

T1 | Environmental
Management Plan
(Mining Lease)





Table of Contents

Executive Summary	1
T.1 Introduction	5
T.1.1 Background	5
T.1.2 The Project	7
T.1.3 Location	8
T.1.4 Project Proponent	14
T.1.5 Land Use & Tenure	14
T.1.6 Stakeholders	15
T.1.7 Environmentally Relevant Activities	15
T.1.8 Standard Environmental Conditions	17
T.2 Project Description	17
T.2.1 Coal Mine	17
T.2.2 Rail Spurline & Loop	17
T.2.3 CHPP & Mine Infrastructure	18
T.3 Environmental Values, Impacts, Commitments, & Draft Conditions	19
T.3.1 Content of the Section	19
T.3.2 General Conditions	20
T.3.2.1 <i>Proposed Environmental Authority Conditions</i>	20
T.3.3 Air Quality & Greenhouse Gas	24
T.3.3.1 <i>Background</i>	24
T.3.3.2 <i>Environmental Values</i>	25
T.3.3.3 <i>Potential Impacts on the Environmental Values</i>	27
T.3.3.4 <i>Greenhouse Gases</i>	30
T.3.3.5 <i>Environmental Protection Objectives</i>	30
T.3.3.6 <i>Performance Criteria</i>	30
T.3.3.7 <i>Control Strategies</i>	31
T.3.3.8 <i>Monitoring</i>	36
T.3.3.9 <i>Commitments</i>	44
T.3.3.10 <i>Proposed Environmental Authority Conditions</i>	45
T.3.4 Water Resources	51
T.3.4.1 <i>Background</i>	51
T.3.4.2 <i>Environmental Values</i>	52
T.3.4.3 <i>Potential Impacts on Environmental Values</i>	54
T.3.4.4 <i>Environmental Protection Objectives</i>	56
T.3.4.5 <i>Performance Criteria</i>	57
T.3.4.6 <i>Control Strategies</i>	57
T.3.4.7 <i>Monitoring</i>	63
T.3.4.8 <i>Commitments</i>	77
T.3.4.9 <i>Proposed Environmental Authority Conditions</i>	78
T.3.5 Noise & Vibration	113
T.3.5.1 <i>Background</i>	113
T.3.5.2 <i>Environmental Values</i>	119



T.3.5.3	Potential Impacts on Environmental Values	119
T.3.5.4	Environmental Protection Objectives	119
T.3.5.5	Performance Criteria	120
T.3.5.6	Control Strategies	120
T.3.5.7	Monitoring	121
T.3.5.8	Commitments	122
T.3.5.9	Proposed Environmental Authority Conditions	122
T.3.6	Waste Management	126
T.3.6.1	Background	126
T.3.6.2	Environmental Values	134
T.3.6.3	Potential Impacts on the Environmental Values	134
T.3.6.4	Environmental Protection Objectives	136
T.3.6.5	Performance Criteria	136
T.3.6.6	Control Strategies	136
T.3.6.7	Monitoring	141
T.3.6.8	Commitments	141
T.3.6.9	Proposed Environmental Authority Conditions	142
T.3.7	Land Management	147
T.3.7.1	Background	147
T.3.7.2	Environmental Values	155
T.3.7.3	Potential Impacts on Environmental Values	155
T.3.7.4	Environmental Protection Objectives	157
T.3.7.5	Performance Criteria	157
T.3.7.6	Control Strategies	157
T.3.7.7	Commitments	160
T.3.8	Rehabilitation & Decommissioning	161
T.3.8.1	Background	161
T.3.8.2	Environmental Values	162
T.3.8.3	Potential Impacts on Environmental Values	162
T.3.8.4	Environmental Performance Objectives	163
T.3.8.5	Performance Criteria	167
T.3.8.6	Control Strategies	175
T.3.8.7	Monitoring	179
T.3.8.8	Commitments	181
T.3.8.9	Proposed Environmental Authority Conditions	181
T.3.9	Terrestrial Ecology	192
T.3.9.1	Environmental Values	192
T.3.9.2	Potential Impacts on Environmental Values	194
T.3.9.3	Environmental Protection Objectives	196
T.3.9.4	Performance Criteria	196
T.3.9.5	Control Strategies	197
T.3.9.6	Monitoring	200
T.3.9.7	Commitments	202
T.3.9.8	Proposed Environmental Authority Conditions	204
T.3.10	Aquatic Ecology & Stygofauna	205



T.3.10.1	Background	205
T.3.10.2	Environmental Values	205
T.3.10.3	Potential Impacts on Environmental Values.....	209
T.3.10.4	Environmental Protection Objectives	210
T.3.10.5	Performance Criteria	210
T.3.10.6	Control Strategies.....	210
T.3.10.7	Monitoring.....	211
T.3.10.8	Commitments	212
T.3.10.9	Proposed Environmental Authority Conditions	212
T.3.11	Cultural Heritage	213
T.3.11.1	Background	213
T.3.11.2	Environmental Values	217
T.3.11.3	Potential Impacts on the Environmental Values	217
T.3.11.4	Environmental Protection Objective	218
T.3.11.5	Performance Criteria	218
T.3.11.6	Control Strategies.....	219
T.3.11.7	Commitments	222
T.4	Environmental Management	223
T.4.1	Monitoring	223
T.4.2	Reporting	223
T.4.2.1	External	223
T.4.2.2	Internal	223
T.4.3	Environmental Management System.....	223
T.4.4	Research.....	223
T.4.5	Roles & Responsibilities	224
T.4.6	Staff Training.....	225
T.4.7	Communications	227
T.4.8	Documentation.....	228
T.4.9	Document Control	228
T.4.10	Environmental Auditing & Review.....	228
T.4.10.1	Monitoring & Measurements	228
T.4.10.2	Evaluation of Compliance	229
T.4.10.3	Non-Conformity, Corrective Action & Preventive Action	229
T.4.10.4	Control of Records	229
T.4.10.5	Internal & External Audits.....	229
T.4.11	Management Review	230
T.4.12	Management Plans & Monitoring Programs.....	230
T.5	Environmental Authority Definitions	233
T.6	References	243
	Attachment A – Environmental Risk Assessment.....	245
	Attachment B – Proposed EA Conditions Summary Table	246



Tables

Table T-1 EMP Structure	6
Table T-2 EMP element recommended structure	6
Table T-3 Property Tenure	14
Table T-4 Environmentally Relevant Activities (ERA's).....	16
Table T-5 Background Particulate Levels.....	25
Table T-6 Sensitive Receptor Locations (dust)	28
Table T-7 Summary of Project Goals for Particulate Matter.....	30
Table T-8 Mitigation Controls Assessed Against Industry Best Standards	34
Table T-9 Method & Frequency of Background Monitoring at Specified Locations	37
Table T-10 Proposed Dust Deposition Monitoring Locations	40
Table T-11 Supplementary Control Strategies	41
Table T-12 Water Quality Monitoring Reference Sites.....	64
Table T-13 Parameters for Baseline Monitoring Program.....	65
Table T-14 Baseline Water Quality Monitoring Schedule.....	66
Table T-15 On-going Water Quality Monitoring Schedule.....	67
Table T-16 Diversion Monitoring Requirements	69
Table T-17 Baseline Monitoring Requirements	69
Table T-18 Construction Monitoring Requirements.....	70
Table T-19 Operations Monitoring Requirements	70
Table T-20 Relinquishment Monitoring Requirements	71
Table T-21 Relinquishment Evaluation Requirements	71
Table T-22 Noise Sensitive Receptors	113
Table T-23 Noise Monitoring Results	115
Table T-24 Environmental Protection (Noise) Policy 2008 - Acoustic Quality Objectives	115
Table T-25 Summary of Operational Noise Design Criteria	116
Table T-26 Blasting Overpressure & Ground Vibration Design Criteria	118
Table T-27 Estimated Waste Generation & Management Strategies (Construction)	127
Table T-28 Estimated Waste Generation & Management Strategies (Operation).....	130
Table T-29 Summary of Management Measures for Coal and Mining Waste Materials	139
Table T-30 Affected Properties.....	147
Table T-31 Rehabilitation Success Criteria	167



Table T-32 Progressive Rehabilitation Throughout the life of the Project	175
Table T-33 Plant Species to be Used for Revegetation of Disturbed Areas	177
Table T-34 Rehabilitation monitoring parameters	179
Table T-35 MNES Known of Likely to Occur in the Project Area	193
Table T-36 Summary of NICH Sites Within Study Area	213
Table T-37 Summary of NICH Sites Close to Study Area	213
Table T-38 Summary of Identified NICH Sites Within Study Area	214
Table T-39 Location of DEHP Registered Sites (within MDL 333)	216
Table T-40 Project Impacts on Non-Indigenous Cultural Heritage Sites	217
Table T-41 Roles & Responsibilities with regard to EMP Implementation & Compliance	224
Table T-42 Training Requirements Matrix	227
Table T-43 Schedule for the Development & Implementation of Supporting Plans & Programs	231

Figures

Figure T-1 Project Regional Location	9
Figure T-2 Property and Mining Tenure	10
Figure T-3 Proposed Project Road and Rail Infrastructure	11
Figure T-4 Proposed Mine Infrastructure Area (MIA) Building and Layout	12
Figure T-5 Project Disturbance Area	13
Figure T-6 EMP Process Stages	19
Figure T-7 Sensitive Receptor Locations	29
Figure T-8 Proposed Monitoring Program Locations	39
Figure T-9 Groundwater Monitoring Bore Locations for the Project Area	76
Figure T-10 Noise Sensitive Receptor Locations	114
Figure T-11 Coarse Reject Placement Location (cross section)	133
Figure T-12 Surrounding Land Uses	151
Figure T-13 Land Areas of Interest	156
Figure T-14 Overall Site Layout Domain Plan	165
Figure T-15 Rehabilitation and Final Landform	166
Figure T-16 Water Courses Identified on the Project Site	207
Figure T-17 Aquatic Survey Site Locations	208
Figure T-18 Location of Non-Indigenous Cultural Heritage Sites	215
Figure T-19 Procedure for Discovery of Items of Potential Cultural Heritage Significance	220



Abbreviations & Units

Abbreviation	Definition
@	at
AARC	AustralAsian Resource Consultants
ACARP	Australian Coal Association Research Program
ACH	Aboriginal Cultural Heritage
ACP	Alpha Coal Project
AEP	Annual Exceedance Probability
AHD	Australian Height Datum
ALC	Agricultural Land Classification
AMP	Archaeological Management Plan
AMD	Acid Metalliferous Drainage
ANC	Acid Neutralising Capacity
ANFO	Ammonium Nitrate / Fuel Oil
ANZECC	Australian and New Zealand Environment and Conservation Council
ARI	Average Recurrence Interval
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
As	Arsenic
ASS	Acid Sulphate Soils
AWS	Automatic Weather Station
Ba	Barium
Bo	Boron
CaCO ₃	Calcium Carbonate
Cd	Cadmium
CDMP	Coal Dust Management Plan
CHPP	Coal Handling & Preparation Plant
Cfu	Colony forming units
Chl <u>a'</u>	Chlorophyll <u>a'</u>
CHMP	Cultural Heritage Management Plan
CLR	Contaminated Land Register
CO	Carbon Monoxide
Co	Cobalt
Cr	Chromium
CSG	Coal Seam Gas
Cu	Copper
dB	Decibell



Abbreviation	Definition
DEEDI	Department of Employment, Economic Development and Innovation
DEHP	Department of Environment & Heritage Protection
DNRM	Department of Natural Resources & Mines
DO	Dissolved Oxygen
DSA	Design Storage Allowance
EA	Environmental Authority
e.g.	Exempli gratia (for example)
EC	Electrical Conductivity
EIS	Environmental Impact Statement
EMOS	Environmental Management Overview Strategy
EMP	Environmental Management Plan
EMR	Environmental Management Register
EMS	Environmental Management System
EP Act	Environmental Protection Act 1994
EPA	Environmental Protection Authority
EPBC	Environment Protection and Biodiversity Conservation
EPC	Exploration Permit Coal
EPP	Environmental Protection Policy
EPR	Environmental Protection Regulation
ERA	Environmentally Relevant Activity
ERE	Endangered Regional Ecosystem
ESA	Environmentally Sensitive Area
ESCP	Erosion Sediment Control Plan
ESP	Exchange Sodium Percentage
EV	Environmental Value
Fe	Iron
FPC	Foliage Protection Cover
FMZ	Fume Management Zone
g/ml	Gram per millilitre
GDE	Groundwater Dependent Ecosystems
GDR	Great Dividing Range
GED	General Environmental Duty
GHG	Greenhouse Gas
GPS	Global Positioning System
HAZMAT	Hazardous Material

Abbreviation	Definition
HERBREC	Herbarium Records
HGPL	Hancock Galilee Pty Ltd
ha	Hectare
Hg	Mercury
HVAS	High Volume Air Sampling
i.e.	Id est. (that is)
IDAS	Integrated Development Assessment System
IDC	Index of Diversion Condition
IPCC	In Pit Crushing and Conveying
JORC	Joint Ore Reserves Committee
KCMP	Kevin's Corner Mine Project
km	Kilometres
L	Litre
LCD	Lagoon Creek Downstream
LCL	Lagoon Creek Lagoon
LCSR	Lagoon Creek final SRD Discharge
LCU	Lagoon Creek Upstream
LFA	Landscape Function Analysis
Li	Lithium
LIA	Light Industrial Area
LOM	Life of Mine
LP Act	Land Protection (Pest and Stock Route) Management Act 2002
LS	Land Suitability
LSCU	Little Sandy Creek upstream
m	metre
MDL	Mineral Development Licence
mg	milligram
MIA	Mine Industrial Area
MIC	Maximum Instantaneous Charge
mL	Millilitre
MLA	Mining Lease Area
Mn	Manganese
MNES	Matters of National Ecological Significance
MRL	Mandatory Reporting Level
MSDS	Material Safety Data Sheet



Abbreviation	Definition
Mtpa	Million tonnes per annum
N	Nitrogen
NA	Not available
N/A	Not applicable
NAF	Non-Acid Forming
NAG	Net Acid Generation
NAPP	Net Acid Producing Potential
NCC	Native Companion Creek
NCWR	Nature Conservation (Wildlife) Regulation
NEPC	National Environment Protection Council
NEPM	National Environment Protection Measure
NGER	National Greenhouse and Energy
NGO	Non Government Organisation
NH ₄	Inorganic nitrogen
NH ₄ ⁺	Ammonium
Ni	Nickel
NICH	Non-Indigenous Cultural Heritage
NO ₂	Nitrogen dioxide
NPER	National Professional Engineer
NPI	National Pollutant Inventory
O ₃	Ozone
OC	Organochlorine Pesticides
OMP	Operational Management Plan
OP	Organophosphorus Pesticides
PAF	Potentially Acid Forming
Pb	Lead
PMLUP	Post Mine Land Use Plan
PoO	Plan of Operation
PPE	Personal Protective Equipment
QPP	Queensland Planning Provisions
RBL	Rating Background Levels
RCU	Rocky Creek upstream
RE	Regional Ecosystem
REMP	Receiving Environment Monitoring Program
ROM	Run of Mine



Abbreviation	Definition
RP	Release Point
RPEQ	Registered Professional Engineer of Queensland
RTN	Right to Negotiate agreements
RUSLE	Revised Universal Soil Loss Equation
SCU	Sandy Creek Upstream
SCL	Strategic Cropping Land
SEIS	Supplementary Environmental Impact Statement
SMD	Slightly to Moderately Disturbed
SMU	Soil Management Unit
SO ₂	Sulphur dioxide
SPU	Spring Creek Upstream
SPRP	State Planning Regulatory Provision
SRD	Spoil Runoff Dam
STP	Sewage Treatment Plant
t	tonne
TBD	To be determined
TDS	Total Dissolved Solids
TEC	Threatened Ecological Community
TEOM	Tapered Element Oscillating Microbalance
TIA	Traffic Impact Assessment
TLO	Train Load Out
TN	Total Nitrogen
TOR	Terms of Reference
TP	Total Phosphorus
TPH	Total Petroleum Hydrocarbons
TSF	Tailings Storage Facility
TSP	Total Suspended Particulate
TSS	Total Suspended Solids
VM Act	Vegetation Management Act 1999
WA	Western Australia
WC	Well Creek
WEEE	Waste Electrical and Electronic Equipment
WHO	World Health Organisation
Zn	Zinc
%	Percentage



Abbreviation	Definition
°C	Temperature (degrees celcius)
µg	Microgram
µg/ml	Microgram per millilitre
µm	Micrometre
µS/cm	Micro Siemens per centimetre
<	Less than
>	Greater than
≤	Less than or equal to
≥	Greater than or equal to

SUPERSEDED



Appendix T Environmental Management Plan

Executive Summary

An Environmental Management Plan (EMP) is required under Section 201 of the *Environmental Protection Act* (EP Act, 1994) as part of the application process for an Environmental Authority (mining activities). Section 202 of the EP Act states that the purpose of an EMP is to propose environmental protection commitments to assist the administering authority prepare the draft Environmental Authority.

