for Rehabilitation *
- Active Rehabilitation Area **

Infrastructure Area includes the coal handling and preparation plant, coal stockpiles, administration buildings, rail loop, rail load-out infrastructure, haul roads, bunding, hardstands, minor water management infrastructure, access tracks, topsoil stockpiles, explosives magazine, power reticulation, temporary offices, other ancillary works (e.g. exploration activities) and construction disturbance.

* Areas considered "Available for Rehabilitation" are indicative only based on estimated rates of rehabilitation. The location of rehabilitation undertaken in a given year may vary although the total areas would remain consistent with the PRCP Schedule.

** Areas considered "Active Rehabilitation" are those in which rehabilitation has commenced.

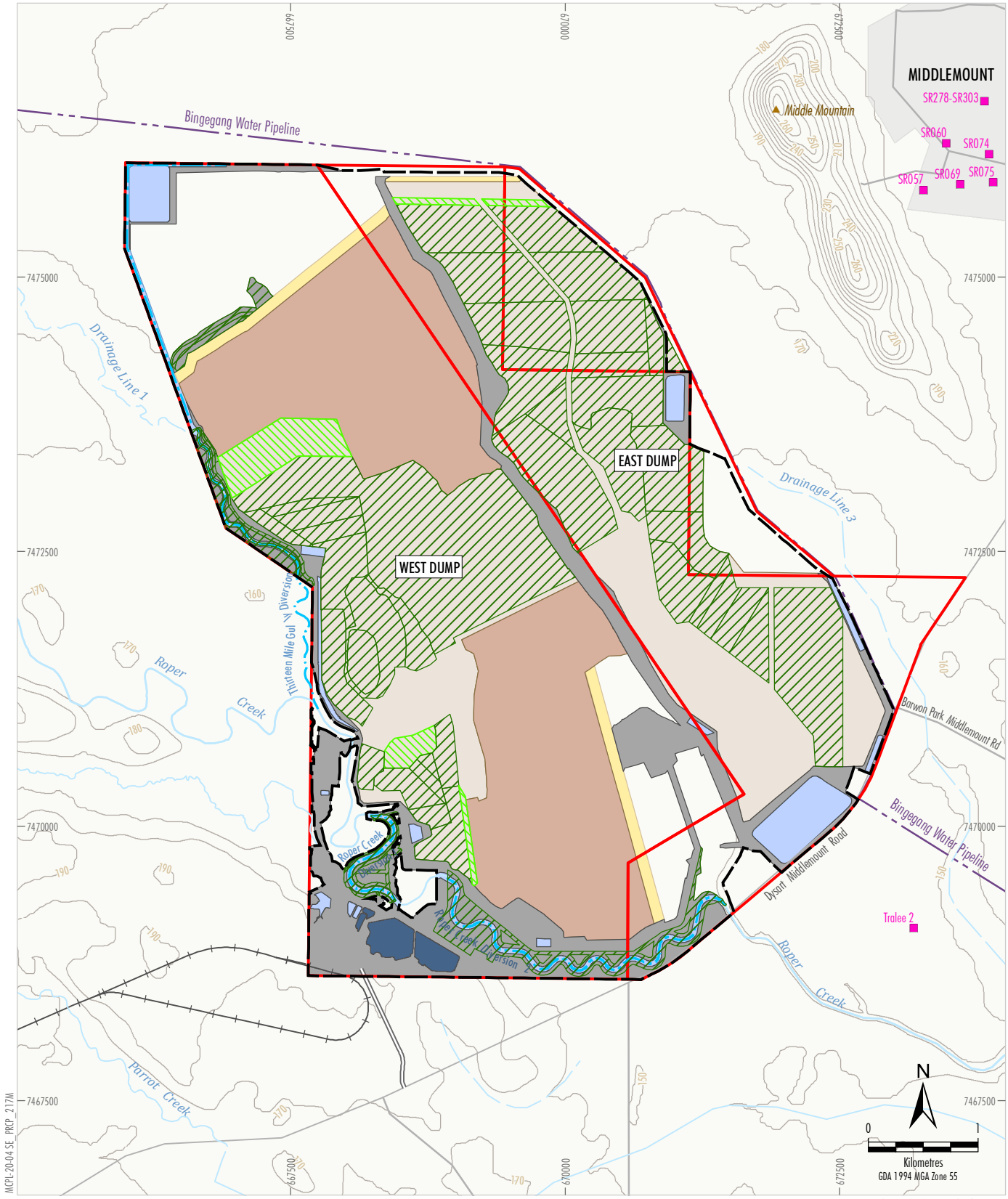
middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Progressive Development and Rehabilitation 2028

Figure 11

MCPL-20-04 SE_PRCP_216N



Source: MCPL (2023); The State of Queensland (2023)

LEGEND

- Mining Lease Boundary (ML)
- Approved Disturbance Footprint
- Middlemount Rail Spur and Loop
- Diversion Structure
- Sensitive Receiver

Project Domains

- Topsoil Stripping
- Open Cut Mining Area
- Waste Rock Emplacement
- Infrastructure Area #
- Tailings Storage Facility
- Water Management

Rehabilitation Domains

- Indicative Area Available for Rehabilitation *
- Active Rehabilitation Area **

Infrastructure Area includes the coal handling and preparation plant, coal stockpiles, administration buildings, rail loop, rail load-out infrastructure, haul roads, bunding, hardstands, minor water management infrastructure, access tracks, topsoil stockpiles, explosives magazine, power reticulation, temporary offices, other ancillary works (e.g. exploration activities) and construction disturbance.

* Areas considered "Available for Rehabilitation" are indicative only based on estimated rates of rehabilitation. The location of rehabilitation undertaken in a given year may vary although the total areas would remain consistent with the PRCP Schedule.

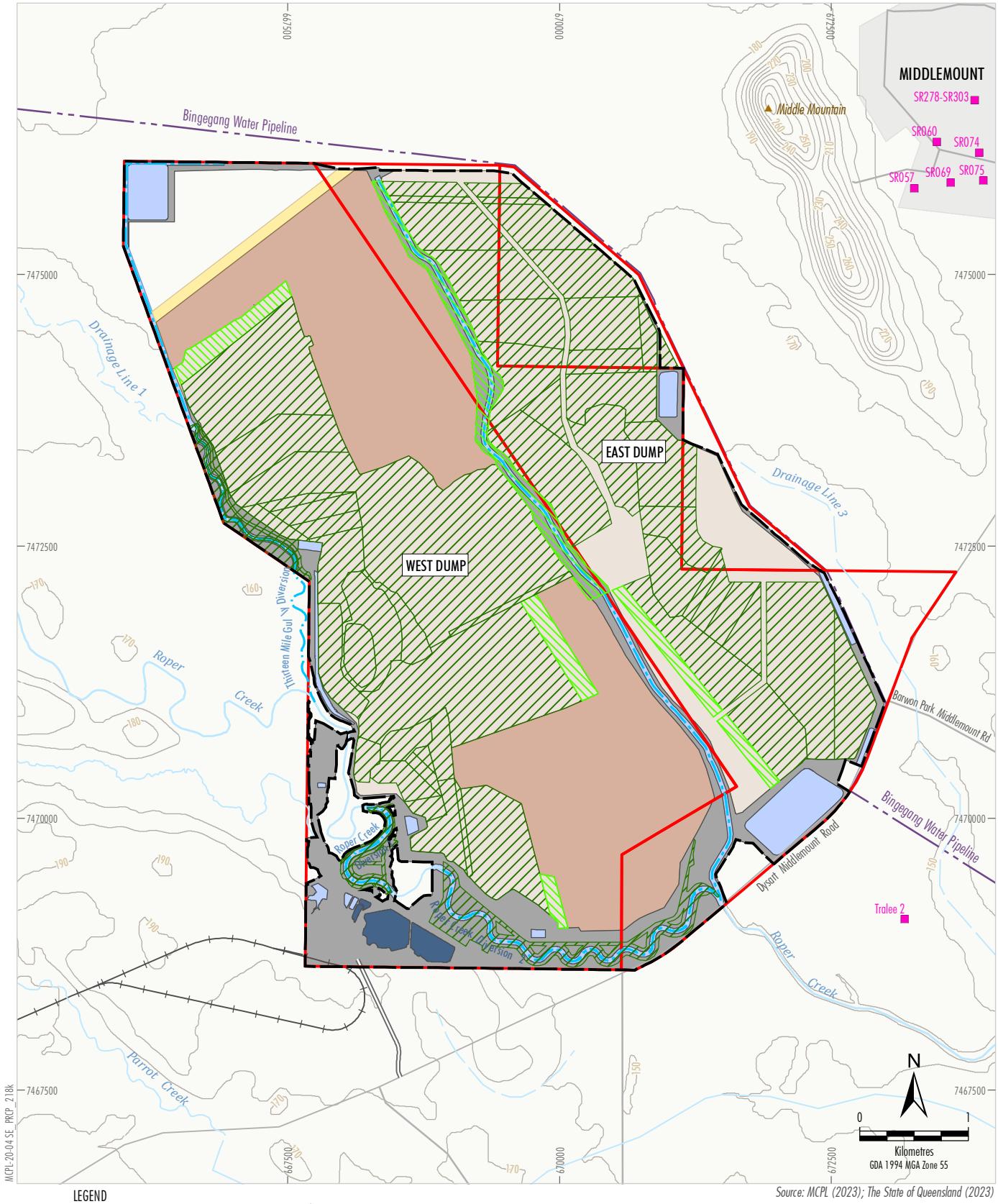
** Areas considered "Active Rehabilitation" are those in which rehabilitation has commenced.

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Progressive Development and Rehabilitation 2032

Figure 12



Source: MCPL (2023); The State of Queensland (2023)

LEGEND

- Mining Lease Boundary (ML)
- Approved Disturbance Footprint
- Middlemount Rail Spur and Loop
- Diversion Structure
- Sensitive Receiver

Project Domains

- Topsoil Stripping
- Open Cut Mining Area
- Waste Rock Emplacement
- Infrastructure Area #
- Tailings Storage Facility
- Water Management

Rehabilitation Domains

- Indicative Area Available for Rehabilitation *
- Active Rehabilitation Area **

Infrastructure Area includes the coal handling and preparation plant, coal stockpiles, administration buildings, rail loop, rail load-out infrastructure, haul roads, bunding, hardstands, minor water management infrastructure, access tracks, topsoil stockpiles, explosives magazine, power reticulation, temporary offices, other ancillary works (e.g. exploration activities) and construction disturbance.

* Areas considered "Available for Rehabilitation" are indicative only based on estimated rates of rehabilitation. The location of rehabilitation undertaken in a given year may vary although the total areas would remain consistent with the PRCP Schedule.

** Areas considered "Active Rehabilitation" are those in which rehabilitation has commenced.

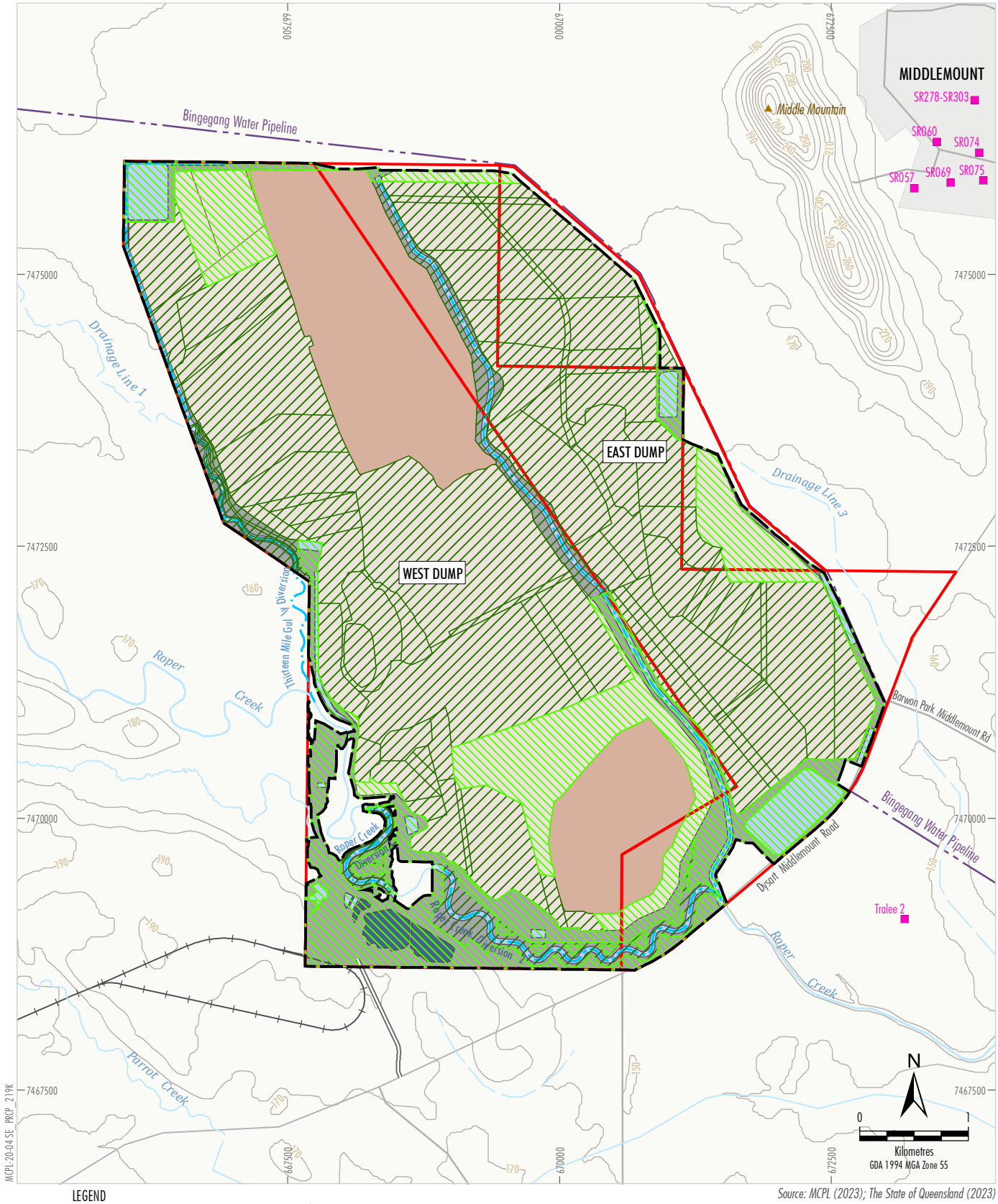
middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Progressive Development and Rehabilitation 2037

Figure 13

MCPL-20-04 SE_PRCP_218k



Source: MCPL (2023); The State of Queensland (2023)

LEGEND

- Mining Lease Boundary (ML)
- Approved Disturbance Footprint
- Middlemount Rail Spur and Loop
- Diversion Structure
- Sensitive Receiver

Project Domains

- Open Cut Mining Area
- Waste Rock Emplacement
- Infrastructure Area #
- Tailings Storage Facility
- Water Management

Rehabilitation Domains

- Indicative Area Available for Rehabilitation *
- Active Rehabilitation Area **

Infrastructure Area includes the coal handling and preparation plant, coal stockpiles, administration buildings, rail loop, rail load-out infrastructure, haul roads, bunding, hardstands, minor water management infrastructure, access tracks, topsoil stockpiles, explosives magazine, power reticulation, temporary offices, other ancillary works (e.g. exploration activities) and construction disturbance.

* Areas considered "Available for Rehabilitation" are indicative only based on estimated rates of rehabilitation. The location of rehabilitation undertaken in a given year may vary although the total areas would remain consistent with the PRCP Schedule.

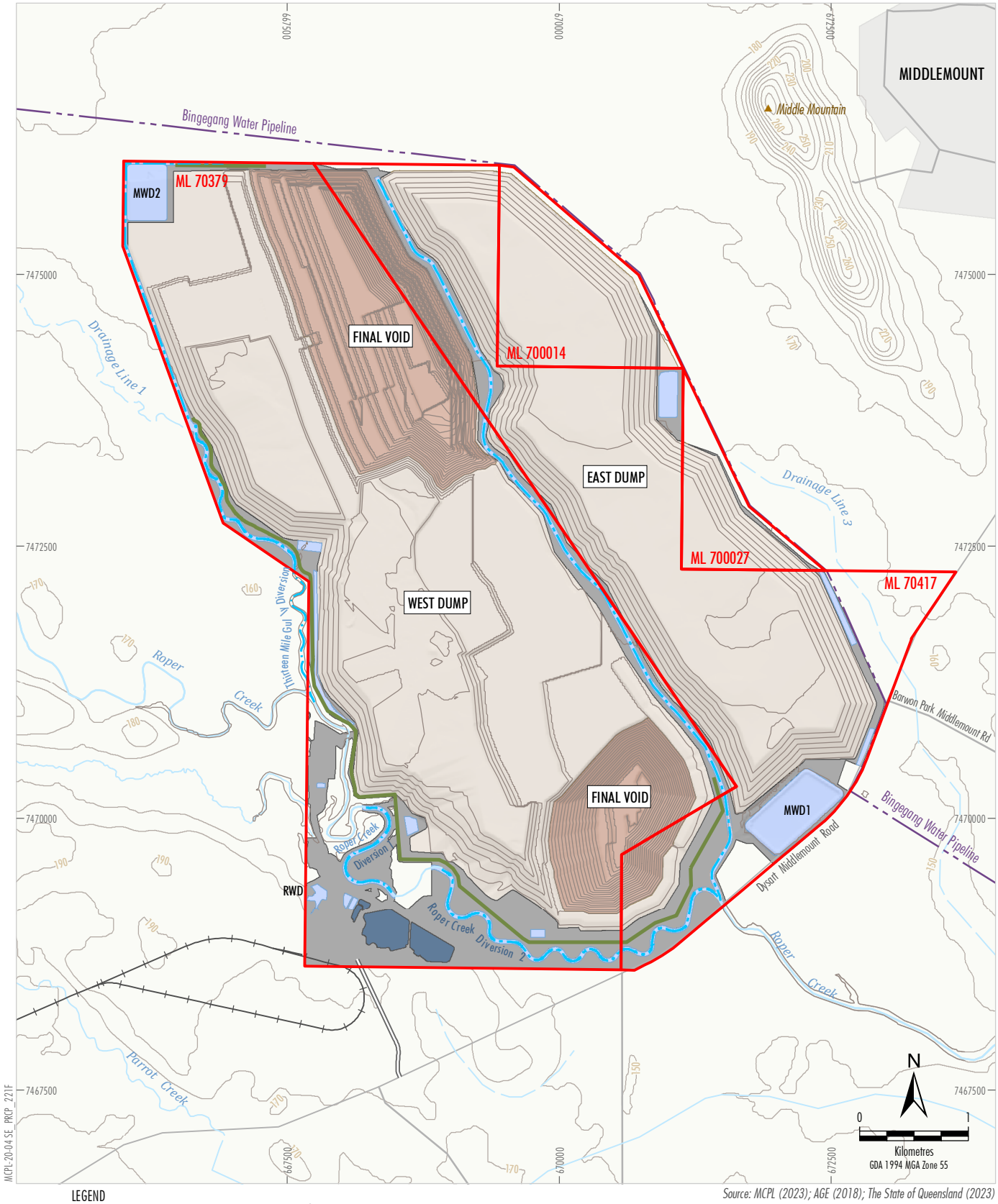
** Areas considered "Active Rehabilitation" are those in which rehabilitation has commenced.

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Progressive Development and Rehabilitation 2044

Figure 14



Source: MCPL (2023); AGE (2018); The State of Queensland (2023)

LEGEND

- Mining Lease Boundary (ML)
- Middlemount Rail Spur and Loop (Retained or Rehabilitated)
- Mine Access Road
- Diversion Structure
- Levee (Rehabilitated)
- Final Landform Contour (10 m)

Project Domains

- Final Void
- Waste Rock Emplacement
- Infrastructure Area #
- Tailings Storage Facility
- Water Management

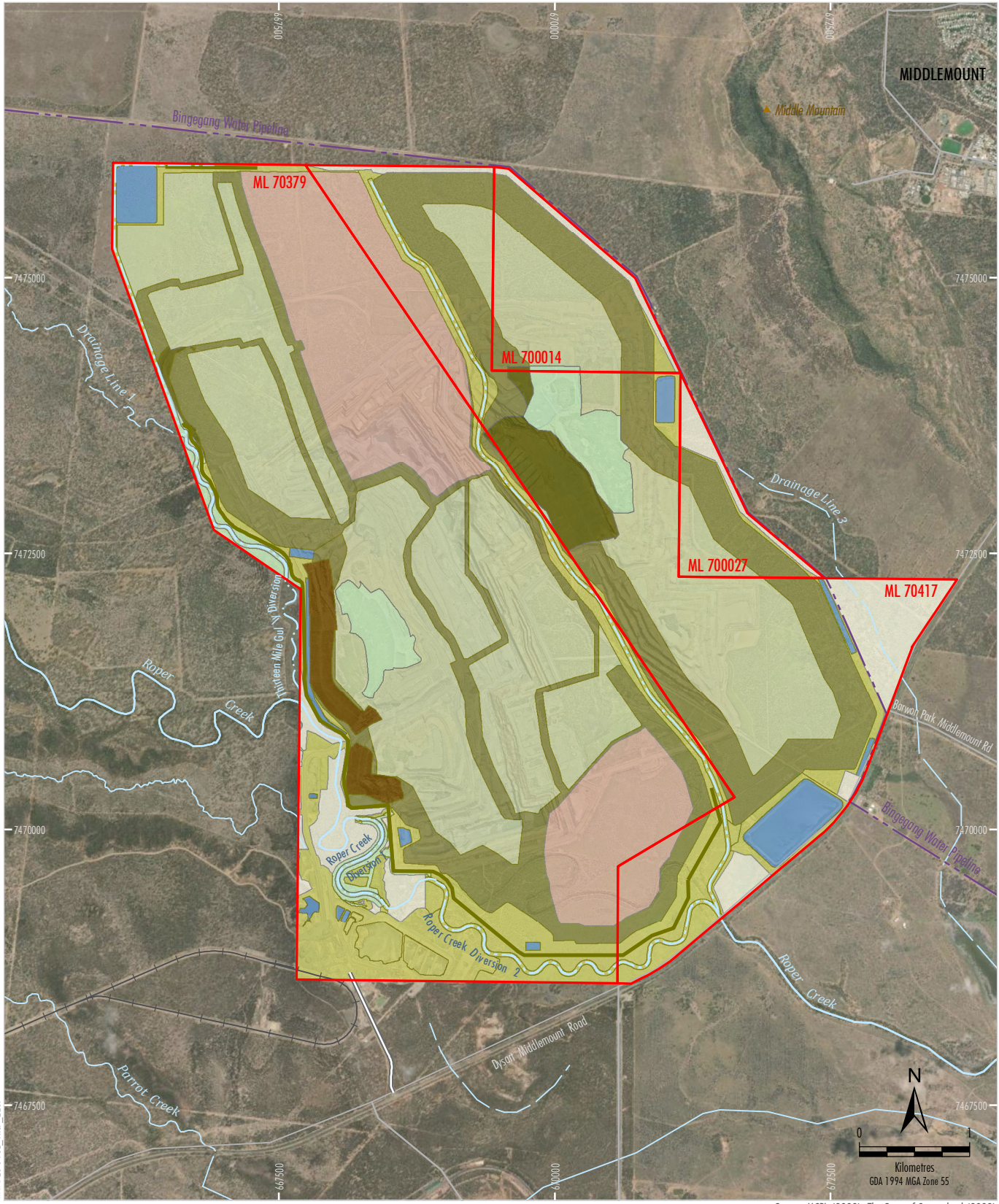
Infrastructure Area includes the coal handling and preparation plant, coal stockpiles, administration buildings, rail loop, rail load-out infrastructure, haul roads, bunding, hardstands, minor water management infrastructure, access tracks, topsoil stockpiles, explosives magazine, power

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Progressive Development and Final Landform

Figure 15



Source: MCPL (2023); The State of Queensland (2023)

MCPL-20-04 SE_PKP_2231

LEGEND

- Mining Lease Boundary (ML)
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure
- Levee (Rehabilitated)

Post-mining Land Use Areas

- Native Ecosystem
- Native Ecosystem (Flat/Undulating)
- Native Ecosystem (with non-native grasses) (Flat/Undulating)
- Native Ecosystem (with non-native grasses) (Slope <16%)
- Native Ecosystem (with non-native grasses) (Slope < 16%)
- Native Ecosystem (with non-native grasses) (Slope >16%)
- Native Ecosystem (Retained Water Management Infrastructure)
- Existing Grazing Pasture

Non-use Management Area

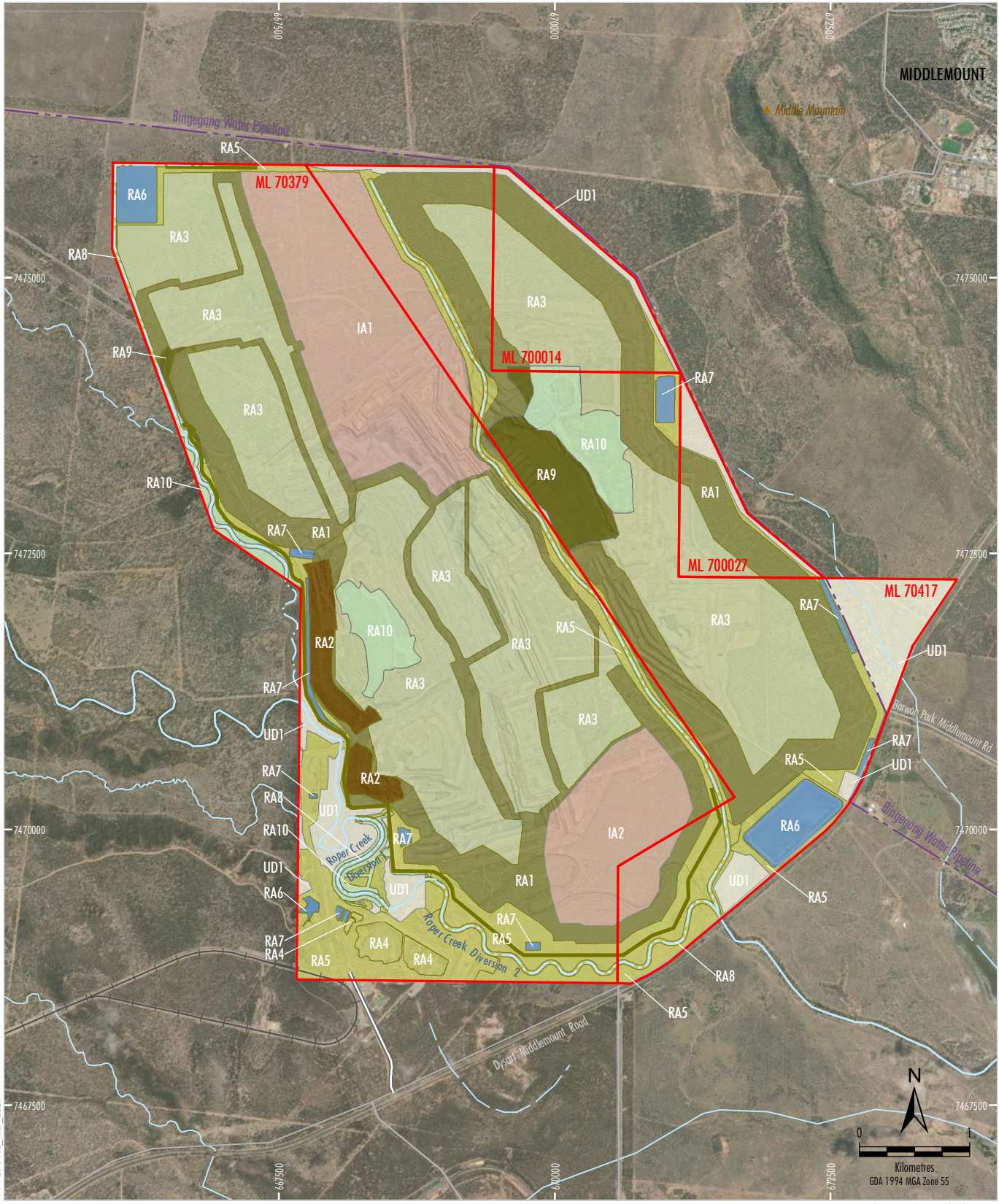
- Residual Void

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Proposed Post-mining Land Uses and Non-use Management Areas

Figure 16



MCPL-20-04 SE_PRCP_222K

LEGEND

- Mining Lease Boundary (ML)
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure
- Levee (Rehabilitated)

Post-mining Land Use Areas

- Native Ecosystem
- Native Ecosystem (Flat/Undulating)
- Native Ecosystem (with non-native grasses) (Flat/Undulating)
- Native Ecosystem (with non-native grasses) (Slope <16%)
- Native Ecosystem (with non-native grasses) (Slope < 16%)
- Native Ecosystem (with non-native grasses) (Slope >16%)
- Native Ecosystem (Retained Water Management Infrastructure)
- Existing Grazing Pasture

Non-use Management Area

- Residual Void

Source: MCPL (2023); The State of Queensland (2022) Orthophoto Mosaic: 2021, 2015

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Rehabilitation Areas and Improvement Areas

Figure 17

3.1.4.2 Rehabilitation Undertaken to Date

Under section 126C(1)(j) of the EP Act, transitional PRC plans must also include the following details about any existing rehabilitation already completed at the time of submission of the proposed PRC plan:

- a description of the rehabilitation works previously carried out;
- when the rehabilitation works commenced and were completed; and
- whether the rehabilitation has been applied for or approved as progressively certified under the EP Act.

Rehabilitation at the Middlemount Coal Mine (Plate 2 and Plate 3) has been progressively undertaken since 2015. Progressive rehabilitation to date (i.e. up to October 2023) has been completed across approximately 265 ha at the Middlemount Coal Mine (Figure 10, Table 11). All areas of rehabilitation at the Middlemount Coal Mine are subject to ongoing monitoring and maintenance activities including reporting within the annual Rehabilitation Monitoring Program.

Plate 2: Cover Crop species present on 5 month old rehabilitation at the Middlemount Coal Mine.

Plate 3: Intermediate pasture with emerging Acacia species present at the Middlemount Coal Mine.

Existing rehabilitation at the Middlemount Coal Mine whilst commenced, has not yet been assessed against the proposed rehabilitation milestones presented in this PRC Plan. Following approval of this PRC Plan areas of existing rehabilitation will be assessed against the approved rehabilitation milestones and success criteria to determine which milestone each area is currently up to and if any rework is required.

Table 11
Progressive Rehabilitation Undertaken to Date

Area	PMLU	Size of Area (ha)	Rehabilitation Milestone[1]	Progression of Rehabilitation Undertaken to Date (ha)[1]
RA2 Waste Rock Emplacement – Existing Rehabilitation (slopes ≤33%)	Native Ecosystem (with non-native grasses)	52	RM1	28
			RM3	28
			RM4	28
			RM5	28
			RM6	-
			RM7	-
			RM8	-
RA5 Infrastructure Area	Native Ecosystem	382	RM1	29
			RM2	29
			RM4	29
			RM5	-
			RM6	-
			RM7	-
			RM8	-
RA8 Water Diversions	Native Ecosystem (with non-native grasses)	58	RM1	16
			RM4	16
			RM5	-
			RM6	-
			RM7	-
			RM8	-
RA9	Native Ecosystem (with non-native grasses)	78	RM1	78
			RM2	78
			RM3	78
			RM4	78
			RM5	78
			RM6	-
			RM7	-
RA10	Native Ecosystem (with non-native grasses)	151	RM1	151
			RM2	151
			RM3	151
			RM4	151
			RM5	151
			RM6	-
			RM7	-

[1] Rehabilitation only reported once all milestone criteria for a given rehabilitation milestone are completed.

The PRCP Schedule (Attachment 1) includes the status of the rehabilitation activities undertaken so far. Work undertaken to date is generally limited to the completion of activities associated with RM1, RM2 RM3, RM4 and RM5 which primarily relate to decommissioning, remediation of contaminated land and landform development, reshaping/re-profiling, and revegetation. Activities associated with other rehabilitation milestones (e.g. RM5 and RM6) have also commenced at the Middlemount Coal Mine, however they have not yet progressed to a point where these milestones are considered to be completed. Rehabilitation activities undertaken prior to the preparation of the PRC Plan and PRCP Schedule were completed in accordance with the methodologies outlined in the Rehabilitation Management Plan (MCPL, 2012), which is the approved land outcome document (and has been superseded by this PRC Plan).

Future rehabilitation activities will continue to progress through the remaining rehabilitation milestones relevant to each area (e.g. RM5 to RM10). MCPL has not yet applied for, or received, progressive certification from DES for any of the rehabilitation completed to date.

3.2 COMMUNITY CONSULTATION

3.2.1 Community Consultation Register

MCPL has undertaken extensive consultation with key stakeholders regarding the PMLU of the Middlemount Coal Mine. Consultation to date has been conducted with the neighbouring landholders, local community, Aboriginal stakeholders, key State and Commonwealth government agencies, Isaac Regional Council and relevant infrastructure owners.

Consultation with the above relevant stakeholders was undertaken for:

- Middlemount Coal Mine Southern Extension Project;
- Middlemount Coal Mine Western Extension Project; and
- Middlemount Coal Mine Stage 2 EIS.

Consultation has also been undertaken with the relevant groups during the preparation of the PRC Plan and PRCP Schedule and will continue to be undertaken for the life of the Middlemount Coal Mine.

A summary of the consultation undertaken to date (where relevant to the PRC Plan) is provided below. Details of any issues raised during consultation regarding rehabilitation and PMLU at the Middlemount Coal Mine and how the issues were considered during the preparation of the PRC Plan and PRCP Schedule are provided in Table 12.

3.2.1.1 Local Community

Community Reference Group

A Community Reference Group (CRG) was established for the Middlemount Coal Mine comprising representatives from the local communities, neighbouring landholders, Isaac Regional Council and MCPL. The CRG provides a mechanism for ongoing communication between MCPL and the local community. MCPL consulted with the CRG on a regular basis throughout the preparation of the Middlemount Coal Mine Southern Extension Project and Western Extension Project.

During the preparation of the PRC Plan and PRCP Schedule, MCPL has arranged consultation with the CRG in Q2 2022 to provide an overview of the PRC Plan and PRCP Schedule process and a summary of key elements including overall timing, PMLU, NUMAs and the additional assessments being undertaken. MCPL will continue to liaise with the CRG throughout the preparation and finalisation of the PRCP.

Adjacent/Underlying Landholders

During the preparation of the PRC Plan and PRCP Schedule, MCPL distributed a briefing to neighbouring (and other local) landholders in Q1 2022, to provide an overview of the PRC Plan and PRCP Schedule process and as summary of key elements including overall timing, PMLU, NUMAs and the additional assessments being undertaken. No responses to the overview have been received to date.

MCPL undertakes regular consultation with the neighbouring landholders regarding mitigation of potential impacts through mechanisms such as negotiated agreements or property acquisitions.

Table 12
Community Consultation Register

Stakeholder	Key Objectives and Information to be Provided	Consultation Activities and Engagement Method	Consultation Date	Issues Raised	How Issues Have Been Considered	Outcomes, Decisions and/or Commitments
Government Agencies						
Department of Environment and Science (DES)	Summary of key elements including overall timing, community consultation plan, PMLUs, NUMAs, completion criteria and supporting assessments being undertaken.	Pre-lodgement Meeting (videoconference) /Email	10 May 2021	-	MCPL considered the feedback provided by DES and has used this feedback to develop the PRC Plan and PRCP Schedule, consistent with previous commitments in EA EPML00716913 and the EVA.	
	Draft PRC Plan and PRCP Schedule provided to DES for review and feedback.	Email	May 2022			
	Final PRC Plan and PRCP Schedule submitted to DES for assessment.	Email	June 2022			
Department of Resources (DoR)	Overview of PRC Plan and PRCP Schedule process and summary of key elements including overall timing, PMLUs, NUMAs and supporting assessments being undertaken.	Email/Letter	May 2022	No issues raised to date.	-	-
Local Government						
Isaac Regional Council	Overview of PRC Plan and PRCP Schedule process and summary of key elements including overall timing, PMLUs, NUMAs and supporting assessments being undertaken.	Letter/Presentation	21 June 2022	No issues raised to date.	-	-
Surrounding Landholders						
Affected (Underlying and Adjoining) Landholders	Overview of PRC Plan and PRCP Schedule process and summary of key elements including overall timing, PMLUs, NUMAs and supporting assessments being undertaken.	Email/Letter	May 2022	No issues raised to date.	-	-

Table 12 (Continued)
Community Consultation Register

Stakeholder	Key Objectives and Information to be Provided	Consultation Activities and Engagement Method	Consultation Date	Issues Raised	How Issues Have Been Considered	Outcomes, Decisions and/or Commitments
Local Community Groups						
Community Reference Group	Overview of PRC Plan and PRCP Schedule process and summary of key elements including overall timing, PMLU, NUMAs and assessments being undertaken.	Letter/Presentation	May 2022	No issues raised to date.	-	-
Local Community and Groups	Overview of PRC Plan and PRCP Schedule process and summary of key elements including overall timing, PMLU, NUMAs and assessments being undertaken.	Community Newsletter/Website	Dec 2021	No issues raised to date.	-	-
Other Community Members	Overview of PRC Plan and PRCP Schedule process and summary of key elements including overall timing, PMLU, NUMAs and assessments being undertaken.	Website	Dec 2021	No issues raised to date.	-	-
Traditional Owners						
Aboriginal Community	Overview of PRC Plan and PRCP Schedule process and summary of key elements including overall timing, PMLU, NUMAs and assessments being undertaken.	Email/Letter	Dec 2021	No issues raised to date.	-	-

Other Local Community Members

A dedicated Middlemount Coal Mine community information line (07 4985 0000) has been established for community members (including neighbouring landholders) to contact MCPL with any questions they may have, and relevant information has been, or will be, made publicly available on the Middlemount Coal Mine website.

3.2.1.2 Aboriginal Community

Cultural Heritage Management Plans (CHMPs) have been formed with the Barada Barna People, the Barada Barna Aboriginal Corporation (as the prescribed body corporate for the Barada Barna People) and the Barada Barna Kabalbara and Yetimarla People #4 (BBKY #4).

As part of the Middlemount Coal Mine Stage 2 Environmental Impact Statement (EIS), CHMPs were formed in consultation with the Barada Barna People in May 2010 and with the BBKY #4 in September 2010. The CHMPs covered MCPL and Ribfield Pty Ltd as tenement holders. The CHMP formed with Barada Barna People covered the northern portions of ML 70379, MLA 70417, MDL 282 and EPC 1225 and the CHMP formed with the BBKY #4 covered the remaining (southern) portions including ML 70379, MLA 70417 and MDL 282.

As part of the Middlemount Coal Mine Western Extension Project, MCPL met with the Barada Barna People to form a new CHMP for the additional area that was not covered by the existing CHMPs.

As part of the Middlemount Coal Mine Southern Extension Project, consultation with the Aboriginal Community was undertaken during preparation of the EVA.

In Q1 2022, during the preparation of the PRC Plan and PRCP Schedule, MCPL distributed a briefing to the Barada Barna People, the Barada Barna Aboriginal Corporation and the BBKY #4 to provide an overview of the PRC Plan and PRCP Schedule process and a summary of key elements including overall timing, PMLUs, NUMAs and the supporting assessments being undertaken. No responses to the briefing have been received to date.

3.2.1.3 Queensland State Government Agencies

MCPL consults with relevant QLD State Government agencies on a regular basis in relation to the current operations at the Middlemount Coal Mine. MCPL undertook extensive consultation with the QLD State Government regarding the Southern Extension Project in 2020.

Consultation with QLD State Government agencies regarding the PRC Plan and PRCP Schedule is ongoing. Consultation undertaken to date are discussed below.

Department of Environment and Science

On 10 May 2021, MCPL met with DES to discuss the preparation of the PRC Plan and PRCP Schedule. MCPL provided a summary of the key elements including the overall timing, community consultation plan, PMLUs, NUMAs and supporting assessments being undertaken. The key objectives for the meeting were related to the final voids, public notification process, PRC Plan and PRCP Schedule scope and the proposed community consultation plan. Feedback from DES was used to inform the preparation of the PRC Plan and PRCP Schedule. In Q2 2022, MCPL provided a preliminary draft of the PRC Plan and PRCP Schedule to DES for their review. High-level advice with regards to the draft PRC Plan and PRCP Schedule was received from DES on 15 June 2022. The final PRC Plan and PRCP Schedule was submitted to DES in June 2022, whereby a site visit of the Middlemount Coal Mine was undertaken by DES to observe the existing rehabilitation and how it aligned with the submitted PRC Plan and PRCP Schedule. Further comments and advice were provided by DES in August 2022 and has been considered in this PRC Plan and the associated PRCP Schedule.

Department of Resources

In Q2 2022, MCPL provided DoR with a briefing letter on the PRC Plan and PRCP Schedule process and a summary of the key elements including overall timing, PMLUs, NUMAs and the supporting assessments being undertaken. No response to the briefing letter has been received to date.

3.2.1.4 Isaac Regional Council

Regular consultation has been undertaken with IRC providing an overview of the PRC Plan and PRCP Schedule process and a summary of key elements including overall timing, PMLUs, NUMAs and the supporting assessments being undertaken.

On 21 June 2022, MCPL engaged with the Isaac Regional Council to discuss the PRC Plan and PRCP Schedule, whereby the Isaac Regional Council were supportive of the amendment of the PMLU.

MCPL will continue to consult with the IRC regarding future outcomes of the PRCP and associated activities at the Middlemount Coal Mine.

3.2.2 Community Consultation Plan

Ongoing future consultation with key stakeholders to be undertaken with regard to the PRC Plan and PRCP Schedule is outlined in Table 13. Consultation and regular updates to the PRC Plan and PRCP Schedule where relevant will be provided at CRG meetings when held.

Table 13
Community Consultation Plan

Stakeholder	Key Objectives of Engagement	Proposed Engagement Method and Activities	Engagement Indicative Timing	Information to be Provided	Mechanism for Feedback Incorporation
Government Agencies					
DES	• To provide updates on rehabilitation progress.	Meetings or Email Rehabilitation Report Milestone Monitoring	Annually	Status of rehabilitation.	PRC Plan Amendments.
DoR	• To outline the status of MLs once rehabilitation is complete.	Email/Letter Report	Post-mining	Status of ML relinquishment.	Post-surrender Management Report.
Local Government					
IRC	• To provide updates on rehabilitation progress. • To ensure any desired changes to post-mining land uses are considered.	Meetings or Email	Annually	Status of rehabilitation.	PRC Plan Amendments.
Surrounding Landholders					
Affected (Underlying and Adjoining) Landholders	• To provide updates on rehabilitation progress. • To discuss retaining infrastructure or water storages/management areas.	Email/Letter	As required	Status of rehabilitation.	PRC Plan Amendments.
Local Community Groups					
CRG	• To provide updates on rehabilitation progress.	Meetings or Email	Annually	Status of rehabilitation.	PRC Plan Amendments.
Local Community and Groups	• To provide updates on rehabilitation progress.	Website	Annually	Status of rehabilitation.	PRC Plan Amendments.
Other Community Members	• To provide updates on rehabilitation progress.	Website	Annually	Status of rehabilitation.	PRC Plan Amendments.
Traditional Owners					
Aboriginal Community	• To provide updates on rehabilitation progress.	Website	Annually	Status of rehabilitation.	PRC Plan Amendments.

3.3 POST-MINING LAND USE

The relevant land outcome document for the Middlemount Coal Mine is EA EPML00716913.

PMLUs for the Middlemount Coal Mine were developed during the preparation of the *Middlemount Coal Project Stage 2 Environmental Impact Assessment* (MCPL, 2011) and further refined following consultation and presented in the *Middlemount Coal Project Stage 2 Supplementary Environmental Impact Statement* (MCPL, 2011). The PMLUs presented within these documents lacked clear and objective descriptions (e.g. nature conservation) however maintained the overall objective of native ecosystem (as existed prior to mining).

Since approval of the *Middlemount Coal Project Stage 2 Environmental Impact Assessment* (MCPL, 2011) the PMLUs for the Middlemount Coal Mine have been revised through subsequent approvals such as the *Middlemount Coal Mine Western Extension Project Environmental Assessment Report* (MCPL, 2018). Revisions to PMLUs since 2010 intended to increase clarity and objective descriptions whilst maintaining the overall optionality for native ecosystem (e.g. inclusion of flora comprising species characteristic of selective REs present within the pre-mining landscape, where practicable).

Consistent with the process outlined in the PRCP Guideline, MCPL has amended the approved PMLUs (described within the abovementioned documents) for the Middlemount Coal Mine into this PRC Plan and associated PRCP Schedule (Table 14).

Native ecosystem is the proposed PMLU for the majority of the Middlemount Coal Mine, as it is located within strategic ecological corridor, accompanied by mixed activities including grazing on unimproved pasture. As per EA EPML00716913, native ecosystem is defined as recreating land to a natural ecosystem as similar as possible to the original ecosystem. As such, the Middlemount Coal Mine would be revegetated to a native ecosystem comprising species characteristic of selective REs for each mining domain. Selected areas would be rehabilitated to native ecosystem with non-native grasses, as these areas have already commenced rehabilitation prior to the commencement of this PRC Plan. Therefore, particular areas of the Middlemount Coal Mine (areas of high erosion risk) would be revegetated incorporating both native and non-native grasses. No horticulture or cropping occurs on the Middlemount Coal Mine site. The PMLU of native ecosystem will be supported by retained water management structures which will provide access to water for potential livestock or other water management purposes. Any unnecessary water management structures at the cessation of operations at the Middlemount Coal Mine would be decommissioned and rehabilitated (Section 3.5.7).

Flora comprising species characteristic of particular REs present within the pre-mining landscape would be incorporated into the final landform, where practicable, to provide habitat corridors for wildlife and visual enhancement. Endemic flora would contain species characteristics of REs which were present in the pre-mining landscape (i.e. these areas would not necessarily aim to recreate particular REs, rather contain species which are commonly present within the listed REs).

In accordance with section 126C(1)(d) of the EP Act, the rehabilitation planning part of the PRC plan must state the extent to which each PMLU for land identified in the PRCP Schedule is consistent with:

a) the outcome of consultation with the community in developing the plan, and

b) any strategies or plans for the land of a local government, the State or the Commonwealth.

This is addressed in the sub-sections below.

Table 14
Post-mining Land Use Transition

Domain	Area (ha)	Approved PMLU[1]	PRCP Transitioned PMLU	Justification for Transition
MIA and CHPP Area	111	Low-density beef cattle grazing or recreated Regional Ecosystem (RE) 11.5.9 (*Eucalyptus crebra* and other *Eucalyptus spp*. and *Corymbia spp*. Woodland on Cainozoic sand plains/remnant surfaces.).	Native ecosystem with selected areas of non-native grasses. Recreated Regional Ecosystem (RE) 11.5.9 (Eucalyptus crebra and other Eucalyptus spp. and Corymbia spp. Woodland on Cainozoic sand plains/remnant surfaces).	The transitioned PMLU achieves a more supporting and productive land use outcome better suited to the surrounding land uses of the Middlemount Coal Mine. The transitioned PMLU would seek to achieve the enduring long-term sustainability of the land post-mining. Some infrastructure components may be retained for beneficial reuse where appropriate. Areas of native vegetation will include species which are characteristic of surrounding vegetation such as RE 11.5.9 (e.g. *Eucalyptus crebra*, other *Eucalyptus spp.* and *Corymbia spp.*), where practicable.
In-pit and out-of-pit overburden spoil dumps (slopes)	691	Rock mulched surface with native grass, with exception of the slope of the southern overburden spoil dump relative to the Roper Creek Floodplain which would be native ecosystem with recreated RE 11.5.3 (*Eucalyptus populnea* +/- *E*. *melanophloia* +/- *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces).	Native ecosystem with selected areas of non-native grasses.	Rock mulching requirements have been reviewed by Verterra and Landloch and advised that slopes ≤16% do not require rock mulching as a revegetation strategy (Section 3.5.3.8). For existing rehabilitation areas and waste dumps designed areas (RA2), where previously constructed slopes are ≤33 %, rock mulch would be applied at a minimum application rate of 0.5m. Native vegetation will include a combination of non-native grasses and native species which are characteristic of surrounding vegetation such as RE 11.5.3 (e.g. *Eucalyptus spp.)*

1 Approved PMLU as defined by EA EPML00716913.

2 Where native ecosystem is defined as recreating land to a natural ecosystem as similar as possible to the original ecosystem.

Exploration Areas

Exploration areas are not classified as a stand-alone mining domain due to all exploration areas being within the current overall mining footprint, incorporated within the existing mining domains. All exploration areas contained within the current mining domains will be rehabilitated in accordance with Rehabilitation Milestone 1 (Table 15).

3.3.1 Community Consultation

As described in Section 3.2.1, during preparation of the Southern Extension Project EVA (MCPL, 2020a), consultation was conducted with the neighbouring landholders, the local community, Aboriginal stakeholders, key State and Commonwealth government agencies, IRC and relevant infrastructure owners. Consultation undertaken to date included summaries of overall timing, community consultation plan, PMLUs, NUMAs (i.e. residual voids), completion criteria and supporting assessments being undertaken.

Consultation has continued to be undertaken with the abovementioned groups during the preparation of this PRC Plan and PRCP Schedule. Where relevant, feedback has been addressed or incorporated.

The PMLU of native ecosystem is considered to be consistent with the outcomes of the community consultation undertaken to date as:

- No queries or issues with the PMLU have been raised by the CRG to date.
- No queries or issues with the PMLU have been raised by adjacent landholders or other members of the local community to date.
- No queries or issues with the PMLU have been raised by other relevant stakeholders.

3.3.2 Relevant Legislation, Plans and Strategies

3.3.2.1 Local and Regional Government

Relevant local and regional government plans/schemes have been considered in the preparation of this PRC Plan and the establishment of the proposed target PMLU.

The *Isaac 2035, Community Strategic Plan: Isaac's 20 year vision* (IRC, 2015) (the Community Plan) provides a long-term vision and strategic direction towards improving the future of the Isaac community in the midst of anticipated changes over the next two decades. The Community Plan is the over-arching document and key driver for the region's Strategic Planning Framework, particularly focusing on community, infrastructure, the economy and the environment. The Community Plan sets out what is important to the Isaac community, including the long standing agricultural industry.

The *Isaac Regional Planning Scheme* (IRC, 2021) (the Planning Scheme) was prepared in accordance with the *Planning Act 2016* as a framework for managing development. The Planning Scheme focuses on liveable communities, economic diversification, community infrastructure, the protection of natural resources and the environment, and safety from natural disasters. The Planning Scheme references the character and amenity that agriculture and grazing encompass in the Isaac region.

The *Mackay, Isaac and Whitsunday Regional Plan* (State of Queensland, 2012) (the Regional Plan) establishes a long-term vision and direction for the region to 2031. The Regional Plan provides an overarching certainty about where the region is heading and a framework to respond to any challenges and opportunities that may arise. The Regional Plan also references the importance that traditional industries like agriculture, fishing and tourism will have in contributing to the regional economy into the future.

The proposed target PMLU of native ecosystem (with selected non-native grasses) is in line with, and keeping with, the vision of the Community Plan, the Planning Scheme, and the Regional Plan as:

- The region's natural environment and native species habitats will be recognised, maintained and enhanced, and the extent of weeds and pests impacting on the region will be minimised.
- The rehabilitated landform will be consistent with the region's character and amenity (e.g. the natural environment).

3.3.2.2 State and Commonwealth Governments

The State and Commonwealth legislation considered during the preparation of the Southern Extension Project EVA (MCPL, 2020a) and this PRC Plan includes:

- *Mineral Resources Act 1989.*
- EP Act 1994.
- EPBC Act 1999.
- *Environmental Offsets Act 2014.*
- *Nature Conservation Act 1992.*
- *Regional Planning Interests Act 2014.*
- *Planning Act 2016*.
- *Water Act 2000.*
- *Water Plan (Fitzroy Basin) 2011.*
- *Native Title Act 1993.*
- *Aboriginal Cultural Heritage Act 2003.*
- *Land Act 1994.*
- *Electricity Act 1994.*
- *Local Government Act 2009*.
- *Isaac Regional Planning Scheme 2021.*
- *Building Act 1975.*
- *Building Regulation 2021*.
- *Code for the Tendering and Performance of Building Work 2016.*

The proposed target PMLU is not considered to be inconsistent with any of the legislation identified above.

3.4 NON-USE MANAGEMENT AREAS

The relevant land outcome document for the Middlemount Coal Mine is EA EPML00716913. Two final voids are described in the land outcome document and have been transitioned into this PRC Plan and PRCP Schedule.

Consistent with the process outlined in the PRCP Guideline, MCPL is not required to comply with the requirements under section 126C(1)(g) or (h), or section 126D(2) or (3) of the EP Act and is not required to complete the information requirements under section 126C(1)(j) of the EP Act for the approved NUMAs.

Condition G19 of EA EPML00716913 requires MCPL to complete an investigation into residual voids and submit a report to the administering authority by 31 October 2021 proposing relevant acceptance criteria. Middlemount submitted a residual void study, addressing the requirements of Condition G19, whereby Plate 4 below details the proposed acceptance criteria as per the Middlemount Coal Mine Geotechnical – Final Void Study (Appendix K). There have been no changes to the final void maximum depth and volume compared to the approved layout in EA EPML00716913.

Table 5 Recommended slope geometry for the final voids

Material	Overall Slope Angle (°)	Bench Height (m)	Berm Width (m)	Batter Angle (°)
Surficial Soils	20	NA	NA	NA
Weathered Permian	NA	30	25	55
Fresh Permian	NA	60	60	60

Table 6 Recommended slope geometry for lowwalls

Material	Overall Slope Angle (°)~	Max. Bench Height (m)	Berm Width (m)*	Batter Angle (°)
Lowwall CAT3 Spoil	27	40	12 to 25	37

~This is the maximumOSA allowed for lowwall designs

*The bench geometries maybe changed to satisfy the OSA, this include bench height and berm width

Plate 4 – Table 5 and 6 from the Middlemount Coal Mine Geotechnical – Final Void Study

Notwithstanding, the legislative requirements under section 126C(1)(d) of the EP Act still apply. In accordance with section 126C(1)(d) of the EP Act, the rehabilitation planning part of the PRC Plan must state the extent to which each NUMA identified in the PRCP Schedule is consistent with:

a) the outcome of consultation with the community in developing the plan; and

b) any strategies or plans for the land of a local government, the State or the Commonwealth.

This is addressed in the sub-sections below.

3.4.1 Community Consultation

As described in Section 3.2.1, during preparation of the Southern Extension Project EVA, consultation was conducted with the neighbouring landholders, the local community, Aboriginal stakeholders, key State and Commonwealth government agencies, IRC and relevant infrastructure owners.

Consultation has also been undertaken with the relevant groups during the preparation of this PRC Plan and PRCP Schedule, and their feedback has been addressed or incorporated.

The approved NUMAs (i.e. the residual voids) are considered to be consistent with the outcomes of the community consultation undertaken to date as:

- No queries or issues with NUMAs have been raised by the CRG to date.
- No queries or issues with NUMAs have been raised by adjacent landholders or other members of the local community.

3.4.2 Relevant Legislation, Plans and Strategies

3.4.2.1 Local Government

The approved NUMAs will be managed in such a way as to minimise any impacts on the vision outcomes in the Community Plan, the Planning Scheme and the Regional Plan, in particular:

- The region's natural environment and native species habitats will be recognised, maintained and enhanced, and the extent of weeds and pests impacting on the region will be minimised.
- The rehabilitated landform will be consistent with the region's character and amenity (e.g. agricultural land and the natural environment).
- The size of the NUMAs has been minimised to maximise the land to be returned to native ecosystem.

3.4.2.2 State and Commonwealth Governments

The proposed NUMAs were considered in accordance with relevant State and Commonwealth legislation during the preparation of the Southern Extension Project EVA (MCPL, 2020a). Relevant legislation considered is listed in Section 3.3.2.2.

The approved NUMAs are considered to be consistent with the relevant legislation identified in Section 3.3.2.2. The northern void is not located within the current floodplain of Roper Creek. The southern final void is located on the pre-mine floodplain of Roper Creek. At the completion of mining the flood protection levee in place during operation of the mine would be decommissioned and incorporated into the final landform to provide flood immunity up to the probable maximum flood (PMF).

Native vegetation cover between the final landform and Roper Creek would be retained.

3.5 REHABILITATION AND MANAGEMENT METHODOLOGY

In accordance with section 126C(1)(e) and (i) of the EP Act, the following section states:

- For each proposed PMLU for land, the proposed methods or techniques for rehabilitating the land to a stable condition in a way that supports the rehabilitation milestones under the proposed PRCP Schedule.
- For each proposed NUMA, the proposed methodology for achieving best practice management of the area to support the management milestones under the proposed PRCP Schedule for the area.

3.5.1 Rehabilitation and Management Milestones

Consistent with the Rehabilitation Requirements for the Middlemount Coal Mine (Attachment F of EA EPML00716913), MCPL in consultation with Verterra (2023) has developed a comprehensive suite of milestones for rehabilitation areas and improvement areas of the Middlemount Coal Mine. Tables 15 and 16 describe these milestones and how they relate to the proposed rehabilitation methodology for the Middlemount Coal Mine (Appendix H).

The sub-sections below provide further detail on how MCPL will manage the rehabilitation activities undertaken at the Middlemount Coal Mine to achieve the rehabilitation milestones.

The following guidelines and relevant information have been considered in development of these milestones:

- PRCP Guideline.
- DES (2014) *Guideline: Rehabilitation requirements for mining resource activities* (Historical).
- Australian Government (2016a) *Leading Practice Sustainable Development Program for the Mining Industry – Mine Rehabilitation*.
- Australian Government (2016b) *Leading Practice Sustainable Development Program for the Mining Industry – Mine Closure*.

MCPL considers the management measures proposed for each rehabilitation area (RA) and improvement area (IA) to be consistent with current “best practice” measures at the time of preparing this PRC Plan and PRCP Schedule. If additional relevant information to this PRC Plan and PRCP Schedule becomes available, or the abovementioned guidelines are materially revised, this PRC Plan and PRCP Schedule would be reviewed and updated as required to ensure that “best practice” management measures are retained.

In addition, MCPL commissioned suitably qualified specialists to develop and refine a Revegetation Management Plan (Verterra, 2023; Appendix H), and to review and evaluate potential risks related to rehabilitation (Risk Mentor, 2021; Verterra, 2023). The Revegetation Management Plan (Verterra, 2023) and PRCP Risk Assessment (Risk Mentor, 2021, Appendix I) informed the rehabilitation management measures and maintenance/monitoring methodologies discussed in Sections 3.5 and 3.6.

The rehabilitation and management milestone progression proposed in this PRC Plan and PRCP Schedule (Table 15 and Table 16) has been developed in consideration of the risks that were attributed to each of the rehabilitation milestones timeframes (Risk Mentor, 2021, Appendix I) (discussed further in Section 3.6).

Table 15
Rehabilitation Milestones and Criteria for Rehabilitation Areas

Milestone Reference	Rehabilitation Milestone	Treatment Zone	Milestone Criteria	Approximate Timeframe
RM1	Infrastructure Decommissioning and Removal	Zone 1	1. a) Services disconnected and decommissioned. 1. b) Built and service infrastructure demolished and removed (except if agreed in writing by the post-mining landowner/holder to retain for beneficial re-use as stated in **Attachment 3 of this PRC plan**). 1. c) All waste removed from site.	3 months
RM2	Identification & remediation of contaminated land	Zone 1 Zone 2	2. a) Contaminated land investigation completed by an appropriately qualified person[1] (AQP) in accordance with the *Environmental Protection Act (1994)* including: • Confirmation that contaminated materials have been removed or remediated; • Confirmation that contaminated water and sediment in dams are treated or removed off site; • No potential for acid rock drainage, and acid rock drainage is measured against the threshold detailed in the Global Acid Rock Drainage Guide (INAP, 2009); and • A Site Suitability Statement confirming the suitability of the property for the PMLUs. 2. b) The Contaminated Land Investigation Document is supported by a Site Investigation Report and, where appropriate, a Validation Report and/or a draft Site Management Plan 2. c) Where ongoing management of residual contamination is deemed appropriate: • Hydrocarbon, heavy metal, or other contaminants limits are established in accordance with DES Queensland Auditor Handbook for Contaminated Land; • A draft Site Management Plan is prepared, and approval of the draft Site Management Plan is obtained from the administering authority. • Site added to the Environmental Management Register if required. *[1]Appropriately qualified person: a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature*	3 months

Table 15 (continued)
Rehabilitation Milestones and Criteria for Rehabilitation Areas

Milestone Reference	Rehabilitation Milestone	Treatment Zone	Milestone Criteria	Approximate Timeframe
RM3	Landform Establishment	Zone 1 Zone 2	**General (applicable to all rehabilitated areas)** 3. a) All major earthworks (including reshaping, pushing/trimming) completed in accordance with design specification provided by an AQP to achieve final stable landforms. 3. b) AQP certifies all rehabilitated landforms achieves a Factor of Safety (FOS) ≥ 1.5 3. c) The erosion and sediment control systems are designed by an AQP, installed, and fit for purpose. **Infrastructure area (MIA, CHPP, Roads)** 3. d) Rehabilitated areas slopes ≤5% 3. e) Slopes over 2% do not exceed continuous slope length of 70m. 3. f) Natural drainage lines are reinstated. **Water storage structures** 3. g) Dam liners removed from site. 3. h) Dams to remain for landholder use are safe for stock access and have vegetated banks. 3. i) Landform shaped to be gently sloping characteristic of the natural landform. **Waste rock emplacement areas** 3. j) Overburden spoil dump area slopes are <16%. 3. k) Rock mulch applied to slopes >16% at minimum application rate of 0.5m. 3. l) For existing rehabilitation areas and waste dumps designed areas (RA2) totaling 52ha, where previously constructed slopes are ≤33 %, rock mulch is applied at a minimum application rate of 0.5m.	3 months

Table 15 (continued)
Rehabilitation Milestones and Criteria for Rehabilitation Areas

Milestone Reference	Rehabilitation Milestone	Treatment Zone	Milestone Criteria	Approximate Timeframe
RM3 (continued)	Landform Establishment	Zone 1 Zone 2	**Waste rock emplacement areas (continued)** 3. m) Potentially Acid Forming material (PAF) is lime dosed at a rate of 10 t/ha where applicable or an alternate rate confirmed by field trials. 3. n) Lime does PAF material covered with 10 m of Non-acid forming (NAF) Permian soil with maximum ratio of PAF to Permian spoil as 1:10, where applicable. **TSF** 3. o) Establishment of Permian caps and bunds on coal reject cells. 3. p) TSF surface reshaped to prevent ponding. 3. q) Engineering report for completed cover system certifies that the installed capping system is as per engineering design plan and is geotechnically stable. **Creek Diversions, Floodplain and levee modification** 3. r) Diversions constructed in accordance with the engineering designs developed by an AQP. 3. s) Drainage system installed and confirmed by an AQP that it is stable and fit for purpose. 3. t) Ground level modifications completed to increase conveyance of floodplain at Roper Creek Diversion 2. 3. u) The operational flood protection levee at Roper Creek decommissioned and rehabilitated to widen the Roper Creek floodplain. 3. v) Roper Creek floodplain modified to provide flood immunity to the southern void up to Probable Maximum Flood (PMF) level as certified by AQP.	3 months

<table>
<tr><th>Milestone Reference</th><th>Rehabilitation Milestone</th><th>Treatment Zone</th><th>Milestone Criteria</th><th>Approximate Timeframe</th></tr>
<tr><td>RM4</td><td>Growth Medium Application</td><td>Zone 1
Zone 2</td><td>4. a) An assessment of soil health and suitability has been completed by an AQP to confirm soil suitability to support relevant PMLU as per this schedule.
4. b) An assessment of growth media characteristics is completed by an AQP that identifies appropriate level of growth medium to achieve requirements stipulated in PRCP schedule Appendix 11: Target range for growth medium nutrients.
4. c) Topsoil ameliorated based on following targets:
(i) Total Nitrogen: >1,500 milligram [mg] per kg [mg/kg]
(ii) Phosphate: >20 mg/kg
(iii) Organic matter: >1.7%
(iv) ESP:<6%
4. d) Topsoil placed to a minimum depth of 200 mm.
4. e) Topsoil harrowed on areas <16% slope.
4. f) Topsoil and spoil ripped to improve the water infiltration rate.
4. g) Soil surface crusting less than 2%.</td><td>6 months</td></tr>
<tr><td>RM5</td><td>Revegetation</td><td>Zone 1
Zone 2
Zone 3</td><td>5. a) Direct seeding completed as per the following:
• PRCP Schedule Appendix 1: Seed mix proportion
• PRCP Schedule Appendix 2: Species list for remnant and non-remnant vegetation
5. b) Seeding is based on achieving the following REs at the following domains:
<table><tr><td>MIA and CHPP area</td><td>RE11.5.9</td></tr><tr><td>Roads including haul roads</td><td>RE11.3.2</td></tr><tr><td>Water storage/management dams</td><td>RE11.3.27</td></tr><tr><td>TSF and TFC</td><td>RE11.7.2</td></tr><tr><td>Creek diversion and levee banks</td><td>RE11.3.25</td></tr><tr><td>Waste Rock Emplacement areas</td><td>RE11.5.3</td></tr></table></td><td>12 months</td></tr>
</table>

Table 15 (continued)
Rehabilitation Milestones and Criteria for Rehabilitation Areas

Milestone Reference	Rehabilitation Milestone	Treatment Zone	Milestone Criteria	Approximate Timeframe
RM6	Achievement Surface Conditions	Zone 1 Zone 2	6. a) Rehabilitated areas are devoid of slumping and active gully erosion. 6. b) Non-vegetation cover (stones, rock cover, litter, logs etc) does not cover greater than 30% of the total area. 6. c) A minimum of 65% ground cover is present. 6. d) Bare surface areas not exceeding 10 m^2 in area or, 10 m in length on a slope. 6. e) Target native trees, shrubs and grass species number and composition is consistent with – • PRCP schedule **Appendix 2: Species list for remnant and non-remnant vegetation** and; • PRCP schedule **Appendix 3: Benchmark for Regional Ecosystem** 6. f) Reseeding or plantation of tube stock completed if determined necessary by an AQP to achieve PRCP schedule **Appendix 3:** Benchmark for Regional Ecosystem. 6. g) The annual monitoring conducted by an AQP shows absence of prohibited or restricted invasive plants (as defined in Biosecurity Act 2014) in groundcover. 6. h) No evidence of erosion classified as 'moderate' or 'severe' as defined by **PRCP Schedule Appendix 4: Erosion classification framework.** 6. i) Soil testing demonstrates achievement of the following parameters: a. Rootzone EC <0.15mS/cm, b. Soil pH <9 and >6 as measured at any part of the root zone, c. Exchangeable Sodium Percentage (ESP%) <6% (at 0-10cm depth). 6. j) Surface water quality results monitored monthly during flow at, but not limited to, downstream locations specified in the **Appendix 5: Receiving Water Upstream Background Sites and Downstream Monitoring Points** of this schedule achieve the following water quality criteria: a. pH: 6.5-9.0 b. Electrical conductivity: <700-µS/cm c. Sulfate: <66mg/L d. Total suspended solids (TSS): <562mg/L	5 years

Table 15 (continued)
Rehabilitation Milestones and Criteria for Rehabilitation Areas

Milestone Reference	Rehabilitation Milestone	Treatment Zone	Milestone Criteria	Approximate Timeframe
RM6 (continued)	Achievement Surface Conditions	Zone 1 Zone 2	6. k) If the surface water quality exceeds criteria above, the applicable upstream/reference site must be compared to the downstream site result; and if the quality measured at a downstream site is equal to or less than the quality measured at the applicable upstream/reference site, no further action is required. 6. l) A Bushfire Management Plan developed in accordance with relevant Queensland Fire and Emergency Services is implemented and risk reviewed every two years.	5 years
RM7	Stable PMLU Condition	Zone 1 Zone 2 Zone 3	7. a) AQP certified the final landform is geotechnically stable and achieved a 1.5 factor of safety. 7. b) Site not listed in the Environment Management Register. 7. c) Rehabilitation area has remained stable when comparing photographs from successive monitoring events, for a period of at least five years post-rehabilitation. 7. d) No evidence of erosion classified as 'severe' as defined by PRCP Schedule **Appendix 4: Erosion classification framework.** 7. e) All drainage follows appropriate drainage paths, fit for purpose designed by an AQP. 7. f) Non-native cover crop grass species constitute no more than 20% total vegetative groundcover confirmed by an AQP in annual monitoring (except for RA9 and RA10, which has up to 100% non-native cover crop grass species). 7. g) A BioCondition assessment is completed by an AQP using the methodology outlined in the latest version of the Queensland Herbarium's 'BioCondition Assessment Manual'.	Up to 20 years

Table 15 (continued)
Rehabilitation Milestones and Criteria for Rehabilitation Areas

<table>
<tr><th>Milestone Reference</th><th>Rehabilitation Milestone</th><th>Treatment Zone</th><th>Milestone Criteria</th><th>Approximate Timeframe</th></tr>
<tr><td>RM7
(continued)</td><td>Stable PMLU Condition</td><td>Zone 1
Zone 2
Zone 3</td><td>7. h) The BioCondition assessment required under RM7(7.g) demonstrates achievement of the PRCP Benchmark for each assessable attribute for the relevant regional ecosystem as per PRCP Schedule Appendix 3: Benchmark for Regional Ecosystem. The relevant regional ecosystem for each domain is given in the following table:
<table>
<tr><td>MIA and CHPP area</td><td>RE11.5.9</td></tr>
<tr><td>Roads including haul roads</td><td>RE11.3.2</td></tr>
<tr><td>Water storage/management dams</td><td>RE11.3.27</td></tr>
<tr><td>TSF and TFC</td><td>RE11.7.2</td></tr>
<tr><td>Creek diversion and levee banks</td><td>RE11.3.25</td></tr>
<tr><td>Waste Rock Emplacement areas</td><td>RE11.5.3</td></tr>
</table>
7. i) AQP reviewed and confirmed that the hydraulic and geomorphic characteristics of rehabilitated portions of Roper Creek (Diversion 1 and 2), and Thirteen Mile Gully (Diversion) are similar to the undisturbed sections of Roper Creek and Thirteen Mile Gully channels.
7. j) There is no evidence of seepage occurring within the mining tenure.
7. k) Surface water quality results monitored monthly during flow at, but not limited to, downstream locations specified in the Appendix 5: Receiving Water Upstream Background Sites and Downstream Monitoring Points of this schedule must not exceed the following, for a minimum of 5 consecutive years:
a. pH: 6.5-9.0
b. Electrical conductivity: <700-µS/cm
c. Sulfate: <66mg/L
d. TSS: <562mg/L
e. Iron (Dissolved): 300 µg/L
f. Mercury (Dissolved): 0.2 µg/L
g. Selenium (Dissolved): 10 µg/L
h. Aluminium (Dissolved): 55 µg/L
i. Boron (Dissolved): 370 µg/L
j. Uranium (Dissolved): 1 µg/L</td><td>Up to 20 years</td></tr>
</table>

Table 15 (continued)
Rehabilitation Milestones and Criteria for Rehabilitation Areas

Milestone Reference	Rehabilitation Milestone	Revegetation Scenario	Milestone Criteria	Approximate Timeframe
RM7 (continued)	Stable PMLU Condition	Zone 1 Zone 2 Zone 3	7. l) If the surface water quality exceeds criteria above, the applicable upstream/reference site must be compared to the downstream site result; and if the quality measured at a downstream site is equal to or less than the quality measured at the applicable upstream/reference site, no further action is required. 7. m) Groundwater quality should be monitored quarterly at, *but not limited to,* monitoring bores listed in **Appendix 6: Groundwater Quality Monitoring Locations and Frequency** of the schedule, for quality characteristics listed in **Appendix 7: Groundwater Quality Limits** of the schedule and 3 consecutive results must not exceed limits included in **Appendix 7: Groundwater Quality Limits** of the schedule for a minimum of 5 consecutive years. 7. n) Groundwater level is monitored quarterly at, *but not limited to,* monitoring bores listed in **Appendix 8: Groundwater level monitoring locations** of the schedule, and all results must not exceed the Trigger Level Thresholds outlined in **Appendix 9: Groundwater Level Thresholds** of the schedule for a minimum of 5 consecutive years.	Up to 20 years
RM8	Retained Water Structures	Zone 1	8. a) All retained water storages to be assessed and approved as safe and stable by an AQP. 8. b) Retained water storage water quality for quality characteristics must not exceed the trigger values for livestock drinking water defined in ANZECC & ARMCANZ 2000.	2 years

Table 16
Management Milestones and Criteria for Improvement Areas

Milestone Reference	Management Milestone	Milestone Criteria	Approximate Timeframe
MM1	High and Low Wall Treatment	1. a) Certification from an AQP that the final void landform, including low and high walls are geotechnically stable and achieved a factor or safety of 1.5. 1. b) Highwall competent rock slopes are <60°, and incompetent slopes <55° with geotechnical stability achieving the minimum 1.5 Factor of Safety. 1. c) Low wall batters < 37°. 1. d) Low wall overall slope <27°and treated with rock mulch. 1. e) Slope geometry for the final voids is as follows: i. Surficial Soils – Overall slope angle <20° ii. Weathered Permian – Bench height <30 m. – Berm width <25 m – Batter Angle <55°. iii. Fresh Permian – Bench height ≤60 m – Berm width 60 m – Batter angle ≤60°. 1. f) Northern Void ≤358 ha in surface area and 285,870,000 m^3 in volume. 1. g) Southern void ≤163 ha in surface area and 157,960,000 m^3 in volume.	2 years
MM2	Achievement of surface requirements	2. a) Access is prohibited to final voids by a bund wall with a minimum height of 2 m, a minimum base width of 4 m and be located at least 10 m beyond the area potentially affected by any instability of the pit edge. 2. b) Bunding confirmed to be geotechnically stable by an AQP. 2. c) Appropriate signage placed every 100 m of the perimeter of the void to clearly identify and convey the purpose (e.g. EP Act 1994 Non- Use Management Area No Entry). 2. d) Installation of fencing completed for the residual void management areas to limit human and livestock access.	12 months

Table 16 (continued)
Management Milestones and Criteria for Improvement Areas

Milestone Reference	Management Milestone	Milestone Criteria	Approximate Timeframe
MM3	Achievement of Sufficient Improvement	3. a) Bund wall remains in place. 3. b) Appropriate signage remains in place. 3. c) Final voids remain structurally stable, with no maintenance requirements and are predicted to remain stable. 3. d) High walls and low walls certified by an AQP as geotechnically stable. 3. e) Installation of contour or graded drains as per construction design certified by an AQP. 3. f) Groundwater quality should be monitored quarterly at, *but not limited to,* monitoring bores listed in PRCP Schedule **Appendix 7: Groundwater Quality Limits**, for quality characteristics listed in **Appendix 8: Groundwater Level monitoring locations** of the PRCP Schedule, and all results comply with limits included in **Appendix 8: Groundwater Level monitoring locations** of the Schedule for a minimum of 5 consecutive years. 3. g) Final void walls confirmed to drain internally to the final void. 3. h) Certification from an AQP that water level in each residual void will not cause environmental harm to the surrounding environment, and the voids act as groundwater sinks to the receiving groundwater environment.	2 years

3.5.2 Rehabilitation Area Commencement Dates

MCPL is committed to commencing rehabilitation in each of the Rehabilitation Areas progressively, as land becomes available. An overview of the anticipated commencement dates, and justification of these dates, is provided in Table 17.

3.5.3 General Rehabilitation Practices

The following sub-sections (Sections 3.5.3.1 to 3.5.3.8) outline the information that is necessary to underpin the development of the rehabilitation and management methodologies for the existing Middlemount Coal Mine.

3.5.3.1 Hydrogeology

Groundwater Occurrence

As described in Section 3.1.2.3, the stratigraphic units occurring within the Middlemount Coal Mine area and immediate surrounds from youngest to oldest, including corresponding hydrogeological systems are (Figure 18):

- Quaternary – Quaternary Alluvium. Alluvial aquifer consisting of localised stream channel deposits and associated flood plain deposits.
- Tertiary – Duaringa Formation. A low-yielding aquifer, more commonly regarded as an aquitard.
- Permian – Permian Coal Measures (principally the Middlemount and Pisces Seams). Low to moderate yielding aquifers confined by interburden/overburden units.

A groundwater bore census conducted by 4T consultants in 2017 (Section 3.1.2.5) concluded that the Quaternary alluvium is not targeted by landholders as a groundwater supply supporting the general understanding that the Quaternary alluvium is not a productive aquifer (Appendix B). The Duaringa formation (tertiary) unconformably overlays the Permian Coal Measures and is more commonly regarded as an aquitard due to its hydraulic properties (i.e. deeply weathered mudstone, sandstone, pebbly sandstone/conglomerate and siltstone, gravel and some interbedded shale and basalt). The underlying Permian Coal Measures are low yielding, and due to the depth to groundwater not commonly accessed by private landholders.

Groundwater Recharge and Discharge Locations

Where saturated, recharge to the Quaternary alluvium occurs via either direct rainfall onto the alluvium, or via seepage through stream beds when creeks are flowing. Stream gauging data for Roper Creek, located to the south of the Middlemount Coal Mine, indicates that surface water flow dissipates quickly following flow events. Recharge from stream flow into the Quaternary alluvium would occur over short time periods as water infiltrates rapidly into the alluvium. When saturated, the groundwater flow direction in the Quaternary alluvium would be expected to be generally north-west to south-east, following the regional topography and drainage network. In the vicinity of the Middlemount Coal Mine, discharge could occur from the Quaternary alluvium via seepage to the underlying Tertiary sediments. However, this would only occur in areas where the alluvium is saturated and a downward vertical hydraulic gradient to the underlying strata occurs.

Recharge to the Tertiary Duaringa Formation occurs via direct infiltration from rainfall in areas where the unit crops out and via seepage from the overlying Quaternary flood plain alluvium, where present. However, recharge is expected to be low due to the predominately clayey nature of the formation. Whereas, recharge to the Permian coal measures occurs in areas where they sub-crop beneath the Tertiary cover. The coal seams all sub-crop within the western portions of the Middlemount Coal Mine area.

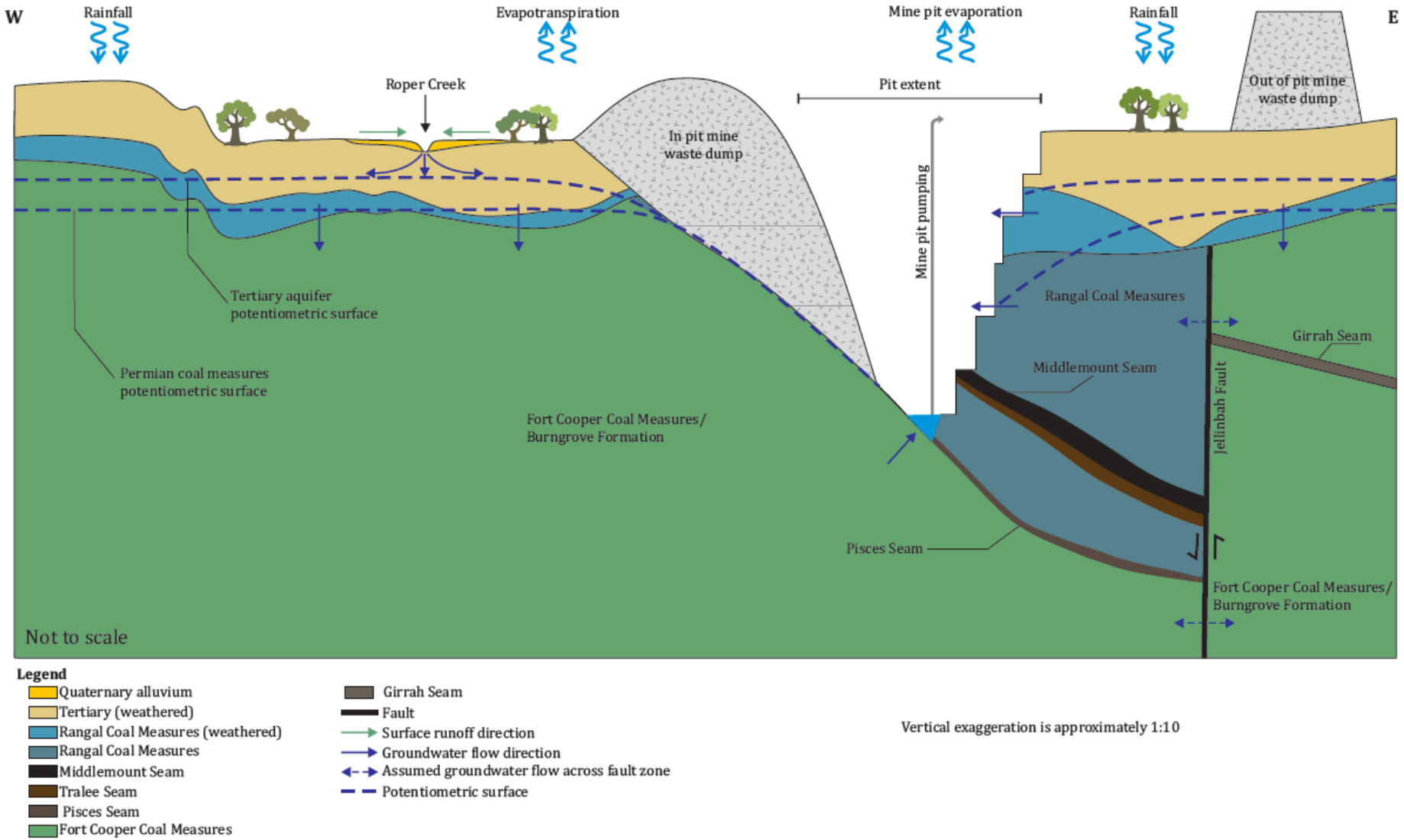


Figure 18: Hydrogeological Conceptual Model (South-west to North-east)

Table 17
Rehabilitation Area Commencement Dates and Justification

Rehabilitation Area	Relevant Activities	PMLU	Rehabilitation Commencement Date	Estimated Completion Date	Justification of Commencement Date
RA1	Waste Rock Emplacement (slope <16%)	Native Ecosystem (with non-native grasses)	2023	2044	Initial rehabilitation activities have already commenced in the eastern emplacement areas. Waste rock emplacement areas associated with RA1 will become available progressively over the life of the mine.
RA2	Waste Rock Emplacement (Existing Rehabilitation [slopes ≤33%])	Native Ecosystem (with non-native grasses)	Already Commenced	2049	Rehabilitation activities have already commenced on the steeper slopes of the western dump.
RA3	Waste Rock Emplacement (Flat/Undulating)	Native Ecosystem	2024	2046	With the development of this RA for the PRCP (no non-native grasses), this RA will commence in 2024.
RA4	Tailings Storage Facility	Native Ecosystem	2044	2052	Tailings storage facilities 1 and 2 and associated flocc cells are intended to be operated throughout the life of the mine. At the cessation of mining, rehabilitation can be progressed.
RA5	Infrastructure	Native Ecosystem	Already commenced	2053	Tailings storage facilities 2 and associated flocc cells are intended to be operated throughout the life of the mine. TFS 1 will be decommissioned, capped and converted to RA 5 Infrastructure. At the cessation of mining, rehabilitation can be progressed.

Table 17 (Continued)
Rehabilitation Area Commencement Dates and Justification

Rehabilitation Area	Relevant Activities	PMLU	Rehabilitation Commencement Date	Estimated Completion Date	Justification of Commencement Date
RA6	Water Management Infrastructure (Mine Water Dams)	Native Ecosystem / Retained Water Management Infrastructure	2044	2053	Water Management infrastructure will be required for the life of mining. MCPL has undertaken consultation with relevant stakeholders and confirmed various water management infrastructure to be retained at the completion of mining (Attachment 3). Due to the size and quantity of the water management dams, they are proposed to be retained and rehabilitated.
RA7	Water Management Infrastructure (Sediment Dams)				
RA8	Water Diversions	Native Ecosystem (with non-native grasses)	Already Commenced	2043	Roper Creek Diversion 1 and Thirteen Mile Gully Diversion extension has already been constructed and rehabilitation commenced. Construction of Roper Creek Diversion 2 is scheduled to commenced in 2024, with rehabilitation progressing subsequently.
RA9	Waste Rock Emplacement (existing rehabilitation [slope <16%])	Native Ecosystem (with non-native grasses)	Already Commenced	2032	Rehabilitation activities have already commenced on top of dump locations and on the in pit dump and western batter areas of the east dump.
RA10	Waste Rock Emplacement (existing rehabilitation [flat/undulating]	Native Ecosystem (with non-native grasses)	Already Commenced	2032	

Groundwater Quality

Groundwater quality is described in Section 3.1.2.5.

Current and Potential Future Groundwater Uses

The bore census conducted in 2017 by 4T consultants (Section 3.1.2.5) concluded that there is limited groundwater use of brackish to saline groundwater, with all identified groundwater bores located in excess of 5 km of the Middlemount Coal Mine. Other users in the area surrounding the Middlemount Coal Mine include the Middlemount Landfill and other mining operations.

Given the availability and quality of groundwater in the area, it is expected that future groundwater uses would remain the same.

Groundwater Flow Direction and Potentiometric Profile

Figure 18 shows the conceptual groundwater model for the Middlemount Coal Mine and illustrates the main hydrogeological processes and mechanisms including flow directions, discharge, recharge, anthropogenic activities and the potentiometric surface (AGE, 2020).

Groundwater monitoring data was recorded for the three predominant aquifers present within the Middlemount Coal Mine, including the Quaternary alluvial aquifer, the Tertiary Duaringa Formation aquifer/aquitard and the Permian coal measures aquifer.

Firstly, given the groundwater levels at the site are typically below the base of the Quaternary alluvium, groundwater monitoring data is not available. However, using literature references as a guide, AGE (2020) estimated the Quaternary alluvium to have a highly variable range of hydraulic conductivity values because of its variable lithology. Sandy to gravelly creek beds within the alluvium are expected to possess higher values of hydraulic conductivity compared to the flood-plain deposits due to their clayey nature. Stream gauging data for Roper Creek indicates surface water flow dissipates quickly after flow events. Therefore, recharge from stream flow would occur over short time periods as the water infiltrates relatively rapidly into the alluvium. When saturated, the groundwater flow in the Quaternary alluvium would expect to be generally from north-west to south-east, following the regional topography and drainage network (AGE, 2020).

Within the Tertiary Duaringa formation aquifer, the presence of significant clay suggests shallow groundwater flow and recharge from rainfall is likely to be minimal. There is limited available data within the Tertiary Duaringa formation aquifer to establish a degree of hydraulic conductivity. Data from surrounding monitoring bores suggest that the Tertiary Duaringa Formation has a wide range, but commonly low hydraulic conductivity due to the weathered claystone and siltstone, sandstone and gravel that comprises the alluvium (AGE, 2020). The regional groundwater flow direction in the Tertiary Duaringa Formation is expected to be coincident with the regional surface drainage being towards the south-east.

Permian coal seams hydraulic parameters were derived from in-situ falling and rising head slug tests on the Permian monitoring bores drilled for the *Middlemount Coal Project Stage 2 Groundwater Technical Report* conducted by Parsons Brinckerhoff (2010c). The tests indicated the Permian coal measures encompassed the generally accepted hydraulic conductivity for coal seams in the Bowen Basin (0.1 m/day).

Groundwater Modelling

As described in Section 3.1.2, a comprehensive Groundwater Impact Assessment was completed for the Middlemount Coal Mine Southern Extension EVA (MCPL, 2020a) (Appendix B). As part of this Groundwater Impact Assessment, a 3D numerical groundwater flow model was developed for the Southern Extension Project based on the model developed for the Western Extension Project. The peer review of the Western Extension Groundwater Assessment (AGE, 2018) by HydroAlgorithmics (2018) concluded the model had an appropriate level of complexity, was generally in accordance with the Australian Groundwater Modelling Guidelines (Barnett et al., 2012) and the groundwater impact assessment was 'fit-for-purpose'.

It is noted that there have been no significant changes to the approved Southern Extension Project since the Western Extension Project Groundwater Assessment (AGE, 2018) was prepared for the Middlemount Coal Mine.

The model has been designed to account for the current and proposed mine plan and potential for cumulative impact from nearby operational mines such as German Creek East, Foxleigh, Foxleigh Plains and Norwich Park. Coal Seam Gas (CSG) production as part of the Bowen Gas Project (Arrow Energy Pty Ltd [Arrow Energy], 2012) within the Rangal Coal Measures approximately 7 km to the north of the Middlemount Coal Mine is also incorporated into the groundwater model. The model represents the key geological units within the model domain as 17 layers, and extends approximately 30 km from north-west to south-east, and 21 km from north-east to south-west.

The numerical groundwater model was used to assess the cumulative impact between the Middlemount Coal Mine and nearby operational and closed mines which include German Creek East, Foxleigh, Foxleigh Plains, and Norwich Park as well as CSG production as part of the Bowen Gas Project (Arrow Energy, 2012). Modelling indicates that depressurisation/drawdown in the Tertiary and Weathered Permian and deeper Middlemount and Pisces seams has some (albeit limited) interaction with depressurisation/drawdown effects from other mines and proposed future CSG production activities (AGE, 2020).

3.5.3.2 Flooding

WRM (2020) completed hydrologic and hydraulic modelling of local catchments to:

- assess the existing and proposed flood behaviour at the Middlemount Coal Mine and surrounds at the completion of the operations;
- assist in the development of conceptual designs for clean water drains and drainage features diversions; and
- assess the conceptual design of flood protection measures for the open cut pits and mine infrastructure, including final landforms.

The existing Middlemount Coal Mine OPSIM water balance model was reviewed and updated to incorporate the Project to assess the performance of the proposed mine affected water management system. The updated OPSIM model was used to predict the performance of the following (WRM, 2020):

- overall water balance – the average inflows and outflows of the water management system for a number of representative realisations;
- mine water inventory – the risk of accumulation (or reduction) of the overall mine water inventory;
- in-pit storage – the risk of accumulation of water in the mining pit, and the associated water volumes;
- external water demand – the risk and associated volumes of requiring imported external water (via the Anglo Coal pipeline) to supplement site mine water supplies;

- uncontrolled spillway discharges – the risk of uncontrolled discharge from the site storages to the receiving environment; and
- controlled releases – the risk and associated volumes of controlled release water to the receiving environment.

Key outcomes from the overall water balance are (WRM, 2020):

- The overall water management system alternates between generating a net gain or loss of water.
- Average annual external water supply requirements vary between 560 to 870 Megalitres (ML)/year over the life of the Project.
- The net CHPP demand (based upon forecast CHPP output numbers) are generally consistent, with a reduction towards the end of the Project life.
- There were no modelled spillway overflows from the mine water system over the life of the Project.

Furthermore, an URBS hydrological model and a TUFLOW two-dimensional hydraulic model was developed by WRM (2020) to simulate the flood behaviour of Roper Creek (including the proposed realignment and extension of Roper Creek Diversion 2) and Thirteen Mile Gully in the vicinity of the Project. The URBS and TUFLOW models were calibrated to recorded water levels and surveyed peak flood levels for the January 2013 ex-tropical Cyclone Oswald flood event. The existing calibrated TUFLOW model was reconfigured to represent:

- pre-mining conditions;
- approved (Stage 2) mine conditions;
- proposed mine conditions; and
- final landform conditions (post-mining).

Peak food levels, extents and depths were determined for the 50 %, 5 %, 2 %. 1 % and 0.1 % AEP events and the PMF event, for the approved and proposed mine conditions models to assess the flood impacts of the Middlemount Coal Mine Southern Extension Project. These events were also used to define the crest height of the flood protection levee during operations and final landform design surrounding the residual voids, post-mining. The flood modelling results for the operations scenario indicate that (WRM, 2020):

- For the 5 % AEP event, flood levels would be unchanged from approved conditions upstream of Roper Creek Diversion 1 and moderately reduce peak flood levels within Roper Creek Diversion 1. Roper Creek would overflow and drain across Middlemount Road for this event, which is not predicted to occur for pre-mining or approved conditions.
- For the 2 % and 1 % AEP events, peak flood levels are generally unchanged upstream of Roper Creek Diversion 2. The Project will increase flows on Middlemount Road and further downstream above approved and pre-mining conditions. Peak flood levels (and flows) would reduce within the Roper Creek channel.

The southern portion of the realigned flood protection levee would be decommissioned to widen the post-mining Roper Creek floodplain at the cessation of mining, with the rehabilitated final landform providing flood immunity to the southern void up to the PMF level from Roper Creek. The post-mining flood modelling results indicate that (WRM, 2020):

- For the 5 % AEP event, Middlemount Road would remain trafficable. The removal of the haul road crossing of Roper Creek and widening of the floodplain would reduce the flows overtopping the Roper Creek Diversion predicted for the operations scenario.

- For the 2 % and 1 % AEP events, peak flood levels along Roper Creek Diversions 1 and 2 would reduce from approved conditions due to the additional conveyance capacity of the widened floodplain.

3.5.3.3 Soil and Capping Material Assessment

Quantity of Available Resources

Soil surveys conducted for the Middlemount Coal Mine by Parsons Brinckerhoff (2010b) suggested the recommended topsoil stripping depths should be based on the quality of the topsoil. Preliminary material inventory to determine the quantity of topsoil available for rehabilitation at the Middlemount Coal Mine was undertaken by Parsons Brinckerhoff. MCPL will continue to assess the available and required soil resource quantities. Majority of topsoil from the proposed disturbance areas will be recovered, reused and available for use in rehabilitation of disturbed areas to meet the requirements of rehabilitation concepts.

Ameliorants and Fertilisers

Prior to commencement of topsoiling works, adequate sampling is to be undertaken to ensure the soil parameters are within the specified range. Dependent upon soil results, additional nutrients may need to be added to the fertilising process.

Existing data indicates that available topsoil materials generally have poor physical and chemical fertility, including low salinity, low organic matter, low nutrient content and a neutral to slightly acidic pH (MCPL, 2012). Therefore, whilst topsoil materials are suitable for use in rehabilitation, they are deficient in key plant nutrients particularly nitrogen and phosphorous. If nutrient deficiencies are not corrected, the rehabilitation would – over the long term – be constrained to a very low level of plant growth and productivity, and to greatly increased erosion risk.

For rehabilitation works to achieve a high level of surface cover, and for that cover to be sustainable, the topsoil needs to be amended to:

- alleviate sodicity;
- increase total nutrient contents;
- establish an organic pool of nutrients; and
- improve soil structure.

As the primary driver for productivity, nitrogen deficiency will likely result in slow growing conditions, likewise phosphorous deficiency commonly results in slow development and stunted plant growth.

Target level (concentration) for the topsoil for Nitrate is > 5 mg/kg with total Nitrogen target > 500 mg/kg (Verterra, 2023). There are no target ranges for Total phosphorous.

After laboratory analyses are complete and the existing nutrient levels are known, amelioration rates can be calculated. Target ranges for each parameter as stated above are considered to be levels at which plant nutrient deficiencies are relieved and plant growth will be promoted (Hazelton and Murphy, 2017; Lambert and Turner, 2000; Noble, 1996; Baker and Eldershaw, 1993). It is not possible to achieve these increases using a single application of soluble fertilisers without significant impacts on plant growth. Therefore, topsoil amelioration will be applied through the application of gypsum and organic matter at rates calculated from soil testing and targets.

Surface Preparation Process

Rehabilitation will be undertaken progressively as the Middlemount Coal Mine expands. The revegetation sequence of works is generally:

1. Rip waste rock material to a minimum of 300 mm using bulldozer or grader tynes spaced at 500 mm centres.
2. Spread topsoil to a depth of 200 mm (based on topsoil availability).
3. Spread gypsum and organic matter at rates calculated from soil testing and targets.
4. Harrow to the full depth (up to 200 mm) with offset disc harrows or similar, and on the contour and void turning over the soil.
5. Apply seed and fertiliser together integrated into soil with scarifiers or harrows (maximum 50 mm depth) or tracking chains to assist with seed incorporation.

General Soil Management Measures

Specific measures that would be implemented to manage soil resources include:

- Areas of disturbance would be stripped progressively, as required, to reduce potential erosion and sediment generation, and to minimise the extent of topsoil stockpiles and the period of soil storage.
- Areas of disturbance to be stripped would be clearly defined so the dozer operator clearly understands the boundaries of the area to be stripped.
- During the topsoil stripping:
  - visual inspections would be conducted to confirm that appropriate soil stripping depth is being recovered; and
  - small areas (e.g. 1 m by 1 m) can be left unstripped at approximately 100 m intervals to record stripping depths, soil profile observations and collect soil samples for analysis.
- Topsoil would be placed directly on completed sections of the final landform or placed in topsoil stockpiles.
- The perimeter of topsoil stockpiles would be marked and appropriately signed.
- The topsoil stockpile locations and volume would be surveyed for inclusion in the topsoil inventory.

Any long-term soil stockpiles would be managed to maintain long-term soil viability through the implementation of the following management practices as listed below:

- Topsoil stockpiles would be retained at a maximum height of 3 m and would not be double stacked to avoid compaction and deterioration of the soil itself.
- Topsoil stockpiles would be constructed to minimise erosion (e.g. roughened surface maintained), encourage drainage, and promote revegetation.
- Wherever practicable, soil stockpiles would not be trafficked, deep ripped or removed in wet conditions to avoid breakdown in soil structure.
- All topsoil stockpiles would be protected with a non-persistent cover crop to reduce erosion potential as soon as practicable after completion of stockpiling.
- Soil stockpiles would be located in positions to avoid surface water flows. Silt stop fencing would be placed immediately down-slope of stockpiles until stable vegetation cover is established.

- An inventory of soil resources (available and stripped) would be maintained and regularly reconciled with rehabilitation requirements.

3.5.3.4 Waste Characterisation

Detailed geochemical investigations (including static and kinetic net acid generation [NAG] testing) have been undertaken on drill-hole interval samples representing the different material types and lithologies present at the Middlemount Coal Mine in 2012, 2013, 2016 and 2019. Coal and mining waste materials at the Middlemount Coal Mine are generated from mining and processing of the Pisces, Tralee and Middlemount coal seams. Spoil is generated from overburden and interburden materials required to be removed in order to access the coal seams. As a result, coal rejects are produced as a by-product from the coal processing at the CHPP.

Geochemical testing was undertaken by RGS Environmental Pty Ltd (RGS) (2013) at the Middlemount Coal Mine and included 'contact' testing and static and kinetic geochemical testing of representative samples of inter/overburden, coal, and coal reject materials from the open cut and CHPP operations. Additional to these investigations, an extensive program of kinetic leach column testing was undertaken for selected sample materials at ALS Laboratory in Brisbane.

On-going characterisation of the mining waste materials (including overburden, interburden, floor, roof and partings) will be completed on a project basis if new areas of the site are planned to be mined that have not been previously characterised. Ongoing characterisation of coarse rejects and tailings will be undertaken periodically to ensure that the material treatment suits the categorisation (MCPL, 2020b).

Overburden and Interburden Characterisation

Testing undertaken by RGS (2013; 2019) collected 32 samples of overburden/interburden (spoil) materials from the open put to best represent the alluvium, weathered and unweathered Tertiary materials (generally sandy clays) and Permian materials (generally sandy siltstone and occasionally mudstone) encountered within the typically uniform stratigraphic profile.

These test results indicate that (RGS, 2013; 2019):

- The overburden and interburden samples ranges from pH neutral to alkaline (pH 7.7 to 10). The overburden samples represent alluvium and tertiary materials which are typically slightly alkaline (median pH 8.3). The interburden samples represent Permian materials which are typically more alkaline (median pH 9.7). the median $EC_{1:5}$ values of the overburden and interburden samples are regarded as representing 'Medium' (450-900 weight-volume [w/v] microSiemen per centimetre [µS/cm]) and 'Low' (140-450 w/v µS/cm) salinity materials.
- Overburden and interburden materials at the Middlemount Coal Mine suggests that spoil is essentially barren of sulfur, is classified as NAF, and has a high factor of safety with respect to any potential to generate Acid and Metalliferous Drainage (AMD).
- The ANC of the interburden (Permian) samples is significantly greater than the overburden (Alluvium and Tertiary) samples and the median ANC values are 4.5 and 57.2 kg H_2SO_4/t, respectively. Hence, the Permian interburden samples may represent a material that could provide a useful source of alkalinity at the Project.
- Results demonstrated that all of the inter/overburden samples have negative NAPP values ranging from -93.5 to -0.3 kg H_2SO_4/t (median -8.6 kg H_2SO_4/t). This data further confirms the AMD risk classification of NAF (Barren) for all of the inter/overburden samples tested, since the negligible amount of acidity that could theoretically be generated would be neutralised in-situ by the inherent amount of excess ANC.

The overburden and interburden excavated as waste rock, is either dozer pushed into the in-pit waste rock emplacements or loaded into trucks for hauling to dedicated out-of-pit waste rock emplacements. The weathered material is typically removed without blasting, but the more competent material requires drilling and blasting.

RGS (2013; 2019) provided the following recommendations for management of the overburden and interburden waste rock:

- Overburden is classified as NAF and is placed in any in-pit or ex-pit spoil dump. Dispersive material is preferentially placed away from the final landform surface.
- Interburden is preferentially placed in-pit to provide the acid neutralisation capacity for spot-dumping of Potentially Acid Forming (PAF) materials and creation of Permian caps and bunds on coal reject cells. Placement in ex-pit spoil can be used to neutralise any PAF material that is placed in the ex-pit spoil.
- If practical, PAF floor materials from the Middlemount seam should remain in the open pit and be covered with NAF spoil. If this is not practical, and any PAF floor materials from the Middlemount seam need to report to the out-of-pit spoil dump areas, it is then recommended that these materials be lime dosed (at a rate of 10 t/ha or as confirmed by field trials) and kept at least 10 m away from the outer surfaces of final landforms by covering with Permian spoil.
- Scale up of leaching tests for PAF materials and mixed PAF/Permian spoil materials is recommended as part of operational planning if co-disposal of these materials is to be implemented;
- Implementing practical site rehabilitation practices for potentially sodic spoil materials to limit the risk of dispersion and erosion of surface materials at emplacement areas (eg. utilise a topsoil cover as part of final rehabilitation).

MCPL will implement these recommended measures at the Middlemount Coal Mine.

Coarse Rejects Characterisation

RGS (2012; 2016) detailed the geochemical characterisation of coarse rejects data for the Middlemount Coal Mine.

Test results indicate that (RGS, 2012; 2016):

- Majority of coarse reject materials have a pH range from neutral (6.1) to alkaline (9.7). Three coarse reject samples that were tests had a pH of below 5, two of them have the lowest observed pH values of 2.6 and 2.8 (RGS, 2013). Additionally, coarse reject samples range from 252 to 687 µS/cm.
- The ANC for coarse reject samples has a median of 21.8 kg H_2SO_4/t. Lowest ANC value was 4.5 H_2SO_4/t., with a maximum of 100 H_2SO_4/t. No results are available regarding the potential availability of the ANC, however previous studies completed on coarse rejects at the Middlemount Coal Mine suggest that most of the ANC content is likely to be readily available to provide acid buffering at higher pH values (RGS, 2012).
- A Standard NAG test was applied to the coarse reject materials and concluded that majority of the samples were PAF, with some samples being from NAF due to the NAG pH identification.

RGS, (2012; 2013; 2016; 2019) provided the following additional recommendations for management of coarse rejects:

- Coarse rejects are discharged to the 240 t rejects bin via the rejects conveyor. Mine Haul trucks haul the rejects from the bin for disposal within the in-pit spoil dump.

- Where rejects production exceeds haulage to in-pit disposal or wet-weather constrains pit access, rejects may be temporarily stored on the rejects pads. Stockpiled rejects are then loaded into haul trucks using front-end loaders or excavator for haulage to the disposal location in-pit.
- To prevent hang-ups of material and minimise temporary stockpiling of rejects, the Coarse Rejects Bin is to be kept below 75 % full and drawn down regularly when operating with Coarse Rejects only while the CHPP is running. The Bin is to be emptied prior to any planned shut-downs.
- In the event that tailings are co-mingled with the coarse rejects on the rejects conveyor, the Coarse Rejects Bin is to be maintained below 50 % capacity and is to be emptied regularly.
- Drainage from coarse rejects storage areas (rejects bin and temporary rejects storage locations) is contained on site (as detailed in the Middlemount Coal Mine Water Management Plan (WRM, 2019). Water is returned to the Raw Water Dam for reuse as soon as practicable.
- Co-disposal of PAF coarse reject/tailings materials and Permian spoil within the boundaries of the open pit area (i.e. internally draining bounds of the open pit spoil). To provide an extra factor of safety, it is recommended that the maximum ratio of PAF coarse reject/tailings to Permian spoil at the open pit spoil emplacement area be 1 to 3 and ideally 1 to 5 as well as being located at least 10 m from the final landform surface.
- If co-disposal is intended to be used at the out-of-pit spoil emplacement area, it is recommended that lime dosing of co-disposed coarse reject/tailings be considered (at a rate of 10 t/ha or at a rate determine in field trials) to increase the lag time of these materials prior to covering with at least 10 m of Permian spoil. Lime dosing could involve a mobile lime dosing plant and/or broadcast application of agricultural lime, for example. To provide an extra factor of safety, it is recommended that the maximum ratio of PAF coarse reject/tailings to Permian spoil at the out-of-pit spoil emplacement area be 1 to 10.
- Ongoing geochemical characterisation (Acid Base Accounting) of representative samples of coal and potential coal rejects materials from the target coal seams below the weathered zone in the open pit.

These recommendations will be implemented by MCPL for the Middlemount Coal Mine.

Tailings Characterisation

RGS (2012; 2016) detailed the geochemical characterisation of coarse rejects and fine rejects (tailings) data for the Middlemount Coal Mine.

Test results indicate that (RGS, 2012; 2016):

- Majority of tailings materials have a pH range from neutral (7) to alkaline (8.6). Additionally, tailings contained an EC range from 488 µS/cm to 1,390 µS/cm.
- The ANC for tailings samples had a minimum of 3.8 kg H2SO4/t, and a maximum of 65.6 kg H_2SO_4/t. No results are available regarding the potential availability of the ANC, however previous studies completed on tailings materials at the Middlemount Coal Mine suggest that most of the ANC content is likely to be readily available to provide acid buffering at higher pH values (RGS, 2012).
- A Standard NAG test was applied to the coarse reject materials and concluded that majority of the samples were PAF, with some samples being from NAF due to the NAG pH identification.

Tailings storage facility design and management are described further in Section 3.5.4.

RGS (2012; 2013; 2016) provided the following additional recommendations for management of coarse rejects and tailings:

- Tailings materials are stored at the small TSF located adjacent to the south western boundary of ML70379, and near the CHPP.
- Co-disposal of PAF coarse reject/tailings materials and Permian spoil within the boundaries of the open pit area (i.e. internally draining bounds of the open pit spoil). To provide an extra factor of safety, it is recommended that the maximum ratio of PAF coarse reject/tailings to Permian spoil at the open pit spoil emplacement area be 1 to 3 and ideally 1 to 5 as well as being located at least 10 m from the final landform surface.
- If co-disposal is intended to be used at the out-of-pit spoil emplacement area, it is recommended that lime dosing of co-disposed coarse reject/tailings be considered (at a rate of 10 t/ha or at a rate determine in field trials) to increase the lag time of these materials prior to covering with at least 10 m of Permian spoil. Lime dosing could involve a mobile lime dosing plant and/or application of agricultural lime. To provide an extra factor of safety, it is recommended that the maximum ratio of PAF coarse reject/tailings to Permian spoil at the out-of-pit spoil emplacement area be 1 to 10.
- At the Middlemount Coal Mine, MCPL uses earth bunded structures as ILF cells designed to hold flocculated tailings temporarily whilst dewatering takes place and excavation/reclamation of dried tailings can occur. The ILF cells have a minimum capacity of one week of CHPP production with additional allowance (freeboard) for rainfall and water management. Cells are designed with no external catchment to minimise flooding potential, environmental risk and Design Storage Allowance (DSA) requirements and will include sufficient DSA capacity in addition to the operational volumes. All water produced is returned to the CHPP or the Raw Water Dam to supply plant make-up water.
- The tailings are dosed with flocculant to accelerate the dewatering process prior to placement in the ILF cells. The dewatered tailings are allowed to dry and are then excavated and trucked to the pit for placement within the in-pit spoil dump. The CHPP is responsible for the operation of the tailings discharge and return water. Mine operations are responsible for tailings reclamation.

3.5.3.5 Landform Design

The approved Middlemount Coal Mine final landform consists of the following:

- in-pit and out-of-pit waste rock emplacements (slopes and upper surface);
- two residual voids;
- water storage/water management dams;
- rehabilitated infrastructure areas (including mine infrastructure area [MIA], CHPP and roads);
- rehabilitated Roper Creek Diversions;
- rehabilitated Thirteen Mile Gully Diversion; and
- rehabilitated TSF and TFCs (FC1 and FC2).

The final landform is presented on Figure 15 which includes surface elevation contours and final project domains.

MCPL engaged Landloch Pty Ltd (2019) to assess landform designs and erosion modelling of the Middlemount Coal Mine. In consideration of the landform design, Landloch (2019) applied the following work scope to parameterise and run runoff/erosion modelling;

- Laboratory measurements of runoff and erosion on rock:soil mixes of materials;
- Use of the Water Erosion Prediction Program (WEPP) erosion model parameters from the laboratory data; and
- Generation of WEPP simulations to develop landform design rules.

The runoff/erosion simulations showed that establishment of a sufficient and sustainable vegetation cover is critical for landform stability.

A further description of each of the key landforms is provided below.

Out-of-pit Waste Rock Emplacements

During the excavation of the box cuts, waste rock is loaded into haul trucks for hauling to out-of-pit waste rock emplacements. Once sufficient space is available behind the active face, waste rock material is placed in-pit behind the active workings to minimise surface disturbance associated with the out-of-pit waste rock emplacements. When the out-of-pit waste rock emplacements are no longer required (i.e. once in-pit emplacement resumes), progressive rehabilitation will be commenced to minimise the amount of time there is active disturbance associated with the out-of-pit waste rock emplacements.

Waste rock will also be placed in out-of-pit waste rock emplacements in selected areas around the final voids so that the rehabilitated final landform provides flood immunity for the final voids up to the PMF. The final elevations of the out-of-pit waste rock emplacements will be at least 8.5 m above natural ground level and 150 m wide. The out-of-pit waste rock emplacements will be contoured to an angle of < 17%, utilising rock mulch where necessary to achieve greater stability (>16%).

The out-of-pit waste rock emplacements will be topsoiled and seeded with grass, tree and shrub species. Revegetation management is discussed further in Section 3.5.3.8.

The final landform design is shown on Figure 15.

In-pit Waste Rock Emplacements (Backfilled Voids)

Once sufficient space is available behind the active face, waste rock material is placed in-pit behind the active workings to minimise surface disturbance associated with out-of-pit waste rock emplacements and to also minimise the size of the final voids. Rehabilitation of the in-pit waste rock emplacements will progressively follow the active mining face, thereby minimising the area of active disturbance at any given time.

Coal rejects will also be disposed of in the in-pit waste rock emplacements. Coarse reject material from the CHPP is placed within in-pit waste emplacements.

In-pit Coal Rejects Emplacements

All coarse coal rejects from the CHPP are placed within the in-pit co-disposal waste emplacements.

Final Voids

Two residual voids are approved at the Middlemount Coal Mine in the northern and southern areas of the open cut extent (Figure 15). The residual voids are to be designed to not cause any serious environmental harm to land, surface water or groundwaters outside of the void in accordance with Condition G17 of the EA. Further detail on the final voids is provided within Section 3.5.5.

The residual voids would partly fill with water (i.e. groundwater recovery and incident rainfall and runoff) and be subject to evapo-concentration effects which would result in the salinity gradually increasing over time.

A safety bund wall consisting of competent rock and/or fencing would be constructed to limit human and livestock/animal access to the residual voids. The bund wall would have a minimum height of 2 m, with a minimum base width of 4 m and be located at least 10 m beyond the area potentially affected by any instability of the open cut pit edge. In places, the safety bund will be incorporated as part of the out-of-pit waste rock emplacements which will serve the purpose of PMF flood protection (as described earlier in this Section 3.5.3.5).

Infrastructure

This mining domain is dominated by the infrastructure associated with the existing mine infrastructure area as well as site wide supporting infrastructure. The infrastructure domain includes, but is not limited to:

- CHPP;
- ROM coal and product stockpiles;
- train loadout and rail loop;
- workshops, stores, administration buildings, toilet complexes, vehicle wash bays, control room and coal testing laboratory, diesel fuel storage area;
- major access roads and haul roads;
- electrical supply infrastructure; and
- water management features including water storages, sediment control structures, diversions, drains and operational flood levees.

Due to the ongoing use of the infrastructure, progressive rehabilitation of significant areas is not practicable as the domain will remain actively utilised with majority of disturbance required for the life of the Middlemount Coal Mine. Notwithstanding, disturbance associated with infrastructure is minimised and will be progressively rehabilitated where possible.

Water Management Features

Water storage and water management dams will be either decommissioned and rehabilitated, or rehabilitated and retained for beneficial reuse, conducive to the surrounding land use if the post-mining land-owner agrees and the dam complies with the limits detained within Australian and New Zealand Environment and Conservation Council (ANZECC) & Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (2000, or its revision) for a period of at least 5 years post mining. Water management features that are required for the life of the mine will not be able to be progressively rehabilitated until the mine lifetime has expired.

Two diversions of Roper Creek are approved at the Middlemount Coal Mine. Both diversions of Roper Creek will be retained as water management infrastructure and revegetated to the PMLU of native ecosystem and as per Treatment Zone 1 in Section 3.5.3.8.

The Thirteen Mile Gully Diversion was approved in July 2013, predominately outside the former boundary of ML 70379, diverts the upstream sub-catchments of Thirteen Mile Gully to Roper Creek. This diversion will be retained as water management infrastructure and revegetated to the PMLU of native ecosystem and as per Treatment Zone 1 in Section 3.5.3.8.

Quality Assurance/Quality Control Requirements

MCPL currently undertakes quality assurance/quality control of rehabilitated areas throughout the rehabilitation process. MCPL staff complete Environmental Quality Inspection Forms (EQIF) at designated Hold Points to ensure that rehabilitation works have been completed to the relevant specifications. At all stages of the rehabilitation sequence, EQIFs need to be completed and signed off by appropriate personnel prior to the continuation of the rehabilitation sequence.

The EQIF process outlines 'Hold Points' which represent key steps in the rehabilitation process where signoff must be obtained from the nominated entities, this may include:

- the contractor representative;
- MCPL Project Managers (e.g. HSEC Manager or similar); and/or
- Members of the Middlemount Coal Mine environmental team.

Methodology to Verify the Success of the Final Landform Design

Successful rehabilitation of the final landform will be assessed through the completion criteria and monitored following the program outlined in Section 3.7.

The certification process undertaken by DES will verify that the rehabilitation and final landform are successful prior to surrender of the EA.

Limitations and Assumptions of the Landform Design

The final landform design has the following limitations and assumptions:

- Simulations were run for a 500-year period.
- Simulations were developed using a 100-year climate sequence.
- Soil availability and quality are based on soil test sites located at an appropriate density.
- Waste characterisation is based on appropriately selected representative samples.
- Climate change projections (CSIRO, 2015) for the central slopes were adopted.

3.5.3.6 Cover Design

As described in Section 3.5.3.4, the waste characterisation test results indicate that appropriate cover design for each the waste outputs is as follows:

- Overburden and interburden:
  - Geochemical test work has found that there is a low to negligible risk of acid mine drainage from overburden at the Middlemount Coal Mine. Notwithstanding, laboratory characterisation of overburden material during operations would be conducted to confirm acid generation potential, consistent with existing operations. Any material that is found to be potentially acid forming (PAF) will not be used as capping material and would continue to be buried within the overburden dump with material that has some acid neutralising capacity (MCPL, 2011).

  - Overburden at the Middlemount Coal Mine has been found to be susceptible to dispersion and is erosion prone. Consistent with existing operations, testing of overburden would be conducted to identify material with high susceptibility for dispersion and slaking. Less dispersive material will be utilised as capping material, where possible.

- Coarse rejects and tailings
  - It is recommended that PAF materials (coarse rejects and tailings) be mixed with Permian and /or covered with Permian spoil. PAF disposal locations should be placed at least 10 m from the final landform and drain to the pit (MCPL, 2020b).
  - Spot dumping of PAF coarse rejects and tailings co-disposal and Permian spoil will occur within the boundaries of the open pit area, with the objective of enabling the acid neutralising capacity of the spoil to neutralise the potential acid formation (MCPL, 2020b).
  - PAF material will be mixed with minimum of three parts Permian spoil by weight (target of five parts Permian to one part PAF material) (MCPL, 2020b).
  - Non-Acid Forming coarse rejects and tailings materials will be treated the same as PAF coarse and fine rejects (MCPL, 2020b).

3.5.3.7 Water Management

Site Water Management System

The Middlemount Coal Mine site water management system is operated in accordance with the *Middlemount Coal Mine Water Management Plan* (WMP) and EA EPML00716913. The objective of the water management system at the Middlemount Coal Mine is to manage all water on site to meet operational, social and environmental objectives encapsulated by the Middlemount Coal Mine EA (EPML00716913).

The objectives of the Middlemount Coal Mine water management system specifically seek to:

- have a strategy that ensures Middlemount Coal Mine does not cause environmental harm via mine affected water spills and has sufficient water available for operation in dry times; and
- to be a good custodian of the community's water resources.

To meet these objectives, specific objectives for each water type are utilised. The existing/approved Middlemount Coal Mine water management system includes:

- Tailings return water: Prevent all discharges of tailings return water to the downstream environment. as well as the reuse of tailing return water.
- Mine affected water: Minimise uncontrolled discharges and ensure adequate water supplies are maintained for site demand.
- On-site stormwater: Maintain water quality leaving the Erosion and Sediment Control (ESC) structures to a quality as close to background levels as reasonably possible.
- Catchment runoff water: Ensure that it is separated from the mine affected and on-site stormwater systems, and allowed to pass uninterrupted down the catchment.
- Contaminated water: Prevent all discharges of contaminated water to the downstream environment.
- External water: Ensure that external water allocation and associated infrastructure is sufficient to meet site demands under low rainfall conditions.

WRM (2020) concluded that the Middlemount Coal Mine surface water management system was detailed and had adequate storage capacity to manage surface water runoff contained on-site for a wide range of possible climatic conditions, including extended wet and dry periods. WRM (2020) also concluded that the potential for an uncontrolled release to receiving waters from the sites water management system was very low (i.e. <1 % AEP).

Water Demand and Supply

The Middlemount Coal Mine sources water subject to the following priority order:

- water runoff captured within the water management system (including any groundwater inflows);
- portable water supplied via truck from Middlemount township to Middlemount Coal Mine; and
- through the usage of water allocations of the Bingegang Pipeline, which runs between the Bingegang weir to the town of Dysart.

Runoff water is preferentially utilised within the CHPP or used as haul road and stockpile dust suppression. Water recycled from the tailing flow cells is returned to a Raw Water Dam (RWD), and reused in the CHPP.

Contaminants That Pose a Risk to Environmental Values

The following potential contaminants have been identified as posing a potential risk to environmental values of the receiving environment:

- acid forming materials;
- dissolved metals;
- total dissolved solids; and
- hydrocarbons.

Source, Pathway and Fate of Contaminants

Key potential sources of contaminants (post-rehabilitation) are:

- in-pit waste rock emplacements;
- In-pit rejects emplacements;
- final voids; and
- the Tailings Storage Facilities.

Pathways for the potential contaminants to reach the receiving environment (e.g. water courses or the groundwater table) include overland flow (e.g. overtopping of the final voids) or infiltration/seepage (e.g. from out-of-pit rejects emplacements).

With regards to overland flow, once rehabilitation is completed, all runoff will be clean water as it will be from rehabilitated surfaces. Runoff within the final void catchments will be directed into the final voids via the safety bund, and will not flow into the receiving environment. Final void catchments will be minimised to allow for rehabilitation contribution to environmental flows.

Infiltration and Seepage Intervention and Collection Controls

With regards to infiltration/seepage (Appendix G):

- Studies undertaken by RGS (2016) determined that most coal samples are initially pH neutral to alkaline, but theoretically have a reduced factor of safety with respect to potential acid generation (albeit that most sulfur is likely to be present in a non-acid generating form (eg. organic sulfur).
- Coal materials are stockpiled for a limited time at site prior to transport off-site to export markets. Coal stockpile areas are sealed with clay compaction during construction and sheeted with competent material. Therefore, the current measures for managing coal stockpile surface water and seepage (collection and monitoring - with lime dosing, if required) employed by MCPL are expected to be appropriate to address the relatively low level of risk to surface water and groundwater resources posed by these materials.

The final landform has been designed to minimise contamination potential as the storages have been designed to prevent seepage. Notwithstanding, if seepage were to occur, it would be drawn to the final voids which act as groundwater sinks for the area, thereby preventing any potential exposure to the receiving environment.

Surface Water Diversions

Temporary and permanent up-catchment diversion structures would be constructed over the life of the Middlemount Coal Mine to divert runoff from undisturbed areas around the open cut pits and waste rock emplacements.

The diversion of Thirteen Mile Gully diverts the flow of water between Drainage line 1 (upstream of Thirteen Mile Gully) to Roper Creek. This diversion that resides within ML 70379 is authorised by the EA. The diversion of Thirteen Mile Gully outside of ML 70379 is authorised under a water licence (No. 608025) under the QLD *Water Act 2000*.

Two diversions of Roper Creek (Roper Creek Diversions 1 and 2) are currently approved under the EA. Roper Creek Diversion 1 has been constructed while Roper Creek Diversion 2 will be constructed in 2022-2023 to allow for the southern extension of the open cut mine within ML 70379.