The content of the EMP is based on the Department of Environment and Resource Management (DERM); Guideline No. 8, *Preparation of an Environmental Management Overview Strategy (EMOS) for Non-standard Mining Projects* (Note: as of 30 March 2012 the functions of DERM relevant to this project are now jointly administered by the Department of Environment and Heritage Protection [DEHP] and Department of Natural Resources and Mines [DNRM]). The commitments expressed are both measurable and auditable; they set objectives and outline control strategies proposed to achieve the objectives.

This EMP has been submitted as part (Appendix T) of the Kevin's Corner Project (the Project) Supplementary Environmental Impact Statement (SEIS); the Environmental Impact Statement (EIS) and subsequent SEIS contain a comprehensive review of the environmental interrelations with the Project. The SEMP is a standalone document, which has been developed in response to the Terms of Reference (TOR) for the Project and addresses the environmental management of the construction, operation, and as far as possible the decommissioning phases of the Project.

The control measures described in this EMP have been developed following consideration of the findings of the Environmental Impact Statement (EIS) and the Supplementary EIS (SEIS), which concluded that a number of environmental values (EV's) would be impacted by the proposed project. The intent of the proposed control measures is to ensure that project related activities will not adversely affect EV's or the health, welfare and amenity of people and land uses by meeting or exceeding statutory requirements and current industry best practice standards.

In line with the TOR, the EMP details the EV's described above, how control measures should be implemented and expected environmental outcomes. The document is comprised of the following components for performance criteria and implementation strategies:

- Commitments to achieve acceptable levels of environmental performance, including: environmental objectives, performance standards and associated measurable indicators, performance monitoring and reporting.
- Impact prevention or mitigation actions to implement the commitments.
- Corrective actions to rectify any deviation from performance standards.
- An action program to ensure the environmental protection commitments are achieved and implemented. This includes strategies in relation to:
 - continuous improvement;
 - environmental auditing;
 - monitoring;
 - reporting;
 - staff training; and

- a rehabilitation program for land proposed to be disturbed under each relevant aspect of the proposal.

The structure of the EMP (in accordance with Section 203 of the EP Act) follows the following format:

- Section 1 – Introduction;
- Section 2 – Project Description;
- Section 3 – Environmental Values, Impacts, Commitments, and Draft Conditions;
- Section 4 – Environmental Management;
- Section 5 – Definitions; and
- Section 6 – References.

This EMP is written to cover the Project and the associated infrastructure on MLA 70425. A separate EMP has been developed for the small associated off lease section of mine rail spur and road diversions. The EV's and control measures described are:

Air Quality & Greenhouse Gases – The primary impact from the project to air quality will be from the generation of dust and coal dust. The project is located in a rural setting and there are few sensitive receptors in the immediate vicinity. The implementation of a suite of industry standard dust minimisation measures described in the Air Quality and Coal Dust Management Plan is considered sufficient to ensure that the stated environmental objectives for air quality are met. Greenhouse gasses generated by the project will be monitored and submitted to The National Greenhouse Accounts register

Water Resources – The activities proposed for the site have the potential to impact on quality and quantity surface waters of the Belyando/Suttor catchment and localised the ground water resources. A mine water management system has been developed which will contain mine affected water on-site for reuse during coal processing. On-site water storages have been designed with sufficient capacity to ensure that controlled releases to the receiving environment will be minimal. An extensive system of surface water and ground water monitoring points has been developed to ensure early detection of any uncontrolled releases of mine affected water from the site to the receiving environment.

Subsidence impacts are anticipated from underground mining activities. A number of pre-subsidence measures will be implemented when applicable within the bed and banks of watercourses to minimise the potential for long-term adverse subsidence impact to arise. These measures are detailed in the Subsidence Management Plan that has been prepared for the Project.

Noise and Vibration – Noise modelling results indicate that full compliance with the EPP (Noise) noise limits will be achieved for the construction of the proposed mine infrastructure during the day, evening or night time periods. However, during the operational phase of the project potential exceedances were identified generated by train movements within the mining lease. A number of rail specific noise minimisation measures and the development of a system to process complaints from neighbouring land holders have been developed to minimise this potential noise nuisance.

No ground vibration impacts are predicted at any near-by sensitive receptor.

Waste Management – General waste will be generated throughout the construction, operation and decommissioning phases of the Project. A Waste Management Plan (WMP) has been developed based on the estimated volumes of waste generation and characterisation. The WMP requires adherence to waste minimisation principles, all regulated waste to be handled and stored in



accordance with regulatory requirements, an on-site landfill to be developed to receive all residual general waste, and an on-site Sewage Treatment Plant to be built producing effluent of Class A+ quality.

Mining wastes will be managed in accordance with a site-specific Overburden and CHPP Rejects Management Plan. Initially, all coarse reject materials will be disposed of within the Open Cut spoil dumps. From around the start of Year 4 to until the end of mine life, the coarse reject material is planned to be placed in the in-pit voids between the overburden (spoil) in the Central / Northern Open Cut pit. Truck-shovel pre-strip spoil materials will be used to cap cover the reject areas. Coarse reject placement will be sequenced such that capping covering of the rejects will be completed progressively as the working face progresses down dip. Fine reject will initially report to the fine reject storage facility (FRSF) in a piped slurry form containing approximately 30% solids and excess water will be recycled from the FRSF using a decant system for reuse at the CHPP.

A comprehensive monitoring and reporting program will be developed to ensure that the management of coal and mining wastes is consistent with relevant legislation and guidelines and leading mining industry practice.

Land Management - The mining lease is currently used for broad scale cattle grazing, and much of the land is either cleared or partially cleared. Several isolated areas have been cropped for fodder species to supplement grazing on native and introduced pastures. Post-mining, rehabilitation of the Project site will return a stable landform capable of uses similar to those prior to disturbance. To achieve this, the nominated post-mine land use for the site is a mix of bushland and grazing land. This will link remnant native vegetation where possible and will aim to return some conservation values. A Rehabilitation Plan will be prepared for the site which will detail progressive rehabilitation and final land form requirements.

Rehabilitation & Decommissioning - A closure strategy will be developed in consultation with the State regulators. Key objectives of the closure strategy will be to provide: a stable landform that is resistant to erosion; a surface cover that minimises the risk of infiltration, promotes shedding of surface water and promotes growth of vegetation; and minimises the risk of environmental harm from seepage.

On closure of the mine, a void management strategy and a revegetation strategy will also be developed for the disturbance areas that seek to complement desirable post-mining land-use objectives whilst maintaining effective erosion and weed controls.

Terrestrial Ecology - No threatened flora species were identified on the mining lease. The southern squatter pigeon (*Geophaps scripta scripta*) was recorded during the surveys in non-remnant grassland habitat within the mining lease. This species is listed as Vulnerable under both the EPBC Act and Schedule 3 of the Nature Conservation (Wildlife) Regulation (NCWR, 2006).

A Supplementary Matters of National Ecological Significance (MNES) report has been developed for the site which has identified a number of MNES listed species found on the site, or deemed likely to occur on the site. The MNES report requires that Species Management Plans are required to address threats associated with the Project, and identify the proposed mitigation measures for each impacted MNES in greater detail. The plans will also be clear in what mitigation measures will be implemented during key project phases of pre-construction, during construction and post construction.

Mitigation measures have been developed which minimise the impact to vegetative communities and wildlife habitat and minimise the spread of invasive species through the development and implementation of a Pest and Weed management Plan.

Aquatic Ecology & Stygofauna – The mining lease is traversed by a number of ephemeral drainage lines and creeks. Sandy Creek flows in a northerly direction the entire length of the site, with the tributaries Well Creek, Middle Creek, Little Sandy Creek and Rocky Creek entering it from the west.

A total of 5 amphibian species (one introduced), 12 birds (nine of which are listed under the EPBC Act as Migratory and / or Marine), one mammal (introduced), one reptile and 7 fish species were identified during the survey.

The proposed diversion of Middle Creek may result in impacts upon the environmental values of the aquatic flora and fauna.

The DEHP Wetland Maps (2009) database shows the presence of riverine wetland systems and lacustrine water bodies on the mining lease. These wetlands however, are not outlined within the Environmentally Sensitive Areas mapping for the Project.

No stygofauna were found on the mining lease.

Mitigation measures developed to protect the EV's of water resources, land and terrestrial ecology are also relevant to aquatic systems. The status of the aquatic communities of the receiving environment will be monitored by the implementation of a Sediment Monitoring Program and an Aquatic Fauna Monitoring Program.

Cultural Heritage – The impacts on recognised and potential non-Indigenous cultural heritage sites will generally be in the nature of subsidence relating to the proposed underground workings, vegetation clearance related to the mine's development of associated infrastructure, and the consequent destruction and/or removal of the structures/features which form the non-Indigenous cultural heritage of the area. These impacts will be managed by the development and implementation of Archaeological Management Plans (AMPs) for non-Indigenous sites and places of archaeological significance on the mining lease.

Indigenous cultural heritage sites will be detailed in cultural heritage survey reports prepared in conjunction with the Wangan & Jagalingou People. Each report will culminate in a management plan established through consultation between the endorsed parties and their technical advisers, and accepted by HGPL, which will provide guidance for the way in which Aboriginal cultural heritage defined by the cultural heritage survey will be managed before construction commences and during the Project.

This EMP does not address the activities associated with the Alpha Coal Project (ACP) or the associated ACP railway line and port (although the rail-line from the Project to the ACP railway line is included).



T.1 Introduction

T.1.1 Background

Hancock Galilee Pty Ltd (HGPL), the Proponent, is proposing to develop the Kevin's Corner Project (the Project), with a combined open cut and underground capacity of 30 million tonnes per annum (Mtpa) product thermal coal. Mining operations will predominantly target the "D" seam in the Upper Permian coal measures of the Galilee Basin, Queensland, Australia.

The coal mine will be supported by privately owned and operated rail and port infrastructure facilities; these do not form part of the Project scope. At the Project site the coal will be mined, washed and conveyed to a train load-out (TLO) facility where it will be transported approximately 500 kilometres (km) to the port facility of Abbot Point on the east coast of Australia for export.

The Coordinator-General (on behalf of Queensland Government) has declared the Project to be a significant project requiring an Environmental Impact Statement (EIS) under Section 26(1)(a) of the *State Development and Public Works Organisation Act* (1971). In February 2010, the Coordinator-General issued the Terms of Reference (TOR) for the Project. The TOR set out the requirements, both general and specific, that should be addressed in preparing the EIS; they also detail the requirements of the Environmental Management Plan (EMP).

The EMP included within the EIS should comply with Section 203 of the *Environmental Protection Act* (EP Act, 1994). The TOR's for the Project states that:

The EMP must comprise the following components for performance criteria and implementation strategies:

- Commitments to acceptable levels of environmental performance, including environmental objectives, performance standards and associated measurable indicators, performance monitoring and reporting.
- Impact prevention or mitigation actions to implement the commitments.
- Corrective actions to rectify any deviation from performance standards.
- An action program to ensure the environmental protection commitments are achieved and implemented. This will include strategies in relation to:
 - continuous improvement;
 - environmental auditing;
 - monitoring;
 - reporting;
 - staff training; and
 - a rehabilitation program for land proposed to be disturbed under each relevant aspect of the proposal.

This EMP has been developed as a standalone document, which forms Appendix T of the Supplementary EIS (SEIS) submission. The structure of the EMP is detailed in Table T-1 and is in accordance with Section 203 of the EP Act.



Table T-1 EMP Structure

Section Number	Section Title	Brief Summary
1	Introduction	Provides an introduction to the EMP and background to the process and location of the proposed Project.
2	Project Description	Describes the activities to be carried out on the site and defines the scope of this EMP.
3	Environmental Values, Impacts, Commitments, and Draft Conditions	Provides information on the impacts (both positive and negative) where the proponent makes a commitment in relation to these impacts. Draft conditions, performance criteria and control strategies are also suggested. Each relevant impact category is discussed systematically.
4	Environmental Management	Includes details of the Project's systems for monitoring, reporting, research, training and auditing.
5	Environmental Authority Definitions	Definitions of words and phrases where identified in the Environmental Authority, the EP Act or subordinate legislation.
6	References	Where underpinning technical reports are referred to, the full document reference will be provided.

The recommended structure of each element of the EMP (as detailed in the TOR) is outlined in Table T-2 with reference to how the recommended structure is addressed in this document. Each element/aspect with an impact to be managed is addressed individually in Section T.3 of the EMP. Where no management is considered necessary, elements are not discussed.

Table T-2 EMP Element Recommended Structure

Recommended Structure	Summary	Where this is Addressed
Element/Issue	Aspect of construction or operation to be managed (as it affects environmental values)	The Background section provides a description of the aspect where management is required (Section T.3).
Operational policy	The operational policy or management objective that applies to the element.	Each aspect has an Environmental Protection Objective where relevant (Section T.3).
Performance criteria	Measurable performance criteria (outcomes) for each element of the operation	Each aspect has a Performance Criteria section where relevant
Implementation strategy	The strategies, tasks or action program (to nominated operational design standards) that would be implemented to achieve the performance criteria.	Within the Control Strategies section for each aspect (Section T.3).
Monitoring	The monitoring requirements to measure actual performance (e.g. specified limits to pre-selected indicators of change).	Each aspect has a Monitoring section where relevant (Section T.3).
Auditing	The auditing requirements to demonstrate implementation of agreed construction and operation environmental management strategies and compliance with agreed performance criteria	This is addressed in the Environmental Management section (Section T.4).
Reporting	Format, timing and responsibility for reporting and auditing of monitoring results	This is addressed in the Environmental Management



Recommended Structure	Summary	Where this is Addressed
		section (Section T.4).
Corrective action	The action (options) to be implemented in case a performance requirement is not reached and the person(s) responsible for action (including staff authority and responsibility management structure).	Each aspect has a Commitments section where relevant environmental commitments have been identified (Section T.3).

The detail provided in this EMP reflects the findings of the SEIS and the requirements of the administering authority as conveyed in the initial round of comments on the EIS. In many instances the specific details on how management / mitigation measures and monitoring programs will be implemented on the site have not yet been developed as the necessary information will not be available until later in the detailed design process. The EMP contains commitments to develop numerous management plans and monitoring programs as this information becomes available. The detailed plans and programs will be added as appendices to this EMP as they are developed.

A schedule for the development of the plans and programs committed to in this EMP is provided in Table T-43. In the meantime a Table of Contents for each plan or program has been provided as appendices to give the administering authority perspective on the nature of the additional information and level of detail that will be provided by this documentation once it has been developed.

T.1.2 The Project

The Proponent has a mining lease application (MLA) 70425 over the Project site. The MLA 70425 for the Project site includes sufficient area in order to design and locate the following key infrastructure:

- run of mine (ROM) stockpiles;
- coal handling and preparation plant (CHPP);
- tailings storage facility (TSF);
- raw water dams;
- environmental dams;
- construction camp and accommodation village;
- site airport;
- mine access roads;
- fuel and oil storage facilities;
- water and wastewater treatment systems;
- sewerage systems;
- creek diversions and drainage channels;
- rail loop;
- light industrial area (including, training and emergency services, light vehicle workshop and heavy welding shop); and



- mine industrial areas for each mining area (including; workshops, warehouses, administration buildings and tyre bays).