Ongoing Water Management and Reduction Requirements

As mining approaches completion, MCPL will consult with landholders and/or relevant agencies regarding the potential for retaining water management structures. As native ecosystem is the target PMLU, it is assumed that most water management structures would be rehabilitated and retained post-mining.

If specific water structures are not suitable to be retained, they would be decommissioned or remediated in consultation with relevant stakeholders, future landholders and with the approval of DES. Relevant remediation measures would be determined on a case-by-case basis.

Once remediation is completed, no ongoing water management would be required for the site.

3.5.3.8 Revegetation

Verterra (2023; Appendix H) has reviewed the existing rehabilitation management methodologies implemented at the Middlemount Coal Mine and have prepared a detailed Revegetation Management Plan as part of this PRCP describing three distinct revegetation treatment zones (consistent with the PMLU of native ecosystem). These are:

- Treatment Zone 1 – Low Slope Areas (slopes of ≤ 16%).
- Treatment Zone 2 – High Slope Areas (slopes of > 16%).
- Treatment Zone 3 – Riparian Areas.
- Treatment Zone 4 – Non-use Management Areas.

Treatment Zone 1

Treatment Zone 1 consists of all revegetation areas with low slopes (i.e. slopes of less than 16%) (Verterra, 2023). The upper surface of the in-pit and out-of-pit waste rock are also included in Treatment Zone 1. This zone does not require rock mulch if the waste rock material (substrate) and topsoil is chemically treated for dispersive properties. Treatment Zone 1 includes the following RAs:

- RA1: Waste Rock Emplacement (slope ≤16%);
- RA3: Waste Rock Emplacement (Flat/Undulating);
- RA4: Tailings Storage Facility;
- RA5: Infrastructure Area;
- RA6: Water Management Infrastructure (Mine Water Dams);
- RA7: Water Management Infrastructure (Sediment Dams);
- RA9: Waste Rock Emplacement – Existing Rehabilitation (slope <16%); and
- RA10: Waste Rock Emplacement – Existing Rehabilitation (Flat/Undulating).

Treatment Zone 2

Treatment Zone 2 consists of all revegetation areas with high slopes (i.e. slopes of greater than 16%), noting this zone does not include the high-walls and some portions of the low-walls for the residual voids (refer to Treatment Zone 4).

Treatment Zone 2 requires the addition of rock mulch to stabilise the steep slope and includes portions of in-pit and out-of-pit waste rock emplacements (where slope >16%). Treatment Zone 2 includes:

- RA2: Waste Rock Emplacement Existing Rehabilitation (slopes ≤33%).

Treatment Zone 3

Treatment Zone 3 consists of all revegetation areas associated with creek diversions. This includes:

- RA8: Water Diversions:
  - Roper Creek Diversions 1 and 2; and
  - Thirteen Mile Gully Diversion.

Treatment Zone 4

Treatment Zone 4 consists of the residual voids at end of mine life (i.e., approved NUMAs) including their equilibrated void waterbody, high wall, and portions of their low wall. Treatment Zone 4 includes:

- IA1: Northern Void; and
- IA2: Southern Void.

Revegetation of the low walls and high walls will be undertaken, where safe and practicable to do so, to stabilise the landform (consistent with the approach for Treatment Zone 2 [i.e., slopes >16%]). Where revegetation cannot be facilitated, it will occur by natural recruitment, and will drain internally to the residual void, to prevent sediment leaving site. The NUMAs will not be used for grazing and will therefore not form a PMLU.

The revegetation strategy for the Middlemount Coal Mine has been based on the re-construction approach to ecological restoration. This approach is most suitable for disturbed areas or construction areas that show modified or disturbed soils, depleted or absent soil seed bank and high potential for domination by weed species that prevent natural regeneration and succession of the pre-disturbance ecological community. This approach is employed when removal of ongoing threatening processes alone is insufficient to allow natural establishment of ecological processes and communities (Appendix H).

The revegetation strategy does not aim to recreate the conditions of the target regional ecosystems in their remnant or undisturbed state. Rather, the strategy is aimed at establishing a safe, stable and non-polluting landform, with a self-sustaining vegetation cover consistent with the proposed PMLU of native ecosystem (Appendix H).

Initial revegetation activities will focus on the implementation of a fast-establishing cover crop species, alongside a deep-rooted legume to bind the soil and contribute nitrogen to the topsoil within the short term. An improved pasture species comprising a mix of species with a stoloniferous habit is utilised to stabilise the landform, and species with a tussock habit to provide palatable grass for grazing and to increase the capacity to accumulation of soil organic matter (Appendix H).

Cover crop species selection will be based on time of year and may vary depending on the topsoil spreading program. Cover crops suitable for use in revegetation treatment zones 1, 2 and where appropriate treatment zone 3 are specified based on seasonality in Table 19. Cover crop species will be sown at an approximate depth of 50 mm below the soil surface to ensure adequate soil moisture is stored before germination is initiated, and that the seed is not too deep to penetrate the soil surface.

Table 19
Seasonal Preferences and Application Rates for Cover Crops

Cover Crop	Optimal Sowing Time	Application Rate (kg/ha)
Japanese Millet	Summer	5 – 15
White French Millet	Summer	5 – 15
Wintaroo Oats	Winter	5 – 15
Barley	Winter	5 – 15
Annual Ryegrass	Winter-Spring	5 – 15

Species recommended for the revegetation project are presented in Table 21 and Table 22 (RA8). Not all species listed (especially grasses and forbs) are required to be used in the revegetation program and are a recommendation only. Species mix and seeding will but subject to availability at the time. A combination of species will be chosen from the list based on the availability of seed prior to revegetation works. However, native groundcover species will be preferentially sourced for treatment zones 1, 2 and 3. In addition, if live topsoiling is used, there will likely be natural recruitment of groundcover species. Native tree species will be seeded within treatment zones 1, 2 and 3 whereby only selected trees are to be seeded on treatment zone 2 due to its steeper gradient.

Seed Procurement and Collection

Seed should be sourced from reputable seed suppliers with documented quality control procedures. Germination and purity testing by a certified laboratory is desirable, however visual inspections by a person possessing suitable qualifications will otherwise be acceptable.

Native seed procurement has a long lead time and without adequate seed storage facilities the timing of supply, resupply and application of seed is important to minimise the storage time outside of controlled conditions. As the Middlemount Coal Mine currently lacks on-site seed storage conditions, procurement timing and storage capabilities should also be considered when scheduling the rehabilitation works.

Riparian Vegetation (Treatment Zone 3)

Creek diversions and drainage lines within the Middlemount Coal Mine final landform (i.e. Treatment Zone 3) would be rehabilitated to achieve the target PMLU of native ecosystem. However, as described above, riparian areas would require a quick to establish seed mix more suited to a riparian environment. Seed species required would vary from the toe of the bank to the overbank area. Seed mixes would require species outlined in Table 22.

Establishment Methods

Direct seeding will be preferred to achieve a dense or continuous cover of green cover crops and grass species. Seeding may be undertaken using conventional broadacre seeding equipment (e.g. combine seeder, spreader with harrows or spinner).

It is recommended that MCPL conduct trials of direct mechanical seeding of tree and shrub species. This can be done after the rehabilitation is stable around years 2-4. These can be completed as a patch mosaic for example. Starting with smaller patches to identify successful methodologies and increasing these areas when confidence of success increases.

Based on the target PMLU of Native Ecosystem, the recommended proportion of seed by species lifeform is shown in Table 20 and candidate species for each lifeform and anticipated seed quantities per ha are shown in Tables 21 and 22 for relevant RAs. Note that not all species listed in Tables 20 and 21 will be used in the revegetation. Rather, a combination of species will be chosen from the list based on the availability of seed. A contingency amount of 20% will typically be utilised to account for mortality. Seed quantity includes cover crop species, although it should be noted that cover crops will be chosen in consideration of season of application.

Further detail candidate tree, shrub and legume species suitable for inclusion in the revegetation seed mix as well as additional detail on the revegetation strategy is provided in the Revegetation Management Plan (Appendix H).

Table 20
Seed Mix Proportions per Plant Species

Stratum	Lower Erosion Risk Areas	High Erosion Risk Areas	
	RA3, RA4, RA5, RA6 and RA7	RA1 and RA2	RA8
Target application rate	22kg/ha	40kg/ha	40kg/ha
Cover Crop	45% (10kg)	38% (15kg)	38% (15kg)
Non-Native Grasses	0%	33% (13kg)	25% (10kg)
Native grass	45% (10kg)	25% (10kg)	25% (10kg)
Native tree and shrub	9% (2kg)	5% (2kg)	5% (2kg)
Native sedge and species that can sustain flood	-	-	8% (3kg)
Tube stock planting	As per rehabilitation milestone criteria (RM6) 6. f)	As per rehabilitation milestone criteria (RM6) 6. f)	As per rehabilitation milestone criteria (RM6) 6. f)

Table 21
Candidate species suitable for inclusion in the revegetation seed mix

Scientific name	Common name	Recommended rate [1]	Target species number by stratum
Cover crops			
Echinochloa esculenta	Japanese Millet (summer)	5.0–15.0	1–2 species
Panicum miliaceum	White French Millett (summer)	5.0–15.0	
Avena sativa	Wintaroo Oats (winter)	5.0–15.0	
Hordeum vulgare	Barley (winter)	5.0–15.0	
Lolium rigidum	Annual ryegrass (winter-spring)	5.0–15.0	
RE 11.3.2 (RA5 – roads)			
Native grasses			
Aristida spp.	(local) Wiregrass sp.	0.5–2.0	8-12 species
Chloris divaricata	Slender chloris	0.5–2.0	
Chloris ventricosa	Tall chloris	0.5–2.0	
Dichanthium sericeum	Queensland bluegrass	0.5–2.0	
Themeda triandra	Kangaroo grass	0.5–2.0	
Bothriochloa decipiens	Pitted bluegrass	0.25–1.0	
Chrysopogon fallax	Golden beard grass	0.25–1.0	
Cymbopogon refractus	Barbed wire grass	0.25–1.0	
Enteropogon acicularis	Curly windmill grass	0.25–1.0	
Eragrostis sororia	Woodland lovegrass	0.25–1.0	
Heteropogon contortus	Black speargrass	0.25–1.0	
Panicum decompositum	Native millet	0.25–1.0	
Panicum effusum	Hairy panic	0.25–1.0	
Native trees and shrubs		Rate (g/ha)	
Eucalyptus populnea	Poplar box	25–75	4-6 species
Eucalyptus crebra	Narrow leaved ironbark	25–75	
Eucalyptus melanophloia	Silver leaved ironbark	25–75	
Acacia excelsa	Ironwood	100–200	
Acacia salicina	Black sally wattle	100–200	
Cassia brewsteri	Leichhardt bean	100–200	
Eremophila mitchellii	False sandalwood	100–150	
Geijera parviflora	Wilga	100–150	
RE 11.3.27	*(RA6&7 – water mgt. infrastr.)*		
Native grasses		Rate (kg/ha)	
Paspalum distichum	Knotgrass	0.5–2.0	2-4 species
Anthosachne scabra	Wheat-grass	0.5–1.0	
Austrostipa aristiglumis	Plains grass	0.5–1.0	
Dichanthium sericeum	Queensland bluegrass	0.5–1.0	
Panicum decompositum	Native millet	0.5–1.0	
Panicum laevinode	Pepper grass	0.5–1.0	
Paspalum scrobiculatum	Ditch millet	0.5–1.0	
Native sedges		Rate (kg/ha)	
Eleocharis plana	Flate spike-rush	0.5–2.0	2-4 species
Marsilea drummondii	Nardoo	0.5–2.0	
Cyperus spp.	(local) Nutgrass sp.	0.5–1.0	

Scientific name	Common name	Recommended rate [1]	Target species number by stratum
Eleocharis pallens	Pale spike-rush	0.5–1.0	
Juncus spp.	(local) Rush sp.	0.5–1.0	
Native trees and shrubs		Rate (g/ha)	
Eucalyptus camaldulensis	River red gum	25–75	
Corymbia intermedia	Pink bloodwood	100–150	
Eucalyptus coolabah	Coolabah	25–75	2-4 species
Eucalyptus largiflorens	Black box	25–75	
Eucalyptus tereticornis	Forest red gum	25–75	
RE 11.5.3	(RA1-3, RA9&10 – waste rock)		
Native grasses		Rate (kg/ha)	
Aristida spp.	(local) Wiregrass sp.	0.5–2.0	
Eragrostis lacunaria	Purple lovegrass	0.5–2.0	
Heteropogon contortus	Black speargrass	0.5–2.0	
Panicum effusum	Hairy panic	0.5–2.0	
Themeda triandra	Kangaroo grass	0.5–2.0	
Bothriochloa decipiens	Pitted bluegrass	0.25–1.0	
Chrysopogon fallax	Golden beard grass	0.25–1.0	
Cymbopogon bombycinus	Citronella grass	0.25–1.0	
Dichanthium sericeum	Queensland bluegrass	0.25–1.0	
Digitaria ammophila	Silky umbrella grass	0.25–1.0	6-8 species
Digitaria brownii	Cotton panic grass	0.25–1.0	
Enneapogon lindleyanus	Conetop nineawn	0.25–1.0	
Enneapogon virens	Pappus grass	0.25–1.0	
Eragrostis brownii	Brown's lovegrass	0.25–1.0	
Eragrostis leptostachya	Paddock lovegrass	0.25–1.0	
Eragrostis sororia	Woodland lovegrass	0.25–1.0	
Eulalia aurea	Silky browntop	0.25–1.0	
Sporobolus caroli	Fairy grass	0.25–1.0	
Tragus australianus	Small burr grass	0.25–1.0	
Triodia pungens	Soft spinifex	0.25–1.0	
Native trees and shrubs		Rate (g/ha)	
Corymbia clarksoniana	Clarkson's bloodwood	100-150	
Eucalyptus melanophloia	Silver leaved ironbark	25-75	
Eucalyptus populnea	Poplar box	25-75	
Acacia conferta	Crowded-leaf wattle	100-200	
Acacia cowleana	Halls Creek wattle	100-200	
Acacia disparrima	Southern salwood	100-200	
Allocasuarina luehmannii	Bull-oak	25–50	
Archidendropsis basaltica	Dead finnish	50-100	
Callitris glaucophylla	White cypress pine	50-100	
Capparis lasiantha	Nipan	50-100	
Carissa ovata	Currant bush	50-100	12-14 species
Cassia brewsteri	Leichhardt bean	50-100	
Corymbia dallachiana	Dallachy's ghost gum	50-100	
Eremophila mitchellii	False sandalwood	100–150	
Erythroxylum australe	-	50-100	
Eucalyptus brownii	Reid River box	25–50	
Eucalyptus cambageana	Dawson River blackbutt	25–50	

Scientific name	Common name	Recommended rate [1]	Target species number by stratum
Eucalyptus crebra	Narrow leaved ironbark	25–50	
Geijera parviflora	Wilga	100-150	
Petalostigma pubescens	Quinine tree	50-100	
Ventilago viminalis	Supplejack	50-100	
RE 11.5.9	(RA5 – MIA, CHPP)		
Native grasses		Rate (kg/ha)	
Aristida spp.	(local) Wiregrass sp.	0.5–2.0	
Cymbopogon refractus	Barbed wire grass	0.5–2.0	
Heteropogon contortus	Black speargrass	0.5–2.0	
Themeda triandra	Kangaroo grass	0.5–2.0	
Alloteropsis semialata	Cockatoo grass	0.25–1.0	
Ancistrachne uncinulata	Hooky grass	0.25–1.0	
Brunoniella acaulis	Blue trumpet	0.25–1.0	
Calyptochloa cylindrosperma	-	0.25–1.0	8-10 species
Chrysopogon fallax	Golden beard grass	0.25–1.0	
Desmodium brachypodum	Large tick trefoil	0.25–1.0	
Ectrosia spp.	-	0.25–1.0	
Eragrostis spartinoides	-	0.25–1.0	
Eremochloa bimaculata	Poverty grass	0.25–1.0	
Mnesithea formosa	Silkytop grass	0.25–1.0	
Panicum effusum	Native millet	0.25–1.0	
Paspalidium spp.	(local) Watercrown grass sp.	0.25–1.0	
Native trees and shrubs		Rate (g/ha)	
Corymbia citriodora	Lemon-scented gum	100-150	
Corymbia clarksoniana	Clarkson's bloodwood	100-150	
Eucalyptus crebra	Narrow leaved ironbark	25-75	
Eucalyptus melanophloia	Silver leaved ironbark	25-75	
Acacia excelsa	Ironwood	100-200	
Acacia leiocalyx	Black wattle	100-200	
Alphitonia excelsa	Soap ash	100-150	
Corymbia dallachiana	Dallachy's ghost gum	100-150	
Corymbia intermedia	Pink bloodwood	100-150	9-12 species
Corymbia lamprophylla	Corymbia intermedia	100-150	
Eucalyptus acmenoides	White mahogany	25-50	
Eucalyptus cloeziana	Gympie messmate	25-50	
Eucalyptus exserta	Queensland pepppermint	25-50	
Eucalyptus tenuipes	Narrow leaved mahognay	25-50	
Lysicarpus angustifolius	Brown hazelwood	50-100	
Melaleuca nervosa	Firebark	25-50	
Petalostigma pubescens	Quinine tree	50-100	
RE 11.7.2	(RA4 – TSF)		
Native grasses		Rate (kg/ha)	

Scientific name	Common name	Recommended rate [1]	Target species number by stratum
Aristida spp.	(local) Wiregrass sp.	0.5–2.0	5-7 species
Paspalidium rarum	-	0.5–2.0	
Urochloa foliosa	Leafy panic	0.5–2.0	
Calyptochloa gracillima	-	0.25–1.0	
Digitaria breviglumis	-	0.25–1.0	
Enneapogon lindleyanus	Conetop nineawn	0.25–1.0	
Entolasia stricta	Wiry panic	0.25–1.0	
Eragrostis lacunaria	Purple lovegrass	0.25–1.0	
Panicum effusum	Native millet	0.25–1.0	
Thyridolepis xerophila	-	0.25–1.0	
Native trees and shrubs		Rate (g/ha)	
Acacia catenulata		100-200	8-10 species
Acacia shirleyi		100-200	
Eucalyptus crebra		25-75	
Acacia blakei		100-200	
Acacia burrowii		100-200	
Acacia crassa		100-200	
Acacia rhodoxylon		100-200	
Acacia sparsiflora		100-200	
Alphitonia excelsa		100-150	
Eucalyptus decorticans		25-50	
Eucalyptus exserta		25-50	
Eucalyptus thozetiana		25-50	

Source: Verterra (2023)

[1] Recommended rates per species up to maximum per stratum rate in Table 20.

[2] Important to note that unless threshed and/or coated, Heteropogon contortus is very difficult to mix and can cause problems with spreading machinery.

Table 22
Candidate species suitable for inclusion in the revegetation seed mix (for RA8)

Scientific name	Common name	Recommended rate (kg/ha) [1]	Target species number by stratum
Native grasses		Rate (kg/ha)	
Heteropogon contortus	Black speargrass	0.5–2.0	8-10 species
Themeda triandra	Kangaroo grass	0.5–2.0	
Arundinella nepalensis	Reedgrass	0.25–1.0	
Bothriochloa bladhii	Forest bluegrass	0.25–1.0	
Chrysopogon filipes	Australian vetiver	0.25–1.0	
Dichanthium sericeum	Queensland bluegrass	0.25–1.0	
Eriochloa crebra	Cup grass/ Spring grass	0.25–1.0	
Eriochloa procera	Slender cup grass	0.25–1.0	
Panicum effusum	Hairy panic	0.25–1.0	
Paspalidium distans	Shotgrass	0.25–1.0	
Paspalidium jubiflorum	Warrego grass	0.25–1.0	
Sporobolus mitchellii	Swamp rats tail	0.25–1.0	
Native sedges		Rate (kg/ha)	
Lomandra longifolia	Spiny-head mat rush	0.5–2.0	1-2 species
Cyperus gracilis	Slender flat sedge	0.5–2.0	
Cyperus spp.	(local) Nutgrass sp.	0.5–1.0	
Native trees and shrubs		Rate (g/ha)	
Eucalyptus camaldulensis	Red river gum	25–75	6-8 species
Eucalyptus tereticornis	Forest red gum	25–75	
Eucalyptus coolabah	Coolabah	25–75	
Acacia salicina	Black sally wattle	100–200	
Acacia stenophylla	River Myall	100–200	
Angophora floribunda	Rough-barked apple	100–150	
Casuarina cunninghamiana	River oak	100–150	
Ficus opposita	Sandpaper fig	25–50	
Lysiphyllum carronii	Red bauhinia	100–150	
Melaleuca bracteata	Black tea tree	25–50	
Melaleuca viminalis	Weeping bottlebrush	25–50	

Source: Verterra (2023)

3.5.4 Tailings Storage Facilities

Coarse reject material from the CHPP is placed within in-pit waste emplacements. Fine reject material is stored TSF2 (Figure 2). TSF2 has been divided into four cells with a further two tailings flocc cells (TFC's) (FC1 and FC2) providing emergency capacity, which have not been required to date. All tailings facilities are constructed with earthen embankments on all sides and do not receive runoff from external catchments.

Fine rejects from the CHPP are comprised mostly of fine silt, clay, water and coal material. The fine rejects are pumped to the TSF cells and flocculant is added prior to deposition. Decant water is pumped to SD1 then returned to the CHPP and raw water dam for reuse.

3.5.5 Voids

3.5.5.1 Minimisation of Residual Voids

There are two residual voids approved at the Middlemount Coal Mine, located in the northern and southern area of the mine pit (Figure 16).

The north void will have a maximum area of 358 ha, and the south void area will have a maximum area of 163 ha. The design of the final landform (including the residual voids) has taken into consideration the disposal of waste rock in-pit to minimise the size of the residual voids where reasonable and practicable.

3.5.5.2 Residual Void Dimensions and Slope Angles

As described in Section 3.4, the residual voids must be consistent with the description provided in most recent Middlemount Coal Mine Geotechnical – Final Void Study (Appendix K), as per Plate 4 below.

Table 5 Recommended slope geometry for the final voids

Material	Overall Slope Angle (°)	Bench Height (m)	Berm Width (m)	Batter Angle (°)
Surficial Soils	20	NA	NA	NA
Weathered Permian	NA	30	25	55
Fresh Permian	NA	60	60	60

Table 6 Recommended slope geometry for lowwalls

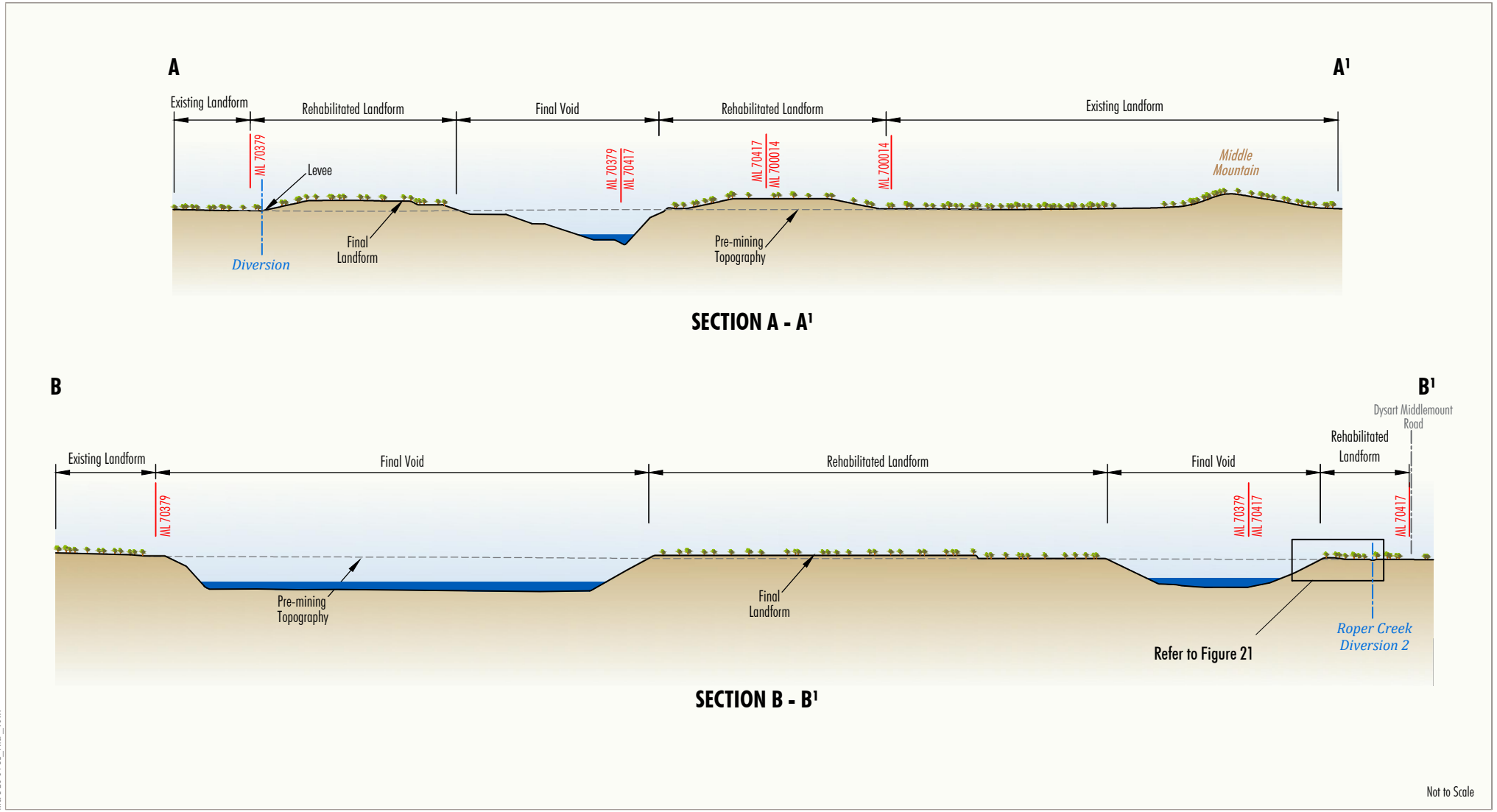
Material	Overall Slope Angle (°)~	Max. Bench Height (m)	Berm Width (m)*	Batter Angle (°)
Lowwall CAT3 Spoil	27	40	12 to 25	37

~This is the maximumOSA allowed for lowwall designs

*The bench geometries maybe changed to satisfy the OSA, this include bench height and berm width

Plate 4 – Table 5 and 6 from the Middlemount Coal Mine Geotechnical – Final Void Study

The residual void designs are shown on Figures 19, 20 and 21.
INSERT FIGURE 19 – INDICATIVE RESIDUAL VOIDS CROSS SECTION LOCATIONS



MCPL-20-04 SE_PRCP_101A

Source: MCPL (2022); AGE (2020)

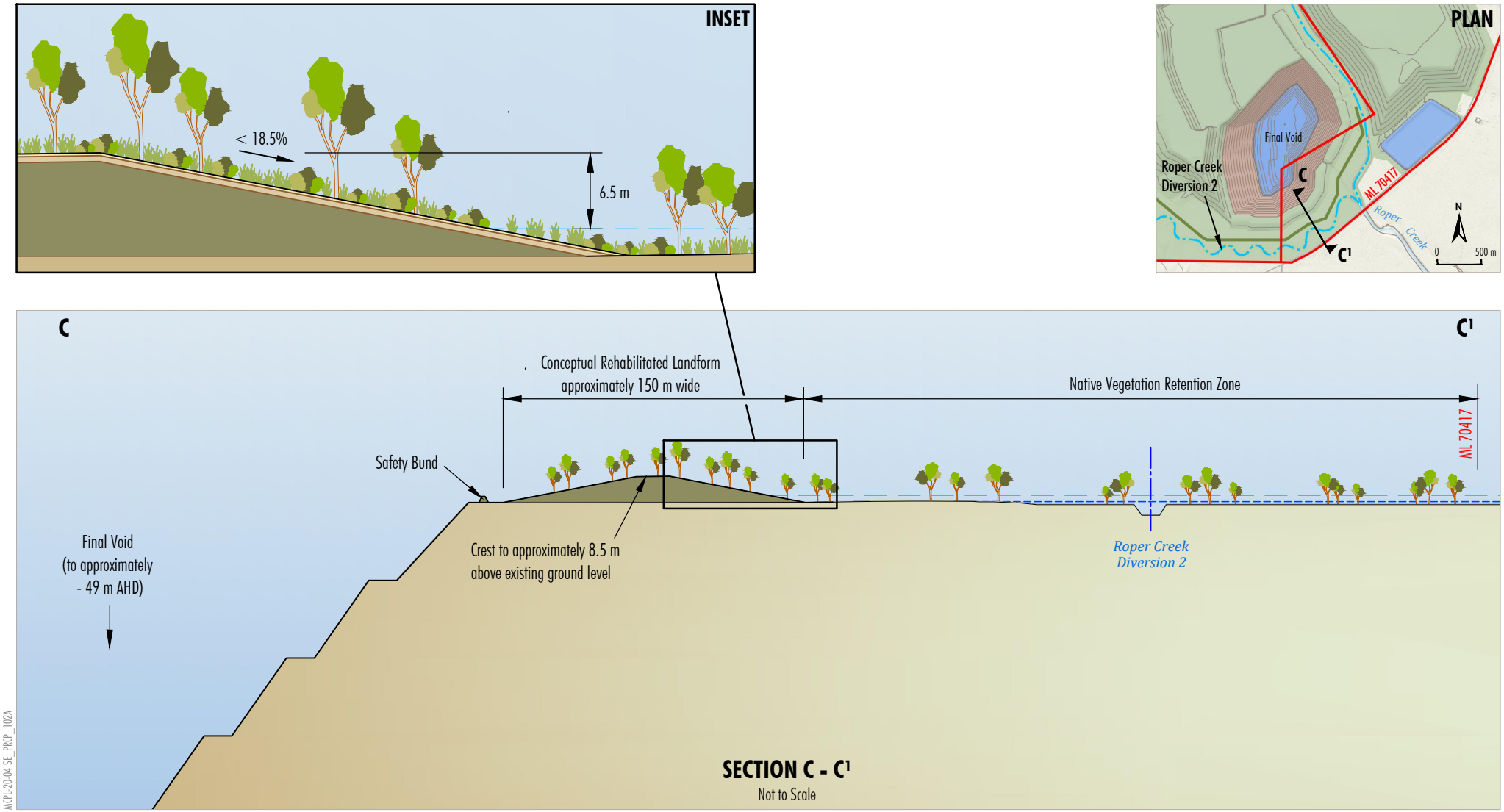
Refer Figure 19 for Cross Section locations.

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Conceptual Cross Sections
of the Rehabilitated Mine Landform

Figure 20



LEGEND

0.1% AEP Flood Level (approximately 155 m AHD) (WRM, 2020)

Probable Maximum Flood (PMF) Level (approximately 156.5 m AHD) (WRM, 2020)

Source: MCPL (2022); WRM (2020); AGE (2020)

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Conceptual Final Landform Design
Relative to the Roper Creek Floodplain

Figure 21

3.5.5.3 Final Void Stability

The Southern Extension Project EVA (MCPL, 2020a) included a Residual Void Slope Stability Study by Geotechnical Consulting Services (2014). The study included an investigation of geotechnical stability of highwall and low wall slopes, environmental stability and provides an indication of the remedial measures needed to achieve geotechnical stability.

The Residual Void Slope Stability Study (Geotechnical Consulting Services, 2014) concluded that the rock highwalls are inherently stable against mass failure in normal conditions but large scale instability is likely in proximity to the Jellinbah fault. The location and nature of the Jellinbah fault system has not been adequately defined, noting that at this stage closure is still a long way off and the final highwall location is likely to change as mining proceeds.

Final void highwalls will be treated (e.g. benched or blasted) so that they are geotechnically stable to an appropriate factor of safety. Once completed, a safety assessment and geotechnical investigation will be undertaken to confirm the safety and stability of the highwall for the long term. An as-built design report will be completed to confirm that the final voids are consistent with the requirements of EA EPML00716913.

A safety bund wall consisting of competent rock and/or fencing would be constructed to limit human and livestock/animal access. The bund wall would have a minimum height of 2 m, with a minimum base width of 4 m and be located at least 10 m beyond the area potentially affected by any instability of the open cut pit edge.

Appropriate signage alerting people to the presence of the voids will be placed around the bund.

3.5.5.4 Final Void Hydrology

Inflows

Once mining operations cease, groundwater inflows to the residual voids would no longer be collected and pumped out, and as a result, the residual voids would gradually begin to fill with groundwater.

Inflows into the residual voids would comprise incident rainfall, runoff within the residual void catchment area and groundwater (including spoil dump infiltration). The catchment area of the residual voids would be minimised and is defined by the surrounding landform including safety bunds and/or upslope diversion channels. The catchment area of the residual voids is shown in the Surface Water Assessment (Appendix A).

Water Level Recovery Analysis

Final void water recovery analyses have been conducted as part of the Surface Water Assessment (Appendix A) based on predicted groundwater inflows developed as part of the Groundwater Assessment (Appendix B).

The model analyses the long-term water level behaviour within both the northern and southern residual voids over a time period of 500 years. These modelling results are highlighted below (Appendix A):

- Final Void (Northern), the water level reaches equilibrium between 6.5 m AHD and 13 m AHD after 200 years, with variation present from this equilibrium value for the remaining 300 years of the simulation. The maximum water level modelled was measured to be around 150 m below the full supply level, and 127 mbgl (pre-mining).

- Final Void (Southern), the water level reaches equilibrium between 32 m AHD and 37 m AHD after 200 years of simulation, with little variation present from the equilibrium value for the remaining 300 years of the simulation. The maximum water level modelled was measured to be around 122 m below the full supply level, and 93 mbgl (pre-mining).

The final void waterbodies are not predicted to spill under any of the simulated climatic sequences, and the voids would remain as long-term groundwater sinks (Appendix A). The water balance modelling also indicates that there would be no interaction between the long-term surface water levels within the North Void and the South Void. Due to different floor elevations and predicted water levels within the voids, a groundwater flow gradient from the South Void into the North Void through the spoil backfill would occur (Appendix A).

3.5.5.5 Final Void Water Quality

Residual void water recovery analyses have been conducted as part of the Surface Water Assessment, which included simulations of the long-term salinity of the residual void waterbodies (Appendix A).

The salinity of the residual voids would gradually increase over time, however as described further below would be contained within the voids (i.e. the voids would remain as long-term groundwater sinks and would not spill [Appendix A]). The salinity levels within the residual void waterbodies were modelled for the first 500 years, with salinity levels expected to increase past the 500 year limit. Comparisons of the peak salinity concentrations and the accumulation of salt for the northern and southern void are given below (Appendix A):

- Final Void (Northern) maximum salinity concentration was modelled to be 74,700 milligrams (mg) per Litre (L) (mg/L), with an accumulation rate of 2,470 tonnes per year;
- Final Void (Southern) maximum salinity concentration was modelled to be 53,950 mg/L, with an accumulation rate of 2,450 tonnes per year.

3.5.6 Underground Mining

This section of the PRCP Guideline is not relevant to the Middlemount Coal Mine as it is an open cut mining operation (Section 3.1.1).

3.5.7 Built Infrastructure

3.5.7.1 Infrastructure Decommissioning and Removal

The vast majority of the Middlemount Coal Mine infrastructure domain is required to support mining operations up to closure, and will be accordingly rehabilitated at the cessation of mining operations. Following cessation of mining, MCPL will progressively decommission and remove all infrastructure from the Middlemount Coal Mine unless otherwise agreed with post-mining landholder(s) and the administering authority. Hydrocarbons (petrol, diesel, oils, greases, degreasers and kerosene), explosives, chemicals and liquid and non-liquid wastes left unused at the completion of mining will be returned to the supplier and/or disposed of in accordance with relevant safety and handling procedures.

If applicable, infrastructure areas which have been the subject of Notifiable Activities will be added to the EMR. The EMR is a public register which contains information about contaminated land in QLD. The EMR also contains information of land which is, or could potentially be, contaminated because it is being used for a Notifiable Activity (i.e. an activity that has the potential to cause land contamination).

3.5.7.2 Remediation of Contaminated Land

Operation of the Middlemount Coal Mine involves undertaking several Notifiable Activities that have the potential to cause land contamination and will potentially disturb areas where evidence of contamination or historical contaminating activities has occurred. Management of contaminated land during the operation of the Middlemount Coal Mine is described in Section 3.1.2.6.

Site investigations of potentially contaminated areas will be undertaken after an area becomes available for rehabilitation, but prior to rehabilitation occurring (Section 3.5.1), to identify and remediate any contaminated soil materials that may exist in accordance with the requirements under Part 8 of Chapter 7 of the EP Act or equivalent statutory provision in force at the time.

Where areas of potential land contamination are identified, MCPL will undertake:

- Preliminary and intrusive contaminated land investigations, as required.
- Removal or onsite-treatment of contaminated water (e.g. affected by hydrocarbons, brine, metals, etc.).
- Removal and appropriate disposal of contaminated materials (PCBs, Dioxins, Mercury, hydrocarbon contaminated soils).
- On-site remediation of hydrocarbon contaminated soils.
- Removal and disposal of asbestos.
- Removal and disposal of plastic (geofabric) liners from dams, leach pads, etc.
- Validation testing to confirm that contaminated soils have been removed/remediated.

3.5.7.3 Environmental Management Register

When land is listed on the EMR for a notifiable activity, it is an indication that the land is likely to be contaminated but it does not mean it needs to be cleaned up or is not suitable for its current land use. This will depend on the nature, extent and risks of any contamination on the land, which can be determined by engaging a suitably qualified person to carry out a site investigation.

Where land is listed on the EMR because it is contaminated, details about the hazardous contaminant affecting the land will be included on the EMR as well as information about what land uses the land is suitable for. Where there is a site management plan in place to manage the contamination so it is suitable for a particular land use, the plan will also be attached to the EMR.

Once the site management plan has been successfully executed and the contamination has been resolved, MCPL will apply for the land to be removed from the EMR.

3.5.7.4 Retained Infrastructure

On 15 May 2020, MCPL wrote to the Department of Environment and Science (*RE: Middlemount Coal Mine, EPML00716913 – Retention of Water Structures)* (Attachment 3) describing the desired retention of several water holding structures within the Middlemount Coal Mine ML. MCPL desires that water holding structures are retained for the purpose of supporting future land uses. All infrastructure proposed to be retained for water management purposes are on land solely held by MCPL.

MCPL as the future landholder consented to the retention of the following water structures and associated infrastructure, which therefore do not require decommissioning, but do require progressive rehabilitation to make non-polluting and safe for farming activities as part of this PRC Plan:

- Mine Water Dam.
- Raw Water Dam.
- Sediment Dam 1 and Sediment Dam 1 extension.
- Sediment Dam 2.
- Sediment Dam 3.
- Sediment Dam 6.
- Sediment Dam 7.
- Sediment Dam 9.
- Sediment Dam 10.
- Sediment Dam 12.
- Workshop sediment dam.
- Blast yard sediment dam.
- Bangers dam.
- Highwall dam 1.
- Highwall dam 2.
- Northern pitwater transfer dam.
- ROM2 sediment dam.
- ROM2 go line sediment dam.
- Polypipe network (to allow future transfer between the dams and pit).

3.6 RISK ASSESSMENT

3.6.1 Risk Identification

Risk Mentor Pty Ltd (Risk Mentor) has undertaken a risk assessment (Risk Mentor, 2021; Appendix I) to identify the risks of a stable condition for land described as a post mining land use not being achieved, and how the risks will be managed or minimised. Risk Mentor has identified the sources of risk, areas of impacts, events and their causes and potential consequences (Tables 23 and 24).

The risks identified by the assessment team generally fell into the following categories:

- Market or other conditions leading to a move to care and maintenance or premature closure of the operation, which could compromise the ability to rehabilitate the Middlemount Coal Mine in line with community expectations.
- Issues with achieving a stable final landform arising from poor physical performance of rehabilitated dumps, dams, or slopes.
- Impacts on the receiving environment (water) due to excursions of contaminated or sediment laden water flows.
- Decommissioning challenges leaving either contaminated or dangerous materials on the site after the completion of rehabilitation works.
- Impacts on ecology (flora or fauna) arising from failure to achieve the target landform and species mix on the site.
- Rehabilitation management issues related to insufficient resourcing or inadequate experience/execution of rehabilitation works.

Risks that were considered to be a result of controls failing could not be ranked (on the basis that a failed control has an indeterminant outcome) and are listed in Table 24.

3.6.2 Risk Evaluation and Treatment

The identified risks were ranked (considering the effect of the applied controls) using the Risk and Control Assessment Criteria (Table 25). The risks identified were considered to be able to be effectively controlled through the implementation of the controls, management and mitigation measures as outlined in Tables 26 and 27.

Further consideration of interactions between rehabilitation milestones and the identified risks is provided in Table 27. The timeframes proposed in this PRC Plan and PRCP Schedule have been developed in consideration of the risks that were attributed to each of the rehabilitation milestones.

A detailed analysis of all risks identified, the residual risk rankings and their associated controls is provided in Appendix I.

Table 23
Identified Rehabilitation Risks

PRCP ID	Mine Closure / Rehabilitation Aspect	Risk Source	Potential Events / Consequences	Loss Type	Existing / Proposed Risk Treatment / Control	Ranking with Controls		
MCPL.01.A	General	Insufficient resourcing (including skills and experience of rehabilitation personnel; funding for, or prioritisation of, rehabilitation activities; ongoing maintenance of rehabilitation requirements).	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact (R) Impact on Reputation	01DV.06 - Reduced area for final rehabilitation 01DY.03 - Offset arrangements 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place	2	C	6
MCPL.01.B	General	Lack of clearly defined responsibilities.	Rehabilitation inadequate, requiring further works.	(O) Asset Damage and Other (R) Impact on Reputation	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place	2	C	6
MCPL.01.C	General	Care and maintenance/premature closure.	Delayed rehabilitation.	(E) Environmental Impact	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place	2	C	6
MCPL.01.D	General	Poor monitoring records management, unable to demonstrate compliance with completion criteria.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.02 - Biannual environmental audits 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place	2	C	6
MCPL.01.E	General	Inadequate consultation with key stakeholders.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place	2	C	6
MCPL.01.F	General	Change in Isaac Regional Council Planning Scheme.	Final land use no longer aligns with local planning scheme.	(E) Environmental Impact	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place	2	C	6
MCPL.02.A	Decommissioning	Generation of waste products from demolition process (e.g. conveyors, electrical substations, compressors, services [pipes/cables], stores, laydown areas, etc.).	Inappropriate disposal of waste products (e.g. at licensed disposal facility).	(E) Environmental Impact	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols	2	D	4
MCPL.02.B	Decommissioning	Failure to remove all infrastructure that is not to be retained post-closure (e.g. services, infrastructure, roads, carparks, hardstand areas, concrete footings).	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors	2	D	4
MCPL.02.C	Decommissioning	Failure to remove all hazardous materials (e.g. carbonaceous material on the surface, hazardous wastes, other wastes).	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 02PY.02 - Specific guidelines for hazardous chemicals 03SY.05 - Contractor Management Plan and Protocols	2	D	4

Table 23 (Continued)
Identified Ranked Rehabilitation Risks

PRCP ID	Mine Closure / Rehabilitation Aspect	Risk Source	Potential Events / Consequences	Loss Type	Existing / Proposed Risk Treatment / Control	Ranking with Controls		
MCPL.02.D	Decommissioning	Land contamination sites not successfully identified or remediated resulting in impacts to the environment.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols	2	D	4
MCPL.02.E	Decommissioning	Failure of borehole or gas well seals.	Resealing of boreholes or gas wells required.	(E) Environmental Impact	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols 04TV.01 - Guidance on gas borehole decommissioning	2	D	4
MCPL.02.F	Decommissioning	Lack of structural integrity of buildings and infrastructure to be retained in final land use.	Collapse/failure of infrastructure to be retained (e.g. dams).	(E) Environmental Impact	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols	2	D	4
MCPL.02.G	Decommissioning	Impacts on European/ historic heritage items.	Damage to heritage items. Prosecution.	(E) Environmental Impact	02PV.01 - Processes to identify all heritage items 02PV.02 - Site land disturbance permits 02PV.03 - Work is occurring within already disturbed footprints 03SV.01 - Database which tracks all known heritage items	1	E	1
MCPL.02.H	Decommissioning	Impacts on Aboriginal heritage items.	Damage to heritage items. Prosecution.	(E) Environmental Impact	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SV.01 - Database which tracks all known heritage items	1	E	1
MCPL.03.A	Ecology - flora and fauna	Landform aspect not suitable for intended target plant species - not meeting required habitats for fauna. With causes including the establishment of overly steep slopes (18.5 degrees may be too steep for ongoing leading practice works on site)	Inability to meet post-mining land use criteria.	(E) Environmental Impact	01DV.10 - Selection of appropriate analogue and reference sites 01DY.02 - Revegetation plan (in line with PRCP) 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances	1	C	3
MCPL.03.B	Ecology - flora and fauna	Tree species established are not suited to riparian environment.	Rehabilitation inadequate, requiring further works and compromising long term stability of diversions	(E) Environmental Impact	01DY.02 - Revegetation plan (in line with PRCP) 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances	1	C	3

Table 23 (Continued)
Identified Ranked Rehabilitation Risks

PRCP ID	Mine Closure / Rehabilitation Aspect	Risk Source	Potential Events / Consequences	Loss Type	Existing / Proposed Risk Treatment / Control	Ranking with Controls		
MCPL.03.C	Ecology - flora and fauna	Tree species established along creek diversions are not suited to riparian environment.	Rehabilitation inadequate, requiring further works and compromising long term stability of diversions	(E) Environmental Impact	01DY.02 - Revegetation plan (in line with PRCP) 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances	1	C	3
MCPL.03.D	Ecology - flora and fauna	Inappropriate revegetation species mix for targeted final land use.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DY.02 - Revegetation plan (in line with PRCP) 01DV.10 - Selection of appropriate analogue and reference sites 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances	1	C	3
MCPL.03.E	Ecology - flora and fauna	Poor quality Topsoil available and spread in areas for revegetation (with contributing factors from relatively young site and limited understanding of requirements by operational teams)	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan	1	C	3
MCPL.04.A	Final Landform	Unknown characterisation of spoil material.	Tertiary spoil material is highly susceptible to erosion which could lead to landform instability, landform failure and insufficient revegetation to meet PMLUs.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4
MCPL.04.B	Final Landform	Insufficient permian rock material for rock mulching and capping of relevant surfaces.	Landform instability, landform failure and insufficient revegetation to meet PMLUs.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control 03SV.06 - Rehabilitation management plan	2	D	4
MCPL.04.C	Final Landform	Final landform instability (e.g. in and out of pit dumps, steep slopes, erosion, highwalls, low walls etc.) affecting post-mining land use.	Landform failure (public safety risk).	(P) Harm to People	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4

Table 23 (Continued)
Identified Ranked Rehabilitation Risks

PRCP ID	Mine Closure / Rehabilitation Aspect	Risk Source	Potential Events / Consequences	Loss Type	Existing / Proposed Risk Treatment / Control	Ranking with Controls		
MCPL.04.D	Final Landform	Final landform instability (e.g. NUMAs, final voids, etc.) affecting post-mining land use.	Landform failure (public safety risk) and NUMAs causing environmental harm.	(P) Harm to People (E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4
MCPL.04.E	Final Landform	Final landform instability (e.g. steep slopes, erosion, highwalls, low walls etc.) affecting post-mining land use (e.g. due to insufficient amelioration of dispersive tertiary spoil and soils).	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4
MCPL.04.F	Final Landform	Final landform unsuitable for final land use (e.g. large rocks present affecting cultivation, settlement and surface subsidence leading to extended ponding etc.).	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4
MCPL.04.G	Final Landform	Final landforms are not consistent with and do not complement the topography of the surrounding region.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4
MCPL.04.H	Final Landform	Erosion and failure of drainage and water management/storage structures.	Impacts on water quality and potential discharge.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4
MCPL.04.I	Final Landform	Failure of the tailings storage facility over time.	Impact on surrounding landform and movement of tailings off site (Pollution of land or surface water by tailings).	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 02PE.01 - Flocculant use achieving a stiff tailings deposition 02PE.06 - Capping of TSF 03SV.03 - RQP involvement in TSF design	2	D	4
MCPL.04.J	Final Landform	Lack of infrastructure to support intended final land use (e.g. dams, fences, watering facilities, etc.). Note: Intended final land use is native ecosystem - minimal infrastructure required.	Farm dams retained insufficient to support grazing and additional dams required.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4

Table 23 (Continued)
Identified Ranked Rehabilitation Risks

PRCP ID	Mine Closure / Rehabilitation Aspect	Risk Source	Potential Events / Consequences	Loss Type	Existing / Proposed Risk Treatment / Control	Ranking with Controls		
MCPL.04.K	Final Landform	Landform (excluding final void domains) not free draining.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control	2	D	4
MCPL.05.P	Rehabilitation Management	Adoption of inappropriate or inadequate rehabilitation techniques, timing and scheduling including allocation of the equipment fleet.	Rehabilitation inadequate, requiring further works and potentially compromising position with Regulators.	(E) Environmental Impact (R) Reputation	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 02PY.01 - Works conducted by suitable contractors 03SV.04 - Change management for rehabilitation 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan 03SY.05 - Contractor Management Plan and Protocols	2	C	6
MCPL.06.A	Water	Contamination resulting from adjacent mining activities (e.g. storage and use of hydrocarbons/chemicals, drilling fluids, spillage of dirty or produced saline water, brine, sewage, tailings emplacement etc.).	Contamination of waterways or land resulting in infringement notice.	(E) Environmental Impact	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 02PY.02 - Specific guidelines for hazardous chemicals 03SV.09 - Mine voids are ground water sinks 03SY.06 - Water Management Plan	2	D	4
MCPL.06.B	Water	Diversion of surface water runoff away from catchment areas.	Loss of water flow downstream due to capture of water in voids.	(E) Environmental Impact	02PE.08 - Drainage minimises water reporting to voids on site 02PV.06 - Erosion and sediment control 03SY.06 - Water Management Plan	2	D	4
MCPL.06.C	Water	Water accumulation in residual voids.	Overtopping/discharge to receiving environment.	(E) Environmental Impact	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 03SV.09 - Mine voids are ground water sinks	2	D	4
MCPL.06.D	Water	Failure of final landform embankments in proximity to the southern residual void.	Inundation of the southern residual void and potential discharge to receiving environment.	(E) Environmental Impact	01DV.02 - Geotechnical analysis and design 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols	2	D	4
MCPL.06.E	Water	Groundwater seepage from residual voids.	Impact to receiving environment.	(E) Environmental Impact	02PE.08 - Drainage minimises water reporting to voids on site 03SV.09 - Mine voids are ground water sinks	2	D	4
MCPL.06.F	Water	Poor water quality/excessive discharges (e.g. acid-drainage, high salinity, etc.).	Impact to receiving environment.	(E) Environmental Impact	02PV.09 - Stripping and stockpiling procedures 03SV.09 - Mine voids are ground water sinks 03SY.06 - Water Management Plan	2	D	4

Table 24
Identified Unranked Rehabilitation Risks

PRCP ID	Mine Closure / Rehabilitation Aspect	Risk Source	Potential Events / Consequences	Loss Type	Existing / Proposed Risk Treatment / Control
MCPL.05.A	Rehabilitation Management	Loss of biological and habitat resources (e.g. subsoil, topsoil, vegetative material, seedbank, rocks, etc.) through clearing, salvage and handling practices.	High quality vegetation/habitat resources lost.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
MCPL.05.B	Rehabilitation Management	Lack of availability and quality of seed resources.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PE.02 - External supplier of seeds 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
MCPL.05.C	Rehabilitation Management	Weed and pest control (or lack thereof), including damage from insects, plant disease, fauna and livestock.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.07 - Weed and Pest Control Management Plan
MCPL.05.D	Rehabilitation Management	Weather and climatic influences (e.g. drought, intense rainfall events/flooding, bushfire, etc.).	Damage or delays to rehabilitation, requiring further works.	(E) Environmental Impact	01DV.07 - Dump designs allow for rainfall events 02PE.08 - Drainage minimises water reporting to voids on site 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
MCPL.05.E	Rehabilitation Management	Insufficient establishment or cover of vegetation due to high plant mortality.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
MCPL.05.F	Rehabilitation Management	Overgrazing of pasture rehabilitation areas.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PE.03 - Site security, fencing, etc. 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SY.04 - Third party agreements
MCPL.05.G	Rehabilitation Management	Vandalism to revegetation areas.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PE.03 - Site security, fencing, etc. 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
MCPL.05.H	Rehabilitation Management	Inadvertent or unauthorised access to rehabilitated areas by mining equipment and vehicles.	Damage or delays to rehabilitation (e.g. collapse of soil structure), requiring further works.	(E) Environmental Impact	02PE.03 - Site security, fencing, etc. 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan

Table 24 (Continued)
Identified Unranked Rehabilitation Risks

PRCP ID	Mine Closure / Rehabilitation Aspect	Risk Source	Potential Events / Consequences	Loss Type	Existing / Proposed Risk Treatment / Control
MCPL.05.I	Rehabilitation Management	Adverse/less well understood geotechnical/geochemical issues associated with dumps and process waste storage facilities (e.g. tailings, reject emplacements, presence of sodic sub-soils) overburden and waste rock dumps etc.	Failing to meet completion criteria, significant erosion and poor quality runoff/infiltration from rehabilitated surfaces effecting surface water and groundwater quality.	(E) Environmental Impact	01DE.01 - Tailings and dam designs and management systems 02PE.04 - Gypsum remediation to improve run-off 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.08 - Water quality monitoring
MCPL.05.J	Rehabilitation Management	Inadequate capping or removal of carbonaceous material.	Spontaneous combustion event.	(E) Environmental Impact	01DE.01 - Tailings and dam designs and management systems 01DV.08 - Mine design considers carbonaceous material in dumps 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 02PV.09 - Stripping and stockpiling procedures 03SV.05 - Topsoil management plan
MCPL.05.K	Rehabilitation Management	Availability of suitable materials for capping of hazardous materials and tailings.	Unable to cap due to lack of suitable material on site.	(E) Environmental Impact	01DE.01 - Tailings and dam designs and management systems 01DV.08 - Mine design considers carbonaceous material in dumps 01DV.09 - Mine plan makes allowances for rehabilitation of the TSF 02PE.01 - Flocculant use achieving a stiff tailings deposition 02PE.05 - Stockpiling rock material for use as an erosion control 02PE.06 - Capping of TSF 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 02PV.09 - Stripping and stockpiling procedures 03SV.05 - Topsoil management plan
MCPL.05.L	Rehabilitation Management	Insufficient spreading of topsoil (not to required thickness) and/or development of soil crusting.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
MCPL.05.M	Rehabilitation Management	Availability of suitable topsoil for growth medium to support revegetation.	Rehabilitation inadequate, requiring further works/importing of topsoil.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
MCPL.05.N	Rehabilitation Management	Topsoil or rock/soil mixture (in particular for dispersive tertiary spoil) unsuitable as growth medium.	Rehabilitation inadequate, requiring further works such as additional treatment/amelioration.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan

Table 24 (Continued)
Identified Unranked Rehabilitation Risks

PRCP ID	Mine Closure / Rehabilitation Aspect	Risk Source	Potential Events / Consequences	Loss Type	Existing / Proposed Risk Treatment / Control
MCPL.05.O	Rehabilitation Management	Substrate inadequate to support revegetation or agricultural land capability (e.g. lack of organic matter, nutrient deficiency, lack of soil biota, adverse soil chemical properties, exposed hostile geochemical materials, overly compacted, and any other factors impeding the effective rooting depth).	Soil quality insufficient to support revegetation.	(E) Environmental Impact	As for MCM.04.I 01DE.01 - Tailings and dam designs and management systems 02PE.04 - Gypsum remediation to improve run-off 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.08 - Water quality monitoring
MCPL.05.Q	Rehabilitation Management	Adoption of inappropriate or inadequate rehabilitation monitoring to inform maintenance program.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.02 - Biannual environmental audits 03SV.04 - Change management for rehabilitation 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
MCPL.05.R	Rehabilitation Management	Adoption of inappropriate or inadequate rehabilitation monitoring to demonstrate compliance with completion criteria.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
MCPL.05.S	Rehabilitation Management	Rehabilitation doesn't align with analogue/reference site, unable to demonstrate compliance with completion criteria.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	01DV.10 - Selection of appropriate analogue and reference sites 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
MCPL.05.T	Rehabilitation Management	Vegetation not self-sustaining, unable to demonstrate compliance with completion criteria.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SY.02 - Milestone and completion criteria 04TV.01 - Guidance on gas borehole decommissioning
MCPL.05.U	Rehabilitation Management	Public/livestock access to void.	Risk to public safety and livestock.	(P) Harm to People	02PE.03 - Site security, fencing, etc. 02PE.07 - Bunding and barricading of voids and steep slopes 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
MCPL.05.V	Rehabilitation Management	Legacy exploration bore holes not rehabilitated at end of mine life.	Rehabilitation inadequate, requiring further works.	(E) Environmental Impact	03SV.09 - Mine voids are ground water sinks 04TV.04 - Response to third party audits
MCPL.05.W	Rehabilitation Management	Discharge of particulates to the atmosphere during rehabilitation earthworks	Air pollution by discharge of particulates	(E) Environmental Impact	02PV.02 - Site land disturbance permits 03SV.06 - Rehabilitation Management Plan 03SY.05 - Contractor Management Plan and Protocols 04TV.02 - Internal reporting of any non-compliances

Table 25
Risk and Control Assessment Criteria

MCPL RISK MATRIX						
LIKELIHOOD		**RISK LEVEL**				
A **Very Likely** (5)	Likely to occur on site in most circumstances.	MODERATE (5)	MODERATE (10)	HIGH (15)	EXTREME (20)	EXTREME (25)
B **Likely** (4)	Probably will occur on site under certain circumstances.	LOW (4)	MODERATE (8)	HIGH (12)	HIGH (16)	EXTREME (20)
C **Possible** (3)	Could occur on site at some point in time.	LOW (3)	MODERATE (6)	MODERATE (9)	HIGH (12)	EXTREME (15)
D **Unlikely** (2)	May occur but not very likely on this site.	LOW (2)	LOW (4)	MODERATE (6)	MODERATE (8)	HIGH (10)
E **Rare** (1)	Highly unlikely to occur on this site.	LOW (1)	LOW (2)	LOW (3)	LOW (4)	MODERATE (5)

Area of Effect	**ESTIMATED LEVEL OF CONSEQUENCE**				
	Low (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
P Harm to People	Report only Near miss First aid injury (RO, FAI)	Medical treatment injury or restricted work injury (MTI, RWI)	Serious injury or disabling reversible impairment (LTI)	Fatality or disabling irreversible impairment	Multiple fatalities
E Environmental Impact	Environmental nuisance Limited damage to minimal area of low significance	Minor short term medium term material environmental harm to small area(s) of limited significance	Serious short to medium term environmental harm with widespread impacts	Major environmental harm Relatively wide spread medium to long term impacts	Extreme environmental harm Long term wide spread effects on environment
A Asset damage and other consequential business losses	Slight damage <$5,000 No disruption to operations	Minor damage <$50,000 Brief disruption < 12 hours	Localised damage <$500,000 Partial shutdown < 1 day	Major damage <$2,000,000 Major shutdown < 1 week	Extensive damage >$2,000,000 Extensive loss > 1 week
R Impact on Reputation	Slight impact Public aware but no public concern	Limited impact Some local public concern	Considerable impact with potential for wider public concern	National impact with potential for wider public concern	International impact. International public attention

Table 25 (Continued)
Risk and Control Assessment Criteria

RISK	ACCEPTABILITY / AUTHORITY TO PROCEED	ACTION TO TAKE
Extreme Risk	**UNACCEPTABLE RISK – STOP – DO NOT START** If an Formal Risk Assessment is being conducted, a Manager is to re-conduct / review risk assessment with a team and identify appropriate controls to reduce the risk to an acceptable level. If a JSEA is being conducted, then a formal Risk Assessment shall be conducted under the guidance of the Department Manger. Upon agreement with findings and the controls the SSE shall formally approve the risk assessment. The SSE may engage more people to review the risk assessment if an acceptable level of risk was not achieved. The SSE must be contacted if not present on the site at the time the hazard / risk are identified.	Cannot proceed until elimination, substitution or engineering controls or a combination of these are implemented to reduce the risk to Moderate or Low. The overall task approach must be under Supervision (minimum the Department Superintendent) when it is undertaken and the most senior personnel at MCPL are aware of the task's occurrence. Emergency Response considerations are documented within the risk assessment. Monitoring of the controls effectiveness (PTO) shall be undertaken and documented by the work's Supervisor throughout the activity.
High Risk	**UNACCEPTABLE RISK – STOP – DO NOT START** If an Formal Risk Assessment is being conducted, Departmental Superintendent is to reconvene the team (option to involve more experts) and review the Risk Assessment. Appropriate controls must be identified to reduce the risk to an acceptable level. If a JSEA is being conducted, then a formal Risk Assessment shall be conducted under the guidance of the Department Superintendent. Upon agreement with findings and the controls the Department Manager shall formally approve the JSEA or RA. The SSE shall review the RA and approve the commencement of the works if the Department Manager is not on site.	Cannot proceed until elimination, substitution or engineering controls or a combination of these are implemented to reduce the risk to Moderate or Low. The task must be Supervised (minimum Supervisor / OCE) while it is being performed and a senior MCPL Manager must be aware that the tsk is being performed. Monitoring of the controls effectiveness (PTO) shall be undertaken and documented by the work's Supervisor throughout the activity.
Moderate Risk	**ACCEPTABLE RISK – CAN START** Provided that identified controls are implemented immediately and the controls effectiveness is being monitored. Relevant OCE / Superintendent shall approve the Risk Assessment / JSEA.	Proceed with task: Requires supervision and monitoring of controls effectiveness.
Low Risk	**ACCEPTABLE RISK – CAN START PROVIDED:** Implement controls are identified. Continue to monitor for changes which may elevate risk score. Relevant OCE / Superintendent shall approve the Risk Assessment / JSEA.	Proceed with agreed controls in place.