T.1.3 Location

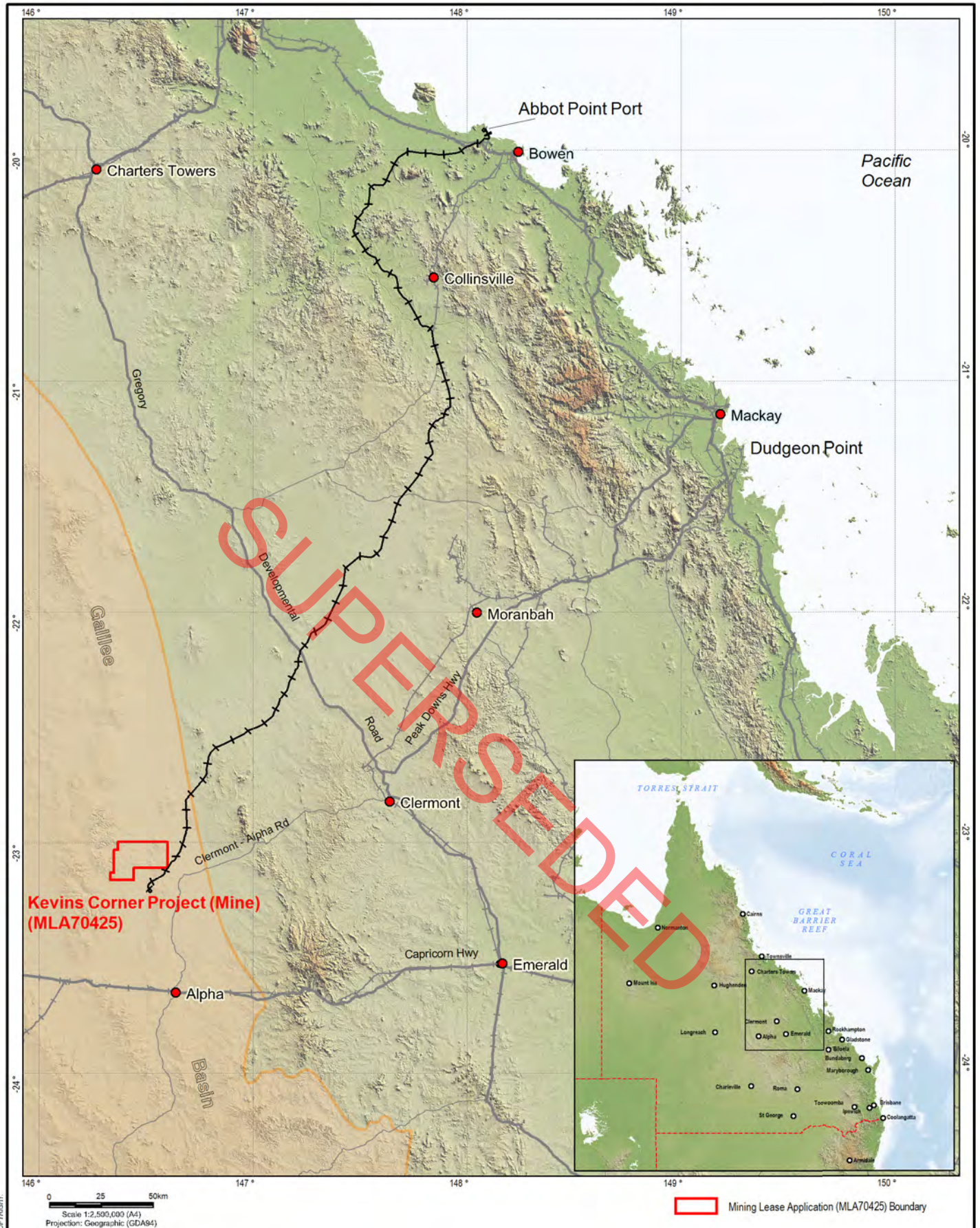
The Project site is located in the Galilee Basin, Central Queensland, approximately 90 km north-west of the township of Alpha; 110 km south-west of the township of Clermont and approximately 340 km south-west of Mackay. Access to the mining lease is from the Degulla Road off the Clermont-Alpha Road, north off the Capricorn Highway at Alpha.

Figures T-1 to T-5 show the following aspects of the Project:

- Figure T-1 – Project regional location;
- Figure T-2 – Property and mining tenure;
- Figure T-3 – Proposed project road and rail infrastructure;
- Figure T-4 – Mine infrastructure area;
- Figure T-5 – Project disturbance area.

Cudmore National Park is situated immediately to the north-west of the Project area. A portion (1,673.5 ha) of MLA 70425 is located over lands identified as Cudmore Resources Reserve. This reserve has been created distinct from the protected National Park to recognise its ecological and cultural values as well as the interest in the land for mining purposes.

There are no other areas of high ecological sensitivity within 25 km of the Project.



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PROJECT REGIONAL LOCATION

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REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-1**

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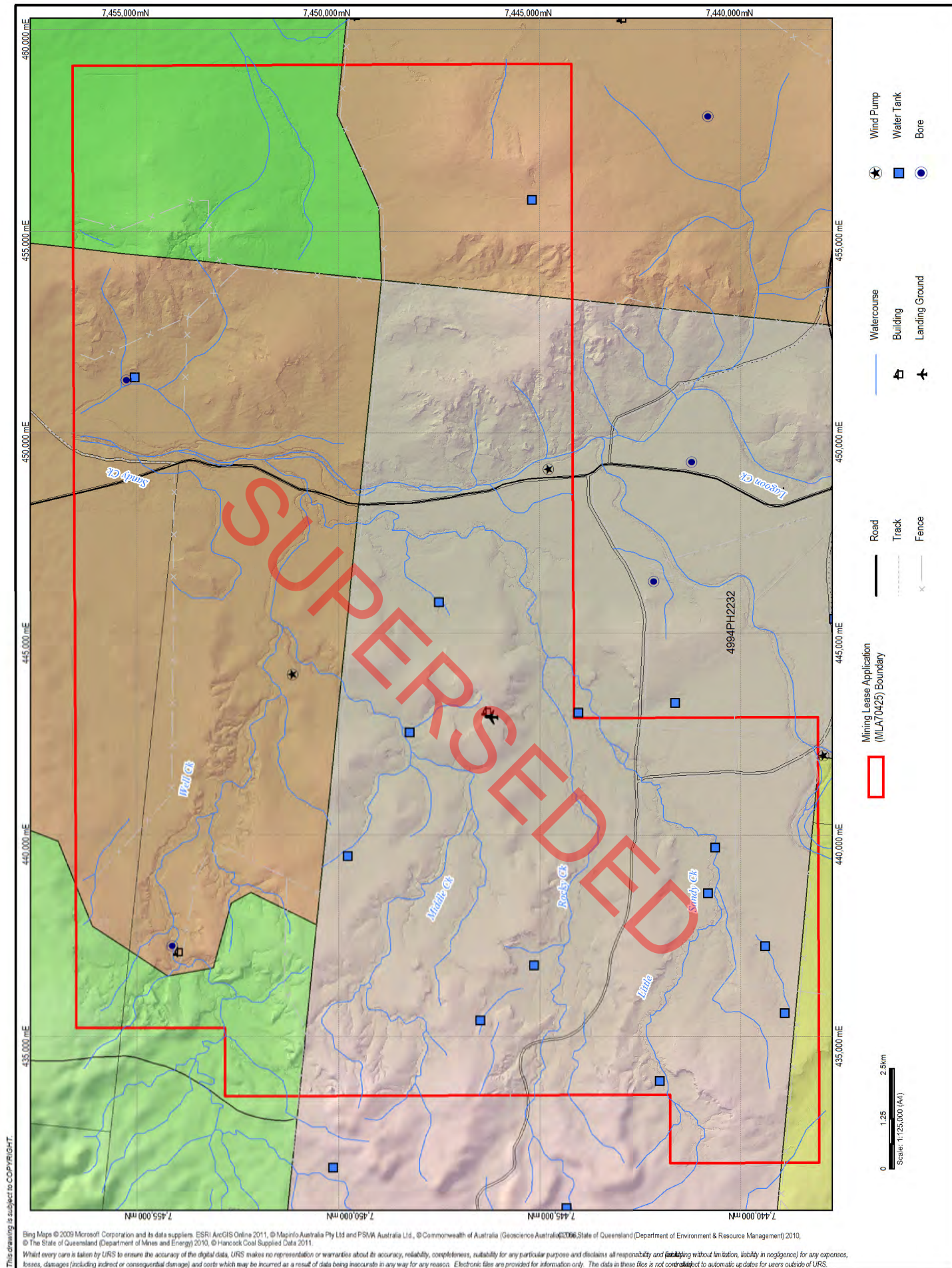
Approved: **RS**

Date: 14-09-2012

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PROPERTY AND MINING TENURE

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REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: T-2



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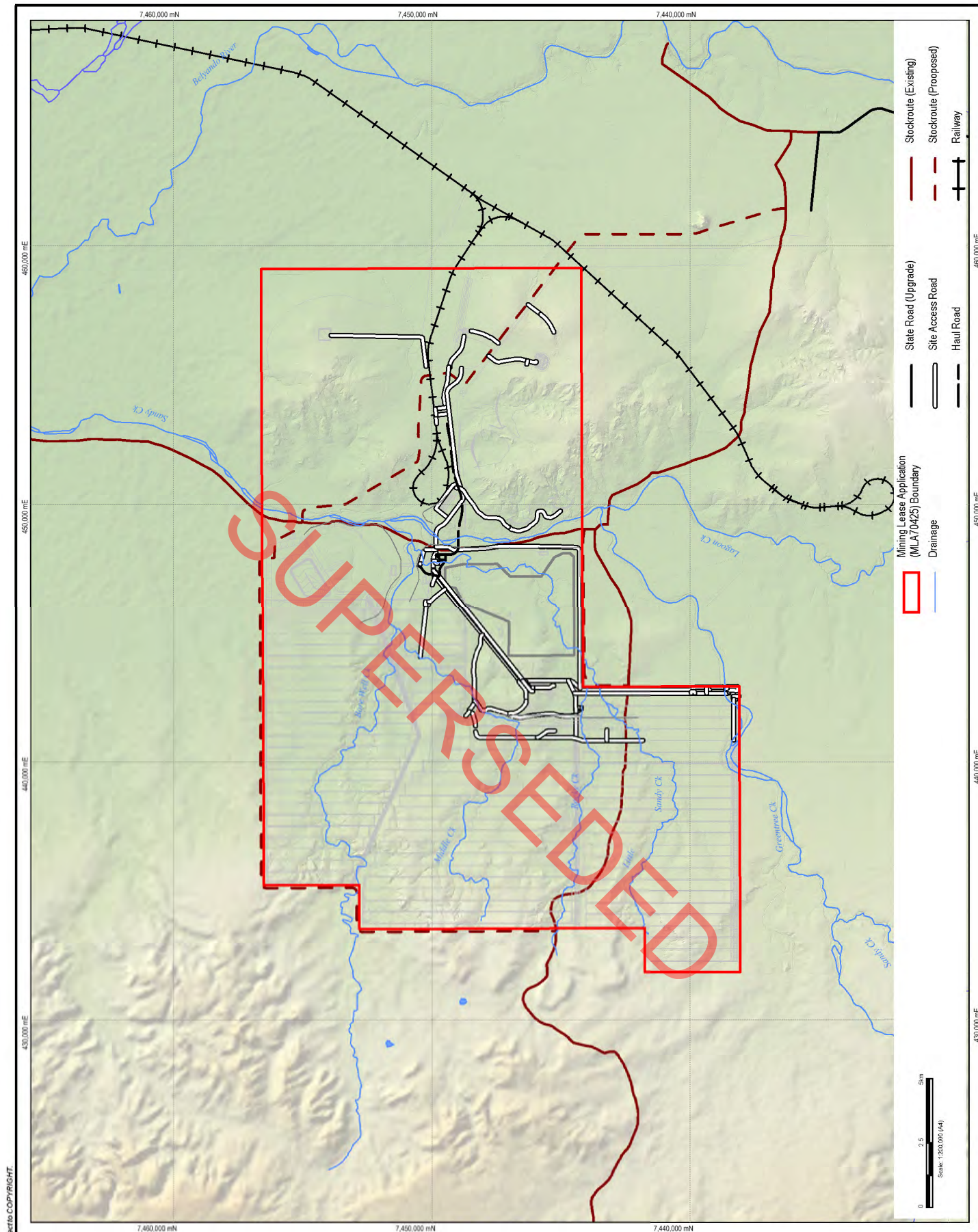
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Approved: RS

Date: 14-09-2012

Rev: A

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PROPOSED PROJECT ROAD AND RAIL INFRASTRUCTURE

URS

REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-3**



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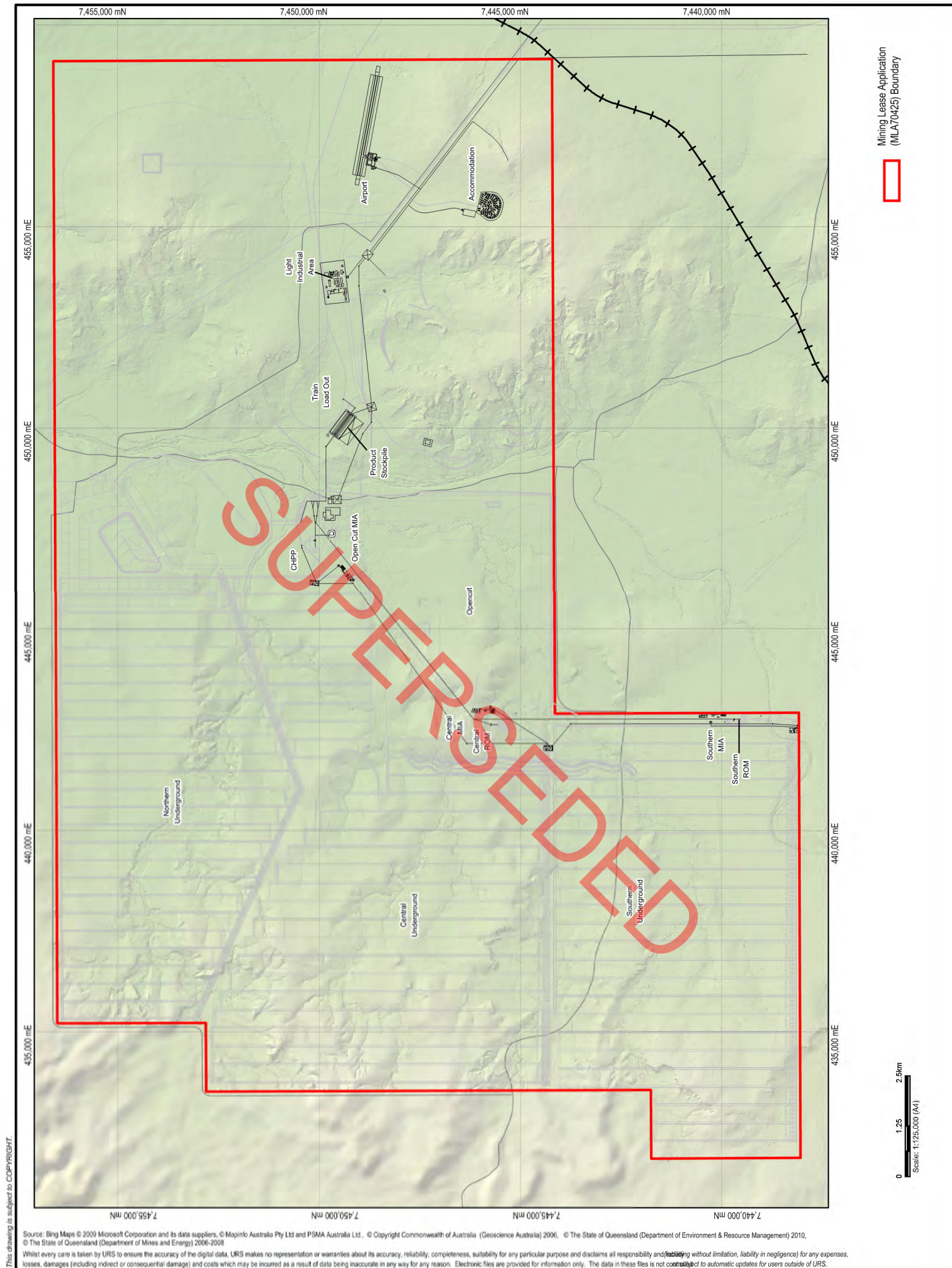
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Date: 21-09-2012

Rev: **C**

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Datum: GDA94, MGA Zone55

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PROPOSED MINING INFRASTRUCTURE AREA (MIA) BUILDINGS AND LAYOUT

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REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-4**