Table 26
Controls, Management and Mitigation Measures

Control Name	Expectation	Selection Reason	Responsible
01DE.01 - Tailings and dam designs and management systems	Tailings and other dams appropriately designed - to contain material and any affected water.	Addressing potential for collapse or uncontrolled release of site fluids.	Maintenance & Project Manager
01DV.01 - Surveyed plans of all mine features	Surveyed plans (and all infrastructure included in the PRCP) (to confirm that all locations, structures and features of substance are identified).	Preventing key items or built features not being addressed during rehabilitation as their physical locations are known and mapped.	Technical Services Manager
01DV.02 - Geotechnical analysis and design	Geotechnical analyses and implementation of designs to achieve long term stable landforms. As new materials are identified this leads to review and updating (as required) of designs.	Protection against changes in geotechnical conditions leading to final landform instability.	Technical Services Manager
01DV.03 - Geomorphic design protocols	Current designs are aligned with relevant QLD design principles. Planned to implement geomorphic design principles being applied to the design of the final landform.	Protection against longer term instability of the final landform.	HSEC Manager
01DV.04 - Factor of safety applied to designs	Factor of safety of 2 applied to the void design - to address the weathering expected within 10's of years.	Protection against longer term instability of the final landform.	Technical Services Manager
01DV.05 - Longitudinal study of erosion performance	Prior studies of erosion potential of dumps and rehabilitation methodology has been developed.	Addressing potential for using incorrect inputs in final landform designs.	HSEC Manage r
01DV.06 - Reduced area for final rehabilitation	Progressive rehabilitation (in conformance with the PRCP) minimising the amount of land to rehabilitate.	Addressing potential for extensive works being required at the end of mine life.	Technical Services Manager
01DV.07 - Dump designs allow for rainfall events	Dump designs covering modelled rainfall events.	Addressing potential for excessive erosion in heavy rainfall.	HSEC Manager
01DV.08 - Mine design considers carbonaceous material in dumps	Mine design/mine planning identifies carbonaceous material and manages this appropriately.	Addressing potential for spontaneous combustion in dumps or stockpiles.	Technical Services Manager
01DV.09 - Mine plan makes allowances for rehabilitation of the TSF	Mine plan has significant time-frame for rehabilitating TSF whilst ongoing mining of the pit is occurring.	Addressing potential for incomplete capping of the tailings storage facility.	Technical Services Manager
01DV.10 - Selection of appropriate analogue and reference sites	Selection of appropriate analogue and reference sites - Verterra have reviewed the reference sites to confirm suitability and present a monitoring strategy based on which site suits which domain on site.	Addresses potential to not achieve desired rehabilitation performance due to a lack of understanding of species mix and micro-climate impacts.	HSEC Manager
01DY.01 - Planning for decommissioning works	Appropriate planning and decommissioning works.	Specifically identifies waste products to allow for their safe disposal on or off site.	HSEC Manager
01DY.02 - Revegetation plan (in line with PRCP).	Revegetation plan (in line with PRCP) to identify appropriate species, purchase in line with the plan and arrange for planting and relevant nurturing to meet requirements.	Achieve a species mix which will allow the completion criteria to be met	HSEC Manager
01DY.03 - Offset arrangements	Provisions in place to provide like for like habitat to replace any degraded habitats on the mine site.	Minimise environmental impacts.	HSEC Manager
02PE.01 - Flocculant use achieving a stiff tailings deposition	Operational strategy is the use of flocculant - leading to a very stiff material - which would constrain any release.	Addresses long term escape of stored tailings.	CHPP Manager
02PE.02 - External supplier of seeds	External supplier of seeds.	Addresses potential for poor germination rates and inappropriate seed mix.	HSEC Manager
02PE.03 - Site security, fencing, etc.	Site security, including rural fencing of lease, demarcation and signage, and exclusion of stock.	Addressing potential for overgrazing, access by unwanted third parties or feral animal access to the site.	HSEC Manager
02PE.04 - Gypsum remediation to improve run-off	Gypsum remediation assists in improving run-off quality.	Addressing poor quality run-off from the site.	HSEC Manager
02PE.05 - Stockpiling rock material for use as an erosion control	Rock material for hydraulic breaks over tailings.	Addressing hydraulic erosion of the TSF dam wall (and other dam walls, drains, etc.).	HSEC Manager
02PE.06 - Capping of TSF	Rehab management plan includes procedures for and description of capping requirements for the TSF.	Addressing potential for incomplete capping of the tailings storage facility.	HSEC Manager
02PE.07 - Bunding and barricading of voids and steep slopes	Bunding and barricading - Construct a safety bund wall of competent rock and/or fencing to limit human and livestock/animal access.	Addressing potential for injury to members of the public or livestock at the site.	HSEC Manager

Table 26 (Continued)
Controls, Management and Mitigation Measures

Control Name	Expectation	Selection Reason	Responsible
02PE.08 - Drainage minimises water reporting to voids on site	Executed designs minimise the catchment reporting to the void.	Addressing the unwanted build up of water stocks in site voids.	Technical Services Manager
02PE.09 - Over-topping buffer in site voids	Significant buffer before over-topping and final void water balance indicates a very low risk of spill (<1% annual exceedance probability).	Addressing potential for over-topping of site voids post mining.	Technical Services Manager
02PV.01 - Processes to identify all heritage items	Planning and survey process to identify all heritage items so that they can be avoided.	Prevent damage to a heritage site degrading environmental values in an area.	Health, Safety, Training, Environment & Community Manager
02PV.02 - Site land disturbance permits	Site land disturbance permits.	Preventing damage to heritage sites, natural features or other sensitive locations.	Health, Safety, Training, Environment & Community Manager
02PV.03 - Work is occurring within already disturbed footprints	Work is predominantly occurring within already disturbed footprints.	Preventing disturbance to less affected items of environmental value.	Executive General Manager/SSE
02PV.04 - Rehabilitation of appropriate species of vegetation	Rehabilitation protocols including identifying and planting appropriate species of vegetation.	Minimise the potential that planted species will not lead to meeting required environmental values at closure.	Health, Safety, Training, Environment & Community Manager
02PV.05 - Long mine life (>20 years)	The long mine life (>20 years) means there is sufficient time to confirm the appropriate vegetation strategy and implement accordingly (time to trial multiple options in order to get the processes right for long term rehabilitation success).	Having a long mine life addresses the potential for seasonal variations to misrepresent the effectiveness of rehabilitation efforts.	HSEC Manager
02PV.06 - Erosion and sediment control	Erosion and sediment control - informed by geochemistry assessments and site operating knowledge.	Protecting against releases to the wider environment during construction and for the longer term landform.	Health, Safety, Training, Environment & Community Manager
02PV.07 - Timing for access to rehabilitated areas	Subsequent land holders could not access the land until the ML's are relinquished and MCPL sells the land to a subsequent party.	Prevents damage to the rehabilitated areas by third parties.	HSEC Manager
02PV.08 - Cleared vegetation is mulched or burnt	Vegetation is mulched or burnt.	Addresses potential for unwanted species in the rehabilitated areas.	HSEC Manager
02PV.09 - Stripping and stockpiling procedures	Stripping processes lead to adequate burial (to prevent any spontaneous combustion threats).	Addressing potential for spontaneous combustion in dumps or stockpiles.	Technical Services Manager
02PY.01 - Works conducted by suitable contractors	Works conducted by suitably qualified contractors - including permits for disposing of any contaminated materials.	This business input/control is intended to minimise the potential for poor execution of required works. It is supported by appropriate supervision, inspection and test plans, and formal contractual arrangements to optimise the outcomes from any works.	HSEC Manager
02PY.02 - Specific guidelines for hazardous chemicals	Specific guidelines in place - beyond standard planning and execution that address any hazardous materials on site.	To minimise the outcome from any hazardous materials brought to, used or created by the operating site.	Senior Environment & Community Advisor
03SV.01 - Database which tracks all known heritage items	Database which tracks all known heritage items.	To identify, geo-locate and characterise all items within proximity of the site and workings.	HSEC Manager
03SV.02 - Biannual environmental audits	Two yearly internal (to the company) independent (to the site) environmental audits commissioned by the company and any recommendations are reviewed and actions tracked.	Challenge any slippage of standards and identify emerging conditions that may require additional resources to be allocated.	HSEC Manager
03SV.03 - RQP involvement in TSF design	RPQ involvement of the TSF as a regulated structure - nominated as a significant risk to ecosystems but with low risk to potential downstream features (harm to humans and environment is low) - and subject to annual inspection.	Addressing instability in the tailings storage facility (TSF).	HSEC Manager
03SV.04 - Change management for rehabilitation	Processes available for amending PRCP in the event of requirement to close the mine early (meeting requirements of a stable landform).	Reducing the potential for delivered rehabilitation not meeting community expectations.	HSEC Manager
03SV.05 - Topsoil management plan	Topsoil management plan (includes identifying the resource, addressing/treating any sodic soils, stockpiling to preserve soil quality, site wide topsoil study, monitoring of topsoil pre-rehab to confirm nutrient and soil chemistry levels/requirements) and topsoil balance reporting.	Addressing potential for topsoil to not meet rehabilitation growing requirements.	HSEC Manager
03SV.06 - Rehabilitation management plan	Quantity of required species is in rehab management plan and monitoring of germination rates. The plan also covers monitoring of general rehabilitation performance, offset status/performance, and programmed and as-required maintenance works.	Addressing failure to execute rehabilitation works in line with PRCP and license requirements.	HSEC Manager

Table 26 (Continued)
Controls, Management and Mitigation Measures

Control Name	Expectation	Selection Reason	Responsible
03SV.07 - Weed and Pest Control Management Plan	Weed and Pest Control Management Plan.	Addressing potential for rehabilitation failure due to weeds or invasive pests.	HSEC Manager
03SV.08 - Water quality monitoring	Water quality monitoring for site dams and the receiving environment.	Addressing potential for cumulative impacts from poor quality water presence or release.	HSEC Manager
03SV.09 - Mine voids are ground water sinks	Ground water modelling of long-term performance indicate that voids will continue to act as a ground water sink.	Addressing unintended releases to or draw from ground water/aquifers.	HSEC Manager
03SY.01 - Monitoring and adaptive management programs	Monitoring and adaptive management programs which determine relevant conditions and provide modification (within design parameters) of activities to achieve design goals.	To prevent changes in performance from becoming more significant by reducing the impact of an emerging condition/threat.	HSEC Manager
03SY.02 - Milestone and completion criteria	Milestone and completion criteria to confirm outcomes are being achieved.	Prevent any long-term slippage of progressive rehabilitation.	HSEC Manager
03SY.03 - Annual reporting of PRCP progress to the Regulator.	Annual reporting of PRCP progress to the Regulator.	Minimise the potential for executed rehabilitation drifting from community expectations.	HSEC Manager
03SY.04 - Third party agreements	Third party agreements - Any third party grazing would be in accordance with appropriate license terms (Rural licence).	Addressing unmanaged access to rehabilitated areas by third parties conducting rural businesses.	HSEC Manager
03SY.05 - Contractor Management Plan and Protocols	Contract management - confirming site requirements are met.	Achieved well executed works being performed by contractors.	Maintenance & Projects Manager
03SY.06 - Water Management Plan	Water Management Plan with clean and dirty water diversions around the pit.	Addressing potential for unwanted collection, storage or release of waters on the site during operations and post closure.	HSEC Manager
04TV.01 - Guidance on gas borehole decommissioning	Gas borehole guidance on decommissioning - that lead to a removal of any threats.	To minimise outcome from encountering any unexpected legacy drill holes and associated features during rehabilitation.	HSEC Manager
04TV.02 - Internal reporting of any non-compliances	Internal reporting of any non-compliances (weekly/monthly) in order to alert management to any emerging threats and required allocation of resources.	Minimise the extent to which rehabilitation works fail to meet requirements of the PRCP.	HSEC Manager
04TV.03 - Government rehabilitation bonds in place	Government holds bonds - which are sufficient to return the site to a stable, suitable landform in the event of the company failing.	Addresses failure of the company.	Executive General Manager/SSE
04TV.04 - Response to third party audits	Response to any third party audits - and activation of the exploration rehabilitation requirements.	Addressing leaving an ongoing threat when one has been identified.	HSEC Manager

Table 27
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
General	MCPL.01.A - Insufficient resourcing (including skills and experience of rehabilitation personnel; funding for, or prioritisation of, rehabilitation activities; ongoing maintenance of rehabilitation requirements).	Rehabilitation inadequate, requiring further works.	01DV.06 - Reduced area for final rehabilitation 01DY.03 - Offset arrangements 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place
	MCPL.01.B - Lack of clearly defined responsibilities.		01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place
	MCPL.01.C - Care and maintenance/premature closure.	Delayed rehabilitation.	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place
	MCPL.01.D - Poor monitoring records management, unable to demonstrate compliance with completion criteria.	Rehabilitation inadequate, requiring further works.	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.02 - Biannual environmental audits 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place
	MCPL.01.E - Inadequate consultation with key stakeholders.		01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place
	MCPL.01.F - Change in Isaac Regional Council Planning Scheme.	Final land use no longer aligns with local planning scheme.	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place
	MCPL.05.D - Weather and climatic influences (e.g. drought, intense rainfall events/flooding, bushfire, etc.).	Rehabilitation inadequate, requiring further works.	01DV.07 - Dump designs allow for rainfall events 02PE.08 - Drainage minimises water reporting to voids on site 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
	MCPL.05.G - Vandalism to revegetation areas.		02PE.03 - Site security, fencing, etc. 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.05.H - Inadvertent or unauthorised access to rehabilitated areas by mining equipment and vehicles.	Damage or delays to rehabilitation (e.g. collapse of soil structure), requiring further works.	02PE.03 - Site security, fencing, etc. 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
General (continued)	MCPL.05.P - Adoption of inappropriate or inadequate rehabilitation techniques, timing and scheduling including allocation of the equipment fleet.	Rehabilitation inadequate, requiring further works and potentially compromising position with Regulators.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 02PY.01 - Works conducted by suitable contractors 03SV.04 - Change management for rehabilitation 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan03SY.05 - Contractor Management Plan and Protocols
	MCPL.05.Q - Adoption of inappropriate or inadequate rehabilitation monitoring to inform maintenance program.	Rehabilitation inadequate, requiring further works.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.02 - Biannual environmental audits 03SV.04 - Change management for rehabilitation 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
	MCPL.05.R - Adoption of inappropriate or inadequate rehabilitation monitoring to demonstrate compliance with completion criteria.		02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.05.S - Rehabilitation doesn't align with analogue/reference site, unable to demonstrate compliance with completion criteria.		01DV.10 - Selection of appropriate analogue and reference sites 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
RM1 Infrastructure Decommissioning and Removal	MCPL.02.A - Generation of waste products from demolition process (e.g. conveyors, electrical substations, compressors, services [pipes/cables], stores, laydown areas, etc.).	Inappropriate disposal of waste products (e.g. at licensed disposal facility).	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols
	MCPL.02.B - Failure to remove all infrastructure that is not to be retained post closure (e.g. services, infrastructure, roads, carparks, hardstand areas, concrete footings).	Rehabilitation inadequate, requiring further works.	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors
	MCPL.02.C - Failure to remove all hazardous materials (e.g. carbonaceous material on the surface, hazardous wastes, other wastes).		01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 02PY.02 - Specific guidelines for hazardous chemicals 03SY.05 - Contractor Management Plan and Protocols
	MCPL.02.E - Failure of borehole or gas well seals.	Resealing of boreholes or gas wells required.	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols 04TV.01 - Guidance on gas borehole decommissioning

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM1 Infrastructure Decommissioning and Removal (continued)	MCPL.02.F - Lack of structural integrity of buildings and infrastructure to be retained in final land use.	Collapse/failure of infrastructure to be retained (e.g. dams).	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols
	MCPL.02.G - Impacts on European/ historic heritage items.	Damage to heritage items. Prosecution.	02PV.01 - Processes to identify all heritage items 02PV.02 - Site land disturbance permits 02PV.03 - Work is occurring within already disturbed footprints 03SV.01 - Database which tracks all known heritage items
	MCPL.02.H - Impacts on Aboriginal heritage items.		01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SV.01 - Database which tracks all known heritage items
RM2 Identification and remediation of contaminated land	MCPL.02.C - Failure to remove all hazardous materials (e.g. carbonaceous material on the surface, hazardous wastes, other wastes).	Rehabilitation inadequate, requiring further works.	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 02PY.02 - Specific guidelines for hazardous chemicals 03SY.05 - Contractor Management Plan and Protocols
	MCPL.02.D - Land contamination sites not successfully identified or remediated resulting in impacts to the environment.		01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols
	MCPL.05.I - Adverse/less well understood geotechnical/geochemical issues associated with dumps and process waste storage facilities (e.g. tailings, reject emplacements, presence of sodic sub-soils) overburden and waste rock dumps etc.	Failing to meet completion criteria, significant erosion and poor quality runoff/infiltration from rehabilitated surfaces effecting surface water and groundwater quality.	01DE.01 - Tailings and dam designs and management systems 02PE.04 - Gypsum remediation to improve run-off 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.08 - Water quality monitoring
	MCPL.05.V - Legacy exploration bore holes not rehabilitated at end of mine life.	Rehabilitation inadequate, requiring further works.	03SV.09 - Mine voids are ground water sinks 04TV.04 - Response to third party audits
	MCPL.06.A - Contamination resulting from adjacent mining activities (e.g. storage and use of hydrocarbons/chemicals, drilling fluids, spillage of dirty or produced saline water, brine, sewage, tailings emplacement etc.).	Contamination of waterways or land resulting in infringement notice.	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 02PY.02 - Specific guidelines for hazardous chemicals 03SV.09 - Mine voids are ground water sinks 03SY.06 - Water Management Plan

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM3 Landform Establishment	MCPL.04.B - Insufficient permian rock material for rock mulching and capping of relevant surfaces.	Landform instability, landform failure and insufficient revegetation to meet PMLUs.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control 03SV.06 - Rehabilitation management plan
	MCPL.04.I - Failure of the tailings storage facility over time.	Impact on surrounding landform and movement of tailings off site (Pollution of land or surface water by tailings).	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 02PE.01 - Flocculant use achieving a stiff tailings deposition 02PE.06 - Capping of TSF 03SV.03 - RQP involvement in TSF design
	MCPL.05.I - Adverse/less well understood geotechnical/geochemical issues associated with dumps and process waste storage facilities (e.g. tailings, reject emplacements, presence of sodic sub-soils) overburden and waste rock dumps etc.	Failing to meet completion criteria, significant erosion and poor quality runoff/infiltration from rehabilitated surfaces effecting surface water and groundwater quality.	01DE.01 - Tailings and dam designs and management systems 02PE.04 - Gypsum remediation to improve run-off 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.08 - Water quality monitoring
	MCPL.05.J - Inadequate capping or removal of carbonaceous material.	Spontaneous combustion event.	01DE.01 - Tailings and dam designs and management systems 01DV.08 - Mine design considers carbonaceous material in dumps 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 02PV.09 - Stripping and stockpiling procedures 03SV.05 - Topsoil management plan
	MCPL.05.K - Availability of suitable materials for capping of hazardous materials and tailings.	Unable to cap due to lack of suitable material on site.	01DE.01 - Tailings and dam designs and management systems 01DV.08 - Mine design considers carbonaceous material in dumps 01DV.09 - Mine plan makes allowances for rehabilitation of the TSF 02PE.01 - Flocculant use achieving a stiff tailings deposition 02PE.05 - Stockpiling rock material for use as an erosion control 02PE.06 - Capping of TSF 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 02PV.09 - Stripping and stockpiling procedures 03SV.05 - Topsoil management plan

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM3 Landform Establishment (continued)	MCPL.06.A - Contamination resulting from adjacent mining activities (e.g. storage and use of hydrocarbons/chemicals, drilling fluids, spillage of dirty or produced saline water, brine, sewage, tailings emplacement etc.).	Contamination of waterways or land resulting in infringement notice.	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 02PY.02 - Specific guidelines for hazardous chemicals 03SV.09 - Mine voids are ground water sinks 03SY.06 - Water Management Plan
	MCPL.04.A - Unknown characterisation of spoil material.	Tertiary spoil material is highly susceptible to erosion which could lead to landform instability, landform failure and insufficient revegetation to meet PMLUs.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.C - Final landform instability (e.g. in and out of pit dumps, steep slopes, erosion, highwalls, low walls etc.) affecting post-mining land use.	Landform failure (public safety risk).	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.E - Final landform instability (e.g. steep slopes, erosion, highwalls, low walls etc.) affecting post-mining land use (e.g. due to insufficient amelioration of dispersive tertiary spoil and soils).	Rehabilitation inadequate, requiring further works.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.F - Final landform unsuitable for final land use (e.g. large rocks present affecting cultivation, settlement and surface subsidence leading to extended ponding etc.).		01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.G - Final landforms are not consistent with and do not complement the topography of the surrounding region.		01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.K - Landform (excluding final void domains) not free draining.		01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM3 Landform Establishment (continued)	MCPL.04.H - Erosion and failure of drainage and water management/storage structures.	Impacts on water quality and potential discharge.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.05.W - Discharge of particulates to the atmosphere during rehabilitation earthworks.	Air pollution by discharge of particulates.	02PV.02 - Site land disturbance permits 03SV.06 - Rehabilitation Management Plan 03SY.05 - Contractor Management Plan and Protocols 04TV.02 - Internal reporting of any non-compliances
RM4 Growth Medium Application	MCPL.03.E - Poor quality Topsoil available and spread in areas for revegetation (with contributing factors from relatively young site and limited understanding of requirements by operational teams).	Rehabilitation inadequate, requiring further works.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.04.F - Final landform unsuitable for final land use (e.g. large rocks present affecting cultivation, settlement and surface subsidence leading to extended ponding etc.).	Rehabilitation inadequate, requiring further works.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.05.A - Loss of biological and habitat resources (e.g. subsoil, topsoil, vegetative material, seedbank, rocks, etc.) through clearing, salvage and handling practices.	High quality vegetation/habitat resources lost.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.05.L - Insufficient spreading of topsoil (not to required thickness) and/or development of soil crusting.	Rehabilitation inadequate, requiring further works.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.05.M - Availability of suitable topsoil for growth medium to support revegetation.		02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.05.N - Topsoil or rock/soil mixture (in particular for dispersive tertiary spoil) unsuitable as growth medium.	Rehabilitation inadequate, requiring further works such as additional treatment/amelioration.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM5 Revegetation	MCPL.03.A - Landform aspect not suitable for intended target plant species - not meeting required habitats for fauna. With causes including the establishment of overly steep slopes (18.5 degrees may be too steep for ongoing leading practice works on site).	Inability to meet post-mining land use criteria.	01DV.10 - Selection of appropriate analogue and reference sites 01DY.02 - Revegetation plan (in line with PRCP) 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances
	MCPL.03.D - Inappropriate revegetation species mix for targeted final land use.	Rehabilitation inadequate, requiring further works.	
	MCPL.03.B - Tree species established are not suited to riparian environment.	Rehabilitation inadequate, requiring further works and compromising long term stability of diversions.	01DY.02 - Revegetation plan (in line with PRCP) 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances
	MCPL.04.J - Lack of infrastructure to support intended final land use (e.g. dams, fences, watering facilities, etc.). Note: Intended final land use is native ecosystem - minimal infrastructure required.	Farm dams retained insufficient to support grazing and additional dams required.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.05.A - Loss of biological and habitat resources (e.g. subsoil, topsoil, vegetative material, seedbank, rocks, etc.) through clearing, salvage and handling practices.	High quality vegetation/habitat resources lost.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.05.B - Lack of availability and quality of seed resources.	Rehabilitation inadequate, requiring further works.	02PE.02 - External supplier of seeds 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
	MCPL.05.C - Weed and pest control (or lack thereof), including damage from insects, plant disease, fauna and livestock.	Rehabilitation inadequate, requiring further works.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.07 - Weed and Pest Control Management Plan

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM5 Revegetation (continued)	MCPL.03.B - Tree species established are not suited to riparian environment.	Rehabilitation inadequate, requiring further works and compromising long term stability of diversions.	01DY.02 - Revegetation plan (in line with PRCP) 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances
	MCPL.04.J - Lack of infrastructure to support intended final land use (e.g. dams, fences, watering facilities, etc.). Note: Intended final land use is native ecosystem - minimal infrastructure required.	Farm dams retained insufficient to support grazing and additional dams required.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.05.A - Loss of biological and habitat resources (e.g. subsoil, topsoil, vegetative material, seedbank, rocks, etc.) through clearing, salvage and handling practices.	High quality vegetation/habitat resources lost.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.05.B - Lack of availability and quality of seed resources.	Rehabilitation inadequate, requiring further works.	02PE.02 - External supplier of seeds 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
	MCPL.05.C - Weed and pest control (or lack thereof), including damage from insects, plant disease, fauna and livestock.	Rehabilitation inadequate, requiring further works.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.07 - Weed and Pest Control Management Plan
	MCPL.05.E - Insufficient establishment or cover of vegetation due to high plant mortality.		02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.06 - Rehabilitation Management Plan
	MCPL.05.T - Vegetation not self-sustaining, unable to demonstrate compliance with completion criteria.		02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SY.02 - Milestone and completion criteria 04TV.01 - Guidance on gas borehole decommissioning
RM6 Achievement of Surface Conditions	MCPL.02.A - Generation of waste products from demolition process (e.g. conveyors, electrical substations, compressors, services [pipes/cables], stores, laydown areas, etc.).	Inappropriate disposal of waste products (e.g. at licensed disposal facility).	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM6 Achievement of Surface Conditions (continued)	MCPL.04.C - Final landform instability (e.g. in and out of pit dumps, steep slopes, erosion, highwalls, low walls etc.) affecting PMLU.	Landform failure (public safety risk).	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.D - Final landform instability (e.g. NUMAs, final voids, etc.) affecting PMLU	Landform failure (public safety risk) and NUMAs causing environmental harm.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.H - Erosion and failure of drainage and water management/storage structures.	Impacts on water quality and potential discharge.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.K - Landform (excluding final void domains) not free draining.	Rehabilitation inadequate, requiring further works.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.05.O - Substrate inadequate to support revegetation or agricultural land capability (e.g. lack of organic matter, nutrient deficiency, lack of soil biota, adverse soil chemical properties, exposed hostile geochemical materials, overly compacted, and any other factors impeding the effective rooting depth).	Soil quality insufficient to support revegetation.	As for MCM.04.I 01DE.01 - Tailings and dam designs and management systems 02PE.04 - Gypsum remediation to improve run-off 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.08 - Water quality monitoring
	MCPL.06.A - Contamination resulting from adjacent mining activities (e.g. storage and use of hydrocarbons/chemicals, drilling fluids, spillage of dirty or produced saline water, brine, sewage, tailings emplacement etc.).	Contamination of waterways or land resulting in infringement notice.	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 02PY.02 - Specific guidelines for hazardous chemicals 03SV.09 - Mine voids are ground water sinks 03SY.06 - Water Management Plan
	MCPL.06.D - Failure of final landform embankments in proximity to the southern residual void.	Inundation of the southern residual void and potential discharge to receiving environment.	01DV.02 - Geotechnical analysis and design 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols
	MCPL.06.F - Poor water quality/excessive discharges (e.g. acid-drainage, high salinity, etc.).	Impact to receiving environment.	02PV.09 - Stripping and stockpiling procedures 03SV.09 - Mine voids are ground water sinks 03SY.06 - Water Management Plan

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM7 Stable PMLU Condition	MCPL.01.F - Change in IRC Planning Scheme.	Final land use no longer aligns with local planning scheme.	01DV.06 - Reduced area for final rehabilitation 02PV.07 - Timing for access to rehabilitated areas 03SV.04 - Change management for rehabilitation 04TV.03 - Government rehabilitation bonds in place
	MCPL.03.A - Landform aspect not suitable for intended target plant species - not meeting required habitats for fauna. With causes including the establishment of overly steep slopes (18.5 degrees may be too steep for ongoing leading practice works on site).	Inability to meet PMLU criteria.	01DV.10 - Selection of appropriate analogue and reference sites 01DY.02 - Revegetation plan (in line with PRCP) 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances
	MCPL.03.C - Tree species established along creek diversions are not suited to riparian environment.	Rehabilitation inadequate, requiring further works and compromising long term stability of diversions.	01DY.02 - Revegetation plan (in line with PRCP) 02PV.04 - Rehabilitation of appropriate species of vegetation 02PV.05 - Long mine life (>20 years) 03SY.01 - Monitoring and adaptive management programs 03SY.02 - Milestone and completion criteria 03SY.03 - Annual reporting of PRCP progress to the Regulator 04TV.02 - Internal reporting of any non-compliances
	MCPL.04.C - Final landform instability (e.g. in and out of pit dumps, steep slopes, erosion, highwalls, low walls etc.) affecting PMLU.	Landform failure (public safety risk).	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.D - Final landform instability (e.g. NUMAs, final voids, etc.) affecting post-mining land use.	Landform failure (public safety risk) and NUMAs causing environmental harm.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM7 Stable PMLU Condition (continued)	MCPL.04.I - Failure of the tailings storage facility over time.	Impact on surrounding landform and movement of tailings off site (Pollution of land or surface water by tailings).	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs02PE.01 - Flocculant use achieving a stiff tailings deposition 02PE.06 - Capping of TSF 03SV.03 - RQP involvement in TSF design
	MCPL.04.J - Lack of infrastructure to support intended final land use (e.g. dams, fences, watering facilities, etc.). Note: Intended final land use is native ecosystem - minimal infrastructure required.	Farm dams retained insufficient to support grazing and additional dams required.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.05.A - Loss of biological and habitat resources (e.g. subsoil, topsoil, vegetative material, seedbank, rocks, etc.) through clearing, salvage and handling practices.	High quality vegetation/habitat resources lost.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
	MCPL.05.C - Weed and pest control (or lack thereof), including damage from insects, plant disease, fauna and livestock.	Rehabilitation inadequate, requiring further works.	02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan 03SV.07 - Weed and Pest Control Management Plan
	MCPL.06.A - Contamination resulting from adjacent mining activities (e.g. storage and use of hydrocarbons/chemicals, drilling fluids, spillage of dirty or produced saline water, brine, sewage, tailings emplacement etc.).	Contamination of waterways or land resulting in infringement notice.	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 02PY.02 - Specific guidelines for hazardous chemicals 03SV.09 - Mine voids are ground water sinks 03SY.06 - Water Management Plan
RM8 Retained Water Structures	MCPL.02.F - Lack of structural integrity of buildings and infrastructure to be retained in final land use.	Collapse/failure of infrastructure to be retained (e.g. dams).	01DV.01 - Surveyed plans of all mine features 01DY.01 - Planning for decommissioning works 02PY.01 - Works conducted by suitable contractors 03SY.05 - Contractor Management Plan and Protocols
	MCPL.04.H - Erosion and failure of drainage and water management/storage structures.	Impacts on water quality and potential discharge.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.J - Lack of infrastructure to support intended final land use (e.g. dams, fences, watering facilities, etc.). Note: Intended final land use is native ecosystem - minimal infrastructure required.	Farm dams retained insufficient to support grazing and additional dams required.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
RM8 Retained Water Structures (continued)	MCPL.06.A - Contamination resulting from adjacent mining activities (e.g. storage and use of hydrocarbons/chemicals, drilling fluids, spillage of dirty or produced saline water, brine, sewage, tailings emplacement etc.).	Contamination of waterways or land resulting in infringement notice.	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 02PY.02 - Specific guidelines for hazardous chemicals 03SV.09 - Mine voids are ground water sinks 03SY.06 - Water Management Plan
	MCPL.06.B - Diversion of surface water runoff away from catchment areas.	Loss of water flow downstream due to capture of water in voids.	02PE.08 - Drainage minimises water reporting to voids on site 02PV.06 - Erosion and sediment control 03SY.06 - Water Management Plan
	MCPL.06.C - Water accumulation in residual voids.	Overtopping/discharge to receiving environment.	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 03SV.09 - Mine voids are ground water sinks
	MCPL.06.E - Groundwater seepage from residual voids.	Impact to receiving environment.	02PE.08 - Drainage minimises water reporting to voids on site 03SV.09 - Mine voids are ground water sinks
MM1 High- and Low Wall Treatment	MCPL.04.D - Final landform instability (e.g. NUMAs, final voids, etc.) affecting PMLU.	Landform failure (public safety risk) and NUMAs causing environmental harm.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
MM2 Achievement of Surface Conditions	MCPL.05.U - Public/livestock access to void.	Risk to public safety and livestock.	02PE.03 - Site security, fencing, etc. 02PE.07 - Bunding and barricading of voids and steep slopes 02PV.02 - Site land disturbance permits 02PV.08 - Cleared vegetation is mulched or burnt 03SV.05 - Topsoil management plan
MM3 Achievement of Sufficient Improvement	MCPL.04.C - Final landform instability (e.g. in and out of pit dumps, steep slopes, erosion, highwalls, low walls etc.) affecting PMLU.	Landform failure (public safety risk).	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.D - Final landform instability (e.g. NUMAs, final voids, etc.) affecting PMLU.	Landform failure (public safety risk) and NUMAs causing environmental harm.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control
	MCPL.04.E - Final landform instability (e.g. steep slopes, erosion, highwalls, low walls etc.) affecting post-mining land use (e.g. due to insufficient amelioration of dispersive tertiary spoil and soils).	Rehabilitation inadequate, requiring further works.	01DV.02 - Geotechnical analysis and design 01DV.03 - Geomorphic design protocols 01DV.04 - Factor of safety applied to designs 01DV.05 - Longitudinal study of erosion performance 02PV.06 - Erosion and sediment control

Table 27 (Continued)
Interactions between Rehabilitation Milestones and Identified Rehabilitation Risks

Rehabilitation Milestone	Risk Sources	Associated Potential Events/Consequences	Relevant Controls
MM3 Achievement of Sufficient Improvement (continued)	MCPL.06.B - Diversion of surface water runoff away from catchment areas.	Loss of water flow downstream due to capture of water in voids.	02PE.08 - Drainage minimises water reporting to voids on site 02PV.06 - Erosion and sediment control 03SY.06 - Water Management Plan
	MCPL.06.C - Water accumulation in residual voids.	Overtopping/discharge to receiving environment.	02PE.08 - Drainage minimises water reporting to voids on site 02PE.09 - Over-topping buffer in site voids 03SV.09 - Mine voids are ground water sinks
	MCPL.06.E - Groundwater seepage from residual voids.	Impact to receiving environment.	02PE.08 - Drainage minimises water reporting to voids on site 03SV.09 - Mine voids are ground water sinks

3.6.3 Rehabilitation Trials and Studies

Rehabilitation trials are undertaken at the Middlemount Coal Mine to inform and improve rehabilitation methodologies for the nominated rehabilitation outcomes. Rehabilitation trials are intended to better manage and minimise the risk of a stable condition not being achieved.

Table 28 below provides a summary of rehabilitation trials undertaken to date at the Middlemount Coal mine, as well as future trials planned to inform ongoing improvements to rehabilitation. Table 28 outlines for each trial:

- the objective of the trial;
- the trial design including, but not limited to, the location, underlying land characteristics and potential issues;
- the details of how the trial will be carried out;
- when the trial will commence;
- the duration of the trial;
- how the trial will be assessed for success;
- how the results of the trial will be incorporated into rehabilitation strategies and the development of milestones; and
- where the trial has previously been carried out by the applicant.

Table 28
Onsite Rehabilitation Trial Details

Rehabilitation Trial and Objectives	Trial Design and Details	Trial Commencement, Location and Duration	Assessment of Success	Incorporation into Rehabilitation Strategies and Milestones
Rock Mulch Trial on the South Dump Outer Slope to determine rock mulch effectiveness at controlling erosion	Trial was established upon a 4H:1V slop using Permian overburden rock and topsoil, covering an area of 7.5 ha of the outer batter of the south dump (Bilyarra, 2020)	Rehabilitation of the rock mulch trial was undertaken in September 2017 within the trial area.	The application of rock mulch was not effective in controlling the development of a series of down cutting gullies across the slope (LRS Environmental, 2017).	This trial was not incorporated into the rehabilitation strategies and milestones.

Table 28 (continued)
On Site Rehabilitation Trial Details

Rehabilitation Trial and Objectives	Trial Design and Details	Trial Commencement, Location and Duration	Assessment of Success	Incorporation into Rehabilitation Strategies and Milestones
North Top of Dump Trial	Trial involved the leveling of spoil, establishing of drains, surface grading and the topsoil replaced. The trial area was then deep ripped, fertilised and seeded with a species mix (Bilyarra, 2019).	Rehabilitation of the North Dump trial was undertaken in 2017, with monitoring in both 2018 and 2019 being noted.	Within the 2018 monitoring, urochloa was noted as the dominant pasture grass, with other species being observed within the rehabilitation area. Within all quadrats, 74% were identified to have less than 50% projected cover (LRS Environmental, 2018). Within the 2019 monitoring of the rehabilitation area, it was observed that Rhodes was the dominant pasture species within 47& of all quadrants. The other dominant pasture species across the rehabilitation trial was both buffel and urochloa (Bilyarra, 2020).	The outcome of the trial was utilised to inform which grassy species would perform as an pasture grass for the rehabilitated land within the PMLU. The trial was also used as an indication of the effectiveness of just topsoil as an rehabilitation method.

Additional studies were compiled both on and off site for the effectiveness of differing methods to control erosion effects on site. The details of these studies are provided below.

Within 2019, a comparison of utilising two different types of rock within the rock mulch was undertaken by Landloch. The two rocks that are studied pit sandstone (Permian rock) and Quarry rock (from Parrot Quarry), with size restrictions for the mulch of 300 mm to 450 mm and a rock:topsoil ratio of 4:1 (Landloch, 2019). This trial was commenced within 2019, with bulk samples being sent to Landloch's Toowoomba Laboratory to be mixed into proportions of rehabilitation interest. The material was testing utilising simulated rain and overland flow, with a control group consisting of just topsoil.

Quarry rock was investigated and found to be considered impractical (Landloch, 2019). Topsoil, along with sufficient vegetation cover level (> 40 %), can be utilised to achieve erosion targets within slopes ≤ 17 %. Rock mulch (utilising 4:1 Permian rock to topsoil) will be required for higher gradients to achieve stability (Landloch, 2019).

Composite soil sampling was undertaken by MCPL personnel within 2021, with laboratory results and recommendations provided by Verterra (2021b). The objective of this study is to determine the recommended rates for both the amelioration (gypsum) and fertilizing requirements.

Additional requirements are the determination of the recommended application and incorporation of ameliorants into rehabilitation zones, and the recommended revegetation species and rates based upon soil analysis. Samples were taken from across the Middlemount Coal Mine, for each rehabilitation area (Verterra, 2021b) (Figure 17).

Post-vegetation modelling indicates a trend of decreased risk of high/very high surface erosion than the pre-vegetation establishment across all sample areas, highlighting the importance of early vegetation cover establishment within rehabilitation works. Additionally, the primary cause of tunnel erosion formation is the inclusion of ripping into the model. Whilst ripping can provide benefits, ripping on the contour or within rocky, dispersive profiles may lead to ponding, seepage and preferential flow paths.

Although less pronounced, a similar trend is recognised where high/very high tunnel erosion risk is reduced post-vegetation establishment (Verterra, 2021b). Amelioration was identified to have a significant effect on the reduction of both surface and tunnel erosion, and should be applied to topsoil if rock mulch is < 500 mm thick.

Soil and waste analysis was undertaken by Landloch within 2019, testing three samples of topsoil and three samples of waste for differing chemical and physical properties. The particle size analysis showed that two of the topsoil samples being similar, with the third topsoil sample possessing more clay and an increased sandy loam texture. Particle distributions of all three waste samples were alike, possessing relatively similar clay, fine and coarse sand proportions between the samples.

Across both the topsoil and the waste samples, the levels of nitrogen were measured to be low, indicating that the organic content within the samples was low. The topsoil samples possessed low phosphorous levels, with plant available phosphorous levels were measured to be moderate in two of the samples, and low in the other sample. The waste samples possessed high phosphorous levels, with plant available phosphorus being measured as moderate across all samples (Landloch, 2019).

Compost analysis was undertaken at Landloch within 2019, testing three samples of compost that were collected by Middlemount Coal Mine personnel for differing chemical properties. Plant available nitrogen was very high, ranging from 27,936 mg/kg to 31,027 mg/kg. Plant available phosphorus was also very high, ranging form 4,300 mg/kg to 4,410 mg/kg within the compost samples. All three samples were also extremely saline, with electrical conductivity ranging from 11.7 dS/cm to 13.4 dS/cm. This high salinity is likely caused by the high levels of chloride within the samples. These high levels of salinity, nitrogen and chloride will cause issues if too much compost is incorporated within the revegetation soils. It is recommended that the rate of compost applied and incorporated into the soil be reduced from 25 m^3/ha to approximately 13 m^3/ha, diluting the chloride and nitrogen levels within the soil into tolerable levels for most plants (Landloch, 2019).

Further soil analysis was undertaken within the Thirteen Mile Creek diversion in 2020, with samples being undertaken from six soil stockpiles, four of which consisting of a clay texture and two consisting of a sandy texture. Chemical properties of the samples were tested, with all samples recording low plant available nitrogen. Plant available phosphorus levels were low to moderate for most of the soil samples undertaken, with one sample recording a high phosphorus level.

The electrical conductivity within the samples all ranged from very low to high, however, chloride levels were recorded as low across the samples, meaning that soluble salts present have a lower likelihood of impairing plant growth. Fertiliser recommendations provided are utilised to improve the levels of nitrogen within the soil, with soluble urea recommended to be applied to aid in the rapid establishment of grasses and shrubs. Application of a polymer coated urea should be applied, to ensure a slow release of nitrogen into the soil, maintaining nitrogen levels for plant growth. For long term nitrogen sources, appropriate legume species are recommended to be incorporated within any seed mixes proposed for revegetation.

3.7 MONITORING AND MAINTENANCE

3.7.1 Milestone Monitoring

Successful revegetation outcomes rely on an integrated and adaptive approach to risk identification and control. Monitoring plays an integral part within the overall management strategy, as it will enable early detection of any risks to revegetation areas as well as the effectiveness of risk management actions undertaken. Effective monitoring will enable significant processes or trends to be detected and, where required, appropriate management actions to be implemented.

Table 30 and 31 provides an overview of the monitoring and/or maintenance program for each of the rehabilitation and improvement milestones, including timing of the activities, quality assurance and/or data management procedures, as well as reporting and review procedures.

3.7.1.1 Revegetation Monitoring

Revegetation monitoring is split into two phases, an establishment phase and a maintenance phase (Table 29). Areas of endemic floral vegetation (i.e. Treatment Zones 1, 2 and 3) have longer establishment and maintenance phases because tree and shrub species as well as grasses and forbs will be directly seeded.

Table 29
Revegetation Phases

Phase	Definition	Anticipated Timeframe (Years)	
		Treatment Zone 1	Treatment Zone 2 and 3
Establishment	The period required for revegetated areas to become self-reliant without watering in normal seasonal conditions.	2	5
Maintenance	The period of growth post-establishment until the time that the revegetated plants become dominant and self-sustaining on the site.	3-5	6-20

A summary of the proposed monitoring methods for each Treatment Zone is provided in Table 32 and discussed in further detail in the Revegetation Plan (Appendix H).

Rehabilitation monitoring sites will be established consistent with the Middlemount Coal Mine Rehabilitation Monitoring Program 2021 (MCPL, 2021) (Attachment 4) and the Revegetation Management Plan (Verterra, 2023) following the completion of each rehabilitation area. Monitoring at these sites will include:

- one fixed 50 m transect;
- one 50 m x 10 m plot (centred on the 50 m transect); and
- five 1 m x 1 m quadrats (at 10 m intervals along the transect, alternating sides).

Sites will be placed at random within newly established rehabilitation polygons, at a density of approximately one site per 10 ha. The data to be collected in each plot/subplot is summarised in Table 32 and discussed further below. Photographic records and GPS locations for all monitoring sites and observed issues will be kept up to date in an appropriate database. To monitor revegetation progress, the data for each vegetation scenario will be averaged across monitoring sites established in similar timeframes and compared to the corresponding reference sites.

Table 30
Management Milestones for Rehabilitation Areas

Rehabilitation Milestone	Timeframe	Milestone Criteria	Monitoring and Maintenance	Timing of Monitoring and Maintenance	Quality Assurance and Data Management Processes and Systems	Reporting and Review
RM1 Infrastructure Decommissioning and Removal	3 months	• All services disconnected and decommissioned	Confirm all services decommissioned	Immediately after decommissioning and removal works are completed.	Decommissioning and removal works will be conducted and certified by suitably qualified person(s).	A report will be provided by the relevant person(s) detailing the activities completed.
		• All wastes removed from site. • All built and service infrastructure demolished and removed (except if agreed in writing by the post-mining landowner/holder to retain for beneficial re-use as stated in Attachment 3 .	Confirm all relevant materials, buildings, water storages and other built and service infrastructure demolished and removed (unless otherwise agreed in writing with landholders and relevant agencies).			

RM2
Identification and Remediation of Contaminated Land
	3 months	• Contaminated land investigation completed by an AQP in accordance with the *Environmental Protection Act 1994 including;*
		  • Confirmation that contaminated materials have been removed or remediated;
		  • Confirmation that contaminated water and sediment in dams are treated or removed off site;
		  • No potential for acid rock drainage, and acid rock drainage is measured against the threshold detailed in the Global Acid Rock Drainage Guide (INAP, 2009); and
		  • A Site Suitability Statement confirming the suitability of the property for the PMLUs.
			Prepare report detailing outcomes/recommendations as a result of the preliminary and intrusive contaminated land investigations.	Within two weeks of undertaking investigations.	Preliminary and intrusive contaminated land investigations will be conducted by suitably qualified person(s).	The Annual Return will include a summary of all remediation works.

		• The Contaminated Land Investigation Document is supported by a Site Investigation Report, and where appropriate, a Validation Report and/or a draft Site Management Plan.	Site suitability statement prepared confirming suitability of land with PMLU. Validation testing completed detailing outcomes and confirming removal of contaminated soils.	Immediately following completion of site suitability statement and commencement validation testing.	Validation testing will be conducted by suitably qualified person(s).	The Annual Return will include a summary of outcomes from validation testing.

		• Where ongoing management of residual contamination is deemed appropriate:
		  • Hydrocarbon, heavy metal, or other contaminants are established in accordance with DES Queensland Auditor Handbook for Contaminated Land);
		  • A draft Site Management Plan is prepared, and approval of the Site Management Plan is obtained from the administering authority.
		  • Site added to the Environmental Management Register if required.
			Monitor levels of hydrocarbons, heavy metals, salinity and cation exchange capacity.
			
			Notification that site has been successfully added to the Environmental Management Register received, If required.
				Immediately following removal/remediation of contaminated materials/land.
				
				Immediately following addition of site to the Environmental Management Register.
					Removal/remediation works will be conducted by suitably qualified person(s).	The Annual Return will include a summary of any sites added to the Environmental Management Register.

Table 30 (continued)
Management Milestones for Rehabilitation Areas

Rehabilitation Milestone	Timeframe	Milestone Criteria	Monitoring and Maintenance	Timing of Monitoring and Maintenance	Quality Assurance and Data Management Processes and Systems	Reporting and Review
RM3 Landform Establishment (continued)	6 months	**General (applicable to all rehabilitated areas)** • All major earthworks (including reshaping, pushing/trimming) completed in accordance with design specification provided by an AQP to achieve final stable landforms. • AQP certifies all rehabilitated landforms achieves a factor of safety of 1.5. • The erosion and sediment control systems are designed by an AQP, installed, and fit for purpose. **Infrastructure area (MIA, CHPP, Roads)** • Rehabilitated areas slopes ≤5% • Slopes over 2% do not exceed continuous slope length of 70m. • Natural drainage lines are reinstated. **Water storage structures** • Dam liners removed from site. • Dams to remain for landholder use are safe for stock access and have vegetated banks. • Landform shaped to be gently sloping characteristic of the natural landform. **Waste rock emplacement areas** • Overburden spoil dump area slopes are <16%. • Rock mulch applied to slopes >16% at minimum application rate of 0.5m. For existing rehabilitation areas and waste dumps designed areas (RA2) totalling 52ha, where previously constructed slopes are ≤33 %, rock mulch is applied at a minimum application rate of 0.5m. **TSF** • Establishment of Permian caps and bunds on coal reject cells. • TSF surface reshaped to prevent ponding. • Engineering report for completed cover system certifies that the installed capping system is as per engineering design plan and is geotechnically stable.	Review and confirm the landform is consistent with requirements.	Immediately following completion.	"As built" drawings will be prepared by a suitably qualified and experienced person(s). Engineering report will certify the cover/capping system has been constructed and installed as per the design.	The Annual Return will include a summary of the development and reshaping of the land, and will include a summary of the capping undertaken. The engineering and design plans will be provided to the Environment & Community Superintendent.

Table 30 (continued)
Management Milestones for Rehabilitation Areas

<table>
<tr><th>Rehabilitation Milestone</th><th>Timeframe</th><th>Milestone Criteria</th><th>Monitoring and Maintenance</th><th>Timing of Monitoring and Maintenance</th><th>Quality Assurance and Data Management Processes and Systems</th><th>Reporting and Review</th></tr>
<tr><td>RM4
Growth Medium Application</td><td>6 months</td><td>• An assessment of soil health and suitability has been completed by an AQP to confirm soil suitability to support relevant PMLU as per this schedule.
• An assessment of growth media characteristics is completed by an AQP that identifies appropriate level of growth medium to achieve requirements stipulated in PRCP schedule Appendix 11: Target range for growth medium nutrients.
• Topsoil ameliorated based on following targets:
(i) Total Nitrogen: >1,500 milligram [mg] per kg [mg/kg]
(ii) Phosphate: >20 mg/kg)
(iii) Organic matter: >1.7%
(iv) ESP:<6%
• Topsoil placed to a minimum depth of 200 mm.
• Topsoil harrowed on areas <16% slope.
• Topsoil and spoil ripped to improve the water infiltration rate.
• Soil surface crusting less than 2%.</td><td>Assessment of soil health and surface preparation activities undertaken and confirmed to meet requirements.</td><td>Immediately following completion.</td><td>Surface preparation will be conducted and certified by a suitably qualified person(s).</td><td>The Annual Return will include a summary of surface preparation activities.</td></tr>
<tr><td>RM5
Revegetation</td><td>12 months</td><td>• Direct seeding completed as per the following:
• PRCP Schedule Appendix 1: Seed mix proportion
• PRCP Schedule Appendix 2: Species list for remnant and non-remnant vegetation
• Seeding is based on achieving the following REs at the following domains:
<table><tr><td>MIA and CHPP area</td><td>RE11.5.9</td></tr><tr><td>Roads including haul roads</td><td>RE11.3.2</td></tr><tr><td>Water storage/management dams</td><td>RE11.3.27</td></tr><tr><td>TSF and TFC</td><td>RE11.7.2</td></tr><tr><td>Creek diversion and levee banks</td><td>RE11.3.25</td></tr><tr><td>Waste Rock Emplacement areas</td><td>RE11.5.3</td></tr></table></td><td>Early survivorship assessment.

Confirm seed placement has occurred to depth of approximately 5 cm (i.e. machinery has been set accordingly).

Confirm establishment of vegetation cover and evidence of generational succession.</td><td>Zero, three, six and 12 months after completion of seeding.

Annually.</td><td>Suitably qualified person(s) to undertake revegetation monitoring and record progressive development allowing for tracking of trends against milestone criteria and reference sites.</td><td>The Annual Return will include a summary of revegetation activities and associated monitoring data.</td></tr>
</table>

Table 30 (continued)
Management Milestones for Rehabilitation Areas

Rehabilitation Milestone	Timeframe	Milestone Criteria	Monitoring and Maintenance	Timing of Monitoring and Maintenance	Quality Assurance and Data Management Processes and Systems	Reporting and Review

RM6
Achievement of Surface Conditions
	5 years	• Rehabilitated areas are devoid of slumping and active gully erosion.
		• Non-vegetation cover (stones, rock cover, litter, logs etc) does not cover greater than 30% of the total area.
		• A minimum of 65% ground cover is present.
		• Bare surface areas not exceeding 10 m^2 in area or, 10 m in length on a slope.
		• Target native trees, shrubs and grass species number and composition is consistent with –
		  • PRCP schedule **Appendix 2: Species list for remnant and non-remnant vegetation** and;
		  • PRCP schedule **Appendix 3: Benchmark for Regional Ecosystem**
		• Reseeding or plantation of tube stock completed if determined necessary by an AQP to achieve PRCP schedule Appendix 3: Benchmark for Regional Ecosystem.
		• The annual monitoring conducted by an AQP shows absence of prohibited or restricted invasive plants (as defined in Biosecurity Act 2014) in groundcover.
		• No evidence of erosion classified as 'moderate' or 'severe' as defined by PRCP Schedule Appendix 4: Erosion classification framework.
		• Soil testing demonstrates achievement of the following parameters:
		  a. Rootzone EC <0.15mS/cm,
		  b. Soil pH <9 and >6 as measured at any part of the root zone,
		  c. Exchangeable Sodium Percentage (ESP%) <6% (at 0-10cm depth).
			Photo monitoring.
			Line intercept monitoring.
			Soil monitoring
				Annually, for a period of five years.	Suitably qualified person(s) to undertake monitoring and record progressive development allowing for tracking of trends against milestone criteria and reference sites.	The Annual Return will include a summary of surface conditions and associated monitoring data.

		• Surface water quality results monitored monthly during flow at, but not limited to, downstream locations specified in the Appendix 5: Receiving Water Upstream Background Sites and Downstream Monitoring Points of this schedule achieve the following water quality criteria:
		  a. pH: 6.5-9.0
		  b. Electrical conductivity: <700-µS/cm
		  c. Sulfate: <66mg/L
		  d. Total suspended solids (TSS): <562mg/L
		• If the surface water quality exceeds criteria above, the applicable upstream/reference site must be compared to the downstream site result; and if the quality measured at a downstream site is equal to or less than the quality measured at the applicable upstream/reference site, no further action is required.
			Water quality testing and review.	Six-monthly		The Annual Return will include a summary of water quality monitoring data

		• A Bushfire Management Plan developed in accordance with relevant Queensland Fire and Emergency Services is implemented and risk reviewed every 2 years.	Review bushfire risk. Implement recommendations, as necessary.	Every two years.	Bushfire risk review to be undertaken by suitably qualified person(s).	The Annual Return will include a summary of all bushfire risk related works.

Table 30 (continued)
Management Milestones for Rehabilitation Areas

<table>
<tr><th>Rehabilitation Milestone</th><th>Timeframe</th><th>Milestone Criteria</th><th>Monitoring and Maintenance</th><th>Timing of Monitoring and Maintenance</th><th>Quality Assurance and Data Management Processes and Systems</th><th>Reporting and Review</th></tr>
<tr>
<td>RM7
Stable PMLU Condition</td>
<td>Up to 20 years</td>
<td>

AQP certified the final landform is geotechnically stable and achieved a 1.5 factor of safety.
Site not listed in the Environment Management Register.
Rehabilitation area has remained stable when comparing photographs from successive monitoring events, for a period of at least five years post-rehabilitation.
No evidence of erosion classified as ‘severe’ as defined by PRCP Schedule Appendix 4: Erosion classification framework.
All drainage follows appropriate drainage paths, fit for purpose designed by an AQP.
Non-native cover crop grass species constitute no more than 20% total vegetative groundcover confirmed by an AQP in annual monitoring (except for RA9 and RA10, which has up to 100% non-native cover crop grass species).
A BioCondition assessment is completed by an AQP using the methodology outlined in the latest version of the Queensland Herbarium’s ‘BioCondition Assessment Manual’.
The BioCondition assessment required under RM7(7.g) demonstrates achievement of the PRCP Benchmark for each assessable attribute for the relevant regional ecosystem as per PRCP Schedule Appendix 3: Benchmark for Regional Ecosystem. The relevant regional ecosystem for each domain is given in the following table:

<table>
<tr><td>MIA and CHPP area</td><td>RE11.5.9</td></tr>
<tr><td>Roads including haul roads</td><td>RE11.3.2</td></tr>
<tr><td>Water storage/management dams</td><td>RE11.3.27</td></tr>
<tr><td>TSF and TFC</td><td>RE11.7.2</td></tr>
<tr><td>Creek diversion and levee banks</td><td>RE11.3.25</td></tr>
<tr><td>Waste Rock Emplacement areas</td><td>RE11.5.3</td></tr>
</table>
</td>
<td>Final landform review.
Obtain record of site removal from the Environmental Management Register.

Photo monitoring.
Line intercept monitoring.
Review against BioCondition Assessment requirements by AQP.</td>
<td>At commencement of milestone.</td>
<td>Certification provided by suitably qualified and experienced person(s).</td>
<td>The Annual Return will include a summary of rehabilitation progress.

The Annual Return will include a summary of surface conditions and associated monitoring data.</td>
</tr>
</table>

Table 30 (continued)
Management Milestones for Rehabilitation Areas

Rehabilitation Milestone	Timeframe	Milestone Criteria	Monitoring and Maintenance	Timing of Monitoring and Maintenance	Quality Assurance and Data Management Processes and Systems	Reporting and Review

RM7
Stable PMLU Condition
(continued)
	Up to 20 years	• AQP reviewed and confirmed that the hydraulic and geomorphic characteristics of rehabilitated portions of Roper Creek (Diversion 1 and 2), and Thirteen Mile Gully (Diversion) are similar to the undisturbed sections of Roper Creek and Thirteen Mile Gully channels.
		• There is no evidence of seepage occurring within the mining tenure.
		• Surface water quality results monitored monthly during flow at, *but not limited to,* downstream locations specified in the **Appendix 5: Receiving Water Upstream Background Sites and Downstream Monitoring Points** of this schedule must not exceed the following, for a minimum of 5 consecutive years:
		  ○ pH: 6.5-9.0
		  ○ Electrical conductivity: <700-µS/cm
		  ○ Sulfate: <66mg/L
		  ○ TSS: <562mg/L
		  ○ Iron (Dissolved): 300 µg/L
		  ○ Mercury (Dissolved): 0.2 µg/L
		  ○ Selenium (Dissolved): 10 µg/L
		  ○ Aluminium (Dissolved): 55 µg/L
		  ○ Boron (Dissolved): 370 µg/L
		  ○ Uranium (Dissolved): 1 µg/L
		• If the surface water quality exceeds criteria above, the applicable upstream/reference site must be compared to the downstream site result; and if the quality measured at a downstream site is equal to or less than the quality measured at the applicable upstream/reference site, no further action is required.
		• Groundwater quality should be monitored quarterly at, *but not limited to,* monitoring bores listed in **Appendix 6: Groundwater Quality Monitoring Locations and Frequency** of the schedule, for quality characteristics listed in **Appendix 7: Groundwater Quality Limits** of the schedule and 3 consecutive results must not exceed limits included in **Appendix 7: Groundwater Quality Limits** of the schedule for a minimum of 5 consecutive years.
		• Groundwater level is monitored quarterly at, *but not limited to,* monitoring bores listed in **Appendix 8: Groundwater level monitoring locations** of the schedule, and all results must not exceed the Trigger Level Thresholds outlined in **Appendix 9: Groundwater Level Thresholds** of the schedule for a minimum of 5 consecutive years.
			Water quality testing and review.	Six-monthly.	Suitably qualified person(s) to undertake monitoring and record progressive development allowing for tracking of trends against milestone criteria and reference sites.	The Annual Return will include a summary of water quality monitoring data.
						.

Table 30 (continued)
Management Milestones for Rehabilitation Areas

Rehabilitation Milestone	Timeframe	Milestone Criteria	Monitoring and Maintenance	Timing of Monitoring and Maintenance	Quality Assurance and Data Management Processes and Systems	Reporting and Review
RM8 Retained Water Structures	2 years	• All retained water storages to be assessed and approved as safe and stable by an AQP. • Retained water storage water quality for quality characteristics must not exceed the trigger values for livestock drinking water defined in ANZECC & ARMCANZ 2000.	Review of water quality against comparable reference sites.	Annually	Testing to be undertaken by suitably qualified person (s	The Annual Return to include a summary of water quality for any retained water structures.