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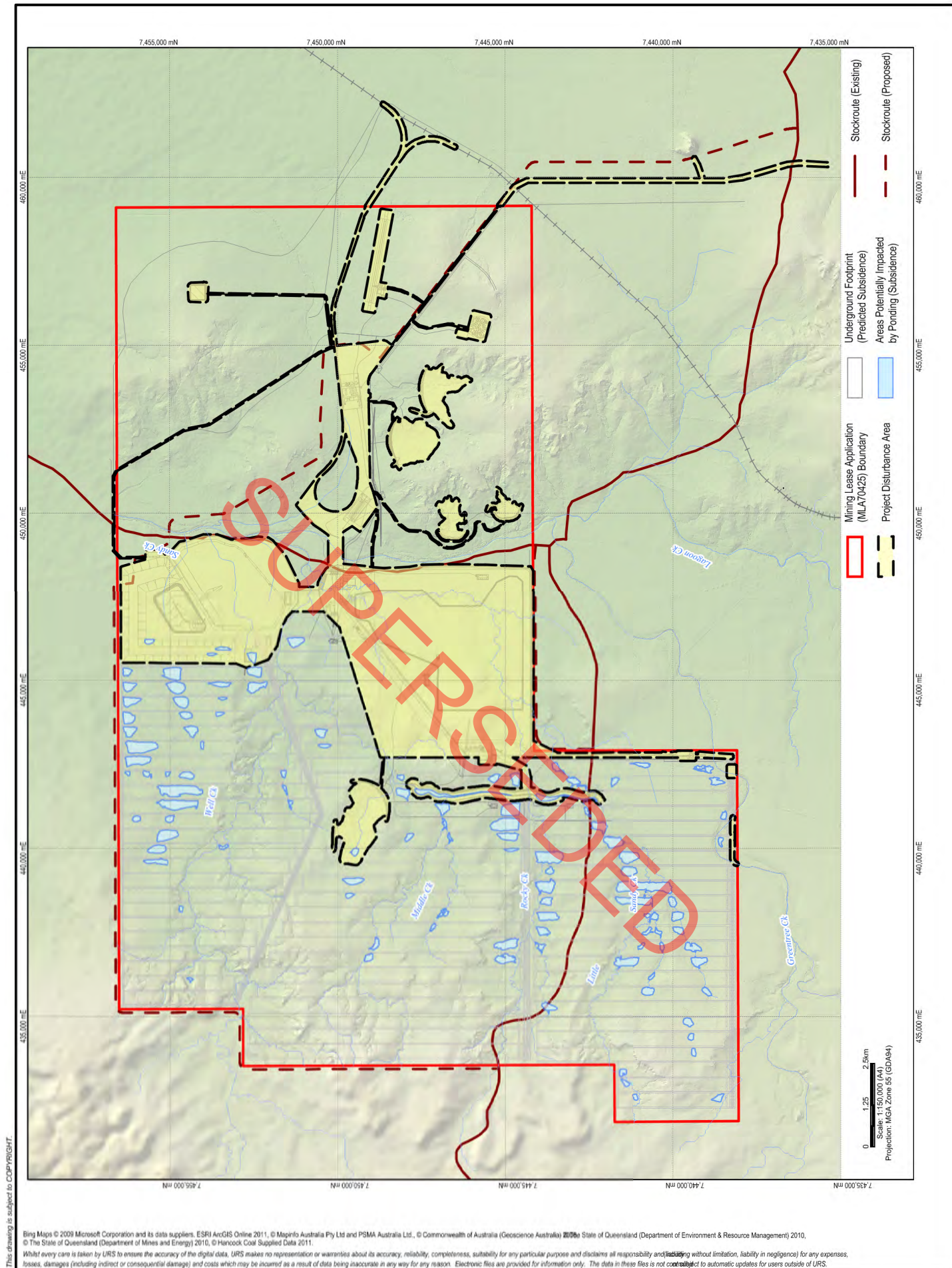
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Approved: RS

Date: 21-09-2012

Rev: C

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**PROJECT
 DISTURBANCE AREA**



T.1.4 Project Proponent

HGPL is an Australian company that has been engaged in the exploration and development of mineral resources for over 50 years. The Proponents mineral exploration capability covers; iron ore, thermal coal, uranium, molybdenum, lead / zinc, gold, diamonds and petroleum.

The pioneering spirit of Hancock Prospecting Pty Ltd that led the development of the Pilbara region in Western Australia is now being directed to the vast potential of the Galilee Basin in Queensland. HGPL has a long-standing interest in the development of the Galilee Basin, with the parent company having held coal exploration permits and investigated the Alpha region since the 1970s.

T.1.5 Land Use & Tenure

Existing land uses across the MLA include the following:

- bushland;
- nature conservation (Cudmore Resources Reserve);
- cattle grazing;
- coal and mineral resource exploration;
- formed and unformed roads;
- areas of Indigenous and non-Indigenous cultural heritage; and
- farming infrastructure (including access tracks, fences, stockyards and sheds).

The dominant land use within the boundaries of the MLA is cattle grazing. The Project area contains landscape that has been cleared and maintained for grazing together with remnant mid-height woodland dominated by Boxwood and Ironbark. Several isolated areas have been previously cropped for fodder species to supplement grazing on native and introduced pastures.

There are several ephemeral creeks on the Project site. These creeks provide habitat, movement corridors and water for terrestrial fauna species within the Project site.

There are eleven homesteads located within a 25km distance of the MLA however there are no homesteads located within the Project area.

The MLA overlaps a number of properties, the size of these are provided in Table T-3; the overlaps between the Project site and the tenures are illustrated in Figure T-2.

Table T-3 Property Tenure

Property Name	Real Property Description	Tenure Type	Size (ha)	Within MLA (ha)	Primary Use
Forrester	Lot 1788 on PH886	Leasehold	42,475	11,406	Cattle Grazing and Breeding
Surbiton	Lot 681 on PH406	Leasehold	20,719	3,523	Cattle Grazing and Fattening
Surbiton South	Lot 3533 on PH56	Leasehold	19,165	2,918	Cattle Grazing and Breeding
Wendouree	Lot 4994 on PH2232	Leasehold	38,800	17,518	Cattle Grazing and Breeding
Hobartville	Lot 649 on PH1981	Leasehold	56,200	461	Cattle Grazing and Breeding



Property Name	Real Property Description	Tenure Type	Size (ha)	Within MLA (ha)	Primary Use
Cudmore Resources Reserve	Lot 1007 on NPW632	Resources Reserve	6,900	1,673	Protected Area

T.1.6 Stakeholders

The Proponent is undertaking an extensive program of community consultation and stakeholder engagement relating to the Project and in conjunction with Alpha Coal (under development by Hancock Coal Pty Ltd), which aims to identify community issues or concerns and ensure the Proponent can be responsive in mitigating issues where possible. The Proponent is also proactively working with stakeholders with the aim to establish long-term relationships with the Queensland communities.

To date key stakeholders include:

- Local education centres, including; day cares, kindergartens, schools, TAFE, colleges and universities;
- Barcaldine Regional Council;
- Emergency services: Police; Ambulance; Fire and Rescue;
- Landowners;
- Community members;
- Community organisations such as: sporting associations rotary; historical groups; aged groups; theatre; arts; show societies; Lifeline; Anglicare; scouts; and girl guides;
- Transport organisations;
- QLD Health;
- QLD Aboriginal & Islander Health;
- QLD Social Welfare;
- QLD Dept Water & Waste Management;
- QLD Roads and Highways;
- Qld Resources Council;
- Non Government Organisations (NGOs);
- Indigenous groups; and
- Business owners and related service providers.

T.1.7 Environmentally Relevant Activities

The Proponent is required to identify all Environmentally Relevant Activities (ERA's) associated with the Project under schedule 2 of the *Environmental Protection Act* (1994); based on the current understanding of the Project and the activities involved, the ERA's in Table T-4 have been identified as relevant to the Project. This EMP describes both the environmental values to be protected, and the measures to be implemented to minimise the environmental impacts of these ERA's, and other mining related activities, on the receiving environment.



Table T-4 Environmentally Relevant Activities (ERA's)

Item	Legislation	Relevant Approval	Status
Environmentally Relevant Activity (ERA) 8	<i>Environmental Protection Act 1994</i>	ERA 8 – Chemical Storage	On-tenure, location and details to be confirmed
Environmentally Relevant Activity (ERA) 15	<i>Environmental Protection Act 1994</i>	ERA 15 – Fuel Burning	On-tenure, location and details to be confirmed
Environmentally Relevant Activity (ERA) 16	<i>Environmental Protection Act 1994</i>	ERA 16 – Extractive and screening activities	On-tenure, location and details to be confirmed
Environmentally Relevant Activity (ERA) 18	<i>Environmental Protection Act 1994</i>	ERA 18 – Boilermaking or Engineering	On-tenure, location and details to be confirmed
Environmentally Relevant Activity (ERA) 31	<i>Environmental Protection Act 1994</i>	ERA 31 – Mineral Processing	On-tenure, location and details to be confirmed
Environmentally Relevant Activity (ERA) 33	<i>Environmental Protection Act 1994</i>	ERA 33 – Crushing, Milling, Grinding or Screening	On-tenure, locations and details to be determined
Environmentally Relevant Activity (ERA) 38	<i>Environmental Protection Act 1994</i>	ERA 38 – Surface Coating	On-tenure, locations and details to be determined
Environmentally Relevant Activity (ERA) 43	<i>Environmental Protection Act 1994</i>	ERA 43 – Concrete Batching	On-tenure, locations and details to be determined
Environmentally Relevant Activity (ERA) 60	<i>Environmental Protection Act 1994</i>	ERA 60 – Waste Disposal	On-tenure, locations and details to be determined
Environmentally Relevant Activity (ERA) 63	<i>Environmental Protection Act 1994</i>	ERA 63 – Sewage Treatment	On-tenure, locations and details to be determined
Environmentally Relevant Activity (ERA) 64	<i>Environmental Protection Act 1994</i>	ERA 64 – Water Treatment	On-tenure, locations and details to be determined
ERA Supporting Applications			
Approval for on-site sewerage treatment plant	<i>Plumbing and Drainage Act 2002</i>	Approval for on-site sewerage treatment plant	On-tenure, locations and details to be determined



Item	Legislation	Relevant Approval	Status
Approval for on-site water treatment plant	<i>Plumbing and Drainage Act 2002</i>	Approval for on-site water treatment plant	On-tenure, locations and details to be determined

T.1.8 Standard Environmental Conditions

The mining activity will be subject to the conditions of an Environmental Authority (mining activities) and the conditions of a Mining Lease. The EMP provides proposed Environmental Authority conditions based on the findings of the EIS, SEIS and current industry best practice.

T.2 Project Description

The development of the Project involves the combined open cut and underground mining within the Galilee Basin. The coal mine will be supported by privately owned and operated rail and port infrastructure facilities for the transport and delivery of export coal (these are covered under separate EIS studies and are excluded from the scope of this EMP).

T.2.1 Coal Mine

The mine will be a new thermal coal mine located within MLA 70425. MLA 70425 is over Exploration Permit Coal (EPC) 1210 and a proportion of Mineral Development License (MDL) 333. The mine is expected to produce up to 30 Mtpa of thermal coal over a 30 year operating life of mine (LOM); however there may be sufficient Joint Ore Reserves Committee (JORC) resources to extend the Project life beyond 30 years.

The Project consists of two open cut pits (Central and Northern open cut pits) extending over an initial strike length of 6.5 km and in time reducing to a steady strike length of 4 km; there are also three underground longwall operations (Southern, Central and Northern underground) proposed in three independent mining areas (see Figure T-4).

Mining of the open cut pits will commence at the seam sub-crop and progress down dip towards the west. The overburden will be removed by truck and shovel excavators and dragline operations. For the first five (5) to seven (7) years it will be stockpiled in out-of-pit spoil emplacements, after which it will be used to progressively backfill the open cut pits as the mine working areas advance to the west.

For the underground component, each longwall panel will be allocated an independent set of "mains" roadways for access, coal clearance and ventilation. The underground workings will require a separate belt drift and man-and-materials drift dedicated to each longwall operation.

The coal from the open cut operations will be mined by excavator and transported by truck. Raw coal from the open cut will be processed at two ROM facilities where it will be reduced in size for further processing at the CHPP. For the underground longwall operations, all ROM coal will be transported directly to the CHPP via an overland conveyor.

T.2.2 Rail Spurline & Loop

Coal will be transported by rail along the Kevin's Corner rail spurline (approximately 19.2 km in total) extending from the Project to the Alpha Coal Project (ACP) rail alignment at approximate chainage 30 km from the Alpha Coal Mine. The proposed Kevin's Corner rail spurline and loop will be comprised of the following standard gauge track sections:



- Mine balloon loop of 11.258 km in length
- Spurline of 7.870 km long connecting to the ACP northbound
- Connection from the spurline to the ACP southbound of 2.265 km
- Bad-order wagon siding of 0.372 km, and
- Light Industrial Area siding.

T.2.3 CHPP & Mine Infrastructure

Sized raw coal will be transferred from the ROM facilities via conveyors to the multi-module CHPP, where it will be washed. The coal resource placed through the ROMs will be processed to produce an export thermal product, with a proportion of the coal reserves having potential to be marketed without processing. A tailings storage facility is required for the high moisture fine coal fraction rejects (tailings). The coarse rejects from the CHPP will be placed in designated locations within the Northern open cut spoil emplacement areas.

The mine infrastructure will include:

- main workshop; warehouse; administration buildings; training and emergency services building; tyre bay; light vehicle workshop, and heavy welding shop;
- product stockpiles, TLO facility and rail loop;
- raw water dams, mine dewatering dams and environment dams;
- construction camp and main accommodation village;
- mine access roads;
- landfill;
- airport and associated landing strip;
- borrow pits;
- fuel, oil, and explosives storage facilities;
- creek diversions, drainage channels and levee bunds;
- water and wastewater systems;
- water treatment plant and sewerage treatment plant;
- electrical systems;
- communications systems;
- conveyors; and
- stockpile areas.

Figure T-4 illustrates the location of all the above key components of the Project including the two open cut pits and the three underground developments.

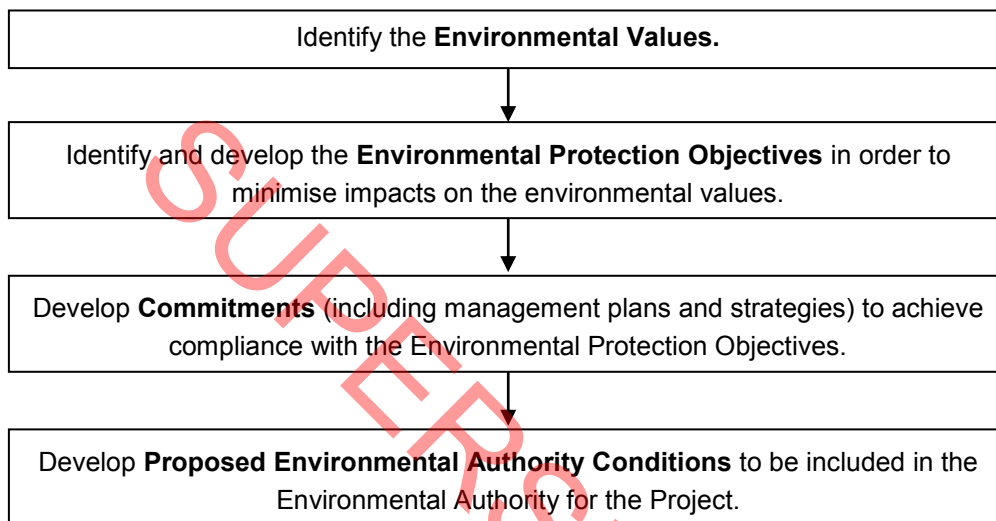


T.3 Environmental Values, Impacts, Commitments, & Draft Conditions

T.3.1 Content of the Section

This EMP was compiled by following the process outlined in the EPA publication *Guidelines to Preparing Environmental Management Plans*. This process is shown in Figure T-6.

Figure T-6 EMP Process Stages



The guiding definitions for the terms that are used throughout the EMP are as follows:

Background: This provides context on the element of operations specific to the impact. This may describe the relevant processes or provide data relating to the extent of the impact.

Environmental Values: Environmental values are those qualities or physical characteristics of the environment that are conducive to ecological health, public amenity or safety. This EMP also describes the potential impacts to the environmental values.

Section 9 of the EP Act describes an environmental value as:

“a quality or physical characteristic of the environment that is conducive to ecological health or public amenity or safety; or another quality of the environment identified and declared to be an environmental value under an environmental protection policy or regulation.”

Environmental Protection Objectives: These describe the key environmental elements and the outcomes to be protected in order to minimise impacts on the environmental values. The identification of key environmental elements was informed by an environmental risk assessment process to identify at-risk environmental values or high risk activities. The outcomes of the environmental risk assessment were used to identify those environmental values which were at risk from the proposed activities and for which it was appropriate to develop Environmental Authority Conditions. In developing this EMP additional and/or more stringent mitigation measures, monitoring requirements and Environmental Authority conditions, have been applied in at-risk areas based on the outcomes of the environmental risk assessment. A summary of the findings of the environmental risk assessment have been provided as Attachment A.



Performance Criteria: These are the indicators by which the level of achievement of the environmental protection objectives can be determined, in a measurable and auditable way.

Control Strategies: These provide a contextual framework for the proposed Environmental Authority conditions and describe the strategies proposed to meet the environmental protection objectives.

Proposed Environmental Authority Conditions: These are draft conditions containing measurable indicators and standards that are proposed to be included in the Environmental Authority to protect identified environmental values that may be impacted on by the Project.

Monitoring: This section details the monitoring requirements the Proponent is proposing for the future monitoring of environmental values.

Commitments: These relate to the improvements identified through the assessment of the impact area (or element) and the Proponents commitment to carry out additional work (i.e. investigations or mitigation).

Each requirement is addressed within the relevant technical section of the EMP; these are presented by impact area.

Words and phrases used throughout this EMP are defined in Section T.5 (Definitions), a glossary of acronyms is also provided at the start of this document. Where a word or term is not defined, the ordinary English meaning applies, and regard should be given to the Macquarie Dictionary.

T.3.2 General Conditions

There are a number of general issues that do not relate to environmental values or control strategies, but are to be included in the Environmental Authority. Conditions of the Environmental Authority are proposed in Section T.3.2.1 (Schedule A – General Conditions).

T.3.2.1 Proposed Environmental Authority Conditions

Schedule A – General Environment

Financial Assurance

- A1** Provide to the administering authority financial assurance for the amount and in the form acceptable to the administering authority in accordance with the most recent edition of the DEHP guideline - *Calculating Financial Assurance for Mining Projects* (120822-EM585) before the proposed mining activities can commence or be varied.

(Note: The calculation of financial assurance for condition (A1) must be in accordance with Guideline 17 as referred to in s. 364(4) of the EP Act, and may include a performance discount. The amount is defined as the maximum total rehabilitation cost for complete rehabilitation of all disturbed areas, which may vary on an annual basis due to progressive rehabilitation. The amount required for the financial assurance must be the highest Total Rehabilitation Cost calculated for any year of the Plan of Operations and calculated using the formula: (Financial Assurance = Highest Total Annual Rehabilitation Cost x Percentage Required)).

- A2** The financial assurance is to remain in force until the administering authority is satisfied that no claim on the assurance is likely.

(Note: Where progressive rehabilitation is completed and acceptable to the administering authority, progressive reductions to the amount of financial assurance will be applicable where



rehabilitation has been completed in accordance with the acceptance criteria defined within the Environmental Authority).

- A3** The amount of financial assurance must be reviewed by the holder of the Environmental Authority when a plan of operations is amended or replaced or the Environmental Authority is amended.

Coal Extraction

- A4** The Environmental Authority holder is approved for a coal extraction to sustain a rate of up to 30 million tonnes per annum (Mtpa) product coal in accordance with this Environmental Authority.

Maintenance of Measures, Plant & Equipment

- A5** The Environmental Authority holder must ensure that:
- (a) All measures, plant and equipment necessary to ensure compliance with the conditions of the Environmental Authority are installed;
 - (b) Such measures, plant and equipment are maintained in a proper condition; and
 - (c) Such measures, plant and equipment are operated in a proper manner.

Monitoring & Records

- A6** Except where specified otherwise in another condition of this authority, all monitoring records and reports required by this Environmental Authority must be kept for a period of not less than five (5) years.
- A7** Upon written request from the administering authority, copies of monitoring records and reports must be made available and / or provided to the administering authority's nominated office within 10 business days or by an alternative timeframe agreed between the administering authority and the holder.
- A8** Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this Environmental Authority must be reviewed for effectiveness in minimising the likelihood of environmental harm on an annual basis, and amended promptly if required, unless a particular review date and amendment program is specified in the plan system or program.

Notification of Emergencies, Incidents & Exceptions

- A9** The holder of this Environmental Authority must notify the administering authority by written notification within 24 hours, after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance, with the conditions of this Environmental Authority.
- A10** The holder of this Environmental Authority must notify the administering authority by written notification within 24 hours, after becoming aware of any emergency, incident or information about circumstances which results or may result in environmental harm not in accordance with the conditions of this Environmental Authority of a contravention of the conditions of this Environmental Authority.
- A11** 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, written advice must be provided to the administering authority in relation to:
- (a) Proposed actions to prevent a recurrence of the emergency or incident;



- (b) The outcomes of actions taken at the time to prevent or minimise environmental harm; and
- (c) Proposed actions to respond to the information about circumstances which result or may result in environmental harm.

A12 The notification in conditions A10-A12 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 substance 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.

Risk Management

A13 The holder of this Environmental Authority must develop and implement a risk management system for mining activities which conforms to the Standard for Risk Management (ISO31000:2009) within three months of issue of the Environmental Authority.

(Note: Implementation of a risk management system is not a defence against a breach of any condition of the Environmental Authority)

Emergency Response & Contingency Planning

A14 An emergency response / contingency plan must be developed and implemented within the current plan of operations to manage unacceptable risks identified in the risk management system or the associated monitoring.

A15 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 the 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 circumstances and nature of incidents to the administering authority.

Third Party Audit

- A16** The holder of the Environmental Authority must nominate an appropriate third party auditor to audit compliance with the conditions of this Environmental Authority within one (1) year of the commencement of the Environmental Authority and then at regular intervals not exceeding three (3) years.
- A17** The holder must at its cost, arrange for independent certification of a third party auditor of findings of the audit report required under condition A17.
- A18** Within 90 days of completing the audit, the holder 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 the recurrence of non-compliance.

Activity

- A19** Contaminants must not be released to the receiving environment unless they are in accordance with the contaminant limits authorised by this Environmental Authority.
- A20** This Environmental Authority authorises environmental harm referred to in the conditions. Where no condition exists or this Environmental Authority is silent on matter, the lack of condition or silence does not authorise environmental harm.

T.3.3 Air Quality & Greenhouse Gas

T.3.3.1 Background

The region surrounding the Kevin's Corner Coal Mine Project is predominantly rural in character supporting cattle grazing. Dust emission sources in the surrounding region will generally consist of activities such as cultivation, harvesting, mustering and other stock movements or farming related transport.

The prevailing wind direction is from the east through to northeast. The wind speed reaches a maximum of 6.6 metres per second (m/s) from the east, with an average wind speed of 2.6 m/s. The site is characterised by occasional light winds from the southeast and very infrequent winds from the west. Sensitive receptors near the project site comprise homesteads to the north, east and south of the mine (see Figure T-7 and Table T-6).

Emissions from the Kevin's Corner Coal Mine Project are generated primarily from activities related to the handling and transport of overburden and coal. The dust emissions from mine-related activities include a range of particle sizes categorised as total suspended particulates (TSP), particulate matter less than 10 micrometres (μm) in diameter (PM_{10}) and particulate matter less than 2.5 μm in diameter ($\text{PM}_{2.5}$).

Emissions to the atmosphere that result from the combustion of diesel fuel include nitrogen dioxide, PM_{10} , $\text{PM}_{2.5}$, sulphur dioxide and trace quantities of volatile organic compounds (such as benzene, formaldehyde and acetaldehyde and 1,3 butadiene). Impacts from mobile sources as a result of the Kevin's Corner Coal Mine Project are limited as:

- Large volumes of traffic (more than 10,000 vehicles per day) are required to impact local air quality¹; and
- Emissions from tailpipes which are only likely to have a significant impact on ambient air quality within 200 m of the road centreline².

Due to the scale of estimated on-site vehicle use and the proximity of the sensitive receptors to the Project, vehicular emissions are not considered to be emitted in sufficient quantities to significantly impact on air quality at sensitive receptor locations.

Emissions to the atmosphere that result from the combustion of ammonium nitrate fuel oil during blasting of overburden can include oxides of nitrogen, nitrogen dioxide, carbon monoxide, sulphur dioxide and particulate matter. It is anticipated that these pollutants will dissipate sufficiently so that impacts on air quality at sensitive receptor locations will not be significant.

Site specific monitoring data for the Project site were not available when dust impacts were predicted in the supplementary impact assessment. Therefore, the background concentrations applied were estimated, based on monitoring data from another coal mine in Queensland. To determine a site specific air quality baseline and whether the estimated background concentrations were representative of local air quality, monitoring of particulate matter and dust deposition was undertaken for 12 months at the Project site. These monitored datasets indicate that the background concentrations used in the

¹ Environmental Protection UK, 2010. 'Development Control: Planning for Air Quality (2010 Update)'. Available online at [http://www.environmental-protection.org.uk/assets/library/documents/Air_Quality_Guidance_2010_\(final2\).pdf](http://www.environmental-protection.org.uk/assets/library/documents/Air_Quality_Guidance_2010_(final2).pdf) Last accessed 18/4/12

² Highways Agency, 2007. 'Design Manual for Roads and Bridges – Environmental Assessment – Environmental Assessment Techniques – Air Quality'. V11 S3 Part 1. Available online at <http://www.dft.gov.uk/ha/standards/dmrb/vol11/section3/ha20707.pdf> Last accessed 18/4/12



supplementary assessment are a conservative representation of air quality in the project locality and region.

Table T-5 Background Particulate Levels

Air Quality Indicator	Averaging Period	Background Level	Source
TSP	Annual	28 $\mu\text{g}/\text{m}^3$	Ensham Central Project EIS
PM ₁₀	24-hour	27 $\mu\text{g}/\text{m}^3$	Ensham Central Project EIS
PM ₁₀	24-hour	22.4 $\mu\text{g}/\text{m}^3$	Monkland's Homestead TEOM ⁽²⁾
PM ₁₀	24-hour	20.0 $\mu\text{g}/\text{m}^3$	Alpha Exploration Camp TEOM ⁽¹⁾
PM ₁₀	24-hour	18.1 $\mu\text{g}/\text{m}^3$	Forrester Homestead TEOM ⁽²⁾
PM _{2.5}	24-hour	5.4 $\mu\text{g}/\text{m}^3$	Ensham Central Project EIS
PM _{2.5}	Annual	2.8 $\mu\text{g}/\text{m}^3$	Ensham Central Project EIS
Dust Deposition	Monthly	68 mg/m ² /day	Proponent (Project EIS)
Dust Deposition	Monthly	13.3 mg/ m ² /day	Alpha Exploration Camp DDG ⁽³⁾
Dust Deposition	Monthly	18.6 mg/ m ² /day	Hobartville Homestead DDG ⁽³⁾
Dust Deposition	Monthly	19.4 mg/ m ² /day	Monkland's Homestead DDG ⁽³⁾
Dust Deposition	Monthly	15.0 mg/ m ² /day	KiaOra Homestead DDG ⁽³⁾
Dust Deposition	Monthly	35.5 mg/ m ² /day	Mentmore Homestead DDG ⁽³⁾
Dust Deposition	Monthly	25.7 mg/ m ² /day	Surbiton Station DDG ⁽³⁾
Dust Deposition	Monthly	45.7 mg/ m ² /day	Surbiton Station (Elsie House) DDG ⁽³⁾
Dust Deposition	Monthly	66.7 mg/ m ² /day	Forrester Homestead DDG ⁽³⁾

Note (1): The background level presented is the 70th percentile of daily average concentrations during the sampling period 01/07/2011 to 30/06/2012 with a data completion rate of $\geq 90\%$.

Note (2): The background level presented is the 70th percentile of daily average concentrations during the sampling period 01/07/2011 to 30/06/2012. The sampling data completion rate at Forrester was 75% and at Monkland's 85%. These concentrations should be treated as indicative of the 24-hour background concentration because the data completion rate is $< 90\%$.

Note (3): To date, six months of dust deposition data have been collected as part of the baseline air quality monitoring program. The results presented are the maximum daily dust deposition rates sampled over this time period and therefore should be considered as conservative.

T.3.3.2 Environmental Values

National Legislative Framework

National air quality guidelines are specified by the National Environment Protection Council (NEPC). The National Environment Protection Measure (NEPM) (Ambient Air Quality) was released in 1998 (with an amendment in 2003) and sets standards for ambient air quality in Australia.

The NEPM (Ambient Air Quality) specifies national ambient air quality standards and goals for the following common air pollutants: carbon monoxide (CO), nitrogen dioxide (NO₂), sulphur dioxide (SO₂), ozone (O₃), particulates (as PM₁₀ and PM_{2.5}), and lead (Pb).

Ambient concentrations of PM_{2.5} are addressed only by advisory reporting standards in the NEPM, which are not applied as goals. Potential particulate emissions and impacts are addressed through consideration of the impacts of TSP and PM₁₀.

The NEPM standards are intended to be applied at monitoring locations that represent air quality for a region or sub-region of more than 25,000 people, and are not used as recommendations for locations near industrial facilities. This report has focussed on demonstrating compliance with the *Environmental Protection (Air) Policy* (EPP (Air), 2008) air quality objectives.

Queensland Legislative Framework

In Queensland, air quality is managed under the *Environment Protection Act* (EP Act, 1994), the *Environmental Protection Regulation* (EPR, 2008) and the *Environmental Protection (Air) Policy* (EPP (Air), 2008).

The EP Act provides for long-term protection for the environment in Queensland in a manner that is consistent with the principles of ecologically sustainable development. The primary purpose of the EPP (Air) is to achieve the objectives of the EP Act in relation to Queensland's air environment. This objective is achieved by the EPP (Air) through:

- Identification of environmental values to be enhanced or protected;
- Specification of air quality indicators and goals to protect environmental values; and
- Provision of a framework for making consistent and fair decisions about managing the air environment and involving the community in achieving air quality goals that best protect Queensland's air environment.

The EPP (Air) applies "to Queensland's air environment" but the air quality objectives specified in the EPP (Air) do not extend to workplaces covered by the *Coal Mine Safety and Health Act* (1999) and the *Workplace Health and Safety Act* (1995) (Section 8 of the EPP (Air)).

The air quality assessment presented in this report addresses off-site ambient air quality impacts only and does not cover workplace health and safety exposure.

Schedule 1 of the EPP (Air) specifies the air quality objectives that are to be (progressively) achieved, though no timeframe for achievement of these objectives is specified. The Queensland DEHP has also adopted a guideline for dust deposition of 4 g/m²/month (c.140 mg/m²/day) above background concentration to ensure adequate protection from nuisance levels of dust. This level was derived from the New Zealand Ministry for the Environment *Good Practice Guide for Assessing and Managing the Environmental Effects of Dust Emissions*³. This guideline level is also consistent with the ambient monitoring of dust conducted in the Hunter Valley, NSW in the 1980's. The former New South Wales (NSW) State Pollution Control Commission set the level to avoid a loss of amenity in residential areas, based on the levels of dust fallout that cause complaints. The current guideline level adopted in NSW⁴ is that the maximum total dust deposition level should not exceed 4 g/m²/month, and that the maximum increase in deposited dust is 2 g/m²/month.

The environmental values of the air environment to be enhanced or protected are:

- The qualities that make the air environment suitable for the life, health and wellbeing of humans; and

³ <http://www.mfe.govt.nz/publications/air/dust-guide-sep01.pdf> Last accessed 18/4/12

⁴ NSW Department of Environment and Conservation (2005). Approved Methods for the Modelling and Assessment of Air Pollutants in New South Wales. August 2005.



- The aesthetic environment.

T.3.3.3 Potential Impacts on the Environmental Values

Potential impacts of dust emissions in the air as a result of mining activities include;

- Health impacts from particulate matter; and
- Impacts on amenity.

Dust emission sources associated with the Kevin's Corner Coal Mine Project include (but may not be limited to):

- Construction phase:
 - clearing of vegetation;
 - infrastructure construction (processing area, haul roads etc.);
 - topsoil disturbance and removal; and
 - transport of materials to site.
- Operational phase:
 - graders;
 - scrapers;
 - dozers operating on overburden, interburden and coal;
 - blasting;
 - front end loading (FEL) of material to trucks;
 - excavators and shovels;
 - truck dumping of material;
 - loading and unloading of stockpiles;
 - draglines;
 - transport of material (overburden, coal, rejects); and
 - conveying of coal to Run of Mine (ROM) and Coal Handling and Processing Plant (CHPP).
- Wind erosion from the product stockpiling area, exposed surfaces and tailings dam;
- The train load-out;
- Rehabilitation; and
- Transfer points.

Potential Health Impacts from Particulate Matter

Generally, it is thought that fine particles below 2.5 µm in diameter may be of a greater health concern than larger particles as they can reach the air sacs deep in the lungs. However, coarse particles (particulate matter 2.5 µm -10 µm) could also be associated with adverse health impacts⁵.

⁵ NSW Department of Health, 'Mine dust and you' factsheet.
<http://www.health.nsw.gov.au/factsheets/environmental/mine_dust.html>. Accessed 2/12/2011.



Ground-level concentrations of TSP, PM₁₀, PM_{2.5} and dust deposition, as a result of mine operations, have been predicted at each of the eleven off-site receptor locations as well as for the proposed on-site accommodation village shown in Figure T-7 and Table T-6. The assessment has been completed for dust emissions associated with mining activities at these receptor locations for six years of the mine life (years 5, 10, 15, 20, 25, 30). The results are compared to the performance criteria in Section T.3.3.6.

Mitigation measures for the Kevin's Corner Coal Mine Project have been proposed and are provided in Section T.3.3.7. Several of these measures have been incorporated into the air quality modelling, such as the engineering controls and dust suppression measures, which are predicted to reduce the impacts from the site. Other measures may need to be implemented during Project operation, such as best practice operational procedures and the rehabilitation strategy.

The proposed Ambient Dust Monitoring Program will be used to assess compliance against the Project goals and the effectiveness of the proposed control measures.

Potential Amenity Impacts

Amenity impacts from dust are usually associated with coarse particles and particles larger than 10 micrometres in diameter. The impact of dust from a nearby mine on local amenity depends on the distance from the mine site and climatic conditions, such as wind (NSW, Department of Health).