Table 31
Management Milestones for Improvement Areas

Management Milestone	Timeframe	Milestone Criteria	Monitoring and Maintenance	Timing of Monitoring and Maintenance	Quality Assurance and Data Management Processes and Systems	Reporting and Review
MM1	2 years	• Certification from an AQP that the final void landform, including low and high walls are geotechnically stable and achieved a factor or safety of 1.5. • Highwall competent rock slopes are <60°, and incompetent slopes <55° with geotechnical stability achieving the minimum 1.5 Factor of Safety. • Low wall batters < 37°. • Low wall overall slope <27°and treated with rock mulch. • Slope geometry for the final voids is as follows: iv. Surficial Soils – Overall slope angle <20° v. Weathered Permian – Bench height <30 m. – Berm width <25 m – Batter Angle <55°. vi. Fresh Permian – Bench height ≤60 m – Berm width 60 m – Batter angle ≤60°. • Northern Void ≤358 ha in surface area and 285,870,000 m3 in volume. • Southern void ≤163 ha in surface area and 157,960,000 m^3 in volume.	Review and confirm the final void high- and low walls are consistent with requirements.	Immediately following completion.	"As built" drawings will be prepared by a suitably qualified and experienced person(s).	The Annual Return will include a summary of the development and reshaping of the land.
MM2	12 months	• Access is prohibited to final voids by a bund wall with a minimum height of 2 m, a minimum base width of 4 m and be located at least 10 m beyond the area potentially affected by any instability of the pit edge. • Bunding confirmed to be geotechnically stable by an AQP. • Appropriate signage placed every 100 m of the perimeter of the void to clearly identify and convey the purpose (e.g. EP Act 1994 Non- Use Management Area No Entry). • Installation of fencing completed for the residual void management areas to limit human and livestock access.	Visual inspection of bund wall and signage.	Following installation.	Record of visual inspection.	Record of visual inspection to be provided to Environment and Community Superintendent.
MM3	2 years	• Bund wall remains in place. • Appropriate signage remains in place.	Visual inspection of bund wall and signage.	One and two years after commencement of milestone.	Record of visual inspection.	Record of visual inspection to be provided to the Environment & Community Superintendent.
		• Final voids remain structurally stable, with no maintenance requirements and are predicted to remain stable. • High walls and low walls certified by an AQP as geotechnically stable. • Installation of contour or graded drains as per construction design certified by an AQP. • Groundwater quality should be monitored quarterly at, *but not limited to,* monitoring bores listed in PRCP Schedule **Appendix 7: Groundwater Quality Limits**, for quality characteristics listed in **Appendix 8: Groundwater Level monitoring locations** of the PRCP Schedule, and all results comply with limits included in **Appendix 8: Groundwater Level monitoring locations** of the Schedule for a minimum of 5 consecutive years. • Final void walls confirmed to drain internally to the final void. • Certification from an AQP that water level in each residual void will not cause environmental harm to the surrounding environment, and the voids act as groundwater sinks to the receiving groundwater environment.	Review and confirm the landform is consistent with requirements.	Immediately following completion.	Engineering report will certify the final voids remain stable.	The engineering report will be provided to the Environment & Community Superintendent.

Table 32
Monitoring Methods for Rehabilitation Milestones

Performance Indicator	Completion Criteria	Monitoring Method	Monitoring Measurement/ Analysis	Treatment Zone 1	Treatment Zone 2	Treatment Zone 3	Establishment	Maintenance
Landform Stability and Erosion	No evidence of moderate or severe erosion[2]	Vegetation Monitoring	Line intercept (50 m transect)	✓	✓	✓	✓	✓
	Erosion maintenance requirements are comparable to designated vegetation reference sites, for a period of at least five years post- mining.	Documentation review	N/A	✓	✓	✓	✓	✓
Topsoil Characterisation	Hydrocarbon, heavy metal, or other contaminants are within allowable limits in accordance with DES Queensland Auditor Handbook and has been certified by an appropriately qualified person.	Soil sampling	Heavy metals scan, Hydrocarbons	✓	✓	✓	✓	
	EC levels of less than 0.15 mS/cmm in soil root zone or less than 110% of designated vegetation reference sites.		Salinity (dS/m)	✓	✓	✓	✓	
	Cation exchange capacity levels are greater than 4 in soil root zone or greater than 110% of designated vegetation reference sites.		Cation Exchange Capacity (CEC)	✓	✓	✓	✓	

[2] Severe erosion has any of the following characteristics – Loss of surface horizons, root exposure, etc. (sheet erosion), >30 rills and/or any >0.3 m deep (rill / gully erosion); presence of tunnel erosion; or evidence of mass soil movement.

Table 32 (Continued)
Monitoring Methods for Rehabilitation Milestones

Performance Indicator	Completion Criteria	Monitoring Method	Monitoring Measurement/ Analysis	Treatment Zone 1	Treatment Zone 2	Treatment Zone 3	Establishment	Maintenance
Ecosystem Functionality and Sustainability	Litter density comparable to designated vegetation reference sites.	Vegetation monitoring	Groundcover quadrats (5 x 1 m^2 quadrats)	✓	✓	✓		✓
	Pasture grass and native species are comparable in cover to designated vegetation reference sites.		Tree and shrub diversity (1 m^2 x 1 m^2 quadrats along 50 m transect at 10 m intervals).	✓	✓	✓		✓
	Evidence of generational succession of trees and shrubs is apparent in rehabilitation areas.		Tree and shrub diversity (1 m^2 x 1 m^2 quadrats along 50 m transect at 10 m intervals).	✓	✓	✓		✓
Native Ecosystem	minimum of 65% vegetation cover is present, and evidence of generational succession of trees and shrubs is apparent in rehabilitated areas.	Vegetation monitoring	Groundcover quadrats (5 x 1 m^2 quadrats)	✓	✓			✓
	Direct seeding of cover crop, pasture species and native vegetation completed (seed mix proportions relevant to native vegetation specified in Revegetation Management Plan and Appendix 1 and 2 of the PRCP Schedule).		Tree and shrub diversity (1 m^2 x 1 m^2 quadrats along 50 m transect at 10 m intervals).	✓	✓		✓	✓

Table 32 (Continued)
Monitoring Methods for Rehabilitation Milestones

Performance Indicator	Completion Criteria	Monitoring Method	Monitoring Measurement/ Analysis	Treatment Zone 1	Treatment Zone 2	Treatment Zone 3	Establishment	Maintenance
Pest Flora and Fauna	Evidence of weed management being successful by weed diversity and density being less than 110% of baseline survey results and abundance being comparable to designated vegetation reference sites.	Vegetation monitoring	Weed cover (1 m^2 x 1 m^2 quadrats along 50 m transect at 10 m intervals)	✓	✓	✓	✓	✓
	Evidence of effective pest management with pest species abundance being comparable to designated vegetation reference sites.		Observations and analysis of vegetation monitoring (5 x 1 m^2 plot)	✓	✓	✓	✓	✓

3.7.1.2 Reference Sites

11 reference sites have been established at the Middlemount Coal Mine in accordance with Condition G11 of EA EPML00716913 and the Middlemount Coal Mine Rehabilitation Monitoring Program (Figure 22) to provide a benchmark for rehabilitation monitoring sites to develop rehabilitation success criteria. Table 33 below lists the reference sites relative to certain revegetation scenarios.

Table 33
Rehabilitation Reference Sites

Site	Easting	Northing	Domain Reference	Ecosystem Description
Existing Reference Sites as per Table G11 of EA EPML00716913 and Middlemount Rehabilitation Monitoring Program (MCPL, 2021)				
1	662226	7475606	• In-pit and out-of-pit spoil dumps	RE 11.5.3
2	665445	7469732	• MIA and CHPP Area • Roads including haul roads • Tailing Storage Facility	RE 11.5.9
3	665832	7470708	• Roads including Haul Roads	RE 11.7.2
4	666054	7469733	• MIA and CHPP Area • Roads including haul roads • Tailing Storage Facility	RE 11.5.9/11.5.18
5	666693	7469888		RE 11.7.2/11.7.1
6	667513	7469830		RE 11.3.2/11.3.7
7	667020	7469836		RE 11.7.2/11.7.1
8	667397	7471016	• Creek Diversions and Levee Banks	RE 11.3.25
9	667724	7471051		RE 11.3.25
10	666702	7473050		RE 11.3.1/11.3.2
11	671581	7472907	• In-pit and out-of-pit spoil dumps	RE 11.5.3
Proposed Reference Sites as per the Revegetation Management Plan				
AS1	662883	7475606	Area not currently in use.	Pre clear RE 11.5.3
AS2	664591	7468202	Area not currently in use.	Pre clear RE 11.12.2
AS3	663833	7471263	Area not currently in use.	Pre clear RE 11.3.25

3.7.1.3 Survivorship Assessment

Monitoring the survivorship of seeded stock will commence immediately after the wet season to obtain baseline data and then at three, six and twelve-month intervals thereafter.

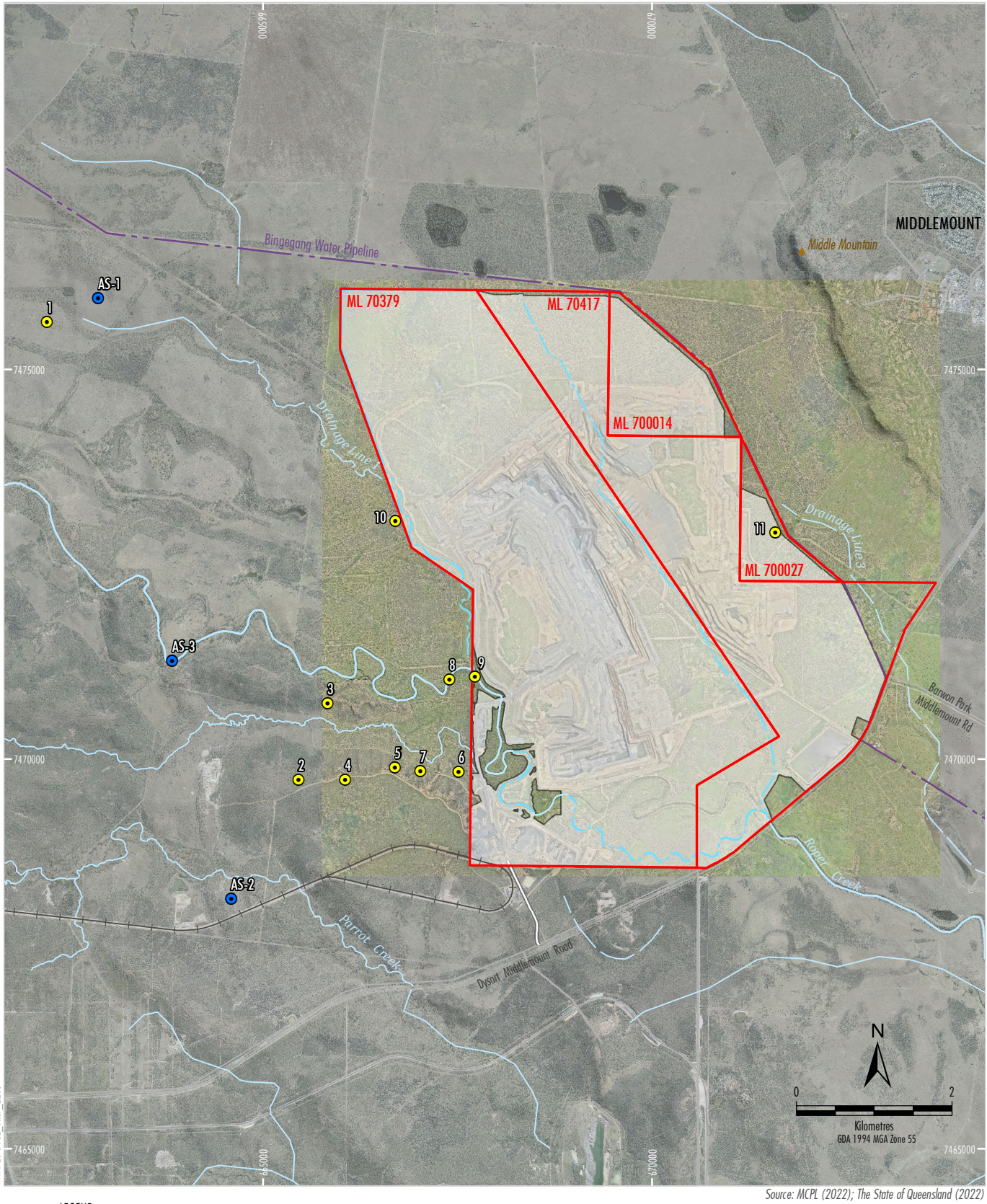
All germinated seeds along the transect will be counted. If survivorship is less than 65 %, supplementary seeding will be undertaken.

Note that monitoring the survivorship does not need to be undertaken by an Ecologist.

3.7.1.4 Landform Stability and Erosion

At the centre point of the transect (25 m), four (4) landscape photos (north, south, east and west) will be taken to record and assess site stability.

An estimation of the prevalence of erosion features, including sheets, rills and gullies along the 50 m transect will be made using the line intercept method. The start and end points of erosion features as they intersect the 50 m transect will be recorded, allowing total length of erosion features to be compared with reference site values.



MCPL-20-04 SE_RKP_222C

Source: MCPL (2022); The State of Queensland (2022)
Orthophoto Mosaic: 2021, 2015

LEGEND

- Mining Lease Boundary (ML)
- Approved Disturbance Footprint
- Middlemount Rail Spur and Loop
- Mine Access Road
- Diversion Structure

Rehabilitation Reference Sites

- Existing
- Proposed

middlemount coal PTY LTD

MIDDLEMOUNT COAL MINE

Existing and Proposed Rehabilitation Reference Sites

Figure 22

3.7.1.5 Topsoil Characterisation

Soil sampling will be undertaken at all monitoring sites during the establishment phase and subsequently if further investigation is required based on other monitoring data (e.g. persistent poor performance in relation to ground cover, erosion etc.).

Soil sampling will generally be undertaken according to the following methodology:

- At the 20 m mark and 40 m mark of each transect, a small area (25 cm by 25 cm) will be cleared of loose surface vegetation, litter and debris to avoid inclusion in the soil sample. Where grass and/or other growing vegetation is present, the vegetation will be cut off at ground level and discarded.
- A clean spade will be used to collect two 0.25 L soil samples to a depth of 10 cm below the surface of the soil.
- The two samples will be combined in a clean plastic clip seal bag (total soil sample approximately 0.5 L) and labelled with site name, monitoring point identifier, collection date and collector's name using a permanent marker.
- Labelled soil samples will be sent for analysis as soon as possible following collection.

3.7.1.6 Ecosystem Functionality and Sustainability

Groundcover and Organic Litter

For the 1 x 1 m quadrats, groundcover will be split into the following components: native perennial grass cover, native forb cover, pasture grass cover, non-native grass cover (that are not pasture species), non-native forb cover and leaf litter, rock and bare ground. Groundcover will be measured by a vertical projection downwards of the living and attached plant material.

Plant Species List / Richness

All pasture and native flora species within the 50 m by 10 m plot (i.e. 5 m either side of the central transect) will be recorded. The presence or absence of reproductive structures (flowers and/or fruit) per species will be noted.

Evidence of Generational Succession

The recruitment attribute assesses the presence of regeneration of the dominant tree and shrub species in the 50 m x 10 m plot. Recruitment is assessed as the proportion of dominant species present at a site that are regenerating.

Tree Canopy Height

Tree canopy height (measured to the top of the highest leaves) refers to the median canopy height in metres, estimated for the trees in the ecologically dominant layer (EDL) or canopy layer within the 50 m x 10 m plot. The median canopy height is the height that has 50 % of canopy trees higher and lower than it.

Tree and Shrub Cover

An estimation of the percentage canopy cover of the living, native tree layer along the 50 m transect will be made using the line intercept method (Greig Smith, 1964). Canopy cover equates to crown cover as defined by Walker and Hopkins (1990). The vertical projection of the tree canopy over the 50 m transect will be recorded. The total length of the project canopy cover of each layer is then divided by the total length of the tape to give an estimate of percentage canopy cover on the site, which then can be compared with the reference site value.

Shrub canopy cover refers to the estimate of the percentage cover of native shrubs recorded along the 50 m transect (similar to the estimation of tree canopy cover using a vertical projection of shrub crowns downwards over the centre line transect).

3.7.1.7 Native Ecosystem Suitability

Groundcover and Organic Litter

For the 1 m x 1 m quadrats, groundcover will be split into the following components: native perennial grass cover, native forb cover, pasture grass cover, non-native grass cover (that are not pasture species), non-native forb cover and leaf litter, rock and bare ground. Groundcover will be measured by a vertical projection downwards of the living and attached plant material.

Plant Species List/Richness

All pasture and native flora species within the 50 m x 10 m plot (i.e. 5 m either side of the central transect) will be recorded.

3.7.1.8 Pest Flora and Fauna

Weed Density

The number of stems or estimate foliage projective cover within the 50 m x 10 m plot of each non-pasture weed species will be recorded. The data will then be extrapolated to obtain the number of stems per ha.

For the 1 m x 1 m quadrats, groundcover will be split into the following components: native perennial grass cover, native forb cover, pasture grass cover, non-native grass cover (that are not pasture species), non-native forb cover and leaf litter, rock and bare ground. Groundcover will be measured by a vertical projection downwards of the living and attached plant material.

Pest Animal Browsing Damage

Pest animal browsing damage is defined as any evidence of damage to planted grasses, shrubs and trees by wallabies, hares, rabbits etc. Where possible, the number of plants within the 50 m x 10 m plot will be counted. A score of 0 to 3 will then be assigned to the plot, with 0 being no damage, 1 being light damage, 2 being moderate damage and 3 being severe damage.

3.7.2 Rehabilitation Maintenance/Contingency

Consistent with the requirements of Condition G14 of the Middlemount Coal Mine EA EPML00716913, MCPL undertakes regular monitoring of rehabilitation areas at the Middlemount Coal Mine in the form of the annual Middlemount Coal Mine Rehabilitation Monitoring Program.

The *Middlemount Coal Mine Rehabilitation Monitoring Program* collects site-specific data on a regular basis to assess and compare against the Middlemount Coal Mine rehabilitation objectives, indicators and completion criteria. The outcomes of monitoring are used to determine the performance of the rehabilitation, and to identify any areas that are at risk of failing to reach rehabilitation objectives. The findings of the Rehabilitation Monitoring Program are compiled annually into a report and submitted to the administering authority.

Whilst the Rehabilitation Monitoring Program would be superseded by this PRCP, all monitoring methods would continue to be implemented as part of the PRCP and regular monitoring and subsequent maintenance and contingencies for rehabilitated areas would continue to take place at the Middlemount Coal Mine.

3.7.2.1 Weed Control

Weed invasion is common throughout the Middlemount Coal Mine area, especially in disturbed areas. As part of Terrestrial Ecology Studies undertaken for the Middlemount *Coal Mine Stage 2 Environmental Impact Statement* four declared plants listed under the *Land Protection (Pest and Stock Route Management) Act, 2002* were recorded (Prickly Acacia [*Acacia nilotica*], Tiger Pear [*Opuntia aurantiaca*], Prickly Pear [Opuntia stricta], and Parthenium Weed [*Parthenium hysterophorus*]). Studies undertaken for the Western Extension and Southern Extension Projects further identified Velvety Tree Pear (*Opuntia tomentosa*) and Harrisia Cactus (*Harrisia martini*) within the Middlemount Coal Mine area.

A weed management strategy is implemented at the Middlemount Coal Mine to reduce the presence of environmental weeds/restricted invasive plants which have potential to impact on the desired conservation outcomes.

The procedure for controlling and monitoring environmental weeds/restricted invasive plants will be as follows:

1. Monitor the location and density of environmental weeds/restricted invasive plants through inspections, including annual monitoring events.
2. Identification of suitable control methods for target environmental weeds/restricted invasive plants.
3. Implementation of the selected control methods on the target environmental weeds/restricted invasive plants.
4. Follow-up site inspections to evaluate the effectiveness of the weed control (within 2 weeks of control).
5. Follow-up control where previous control has been sub-optimal (within 2 weeks of point 4).

Additional weed management activities at the Middlemount Coal Mine to reduce the presence of environmental weeds/restricted invasive plants include:

- Vehicle and machinery wash down before entering the rehabilitation works;
- Treatment of any significant infestations; and
- Recording and mapping infestations/treatments.

The implementation of measures that favour the restoration of healthy native vegetation is also an effective method of weed management. The introduction, establishment and spread of environmental weeds/restricted invasive plants will be minimised through regular monitoring and treatment activities.

In regard to weed management measures, physical removal and chemical application are the main weed control methods available. Appropriately qualified persons will be engaged to undertake weed control.

Active weed control measures will be necessary during establishment of revegetated areas. Management techniques will be species specific, however the preferential management hierarchy is:

- Handpull.
- Spot spray.
- Cut stump (for established woody weeds).

Minor infestations of weeds would be hand removed from rehabilitation areas, larger infestations however would be spot spayed with “frog friendly” glyphosate or approved equivalent (eg. ROUNDUP Bioactive®, Weedmaster DUO®). Broad scale herbicide application will generally be avoided due to the likelihood of damaging or killing grass cover and reducing site stability.

The following controls will be implemented to reduce the risks to safety and environment where appropriate:

- Herbicide applications will be primarily carried out by professional commercial operators, licenced under the *Agricultural Chemicals Distribution Control Act 1966*.
- Weed hygiene declarations for all equipment and vehicles brought onto the site will be up to date prior to arrival. An onsite inspection protocol for equipment and vehicles including personnel and contractor training will be developed and implemented.
- Work orders issued to contractors will stipulate constraints on spray operations, including weather constraints relating to wind, rainfall and temperatures.
- Work orders issued to contractors will include clear operations maps showing delineated work areas, boundaries of different treatment zones and locations of sensitive areas and weed hygiene boundaries.

3.7.2.2 Irrigation/Watering

For the majority of the Middlemount Coal Mine revegetation process, dryland seeding is proposed, with no manual watering activities or irrigation planned to promote soil moisture and sustain vegetation growth.

In some circumstances revegetation of riparian vegetation (blanket cover crop, stoloniferous grasses and legumes) may require irrigation for at least six to eight weeks before the start of the wet season. Hand watering or spraying from a water truck will be utilised where establishment of irrigation is not feasible or practicable.

3.7.2.3 Erosion and Sediment Control

Erosion control strategies are implemented on a catchment basis at the Middlemount Coal Mine. Erosion control structures that have been installed at the Middlemount Coal Mine include, but are not limited to, the following:

- Non-natural erosion control techniques such as chemical surface stabilisers, erosion control matting, soil cement treatment, and/or surface roughening to be used when natural control techniques are unavailable.
- Long sections of run-off in the workings and haul road areas may have bunds installed to minimise the velocity of water. Regular diversions installed off the works via stabilised discharge points.
- Limit the access of clean water in active pit areas by diverting it away or into sediment controls.

Site vehicles and plant generally confined to the defined roadways to prevent unnecessary destabilisation of surfaces.

Sediment control strategies are also implemented on a catchment basis at the Middlemount Coal Mine. Sediment control strategies that have been installed at the Middlemount Coal Mine include, but are not limited to, the following:

- Discharging of sediment basins as required by portable primer pumps with flexible hosing when possible.
- Inspection of sediment ponds and control devices following events such as significant rainfall.
- Boundaries of the permitted disturbance area clearly marked and reinforced through both formal training and toolbox meetings.
- No mining traffic allowed outside the marked disturbance area except at designated entry and exit points.
- Machinery operators given instructions regarding the extent of the site operations, and the meaning of site markings prior to the commencement of works.
- Buffer zones as sediment control devices used where possible.
- Sediment controls, such as silt fences and diversion rains, may be used where sediment run-off occurs as reasonably uniform sheet flow on a slope. The preferable maximum catchment for sediment fences is 0.6 ha per 100 m of fence. Where larger catchments give rise to higher flows, which are concentrated in a narrow channel, more substantial devices than sediment fences may be required.
- Permanent settlement structures constructed and modified as required, and utilised during the site set up phase as a component of the temporary drainage.

3.7.2.4 Management of Pest Fauna

To maintain and preserve the quality of the revegetated pasture (once established), a pest fauna management strategy is implemented at the Middlemount Coal Mine to monitor and, where necessary, control pest fauna. A number of pests have been recorded at the Middlemount Coal Mine including the Red Fox (*Vulpes vulpes*), Feral Pig (*Sus scrofa*), Feral Cat (*Felis catus*), European Rabbit (*Oryctolagus cuniculus*), Cane Toad (*Rhinella marina*) and Wild Dog (*Canis lupis*) (MCPL, 2014; 2020).

Mine staff and/or appropriately qualified persons will be engaged to undertake pest fauna control as required using the most current best-practice methods. The procedure for controlling pest fauna is as follows:

1. Identification of suitable control methods for target vertebrate pest animals (e.g. trapping, systematic 1080 baiting and/or shooting).
2. Implementation of the selected control methods on the target vertebrate pest animals (focusing on high activity areas).
3. Follow-up control where previous control has been sub-optimal.

Where regular monitoring indicates that damage to rehabilitation areas is significant (i.e. browsing from wallabies, hares, rabbits etc) fencing and tree guards will be installed to protect affected areas. Some level of reseeding may be required in these areas following the result of monitoring.

The following actions implemented as part of the pest fauna management strategy:

- Protect feed and water sources.
- Regularly check and mend broken fences.
- Ensure any buildings are in good repair.
- Dispose of any carcasses properly and promptly.
- Work with neighbours and other producers in the area to implement a coordinated approach to feral animal control.
- Keep records as part of the control program.
- Refer to any regional, State or National action plans

Removing available feed and maintaining a clean, rubbish-free environment in order to discourage scavenging and reduce the potential for colonisation of these areas by non-endemic fauna (e.g. introduced rodents, predators and birds) is undertaken at the Middlemount Coal Mine.

3.7.2.5 Management of Livestock

Livestock should be excluded from areas undergoing active revegetation. If native trees are included within the pasture seed mix, these may require several years before they can tolerate potential cattle presence and browsing stress on the trees should be considered before allowing cattle access to the area. Livestock should be excluded from these areas through the use of fencing.

Once revegetation has been successfully established, low density beef cattle grazing may occur for weed control. Benefits of introducing livestock to revegetation areas may include nutrient recycling, stimulation of active growing phases and fire risk reduction.

- Total grazing pressure.
- Appropriate utilisation/stocking rates.
- Strategic grazing (e.g. spelling and herd management).
- Pasture composition.
- Use of hay, supplements, fodder trees and shrubs in a strategic manner.
- Foraging budget strategies.
- Climate and seasonal forecasting of resources.
- Fire management practices.
- Fencing according to land type.
- Access to water.

3.7.3 Reporting Requirements

3.7.3.1 Annual Return

In accordance with section 316J of the EP Act, MCPLs Annual Return must include an evaluation of the effectiveness of:

- the actions taken in relation to each rehabilitation milestone or management milestone under the PRCP Schedule; and
- the environmental management carried out under the PRCP Schedule.

The evaluation must state whether any rehabilitation milestones or management milestones to be completed under the PRCP Schedule during the year have been met and whether MCPL has complied with the conditions imposed on the PRCP Schedule.

3.7.3.2 Progressive Certification

Under section 318Z of the EP Act, the administering authority may certify that a particular area within a relevant tenure for a resource project has been rehabilitated under all relevant requirements of the EP Act, EA EPML00716913, a PRCP Schedule and any relevant guidelines or documents made under the EP Act.

As required by section 318ZF of the EP Act, the progressive certification report must:

- contain the following information:
  - information showing how the rehabilitation milestones and management milestones under the PRCP Schedule have been achieved; and
  - information about the extent to which the relevant conditions stated in the PRCP Schedule have been complied with;
- include:
  - a map of an appropriate scale that shows the proposed certified area; and
  - relevant information to locate the proposed certified area, including, for example, GPS information or a survey; and
- if progressive certification has previously been given for a relevant tenure for the environmental authority:
  - state when the certification was given; and
  - identify the certified area.

3.7.3.3 Surrender Application

Under section 257 of the EP Act, MCPL may apply to the administering authority to surrender the EA (EPML00716913) if, under the *Mineral Resources Act 1989*, MCPL has sought a conditional surrender for all, or part of, a relevant mining tenure.

The surrender application must be accompanied by a compliance statement for the EA, the PRCP Schedule and the conditions imposed on the PRCP Schedule. The compliance statement must state:

- the extent to which relevant activities carried out under the environmental authority have complied with the conditions of the authority;
- whether the rehabilitation milestones and management milestones under the PRCP Schedule have been met; and
- the extent to which conditions imposed on the PRCP Schedule have been complied with.

3.7.4 Auditing

In accordance with section 285 of the EP Act, MCPL must commission an audit of the PRCP Schedule by a rehabilitation auditor for the following periods:

- the three-year period starting on the day the PRCP Schedule takes effect; and
- each three-year period starting on the day after the previous audit period ended.

MCPL must, within four months after the end of each audit period, give the administering authority the rehabilitation auditor's report and a declaration for the audit report stating that MCPL has not knowingly given false or misleading information to the rehabilitation auditor and has given all relevant information to the rehabilitation auditor.

In accordance with section 286 of the EP Act, an audit report for a PRCP Schedule must be in the approved form, and include the following:

- a statement about whether the holder has complied with the PRCP Schedule during the audit period, including:
  - details of actions MCPL has taken, or failed to take, in relation to the rehabilitation milestones and management milestones under the PRCP Schedule; and
  - whether MCPL has complied, or failed to comply, with conditions imposed on the PRCP Schedule; and
  - whether information given to the administering authority about rehabilitation carried out under the PRCP Schedule is accurate;
- an assessment of whether the PMLU for land the subject of the PRCP Schedule is likely to be achieved, having regard to the rehabilitation that has been and is to be carried out under the PRCP Schedule; and
- recommendations about actions MCPL should take to ensure rehabilitation milestones and management milestones are achieved or conditions of the PRCP Schedule are complied with.
- any other information the administering authority reasonably considers necessary to decide whether to take action to amend the schedule under part 6 of the EP Act.

In addition to the mandatory three-yearly audits, the administering authority has the power (under section 322 of the EP Act) to issue an audit notice, which requires the holder of a PRCP Schedule to commission an audit.

3.8 REFERENCES

4T Consultants Pty Ltd (2017) *Middlemount Coal Mine Western Extension Project Groundwater Bore Census.*

Australian and New Zealand Environment and Conservation Council & Agriculture and Resource Management Council of Australia and New Zealand (2000) *Water Quality Guidelines.*

Arrow Energy Pty Ltd (2012) *Bowen Gas Project Environmental Impact Statement – Appendix M Groundwater model technical report. October 2012*

Australasian Groundwater and Environmental Consultants Pty Ltd (2018) *Middlemount Coal Mine Western Extension Project – Groundwater Assessment.*

Australasian Groundwater and Environmental Consultants Pty Ltd (2020) *Middlemount Coal Mine Southern Extension Project - Groundwater Impact Assessment.*

Australian Government (2016a) *Leading Practice Sustainable Development program for the Mining Industry – Mine Rehabilitation*.

Australian Government (2016b) *Leading Practice Sustainable Development program for the Mining Industry – Closure.*

Bilyarra Consulting Pty Ltd (2020) *2019 Rehabilitation Monitoring Report*

Baker, D.E. and Eldershaw, V.J. (1993). *Interpreting Soil Analysis for agricultural use in Queensland*. QDPI QO93014.

Barnett *et al.* (2012) Australian Groundwater Modelling Guidelines

Biodiversity Australia (2018a) *Ecological Impact Assessment: Western Extension Project, Middlemount Coal Mine, Middlemount.*

Biodiversity Australia (2018b) *Ecological Monitoring for Middlemount Coal Offset Areas.*

Biodiversity Australia (2019) *Ecological Monitoring for Middlemount Coal Offset Areas.*

Biodiversity Australia (2020) *Middlemount Coal Mine Southern Extension Project Terrestrial Ecology Assessment*.

Bureau of Meteorology (2020) *Groundwater Dependent Ecosystems Atlas*. Website: http://www.bom.gov.au/water/groundwater/gde/index.shtml

Bureau of Meteorology (2021) *Climate Data Online*.

Commonwealth Scientific and Industrial Research Organisation (2015) *Climate Change in Australia Technical Report.*

Department of Environment and Heritage Protection (2014a) *Queensland Environmental Offsets Policy — Significant Residual Impacts Guideline.*

Department of Environment and Science (2014) *Guideline: Rehabilitation Requirements for mining resource activities.*

Department of Environment and Science (2018). *Environmental Management Register.* Website: https://www.qld.gov.au/environment/pollution/management/contaminatedland/search-registers

Department of Environment and Science (2020a) *Guide to Determining Terrestrial Habitat Quality - Version 1.3.*

Department of Environment and Science (2020b) *Application requirements for activities with noise impacts (ESR/2015/1838).*

Department of Environment and Science (2020c) *Landscape Fragmentation and Connectivity Tool.*

Department of Environment and Science (2021) *Guideline – Progressive rehabilitation and closure plans (SR/2019/4964) (The PRCP Guideline)*. Department of Natural Resources and Mines (2017) Middlemount Coal – drainage lines in ML 70379.

Department of Natural Resources and Mines (2017) *Drainage lines*.

Department of Natural Resources, Mines and Energy (2020) *Strategic Cropping Land*.

Department of Science, Information Technology, Innovation and the Arts (2014) *Queensland Acid Sulfate Soil Technical Manual: Soil Management Guidelines*.

Department of Science, Information Technology and Innovation (DSITI) and the Department of Natural Resources and Mines (DNRM) (2015) *Guidelines for Agricultural Land Evaluation in Queensland*.

Department of Sustainability, Environment, Water, Population and Communities (2011a) Environment Protection and Biodiversity Conservation Act 1999, Draft Referral guidelines for the nationally listed Brigalow Belt reptiles.

Department of Sustainability, Environment, Water, Population and Communities (2011b) Survey Guidelines for Australia's Threatened Reptiles.

Department of Sustainability, Environment, Water, Population and Communities (2011c) Survey Guidelines for Australia's Threatened Mammals.

Department of the Environment (2014) *EPBC Act referral guidelines for the vulnerable koala (combined populations of Queensland, New South Wales and the Australian Capital Territory)*.

Department of the Environment, Water, Heritage and the Arts (2010a) *Survey Guidelines for Australia's Threatened Birds*.

Department of the Environment, Water, Heritage and the Arts (2010b) *Survey Guidelines for Australia's Threatened Bats*.

DPM Enviros*c*iences (2020) *Middlemount Coal Mine Southern Extension Project – Aquatic Ecology Assessment.*

Ecology & Heritage Partners (2012) *Ecological Investigations within the Offset Area for Stage 2 of the Middlemount Coal Mine, Queensland. Queensland, Australia.*

Eyre T.J, Ferguson D.J., Hourigan, C.L., Smith, G.C., Mathieson, M.T., Kelly, A.L., Venz, M.F., Hogan, L.D and Rowland, J. (2018). *Terrestrial Vertebrate Fauna Survey Guidelines for Queensland Version 3.0. Queensland Herbarium, Department of Environment and Science, Queensland.*

FRC Environmental (2010) *Middlemount Coal Project EIS, Stage 2: Aquatic Ecology*. FRC Environmental, Wellington Point.

Future Beef (2012) *Pasture Photo Standards*.
Accessed from: https://futurebeef.com.au/knowledgecentre/pasture-photo-standards/.

Geo-Environmental Management Pty Ltd (2021) *Mine Waste Geochemical Characterisation.*

Geotechnical Consulting Services (2014) *Residual Void Slope Stability Study*

Greig-Smith, P. (1964) *Quantitative Plant Ecology*. Butterworths, London.

P. Hazleton and B. Murphy (2017) *Interpreting Soil Test Results.*

HydroAlgorithmitics (2018) *Middlemount Coal Mine Western Extension Project – Groundwater Assessment Peer Review*

Isaac Regional Council (2015) *Community Strategic Plan: Isaac's 20 year vision.*

Isaac Regional Council (2021) *Isaac Regional Planning Scheme 2021.*

Lambert and Turner (2000) *Commercial Forest Plantations on Saline Lands,* CSIRO Publishing, Collingwood, VIC.

Landloch Pty Ltd (2019) *Laboratory erodibility measurement and assessment of final landform designs using rock amour.*

LRS Environmental (2017) *Review of Rock Mulch Trial*

Middlemount Coal Pty Ltd. Geo-Environmental Management Pty Ltd (2021) *Mine Waste Geochemical Characterisations.* Prepared for the Middlemount Coal Mine.

Middlemount Coal Pty Ltd (2011) *Middlemount Coal Project Stage 2 Environmental Impact Assessment.*

Middlemount Coal Pty Ltd (2012) *Middlemount Coal Mine Rehabilitation Management Plan.*

Middlemount Coal Pty Ltd (2014) *Pest fauna Management Strategy Prepared for MCM.*

Middlemount Coal Pty Ltd (2019) *Plan of Operations Middlemount Coal Mine (EPML00716913).*

Middlemount Coal Pty Ltd (2020a) *Middlemount Coal Mine Southern Extension Project Environmental Values Assessment.*

Middlemount Coal Pty Ltd (2020b) *Middlemount Coal Mine Mining By-Products Management Plan.*

Middlemount Coal Pty Ltd (2021) *Middlemount Coal Mine Rehabilitation Monitoring Program 2021*

Naturecall Environmental (2013). *Ecological Monitoring for Offset Area, Middlemount Coal Mine.*

Naturecall Environmental (2014a) *Ecological Monitoring for Offset Area, Middlemount Coal Mine – Fauna and Pest Species Survey.*

Naturecall Environmental (2014b) *Ecological Monitoring for Offset Area, Middlemount Coal Mine.*

Naturecall Environmental (2015a). *Ecological Monitoring for Offset Area, Middlemount Coal Mine.*

Naturecall Environmental (2015b). *Terrestrial Ecological Impact Assessment – North East Extension, Middlemount Coal Mine.*

Naturecall Environmental (2016). *Ecological Monitoring for Offset Area, Middlemount Coal Mine.*

Naturecall Environmental (2017) *Ecological Monitoring for Offset Area, Middlemount Coal Mine.*

Nelder, V.J., Wilson, B.A., Dillewaard, H.A., Ryan, T.S., Butler, D.W., McDonald, W.J.F, Addicott, E.P. and Appelman, C.N. (2020) *Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland. Version 5.1. Queensland Herbarium, Queensland. Department of Environment and Science, Brisbane.*

Noble, K.E. (ed.). (1996). *Understanding and Managing Soils in the Moreton Region*, Department of Primary Industries Training Series QE96003, Brisbane.

Parsons Brinkerhoff (2010a) *Middlemount Coal Project, Stage 2 Terrestrial Ecological Impact Assessment.* Prepared for Middlemount Coal Pty. Ltd.

Parsons Brinkerhoff (2010b) *Middlemount Coal Project, Stage 2 Geology, Soils and Land Resource Assessment.* Prepared for Middlemount Coal Pty. Ltd.

Parsons Brinkerhoff (2010c) *Middlemount Coal Project, Stage 2 Groundwater Technical Report.* Prepared for Middlemount Coal Pty. Ltd.

RGS Environmental Pty Ltd (2012) *Geochemical Assessment of Course Rejects and Tailings Materials – Middlemount Coal Mine.*

RGS Environmental Pty Ltd (2013) *Middlemount Coal Project – Geochemical Assessment of Coal and Mining Waste Materials*. Document prepared for Middlemount Coal Pty Ltd.

RGS Environmental Pty Ltd (2016) *Review of Geochemical Monitoring Data.*

RGS Environmental Pty Ltd (2019) *Middlemount Coal Mine - Mining Waste Management Plan.* Prepared for Middlemount Coal Pty Ltd.

Risk Mentor Pty Ltd (2021) *PRCP Risk Assessment prepared for the Middlemount Coal Mine.*

State of Queensland (2012) *Mackay, Isaac and Whitsunday Regional Plan.*

Verterra Ecological Engineering Pty Ltd (2023) *Revegetation Management Plan*. Prepared for Middlemount Coal Pty Ltd

Verterra Ecological Engineering Pty Ltd (2021b) *Spoil Amendment Recommendations.* Prepared for Middlemount Coal Pty Ltd

Walker, J., and Hopkins, M.S. (1990) *Vegetation*. In McDonald, R.C., Isbell, R.F., Speight, J.G., Walker, J., and Hopkins, M.S. (Eds.), Australian Soil and Land Survey Field Handbook. Second edition. Inkata Press, Melbourne, pp. 58–86.

WRM Water & Environment (2019) *Middlemount Coal Mine Water Management Plan*. Prepared for Middlemount Coal Pty Ltd.

WRM Water & Environment (2020) *Middlemount Coal Mine Southern Extension Project Surface Water Impact Assessment.*

ATTACHMENT 1

PROGRESSIVE REHABILITATION AND CLOSURE PLAN SCHEDULE

Refer to separate excel spreadsheet

ATTACHMENT 2

ENVIRONMENTAL AUTHORITY EMPL00716913 (MAY 2021)

Environmental Protection Act 1994

Environmental authority EPML00716913

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Environmental authority number: EPML00716913

Environmental authority takes effect on 26 May 2021

Environmental authority holder(s)

Name(s)	Registered address
RIBFIELD PTY. LTD.	Level 17 444 Queen St BRISBANE CITY QLD 4000 Australia
MIDDLEMOUNT COAL PTY LTD	Level 17 444 Queen St BRISBANE CITY QLD 4000 Australia

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Schedule 3 13: Mining black coal	ML70379
	ML70417
	ML700014
	ML700027
Ancillary 63 - Sewage Treatment 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of (a-i) 21 to 100EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme	ML70379
	ML70417
	ML700014
	ML700027
Ancillary 31 - Mineral processing 2: Processing, in a year, the following quantities of mineral products, other than coke (b) more than 100,000t	ML70379
	ML70417
	ML700014
	ML700027

Environmentally relevant activity/activities	Location(s)
Ancillary 15 - Fuel burning Using fuel burning equipment that is capable of burning at least 500kg of fuel in an hour	ML70379
	ML70417
	ML700014
	ML700027
Ancillary 08 - Chemical Storage 3: Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)	ML70379
	ML70417
	ML700014
	ML700027

Additional information for applicants

Environmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the *Environmental Protection Act 1994* (EP Act).

Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days)

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term ‘duty to notify’.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or

b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or

c) otherwise- one the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the *Planning Act 2016* or an SDA Approval under the *State Development and Public Works Organisation Act 1971*), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.

Dr Alison Cummings
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

Date Issued*: 26 May 2021*

Enquiries:
Business Centre (Coal)
Department of Environment and Science
PO Box 3028
EMERALD QLD 4720
Phone: (07) 4987 9320
Email: CRMining@des.qld.gov.au

Obligations under the *Environmental Protection Act 1994*

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

Other permits required

This permit only provides an approval under the *Environmental Protection Act 1994*. In order to lawfully operate you may also require permits / approvals from your local government authority, other business units within the department and other State Government agencies prior to commencing any activity at the site. For example, this may include permits / approvals with your local Council (for planning approval), the Department of Transport and Main Roads (to access state controlled roads), the Department of Natural Resources, Mines and Energy (to clear vegetation), and the Department of Agriculture and Fisheries (to clear marine plants or to obtain a quarry material allocation).

Obligations under the *Mining and Quarrying Safety and Health Act 1999*

If you are operating a quarry, other than a sand and gravel quarry where there is no crushing capability, you will be required to comply with the *Mining and Quarrying Safety and Health Act 1999*. For more information on your obligations under this legislation contact Mine Safety and Health at www.dnrme.qld.gov.au, or phone 13 QGOV (13 74 68) or your local Mines Inspectorate Office.

Development Approval

This permit is not a development approval under the *Planning Act 2016*. The conditions of this environmental authority are separate, and in addition to, any conditions that may be on the development approval. If a copy of this environmental authority is attached to a development approval, it is for information only, and may not be current. Please contact the Department of Environment and Science to ensure that you have the most current version of the environmental authority relating to this site.

Conditions of environmental authority

Schedule A: General	
Condition number	**Condition**
A1	**Scope of activity** This environmental authority authorises the mining of 5.7 million tonnes of run of mine (ROM) coal per annum.
A2	**Prevent and /or minimise likelihood of environmental harm** In carrying out the environmentally relevant activities, you must take all reasonable and practicable measures to prevent and/or to minimise the likelihood of environmental harm being caused. Any environmentally relevant activity, that, if carried out incompetently, or negligently, may cause environmental harm, in a manner that could have been prevented, shall be carried out in a proper manner in accordance with the conditions of this authority.
A3	**Maintenance of measures, plant and equipment** The environmental authority holder must ensure: a) that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed; b) that such measures, plant and equipment are maintained in a proper condition; c) that such measures, plant and equipment are operated in a proper manner; and d) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.
A4	**Monitoring and records** Record, compile and keep for a minimum of **five (5) years** all monitoring results required by this environmental authority and provide all or any of these records upon request by the administering authority.
A5	Where monitoring is a requirement of this environmental authority, ensure that an appropriately qualified person(s) conducts all monitoring.
A6	**Notification of emergencies, incidents and exceptions** The holder of this environmental authority must notify the administering authority by written notification within **twenty-four (24) hours**, after becoming aware of any emergency or incident which results in the release of contaminants, or information about circumstances which results or may result in environmental harm, not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority.
A7	Not more than **ten (10) business days** following the initial notification of an emergency, incident or information about circumstances which result or may result in environmental harm or the release of contaminants, or within **twenty-four (24) hours** after receiving the results from analysed samples, written advice must be provided to the administering authority in relation to: a) results and interpretation of any samples taken and analysed; and b) proposed actions to prevent a recurrence of the emergency or incident.

A8	The notification in **Conditions A9 and A10** must include, but not be limited to, the following: a) the environmental authority number and name of the holder; b) the name and telephone number of the designated contact person; c) the location of the emergency or incident; d) the date and time of the emergency or incident; e) the time the holder of the environmental authority became aware of the emergency or incident; f) where known: i. the estimated quantity and type of substances involved in the emergency or incident; ii. the actual or potential cause of the emergency or incident; iii. a description of the nature and effects of the emergency or incident including environmental risks, and any risks to public health or livestock; g) any sampling conducted or proposed, relevant to the emergency or incident; h) immediate actions taken to prevent or mitigate any further environmental harm caused by the emergency or incident; and i) what notification of stakeholders who may be affected by the emergency or incident has occurred or is being undertaken.
A9	**Risk Management** The environmental authority holder must maintain and implement a risk management system for mining activities which conforms to the "Risk Management - Principles and Guidelines (AS/NZS ISO 31000:2009)".
A10	The environmental authority holder must not implement a risk management system that contravenes or prevents the implementation of any condition of this environmental authority.
A11	**Emergency Response and Contingency Planning** An emergency response/contingency plan must be developed and implemented to manage unacceptable environmental risks identified in the risk management system or the associated monitoring.

A12	The emergency response/contingency plan must address the following matters: a) response procedures to be implemented to reduce the likelihood of environmental harm arising from incidents of unacceptable risk; b) response procedures to minimise the extent and duration of environmental harm by an incident; c) the practices and procedures to be employed to restore the environment or mitigate any environmental impact caused; d) a description of the resources to be used in response to an incident; e) the training of staff that will be called upon to respond to incidents; f) procedures to investigate the cause of any incidents, including releases, and where necessary, implement remedial actions to reduce the likelihood of recurrence of similar events; g) the provision and availability of documented procedures to staff attending any incident to enable them to effectively respond; and h) timely and accurate reporting of the circumstance and nature of incidents to the administering authority.
A13	**Third Party Audit** The holder of the environmental authority must nominate an appropriate third party auditor to audit compliance with the conditions of this environmental authority. The third party audit must be completed by 3 December 2017, and then at regular intervals not exceeding **three (3) years**.
A14	The holder must, at its cost, arrange for independent certification by a third party auditor of findings of the audit report required under **Condition A13**.
A15	Within **ninety (90) days** of completing the audit, provide a written report to the administering authority detailing any non-compliance issues that were found (if no non-compliance issues were found this should be stated in the report). If non-compliance issues were found the report must also address: a) actions taken by the holder of this environmental authority to ensure compliance with this environmental authority; and b) actions taken to prevent a recurrence of non-compliance.
A16	Where a condition of this environmental authority requires compliance with a standard published externally to this environmental authority and the standard is amended or changed subsequent to the issue of this environmental authority the holder of this environmental authority must: a) comply with the amended or changed standard within **two (2) years** of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation; and b) until compliance with the amended or changed standard is achieved, continue to remain in compliance with the standard that was current immediately prior to the relevant amendment or change.

A17	**Activity** All land subject to mining activities must be rehabilitated to a safe, stable and non-polluting landform, with a self-sustaining vegetation cover (except for the residual voids), in accordance with **Condition G9**.
A18	Contaminants must not be released to the receiving environment unless they are in accordance with the contaminant limits authorised by this environmental authority.
A19	This environmental authority does not authorise environmental harm unless a condition contained within the authority explicitly authorises that harm. Where there is no condition or the authority is silent on a matter, the lack of a condition or silence shall not be construed as authorising harm.
A20	The only mining activities to be carried out under this environmental authority are the mining activities defined within the parameters in Attachment A of this environmental authority.
A21	**Definitions** Words and phrases used throughout this environmental authority are defined in the Definitions section of this authority. Where a definition for a term used in this environmental authority is sought and the term is not defined within this environmental authority, the definitions in the *Environmental Protection Act 1994*, its regulations and policies must be used.

Schedule B: Air	
Condition number	**Condition**
B1	**Dust nuisance** Subject to **Conditions B2 and B3** the release of dust or particulate matter or both resulting from the mining activity must not cause an environmental nuisance at any sensitive or commercial place.
B2	When requested by the administering authority, dust and particulate monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.

B3	The environmental authority holder must ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by the mining activities do not cause an exceedance of the following levels when measured at any sensitive or commercial place: a) dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with the most recent version of Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air – Determination of particulates – Deposited matter – Gravimetric method. b) a concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (µm) (PM_{10}) suspended in the atmosphere of 50 micrograms per cubic metre over a **twenty four (24) hour** averaging time, for no more than five exceedances recorded each year (excluding natural events such as bushfires and dust storms), when monitored in accordance with the most recent version of either: i. Particulate matter – determination of suspended particulate PM10 high-volume sampler with size-selective inlet – Gravimetric method, when monitored in accordance with Australian Standard AS 3580.9.6 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM10 high volume sampler with size-selective inlet – Gravimetric method; or ii. Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM_{10} low volume sampler—Gravimetric method. c) The use of alternative methods of monitoring dust and particulate matter, in accordance with the administering authority's 'Air Quality Sampling Manual' must be approved in writing by the administering authority prior to implementation.
B4	If monitoring indicates exceedance of the relevant limits in **Conditions B3**, then the environmental authority holder must: a) address the complaint including the use of appropriate dispute resolution if required; b) immediately implement dust abatement measures so that emissions of dust from the activity do not result in further environmental nuisance; and c) notify the administering authority within **five (5) business days**.
B5	**Odour nuisance** The release of noxious or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the mining activity must not cause an environmental nuisance at any nuisance sensitive or commercial place.
B6	When requested by the administering authority odour monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.

B7	If the administering authority determines the odour released to constitute an environmental nuisance the environmental authority holder must: a) address the complaint including the use of appropriate dispute resolution if required; and b) immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental nuisance.
B8	**Meteorological monitoring** The environmental authority holder must establish a permanent, continuous, real time meteorological and dust monitoring network to measure and record wind speed, wind direction, temperature, rainfall, relative humidity and PM10. The station must comply with the following Standards (or their successors): a) "AS 2923-1987: Ambient air – Guide for measurement of horizontal wind for air quality applications" or its successor. b) "AS/NZS 3580.1.1:2016: Methods for sampling and analysis of ambient air. Guide to siting air monitoring equipment" or its successor.

Schedule C: Surface Water	
Condition number	**Condition**
C1	**Contaminant release** Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of the authorised mining activities, except as permitted under the conditions of this environmental authority.
C2	The release of mine affected water to waters must only occur from the release points specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters** and depicted in Attachment B, attached to this environmental authority.

Table C1: Mine Affected Water Release Points, Sources and Receiving Waters

Release point (RP)	Easting (GDA94, MGA 55)	Northing (GDA94, MGA 55)	Mine affected water source and location	Monitoring point	Receiving waters description
RP 1	667,725	7,469,370	Raw Water Dam	Spillway/pipe	Roper Creek
RP 2	671,743	7,469,842	Mine Water Dam	Spillway/pipe	Roper Creek
SD 1	668,008	7,469,218	Sediment Dam 1	Spillway/pipe	Roper Creek
SD 2	668,093	7,470,858	Sediment Dam 2	Spillway/pipe	Roper Creek
SD 3	668,457	7,470,213	Sediment Dam 3	Spillway/pipe	Roper Creek
SD 7	671,125	7,474,067	Sediment Dam 7	Spillway/pipe	An unnamed drainage feature
NROM	667,858	7,470,294	North ROM Dam	Spillway/pipe	Roper Creek

C3	The release of mine affected water to internal water management infrastructure that is installed and operated in accordance with a water management plan that complies with **Conditions C28 to C29** inclusive is permitted.
C4	The release of mine affected water to waters in accordance with **Condition C2** must not exceed the release limits stated in **Table C2: Mine Affected Water Release Limits** when measured at the monitoring points specified in **Table C1: Mine Affected Water Release Points**, **Source and Receiving Waters** for each quality characteristic.

Table C2: Mine Affected Water Release Limits

Quality Characteristic	Release Limits	Monitoring Frequency	Comments
Electrical Conductivity (µS/cm)	Release limits specified in Table C4 for variable flow criteria	Daily during release (the first sample must be taken within 2 hours of commencement of release)	
pH (pH units)	6.5 (minimum) 9.0 (maximum)	Daily during release (the first sample must be taken within 2 hours of commencement of release)	
Turbidity (NTU)	No limit	Daily during release (first sample within 2 hours of commencement of release)	Turbidity is required to assess ecosystems impacts and can provide instantaneous results.
Suspended Solids (mg/L) (80th percentile of reference sites detailed in Table C6)	Flow <2m^3/s 562 mg/L Flow >2m^3/s 1062 mg/L	Daily during release (first sample within 2 hours of commencement of release)	Suspended solids are required to measure the performance of sediment and erosion control measures.
Sulfate (SO_4^{2-}) (mg/L)	Release limits specified in **Table C4** for variable flow criteria	Daily during release (first sample within 2 hours of commencement of release)	Drinking water environmental values from National Health and Medical Research Council 2006 guidelines or ANZECC 2000

C5	The release of mine affected water to waters from the release points must be monitored at the locations specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters** for each quality characteristic and at the frequency specified in **Table C2: Mine Affected Water Release Limits** and **Table C3: Release Contaminant Trigger Investigation Levels Potential Contaminants**.

Table C3: Release Contaminant Trigger Investigation Levels Potential Contaminants

Quality characteristic	Trigger levels (µg/L)	Comment on trigger level	Monitoring frequency
Aluminium	55	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Arsenic	13	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Cadmium	0.2	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Chromium	1	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Copper	2	For aquatic ecosystem protection, based on LOR for ICPMS	Commencement of release and thereafter weekly during release
Iron	300	For aquatic ecosystem protection, based on low reliability guideline.	Commencement of release and thereafter weekly during release
Lead	4	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Mercury	0.2	For aquatic ecosystem protection, based on LOR for CV FIMS	Commencement of release and thereafter weekly during release
Nickel	11	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Zinc	8	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Boron	370	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Cobalt	90	For aquatic ecosystem protection, based on low reliability guideline	Commencement of release and thereafter weekly during release
Manganese	1,900	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Molybdenum	34	For aquatic ecosystem protection, based on low reliability guideline	Commencement of release and thereafter weekly during release
Selenium	10	For aquatic ecosystem protection, based on LOR for ICPMS	Commencement of release and thereafter weekly during release
Silver	1	For aquatic ecosystem protection, based on LOR for ICPMS	Commencement of release and thereafter weekly during release
Uranium	1	For aquatic ecosystem protection, based on LOR for ICPMS	Commencement of release and thereafter weekly during release

Vanadium	10	For aquatic ecosystem protection, based on LOR for ICPMS	Commencement of release and thereafter weekly during release
Ammonia	900	For aquatic ecosystem protection, based on SMD guideline	Commencement of release and thereafter weekly during release
Nitrate	1,100	For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN	Commencement of release and thereafter weekly during release
Petroleum hydrocarbons (C6-C9)	20	For aquatic ecosystem protection, based on LOR for GC-FID	Commencement of release and thereafter weekly during release
Petroleum hydrocarbons (C10-C36)	100	For aquatic ecosystem protection, based on LOR for GC-FID	Commencement of release and thereafter weekly during release
Fluoride (total)	2,000	Protection of livestock and short term irrigation guideline	Commencement of release and thereafter weekly during release
Sodium (mg/L)	180	Based on the Australian Drinking Water Guidelines (NHMRC,NRMCC, 2011)	Commencement of release and thereafter weekly during release

Note:
1. All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered).Trigger levels for metals/metalloids apply if dissolved results exceed trigger.
2. SMD – slightly moderately disturbed level of protection, guideline refers ANZECC & ARMCANZ (2000).
3. LOR – typical reporting for method stated. ICPMS/CV FIMS/GC-FID – analytical methods required to achieve LOR.

C6

If quality characteristics of the release exceed any of the trigger levels specified in **Table C3: Release Contaminant Trigger Investigation Levels Potential Contaminants** during a release event, the environmental authority holder must cease the release and compare the downstream results in the receiving waters to the trigger values specified in **Table C3: Release Contaminant Trigger Investigation Levels Potential Contaminants** and:

a) where the trigger values are not exceeded then no action is to be taken; or
b) where the downstream results exceed the trigger values specified in **Table C3: Release Contaminant Trigger Investigation Levels Potential Contaminants**, for any quality characteristic, compare the results of the downstream site to the data from background monitoring sites and;
    i. if the result is less than the background monitoring site data, then no action is to be taken; or
    ii. if the result is greater than the background monitoring site data, complete an investigation into the potential for environmental harm and provide a written report to the administering authority within 28 days of receiving the result, outlining:
        1. details of the investigations carried out; and
        2. actions taken to prevent environmental harm.

Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with **C6(b)(ii)** of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

C7	If an exceedance in accordance with **Condition C6(b)(ii)** is identified, the holder of the environmental authority must notify the administering authority in writing within **twenty four** (**24) hours** of receiving the result.
C8	**Mine affected release events** The holder must ensure an automatic stream flow gauging station/s is installed, operated and maintained to determine and record stream flows at the locations and flow recording frequency specified in **Table C4: Mine Affected Water Release During Flow Events**.
C9	The release of mine affected water to waters in accordance with **Condition C2** must only take place during periods of natural flow events in accordance with the receiving water flow criteria for discharge specified in **Table C4: Mine Affected Water Release During Flow Events** for the release point(s) specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters.**
C10	The release of mine affected water to waters in accordance with **Condition C2** must not exceed the Electrical Conductivity and Sulfate release limits or the Maximum Release Rate (for all combined release point flows) for each receiving water flow criteria for discharge specified in **Table C4: Mine Affected Water Release During Flow Events** when measured at the monitoring points specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters**.
C11	The daily quantity of mine affected water released from each release point must be measured, recorded and provided to the administering authority on request.
C12	Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build-up of sediment in such waters.
C13	The environmental authority holder must notify the administering authority via WaTERS within **twenty four (24) hours** after commencing to release mine affected water to the receiving environment. Notification must include the submission of written advice to the administering authority of the following information: a) Release commencement date and time; b) Details regarding the compliance of the release with the conditions of Department interest: Water of this environmental authority (that is, contaminant limits, natural flow, discharge volume); c) Release point/s; d) Release rate; e) Release salinity; and f) Receiving water/s including the natural flow rate.