Concerns about amenity from mine site dust often relate to visibility of dust plumes and dust sources. Visible dust is usually due to short-term episodes of high emissions, such as from blasting.

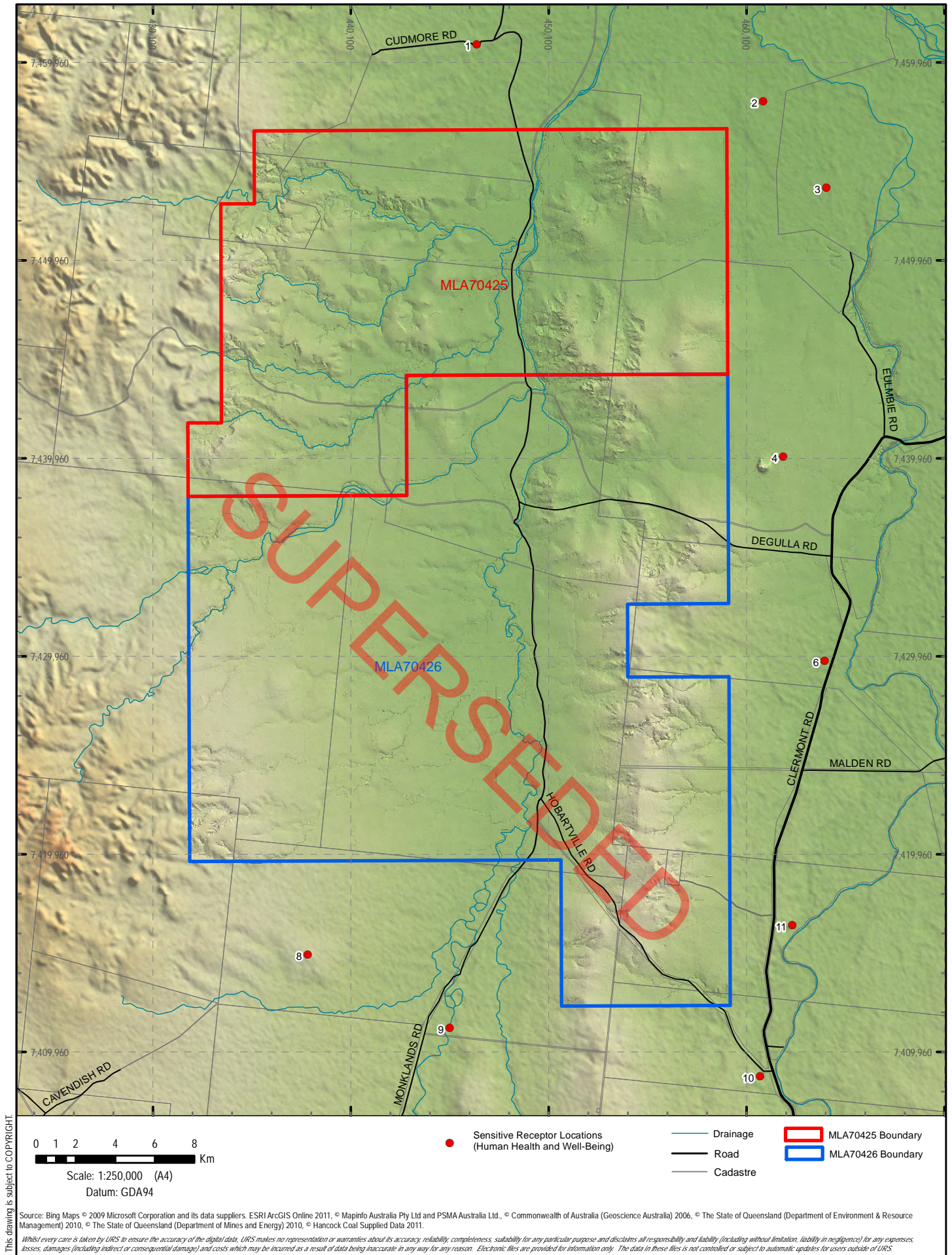
Other amenity impacts include dust depositing on fabrics (such as washing) or on house roofs, and the transport of dust from roofs to water tanks during rain.

Dust deposition impacts from the Project are predicted to be within the performance criteria for dust deposition at all sensitive receptors.

Table T-6 Sensitive Receptor Locations (dust)

ID	Description	Latitude	Longitude
1	Forrester Homestead	446462	7460888
2	Surbiton Station	460936	7458001
3	Eulimbie Homestead	464135	7453631
4	Surbiton Homestead	461950	7440055
6	Burtle Homestead	464057	7429716
8	Kia Ora Homestead	437918	7414891
9	Monklands Homestead	445097	7411185
10	Mentmore Homestead	460780	7408727
11	Tressillian Homestead	462419	7416374
13	Spring Creek Homestead	429264	7414981
14	Glenn Innes Homestead	441884	7408274

* IDs 5, 7 and 12 are not included because they were allocated to the Hobartville, Wendouree Homesteads and the Alpha Accommodation Village which are not sensitive receptors. IDs 15 and 16 are not included because these are receptors for which the environmental value of health and biodiversity of ecosystems must be protected or enhanced.



SENSITIVE RECEPTOR LOCATIONS





T.3.3.4 Greenhouse Gases

The following sources would contribute to direct and indirect greenhouse gas (GHG) emissions from the Project:

- Fugitive emissions of coal seam gas (CSG) from the open cut mining of coal (direct emission);
- Fuel (diesel) consumption in heavy equipment and light vehicles (direct emission);
- Combustion of explosives used in blasting (direct emission);
- Clearance of vegetation from the mining lease; and
- Electricity consumption in plant and machinery (indirect emission).

The National Greenhouse Accounts register together with site-specific data on coal seam gas content of the target coal seams were used to estimate the GHG emissions from the Project.

In total, the Project is estimated to result in approximately 59.4 Mt CO₂-e of direct and indirect GHG gases over its life, or an average of 2.1 Mt CO₂-e on an annual basis. The annual GHG emissions for the project represent 0.35% of Australia's 2009 GHG emissions.

T.3.3.5 Environmental Protection Objectives

- To minimise the impacts of mine-derived dust on sensitive receptors within and beyond the boundaries of the mining lease by ensuring the air quality performance criteria listed in Section T.3.3.6 are met at sensitive receptor locations; and
- To implement energy efficiency initiatives.

T.3.3.6 Performance Criteria

The performance criteria for air quality are:

- Compliance with the requirements of the Project's Environmental Authority;
- Dust and particulate monitoring in accordance with the control strategies outlined below;
- No substantiated dust complaints from the community; and
- Adherence to the project goals described in Table T-7 which are based on the EPP (Air) objectives and Queensland DEHP guidelines for TSP, PM₁₀, PM_{2.5} and dust deposition.

Table T-7 Summary of Project Goals for Particulate Matter

Pollutant	Averaging Period	Objective or Goal	Jurisdiction
TSP	Annual	90 µg/m ³	EPP (Air)
PM ₁₀	24-hour	50 µg/m ³	EPP (Air) ⁽¹⁾
PM _{2.5}	24-hour	25 µg/m ³	EPP (Air)
PM _{2.5}	Annual	8 µg/m ³	EPP (Air)
Dust Deposition	Monthly	120 mg/m ² /day ⁽²⁾	Adopted from Queensland DNRm and DEHP ⁽³⁾

Note (1): five exceedances allowed per year.

Note (2): dust deposition is measured as total insoluble solids as defined by AS 3580.10.1-2003:1991 (AM-19).

Note (3): the recommended Goal for the rate of dust deposition by DEHP and DNRm is 4 g/m²/month which is c133 mg/m²/day based on a 30-day month as described in Section 2. In the EIS a dust deposition project goal of 140 mg/m²/day was adopted. However, Adherence to a goal of 120 mg/m²/day, represents a precautionary approach to ensure that the 4g/m²/month guideline adopted by DEHP and DNRm is met.



The results of the dispersion modelling indicate that receptor 1 (Forrester Homestead), located to the north of MLA70425, will be most affected by dust emissions from the site. The air quality impacts predicted by the dispersion model can only be validated by comparing predicted concentrations against observational data but only limited data are currently available. The results of the dispersion modelling indicate that:

- Refined dispersion modelling used in the SEIS estimates that emissions of dust from the Project (including ambient background dust sources) are predicted to result in elevated levels of particulate matter that exceed the goal of $50 \mu\text{g}/\text{m}^3$ for the 24-hour average ground-level concentration of PM_{10} at sensitive receptor 1 only. Modelling predicts an exceedance of the Project goal at Receptor 1 during Year 5 by 6%. The predicted concentrations at the remaining receptors are under the Project goal, as they were reported in the EIS. In year 25, it is predicted that the Project will be compliant at all sensitive receptors.
- During the life of the mine, the ground-level concentration of $\text{PM}_{2.5}$ is not predicted to exceed the goal of $25 \mu\text{g}/\text{m}^3$ for the 24-hour average and $8 \mu\text{g}/\text{m}^3$ for the annual average ground-level concentration.
- Ground-level concentrations of TSP are not predicted to exceed the goal of $90 \mu\text{g}/\text{m}^3$ for the annual average at any sensitive receptor location.
- Ground-level rates of dust deposition are not predicted to exceed the relevant mine goals at any of the receptor locations included in the dispersion modelling.

It has been demonstrated that the sensitive receptors in the study are likely to lie outside the typical exclusion zone of the most intense overburden blasts.

T.3.3.7 Control Strategies

Control of ambient levels of dust as a result of the operation of Kevin's Corner Coal Mine Project may be achieved through reduction of source generation using several management measures, including:

- Engineering control measures (partially included in the dispersion modelling);
- Dust suppression measures (partially included in the dispersion modelling);
- Rehabilitation of exposed surfaces (excluded from the dispersion modelling); and
- Operational procedures (excluded from the dispersion modelling).

Engineering Control Measures

The Proponent has designed engineering control measures into the Project, where appropriate and technically possible. Controls incorporated in the dispersion modelling, that will be implemented on-site, include:

- Minimisation of dragline drop height to 6 m;
- Partial enclosure of transfer points; and
- Dust prevention measures on drills.

Additional control measures that will be considered for application at the site to further reduce dust emissions include:

- Enclosure of sizing stations;

- Partial enclosure of overland conveyors;
- Coal surface veneering or partial enclosure of coal trains;
- Belt washing and belt scrapers to minimise dust from the return conveyors;
- Reduced drop height from stackers to stockpiles where possible; and
- Enclosure of raw coal surge bins.

However, other measures may be found to be as or more effective in the operational mine.

Dust Suppression Measures

Dust suppression measures primarily include the application of water to control dust emissions. Measures that will be implemented include:

- Watering of haul roads (>2 litres/m²/hour of water applied where safety permits); and
- Watering of Run of Mine (ROM) stockpiles using water sprays as required.

Additional dust suppression measures will be considered for application at the site such as when dust is visibly observed as being generated from stockpiles due to stacking and reclaiming activities, or as a result of wind speed dependant emissions. Measures that may be implemented to further reduce dust emissions include:

- Water sprays on stacker/reclaimer units;
- Water sprays at conveyor transfer points; and
- Optimal moisture content of product coal and reject material as they leave the CHPP which avoids the need for supplementary watering.

In the event that adverse conditions are encountered during operation of the Project, additional dust suppression measures may have to be implemented. The circumstances where this might be required include pre-strip and overburden dumping operations in the northern and central pits and during construction of the CHPP and associated infrastructure. The requirements for these additional dust suppression measures will be determined through the Operational Management Plan (OMP).

In addition to the above dust suppression measures, a Coal Dust Management Plan (CDMP) will be developed which will contain dust suppression measures specific to the rail loop. The recommendations outlined in the QR Network Coal Dust Management Plan (2010), will be incorporated into the CDMP for the Kevin's Corner Project where possible.

Rehabilitation of Exposed Surfaces

Rehabilitation of exposed surfaces will be undertaken progressively as mining and stockpiling activities are completed. A detailed Rehabilitation Plan (SEIS, Volume 2, Appendix T4.09) will be developed for the Project, which will include the use of fast-growing temporary cover material to accelerate the effectiveness of dust controls. Improving the effectiveness and time for rehabilitation measures will result in reduced dust emissions from exposed areas.

Operational Procedures

Operational procedures set out how the Project will be operated to meet targets for air quality performance. The following operational procedures will be implemented in order to meet targets for air quality performance:

- Maintenance of water spray equipment and engineering controls to minimise dust emissions;



- Provision of sufficient number of watering trucks to allow for continuation of dust suppression when one or more truck is out of service;
- Monitoring of meteorology, ambient air quality and rates of dust deposition in the vicinity of the mine (Section T.3.3.8);
- Management of topsoil stripping so that dust does not become a safety hazard or severe nuisance;
- Restriction of land disturbance to that necessary for the operation and minimise the area of land disturbed at any one time;
- Operation of a Fume Management Zone (FMZ) around the pits where emissions from blasting will be carefully managed in compliance with best practice recommendations⁶;
- Maintenance of a register of dust complaints;
- Prompt investigation of all complaints about dust and take appropriate action to reduce dust nuisance; and
- Review of dust monitoring data to identify trends and implement corrective actions if necessary.

In addition, the following operational procedures may be incorporated into the site operations:

- Implementation of an appropriate speed limit for light vehicles on unsealed roads;
- Product coal supplied for coal transport to have a coal-surface water content designed to reduce dust emissions during rail transport; and
- Avoid burning cleared vegetation.

Rail Loop Specific Measures

- Recommendations outlined in the QR Network 2010, CDMP, will be incorporated into the CDMP for the Kevin's Corner Projects where possible;
- Coal surface veneering or partial coverage will be applied to all coal wagons as per the commitments of the QR Network Coal Dust Management Plan (SEIS Volume 2, Appendix C, Section C.13);
- Significant coal spillage the rail loop corridor will be cleaned up on an as required basis;
- Continue to seek improved coal loading techniques to reduce over-filling (and subsequent coal spillage onto the rail corridor);
- Improve the profile of the coal load to reduce surface erosion during transport; and
- Avoid allowing trains to idle near sensitive receptors.

Assessment of Mitigation Controls Against Industry Best-Practice

The measures which will be adopted for the control of ambient levels of dust as a result of the operation of Kevin's Corner Coal Mine Project have been assessed against industry best practice measures documented in the New South Wales Coal Mining Benchmarking Study⁷. This assessment is summarised in [Table T-8](#).

⁶ DEEDI (2011). Queensland Guidance Note QGN 20 v3 Management of oxides in nitrogen in open cut blasting

⁷ Katestone Environmental Pty Ltd (2010). NSW Coal Mining Benchmarking Study: International Best Practice Measures to Prevent and/or Minimise Emissions of Particulate Matter from Coal Mining. December 2010.



Table T-8 Mitigation Controls Assessed Against Industry Best Standards

Control Measures	Key actions adopted in NSW coal mines	Proportion of NSW coal mines implementing the action (%)	Planned implementation at Kevin's Corner Coal Mine Project	Comment
Haul roads	Haul road watering	96	✓	
	Speed limits on haul roads	35	✓	
	Well defined haul roads	31	✓	
	Use of alternative transport methods to reduce the vehicle kilometres travelled (introduction of IPCC)	--	--	The haulage routes in the proposed mine plans are considered to be optimal for the minimisation of vehicle kilometres travelled therefore dust emissions
Wind erosion	Water exposed areas/active areas	85	✓	
	Minimise area of disturbance	69	✓	
	Water application by fixed sprays or water cart on ROM pad	65	✓	
Rehabilitation of exposed surfaces	Progressive rehabilitation	65	✓	
	Seeding topsoil	38	✓	
	Use of ameliorants to improve soil	23	✓	As required
	Use of organic growth medium	12	✓	As required
Bulldozing	Use of water to keep travel routes and materials moist	0	×	
Blasting and drilling	Dust suppression system on the drills	52	✓	
	Drill rigs have dust curtains	48	✓	
	Fabric filters on the drill	0	✓	
Draglines	Minimise drop height	86	✓	
Loading and dumping overburden	Water sprays or boom spray on water cart	88	×	Considered unnecessary as overburden is naturally moist. Sample data has shown that moisture



Control Measures	Key actions adopted in NSW coal mines	Proportion of NSW coal mines implementing the action (%)	Planned implementation at Kevin's Corner Coal Mine Project	Comment
				content ranges from 13.9 % in year 5 to 10.6% in year 30.
	Suspension or modification of operations during adverse weather	48	×	
Loading and dumping ROM coal	Automatic water sprays whilst dumping into ROM hopper	77	✓	
	Water application by fixed sprays or water cart of ROM pad	65	✓	
Conveyors and transfers	Water sprays at transfers	58	✓	
	Conveyor wind shielding-one of two sides	42	✓	
	Enclosed transfers	38	✓	Partial enclosure
Stacking and reclaiming product coal	Water sprays or boom spray on water cart	88	✓	
	Bucket wheel, portal or bridge reclaimer	12	✓	
Air quality management tools	Dust deposition gauges	88	✓	
	Meteorological monitoring	81	✓	
	Ceasing or modifying activities on dry windy days considering monitoring information	42	✓	Meteorological data will be used to assist in the selection of appropriate mitigation
	TEOMs	35	✓	

-- The action is indicated as being a best practice measure in the NSW benchmarking study and will be adopted by HCPL. However, the proportion of NSW mines which have adopted this measure is not reported.

Table T-8.

Table T-8 shows that all the best practice control measures which have been adopted by over 50% of mine operations in New South Wales are proposed to be adopted by HGPL for the control of emissions from the Kevin's Corner Coal mine. This excludes the use of water sprays during overburden loading and dumping. However, sampling from the nearby Alpha Coal Mine test pit has

shown the moisture content from overburden to be high enough that it can be considered naturally moist⁸.

Prevention & Mitigation of Worst Case Impacts

Due to the varying depths of pit activities, particular consideration will be paid to operations that are close to the natural surface level, such as truck and shovel operations and overburden dumping. To prevent worst-case conditions from occurring, mine planning will give consideration to implementing additional dust control measures for operations that are close to the natural surface level.

These could include watering of truck and shovel operations that are close to the ends of the pits.

Greenhouse Gases

The following GHG emission management control strategies will be implemented:

- Plant and equipment:
 - Energy efficiency ratings will be considered, with higher ratings being the preferred option;
 - Plant and equipment will be regularly serviced and maintained according to manufacturer's recommendations; and
 - Plant and equipment will be operated in an appropriate manner.
- Blasting activities will be optimised to minimise double handling; and
- A GHG inventory will be maintained from the beginning of the construction phase, and the reporting requirement to the Greenhouse and Energy Data Officer will be filed annually (per the National Greenhouse and Energy (NGER) legislation).

T.3.3.8 Monitoring

The outcomes of the Ambient Air Monitoring Program will be used by the Proponent to determine whether the mine's operations are contributing to excessive dust levels at nearby sensitive receptors. The Proponent will take action to avoid adverse impacts on air quality at nearby receptor locations. The monitoring data will be used to provide an indication of excessive off-site dust levels that may be attributable to the mine's operations in order that appropriate and effective corrective actions can be identified and implemented.

This will also allow for validation of the dispersion modelling undertaken to predict the off-site impacts.

Monitoring Standards

Ambient air monitoring will be conducted in accordance with and/or in consideration of:

- AS3580.9.8-2008 (or subsequent editions) *Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser*;
- AS/NZS 3580.1.1:2007, *Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment*;
- Australian Standard AS2923.1987 (or subsequent editions) *Ambient air - Guide for measurement of horizontal wind for air quality applications*;

⁸ Hancock Galilee Pty Ltd (2012). Kevin's Corner Coal Mine Project - Air Quality and Greenhouse Gas Assessment-Supplementary Report. 13 April 2012.



- AS/NZS 3580.10.1:2003, *Methods for sampling and analysis of ambient air – Determination of ambient air - Determination of suspended particulate matter – Deposited matter – Gravimetric method*;
- Queensland Government, *Air Quality Sampling Manual*; and
- A method determined in consultation with the Administering Authority.

Ambient Air Monitoring Program

Background Monitoring

Presented in Table T-9 is a summary of the frequency of monitoring for particulates, dust deposition and meteorology to represent the existing background conditions in the Project area. The baseline monitoring program is a joint exercise for both the Alpha and Kevin's Corner projects and consists of three ambient Tapered Element Oscillating Microbalance (TEOM) dust monitors installed to measure PM₁₀ concentrations and eight dust deposition gauges installed to measure dust deposition. Presented in Figure T-8 are the locations of the TEOMs, dust gauges and meteorological monitors for the two project sites. It should be noted that location 12 monitoring is actually being undertaken at the Alpha Exploration Camp in advance of construction of the Accommodation Village at the same site.

Table T-9 Method & Frequency of Background Monitoring at Specified Locations

Location ID	Location Description	Dust Deposition Gauge (monthly)	TEOM (PM ₁₀) (continuous)	Meteorology (continuous)
1	Forrester Homestead	✓	✓	✓
2	Surbiton Station	✓	--	--
2a	Surbiton Station (Elsie House)	✓	--	--
5*	Hobartville Homestead	✓	--	--
8	Kia Ora Homestead	✓	--	--
9	Monklands Homestead	✓	✓	✓
10	Mentmore Homestead	✓	--	--
12*	Alpha Exploration Camp	✓	✓	✓

-- sampling not being undertaken

* not a sensitive receptor

Monitoring of ambient particulate concentrations, rates of dust deposition and meteorology are being undertaken in order to establish a representative baseline prior to the commencement of construction and operation. Although not considered as representative as a validation study monitored ambient particulate concentrations during construction (particularly of the box cut) and operation, will provide insight to the relative level of conservatism inherent in the dispersion modelling.

Dust Monitoring

A Dust Monitoring Program has been designed to provide HGPL with the information required to demonstrate to the administering authority that the environmental values for ambient air quality and dust nuisance in the Project area are not being compromised by emissions from the operation of the Project. This will be achieved through the combination of the following:

- Continuous monitoring of PM₁₀ at sensitive receptor locations where exceedances are predicted;



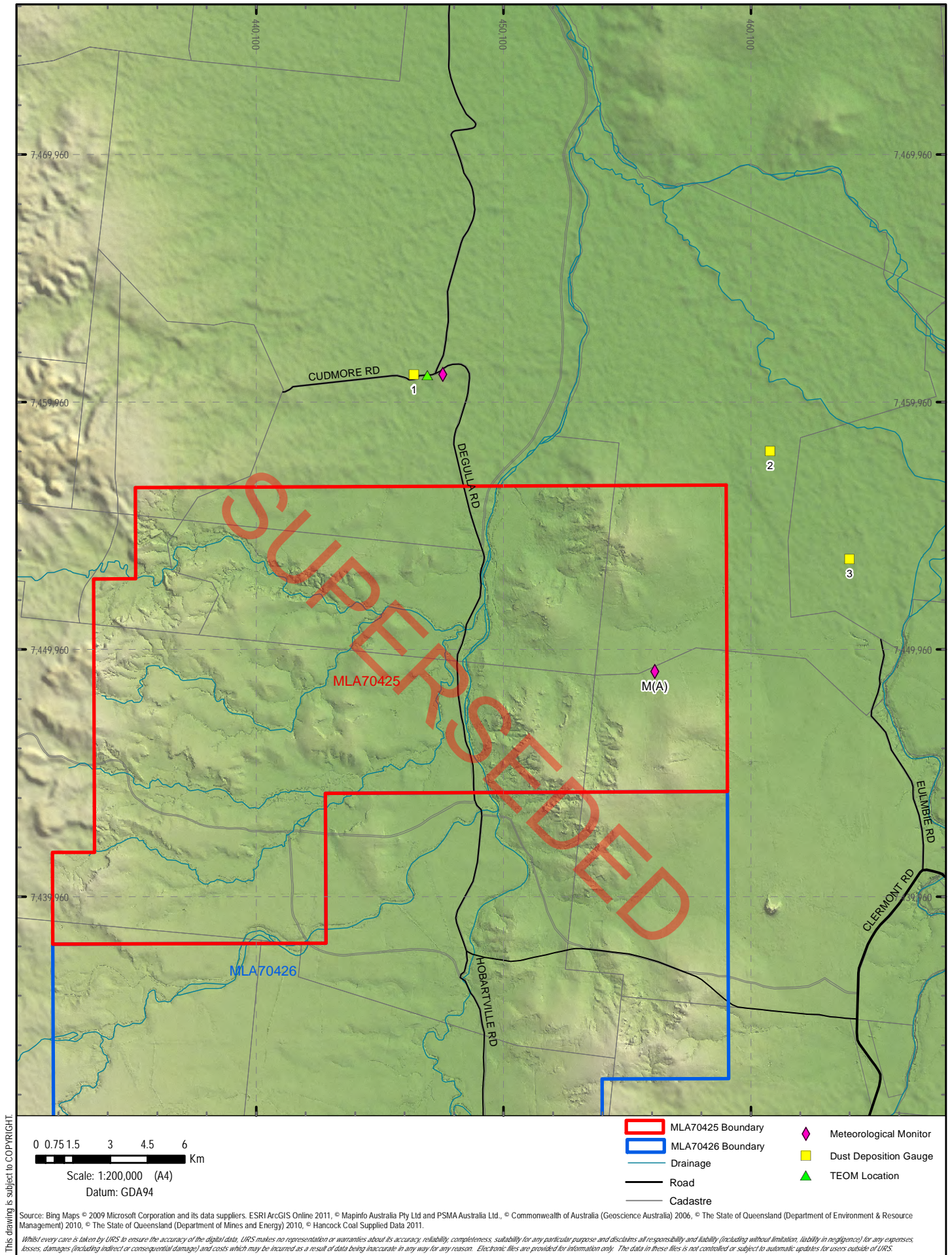
- Monthly sampling using dust deposition gauges at sensitive receptor locations;
- Continuous meteorological monitoring; and
- The use of modelled and monitored datasets to provide focussed mitigation of emissions from sources which have been predicted to contribute most to modelled exceedances.

Proposed Monitoring Locations

The precise location of monitoring equipment will be dependent on the siting requirements of the instrumentation to be implemented at each site.

Presented in Figure T-8 and Table T-10 are the proposed monitoring locations for the operational phase which will be under the control of the Kevin's Corner Coal Mine Project. The locations are approximate and subject to field inspection.

SUPERSEDED



PROPOSED MONITORING LOCATIONS





Table T-10 Proposed Dust Deposition Monitoring Locations

Air Quality Determination	Sampling Frequency	Relevant upwind location	Monitoring point location (GDA 94)		Monitoring point description
			Lat	Long	
PM ₁₀ (TEOM*)	Hourly	NA	-22.9578	146.4778	AQMS(1): Forrester Homestead
Dust Deposition (TEOM*)	Monthly	DDG(U1): Upwind Gauge 1	-22.9578	146.4778	DDG(1): Forrester Homestead
			-22.9994	146.4760	
		DDG(U2): Upwind Gauge 2	-22.9823	146.6076	DDG(2): Surbiton Station
			-22.9995	146.6005	
		DDG(U3): Upwind Gauge 3	-23.0254	146.6500	DDG(3): Eulimbie Homestead
			-23.0450	146.6001	
Meteorological data (AWS**)	Hourly	NA	-23.0658	146.5769	M(A): Kevin's Corner Coal Mine Project Airport
			-22.9578	146.4778	AQMS(1): Forrester Homestead

* Tapered Element Oscillating Microbalance

** Automatic Weather Station

Data obtained from the Ambient Dust Monitoring Program will be used to identify potential dust impacts related to the operational management of mining activities at the Project site. The data will be used to identify the dust-emission source and will allow the Proponent to develop targeted and effective mitigation measures that can be incorporated into the operational procedures for the management of dust impacts.

For the management of PM₁₀ emissions, a pre-emptive approach will be taken whereby operational procedures are triggered in advance of the monitoring of an exceedance. The operational procedures are as follows:

Ambient PM₁₀ Concentrations

Monitoring for PM₁₀ and meteorological variables at the locations identified in Figure T-8 and Table T-10 will be undertaken and will comprise:

- A TEOM being a continuous real time monitoring system for particulate matter with an aerodynamic diameter of less than 10 µm (PM₁₀) suspended in the atmosphere over a 24-hour averaging time monitor in accordance with Australian Standard AS3580.9.8-2008 (or subsequent editions) *Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - PM₁₀ continuous direct mass method using a tapered element oscillating microbalance analyser*;
- Any alternative method of PM₁₀ monitoring which may be permitted by the Air Quality Sampling Manual as published from time to time by the administering authority; and
- An Automatic Weather Station (AWS) using meteorological instruments to monitor wind speed, wind direction, humidity, temperature and solar radiation on a continuous basis in accordance with Australian Standard AS3580.14-2011 (or subsequent editions) *Methods for sampling and analysis of ambient air-meteorological monitoring for ambient air quality monitoring applications*.

If monitoring of nominated "trigger value" from any TEOM in the monitoring network occurs, the following actions will be taken. It should be noted that initial analysis of monitoring data from the background



monitoring program indicates that a rolling 12-hour average PM₁₀ concentration "trigger value" of $\geq 60 \mu\text{g}/\text{m}^3$ is the most appropriate indicator of a future exceedance of the 24-hour average goal. However, an iterative approach will be taken to the development of this trigger level as operational monitoring data from the TEOM network becomes available. This could include the use of unique triggers for the TEOMs located at each sensitive receptor:

- Triggers raised by the real-time monitoring network will be transmitted to either a central control person and/or the relevant control centre(s);
- The control centre will review wind rose data from the AWS for the trigger period in order to identify the general direction of possible dust emission source(s) from the sensitive receptor. This formation will be used to determine the origin of the dust generating activity if the wind direction is from the mine to the receptor;
- The control centre will review TEOM and meteorological data from monitoring sites upwind of the mine at the time of the exceedance to determine if the trigger is due to a regional event, indicated by elevated concentrations at TEOMs located upwind of the dust generating activity, or a local source not related to the mine;
- If the TEOM and meteorological data indicate that the mine is the likely cause of the trigger and corrective measures are identifiable, these will be implemented pro-actively, in advance of an exceedance of the PM₁₀ 24-hour average goal. The sources identified as making the most significant contribution to modelled exceedances specific to each receptor will be the focus of these mitigation measures. The central control person and/or the relevant control centre(s) will proactively identify the likely dust mitigation measures required for activities throughout the day which will be re-communicated to ensure that all mitigation measures are properly applied;
- A provisional, minimum gap between triggers of 3 hours will be left to give time for the mitigation actions to be implemented and take effect. The assessment of the effectiveness of mitigation will take into account the wind speed and distance to the monitoring location. An iterative approach will be taken to the determination of the most appropriate gap between triggers as operational monitoring data from the TEOM network becomes available;
- If another trigger occurs after the minimum gap between triggers has elapsed, the mitigation actions will be reassessed;

If the trigger values continue to occur on a regular basis, supplementary measures could be adopted into the routine site control measures as soon as is reasonably practicable. These measures could include one or more of those described in Table T-11.

Table T-11 Supplementary Control Strategies

Mining Activity/Source	Additional Control Measure
CHPP	Installation of temperature sensors at varying heights to supplement the automatic weather station data. The temperature differential could be used to indicate the presence of a temperature inversion layer and resulting calm conditions.
Use of active stockpiles	Regular water spraying (2litres/m ² /hour) when dust is visibly observed as being generated from stockpiles due to stacking and reclaiming activities
Truck dumping coal	Level 1 watering (2litres/m ² /hour)

Mining Activity/Source	Additional Control Measure
Use of disturbed areas	Planting of a wind break
Use of haul roads	Application of chemical suppressants to roads generating impacts Alteration of routes to increase separation distances where practicable Reduction of vehicle speed limit Road grading Reduce number of trips through the use of larger trucks to transport material Permanent sealing of site roads
Batch drop conveyor	Partial cover of chute
Loading trains	Partial cover of chute
Coal loading for transport	Profile coal surface to flat shape to minimise wind resistance
Stacker and reclaiming product coal	Regular water spraying of Stacker reclaimer units Variable height stacker or tripper with chute/windshield Coal sizer ventilated through filter
Conveyor transfer points	Regular water spraying Conveyor wind shielding (roof) Soft loading chutes
Moisture content	Further optimise the moisture content of product coal and reject material as they leave the CHPP which avoids the need for supplementary watering.
Stockpiling	Use of level 1 watering (2litres/m ² /hour) and/or chemical suppressants
Grading	Level 1 watering (2litres/m ² /hour)
Wind erosion	Topsoil stripping when moisture is elevated but not sodden Use of wind barriers
Rehabilitation of exposed surfaces	Hydraulic mulch seeding
Blasting and drilling	Drill area moistened No drilling in adverse weather conditions
Draglines	Place material on overburden piles in a manner which minimises emissions
Loading and dumping overburden	Automatic water sprays Minimise drop height No dumping on high emplacements in strong winds
Loading and dumping ROM coal	ROM hopper enclosure of three sides and a roof Enclosure with fabric filter
Air Quality management tools	High Volume Air Sampling (HVAS) Directional dust gauges Continuous non-standard particulate measurement method GPS in trucks and dust controls SMS alarm system during high winds

- If all reasonably practicable additional mitigation controls have been applied rigorously and exceedances of the performance criteria continue to be monitored, an air quality specialist will be commissioned to conduct a site-based Dust Audit which would include:
 - Review the suitability of the site-based monitoring program;



- Provide recommendations; and
- Prepare a report outlining the findings and recommendations of the Dust Audit.