Table C4: Mine Affected Water Release During Flow Events

Release point (RP)	Gauging station	Gauging station Easting, (GDA94, MGA 55)	Gauging station Northing, (GDA94, MGA 55)	Receiving water flow recording frequency	Receiving water flow criteria for discharge	Maximum release rate (for all combined RP flows)	Electrical conductivity and Sulfate release limits
RP1 RP2 SD1 SD2 SD3 SD7 NROM	Ref 1	667,484	7,471,112	Continuous (minimum daily)	Low Flow For a period of 28 days after natural flow events that exceed 2m^3/s	0.4 m^3/s	Electrical conductivity (µS/cm) 700. Sulfate (SO_4^{2-}): 250 mg/L
					Medium flow > 2 m^3/s	1.12 m^3/s	Electrical conductivity (µS/cm) 1500. Sulfate (SO_4^{2-}): 250 mg/L
					High flow > 10 m^3/s	5.6 m^3/s	Electrical conductivity (µS/cm) 1500. Sulfate (SO_4^{2-}): 250 mg/L
					>10 m^3/s	>1.6 m^3/s	Electrical conductivity (µS/cm) 3500. Sulfate (SO_4^{2-}): 300 mg/L
					Very High Flow >25 m^3/s	2.1 m^3/s	Electrical conductivity (µS/cm) <6000. Sulfate (SO_4^{2-}): 500 mg/L

C14	The holder of this environmental authority must notify the administering authority, via WaTERS, as soon as practicable (and within twenty four hours) after cessation of a release notified under **Condition C13**. The cessation notification must include the following information: a. release cessation date/time; b. release points; c. release rates; d. water quality of release; e. total volume of water released; f. natural flow rate in the receiving water; and g. details regarding the compliance of the release with the conditions of Schedule F Water of this environmental authority. Note: Successive or intermittent releases occurring within twenty four hours of the cessation of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance with **Conditions C13**, **C14** and **C15**, provided the relevant details are submitted in the final cessation and 28 day report in accordance with **Conditions C14** and **C15**.
C15	The holder of this environmental authority must within twenty eight days after cessation of a release event notified under **Condition C13** provide a report and supporting raw data to the administering authority via WaTERS, which must include the following information: a. all continuous and in-situ water quality monitoring results (including laboratory analyses); and b) any further matters pertinent to the water release event.
C16	**Notification of release event exceedance** If the release limits defined in **Table C2: Mine Affected Water Release Limits** are exceeded, the holder of the environmental authority must notify the administering authority via WaTERS within **twenty-four (24) hours** of receiving the results.

C17	The environmental authority holder must, within **twenty-eight (28) days** of a release that is not compliant with the conditions of this environmental authority, provide a report to the administering authority via WaTERS detailing: a) the reason for the release; b) the location of the release; c) the total volume of the release and the daily quantity of mine affected water released from each release point, and which (if any) part of these releases was non-compliant; d) the total duration of the release and which (if any) part of this period was non-compliant; e) all in situ and any water quality monitoring results (including all laboratory analyses); f) identification of any environmental harm as a result of the non-compliance; and g) any other matters pertinent to the water release event.
C18	**Receiving environment monitoring and contaminant trigger levels** The quality of the receiving waters must be monitored at the locations specified in **Table C6: Receiving Water Upstream Background Sites and Downstream Monitoring Points** for each quality characteristic and at the monitoring frequency stated in **Table C5: Receiving Waters Contaminant Trigger Levels**.
C19	If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in **Table C5: Receiving Waters Contaminant Trigger Levels** during a release event, the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and: a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic, then no action is to be taken; or b) where the downstream results exceed the upstream results, complete an investigation into the potential for environmental harm and provide a written report to the administering authority within **three (3) months**, outlining: i. details of the investigations carried out; and ii. actions taken to prevent environmental harm.

Table C5: Receiving Waters Contaminant Trigger Levels

Quality characteristic	Trigger level	Monitoring frequency
pH	6.5 – 8.5	Daily during the release
Electrical Conductivity (µS/cm)	700	
Suspended Solids (mg/L) (80th percentile* of reference**)	562 at Flow <2m^3/s	
	1062 at Flow >2m^3/s	
Sulfate (SO_4^{2-}) (mg/L)	250	
Sodium (mg/L)	180	

Note:
* 80th percentiles are calculated using ANZECC (2000) methodology (section 7.4.4.1)
** Reference sites are defined in Table C6.

Table C6: Receiving Water Upstream Background Sites and Downstream Monitoring Points

Monitoring points	Receiving waters location description	Easting (GDA94, MGA 55)	Northing (GDA94, MGA 55)
Upstream background monitoring points			
Ref 1	Roper Creek at western ML70379 boundary (Upstream of Thirteen Mile Gully diversion)	667,484	7,471,112
Downstream monitoring points			
IMPAC1	Roper Creek at Middlemount Road	671,505	7,469,167
IMPAC2	Roper Creek Tributary at Middlemount Road	673,094	7,471,230

Note:
a) The upstream monitoring point should be within six (6) km of the release point.
b) The downstream point should not be greater than six (6) km from the release point.
c) The data from background monitoring points should not be used where they are affected by releases from other mines.

C20	**Receiving environment monitoring program (REMP)** The environmental authority holder must develop and implement a Receiving Environment Monitoring Program (REMP) to monitor, identify and describe any adverse impacts to surface water environmental values, quality and flows due to the authorised mining activity. This must include monitoring the effects of the mine on the receiving environment periodically (under natural flow conditions) and while mine affected water is being discharged from the site. For the purposes of the REMP, the receiving environment is the waters of Roper Creek and connected waterways within ten (10) km downstream of the release. The REMP should encompass any sensitive receiving waters or environmental values downstream of the authorised mining activity that will potentially be directly affected by an authorised release of mine affected water.
C21	The REMP must: a) assess the condition or state of receiving waters, including upstream conditions, spatially within the REMP area, considering background water quality characteristics based on accurate and reliable monitoring data that takes into consideration temporal variation (e.g. seasonality); and b) be designed to facilitate assessment against water quality objectives for the relevant environmental values that need to be protected; and c) include monitoring from background reference sites (e.g. upstream or background) and downstream sites from the release (as a minimum, the locations specified in **Table C6: Receiving Water Upstream Background Sites and Down Stream Monitoring Points**); and d) specify the frequency and timing of sampling required in order to reliably assess ambient conditions and to provide sufficient data to derive site specific background reference values in accordance with the Queensland Water Quality Guidelines 2006. This should include monitoring during periods of natural flow irrespective of mine or other discharges; and e) include monitoring and assessment of dissolved oxygen saturation, temperature and all water quality parameters listed in **Table C2: Mine Affected Water Release Limits** and **Table C3: Release Contaminant Trigger Investigation Levels Potential Contaminants**); and f) include, where appropriate, monitoring of metals/metalloids in sediments (in accordance with ANZECC & ARMCANZ 2000, BATLEY and/or the most recent version of AS5667.1 Guidance on Sampling of Bottom Sediments); and g) include, where appropriate, monitoring of macroinvertebrates in accordance with the AusRivas methodology, and h) apply procedures and/or guidelines from ANZECC & ARMCANZ 2000 and other relevant guideline documents; and i) describe sampling and analysis methods and quality assurance and control; and j) incorporate stream flow and hydrological information in the interpretations of water quality and biological data.

C22	A REMP Design Document that addresses the requirements of the REMP must be prepared and made available to the administrating authority upon request.
C23	A report outlining the findings of the REMP, including all monitoring results and interpretations must be prepared annually and made available on request to the administrating authority. This must include an assessment of background reference water quality, the condition of downstream water quality compared against water quality objectives, and the suitability of current discharge limits to protect downstream environmental values.
C24	**Water reuse** Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as farm dams or tanks, or used directly at properties owned by the environmental authority holder or a third party (with the written consent of the third party) for the purpose of: a) stock watering; b) irrigation; or c) dust suppression; with water quality limits appropriate for the intended purpose.
C25	If the responsibility for mine affected water is given or transferred to another person in accordance with **Condition C24:** a) the responsibility for the mine affected water must only be given or transferred in accordance with a written agreement (the third party agreement); and b) the third party agreement must include a commitment from the person utilising the mine affected water to use it in such a way as to prevent environmental harm or public health incidents and generally make the persons aware of the General Environmental Duty (GED) under section 319 of the *Environmental Protection Act 1994*, environmental sustainability of the water disposal and protection of environmental values of waters; and **c)** the third party agreement must be signed by both parties to the agreement.
C26	**Water general** All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.
C27	The release of any contaminants as permitted by this environmental authority, directly or indirectly to waters, other than internal water management infrastructure that is installed and operated in accordance with a water management plan that complies with **Conditions C29 to C30** inclusive: a) must not produce any visible discolouration of receiving waters; and b) must not produce any slick or other visible or odorous evidence of oil, grease or petrochemicals nor contain visible floating oil, grease, scum, litter or other objectionable matter.

C28	**Annual water monitoring reporting** The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format with each annual return: a) the date on which the sample was taken; b) the time at which the sample was taken; c) the monitoring point at which the sample was taken; d) the measured or estimated daily quantity of the mine affected waters released from all release points; e) the release flow rate at the time of sampling for each release point; f) the results of all monitoring and details of any exceedance with the conditions of this environmental authority; and g) water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.
C29	**Water Management Plan** A Water Management Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities. The Water Management Plan must: a) provide for effective management of actual and potential environmental impacts resulting from water management associated with the mining activity carried out under this environmental authority; and b) be developed in accordance with Department of Environment and Science guideline Preparation of water management plans for mining activities and include: i. a study of the source of contaminants; ii. a water balance model for the site; iii. a water management system for the site; iv. measures to manage and prevent saline drainage; v. measures to manage and prevent acid rock drainage; vi. contingency procedures for emergencies; and vii. program for monitoring and review of the effectiveness of the water management plan.
C30	A copy of the Water Management Plan must be provided to the administering authority on request.
C31	**Saline drainage** The holder of this environmental authority must ensure proper and effective measures are taken to avoid or otherwise minimise the generation and/or release of saline drainage
C32	**Acid rock drainage** The holder of this environmental authority must ensure proper and effective measures are taken to avoid or otherwise minimise the generation and/or release of acid rock drainage

C33	**Stormwater and water sediment controls** An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater. The Erosion and Sediment Control Plan must be reviewed, updated and submitted to the administering authority at an interval no greater than **3 years** from the previous submission of an Erosion and Sediment Control Plan.
C34	Stormwater, other than mine affected water, is permitted to be released to waters from: a) erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by **Condition C33**; and b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with **Conditions C29 to C30** inclusive, for the purpose of ensuring water does not become mine affected water.
C35	**Sewage Treatment** The daily operation of the sewage treatment plant and pollution control equipment must be carried out by a person(s) with appropriate experience and/or qualifications to ensure the effective operation of that treatment system and control equipment.
C36	Treated effluent from the sewage treatment plant must only be discharged from the authorised discharge points, as specified in Table C7: Effluent Discharge Locations.

Table C7: Effluent Discharge Locations

Authorised discharge points	Location
STP Discharge Point 1	Tailings Storage Facility

C37	Treated effluent must not be released to land, or used for irrigation or dust suppression.
C38	Treated effluent must not be released from the site to any waters or the bed and banks of any waters.
C39	Water or stormwater contaminated by sewage treatment activities must not be released to any waters or the bed and banks of any waters.
C40	**Biosolids** Biosolids produced by the activity for re-use must be: a) sampled, analysed, graded and classified according to the procedures specified in the administering authority's systems and standard; and b) re-used under a relevant approval issued by the administering authority

Schedule D: Groundwater	
Condition number	**Condition**
D1	**Groundwater monitoring and management program** The holder of this environmental authority must implement a groundwater monitoring and management program. The program must be able to detect a significant change to groundwater quality values due to the mining activities conducted under this environmental authority.
D2	The groundwater monitoring and management program required by **Condition D1** must: a) identify potential sources of contamination to groundwater from the mining activity; b) identify and minimise the potential for environmental harm on relevant groundwater environmental values; c) document sampling and monitoring methodology; d) ensure that the parameters being monitored are appropriate for use; e) ensure that monitoring bores are chemically representative of the target aquifer ; f) ensure sufficient information to allow the holder to determine predicted seasonal fluctuations of groundwater levels; g) ensure that adequate groundwater monitoring and data analysis is undertaken to achieve the following objectives: i. detect any impacts to groundwater levels due to the activity; detect any impacts to groundwater quality due to the activity; ii. determine compliance with **Condition C1**; iii. determine trends in groundwater quality; iv. include an appropriate quality assurance and quality control program; and v. include a conceptual groundwater model that includes groundwater flow parameters.

D3	The groundwater monitoring and management program required by **Condition D1**, must be reviewed on an annual basis by an appropriately qualified person. The review must include: a) an assessment of groundwater levels and groundwater quality value data collected in relation to **Schedule C – Water** of this environmental authority; b) an assessment of the suitability of the monitoring network to detect a significant change to groundwater quality values; c) an assessment of the program against the requirements under **Condition D2**; d) recommended actions and reasonable timeframes for these actions to ensure that actual and potential environmental impacts are effectively identified and managed; e) identification of any amendments to the groundwater monitoring and management program following the review; f) identification of any changes in water quality in the monitoring bores; g) maps showing the actual water level drawdown contours caused by the take of associated water for each aquifer; h) details of any review undertaken of the numerical groundwater model since the previous Annual Monitoring Report; i) an assessment of any differences between the actual water level impact and the impact predicted for the same period in the most current numerical groundwater model; and j) details of any bores which are predicted by the most current numerical groundwater model to be located in the affected area.
D4	A report outlining the findings and outcomes of the review required by **Condition D3** must be prepared by the appropriately qualified person and provided to the administering authority within 6 months of the end of the annual period to which the review relates. The report must include: a) an outline of the findings and outcomes of the assessments required by **Condition D3**; and b) any groundwater monitoring data obtained by the environmental authority holder under **Condition D1** and an outline of the findings and outcomes of any analysis undertaken in relation to that data under **Condition D2**; and c) an outline of any actions and their associated timeframes recommended by the appropriately qualified person under **Condition D3 (d)**; and d) all groundwater data to be submitted to the administering authority via WaTERS.
D5	The holder of this environmental authority must attach to the review report required by **Condition D4**, a written response detailing the actions taken or to be taken by the holder of this environmental authority: a) to ensure compliance with this environmental authority; and b) to minimise impacts or potential impacts on groundwater resources by the mining activities carried out under this environmental authority.

D6	The recommended actions detailed under **Condition D3 (d)** must be completed within the associated timeframes detailed under **Condition D3 (d)**, unless the administering authority has approved otherwise in writing.
D7	**Groundwater Monitoring** Groundwater quality must be monitored at the locations and frequencies specified in **Table D1: Groundwater Quality Monitoring Locations and Frequency** for the parameters identified in **Table D2: Groundwater Quality Investigation Trigger Levels**.
D8	The groundwater investigation trigger levels limit type ‘Median” referred to in **Table D2: Groundwater Quality Investigation Trigger Levels** must be determined on the most recent three (3) consecutive routine monitoring samples.

Table D1: Groundwater Quality Monitoring Locations and Frequency

Monitoring points	Easting (GDA 94, MGA 55)	Northing (GDA 94, MGA 55)	Target Aquifer	Monitoring frequency
MW2	667,603	7,471,239	Tertiary	Quarterly
MW3 [a]	670,647	7,469,955	Tertiary	
MW4	667,683	7,468,659	Intrusives and Girrah coal seam	
MW5M [b]	667,790	7,475,131	Middlemount coal seam	
MW5P [b]	667,796	7,745,130	Pisces coal seam	
MW6	669,452	7,468,670	Tertiary	
MW7P [b]	669,777	7,472,247	Pisces coal seam	
MW8FR [b]	669,941	7,472,277	Fort Cooper Coal Measures	
MW9A	670,246	7,469,610	Tertiary	
MW9M	670,243	7,469,619	Middlemount coal seam	
MW9P	670,251	7,469,592	Pisces coal seam	
MW10A	669,783	7,475981	Tertiary	
MW11A	672,355	7,472,275	Tertiary	
MW12A	671,640	7,469,853	Tertiary	
MW16A	666,878	7,472,826	Tertiary and weathered Fort Cooper Coal Measures	
MW17A	669,790	7,475,985	Weathered and fresh Fort Cooper Coal Measures	
MW18A	666,452	7,478,605	Tertiary and weathered Fort Cooper Coal Measures	

Note:
[a]MW3 will continue to be monitored until pit progression prevents monitoring. MW9A installed as a replacement well for MW3.
[b]To be monitored until pit progression prevents monitoring.

D9	Subject to requirements of **Condition D7**, if the groundwater investigation trigger levels defined in **Table D2: Groundwater Quality Investigation Trigger Levels** are exceeded then the environmental authority holder must: a) complete an investigation into the potential for environmental harm; and b) notify the administering authority via WaTERS within **twenty-eight (28) days** of receiving the analysis results.

D10	The exceedance investigation under **Condition D9** must be completed and submitted to the administering authority via WaTERS within **three (3) months** of the exceedance.
D11	Where it is identified that there is potential for environmental harm, an action plan to mitigate potential harm must be developed by an appropriately qualified person and implemented within **three (3) months** of the completion of the investigation under **Condition D9**.
D12	Groundwater levels affected by the mining activities must be monitored at the locations and frequencies defined in **Table D3: Groundwater Level Monitoring Locations.**
D13	In the event that groundwater fluctuations exceed the groundwater level trigger values defined in **Table D4: Groundwater Level Trigger Values** at the groundwater monitoring locations nominated in **Table D3: Groundwater Level Monitoring Locations**, an investigation must be undertaken within **fourteen (14) days** of detection to determine if the fluctuations are a result of: a) mining activities; b) pumping from licensed bores; or c) seasonal variation.
D14	If the results of the investigation undertaken in accordance with **Condition D13** identify that the groundwater fluctuations are a result of mining activities, the holder of the environmental authority must notify the administering authority via WaTERS and provide a copy of a report detailing the findings and outcomes of the investigation within **seven (7) days** of completing the investigation.

Table D2: Groundwater Quality Investigation Trigger Levels

Parameter	**Unit**	**Trigger Levels**	**Limit Type**
pH	pH Units	6.5 – 8.5	Minimum/ Maximum
Electrical Conductivity	μS/cm	35,000	Maximum
Total Dissolved Solids	mg/L	23,550	Maximum
Calcium Magnesium Sodium Potassium CO^3 HCO^3	mg/L	No triggers or limit set for these parameters. Analysis is conducted for groundwater quality interpretation only.	
Chloride	mg/L	12,700	Median
SO_4^{2-}	mg/L	2,000	Median
Iron	mg/L	14	Maximum
Mercury	mg/L	0.002	Maximum
Selenium	mg/L	0.05	Maximum
Total Petroleum Hydrocarbons (C10-14)	μg/L	50	Maximum
Total Petroleum Hydrocarbons (C15-28)	μg/L	185	Maximum
Total Petroleum Hydrocarbons (C29-36)	μg/L	90	Maximum

.

Table D3: Groundwater Level Monitoring Locations

Monitoring points	Easting (GDA94, MGA 55)	Northing (GDA94, MGA 55)	Surface RL (mAHD)	Target Aquifer	Frequency
MW2	667,603	7,471,239	163.12	Tertiary	Quarterly
MW3 [a]	670,647	7,469,955	155.44	Tertiary	Quarterly
MW4	667,683	7,468,659	183.11	Intrusives and Girrah coal seam	Quarterly
MW5M [b]	667,790	7,475,131	174.52	Middlemount coal seam	Quarterly
MW5P [b]	667,796	7,475,130	174.66	Pisces coal seam	Quarterly
MW6	669,452	7,468,670	158.26	Tertiary	Quarterly
MW7P [b]	669,777	7,472,247	163.87	Pisces coal seam	Quarterly
MW8FR [b]	669,941	7,472,277	164.33	Fort Cooper Coal Measures	Quarterly
MW9A	670,246	7,469,610	156.32	Tertiary	Quarterly
MW9M	670,243	7,469,619	156.36	Middlemount coal seam	Quarterly
MW9P	670,251	7,469,592	156.26	Pisces coal seam	Quarterly
MW10A	669,783	7,475981	175.75	Tertiary	Quarterly
MW11A	672,355	7,472,275	156.21	Tertiary	Quarterly
MW12A	671,640	7,469,853	158.28	Tertiary	Quarterly
MW16A	666,878	7,472,826	162.48	Tertiary and weathered Fort Cooper Coal Measures	Quarterly
MW17A	669,790	7,475,985	175.77	Weathered and fresh Fort Cooper Coal Measures	Quarterly
MW18A	666,452	7,478,605	181.70	Tertiary and weathered Fort Cooper Coal Measures	Quarterly
MW19VWP	671,659	7,469,856	158.38	Weathered Fort Cooper Coal Measures and Fort Cooper Coal Measures [c]	Quarterly
MW20VWP	672,816	7,471,543	155.90	Fort Cooper Coal Measures[d]	Quarterly

Notes:
[a] MW3 will continue to be monitored until pit progression prevents monitoring. MW9A installed as a replacement well for MW3;
[b] To be monitored until pit progression prevents monitoring.
[c] MW19VWP sensors installed at 50 mbgl (VW3) (for the base of weathered Fort Cooper Coal Measures), and 109 mbgl (VW2) and 150 mbgl (VW1) (for the Fort Cooper Coal Measures).
[d] MW20VWP sensor installed at 88 mbgl (VW2) (for the Fort Cooper Coal Measures).

Table D4: Groundwater Level Trigger Values

Monitoring points	Groundwater Fluctuation Trigger Level Threshold
MW2	>2 metres per year
MW3 [a]	total groundwater level of <115.39 m AHD
MW4	>2 metres per year
MW6	total groundwater level of <122.15 m AHD
MW9A	total groundwater level of <113.17 m AHD
MW10A	>2 metres per year
MW11A	>2 metres per year
MW12A	>2 metres per year
MW16A	total groundwater level of <129.2 m AHD
MW17A	total groundwater level of <135.6 m AHD
MW18A	>2 metres per year
MW19VWP-VW3	total groundwater level of <130.8 m AHD
MW19VWP-VW2	>2 metres per year
MW19VWP-VW1	>2 metres per year
MW20VWP-VW2	>3 metres per year

Notes:
[a]MW3 will continue to be monitored until pit progression prevents monitoring. MW9A installed as a replacement well for MW3.

D15	The groundwater monitoring data must be reviewed on an annual basis. The review must include the assessment of groundwater levels and quality data, and the suitability of the monitoring network. The assessment must be submitted to the administering authority within **twenty-eight (28) days** of receiving the report.
D16	The groundwater quality trigger values in **Table D2 Groundwater Quality Investigation Trigger Levels** and monitoring points must be reviewed every two years. Total Groundwater contaminant limits are to be determined in accordance with the Guideline 'Using monitoring data to assess groundwater quality and potential environmental impacts' and provided in an amendment application to the administering authority by 16 April 2022.
D17	The groundwater level trigger values in **Table D4 Groundwater Trigger Level Values** and monitoring points must be reviewed every two years. Total Groundwater levels are to be determined in accordance with the guideline 'Using monitoring data to assess groundwater quality and potential environmental impacts' and provided in an amendment application to the administering authority by 16 April 2022.
D18	**Groundwater monitoring** The following information must be recorded in relation to all water sampling: a) the date on which the sample was taken; b) the time at which the sample was taken; c) the monitoring point at which the sample was taken; d) the results of all monitoring; e) groundwater levels; and f) sampling methodology.

D19	The method of water sampling required by this environmental authority must comply with that set out in the latest edition of the administering authority's Monitoring and Sampling Manual.
D20	**Bore construction and maintenance and decommissioning** All groundwater bores (including groundwater monitoring bores) must be constructed in accordance with the *Minimum Construction Requirements for Water Bores in Australia* (2012)(or its latest version).
D21	The construction, maintenance and management, and decommissioning of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring.

Schedule E: Acoustic	
Condition number	**Condition**
E1	**Noise nuisance** Subject to **Conditions E2 and E3**, noise from the mining activity must not cause an environmental nuisance at any noise sensitive or commercial place.
E2	**Noise monitoring** When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring. Monitoring must include: a) $L_{Aeq,\ adj,\ 15\ mins}$ (external); b) $L_{A1,\ adj,\ 15\ mins}$ (internal – or a measured external noise level and calculation of corresponding internal noise level); c) the level and frequency of occurrence of impulsive or tonal noise; d) atmospheric conditions including wind speed and direction; e) effects due to extraneous factors such as traffic noise; and f) location, data and time of recording.

E3	If the environmental authority holder can provide evidence through monitoring that the limits defined in **Table E1: Noise Limits**, are not being exceeded then the holder is not in breach of **Condition E1**.
E4	If monitoring indicates the noise component from the Project exceeds the limits in **Table E1: Noise Limits**, then the environmental authority holder must: a) address the complaint including the use of appropriate dispute resolution if required; and b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.

Table E1: Noise Limits

Noise level dB(A)	**Monday to Sunday (including public holidays)**		
	7am – 6pm	**6pm – 10pm**	**10pm – 7am**
Noise measured at a 'sensitive place' expressed as:			
$L_{Aeq, adj, 15 mins}$*	**RBL + 5**	**RBL + 5**	**RBL + 5**
$L_{A1, adj, 15 mins}$**	40	40	40
Noise measured at a 'commercial place' expressed as:			
$L_{Aeq, adj, 15 mins}$*	**RBL + 10**	**RBL + 10**	**RBL + 10**
$L_{A1, adj, 15 mins}$**	45	45	45

NOTE:
* External noise limit
** Internal noise limit
RBL means Rated Background Level as defined in the administering authority's Guideline, Planning for Noise Control.

E5	The method of measurement and reporting of noise monitoring must comply with the current edition of the administering authority's Noise Measurement Manual.
E6	**Vibration nuisance** Vibration from the licensed activities must not cause an environmental nuisance at any sensitive or commercial place.
E7	When requested by the administering authority, vibration monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.
E8	Vibration monitoring must include the following descriptors, characteristics and conditions: a) location of the blast(s) within the mining area (including which bench level); b) atmospheric conditions including temperature, relative humidity and wind speed and direction; and c) location, date and time of recording.

E9	If monitoring indicates exceedance of the relevant limits in **Table E2: Vibration Limits**, then the environmental authority holder must: a) address the complaint including the use of appropriate dispute resolution if required; and b) immediately implement vibration abatement measures so that vibration from the activity does not result in further environmental nuisance.
E10	The airblast overpressure level from blasting operations on the premises must not exceed the limits defined in **Table E3: Airblast Overpressure Level** at any nuisance sensitive or commercial place.

Table E3: Airblast Overpressure Level

Location	**Airblast Overpressure Measured**
Sensitive or commercial place	Air blast overpressure level of 115 dB (Linear peak) for 9 out of 10 consecutive blasts initiated and not greater than 120 dB (Linear peak) at any time.

E11	When requested by the administering authority, airblast overpressure monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.
E12	Airblast overpressure monitoring must include the following descriptors, characteristics and conditions: a) location of the blast(s) within the mining area (including which bench level); b) atmospheric conditions including temperature, relative humidity and wind speed and direction; and c) location, date and time of recording.
E13	If monitoring indicates exceedance of the relevant limits in **Table D3: Airblast Overpressure Level**, then the environmental authority holder must: a) address the complaint including the use of appropriate dispute resolution if required; and b) immediately implement airblast overpressure abatement measures so that airblast overpressure from the activity does not result in further environmental nuisance.
E14	The method of measurement and reporting of airblast overpressure levels must comply with the current edition of the administering authority's Noise Measurement Manual.

Schedule F: Waste	
Condition number	**Condition**
F1	Unless otherwise permitted by the conditions of this environmental authority or with prior approval from the administering authority and in accordance with a relevant standard operating procedure, waste must not be burnt.
F2	The holder of this environmental authority may burn vegetation cleared in the course of carrying out extraction activities provided the activity does not cause environmental harm at any sensitive place or commercial place.

F3	**Mine waste** A Mining Waste Management Plan must be developed and implemented by an appropriately qualified person for every stage of the mining activities. The Mining Waste Management Plan must at a minimum include: a) characterisation programs to ensure that all mining waste is progressively characterised during disposal for net acid producing potential, salinity and the following contaminants: pH, Electrical Conductivity (EC), Acid Neutralising Capacity (ANC), Net Acid Generation (NAG) (reporting NAG capacity and NAG pH after oxidation), Total Sulphur (S), Chromium Reducible Sulphur (Scr), Boron (B) Cadmium (Cd), Iron (Fe), Aluminium (Al), Copper (Cu), Magnesium (Mg), Manganese (Mn), Calcium (Ca), Sodium (Na), Zinc (Zn) and Sulfate (SO_4); b) characterisation programs to ensure that the physical properties of the mining waste is progressively characterised during disposal; c) the availability or leachability of metals from the mining waste; d) quantification of PAF from mining waste present; e) review impacts of the PAF mining waste on the rehabilitation; f) management actions for mining waste that has been identified as having a high availability or leachability of metals; g) management actions for mining waste that has been defined as PAF; h) identification of environmental impacts and potential environmental impacts; i) control measures for routine operations to minimise likelihood of environmental harm; j) contingency plans and emergency procedures for non-routine situations; k) periodic review of environmental performance and continual improvement. l) containment of tailings; m) records to indicate locations and characteristics of tailings stored within the tailings storage facility; n) the management of seepage and leachates from tailings storages both during operation and the foreseeable future; o) the control of fugitive emissions to air; and p) a program for progressive sampling and characterisation to identify acid producing potential and metal concentrations of tailings.
F4	Within **twenty (20) business days** of receiving comments from the administering authority as per **Condition F3**, the Mining Waste Management Plan must be updated to address the comments and submitted to the administering authority.
F5	**Acid Sulfate soils** Treat and manage acid Sulfate soils in accordance with the latest edition of the Queensland Acid Sulfate Soil Technical Manual.

Schedule G: Land	
Condition number	**Condition**
G1	**Topsoil** Topsoil must be strategically stripped ahead of mining in accordance with a Topsoil Management Plan.
G2	**Preventing contaminant release to land** Contaminants must not be released to land in a manner which constitutes nuisance, material or serious environmental harm, unless otherwise authorised by a condition of this environmental authority.
G3	**Chemicals Storage** Chemicals and fuels must be effectively contained and controlled in a manner that prevents environmental harm and where relevant, meet Australian Standards, where such a standard is applicable.
G4	Spillage of all chemicals and fuels must be controlled in a manner that prevents environmental harm.
G5	All explosives, corrosive substances, toxic substances, gases and dangerous goods must be stored and handled in accordance with the relevant Australian Standard, where such a standard is applicable.
G6	**Spill Kit** An appropriate spill kit, personal protective equipment and relevant operator instructions/emergency procedure guides for the management of wastes, chemicals and flammable and combustible liquids associated with the activity must be kept at the site.
G7	Anyone operating with wastes, chemicals or flammable and combustible liquids under this approval must be trained in the use of the spill kit
G8	**Infrastructure** All infrastructure, constructed by or for the environmental authority holder during the licensed activities including water storage structures, must be removed from the site prior to surrender, except where agreed in writing by the post-mining landowner/holder and where there is a demonstrated benefit to the post-mining landowner/holder
G9	All areas significantly disturbed by mining activities must be rehabilitated to a safe, stable and non-polluting landform, with a self-sustaining vegetation cover (except for the residual voids), in accordance with: a) Table G1: Landform Design Criteria; b) Table G2: Final Land Use and Rehabilitation Approval Schedule; c) Table G3: Residual Void Design; d) Table G4: Rehabilitation Schedule; e) Attachment C: Final Landform f) Attachment F: Rehabilitation Requirements; and g) As otherwise detailed in **Condition G21**.

Table G1: Landform Design Criteria

Disturbance Type	Maximum Projective Surface Area (ha)	Maximum Slope	Vertical Height Range (m)
Elevated Landforms	853	< 18.5%	0-64
Infrastructure Areas	112	< 5%	0-15

Table G2: Final Land Use and Rehabilitation Approval Schedule

Disturbance type	**Maximum surface area (ha)**	**Pre-mine land use**	**Post-mine land suitability classification for cattle grazing***	**Proposed post-mine land use**
MIA and CHPP area	111	Stage 1 MIA and CHPP area	3 to 5 (as per pre-mining)	Low density beef cattle grazing or recreated Regional Ecosystem 11.5.9 (*Eucalyptus crebra* and other *Eucalyptus spp*. And *Corymbia spp*. Woodland on Cainozoic sand plains/remnant surfaces.)
Roads including haul roads	46	Stage 1 roads and sparse cattle grazing on native vegetation	3 to 5 (as per pre-mining)	Retained for beneficial reuse where appropriate, or a land use conducive to the surrounding land use including recreation of: Regional Ecosystem 11.3.2 (*Eucalyptus populnea* woodland on alluvial plains) Regional Ecosystem 11.7.2 (*Acacia spp*. Woodland on Cainozoic lateritic duricrust. Scarp retreat zone) Regional Ecosystem 11.5.9 (*Eucalyptus crebra* and other *Eucalyptus spp*. And *Corymbia spp*. Woodland on Cainozoic sand plains/remnant surfaces)
Creek diversion and levee banks	371	Low density cattle grazing on native vegetation	5	Retained, with recreated RE 11.3.25 (*Eucalyptus terticornis* or *E. camaldulensis* woodland fringing drainage lines) Thirteen Mile Gully Diversion would be revegetated with species characteristic of RE 11.3.1b (Open forest dominated by *Acacia harpophylla* and/or *Casuarina cristata*), RE 11.3.2c (*Eucalyptus populnea* woodlands on floodplains) and RE 11.3.25 (*Eucalyptus tereticornis* or *Eucalyptus camaldulensis* woodland fringing drainage lines)

In-pit and out-of-pit overburden spoil dumps (Slopes)	691	Low density cattle grazing on native vegetation and Stage 1 bulk sample pit	5	Rock mulched surface with native grass, with exception of the slope of the southern overburden spoil dump relative to the Roper Creek Floodplain which would be native ecosystem with recreated RE 11.5.3 (*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces)
In-pit and out-of-pit overburden spoil dumps (upper surface)	1458	Low density cattle grazing on native vegetation and Stage 1 bulk sample pit	5	Native ecosystem** with recreated RE 11.5.3 (*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces)
Low wall spoil (above natural ground level)	60	Low density cattle grazing on native vegetation and Stage 1 bulk sample pit	5	Native ecosystem** with recreated RE 11.5.3 on benches (*Eucalyptus populnea* +/- *E. melanophloia* +/- *Corymbia clarksoniana* on Cainozoic sand plains/remnant surfaces)
North residual void	358	Low density cattle grazing on native vegetation	N/A	Residual void
South residual void	163	Low density cattle grazing on native vegetation	N/A	Residual void
Water storage/water management dams	68	Low density cattle grazing on native vegetation	3-4 (where rehabilitated) 5 (where retained)	Retained for beneficial reuse where appropriate, or a land use conducive to the surrounding land use, including wetlands, recreated RE 11.3.27 (Freshwater wetlands)
TSF and TFC	24	Stage 1 TSF and TFC	5	RE 11.7.2 (*Acacia spp*. Woodland on Cainozoic lateritic duricrust. Scarp retreat zone)

Notes:** Where native ecosystem is defined as recreating land to a natural ecosystem as similar as possible to the original ecosystem.
* Low density cattle grazing is assumed to be up to 0.07 head/hectare. Stocking rates will be revised based on field trials and establishment of reference sites during mine operation.

Table G3: Residual Void Design

Void identification	Void high wall – competent rock slope (degrees)	Void high wall incompetent rock slope (degrees)	Void low wall – competent rock slope (degrees)	Void low wall – incompetent rock slope (degrees)	Void maximum surface area (ha)	Void maximum depth (m)	Void volume* (m^3)
North Void	59	36	30	30	358	235	285,870,000
South Void	59	36	30	30	163	199	157,960,000

Note: * based on the full supply volume at full supply levels of 160 m AHD and 150 m AHD for the North Void and South Void, respectively.

Table G4: Rehabilitation Schedule

End of Calendar year	Maximum total area of disturbance (ha)	Minimum area of rehabilitation (ha)
2023	2,265	348
2028	2,700	821
2032	2,850	1,398

G10	Self-sustaining vegetation, as per **Attachment F**, must be consistent with the reference sites identified in **Table G5: Reference Sites.**

Table G5: Reference Sites

Reference Site	Domain Reference	Easting (GDA94, MGA 55)	Northing (GDA94, MGA 55)	Description
1	• In-pit and out-of-pit spoil dumps	662,226	7,475,606	RE 11.5.3
2	• MIA and CHPP area • Roads including haul roads • Tailings Storage Facility	665,455	7,469,732	RE 11.5.9
3	▪ Roads including haul roads	665,832	7,470,708	RE 11.7.2

G11	Rehabilitation must commence and be undertaken progressively in accordance with: a) the Rehabilitation Management Plan; and **b) Table G4: Rehabilitation Schedule.**

G12	Complete a Rehabilitation Management Plan for all areas disturbed by authorised mining activities. The Rehabilitation Management Plan must be developed and implemented by an appropriately qualified person that includes, at a minimum: a) a map of existing areas of rehabilitation; b) a strategy and schedule for the progressive rehabilitation of all disturbance during the life of the mine; c) a strategy for successfully achieving the rehabilitation requirements of this environmental authority; d) details of rehabilitation methods to be applied to each domain; e) description of rehabilitation indicators and how these will be monitored; f) description of management actions to address unsuccessful rehabilitation or redesign; g) explanation of planned native vegetation rehabilitation areas and corridors; h) details of the objectives and success criteria for rehabilitation of each mining domain to achieve rehabilitation outcomes listed in Attachment F: Rehabilitation Requirements and **Table G3: Residual Void Design**; i) an assessment of the geotechnical issues and erosivity of the proposed final landforms, including final voids, to demonstrate long-term landform stability. Reference is to be made to the Queensland Mining Guidelines (or subsequent reprints) in making this assessment. Reference is also to be made to the Natural Hazard Management Areas (Landslide) within the SPP 1/03 Guideline. Emergency service agencies will be consulted in relation to any required hazard and risk management advice; j) details of landform design to achieve rehabilitation outcomes listed in Attachment F: Rehabilitation Requirements and **Table G1: Landform Design Criteria**, including end of mine design and schematic representation of final landform inclusive of: i. drainage design and features; ii. slope designs; iii. cover design; iv. erosion controls proposed on reformed land; k) details of how landform design will be consistent with the surrounding topography; l) specify the spoil characteristics, soil analysis and soil separation for use on rehabilitation; m) specify the topsoil requirements for the site and how topsoil will be managed for use in rehabilitation; n) details of any topsoil deficit and how any deficit will be managed for successful rehabilitation; o) identifies 3 reference and 3 rehabilitation sites to be used to develop rehabilitation success criteria; p) description of monitoring of reference sites and rehabilitated areas inclusive of statistical design; q) description of rehabilitation monitoring and maintenance requirements to be applied to all areas of disturbance; r) include a cost benefit analysis/triple bottom line assessment (or an alternative assessment method) of the proposed final landform design criteria and alternatives; and s) identification of potential problems and how they will be addressed.

G13	Where there is any inconsistency between the Rehabilitation Management Plan and this environmental authority, the conditions of this environmental authority prevail.
G14	**Rehabilitation Monitoring Program** A Rehabilitation Monitoring Program must be developed and implemented by a person possessing appropriate qualifications and experience in the field of rehabilitation management, nominated by the environmental authority holder.
G15	The environmental authority holder must review the Rehabilitation Monitoring Program required by **Condition G14** at intervals no greater than **three (3) years** from **29 June 2019**. If the environmental authority holder needs to make changes to the Rehabilitation Monitoring Program, they must: a) submit the Rehabilitation Monitoring Program to the administering authority for review and comment; and b) within **twenty (20) business days** of receiving comments from the administering authority, the Rehabilitation Monitoring Plan must be updated to address the comments and resubmitted to the administering authority.
G16	A report of the findings of the Rehabilitation Monitoring Program must be updated and submitted to the administering authority, on 29 June of each calendar year , containing at a minimum: a) how the rehabilitation objectives as per Attachment F of this environmental authority will be achieved; b) how the rehabilitation objectives in the Rehabilitation Management Plan required by **Condition G12** are being met; c) if rehabilitation objectives are not being met, the corrective actions to be taken; d) specify the minimum sampling intensity for the monitoring of progressive rehabilitation; e) a statistical analysis of how areas of rehabilitation compared to analogue sites listed in **Table G5: Reference Sites**; f) a statistical analysis of how areas of rehabilitation are meeting the requirements of **Condition G9**; g) the sampling and monitoring intensity used in the Rehabilitation Monitoring Program required by **Condition G14**; h) justification of the suitability of the minimum sampling intensity; and i) justification of the sampling and monitoring intensity used in the Rehabilitation Monitoring Program required by **Condition G14**.
G17	**Residual void outcome** Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority.
G18	At the completion of decommissioning and rehabilitation, residual voids must be protected from Probable Maximum Floods (PMFs) from nearby watercourses such that the protection is sustainable for the foreseeable future.

G19	Complete an investigation into residual voids and submit a report to the administering authority proposing acceptance criteria to meet the outcomes in **Conditions G17 and G18** and landform design criteria by **31 October 2021**. The investigation must at a minimum include the following: a) a study of options available for minimising final void area and volume; b) a void hydrology study, addressing the long-term water balance in the voids, connections to groundwater resources and water quality parameters in the long term; and c) a pit wall stability study, considering the effects of long-term erosion and weathering of the pit walls and the effects of significant hydrological events. Note: These studies will be undertaken during the life of the mine, and must include detailed research and modelling.
G20	All reasonable and practical measures must be taken to minimise the size of the void remaining after mining activities cease.
G21	**Post Closure Management Plan** A Post Closure Management Plan for the site must be developed and submitted, for review and comment, to the administering authority at least **eighteen (18) months** prior to the final coal processing on site and implemented for a nominal period of: a) at least thirty (30) years following final coal processing on site; or b) a shorter period if the site is proven to be geotechnically and geochemically stable and it can be demonstrated to the satisfaction of the administering authority that no release of contaminants from the site will result in environmental harm.

G22	The Post Closure Management Plan must include the following elements: a) operation and maintenance of: i. wastewater collection and reticulation systems; ii. wastewater treatment systems; iii. the groundwater monitoring network; iv. the flood protection levee and final landform relative to Roper Creek; v. final cover systems of spoil dumps; and vi. vegetative cover; and b) monitoring of: i. surface water quality; ii. groundwater quality; iii. seepage rates; iv. erosion rates; v. the integrity of the flood protection levee and final landform relative to Roper Creek; vi. the integrity and stability all slopes, ramps and voids; and vii. the health and resilience of native vegetation cover. c) investigation of: i. soil contamination; and ii. landform failure.
G23	Within **twenty (20) business days** of receiving comments from the administering authority on the Post Closure Management Plan submitted in accordance with **Condition G21**, the Post Closure Management must be updated to address the comments and resubmitted to the administering authority.
G24	**Impacts to Prescribed Environmental Matters** Significant residual impacts to prescribed environmental matters as per the *Environmental Offsets Act 2014*, are only authorised to occur: a) for the prescribed environmental matter specified in **Table G6: Significant residual impacts to prescribed environmental matters**, and as indicated in **Attachment D: Location of Authorised impacts to prescribed environmental matters**; and b) for the prescribed environmental matter specified in **Table G6: Significant residual impacts to prescribed environmental matters**, the impacts do not exceed the maximum extent of impact specified for that prescribed environmental matter.
G25	A notice of election for the environmental offset, must be provided to the administering authority no less than **three (3) months** before the proposed commencement of the significant residual impacts to the prescribed environmental matters.

Table G6: Significant residual impacts to prescribed environmental matters.

Prescribed environmental matter	Maximum extent of impact (ha)	Environmental offset required
Regulated Vegetation		
Regional ecosystems (not within an urban area) that intersect a watercourse on the vegetation management watercourse map – RE 11.3.25e	1	Yes
Endangered Regional Ecosystem - RE 11.4.9*	0.5*	No*
Endangered Regional Ecosystem - RE 11.3.1*	15*	No*
Of Concern Regional Ecosystem (not within an urban area) - RE 11.3.2	63	Yes
Of Concern Regional Ecosystem (not within an urban area) RE 11.3.2b	1	Yes
Of Concern Regional Ecosystem (not within an urban area) - RE 11.3.2/RE 11.3.4	1.5	Yes
Regional ecosystems (not within an urban area) that intersect a wetland on the vegetation management wetlands map - RE 11.3.27d	1.9	No
Regional ecosystems within the defined distance of a vegetation management watercourse (RE 11.3.2, 11.3.7 and RE 11.3.25)	3.7	Yes
Connectivity areas		
Connectivity area that is a regional ecosystem (not in urban area)	439.5	Yes
Wetlands and watercourses		
A wetland of high ecological significance shown on the Map of referable wetlands	0.75	Yes
Protected wildlife habitat		
Habitat for an animal that is vulnerable wildlife – *Denisonia maculata* (ornamental snake)*	15.5*	No*
	12.81	No
Habitat for an animal that is vulnerable wildlife – *Geophaps scripta scripta* (squatter pigeon)*	569.5*	No*
	233	No
Habitat for an animal that is vulnerable wildlife – *Petauroides volans* (greater glider)*	175*	No*
	63.3	Yes
Habitat for an animal that is vulnerable wildlife – *Phascolarctos cinereus* (koala)*	175*	No*
	63.3	Yes
Habitat for an animal that is special least concern wildlife – *Tachyglossus aculeatus* (short-beaked echidna)	351.5	No
Legally Secured Offset Area		
Legally secured offset area - Stage 2 Offset Area*	32*	No*
Legally secured offset area - Rail Loop and Spur Offset Area	22	Yes

*This matter will be offset under EPBC Act approval conditions.

G26	**Exploration Activities on Mining Lease 70379** The environmental authority holder is authorised to conduct exploration activities, including rehabilitation activities, on Mining Lease (ML) 70379.
G27	**Conditions G28 to G40** only apply to parts of ML70379 where surface rights are held for exploration drilling only.
G28	When conducting exploration activities, the holder of the environmental authority must ensure that the area and duration of disturbance to land and vegetation is minimised. The operational areas of individual drill sites must not exceed 1000 metres squared. Sump size must not exceed 100 metres squared and 2 metres deep.

G29	All clearing of mature trees must be prevented or minimised
G30	The holder of the environmental authority must not carry out exploration activities in a Category A or B environmentally sensitive area or riverine areas. Activities involving machinery must not be carried out within 1km of a Category A environmentally sensitive area. The holder of the environmental authority is authorised to undertake no more than 119 drill sites, within the 500 m buffer of Category B environmentally sensitive areas, in accordance with **Attachment E: Drill Hole Locations ML70379**.
G31	The holder of the environmental authority must not carry out activities within 100m of a Historical, Archaeological or Ethnographic site.
G32	The holder of the environmental authority must not drill, excavate or clear vegetation: a) in standing waters, wetlands or lakes; or b) on the sloped banks or within 3m of the top of the bank or 5m of the toe of the bank; or c) within, or on the levee banks of the normal flow channel.
G33	The holder of this environmental authority must consult with the landowner prior to establishing any new roads and tracks.
G34	When constructing new roads and tracks, the holder of the environmental authority must ensure that the area and duration of disturbance to land, vegetation and watercourses is minimised. Track construction involving blade clearing of established vegetation and or the clearing of mature trees is to be minimised.
G35	Tracks are not to be constructed greater than 5m in width.
G36	The holder of the environmental authority must decommission all non-artesian drill holes, apart from those still required for monitoring purposes as soon as practical, but no later than 6 months after the hole was drilled by undertaking the following actions: a) where practical dispose of all unused drill chips to the hole or to a sump pit and; b) cap the hole at a depth that is appropriate for the previous land use of the area (unless the land owner stipulates a future use which requires the cap to be placed deeper); and c) backfill the hole above the cap with soil or material similar to the surrounding soil or material. For drill holes that will be mined through within 2 years, the hole must be capped and the sump backfilled as soon as practical, but no later than 6 months after the hole was drilled.
G37	The holder of the environmental authority must isolate non-artesian aquifers where a drill hole intersects more than one water bearing strata by casing or plugging the hole as soon as practical after the hole is no longer required, but no later than **two (2) months** after the hole was drilled, apart from those holes that are still required for monitoring purposes if: a) the flow difference between aquifers exceeds 500 L/hour; and b) the difference in electrical conductivity of water is greater than 10 percent of the lower value.

G38	**Conditions G39** and **G40** do not apply to a non-artesian exploration drill hole if: a) the land owner and the explorer have agreed that it should be left for conversion to a water bore; and b) the landowner gives a written undertaking to accept responsibility for the hole; and c) the details of the agreement and the drill hole (such as its GPS location and the drill logs showing the water bearing strata and flow rates) are provided to the Department of Natural Resources, Mines and Energy within **30 days** of the land owner giving the undertaking; and d) the hole is temporarily capped so as to prevent possible ingress of surface waters and associated sediments and pollutants.
G39	The holder of the environmental authority must ensure that exploration drill holes do not strike artesian flows of water.
G40	The holder of the environmental authority must ensure that exploration drill holes that are to be retained for future mineral resource evaluation purposes are cased and capped. Holes to be retained for more than three years must be capped with steel casing and appropriately identified.
G41	**Rehabilitation of exploration activities on ML70379** For all exploration drill holes on ML70379, the holder of the environmental authority must complete the rehabilitation processes as soon as practical and within **six (6) months** of the completion of exploration activities at those areas. For drill holes that will be mined through within 2 years, the hole must be capped and the sump backfilled as soon as practical, but no later than 6 months after the hole was drilled.
G42	**Condition G43** does not apply to any excavations, drill holes or sampling sites that are to remain after the completion of exploration activities, by agreement with the land owner.
G43	The holder of the environmental authority must rehabilitate areas disturbed by exploration drilling to a stable landform similar to that of surrounding undisturbed areas and in accordance with **Attachment F: Rehabilitation Requirements**.
G44	The holder of the environmental authority must spread seeds or plant species that will promote vegetation of a similar species and density of cover to that of the surrounding undisturbed areas or vegetation that is appropriate for providing erosion control and stabilisation of the areas disturbed by exploration drilling.

Schedule H: Regulated Structures	
Condition number	**Condition**
H1	**Assessment of consequence category** The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933) at the following times: a) prior to the design and construction of the structure, if it is not an existing structure; or b) prior to any change in its purpose or the nature of its stored contents.
H2	A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.
H3	Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933).
H4	**Design and construction[1] of a regulated structure** **Conditions H5 to H9** inclusive do not apply to existing structures. [1] Construction of a dam includes modification of an existing dam — refer to the definitions.
H5	All regulated structures must be designed by, and constructed under the supervision of, a suitably qualified and experienced person in accordance with the requirements of the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933).
H6	Construction of a regulated structure is prohibited unless the holder has submitted a consequence category assessment report and certification to the administering authority has been certified by a suitably qualified and experienced person for the design and design plan and the associated operating procedures in compliance with the relevant condition of this authority.
H7	Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933), and must be recorded in the Regulated Dams-Levees register.

H8	Regulated structures must: a) be designed and constructed in accordance with and conform to the requirements of the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933); b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of: i. floodwaters from entering the regulated dam from any watercourse or drainage line; and ii. wall failure due to erosion by floodwaters arising from any watercourse or drainage line.
H9	Certification by the suitably qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure, and state that: a) the 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure; and b) construction of the regulated structure is in accordance with the design plan.
H10	**Operation of a regulated structure** Operation of a regulated structure, except for an existing structure, is prohibited unless the holder has submitted to the administering authority: a) one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with **Condition H6**; b) a set of 'as constructed' drawings and specifications; c) certification of those 'as constructed drawings and specifications' in accordance with **Condition H9**; d) where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan; e) the requirements of this authority relating to the construction of the regulated structure have been met; f) the holder has entered the details required under this authority, into a Register of Regulated Dams; and g) there is a current operational plan for the regulated structures.

H11	For existing structures that are regulated structures: a) where the existing structure that is a regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, the holder must submit to the administering authority within **twelve (12) months** of the commencement of this condition a copy of the certified system design plan including that structure; and b) there must be a current operational plan for the existing structures
H12	Each regulated structure must be maintained and operated, for the duration of its operational life until decommissioned and rehabilitated, in a manner that is consistent with the current operational plan and, if applicable, the current design plan and associated certified 'as constructed' drawings
H13	**Mandatory reporting level** **Conditions H14 to H17** inclusive only apply to Regulated Structures which have not been certified as low consequence category for 'failure to contain – overtopping'.
H14	The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of that dam, it is clearly observable.
H15	The holder must, as soon as practical and within **forty-eight (48) hours** of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
H16	The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated dam.
H17	The holder must record any changes to the MRL in the Register of Regulated Structures
H18	**Design storage allowance** The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken prior to **1 July** of each year.
H19	By **1 November** of each year, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume), to meet the Design Storage Allowance (DSA) volume for the dam (or network of linked containment systems).
H20	The holder must, as soon as possible and within **forty-eight (48) hours** of becoming aware that the regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on **1 November** of any year, notify the administering authority.
H21	The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on **1 November** of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.

H22	**Annual inspection report** Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.
H23	At each annual inspection, the condition and adequacy of all components of the regulated structure must be assessed and a suitably qualified and experienced person must prepare an annual inspection report containing details of the assessment and include recommended actions to ensure the integrity of the regulated structure.
H24	The suitably qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933).
H25	The holder must: a) within **20 business days** of receipt of the annual inspection report, provide to the administering authority: i. the recommendations section of the annual inspection report; and ii. if applicable, any actions being taken in response to those recommendations; and b) if, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this to the administering authority within **ten (10) business** days of receipt of the request.
H26	**Transfer arrangements** The holder must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority
H27	**Decommissioning and rehabilitation** Dams must not be abandoned but be either: a) decommissioned and rehabilitated to achieve compliance with Conditions **G21** to **G31** of this environmental authority; or b) be left in-situ for a beneficial use(s) provided that: i. it no longer contains contaminants that will migrate into the environment; and ii. it contains water of a quality that is demonstrated to be suitable for its intended beneficial use(s); and iii. the administering authority, the holder of the environmental authority and the landholder agree in writing that the dam will be used by the landholder following the cessation of the environmentally relevant activity(ies).

H28	**Register of Regulated Dams** A Register of Regulated Dams must be established and maintained by the holder for each regulated dam
H29	The holder must provisionally enter the required information in the Register of Regulated Dams when a design plan for a regulated dam is submitted to the administering authority
H30	The holder must make a final entry of the required information in the Register of Regulated Dams once compliance with **Condition H10 and H11** has been achieved.
H31	The holder must ensure that the information contained in the Register of Regulated Dams is current and complete on any given day.
H32	All entries in the Register of Regulated Dams must be approved by the chief executive officer for the holder of this authority, or their delegate, as being accurate and correct.
H33	The holder must, at the same time as providing the annual return, supply to the administering authority a copy of the records contained in the Register of Regulated Dams, in the electronic format required by the administering authority.
H34	**Transitional arrangements** All existing structures that have not been assessed in accordance with either the Manual or the former Manual for Assessing Hazard Categories and Hydraulic Performance of Dams must be assessed and certified in accordance with the Manual within **six (6) months** of amendment of the authority adopting this schedule.
H35	All existing structures must subsequently comply with the timetable for any further assessments in accordance with the Manual specified in **Table H1: Transitional hydraulic performance requirements for existing structures**, depending on the consequence category for each existing structure assessed in the most recent previous certification for that structure
H36	**Table H1: Transitional hydraulic performance requirements for existing structures** ceases to apply for a structure once any of the following events has occurred: a) it has been brought into compliance with the hydraulic performance criteria applicable to the structure under the Manual; or b) it has been decommissioned; or c) it has been certified as no longer being assessed as a regulated structure.
H37	Certification of the transitional assessment required by **Conditions H34 and H35** (as applicable) must be provided to the administering by **22 February 2015**.

Table H1: Transitional hydraulic performance requirements for existing structures

Transition period required for existing structures to achieve the requirements of the Manual for Assessment Consequence Categories and Hydraulic Performance of Dams (ESR/2016/1933)			
Compliance with criteria	**High**	**Significant**	**Low**
>90% and a history of good compliance performance in the last 5 years	No transition required	No transition required	No transitional conditions apply. Review consequence assessment every 7 years.
> 70% to less than or equal to 90%	Within 7 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Within 10 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	No transitional conditions apply. Review consequence assessment every 7 years.
>50% less than or equal to 70%	Within 5 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Within 7 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	No transitional conditions apply. Review consequence assessment every 7 years.
less than or equal 50%	Within 5 years or as per compliance requirements (e.g. Transitional Environmental Program).	Within 5 years or as per compliance requirements (e.g. Transitional Environmental Program).	No transitional conditions apply. Review consequence assessment every 7 years.

Schedule I: Watercourse Diversion	
Condition number	**Condition**
I1	**Permanent watercourse diversion – Thirteen Mile Gully and Roper Creek** The Thirteen Mile Gully Diversion depicted at **Attachment G** and the Roper Creek Diversions depicted at **Attachment H** of this environmental authority are authorised as permanent watercourse diversions.

I2	Permanent watercourse diversions must be designed and constructed to: a) incorporate natural features (including geomorphic and vegetation) present at the location of the diversion; b) maintain the pre-existing hydrologic characteristics of surface water and groundwater systems for the area in which the watercourse diversion is located; c) maintain the hydraulic characteristics of the permanent watercourse diversion that are equivalent to other local watercourses and are suitable for the area in which the diversion is located without using artificial structures that require ongoing maintenance; d) maintain sediment transport and water quality regimes that allow the diversion to be self-sustaining, while minimising any impacts to upstream and downstream water quality, geomorphology or vegetation; and e) maintain equilibrium and functionality in all substrate conditions at the location of the diversion.
I3	**Design plan – All diversions** A certified Design Plan that achieves **Condition I2** must be submitted to the administering authority at least **ten (10) business days** before commencing construction of the diversion.
I4	The certified design plan for any temporary or permanent watercourse diversion must be consistent with the functional design/s that formed a part of the application documents for this authority
I5	**Construction and operation – All diversions** A certified set of 'as constructed' drawings and specifications must be submitted to the administering authority within **sixty (60) business days** from the completion of construction of the permanent watercourse diversion. These drawings and specifications must state: a) that the 'as constructed' drawings and specifications meet the original intent of the design plan for the watercourse diversion. b) construction of the watercourse diversion is in accordance with the design plan.
I6	**Register – All diversions** The details of watercourse diversions planned and constructed under an environmental authority must be accurately recorded on the Register of Watercourse Diversions kept by the holder of the authority. An electronic copy must be provided to the administering authority on request.

---------- <Insert Page Break>----------

Definitions

Key terms and/or phrases used in the environmental authority EPML00716913 document are defined in this section. Applicants should note that where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

"acceptance criteria" means the measures by which the actions implemented to rehabilitate the land are deemed to be complete. The acceptance criteria indicate the success of the rehabilitation outcome or remediation of areas which have been significantly disturbed by the mining activities. Acceptance criteria may include information regarding:

a) vegetation establishment, survival and succession;

b) vegetation productivity, sustained growth and structure development;

c) fauna colonisation and habitat development;

d) ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;

e) microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;

f) effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;

g) resilience of vegetation to disease, insect attack, drought and fire; and

h) vegetation water use and effects on groundwater levels and catchment yields.

"acid rock drainage" means any contaminated discharge emanating from a mining activity formed through a series of chemical and biological reactions, when geological strata is disturbed and exposed to oxygen and moisture as a result of mining activity.

"airblast overpressure" means energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dB).

"affected person" means an affected person under section 38 of the *Environmental Protection Act 1994.*

"annual inspection report" means an assessment prepared by a suitably qualified and experienced person containing details of the assessment against the most recent consequence assessment report and design plan (or system design plan);

a) against recommendations contained in previous annual inspections reports;

b) against recognised dam safety deficiency indicators;

c) for changes in circumstances potentially leading to a change in consequence category;

d) for conformance with the conditions of this authority;

e) for conformance with the 'as constructed' drawings;

f) for the adequacy of the available storage in each regulated dam, based on an actual observation or observations taken after 31 May each year but prior to 1 November of that year, of

accumulated sediment, state of the containment barrier and the level of liquids in the dam (or network of linked containment systems);

g) for evidence of conformance with the current operational plan.

"Annual exceedance probability" or "**AEP**" the probability that at least one event in excess of a particular magnitude will occur in any given year

"appropriately qualified person" means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods or literature.

"assessed" and **"assessment"** by a suitably qualified and experienced person in relation to a hazard assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

a) exactly what has been assessed and the precise nature of that assessment;

b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;

c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and

d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

"associated works" in relation to a dam, means:

a) operations of any kind and all things constructed, erected or installed for that dam; and

b) any land used for those operations.

"authorised place" means the place authorised under this environmental authority/development approval for the carrying out of the specified environmentally relevant activities.

"authority" means this environmental authority (EPML001716913) under the *Environmental Protection Act 1994*.

"certification" means assessment and approval must be undertaken by a suitably qualified and experienced person in relation to any assessment or documentation required by this Manual, including design plans, 'as constructed' drawings and specifications, construction, operation or an annual report regarding regulated structures, undertaken in accordance with the Board of Professional Engineers of Queensland Policy Certification by RPEQs (ID: 1.4 (2A)).

"certifying", "certify" or "certified" have a corresponding meaning as 'certification'.

"chemical" means

a) an agricultural chemical product or veterinary chemical product under the *Agricultural and Veterinary Chemicals Code Act 1994* (Cwlth); or

b) a dangerous good under the dangerous goods code; or

c) a drug or poison mentioned on the current Poisons Standard under the Therapeutic Goods Act 1989 (Cwlth); or

d) a substance intended for use as

i) a fertiliser for agricultural, horticultural or garden use, other than mushroom growing substrate or compost; or

ii) a paint or paint solvent, pigment, dye printing ink, industrial polish, degreasing agent, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, biocide or firefighting foam; or

iii) a pesticide, insecticide, fungicide, herbicide, rodenticide, nematicide, miticide, fumigant or related product; or

iv) a surface active agent, including, for example, soap and detergent; or

e) class 1 and 2 combustible liquids under AS1940; or

f) a chemical toxicant for which guidelines are prescribed under the Australian water quality management guidelines.

"commercial place" means any of the following types of premises

a) a hotel, motel, caravan park, café, food store or canteen;

b) an assembly building, institution building, kindergarten, child minding centre, school or other building used for education;

c) premises where a sport or game is ordinarily played in public

d) an exhibition round, show ground or racecourse

e) an office, shop or other premises where business or work, other than a manufacturing process, is carried out.

"competent person" means a person with the demonstrated skill and knowledge required to carry out the task to a standard necessary for the reliance upon collected data or protection of the environment.

"construction" or **"constructed"** in relation to a dam includes building a new dam and modifying or lifting an existing dam, but does not include investigations and testing necessary for the purpose of preparing a design plan.

"control measures" means actions that can be taken in order to minimise environmental impacts or environmental harm. Control measures can be, but are not limited to, planning, procedural or engineering controls.

"consequence" in relation to a structure as defined, means the potential for environmental harm resulting from the collapse or failure of the structure to perform its primary purpose of containing, diverting or controlling flowable substances.

"consequence category" means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933).

"cover material" means any soil or rock suitable as a germination medium or landform armouring.

"dam" means a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works.

"dam crest volume" means the volume of material (liquids and/or solids) that could be within the walls of a dam at any time when the upper level of that material is at the crest level of the dam. That is, the instantaneous maximum volume within the walls, without regard to flows entering or leaving (e.g. via spillway)

"design plan" is a document setting out how all identified consequence scenarios are addressed in the planned design and operation of a regulated structure.

"design storage allowance" or **"DSA"** means an available volume, estimated in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933) published by the administering authority, must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an annual exceedance probability (AEP) specified in that Manual.

"designer" for the purposes of a regulated dam, means the certifier of the design plan for the regulated dam.

"environmental authority" means the same as "authority".

"environmental authority holder" or **"holder"** means the holder of this environmental authority.

"emergency action plan" means documentation forming part of the operational plan held by the holder or a nominated responsible officer, that identifies emergency conditions that sets out procedures and actions that will be followed and taken by the dam owner and operating personnel in the event of an emergency. The actions are to minimise the risk and consequences of failure, and ensure timely warning to downstream communities and the implementation of protection measures. The plan must require dam owners to annually update contact.

"environmental harm" has the meaning given in the *Environmental Protection Act 1994*.

"environmental impacts" means changes that occur in the environment as a result of the mining activities. Impacts could be positive, negative or neutral.

"environmental offset" has the meaning in section 7 of the *Environmental Offsets Act 2014.*

"environmental value" has the meaning given in the *Environmental Protection Act 1994*;

"environmentally sensitive areas" refer to Schedule 12 of the Environmental Protection Regulation 2008.

"existing structure" means a structure that prior to 22 August 2014 meets any or both of the following:

a) a structure with a design that is in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933) and that is considerably in progress; or

b) a structure that is under considerable construction or that is constructed.

"flowable substance" means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids, fluids or solids or a mixture that includes water and any other liquids, fluids or solids either in solution or suspension.

"**hydraulic performance**" means the capacity of a regulated dam to contain or safely pass flowable substances based on the design criteria specified for the relevant consequence category in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933).

"infrastructure" means water storage dams, roads and tracks, buildings and other structures built for the purpose of mining activities but does not include facilities required for the long term management of mining impacts or the protection of potential resources. Such facilities include dams containing hazardous waste, waste rock dumps, voids, or ore stockpiles and buildings or other structures whose ownership can be transferred and which have a residual beneficial use for the next owner of the operational land or the background land owner.

"$L_{A\ 10,\ adj,\ 10\ mins}$" means the A-weighted sound pressure level, (adjusted for tonal character and impulsiveness of the sound) exceeded for 10% of any 10-minute measurement period, using Fast response.

"$L_{A\ 1,\ adj,\ 10\ mins}$" means the A-weighted sound pressure level, (adjusted for tonal character and impulsiveness of the sound) exceeded for 1% of any 10-minute measurement period, using Fast response.

"$L_{A,\ max\ adj,\ T}$" means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over any 10-minute period, using Fast response.

"land" in the "land schedule" of this document means land excluding waters and the atmosphere.

"land capability" as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

"land suitability" as defined in the DSITI 2015 "Guideline for Agricultural Land Evaluation in Queensland".

"levee" means an embankment that only provides for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of water or flowable substances at any other times

"low consequence dam" means any dam that is not a high or significant consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933).

"mandatory reporting level" or **"MRL"** means a warning and reporting level determined in accordance with the criteria in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933) published by the administering authority.

"manual" means the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933) published by the administering authority.

"mature tree" means any tree that is 70% or greater of the predominant canopy height.

"maximum extent of impact" means the total, cumulative, residual extent and duration of impact to a prescribed environmental matter that will occur over a project's life after all reasonable avoidance and reasonable on-site mitigation measures have been, or will be, undertaken.

"mg/L" means milligrams per litre.

"mine affected water"

a) means the following types of water:

   (i) pit water, tailings dam water, processing plant water;

(ii) water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2008 if it had not formed part of the mining activity;

(iii) rainfall runoff which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall runoff discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such runoff, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water;

(iv) groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated;

(v) groundwater from the mine's dewatering activities;

(vi) a mix of mine affected water (under any of paragraphs i)-v) and other water.

b) does not include surface water runoff which, to the extent that it has been in contact with areas disturbed by mining activities that have not yet been completely rehabilitated, has only been in contact with:

(i) land that has been rehabilitated to a stable landform and either capped or revegetated in accordance with the acceptance criteria set out in the environmental authority but only still awaiting maintenance and monitoring of the rehabilitation over a specified period of time to demonstrate rehabilitation success; or

(ii) land that has partially been rehabilitated and monitoring demonstrates the relevant part of the landform with which the water has been in contact does not cause environmental harm to waters or groundwater, for example:

a. areas that are been capped and have monitoring data demonstrating hazardous material adequately contained with the site;

b. evidence provided through monitoring that the relevant surface water would have met the water quality parameters for mine affected water release limits in this environmental authority, if those parameters had been applicable to the surface water runoff; or

(iii) both.

"modification" or "**modifying"** (see definition of 'construction').

"non polluting" means having no adverse impacts upon the receiving environment.

"notice of election" has the meaning in section 18(2) *Environmental Offsets Act 2014*.

"noxious" means harmful or injurious to health or physical well-being, other than trivial harm.

"natural flow" means the flow of water through waters caused by nature.

"NTU" means nephelometric turbidity units.

"offensive" means causing reasonable offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive, other than trivial harm.

"operational land" means the land on which the mining activities are authorised to be carried out.

"operational plan" includes:

a) normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance); and

b) contingency and emergency action plans including operating procedures designed to avoid and/or minimise environmental impacts including threats to human life resulting from any overtopping or loss of structural integrity of the regulated structure.

"peak particle velocity (ppv)" means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mms^{-1}).

"**prescribed environmental matters**" has the meaning in section 10 of the *Environmental Offsets Act 2014*, limited to the matters of State environmental significance listed in schedule 2 of the Environmental Offsets Regulation 2014.

"protected area" means a protected area under the *Nature Conservation Act 1992*; or

a) a marine park under the *Marine Parks Act 2004*; or

b) a World Heritage Area.

"receiving environment" in relation to an activity that causes or may cause environmental harm, means the part of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to):

a) a watercourse;

b) groundwater; and

c) an area of land that is not specified in Schedule # – Table # (Authorised Activities) of this environmental authority.

The term does not include land that is specified in Schedule # – Table # (Authorised Activities) of this environmental authority.

"receiving waters" means the waters into which this environmental authority authorises releases of mine affected water.

"reference site" (or analogue site) may reflect the original location, adjacent area or another area where rehabilitation success has been completed for a similar biodiversity. Details of the reference site may be as photographs, computer generated images and vegetation models etc.

"Register of Regulated Dams" includes:

a) date of entry in the register;

b) name of the dam, its purpose and intended/actual contents;

c) the consequence category of the dam as assessed using the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933);

d) dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam;

e) name and qualifications of the suitably qualified and experienced person who certified the design plan

f) for the regulated dam, other than in relation to any levees –

   (i) the dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam;

(ii) coordinates (latitude and longitude in GDA94) within five metres at any point from the outside of the dam including its storage area

(iii) dam crest volume (megalitres);

(iv) spillway crest level (metres AHD).

(v) maximum operating level (metres AHD);

(vi) storage rating table of stored volume versus level (metres AHD);

(vii) design storage allowance (megalitres) and associated level of the dam (metres AHD);

(viii) mandatory reporting level (metres AHD);

g) the design plan title and reference relevant to the dam;

h) the date construction was certified as compliant with the design plan;

i) the name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan;

j) details of the composition and construction of any liner;

k) the system for the detection of any leakage through the floor and sides of the dam;

l) dates when the regulated dam underwent an annual inspection for structural and operational adequacy, and to ascertain the available storage volume for 1 November of any year;

m) dates when recommendations and actions arising from the annual inspection were provided to the administering authority; and

n) dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.

"regulated dam" means any dam in the significant or high consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933) published by the administering authority.

"regulated structure" includes land-based containment structures, levees, bunds and voids, but not a tank or container designed and constructed to an Australian Standard that deals with strength and structural integrity.

"rehabilitation" the process of reshaping and revegetating land to restore it to a stable landform.

"release event" means a surface water discharge from mine affected water storages or contaminated areas on the licensed place.

"representative" means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

"riverine" the land adjoining and associated with watercourses, including the bed, banks adjoining terraced land and riparian vegetation.

"RL" means reduced level, relative to mean sea level as distinct from depths to water.

"saline drainage" means the movement of waters, contaminated with salt(s), as a result of the mining activity.

"self-sustaining" means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

"sensitive place" means:

a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or

b) a motel, hotel or hostel; or

c) an educational institution; or

d) a medical centre or hospital; or

e) a protected area under the Nature Conservation Act 1992, the Marine Parks Act 2004 or a World Heritage Area; or

f) a public park or gardens.

"significant residual impact" has the meaning in section 8 *Environmental Offsets Act 2014.*

"site" means the same as "operational land"

"stable" in relation to land, means land form dimensions are or will be stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.

"stakeholder" means an individual or group concerned with or affected by the environmental performance of the holder of the environmental authority.

"structure" means dam or levee.

"spillway" means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges form the dam, normally under flood conditions or in anticipation of flood conditions.

"suitably qualified and experienced person" in relation to regulated structures means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the Professional Engineers Act 2002, and has demonstrated competency and relevant experience:

a) for regulated dams, an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design.

b) for regulated levees, an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments.

Note: It is permissible that a suitably qualified and experienced person obtain subsidiary certification from an RPEQ who has demonstrated competence and relevant experience in either geomechanics, hydraulic design or engineering hydrology

"system design plan" means a plan that manages an integrated containment system that shares the required.

"TFC" means Tailings Flocc Cell.

'the Act' means the *Environmental Protection Act 1994*.

"tolerable limits" means a range of parameters regarded as being sufficient to meet the objective of protecting relevant environmental values. For example, a range of settlement for a tailings capping, rather than a single value, could still meet the objective of draining the cap quickly, preventing pondage and limiting infiltration and percolation.

"**total groundwater level**" means the total groundwater level drawdown observed within each monitoring bore measured since the commencement of mining.

"µS/cm" means micro siemens per centimetre.

"void" means any constructed, open excavation in the ground.

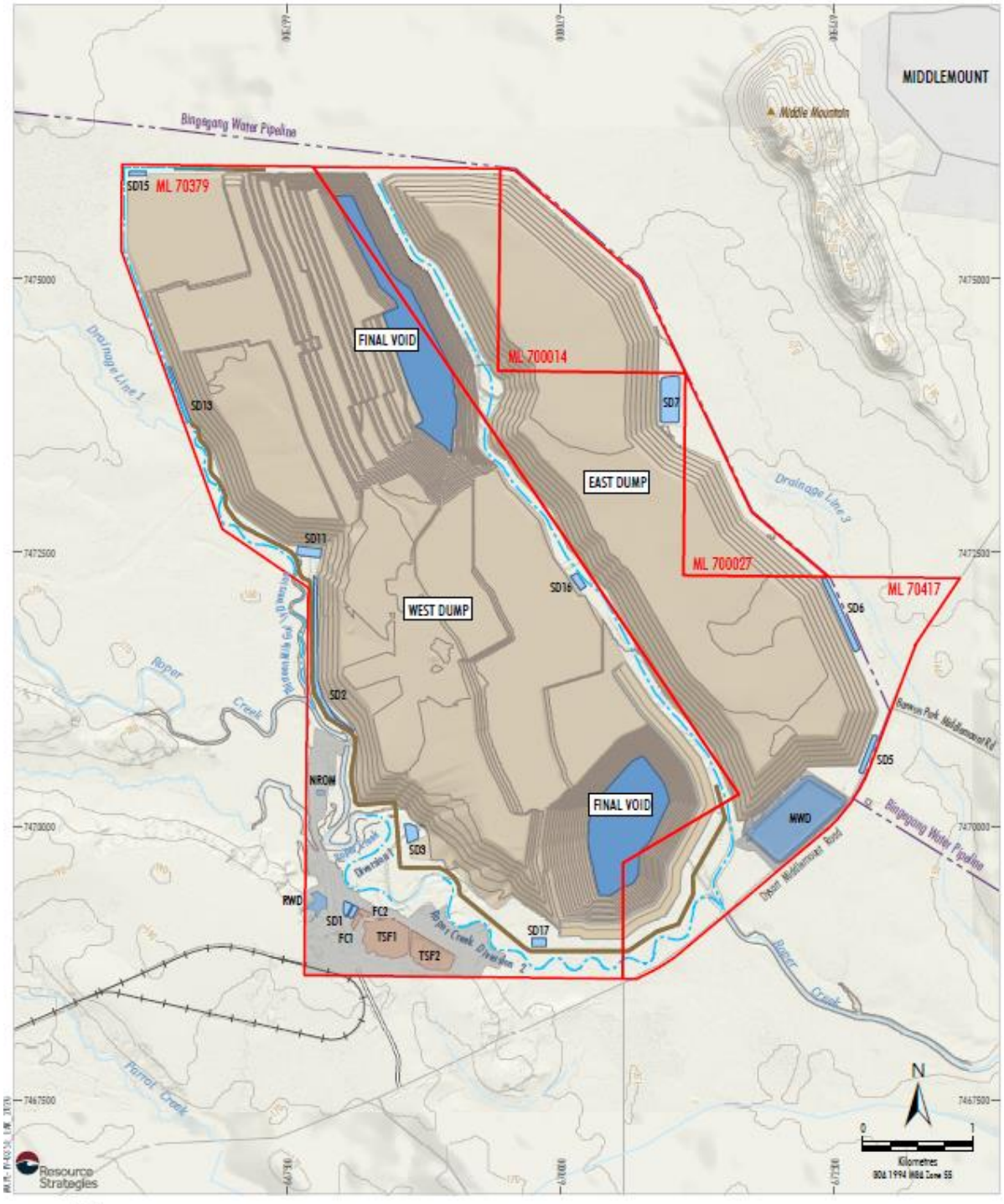
"watercourse" has the same meaning given in the *Water Act 2000*.

"water quality" means the chemical, physical and biological condition of water.

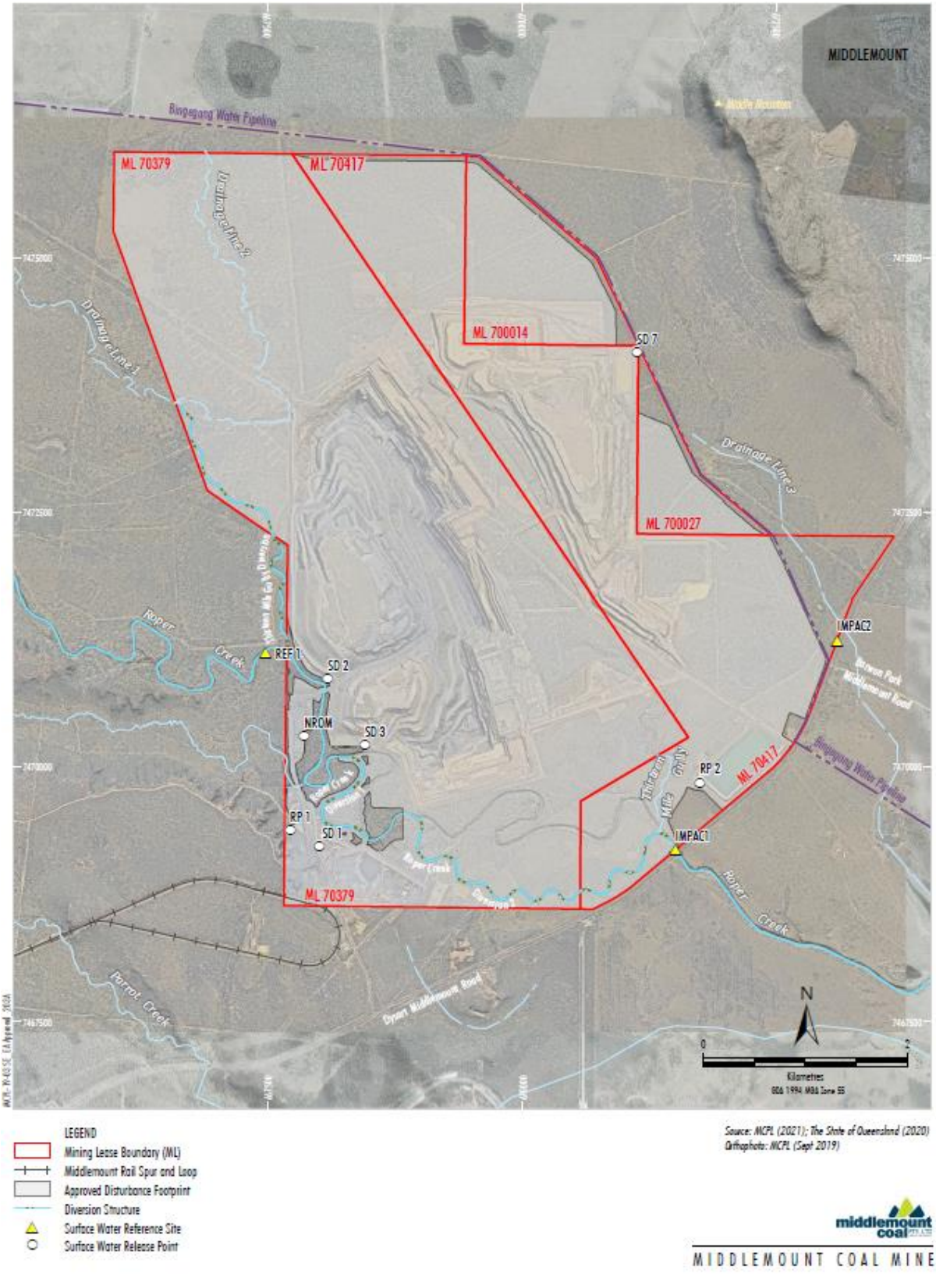
"waters" includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater.

End of definitions

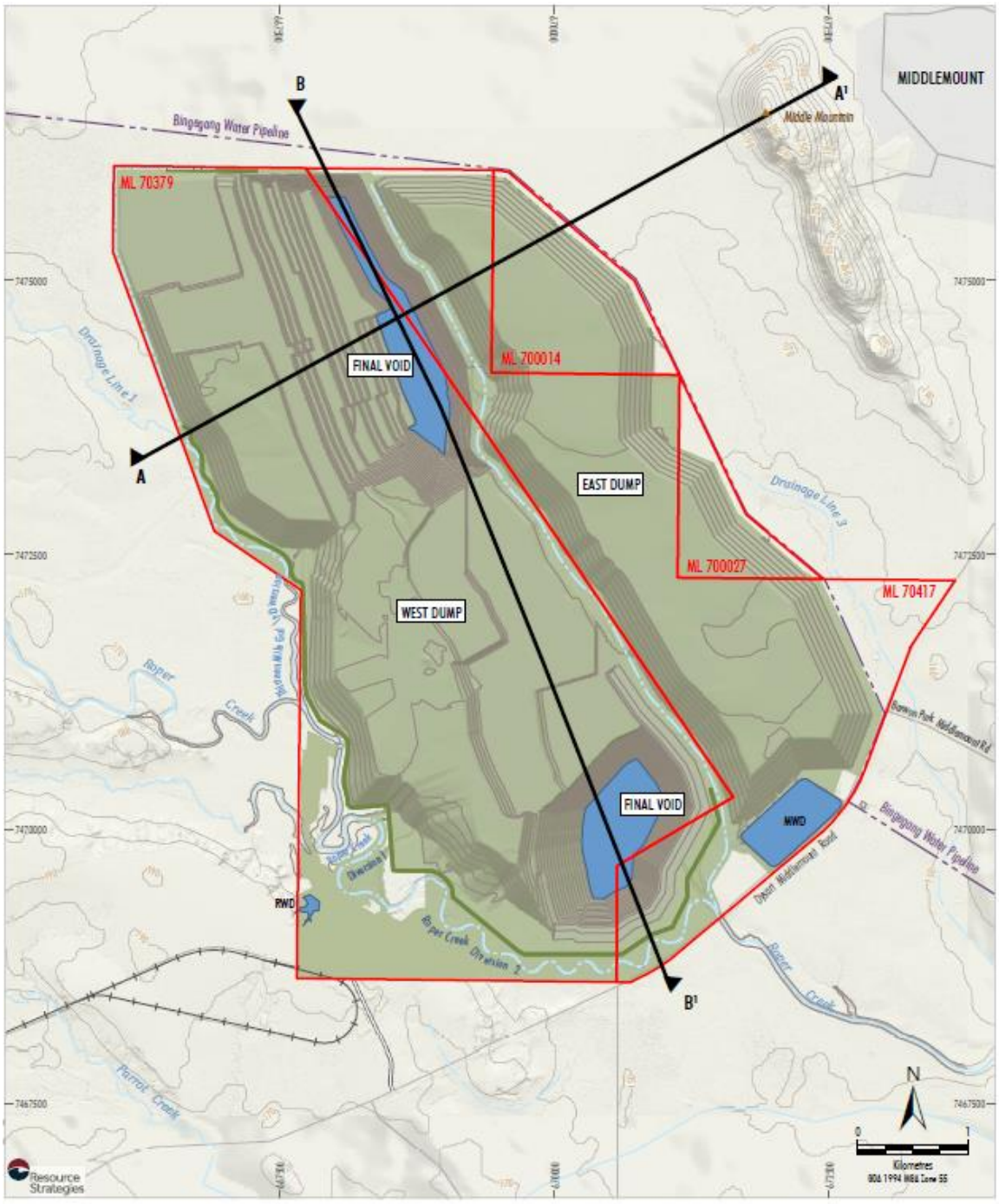
Attachment A: Mining Activities



Attachment B: Mine affected water release points



Attachment C: Final Landform

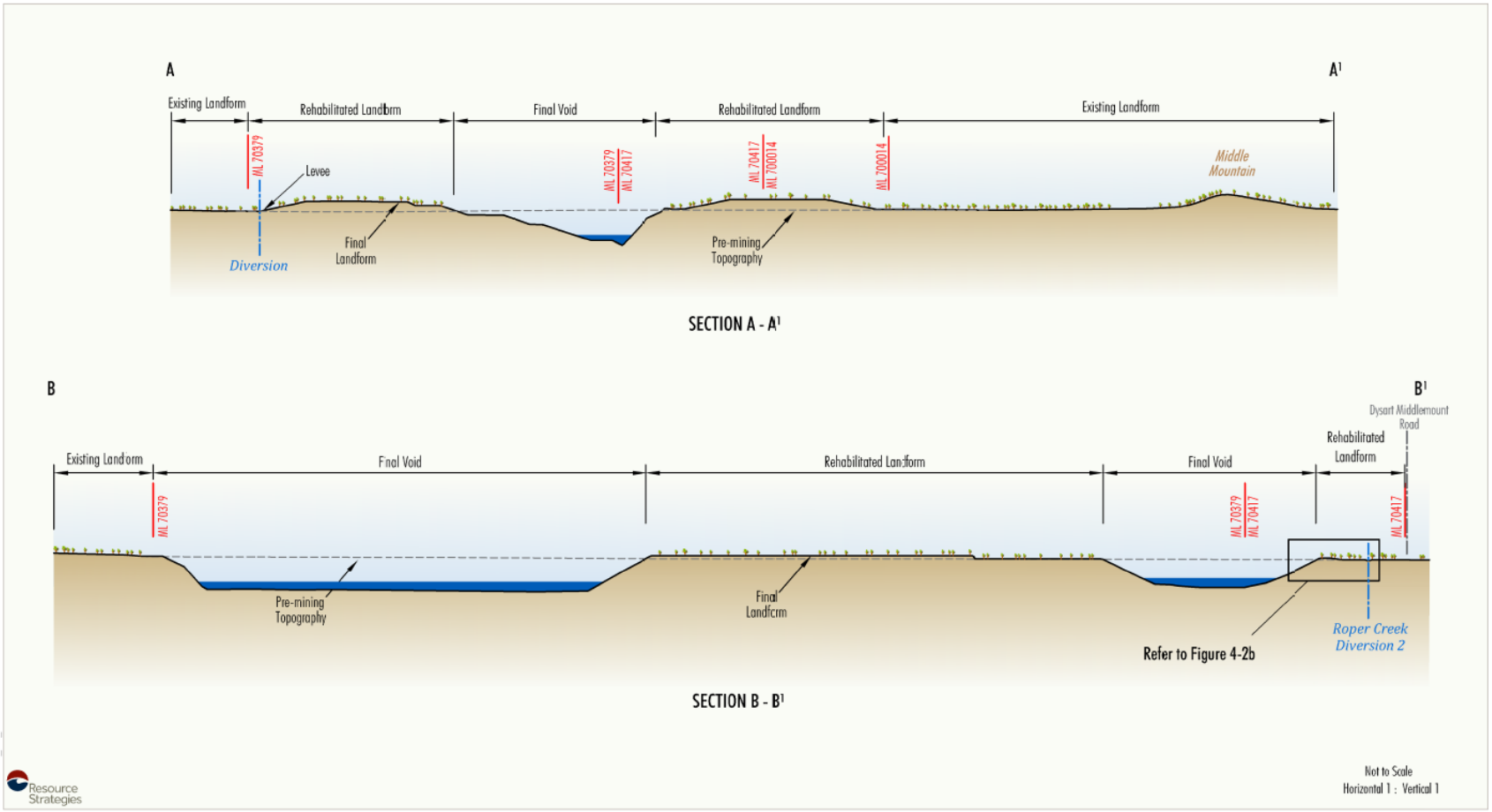


LEGEND
- Mining Lease Boundary (ML)
- Established Rehabilitation
- Water Storage
- Diversion Structure
- Removed Levee (Rehabilitated)
- Mine Access Road (Retained or Rehabilitated)
- Middlemount Rail Spur and Loop (Retained or Rehabilitated)
- Cross Section Location

Source: MCPL (2020); AGE (2020); The State of Queensland (2020)

middlemount coal

Conceptual General Arrangement
Post-mining
- Cross Section Locations

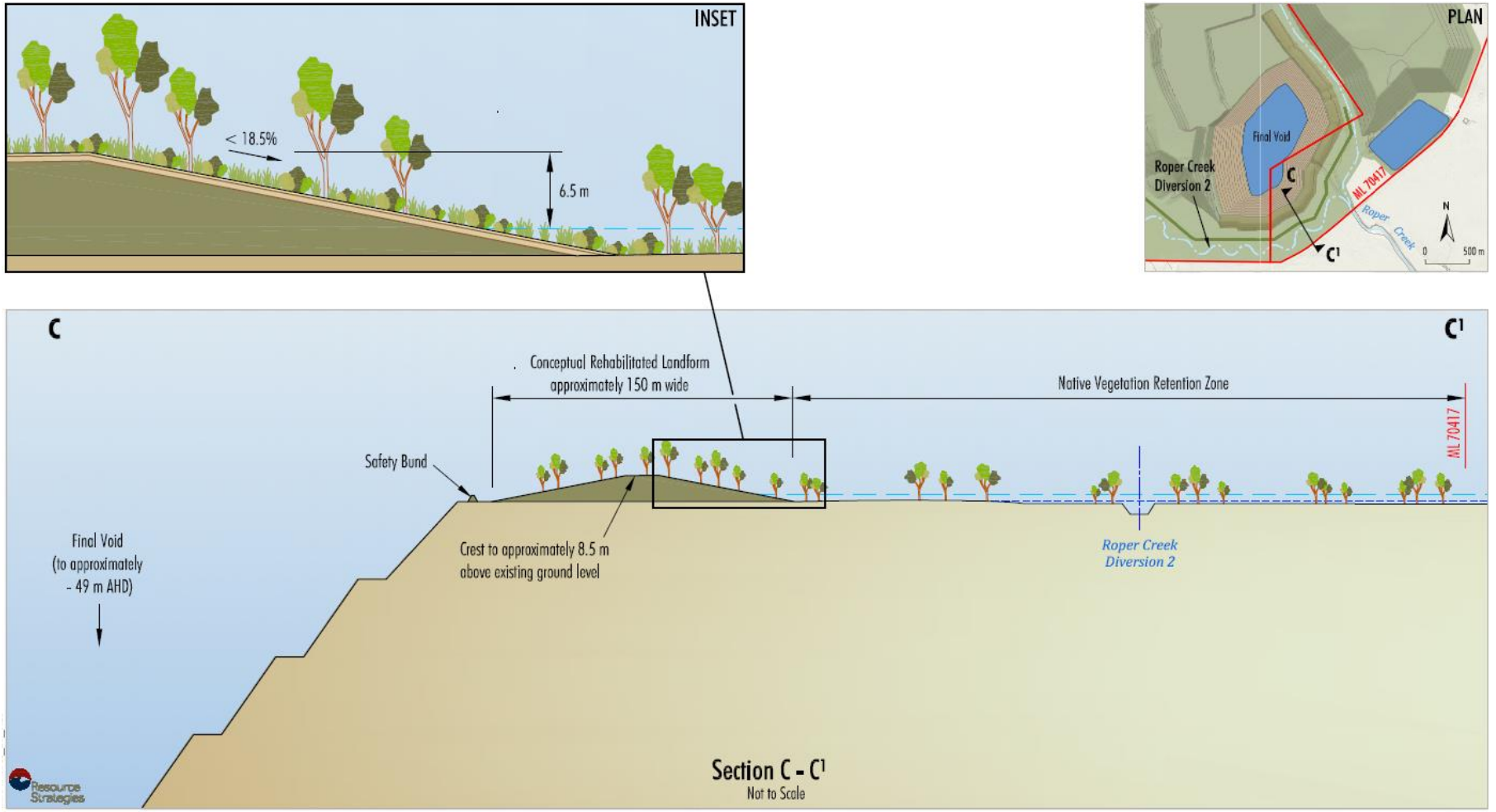


Source: MCPL (2020); AGE (2020)

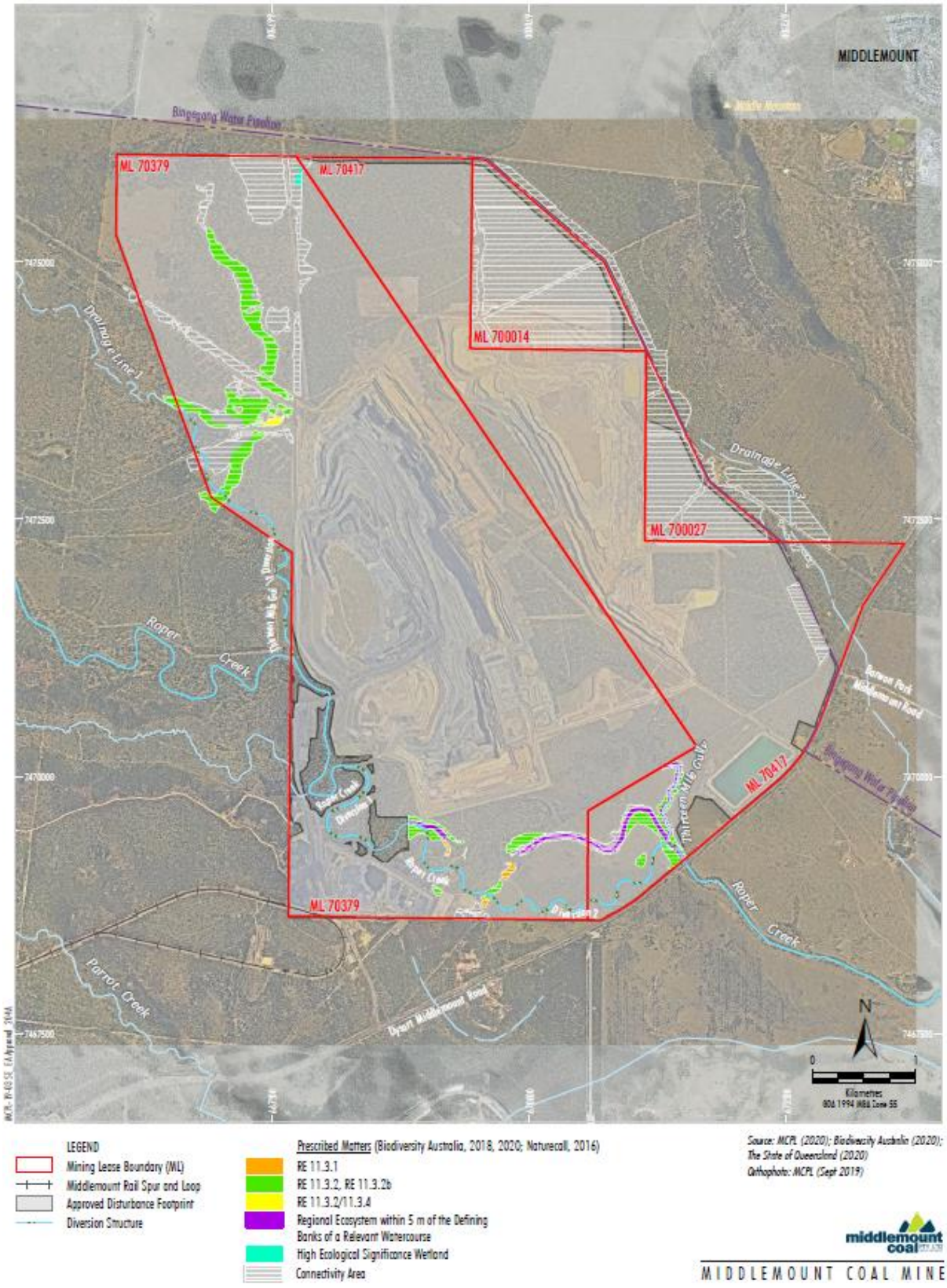
Refer Figure 4-1 for Cross Section locations.

middlemount coal

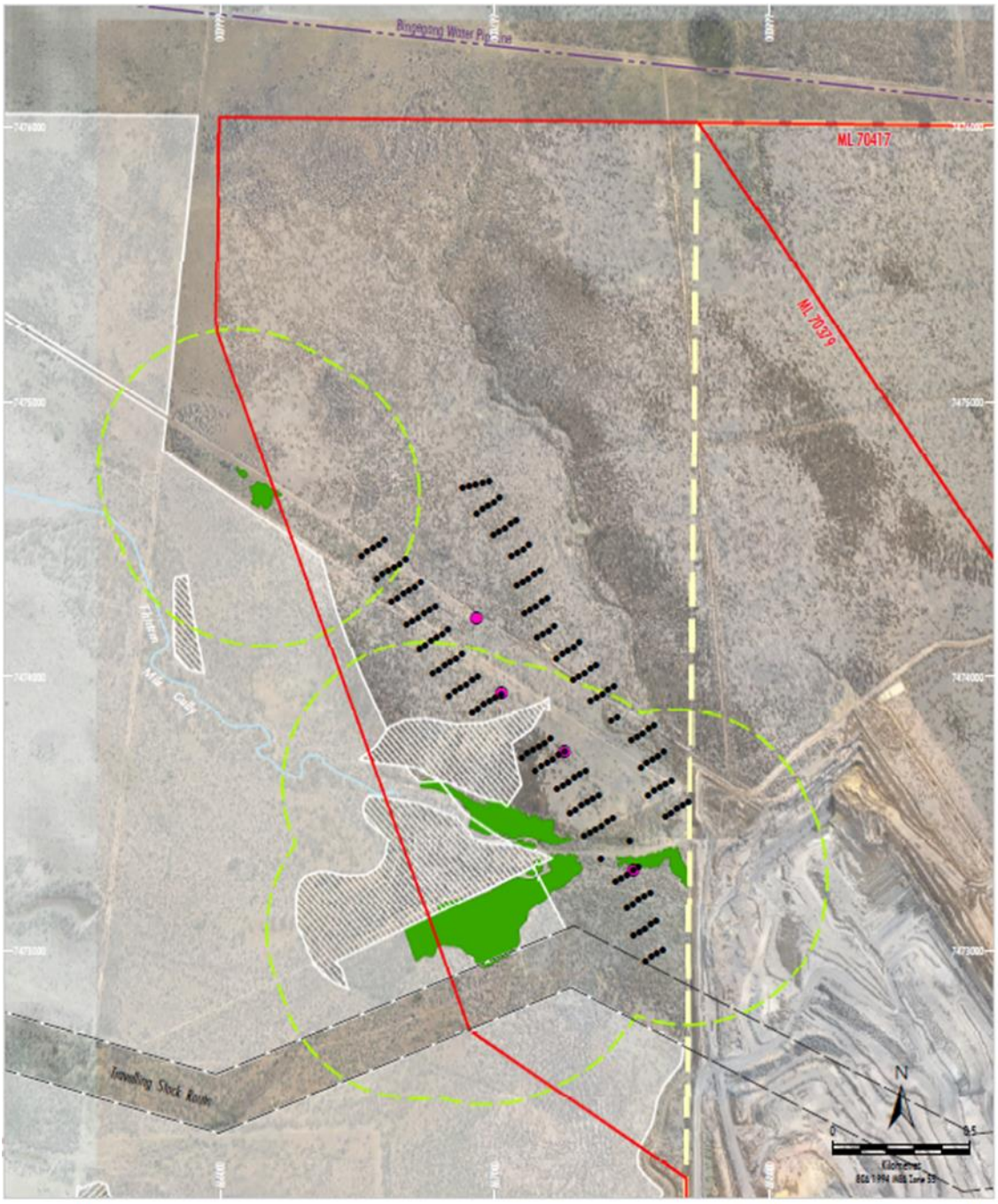
Conceptual Cross Sections of the Rehabilitated Mine Landform


INSET
< 18.5%
6.5 m
PLAN
Final Void
Roper Creek Diversion 2
C
C1
ML 70417
Roper Creek
N
0
500 m
C
C1
Conceptual Rehabilitated Landform approximately 150 m wide
Native Vegetation Retention Zone
Safety Bund
ML 70417
Final Void (to approximately - 49 m AHD)
Crest to approximately 8.5 m above existing ground level
Roper Creek Diversion 2
Section C - C1
Not to Scale
Resource Strategies
LEGEND
0.1% AEP Flood Level (approximately 155 m AHD) (WRM, 2020)
Probable Maximum Flood (PMF) Level (approximately 156.5 m AHD) (WRM, 2020)
Source: MCPL (2020); WRM (2020); AGE (2020)
middlemount coal
Conceptual Final Landform Design
Relative to the Roper Creek Floodplain

Attachment D: Location of authorised impacts to prescribed environmental matters



Attachment E: Drill Hole Locations ML70379



LEGEND
Mining Lease Boundary (ML)
Existing Offset Area - Stage 2 Project (EPBC 2010/5394) (Declared Area Map 2013/003919)
Existing Offset Area - Thirteen Mile Gully Project (Declared Area Map 2013/003919)
Existing Offset Area - Rail (Declared Area Map 2013/003919)
Surface Rights Area Boundary
Category B Environmentally Sensitive Areas
Ground-truthed Endangered Regional Ecosystems (Brigalow RE11.3.1 and RE11.4.9) (Nature Call, May 2017)
Ground-truthed Endangered Regional Ecosystems 500m Buffer
Drill Hole Type
Proposed LOX Hole
Proposed Core Hole

Source: MCPL (2018); Department of Natural Resources and Mines (2017)
Orthophoto: MCPL (June 2017)

middlemount coal

MIDDLEMOUNT COAL MINE

Proposed Drill Hole Locations

Figure 1

Attachment F: Rehabilitation Requirements

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
MIA, CHPP and roads (including haul roads)	Safe to humans and wildlife	Hazardous materials adequately managed or removed.	Contaminated land assessment undertaken by an appropriately qualified person.	Evidence which has been certified by an appropriately qualified person that: - Residual soil contamination on the mining leases has been removed, neutralized or isolated. - Hydrocarbon, heavy metal or other contamination levels are within allowable departmental limits - Site added to the Environmental Management Register if required.
			Remediation of contaminated land.	
		Very low probability of subsidence or rock fails with serious consequences.	Safety assessment of landform stability.	Certification by an appropriately qualified person that the land is safe for the post-mining land use.
			Appropriate decommissioning of infrastructure.	A risk assessment undertaken by an appropriately qualified person prior to the surrender of the environmental authority to ensure the site is safe and all infrastructure has been decommissioned appropriately and in accordance with the conditions of the environmental authority and any applicable Australian Standard or guideline.
	Non-polluting	Polluted water contained on site or treated	Upstream and downstream surface and ground water quality (e.g. sediment load, pH, heavy metal content, etc.) meet EA conditions.	▪ Evidence certified by an appropriately qualified person that receiving waters affected by surface water run-off have contaminant limits consistent with those specified in **Table C5** of the EA, for the period of the Post Closure Management Plan required by Condition F31.
		Ensure any residual water bodies have a low risk of environmental harm		
		No contamination of surface water and groundwater resources.		

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				▪ Evidence certified by an appropriately qualified person that groundwater quality characteristics are within those prescribed in **Table C8** of the EA, for the period of the Post Closure Management Plan required by Condition F31.
	Stable	Very low probability of subsidence or rock fails with serious consequences	Slope angle, length and profile	Evidence certified by an appropriately qualified person that: - Landform recontoured to be conducive to the adjacent landforms. - All slopes are less than 5%. - For slopes over 2%, continuous slope length does not exceed 70 m (i.e. engineered structures such as contour banks, cut-off drains etc. are implemented on all slopes such that continuous slope length does not exceed 70 m.
		Very low probability of slope slippage with serious consequences		
		Adequate vegetation cover established to minimise erosion	Vegetation type, density and cover.	Evidence certified by an appropriately qualified person that: - a minimum of 70% vegetative cover is present and maintained; - non-vegetation cover (stones, rock cover, litter, logs etc) does not cover greater than 30% of the total area; - bare surface areas are not to exceed 20 m^2 in area, based on a five year average period; and - bare surface areas are not to exceed a length of 10 m along slope, based on a five year average period

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		Landform design achieves appropriate erosion rates	Erosion rates and gully formation.	▪ Evidence certified by an appropriately qualified person that erosion rates comparable to designated reference sites, for the period of the Post Closure Management Plan required by Condition F31.
	Able to sustain an agreed post mining land use	Soil properties that support and will continue to support the desired final land use	Landscape function, such as rate of soil loss, erosion features, soil physical parameters, organic matter and nutrient content and cycling	▪ Evidence, certified by an appropriately qualified person, that: - Vegetation established in accordance with post-mining land use given in Table F2 of the EA; and - Water infiltration, aggregate stability and bulk density rates of rehabilitated areas are comparable to rates at designated reference sites that are representative of the post mining land use.
			Topsoil and subsoil support the proposed land use.	
		Establish specified self-sustaining natural vegetation or habitat.	Ecosystem functionality, such as vegetation dynamics, habitat complexity and habitat quality	▪ Evidence certified by an appropriately qualified person that: - Nutrient cycling processes are comparable to designated references sites which are representative of the post mining land use; - Species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence; - Evidence of generational succession of trees and shrubs is apparent in rehabilitated areas;

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				- Weeds do not dominate native species after disturbance or after rain; - Pests do not occur in substantial numbers or visibly affect the development of native plant species; - Vegetative material layer(s) (e.g. leaf litter) is evident and contributing to nutrient cycling and development of microbial mass.
		Establish land use with comparable management requirements to similarly used non-mining land	Achievement of agreed final land use	Evidence certified by an appropriately qualified person that for areas established to cattle grazing: - Cattle stocking rate is comparable to designated reference sites; and
			Rehabilitation progress and success rate	

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
			Ongoing sustainability of agreed final land use.	- land maintenance requirements are comparable to designated reference sites ▪ Evidence certified by an appropriately qualified person that for areas established to regional ecosystems: - densities of native tree, shrub and grass species are representative of the target Regional Ecosystems as determined through comparison with designated reference sites; - community structure (groundcover, shrub and tree layers) are representative of the target Regional Ecosystems as determined through comparison with designated reference sites; - non-native cover crop grass species constitute no more than 20% of the area of total vegetative cover; and - native tree, shrub and grass species which are representative of surrounding ecosystems and which will support the post-mine land use are to constitute 80% of the area of established vegetative cover
Final voids below natural ground level (including ramps)	Safe to humans and wildlife	Structurally safe with very low probability of subsidence or rock fails with serious consequences	Safety assessment of landform stability.	Certification by an appropriately qualified person, that final voids are stable, including: - Certification that slopes are as per Table F3:Residual Void Design and are geotechnically stable for the foreseeable future; - Certification that drainage structures are sufficiently designed and implemented for operation into the

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				foreseeable future, and direct surface water flow away from residual voids; - Certification that erosion and sediment controls are sufficiently designed and implemented for operation into the foreseeable future. - Safety assessment conducted and included in Post Closure Management Plan; and - Geotechnical stability of the high wall, low wall and end walls has been achieved and geotechnical investigations demonstrating this have been undertaken and reported.
		Hazardous materials adequately managed	Contaminated land assessment.	Evidence which has been certified by an appropriately qualified person that: ▪ Hydrocarbon, heavy metal or other contamination levels are within allowable departmental limits;
			Risk to humans and animals	- No acid rock drainage is occurring or has the potential to occur; and ▪ Fencing and/or safety bunding and prominent signage is installed around the perimeter of the final voids to restrict access.
	Non-polluting	Polluted water contained on site or treated	Residual void water quality	Evidence which is certified by an appropriately qualified person that: - The low, high and end walls drain internally to the final void; and - Final void waters comply with specifications detailed in the Residual Void Water Quality Management Plan.
		Ensure any residual water bodies have a low risk of environmental harm		

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		No contamination of surface water and groundwater resources	Upstream and downstream surface and ground water quality (e.g. sediment load, pH, heavy metal content, etc) meet EA conditions	Evidence which is certified by an appropriately qualified person that: ▪ Groundwater and monitoring bores have parameters consistent with those specified in **Table C8** of the EA, for the period of the Post Closure Management Plan; ▪ Based on up to date groundwater modelling, that any residual void water will not overflow nor potentially contaminate any other surface water bodies; and ▪ Voids do not discharge to any receiving waters, including surface water and groundwater.
	Stable	Very low probability of subsidence or rock fails with serious consequences	Safety assessment of landform stability including slope angle, length and profile.	Certification from an appropriately qualified person that the final voids are stable into the foreseeable future and have been constructed in accordance with RPEQ designs and the criteria defined in Table F3: Residual Void Design of the EA.
		Very low probability of slope slippage with serious consequences		

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		Landform design achieves appropriate erosion rates	Erosion rates and gully formation	
In-pit and out-of-pit overburden spoil dumps (slopes)	Safe to humans and wildlife	Hazardous materials adequately managed	Contaminated land assessment.	Evidence which has been certified by an appropriately qualified person that: - Hydrocarbon, heavy metal or other contamination levels are within allowable departmental limits; and - No acid rock drainage is occurring or has the potential to occur.

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		Very low probability of subsidence or rock fails with serious consequences	Safety assessment of landform stability including slope angle, length and profile.	Evidence certified by an appropriately qualified person that: ▪ Geotechnical stability has been achieved and geotechnical investigations demonstrating this have been undertaken and reported; ▪ The land is safe for the proposed post mining land use detailed in Table F2 of the EA; ▪ The landform is designed in accordance with the parameters defined in Table F1; and ▪ Slope angle does not exceed 18.5 percent.
	Non-polluting	Polluted water contained on site or treated.	Upstream and downstream surface and ground water quality (e.g. sediment load, pH, heavy metal content, etc) meet EA conditions.	Evidence certified by an appropriately qualified person that: ▪ Groundwater monitoring bores have parameters consistent with those specified in **Table C8** of the EA, for the period of the Post Closure Management Plan; and ▪ Receiving waters affected by surface water run-off have contaminant limits consistent with those specified in **Table C5** of the EA, for the period of the Post Closure Management Plan;
			Performance of capping.	
		Ensure any residual dams have a low risk of environmental harm.	Residual dam water quality.	Evidence certified by an appropriately qualified person that: - Water quality in water storage and management dams which are retained for beneficial reuse comply with the limits detailed within ANZECC or ARMCANZ for that beneficial use, for a period of at least five years.
	Stable	Very low probability of subsidence or rock fails with serious consequences.	Safety assessment of landform stability including	Evidence certified by an appropriate person that:

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		Very low probability of slope slippage with serious consequences.	slope angle, length and profile.	▪ rock mulch has 100% coverage of the overburden spoil dumps surface area (i.e. no bare areas exist) ▪ Geotechnical stability has been achieved and geotechnical investigations demonstrating this have been undertaken and reported; ▪ The land is safe for the proposed post mining land use detailed in Table F2 of the EA; ▪ The landform is designed in accordance with the parameters defined in Table F1; and ▪ Slope angle does not exceed 18.5 percent.
		Landform design achieves appropriate erosion rates.	Erosion rates and gully formation	Evidence, which has been certified by an appropriately qualified person, that erosion rates of rehabilitated areas are suitable for the post mining land use defined in Table F2 of the EA.
		Adequate vegetation cover established to minimise erosion.	Vegetation type and density	Evidence, which has been certified by an appropriately qualified person, that the vegetation type and density of species in rehabilitated areas are suited to the soil composition, slope, aspect, climate and post mining land use defined in Table F2 of the EA.
	Able to sustain an agreed post mining land use	Soil properties that support and will continue to support the desired final land use.	Landscape function, such as rate of soil loss, erosion features, soil physical parameters, organic matter and nutrient content and cycling.	Evidence, certified by an appropriately qualified person, that: - Vegetation established in accordance with post-mining land use given in Table F2 of the EA; and - Water infiltration, aggregate stability and bulk density rates of rehabilitated areas are comparable to rates at designated reference sites that are representative of the post mining land use; and - vegetative material layer(s) (e.g. leaf litter) is evident and contributing to nutrient cycling and development of microbial mass.
			Topsoil and subsoil support the proposed land use.	

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		Establish specified self-sustaining natural vegetation or habitat.	Ecosystem functionality, such as vegetation dynamics, habitat complexity and habitat quality.	Evidence, certified by an appropriately qualified person, that: ▪ Species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence; ▪ Evidence of generational succession of trees and shrubs is apparent is rehabilitated areas; ▪ weeds do not dominate native species after disturbance or after rain; and ▪ pests do not occur in substantial numbers or visibly affect the development of native plant species.
		Establish land use with comparable management requirements to similarly used non-mining land	Rehabilitation progress and success rate. Achievement of agreed final land use. Ongoing sustainability of agreed final land use.	▪ Evidence certified by an appropriately qualified person that for areas established to cattle grazing: - Cattle stocking rate is comparable to designated reference sites; and - land maintenance requirements are comparable to designated reference sites ▪ Evidence certified by an appropriately qualified person that for areas established to regional ecosystems: - densities of native tree, shrub and grass species are representative of the target Regional Ecosystems as determined through comparison with designated reference sites; - community structure (groundcover, shrub and tree layers) are representative of the target Regional Ecosystems as determined through comparison with designated reference sites; - non-native cover crop grass species constitute no more than 20% of the area of total vegetative cover; and

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				- native tree, shrub and grass species which are representative of surrounding ecosystems and which will support the post-mine land use are to constitute 80% of the area of established vegetative cover.
In-pit and out-of-pit overburden spoil dumps (upper surface)	Safe to humans and wildlife	Hazardous materials adequately managed.	Contaminated land assessment.	Evidence which has been certified by an appropriately qualified person that: - Hydrocarbon, heavy metal or other contamination levels are within allowable departmental limits; and - No acid rock drainage is occurring or has the potential to occur.
		Very low probability of subsidence or rock fails with serious consequences.	Safety assessment of landform stability including slope angle, length and profile.	Evidence certified by an appropriately qualified person that: ▪ Geotechnical stability has been achieved and geotechnical investigations demonstrating this have been undertaken and reported; ▪ The land is safe for the proposed post mining land use detailed in Table F2 of the EA; and ▪ Slope angle does not exceed 2%
	Non-polluting	Polluted water contained on site or treated	Upstream and downstream surface and ground water quality (e.g. sediment load, pH, heavy metal content, etc) meet EA conditions. Performance of capping.	Evidence certified by an appropriately qualified person that: ▪ Groundwater monitoring bores have parameters consistent with those specified in **Table C8** of the EA, for the period of the Post Closure Management Plan; ▪ receiving waters affected by surface water run-off have contaminant limits consistent with those specified in **Table C5** of the EA, for the period of the Post Closure Management Plan; and ▪ no long-term (>2 months) ponding of water on soil surface.

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		Ensure any residual water bodies have a low risk of environmental harm	Residual dam water quality.	Evidence certified by an appropriately qualified person that: ▪ Water quality in water storage and management dams which are retained for beneficial reuse comply with the limits detailed within ANZECC or ARMCANZ for that beneficial use, for a period of at least five years.
	Stable	Very low probability of subsidence or rock fails with serious consequences. Very low probability of slope slippage with serious consequences.	Safety assessment of landform stability including slope angle, length and profile.	Evidence certified by an appropriate person that: ▪ Geotechnical stability has been achieved and geotechnical investigations demonstrating this have been undertaken and reported; ▪ the land is safe for the proposed post mining land use detailed in Table F2 of the EA; ▪ slope angle does not exceed 2%; ▪ a minimum of 70% vegetative cover is present and maintained; ▪ non-vegetation cover (stones, rock cover, litter, logs etc.) comprise not greater than 30% of the total area ▪ bare surface areas do not exceed 5m^2 in area, over a five year average period; and ▪ bare surface areas are not to exceed a length of 5 m along slope, over a five year average period.
		Landform design achieves appropriate erosion rates.	Erosion rates and gully formation.	Evidence, which has been certified by an appropriately qualified person, that erosion rates of rehabilitated areas are suitable for the post mining land use specified in Table F2 of the EA.
		Adequate vegetation cover established to minimise erosion.	Vegetation type, density and cover.	Evidence, which has been certified by an appropriately qualified person, that the vegetation type and density of species in rehabilitated areas are suited to the soil composition, slope, aspect, climate and post mining land use defined in Table F2 of the EA.

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
	Able to sustain an agreed post mining land use	Soil properties that support and will continue to support the desired final land use	Topsoil and subsoil support the proposed land use.	Evidence, certified by an appropriately qualified person, that topsoil has been respread to a suitable depth in rehabilitated areas to sustain the post mining land use specified in Table F2 of the EA.
			Landscape function, such as rate of soil loss, erosion features, soil physical parameters, organic matter and nutrient content and cycling.	Evidence, certified by an appropriately qualified person, that: ▪ soil surface crusting occurs in less than 2% of the rehabilitated domain area; ▪ water infiltration, aggregate stability and bulk density rates of rehabilitated areas are comparable to rates at designated reference sites which are representative of the post-mining land use; ▪ nutrient cycling processes are comparable to designated references sites which are representative of the post mining land use; and ▪ vegetative material layer(s) (e.g. leaf litter) is evident and contributing to nutrient cycling and development of microbial mass.
		Establish specified self-sustaining natural vegetation or habitat	Ecosystem functionality, such as vegetation dynamics, habitat complexity and habitat quality	Evidence, certified by an appropriately qualified person, that: ▪ vegetation established in accordance with post-mining land use given in Table F2 of the EA; ▪ species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence; ▪ evidence of generational succession of trees and shrubs is apparent is rehabilitated areas; ▪ weeds do not dominate native species after disturbance or after rain; ▪ pests do not occur in substantial numbers or visibly affect the development of native plant species;

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				▪ densities of native tree, shrub and grass species are representative of the target Regional Ecosystems as determined through comparison with designated reference sites; ▪ community structure (groundcover, shrub and tree layers) are representative of the target Regional Ecosystems as determined through comparison with designated reference sites; ▪ non-native cover crop grass species constitute no more than 20% of the area of total vegetative cover; and ▪ native tree, shrub and grass species which are representative of surrounding ecosystems and which will support the post-mine land use are to constitute 80% of the area of established vegetative cover.
		Establish land use with comparable management requirements to similarly used non-mining land.	Ongoing sustainability of agreed final land use. Rehabilitation progress and success rate. Achievement of agreed final land use	▪ Evidence certified by an appropriately qualified person that for areas established to cattle grazing: - Cattle stocking rate is comparable to designated reference sites; and - land maintenance requirements are comparable to designated reference sites.

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				▪ Evidence certified by an appropriately qualified person that for areas established to regional ecosystems: - densities of native tree, shrub and grass species are representative of the target Regional Ecosystems as determined through comparison with designated reference sites; and - community structure (groundcover, shrub and tree layers) are representative of the target Regional Ecosystems as determined through comparison with designated reference sites.
Low wall spoil (above natural ground level)	Safe to humans and wildlife	Hazardous materials adequately managed.	• Safety assessment of dumps, voids and other slopes. • landform stability including slope angle, length and profile.	Evidence, certified by an appropriately qualified person, that: - Hydrocarbon, heavy metal or other contamination levels are within allowable departmental limits; and - no acid rock drainage is occurring or has the potential to occur.
		Very low probability of subsidence or rock fails with serious consequences.		Evidence, certified by an appropriately qualified person, that: ▪ Geotechnical stability has been achieved and geotechnical investigations demonstrating this have been undertaken and reported.

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				▪ slope angle will be retained at angle specified in Table F2 of the EA.
	Non-polluting	Polluted water contained on site or treated	Upstream and downstream surface and ground water quality (e.g. sediment load, pH, heavy metal content, etc) meet EA conditions	Evidence, certified by an appropriately qualified person, that: ▪ Groundwater monitoring bores have parameters consistent with those specified in Table C8 of the EA, for the period of the Post Closure Management Plan. ▪ receiving waters affected by surface water run-off have contaminant limits consistent with those specified in Table C5 of the EA, for the period of the Post Closure Management Plan.
			Performance of capping	
		Ensure any residual water bodies have a low risk of environmental harm	Residual dam water quality.	Evidence certified by an appropriately qualified person that: ▪ Water quality in water storage and management dams which are retained for beneficial reuse comply with the limits detailed within ANZECC or ARMCANZ for that beneficial use, for a period of at least five years.
	Stable	Very low probability of subsidence or rock fails with serious consequences	Safety assessment of landform stability including slope angle, length and profile.	Evidence, certified by an appropriately qualified person, that: ▪ Geotechnical stability has been achieved and geotechnical investigations demonstrating this have been undertaken and reported. ▪ slope angle retained at angle specified in Table F2 of the EA.
		Very low probability of slope slippage with serious consequences		
		Landform design achieves appropriate erosion rates	erosion rates and gully formation	Evidence, which has been certified by an appropriately qualified person, that erosion rates of rehabilitated areas are suitable for the post mining land use defined in Table F2 of the EA.

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
	Able to sustain an agreed post mining land use (benches within low wall spoil only)	Soil properties that support and will continue to support the desired final land use	Topsoil and subsoil support the proposed land use.	Evidence, certified by an appropriately qualified person, that topsoil has been respread to a suitable depth in rehabilitated areas to sustain the post mining land use specified in Table F2 of the EA.
			Landscape function, such as rate of soil loss, erosion features, soil physical parameters, organic matter and nutrient content and cycling.	Evidence, certified by an appropriately qualified person, that: ▪ vegetative material layer(s) (e.g. leaf litter) is evident and contributing to nutrient cycling and development of microbial mass.
		Establish specified self-sustaining natural vegetation or habitat	Ecosystem functionality, such as vegetation dynamics, habitat complexity and habitat quality.	Evidence, certified by an appropriately qualified person, that: ▪ evidence of generational succession of trees and shrubs is apparent in rehabilitated areas; ▪ vegetation established in accordance with post-mining land use given in Table F2 of the EA on benches within low wall spoil; ▪ species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence; ▪ weeds do not dominate native species after disturbance or after rain; and ▪ pests do not occur in substantial numbers or visibly affect the development of native plant species.
		Establish land use with comparable management requirements to similarly used non-mining land	Rehabilitation progress and success rate.	Evidence certified by an appropriately qualified person that for areas established to regional ecosystems: - densities of native tree, shrub and grass species are representative of the target Regional Ecosystems as
			Achievement of agreed final land use	

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
			Ongoing sustainability of agreed final land use.	determined through comparison with designated reference sites; and ▪ community structure (groundcover, shrub and tree layers) are representative of the target Regional Ecosystems as determined through comparison with designated reference sites.
Water storage/ water management dams	Safe to humans and wildlife	Hazardous materials adequately managed	Contaminated land assessment	Evidence, certified by an appropriately qualified person, that: ▪ hydrocarbon, heavy metal or other contamination levels are within allowable departmental limits; ▪ site added to the Environmental Management Register if required.
		Very low probability of subsidence or rock fails with serious consequences	Safety assessment of landform stability.	Evidence, certified by an appropriately qualified person, that: ▪ Geotechnical stability has been achieved and geotechnical investigations demonstrating this have been undertaken and reported; and ▪ the land is safe for the proposed post mining land use detailed in Table F2 of the EA.
	Non-polluting	Polluted water contained on site or treated	Contaminated land assessment	Evidence, certified by an appropriately qualified person, that:

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
		Ensure any residual water bodies have a low risk of environmental harm	Upstream and downstream surface and ground water quality (e.g. sediment load, pH, heavy metal content, etc) meet EA conditions.	▪ Receiving waters affected by surface water run-off have contaminant limits consistent with those specified in **Table C5** of the EA, for the period of the Post Closure Management Plan. ▪ water quality in water storage and management dams which are retained for beneficial reuse comply with the limits detailed within ANZECC or ARMCANZ for that beneficial use, for a period of at least five years.
	Stable	Very low probability of subsidence or rock fails with serious consequences Very low probability of slope slippage with serious consequences	Safety assessment of landform stability including slope angle, length and profile.	Evidence, certified by an appropriately qualified person, that: ▪ non-vegetation cover (stones, rock cover, litter, logs etc.) comprise not greater than 30% of the total area; ▪ bare surface areas do not exceed 20 m^2 in area, over a five year average period; and ▪ bare surface areas are not to exceed a length of 10 m along slope, over a five year average period.
		Landform design achieves appropriate erosion rates	Erosion rates and gully formation	Evidence, which has been certified by an appropriately qualified person, that erosion rates of rehabilitated areas are suitable for the post mining land use defined in Table F2 of the EA.
		Adequate vegetation cover established to minimise erosion	Vegetation type, density and cover	Evidence, certified by an appropriately qualified person, that: ▪ minimum of 70% vegetative cover is present and maintained on banks and external dam walls.
	Able to sustain an agreed post mining land use	Soil properties that support and will continue to support the desired final land use.	Landscape function, such as rate of soil loss, erosion features, soil physical parameters, organic matter and nutrient content and cycling.	Evidence, certified by an appropriately qualified person, that: ▪ Soil surface crusting occurs in less than 5% of the rehabilitated domain area; ▪ water infiltration, aggregate stability and bulk density rates of rehabilitated areas are comparable to rates at designated reference sites which are representative of the post mining land use;

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				▪ vegetative material layer(s) (e.g. leaf litter) is evident and contributing to nutrient cycling and development of microbial mass; and ▪ nutrient cycling processes are comparable to designated references sites which are representative of the post mining land use.
		Establish specified self-sustaining natural vegetation or habitat.	Ecosystem functionality, such as vegetation dynamics, habitat complexity and habitat quality.	Evidence, certified by an appropriately qualified person, that: ▪ Species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence; ▪ evidence of generational succession of trees and shrubs is apparent in rehabilitated areas; ▪ weeds do not dominate native species after disturbance or after rain; and ▪ pests do not occur in substantial numbers or visibly affect the development of native plant species.
		Establish land use with comparable management requirements to similarly used non-mining land	Rehabilitation progress and success rate. Achievement of agreed final land use. Ongoing sustainability of agreed final land use.	Evidence certified by an appropriately qualified person that for areas established to regional ecosystems: - densities of native tree, shrub and grass species are representative of the target Regional Ecosystems as determined through comparison with designated reference sites; and

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
				▪ community structure (groundcover, shrub and tree layers) are representative of the target Regional Ecosystems as determined through comparison with designated reference sites.
Exploration	Safe to humans and wildlife Non-polluting Stable	Site is safe for humans and animals now and in the foreseeable future	All exploration drill holes undertaken have been rehabilitated	▪ Certification that all exploration dill holes not agreed to in writing with the post-mining landholder to be converted to either a water bore or groundwater monitoring bore have been made safe and stable, and will remain safe and stable.

Mine Domain	Rehabilitation Goal	Rehabilitation Objectives	Indicators	Completion Criteria
	Able to sustain an agreed post mining land use			▪ Certification that all aquifers have been isolated where exploration drill holes have intersected more than one water bearing strata, in accordance with the 'Minimum Construction Requirements for Water Bore in Australia' (Australian Government, February 2012) or latest edition. ▪ Evidence of written landholder agreement for the retention of any exploration drill holes to be converted to a water bore. ▪ Certification that all exploration drill holes agreed to in writing with the post-mining landholder to be converted to a water bore, have been converted in accordance with the 'Minimum Construction Requirements for Water Bore in Australia' (Australian Government, February 2012) or latest edition. ▪ Certification that all exploration drill holes converted to water bores as per the written landholder agreement, are compliant with the Water Act 2000.

Attachment G: Diversion footprint - Thirteen Mile Gully

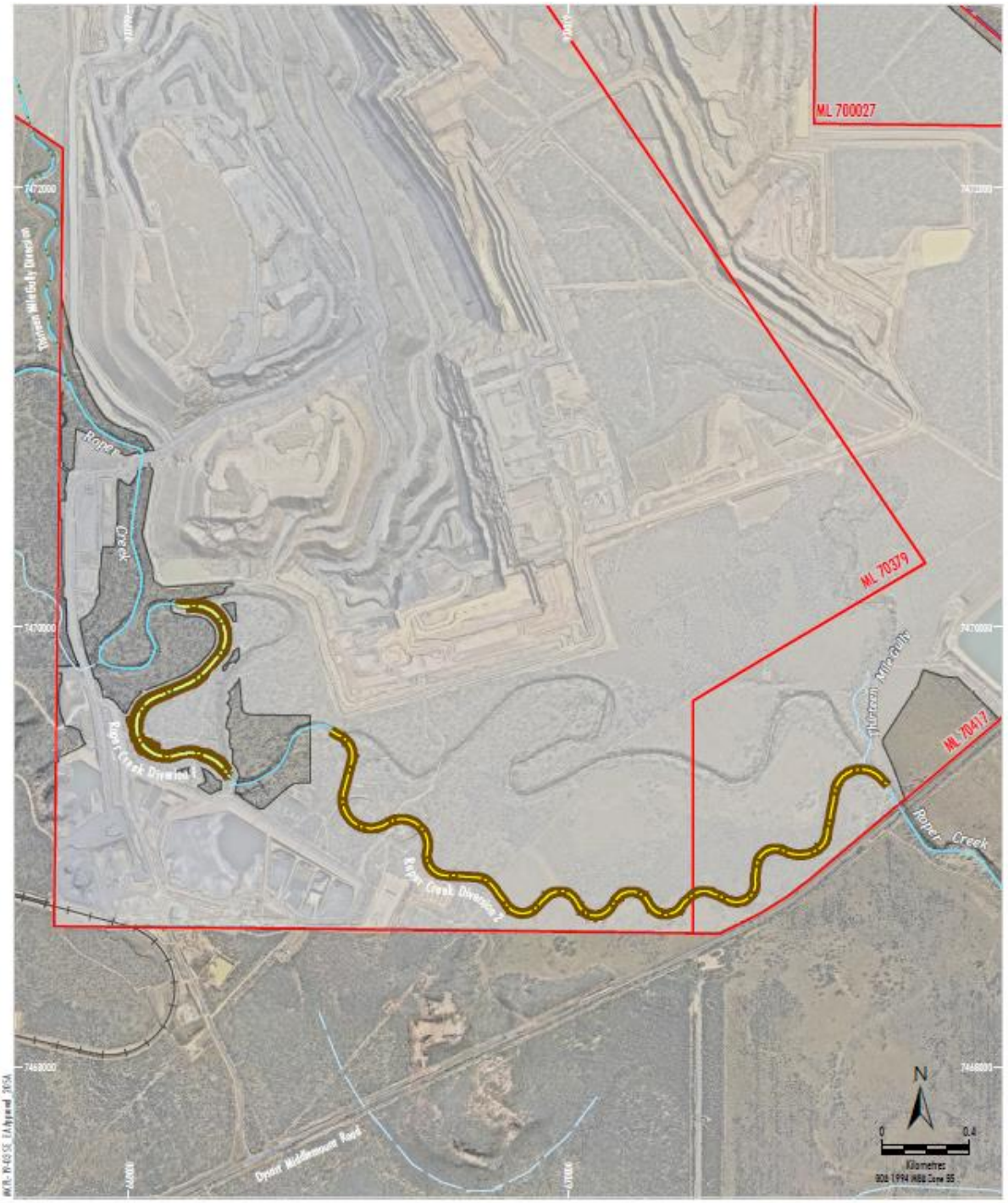
LEGEND
Mining Lease Boundary (ML)
Watercourse
Drainage
Existing Thirteen Mile Gully Diversion Footprint
Western Extension Project Diversion (Functional Design)

Source: MCPL (2018); Department of Natural Resources and Mines (2019); WRM (2019)
Orthophoto: MCPL (Dec 2018)

middlemount coal

MIDDLEMOUNT COAL MINE
Diversion Footprint

Attachment H: Diversion Footprints - Roper Creek



END OF ENVIRONMENTAL AUTHORITY

ATTACHMENT 3

LETTER FROM MIDDLEMOUNT COAL MINE TO THE DEPARTMENT OF ENVIRONMENT AND SCIENCE (RE: MIDDLEMOUNT COAL MINE, EMPL00716913 – RETENTION OF WATER STRUCTURES). DATED 15 MAY 2020

Level 17,444 Queen Street,
Brisbane City, QLD 4000

GPO Box 241
Brisbane, QLD 4001

P: (617) 3179 2000
F: (617) 3179 2098
E: info@middlemountcoal.com.au
W: www.middlemountcoal.com.au

middlemount coal PTY LTD
ABN 49 122 348 412

15 May 2020

Jeremy Wheeler
Senior Environmental Officer (Assessment)
Department of Environment and Science
GPO Box 3028
Emerald QLD 4720

Dear Jeremy,

RE: Middlemount Coal Mine, EMPL00716913 – Retention of Water Structures

Background

Middlemount Coal Pty Ltd owns the following cadastral lots under the Middlemount Coal MLs.

- Lot 5 on SP210524
- Lot 3 on SP282156
- Lot 2 on SP248577
- Lot 1 on SP282156
- Lot 4 on SP242660

A plan showing the ML and cadastral boundaries is presented below in Figure 1.

Retention of Water Structures

For the purposes of the Estimated rehabilitation Calculator, as the owner of the cadastral lots mentioned above, Middlemount Coal Pty Ltd agrees to allow the retention of a number of water holding structures across the ML.

The structures would serve a useful purpose for future land uses in the event of the project going into administration and closure of the mine.

These water retention structures include the following:

- Mine Water Dam
- Raw Water Dam
- Sediment Dam 1 and Sediment Dam 1 extension
- Sediment Dam 2
- Sediment Dam 3
- TSF2 (drying cells)
- Sediment Dam 6

- Sediment Dam 7
- Sediment Dam 9
- Sediment Dam 10
- Sediment Dam 12
- Workshop sediment dam
- Blast yard sediment dam
- Bangers dam
- Highwall dam 1
- Highwall dam 2
- Northern pitwater transfer dam
- ROM2 sediment dam
- ROM2 go line sediment dam
- Polypipe network (to allow future transfer between the dams and pit

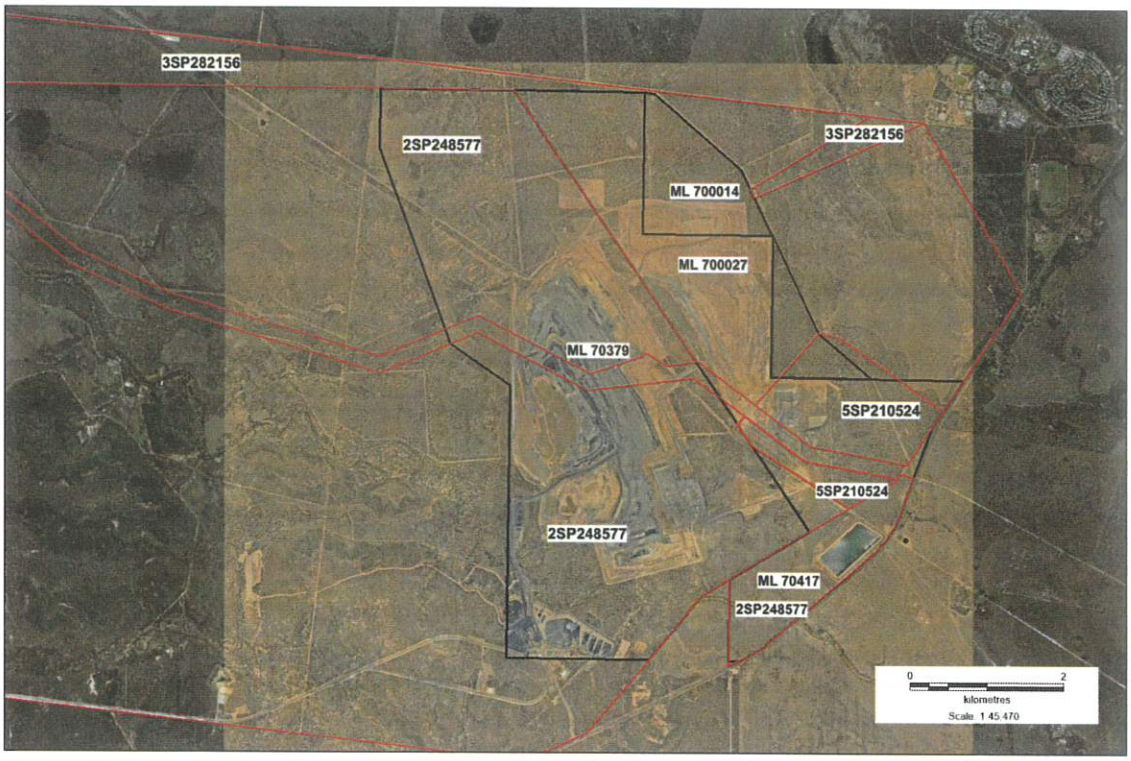


Figure 1: Map showing Lot and Plan boundaries (red) and ML boundaries (black)

If you wish to discuss this matter, please don't hesitate to contact the undersigned on (07) 4985 0059.

Yours faithfully

Albert Schneepers
Executive General Manager/SSE
Middlemount Coal

ATTACHMENT 4

MIDDLEMOUNT COAL MINE REHABILITATION MONITORING PROGRAM 2021

middlemount coal PTY LTD

Rehabilitation Monitoring Program and Schedule

2021

8 October 2021

Project No.: 0606252

The business of sustainability

ERM

Document details	
Document title	Rehabilitation Monitoring Program and Schedule
Document subtitle	2021
Project No.	0606252
Date	8 October 2021
Version	1.0
Author	Martine Goldner; Amanda Maier
Client Name	Middlemount Coal Pty Ltd

Document history

				ERM approval to issue		
Version	Revision	Author	Reviewed by	Name	Date	Comments
Draft	1.0	Martine Goldner / Amanda Maier	Dr Toivo Zoete	Chris Gimber	30/07/21	

Signature Page

8 October 2021

Rehabilitation Monitoring Program and Schedule

2021

Martine Goldner
Principal Consultant

Chris Gimber
Partner

ERM Australia Pacific Pty Ltd

Level 15 309 Kent Street

Sydney NSW 2000

© Copyright 2021 by ERM Worldwide Group Ltd and/or its affiliates ("ERM").
All rights reserved. No part of this work may be reproduced or transmitted in any form,
or by any means, without the prior written permission of ERM.

CONTENTS

1. INTRODUCTION 1

2. REVIEW OF THE EXISTING MONITORING PROGRAM 2

3. DEVELOPMENT OF REVISED MONITORING PROGRAM 10

3.1 Establishment of monitoring locations 10
3.2 Monitoring Timing and Frequency 13

4. MONITORING PROGRAM METHODOLOGY 14

4.1 Field Data Collection 14
4.1.1 Site Establishment 14
4.2 Rehabilitation Objectives 14

5. MONITORING PROGRAM SCHEDULE 19

6. REFERENCES 21

List of Tables

Table 1: Assessment of existing rehabilitation monitoring techniques 3
Table 3 Ideal Criteria for Key Soil Chemical Properties 16
Table 5 Rehabilitation Monitoring Program Schedule 20

1. INTRODUCTION

Middlemount Coal Pty Ltd is an incorporated joint venture between Peabody Energy Australia Pty Ltd and Yancoal Australia Ltd, and operate Middlemount Coal Mine (MCM), an open cut coal operation located approximately 90 kilometres north-east of Emerald, Queensland.

MCM is required under their current Environmental Authority (EA) EPML00716913 (issued 26 May 2021) to develop and implement a Rehabilitation Monitoring Program (RhMP) as per the EA excerpt below (Condition G14), and to comply with the following conditions in the EA relating to rehabilitation monitoring:

G15	The environmental authority holder must review the Rehabilitation Monitoring Program required by **Condition G14** at intervals no greater than **three (3) years** from **29 June 2019**. If the environmental authority holder needs to make changes to the Rehabilitation Monitoring Program, they must: a) submit the Rehabilitation Monitoring Program to the administering authority for review and comment; and b) within **twenty (20) business days** of receiving comments from the administering authority, the Rehabilitation Monitoring Plan must be updated to address the comments and resubmitted to the administering authority.
G16	A report of the findings of the Rehabilitation Monitoring Program must be updated and submitted to the administering authority, on 29 June of each calendar year , containing at a minimum: a) how the rehabilitation objectives as per Attachment F of this environmental authority will be achieved; b) how the rehabilitation objectives in the Rehabilitation Management Plan required by **Condition G12** are being met; c) if rehabilitation objectives are not being met, the corrective actions to be taken; d) specify the minimum sampling intensity for the monitoring of progressive rehabilitation; e) a statistical analysis of how areas of rehabilitation compared to analogue sites listed in **Table G5: Reference Sites**; f) a statistical analysis of how areas of rehabilitation are meeting the requirements of **Condition G9**; g) the sampling and monitoring intensity used in the Rehabilitation Monitoring Program required by **Condition G14**; h) justification of the suitability of the minimum sampling intensity; and i) justification of the sampling and monitoring intensity used in the Rehabilitation Monitoring Program required by **Condition G14**.

Table G5: Reference Sites

Reference Site	Domain Reference	Easting (GDA94, MGA 55)	Northing (GDA94, MGA 55)	Description
1	• In-pit and out-of-pit spoil dumps	662,226	7,475,606	RE 11.5.3
2	• MIA and CHPP area • Roads including haul roads • Tailings Storage Facility	665,455	7,469,732	RE 11.5.9
3	▪ Roads including haul roads	665,832	7,470,708	RE 11.7.2

The intent of rehabilitation monitoring is to collect site-specific data on a regular basis to assess and compare against the site's rehabilitation objectives, indicators and completion criteria. The outcomes of monitoring are used to determine the performance of the rehabilitation, and to identify any areas that are at risk of failing the stability, safety, and sustainability criteria.

This rehabilitation monitoring program is designed to be an evolving document that is reviewed and updated as areas of rehabilitation are completed and established. The results of each monitoring period should be utilised to guide corrective actions for any areas or aspects of rehabilitation that were found to be inadequate during monitoring, such as rework in areas of significant erosion. The results may also be used to adjust the monitoring program, including changes to the monitoring sites, frequency of monitoring, and variables monitored.

A long term review of monitoring results may be required in the future to assess the appropriateness of rehabilitation targets, as rehabilitation areas continue to be monitored against these targets.

2. REVIEW OF THE EXISTING MONITORING PROGRAM

Under Condition G15 of the EA, a review of the existing RhMP (previously developed by GT Environmental (2018), was completed and is provided in *Table 1*.

The basis of the assessment was to determine if the RhMP is meeting its key objective of collecting the required information to support an understanding of how rehabilitated areas are progressing towards achieving the rehabilitation objectives and completion criteria stipulated for the site. The assessment considered accepted standard practices in the region, practical experience of rehabilitation monitoring in the region, and the site's EA requirements.

Upon consultation with site, reviewing the existing monitoring program (GT Environmental, 2018) and considering the latest monitoring reporting provided (Bilyarra Consulting, 2019), which were completed in accordance with the previous RhMP specification, a preliminary re-design of the RhMP was completed.

ERM's rehabilitation and closure expert, Matt Lord, developed an updated draft monitoring framework, drawing from an understanding of the site and the historical monitoring, leading industry practice for rehabilitation monitoring and an appreciation of the science of demonstrating progression towards relinquishment criteria and associated timelines. The re-designed monitoring program was aimed at addressing any gaps found, was supplied to site personnel for discussion, and tentatively agreed to be adopted as a preliminary revised RhMP to be 'tested' through application.

Field surveys were then conducted using the new monitoring techniques (and the methodology outlined in the revised RhMP), to determine if the revised program was deemed to be adequate to address the requirements in the EA. The RhMP was subsequently finalised with the benefit of this additional understanding of site context and conditions.

Table 1: Assessment of existing rehabilitation monitoring techniques

Overview of existing monitoring program	Updates to monitoring program
■ On ground monitoring for three (3) years, then use remote sensing techniques every 5 years. Formal audit of progress towards EA requirements every 3 years ■ Survey timing between May and August ■ Sampling density 1 transect per hectare up to 100 hectare, then reducing in resolution ■ Aerial photo interpretation ■ Photo monitoring points (geotagged for context & start/end of transects) ■ Resurvey of previous transects ■ Reference site sampling at 3x locations (as per EA) ■ Primary assessment: transect sampling (Nelder et al, 2005) - 25x10m - Trees and shrubs within 100m of transect start - Flora spp list, recording stratum, abundance and height/density of strata - Proportion of groundcover veg, litter and bare earth within 10x1m^2 quadrats, as well as dominant spp contributions - Measurements of individual trees in every 10th transect, plus data collection for Landscape Function Analysis (LFA) in these locations ■ Not clear if soil sampling and assessment, and groundwater and surface water monitoring and assessment, is within monitoring scope ■ Secondary assessment: revegetation monitoring (with varied frequency) considering weeds, health of plants, signs of disturbance & regeneration, habitat values, and diversity and structure. Timing from monthly to 3 yearly. ■ Tertiary assessment also proposed: 'passive surveillance by site personnel' ■ Annual summary rehabilitation report (primary assessment), and rehabilitation monitoring report (secondary assessment) (to be completed at six monthly intervals up to 2 years, then annually for 7 years, then every 3 years) to be provided.	■ On ground monitoring agreed every 1, 2, 3, 5 and 10 years ■ Field survey completed in June due to supplier contract negotiations, however moving forward this should aim to be completed by May at the latest. ■ Sampling density reduced to 1 transect per 10 hectares as per Queensland Herbarium best practice (Neldner et al. 2020). ■ Reference site sampling at 9x locations (to increase representativeness of the underlying RE communities). ■ Pre-monitoring work: - Identification of rehabilitation areas with uniform rehabilitation (e.g. age) and site characteristics (e.g. slopes), as can be represented in mapping polygons, to be included in the annual monitoring and identification of the locations for transects to be established, ensuring the stipulated sampling intensity (of 1 transect per 10ha) is met. - Assessment of slope angles and lengths for compliance with site-specific criteria using LiDAR survey data. - Assessment of sediment deposition, using LiDAR survey data to show areas and extent of erosion and deposition. Note that this was not completed during the pre-work this year due to time constraints for field surveys, but should be incorporated moving forward; - Identification of any areas of persistent bare ground in rehabilitation five years old or greater. - Assessment of any factors that may have adversely affected rehabilitation areas including drought, fire, predation by insects, excessive grazing, unauthorised vehicle traffic, vegetation die-back, or soil disturbance/ burrowing caused by pest animals (e.g. pigs or rabbits). - Review of climate data (preferably from the site weather station, or alternatively from the nearest weather observation station), including records of recent rainfall events, intensity, duration and relationship to the time of seeding. ■ Primary assessment: transect sampling: - 50m x 10m belt transects were established, and appeared to adequately capture all species present. Photo monitoring points recorded (geotagged start/ end). - Flora spp. list, was recorded noting species name, location on transect where they are first encountered, native/ introduced/ declared, and height of each woody plant species recorded that occurs over 2m in height and density.

Overview of existing monitoring program	Updates to monitoring program
	- Proportion of groundcover (basal/ live cover, litter, bare ground, rocks and cryptograms) within 5x1m2 quadrats. Biomass estimated using photostandards (grasses) and point frame method (basal cover). - Habitat complexity estimated at start, middle and end points of transect, noting percentage of canopy (tree and shrub) cover, ground cover, logs, rocks and woody debris cover, free standing water and soil moisture, and tree hollows. - Soil sampling to a depth of 10cm at 5 points across the transect, to create a composite soil sample to be analysed for the transect. - Visual assessment of erosion, with rills/ gullies start and end points recorded along the transect to assess through time. - LFA was removed, as it had not been completed during the 2019 monitoring due to time constraints (Bilyarra Consulting, 2019). The revised RhMP was considered to provide a suitable snapshot of the rehabilitation condition without this technique being employed. ■ Annual summary rehabilitation monitoring report provided.

Relevant Rehabilitation Objective (From EA)	Relevant Completion Criteria (from EA)	Assessment of Existing Monitoring Techniques	Initial Assessment & Suggestions	Updates after completing surveys
Very low probability of subsidence or rock fails with serious consequences	■ *Slope angle does not exceed 18.5 degrees (dump slopes)* ■ *Slope angle does not exceed 2% (dump tops)*	No assessment of slope completed.	Consider including: ■ Field slope assessment (clinometer) ■ GIS slope compliance review	Both field slope assessments were completed as well as an overall slope review using LiDAR. Recommended to continue to use LiDAR as primary method as yield more valuable information as to compliance with slope requirements, with better spatial coverage..
Polluted water contained on site or treated.	■ *Groundwater monitoring bores have parameters consistent with those specified in Table C8 of the EA, for the period of the Post Closure Management Plan* ■ *Receiving waters affected by surface water run-off have contaminant limits consistent with those specified in Table C5 of the EA, for the period of the Post Closure Management Plan* ■ *No long-term (>2 months) ponding of water on soil surface (dump tops)*	No consideration of groundwater or receiving waters monitoring results, or long term ponding on dump tops.	Consider including: ■ High-level review of groundwater & receiving water monitoring results ■ Standing/ponded water in habitat assessment	High level review of groundwater and receiving water monitoring results was not completed, due to discrepancies in reporting periods, however it is recommended to include these in future monitoring. Standing water assessments completed as part of habitat complexity assessment.
Very low probability of subsidence or rock fails/ slope slippage with serious consequences.	■ *Rock mulch has 100% coverage of the overburden spoil dumps surface area (i.e. no bare areas exist)*	Proportion of groundcover veg, litter and bare earth monitored within 10x1m^2 quadrats.	Continue to record proportion of bare earth as existing. Consider including:	Completed.

Relevant Rehabilitation Objective (From EA)	Relevant Completion Criteria (from EA)	Assessment of Existing Monitoring Techniques	Initial Assessment & Suggestions	Updates after completing surveys
Very low probability of slope slippage with serious consequences.	■ *The land is safe for the proposed post mining land use detailed in Table F2 of the EA* ■ *Slope angle does not exceed 18.5 degrees* *For dump tops* ■ *slope angle does not exceed 2%* ■ *a minimum of 70% vegetative cover is present and maintained* ■ *non-vegetation cover (stones, rock cover, litter, logs etc.) comprise not greater than 30% of the total area* ■ *bare surface areas do not exceed 5m^2 in area, over a five year average period* ■ *bare surface areas are not to exceed a length of 5 m along slope, over a five year average period*	No link between areas monitored and PMLUs. No assessment of slope completed.	■ Field slope assessment (clinometer) and/or GIS slope compliance review ■ Another measure of stability (an erosion ranking?) to decouple from rock mulching ■ Expand habitat assessment to consider percent stones, rock cover and woody debris. ■ Bolster reference site monitoring to present the 'natural' state for PMLUs. Expand replicates transects, and across REs to show natural diversity.	Have utilised a standard erosion ranking as discussed in next sections. Completed. Completed.
Landform design achieves appropriate erosion rates.	*… erosion rates of rehabilitated areas are suitable for the post mining land use defined in Table F2 of the EA.*	No consideration of erosion completed.	Consider including: ■ Field assessment and ranking of erosion (in line with standard practices)	Have utilised a standard erosion ranking as discussed in next sections.
Adequate vegetation cover established to minimise erosion.	*… vegetation type and density of species in rehabilitated areas are suited to the soil composition, slope, aspect, climate and post mining land use defined in Table F2 of the EA.*	Linkages between vegetation type and density between rehabilitated areas and	Consider including: ■ Bolster monitoring at reference sites/ REs and	Completed.

Relevant Rehabilitation Objective (From EA)	Relevant Completion Criteria (from EA)	Assessment of Existing Monitoring Techniques	Initial Assessment & Suggestions	Updates after completing surveys
		reference sites/ REs/ PMLUs not apparent.	conduct analysis to link rehab areas to these areas ■ Use monitoring to establish a 'reference' range for soil composition, slope, aspect climate and PMLUs	Require further monitoring at now established locations (including previous reference site monitoring data) to start to build a reference 'range' across soil composition, slope, climate and PMLUs, to compare with rehabilitated areas.
Soil properties that support and will continue to support the desired final land use.	■ *Vegetation established in accordance with post-mining land use given in Table F2 of the EA* ■ *Water infiltration, aggregate stability and bulk density rates of rehabilitated areas are comparable to rates at designated reference sites that are representative of the post mining land use* ■ *vegetative material layer(s) (e.g. leaf litter) is evident and contributing to nutrient cycling and development of microbial mass* *… topsoil has been respread to a suitable depth in rehabilitated areas to sustain the post mining land use specified in Table F2 of the EA (dump tops)* ■ *soil surface crusting occurs in less than 2% of the rehabilitated domain area*	Primary transect sampling likely to cover some of requirements to address the completion criteria, with some exceptions. Proportion of groundcover veg, litter and bare earth monitored within 10x1m2 quadrats.	Continue with primary transect based sampling. Consider including: ■ Basic soil analysis to inform water infiltration, aggregate stability, nutrient cycling etc. ■ Widen habitat assessment to consider recording crusting	Completed.
Establish specified self-sustaining	*Species in rehabilitated areas show evidence of flowering, viable seed setting, germination and emergence;*	Primary transect sampling likely to cover some of requirements to	Continue with primary transect based sampling.	Tree heights and density are recorded as part of the

Relevant Rehabilitation Objective (From EA)	Relevant Completion Criteria (from EA)	Assessment of Existing Monitoring Techniques	Initial Assessment & Suggestions	Updates after completing surveys
natural vegetation or habitat	■ *Evidence of generational succession of trees and shrubs is apparent is rehabilitated areas;* ■ *weeds do not dominate native species after disturbance or after rain; and* ■ *pests do not occur in substantial numbers or visibly affect the development of native plant species.* *vegetation established in accordance with post-mining land use given in Table F2 of the EA (dump tops)* *densities of native tree, shrub and grass species are representative of the target Regional Ecosystems as determined through comparison with designated reference sites* ■ *community structure (groundcover, shrub and tree layers) are representative of the target Regional Ecosystems as determined through comparison with designated reference sites;* ■ *non-native cover crop grass species constitute no more than 20% of the area of total vegetative cover; and* ■ *native tree, shrub and grass species which are representative of surrounding ecosystems and which will support the post-*	address the completion criteria, with some exceptions. Weeds and pest species likely to be recorded. Densities of tree, shrub and grass species are recorded, as is community structure and native/non-native species, and can be compared to reference sites.	Consider including: ■ Indication of successional processes ■ Ensure full flora list is collated for each stratum, down to species level	monitoring, however the presence of reproductive features, and number of seedlings was not recorded. Recommend to include these in future monitoring. A full flora list is provided (down to species level where able).

Relevant Rehabilitation Objective (From EA)	Relevant Completion Criteria (from EA)	Assessment of Existing Monitoring Techniques	Initial Assessment & Suggestions	Updates after completing surveys
	mine land use are to constitute 80% of the area of established vegetative cover.			
Establish land use with comparable management requirements to similarly used non-mining land	*for areas established to cattle grazing:* ■ *Cattle stocking rate is comparable to designated reference sites;* *and for areas established to regional ecosystems:* ■ *densities of native tree, shrub and grass species are representative of the target Regional Ecosystems as determined through comparison with designated reference sites;* ■ *community structure (groundcover, shrub and tree layers) are representative of the target Regional Ecosystems as determined through comparison with designated reference sites;* ■ *non-native cover crop grass species constitute no more than 20% of the area of total vegetative cover; and* ■ *native tree, shrub and grass species which are representative of surrounding ecosystems and which will support the post-mine land use are to constitute 80% of the area of established vegetative cover.*	Primary transect sampling likely to cover some of requirements to address the completion criteria, particularly for regional ecosystems. Densities of tree, shrub and grass species are recorded, as is community structure and native/non-native species, and can be compared to reference sites.	Continue with primary transect based sampling. Consider including: ■ An indicator of pasture yield to establish cattle stocking rates comparisons (either using photo standards or direct pasture yields) ■ Ensure full flora list is collated for each stratum, down to species level.	Photo-standards were utilised (from the Queensland Government) and a full flora list is provided (down to species level where able).

3. DEVELOPMENT OF REVISED MONITORING PROGRAM

The revised monitoring framework developed on the basis of reviewing the existing program, monitoring reports, the EA, best practice and site consultation, is outlined in the following sections. The revised framework is intended to address a number of key concerns highlighted in the review, nominally around sampling density and linkage between monitoring techniques (and information collected) and the EA completion criteria. Ongoing annual review of the revised framework is recommended.

Given revised methodology was proposed for the 2021 monitoring event, it was agreed with site to complete monitoring for all the rehabilitation areas this year.

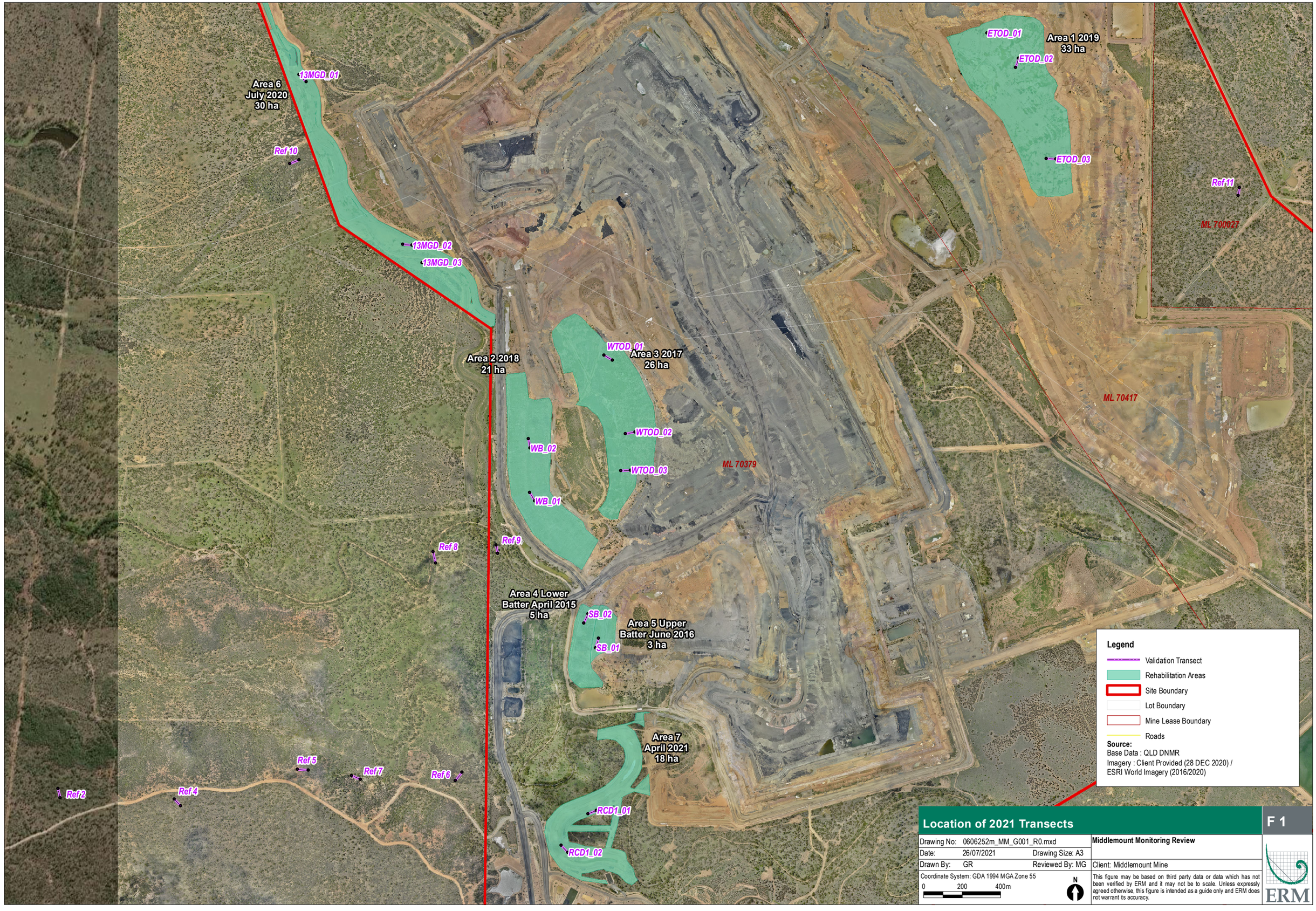
3.1 Establishment of monitoring locations

Transect based sampling is widely used in industry to monitor rehabilitation. For MCM, a sampling intensity of one transect per ten hectares has been adopted. This is consistent with the sampling density of one sample per 4ha-16ha for mapping scales of 1:10,000-1:20,000, respectively, as recommended by Neldner et al. (2020), for sampling of remnant vegetation in Queensland.

It is recommended that the transect start points be randomly selected, and that the transect runs diagonally across the slope. This will prevent coinciding with rehabilitation patterns that typically align with the contour of the slope itself, such as topsoil spreading or seeding equipment passes, as well as erosion features that typically run downslope. To avoid edge effects, randomly selected sites that fall within 20m of the edge of a rehabilitation area or disturbance features will be relocated. Photo points will be established at the start and end of each transect, aimed down the centreline. Three reference sites within particular Regional Ecosystem (RE) vegetation communities are stipulated within the existing EA for certain mining domains (as per Table G5: Reference Sites in the EA). These sites were chosen prior to the development of the mine and assume that edaphic and other conditions within the rehabilitated sites will approximate those in the reference sites. However, there were no replicate transects specified within a single RE community, and so the establishment of further reference site locations, within the same REs, was completed, so as to ensure the reference data is representative and is more capable of showing or capturing variability within a single RE community. As rehabilitation progresses and long term monitoring information continues to be collected, it may be necessary to re-assess the suitability of the reference sites given physical and vegetative constraints of rehabilitation.

The transect monitoring locations (for both rehabilitation and reference sites) for the 2021 monitoring event are provided in Figure 1. The location of the reference sites within the required REs is provided in Figure 2.

This program should be checked annually (noting a formal review is required every three years under the EA), to ensure the area to be monitored (in hectares) is aligned with the latest site plan or schedule for the completion of new rehabilitation areas.



Location of 2021 Transects

F 1

Drawing No:	0606252m_MM_G001_R0.mxd		**Middlemount Monitoring Review**
Date:	26/07/2021	Drawing Size: A3	
Drawn By:	GR	Reviewed By: MG	Client: Middlemount Mine

Coordinate System: GDA 1994 MGA Zone 55

0 200 400m

N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

Area 6
Area 1
Area 3
Area 2
Area 4
Area 5
Area 7
ML 700014
ML 700027
ML 70379
ML 70417
13MGD_01
13MGD_02
13MGD_03
ETOD_01
ETOD_02
ETOD_03
WTOD_01
WTOD_02
WTOD_03
WB_01
WB_02
SB_01
SB_02
RCD1_01
RCD1_02
Ref 2
Ref 4
Ref 5
Ref 6
Ref 7
Ref 8
Ref 9
Ref 10
Ref 11

<bol>Source:</bol>
Base Data & RE Mapping : QLD DNMR
Imagery : Client Provided (28 DEC 2020) / ESRI World Imagery (2016/2020)

Legend

- Validation Transect
- Rehabilitation Areas
- Site Boundary
- Mine Lease Boundary

Regional Ecosystem

- 11.12.1
- 11.12.2
- 11.3.1
- 11.3.1/11.3.2
- 11.3.2
- 11.3.2/11.3.21
- 11.3.2/11.3.7
- 11.3.25
- 11.3.27
- 11.3.7
- 11.4.8
- 11.4.9
- 11.4.9/11.4.8
- 11.5.2
- 11.5.3
- 11.5.9
- 11.5.9/11.5.18
- 11.7.2/11.5.18
- 11.7.2/11.7.1
- 11.7.2/11.7.4
- 11.7.4/11.5.18

Regional Ecosystem Mapping

F 2

Drawing No: 0606252m_MM_G003_R0.mxd		Middlemount Rehabilitation Monitoring
Date: 30/07/2021	Drawing Size: A3	
Drawn By: GR	Reviewed By: MG	Client: Middlemount Mine

Coordinate System: GDA 1994 MGA Zone 55
0 200 400 600m
N

This figure may be based on third party data or data which has not been verified by ERM and it may not be to scale. Unless expressly agreed otherwise, this figure is intended as a guide only and ERM does not warrant its accuracy.

ERM

3.2 Monitoring Timing and Frequency

Monitoring should occur at the end of the 'wet season', nominally between March and May, when the presence of diagnostic parts (flowers, above ground parts) for many grasses, annuals, and other species is at its optimum. It will also enable an accurate assessment of erosion features, and understanding of the impact of surface water movement across the rehabilitated landscapes following the previous wet summer season.

Monitoring of rehabilitation is recommended at years 1, 2, 3, 5, 10 and 15, reflecting that the most rapid vegetation development, and options for early intervention, occurs in the early stages of establishment. While vegetation on rehabilitated sites is expected to develop relatively quickly, requiring frequent monitoring, vegetation in reference sites is mature, and is not expected to show significant changes from year to year. The frequency of monitoring in reference sites can therefore be completed once every 5 years. Note that where major rework is required, the year of the rework should be considered as Year 1 for the purpose of the rehabilitation monitoring scheduling. A recommended schedule for the completion of monitoring activities is provided in Section *5*.

The frequency of specific components of the monitoring are outlined below:

- Slope assessments – to be completed every monitoring event to ensure compliance with specific slope criteria prescribed in the EA (Table G1: Landform Design Criteria). This should be done using the latest available LiDAR for the site, assessed against the Landform Design Criteria.

Table G1: Landform Design Criteria

Disturbance Type	Maximum Projective Surface Area (ha)	Maximum Slope	Vertical Height Range (m)
Elevated Landforms	853	< 18.5%	0-64
Infrastructure Areas	112	< 5%	0-15

Soil sampling – to be completed during Year 1 to provide baseline information, then the need for additional sampling should be considered every five years, as soil chemistry is unlikely to show rapid changes. Although not considered essential, follow up soil sampling will determine if the growth media is maturing with time, so as to support establishment and growth of desirable species. Monitoring results may also indicate amelioration / maintenance requirements. Periodic ongoing monitoring may also ascertain effectiveness of amelioration, nitrogen fixation, emergence or leaching of salts in the soil profile, among other soil characteristics and processes. It is considered valid to initially review the condition and status of rehabilitation overall, and then progress soil sampling primarily (or only) for areas where concern is held as to the progression towards acceptable completion criteria.

- Persistent areas of bare ground – surface areas in which vegetation establishment has failed over five years, or where distinct dieback is apparent over three consecutive years, should be sampled to identify possible issues with growth media.

These requirements should be assessed prior to each annual monitoring event and be built into the program as appropriate.

4. MONITORING PROGRAM METHODOLOGY

4.1 Field Data Collection

4.1.1 Site Establishment

Monitoring transect start locations are to be randomly established within rehabilitation areas, for example, using a GIS tool prior to field work, then verified and confirmed by field technicians. Transects of 50m length should be laid out diagonally across the slope. Vegetation is to be assessed on and within 5m of each side of each transect, resulting in a 500m^2 assessment area. Metal star pickets are to be driven into the start and end points of each transect. The assessment area is divided into five blocks of 10m length each as sub-units for recording a range of vegetation variables (see below). Quadrats (1m x 1m) will be established at 10m intervals along each transect for cover monitoring.

Photo points are established at the start and end of each transect, aimed down the centre line. All field data will be captured using tablets with GIS capabilities, to ensure accurate recording of the GPS locations of the transects, and of any significant issues to be recorded. This data is recommended to be maintained in a GIS database onsite for ease of management. Relevant data is also entered into spreadsheets to allow data handling, analyses, display, and management post-monitoring.

4.2 Rehabilitation Objectives

The following steps of the updated methodology (outlined in Table 1) have been grouped according to which rehabilitation objective they help meet. There is some minor duplication, but this serves to highlight how interrelated the variables are, and how critical they are to achieving rehabilitation objectives.

Very low probability of subsidence or rock fails, or slope slippage, with serious consequences and landform design achieves appropriate erosion rates.

- Assessment of slope angles and lengths for compliance with site-specific criteria using LiDAR survey data.
- Assessment of sediment deposition, so as to comply with EA Condition G2 (preventing contaminant release to land) and assess erosional stability of slopes, using LiDAR survey data to show areas and extent of erosion and deposition. Note that this was not completed during the pre-work this year due to time constraints for field surveys, but should be incorporated moving forward.
- Identification of any areas of persistent bare ground in rehabilitation five years old or greater.
- Assessment of any factors that may have adversely affected rehabilitation areas including drought, fire, predation by insects, excessive grazing, unauthorised vehicle traffic, vegetation die-back, or soil disturbance/ burrowing caused by pest animals (e.g. pigs or rabbits).
- Habitat complexity is to be measured at each transect at the start of the transect (0m), the centre of the transect (25m) and at the end of the transect (50m) to obtain representative data of the habitat complexity for the area. The assessment should be conducted visually and identify:
    - Canopy (tree and shrub) cover percentage;
    - Ground cover percentage;
    - Logs, rocks and woody debris cover percentage;
    - Free standing water and available soil moisture; and

- Tree hollows (as visible from each monitoring assessment point along the transect).

- Visual signs of erosion within, or in close proximity to the transect, are recorded as per the *Australian Soil and Land Survey – Field Handbook 3rd edition (2009)*, including, for example, whether erosion is active or stable, the depth of erosion, erosion type, among other erosion characteristics. Where rills and/or gullies are recorded, the start and end points along the transect (position) and the depth (in cm) for each feature are recorded.
- Cover composition is to be recorded in 1m x 1m quadrats placed at 10m intervals along the transect. Variables recorded in each quadrat include percentage overall of basal/ live material, litter, bare ground, cryptograms, and competent rock (greater than 50mm diameter), for a total of 100 percent. Biomass for grasses should be estimated using relevant photo standards, whilst basal cover should be estimated using the point frame method.

Polluted water contained on site or treated.

- Groundwater and surface water monitoring records were unable to be incorporated due to time constraints but should be in future monitoring events.

Adequate vegetation cover established to minimise erosion.

- Review of climate data (preferably from the site weather station, or alternatively from the nearest weather observation station), including records of recent rainfall events, intensity, duration and relationship to the time of seeding. Seed germination and vegetation establishment success in the Bowen Basin is strongly reliant on rainfall. Rainfall following cultivation and prior to seeding can result in surface crusting and subsequent poor germination strike. Rainfall initiated germination followed by a period of hot, dry weather can result in desiccation and death of emerging seedlings. Regular light rainfall events following seeding will likely result in successful germination and vegetation establishment.
- Cover composition is to be recorded in 1m x 1m quadrats placed at 10m intervals along the transect. Variables recorded in each quadrat include percentage overall of basal/ live material, litter, bare ground, cryptograms, and competent rock (greater than 50mm diameter), for a total of 100 percent. Biomass for grasses should be estimated using relevant photo standards, whilst basal cover should be estimated using the point frame method.
- Habitat complexity is to be measured at each transect at the start of the transect (0m), the centre of the transect (25m) and at the end of the transect (50m) to obtain representative data of the habitat complexity for the area. The assessment should be conducted visually and identify:
  - Canopy (tree and shrub) cover percentage;
  - Ground cover percentage;
  - Logs, rocks and woody debris cover percentage;
  - Free standing water and available soil moisture; and
  - Tree hollows (as visible from each monitoring assessment point along the transect).

Visual signs of erosion within, or in close proximity to the transect, are recorded as per the *Australian Soil and Land Survey – Field Handbook 3rd edition (2009)*, including, for example, whether erosion is active or stable, the depth of erosion, erosion type, among other erosion characteristics. Where rills and/or gullies are recorded, the start and end points along the transect (position) and the depth (in cm) for each feature are recorded.

Soil properties that support and will continue to support the desired final land use.

- Top soil samples are collected for subsequent soil analysis as described below:

1. At 10m intervals along the transect, a hole is dug using a stainless steel hand trowel to a depth of 100mm;
2. A sample of the hole wall is taken from 0 to 100mm (as a representation of the topsoil profile), collected in a container, and mixed once all five samples had been collected, creating one bulk soil sample per transect;
3. Approximately 200g of the bulk soil sample is bagged in a plastic ziplock bag, and sent for chemical analysis at a NATA-accredited laboratory, with the following analytes tested:
    a. pH;
    b. Electrical Conductivity at 25°C (EC, expressed in µS/cm);
    c. Sulphate as SO_4 (expressed in mg/kg);
    d. Chloride (expressed in mg/kg);
    e. Organic Matter (expressed in mg/kg);
    f. Total Nitrogen as N (expressed in mg/kg);
    g. Nitrate as N (in solution, expressed in mg/kg);
    h. Total Phosphorus as P (expressed in mg/kg);
    i. Cation Exchange Capacity and levels of exchangeable cations (Ca, Mg, K, Na) (expressed in m_{eq}/100g);
    j. Exchangeable Sodium Percent (ESP, expressed as a percentage);
    k. Emerson class, texture and colour and
    l. Extractable metals (Cu, Fe, Mn, Zn).

It is recommended to incorporate the full Agricultural suite moving forward, which provides further data on the fertility of the soil such as extractable potassium and phosphorus, ammonia as N, and exchangeable cations, in a discounted suite.

The amount (or presence), type and quality of the growth medium used in rehabilitation activities are factors that influence vegetation establishment, and therefore rehabilitation success. In relation to soil chemical properties in rehabilitation areas, general ideal criteria to be achieved are listed in Error! Reference source not found..

Table 2 Ideal Criteria for Key Soil Chemical Properties

Parameter	Land use – Pasture	Land use – Woodland
pH	5.5 – 7.5	5.0 – 8.5
EC (µS/cm)	< 700	< 700
Sulphates (mg/kg)	5 – 10	5 – 10
Nitrates (mg/kg)	> 12.5	> 12.5
Total Nitrogen (mg/kg)	200-1000	200-1000

Parameter	Land use – Pasture	Land use – Woodland
Phosphorus (mg/kg)	≥ 50	≥ 50
Chloride (mg/kg)	< 350	< 350
Cation Exchange Capacity (CEC) and Exchangeable cations (m_{eq}/100g)	>5	>5
Exchangeable Sodium Percentage (ESP) (%)	< 5	< 5
Organic Matter (mg/kg)	2-3	2-3

A brief interpretation of key chemical attributes of soils tested during this monitoring program (and how they underpin rehabilitation performance and plant establishment success) is provided below:

- Soil pH largely regulates the availability of nutrients to plants. A soil pH range of 5 – 8 is generally considered conducive to adequate plant growth for most species (Lake, 2000; Burns, 2005);
- Soil salinity inhibits plants growth for two reasons: by reducing the ability of the plants to take up water and by entering the transpiration stream of plants, thereby injuring plant cells in the transpiring leaves (Munns, 2002). Therefore, soil salinity can prevent seed germination, retard plant growth, reducing ecosystem diversity (DITR, 2006). Soils having an EC over 4000 µS/cm are considered saline (Munns, 2002);
- CEC is the capacity of the soil to hold and exchange cations, and is an important driver of stability of soil structure, nutrient availability for plant growth, soil pH, and the soil's reaction to fertilisers and other ameliorants. A CEC over 5 meq/100g is considered adequate and indicates a moderate/good capacity of the soil to retain nutrients (Hazelton and Murphy, 2007);
- Sodicity (measured as ESP) refers to a condition where a high proportion of readily soluble sodium is present in soil, affecting its structural stability, reducing infiltration rates and soil moisture holding capacity and increasing soil strength to the point where plant growth is affected (Rangasamy et al, 2010). Soil sodicity affects plant establishment by restricting root development and access to nutrients. Additionally, higher soil sodicity leads to an increasing potential for the development of erosion (DITR, 2006). Soils with ESP less than 6% are considered non-sodic, those where ESP is ranges between 6 – 15% are slightly to moderately sodic, and those with ESP over 15% are highly sodic;
- Soil fertility can be quantified through the levels of key nutrients and organic matter (or organic carbon) present in the soil. Of the available nutrients, N, P and K are important as they usually are the limiting nutrients for the growth of most plants. Sulphur is also a key nutrient in pasture communities. A critical range for extractable Sulphur is 5 – 10 mg/kg (Lewis 1999)
- The levels of chloride and sulphates in soils are usually tested to detect potential toxicities that would impede healthy plant growth. Chloride levels over 350 mg/kg are considered toxic and can cause severe problems to plants (e.g. severely limited growth, leaf necrosis), while sulphate levels over 3000 mg/kg can lead to soil acidification and plant death.
- Organic matter assists not only by providing habitat for organisms in the soil improving soil structure, but also by increasing organic nitrogen supply. The CEC of the soil is also likely to increase with time (Baker et al, 1993; Hazelton & Murphy, 2007).

- Cover composition is to be recorded in 1m x 1m quadrats placed at 10m intervals along the transect. Variables recorded in each quadrat include percentage overall of basal/ live material, litter, bare ground, cryptograms, and competent rock (greater than 50mm diameter), for a total of 100 percent. Biomass for grasses should be estimated using relevant photo standards, whilst basal cover should be estimated using the point frame method.

Establish specified self-sustaining natural vegetation or habitat

- Ground cover, shrub and tree species are identified and recorded by the first block in which they are encountered, to allow for species area curves to be calculated. For each species, the following information should be recorded:
  - Species name (scientific to at least genus, but ideally to species level where possible);
  - Location on transect of first encounter (block);
  - Native / Introduced / Declared weed; and
- The height and number of each woody plant species (shrubs and trees) recorded in the block over 2m in height (for example, using a clinometer).Descriptive statistics and accompanying graphs should be completed for vegetation biodiversity and cover condition for each rehabilitation area, covering the following:
  - Species Richness: The total number of species, accumulating across the length of the transect;
  - Native / Introduced Species: The proportion of native to introduced species. This information is particularly important where native ecosystem is the designated post-mining land use; and
  - Ground Cover Distribution: The percentage of each cover type (live material/ basal, litter, bare ground, cryptograms, and competent rock) as an average across the length of the transect.
- Increased sampling intensity of reference sites to ensure representativeness and establish a range of reference values to apply to rehabilitation.

5. MONITORING PROGRAM SCHEDULE

Table 3 shows which rehabilitation areas should be included in the ongoing rehabilitation monitoring program for all current and future anticipated rehabilitation areas at MCM, and is current for the 2021 year. The schedule is aligned to both the sampling density and also frequency for monitoring to be completed over time. This should be updated annually as rehabilitation is completed (and therefore new rehabilitation areas confirmed), as well as ensuring any changes to the schedule is captured.

Middlemount Coal - Rehabilitation Monitoring Program Schedule

	Transect identifier	RE (reference sites)	Rehabilitation Completion Year	Area (ha)	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035
Middlemount Coal Rehabilitation																								
Reference sites	*Ref 1*									NC					√					√				
	Ref 2	11.5.9b/ 11.5.18								√					√					√				
	Ref 3									NC					√					√				
	Ref 4	11.5.9b/ 11.5.18								√					√					√				
	Ref 5	11.7.2/ 11.7.1								√					√					√				
	Ref 6	11.3.2/ 11.3.7								√					√					√				
	Ref 7	11.7.2/ 11.7.1								√					√					√				
	Ref 8	11.3.25								√					√					√				
	Ref 9	11.3.25								√					√					√				
	Ref 10	11.3.1/ 11.3.2								√					√					√				
	Ref 11	11.5.3								√					√					√				
Diversions (Roper Ck and 13 Mile Gully)	RCD1_01		2021	17						√	Y1	Y2	Y3		Y5					Y10				
	RCD1_02									√	Y1	Y2	Y3		Y5					Y10				
	13MGD_01		2020	30						√	Y2	Y3		Y5					Y10					
	13MGD_02									√	Y2	Y3		Y5					Y10					
	13MGD_03									√	Y2	Y3		Y5					Y10					
Western Batter	WB_01		2018	21				Y1	Y2	√		Y5					Y10							
	WB_02							Y1	Y2	√		Y5					Y10							
Southern Batter	SB_01		2015/ 2016	7		Y1	Y2	Y3		√					Y10									
	SB_02					Y1	Y2	Y3		√					Y10									
Western Top of Dump	WTOD_01		2017	26			Y1	Y2	Y3	√	Y5					Y10								
	WTOD_02						Y1	Y2	Y3	√	Y5					Y10								
	WTOD_03						Y1	Y2	Y3	√	Y5					Y10								
Eastern Top of Dump	ETOD_01		2019	33					Y1	√	Y3		Y5					Y10						
	ETOD_02								Y1	√	Y3		Y5					Y10						
	ETOD_03								Y1	√	Y3		Y5					Y10						
add forecasted areas																								

Table Legend: Y1 – Year 1; Y2 – Year 2; Y5 – Year 5; Y10+ – Year 10+; U – Unknown (age of rehabilitation); NC - Not Completed

*** Note the monitoring frequency/ survey year has been reset for all rehabilitated areas at Middlemount.*

6. REFERENCES

Baker, Dennis E., and Eldershaw, V.J. (1993). Interpreting soil analyses – for agricultural land use in Queensland. DPI Project Report Series QO93014. Department of Primary Industries, Brisbane, Qld.

Bilyarra Consulting (2019),

Burns, M. (2005) The keys to sustainable ecosystem establishment on mine sites, Global Soil Systems, June 2005.

DES (2021) Environmental Authority EPML00716913 – Middlemount Coal Mine. Took affect 26 May 2021.

DITR (2006) Mine Rehabilitation Leading Practice Handbook, Department of Industry, Tourism and Resources, Commonwealth of Australia, October 2006.

GT Environmental (2018) Middlemount Coal Mine Revised Rehabilitation Monitoring Program, 2018.

Hazelton, P. and Murphy, B. (2007) Interpreting soil test results – What do all the numbers mean?, NSW Department of Natural Resources, CSIRO Publishing, Collingwood.

Lake, B. (2000). Understanding Soil pH. Acid Soil Management, Leaflet No. 2, prepared for the New South Wales Acid Soil Action Program, NSW Agriculture, Yanco.

Lewis, D.C. (1999) Sulphur. In Soil Analysis: An interpretation manual, (Eds KI Peverill, LA Sparrow and DJ Reuter). CSIRO Publishing, Melbourne.

McCann, R. (2018) Middlemount Coal Mine Revised Rehabilitation Monitoring Program. Report produced for Middlemount Coal Mine. GT Environmental.

Munns, R. (2002). Comparative physiology of salts and water stress. Plant, Cell and Environment 25, pp 239-250.

Neldner, V.J., B.A. Wilson, H.A. Dillewaard, T.S. Ryan, D.W. Butler, W.J.F. McDonald, E.P. Addicott and C.N. Appelman (2020)Methodology for survey and mapping of regional ecosystems and vegetation communities in Queensland. Version 5.1. Updated March 2020. Queensland Herbarium, Environmental Protection Agency, Brisbane. pp.144

Rangasamy, P., North, S. and Smith A. (2010) Diagnosis and management of sodicity and salinity in soil and water in the Murray Irrigation region, The University of Adelaide, SA.

ERM has over 160 offices across the following countries and territories worldwide

Argentina
Australia
Belgium
Brazil
Canada
Chile
China
Colombia
France
Germany
Ghana
Guyana
Hong Kong
India
Indonesia
Ireland
Italy
Japan
Kazakhstan
Kenya
Malaysia
Mexico
Mozambique
Myanmar
The Netherlands
New Zealand
Norway
Panama
Peru
Poland
Portugal
Puerto Rico
Romania
Russia
Senegal
Singapore
South Africa
South Korea
Spain
Sweden
Switzerland
Taiwan
Tanzania
Thailand
UAE
UK
US
Vietnam

ERM's Brisbane Office
Level 4, 201 Leichhardt Street
Spring Hill QLD 4000

T: (07) 3839 8393
F: (07) 3839 8381

www.erm.com

The business of sustainability

ERM