Dust Deposition

The monitoring of dust deposition is intended to link into an operational procedure for the response to complaints and protection of the sensitive receptors from dust nuisance. It is intended to complement the pro-active TEOM and AWS monitoring program. Monitoring for dust deposition at the locations identified in Figure T-8 and Table T-10 will be undertaken and will comprise dust deposition monitored in accordance with Australian Standard/New Zealand Standard 3580.10.1:2003 (or subsequent editions) *Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method*.

If a non-vexatious complaint is received regarding dust emissions or an exceedance of the goal of 120 mg/m²/day is obtained at any of the receptor monitoring locations, the following actions will be implemented:

- Query the laboratory in relation to any unusual findings during the analysis;
- Where coal is a potential component of the dust source, compare the organic (combustible) and inorganic components of the dust samples to determine the relative contribution of coal dust from the mine to the total dust sample. The analysis of this information across the monitoring network will be used to determine if dust has been generated from regional events during the month;
- Review wind rose data from the AWS in order to identify the general direction of possible dust emission source(s) from the sensitive receptor;
- Determine whether regional rates of dust deposition have been elevated over the sampling month through the analysis of dust deposition at the sites representative of background;
- Review site-based activities focusing on identifying if there have been any changes to activities in locales identified by the monthly wind rose compared with the previous month;
- If corrective measures are identifiable, these will be implemented;
- Corrective actions and outcomes will be recorded and reported in accordance with the site-based incident report procedure;
- If there is an exceedance of the performance criteria of 120 mg/m²/day for two (2) consecutive months, the local environment at the dust deposition monitoring sites will be assessed by suitably qualified site personnel in order to identify local factors or activities that may have caused elevated dust levels;
- Additional monitoring at the site(s) for which there have been exceedances of the performance criteria of 120 mg/m²/day for two consecutive months will include at least one (1) month of continuous, gravimetric equivalent monitoring of PM₁₀ using a method and location approved in consultation with the DNRM. The monitoring period will commence as soon as practical and will continue until the end of the next full month of dust deposition monitoring; and
- If there is an exceedance of the performance criteria of 120 mg/m²/day for a period of four (4) consecutive months, or if monitoring highlights that dust emissions from site-based activities have contributed to elevated levels of PM₁₀ that are considered harmful by the regulatory authority but it is not possible to isolate and mitigate problematic dust emission source(s) then a Dust Site Audit will be undertaken by an air quality specialist.

Investigative Analysis & Reporting

If an exceedance of either the PM₁₀ 24-hour average or dust deposition performance criteria is monitored, corrective actions and outcomes will be recorded and reported in accordance with the site-based incident report procedure. This will include the following:

- Review 24-hour average TEOM data to determine if the performance criteria have been exceeded and investigate whether the trigger value is a reliable indicator of an exceedance. The trigger value will be refined if appropriate;
- Review site-based activities focusing on identifying if there have been any changes to activities in locales which may have led to the TEOM trigger and for dust deposition identified by the monthly wind rose compared with the previous month;
- Review of the local environment at the dust deposition monitoring sites by suitably qualified site personnel in order to identify local factors or activities that may have caused elevated dust levels;
- Compare the organic (combustible) and inorganic component of the dust deposition sample to that from the corresponding upwind and background sites to determine the relative contribution of dust from the mine;
- Determine whether regional PM₁₀ concentrations and rates of dust deposition have been elevated over the sampling month through the analysis of dust deposited at the background sites; and
- Provide a written report to the Administering Authority as soon as is reasonably practicable assessing whether or not the exceedance was contributed to by an extreme weather circumstance or a non- Kevin's Corner Coal Mine related local emissions source.

Revision of the site monitoring program may be warranted based on future development within the regional airshed. The Proponent will also:

- Investigate all complaints about dust promptly and take appropriate action to reduce dust nuisance;
- Maintain a register of dust complaints; and
- Review dust monitoring data to identify trends and implement corrective actions if necessary.

T.3.3.9 Commitments

- The Proponent will develop and implement an Air Quality Management Plan and an Ambient Air Quality Monitoring Program for the site prior to the commencement of any vegetation clearing or construction activities;
- The Proponent will achieve and maintain the level of dust control outlined in the Environmental Authority;
- The Proponent will meet the Ambient Air Monitoring Program requirements agreed with the administering authority;
- The Proponent will investigate all substantiated dust related complaints;
- The Proponent will implement corrective actions resulting from substantiated complaint investigations as required;
- All monitoring and sampling techniques will be consistent with the DEHP's *Air Quality Sampling Manual* and applicable Australian Standards;



- The Project will investigate energy efficiency ratings of plant and equipment for consideration in plant installations;
- The Project will maintain plant and equipment in a proper condition;
- A greenhouse gas inventory will be maintained from construction onwards with reporting requirements to the Greenhouse and Energy Data Officer filled annually (as per the NGER legislation);

T.3.3.10 Proposed Environmental Authority Conditions

Schedule B - Air Quality

General

- B1** The release of noxious and offensive odours, or any other noxious or offensive airborne contaminants resulting from the activities to which this Environmental Authority relates, must not cause a nuisance at any sensitive place.

Dust Nuisance

- B2** The holder must implement and maintain best practice dust control procedures that incorporates a program for continuous improvement for the management of dust resulting from mining activities with respect to, but not limited to equipment selection, mine planning, engineering design and operation and staff training.
- B3** Dust and particulate matter must not exceed any of the following levels when measured at any sensitive place:
- (a) A level of deposited dust of $120 \text{ mg/m}^2/\text{day}$ based on a monthly average;
 - (b) A concentration of total particulate matter suspended in the atmosphere of $90 \text{ }\mu\text{g/m}^3$ over a 1 year averaging time.
- B4** The holder must take all reasonable and practicable measures to limit the concentration of particulate matter generated by the mining activities with an aerodynamic diameter of less than $10 \text{ }\mu\text{m}$, to $50 \text{ }\mu\text{g/m}^3$ suspended in the atmosphere over a 24 hour averaging time with not more than 5 exceedances recorded over 12 months in any sensitive place.

Dust Monitoring Program

- B5** The holder of the Environmental Authority must develop and implement a dust and particulate matter monitoring and control program.
- B6** The Program shall include, but not necessarily be limited to:

The collection of air quality and meteorological data at locations specified in

- (a) Table B-1 Ambient Dust Monitoring Program and using the combination of monitoring methods described in Table B- 2 Air Quality Monitoring Methods specified by the administering authority for each of the locations and included in the Plan of Operations for operational activities.

- (b) A system to identify adverse meteorological conditions likely to produce elevated levels of PM₁₀ at a sensitive place due to mining activities; and
- (c) A dust control strategy that would activate the timely implementation of supplementary particulate control measures (listed in Table B- 3 Supplementary Particulate Control Measures) in addition to the best practice dust control measures during periods identified in (b).

Table B-1 Ambient Dust Monitoring Program

Air Quality Determination	Sampling Frequency	Relevant upwind location	Monitoring point location (GDA 94)		Monitoring point description
			Lat	Long	
PM ₁₀	Hourly	NA	-22.9578	146.4778	AQMS(1): Forrester Homestead
Dust Deposition	Monthly	DDG(U1): Upwind Gauge 1	-22.9578	146.4778	DDG(1): Forrester Homestead
			-22.9994	146.4760	
		DDG(U2): Upwind Gauge 2	-22.9823	146.6076	DDG(2): Surbiton Station
			-22.9995	146.6005	
		DDG(U3): Upwind Gauge 3	-23.0254	146.6500	DDG(3): Eulimbie Homestead
			-23.0450	146.6001	
Meteorological data	Hourly	NA	-23.0658	146.5769	M(A): Kevin's Corner Coal Mine Project Airport
			-22.9578	146.4778	AQMS(1): Forrester Homestead

Table B- 2 Air Quality Monitoring Methods

Method	Standard
Concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre PM ₁₀ suspended in the atmosphere over a 24 hour averaging time.	AS 3590.9.8: 2008
Concentration of particulate matter suspended in the atmosphere in micrograms per cubic metre over a 24 hour averaging time.	AS/NZS 3580.9.3: 2003
Deposited dust	AS 3580.10.1: 2003
Meteorological data	AS 2923- 1987
Siting of monitoring equipment	AS/NZS 3580.1.1: 2007

Table B- 3 Supplementary Particulate Control Measures

Mining Activity/Source	Additional Control Measure
CHPP	Installation of temperature sensors at varying heights to supplement the automatic weather station data. The temperature differential could be used to indicate the presence of a temperature inversion layer and resulting calm conditions.
Use of active stockpiles	Regular water spraying (2litres/m ² /hour) when dust is visibly observed as being generated from stockpiles due to stacking and reclaiming activities
Truck dumping coal	Level 1 watering (2litres/m ² /hour)
Use of disturbed areas	Planting of a wind break



Mining Activity/Source	Additional Control Measure
Use of haul roads	Application of chemical suppressants to roads generating impacts Alteration of routes to increase separation distances where practicable Reduction of vehicle speed limit Road grading Reduce number of trips through the use of larger trucks to transport material Permanent sealing of site roads
Batch drop conveyor	Partial cover of chute
Loading trains	Partial cover of chute
Coal loading for transport	Profile coal surface to flat shape to minimise wind resistance
Stacker and reclaiming product coal	Regular water spraying of Stacker reclaimer units Variable height stacker or tripper with chute/windshield Coal sizer ventilated through filter
Conveyor transfer points	Regular water spraying Conveyor wind shielding (roof) Soft loading chutes
Moisture content	Further optimise the moisture content of product coal and reject material as they leave the CHPP which avoids the need for supplementary watering.
Stockpiling	Use of level 1 watering (2litres/m ² /hour) and/or chemical suppressants
Grading	Level 1 watering (2litres/m ² /hour)
Wind erosion	Topsoil stripping when moisture is elevated but not sodden Use of wind barriers
Rehabilitation of exposed surfaces	Hydraulic mulch seeding
Blasting and drilling	Drill area moistened No drilling in adverse weather conditions
Draglines	Place material on overburden piles in a manner which minimises emissions
Loading and dumping overburden	Automatic water sprays Minimise drop height No dumping on high emplacements in strong winds
Loading and dumping ROM coal	ROM hopper enclosure of three sides and a roof Enclosure with fabric filter
Air Quality management tools	High Volume Air Sampling (HVAS) Directional dust gauges Continuous non-standard particulate measurement method GPS in trucks and dust controls SMS alarm system during high winds

- B7** The dust and particulate matter monitoring program must be submitted to the administering authority with the Plan of Operations, this will deal with the baseline and operational monitoring.

B8 Where monitoring at locations identified in

Table B-1 Ambient Dust Monitoring Program indicates that the air quality objectives detailed in condition B3 have been exceeded, the holder must investigate the matter and report to the administering authority within 14 days of receipt of monitoring results:

- (a) The concentration of PM₁₀ particulates or dust deposition rate recorded;
- (b) A description of meteorological conditions occurring at the time; and
- (c) The measures taken to reduce dust generated by the mining activities.

B9 If requested by the administering authority, dust and particulate monitoring must be undertaken for a stated period at a specified sensitive place, and the results provided to the administering authority within 14 days following completion of monitoring.

B10 If monitoring conducted pursuant to condition B9 indicates an exceedance of the levels detailed in condition B3, the holder must:

- (a) Address the complaint through the use of appropriate dispute resolution if required; and
- (b) Implement dust abatement measures as soon as reasonably practicable.

B11 The results of PM₁₀, dust deposition and meteorological monitoring must be reported to the administering authority on request. If requested, the results of PM₁₀, dust deposition and meteorological monitoring will be made available for use in any air quality monitoring network in the region operated independently of mining operations.

B12 The holder of the Environmental Authority must report annually to the administering authority:

- (a) The results and an analysis of dust and particulate matter monitoring, including consideration of the relevant meteorological data;
- (b) Details of the use of high management control measures including the dust and atmospheric conditions that triggered the action, when, where and what action was applied, and the effectiveness of the action meeting the requirements of conditions B3 and B4;
- (c) Identification of any trends (daily and seasonally) that should be considered in management of the mining activities and dust management practices; and
- (d) Any changes to the dust and particulate control actions and monitoring resulting from an analysis of a, b and c.

Dust Management Plan

B13 As part of the Environmental Management Plan required for the project approval, the holder shall prepare and implement a Coal Dust Management Plan to outline measures to minimise and manage any impacts from the operation of the project on local air quality. The Plan shall include, but not necessarily be limited to:

- (a) Identification of all major sources of dust emissions from the sources identified;
- (b) Description of the procedures to manage the dust emissions from the sources identified;
- (c) Collection of air quality and meteorological data at each location;



- (d) Identifying adverse meteorological conditions likely to produce elevated levels of PM10 at a sensitive or commercial place due to the mining activities;
- (e) Developing a weather forecasting system for the site;
- (f) Integration of dust control strategy with the weather forecasting system that would activate the timely management of dust control in addition to the best practice dust control measures during adverse meteorological conditions;
- (g) Protocols for regular maintenance of plant and equipment, to minimise the potential for fugitive dust emissions; and
- (h) Description of procedures to be undertaken if any non-compliance is detected.

General Dust Control

- B 14** The holder must design, construct, commission, operate and maintain the project in a manner that minimises or prevents the emission of dust from the site including wind-blown and traffic generated dust.
- B15** The holder must design, construct, operate and maintain the project in a manner that minimises the potential generation of fugitive dust emissions from plant and equipment, including where relevant and practicable, design of the project to minimise the number of coal transfer points, minimise the drop height from stackers to stockpiles, full or partial enclosure of conveyers and installation of wind shields and belt cleaning systems to conveyers.
- B16** For the purpose of avoiding any release of dust or particulate matter from the approved place which could cause environmental nuisance, the following measures must be taken:
 - (a) Stockpiles must be maintained using all reasonable and practicable measures to minimise the release of wind-blown or particulate matter to the atmosphere. Reasonable and practicable measures may include but are not limited to, anemometer switching systems which trigger operation of effective water spray systems during winds likely to generate such releases, uses of approved dust suppressants, shielding and storage in bunkers;
 - (b) Trafficable areas must be maintained using all reasonable and practicable measures to minimise the release of windblown dust or traffic generated dust to the atmosphere. Reasonable and practicable measures may include but are not limited to, sealing with bitumen or other suitable material; keeping surfaces clean; use of water sprays; adoption and adherence to speed limits (e.g. less than 50 km/h for unsealed road); use of approved dust suppressants and wind breaks.
 - (c) External transfer conveyers must be operated and maintained using all reasonable and practicable measures to minimise the release of wind-blown dust or particulate matter to the atmosphere. Reasonable and practicable measures may include, but are not limited to, transfer of materials in a moist state; enclosure or sealing of conveyers; use of water sprays at transfer points; shielding and wind breaks; and
 - (d) Water sprays or other dust control system must be installed at all major dust emission sources.



Odour Nuisance

- B17** The release of noxious and offensive odours or any other noxious or offensive air borne contaminants resulting from the mining activity must not cause an environmental nuisance at any nuisance sensitive or commercial place.
- B18** 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 14 days to the administering authority following completion of monitoring.
- B19** 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.

Meteorological Monitoring

- B20** The Environmental Authority holder must establish and maintain a permanent automatic meteorological station to continuously measure and record wind speed, wind direction, temperature, relative humidity and rainfall intensity.
- (Note: It is possible for the Environmental Authority holder to use relevant and available weather monitoring information collected by other parties as reference data for the purposes of this condition).*
- B21** The holder must record, compile and keep all monitoring records obtained from the automatic meteorological station.



T.3.4 Water Resources

T.3.4.1 Background

Surface Water Resources

The Project site (MLA 70425) is located within the Belyando/Suttor catchment, a sub-catchment of the Burdekin River. Sandy Creek is the main tributary through the site and flows into the Belyando River 19 km to the north of the Project area. The Belyando River joins the Suttor River a further 200 km downstream and eventually the Burdekin River at Lake Dalrymple (Burdekin Falls Dam). Several other tributaries flow into Sandy Creek within the mine lease including Sandy Creek, Little Sandy Creek, Rocky Creek, Middle Creek, Greentree Creek and Well Creek. All other streams located in the project area are tributaries of these watercourses.

The Belyando River catchment is bounded by the Great Dividing Range in the west with Denham and Drummond Ranges to the east and flows in a northerly direction to join the Suttor River in its lower reaches. Sandy Creek catchment to the junction with the Belyando River covers an area of approximately 7,700 km².

The Project area is generally characterised by flat terrain with the highest areas in the west reaching an elevation of approximately 400 m and lower terrain towards the east of the mine lease ranging from 290 m to 350 m. The sub-catchments within the Project area are comprised almost entirely of open pasture or grazing land with little development.

The Belyando/Suttor catchment produces a highly ephemeral flow, closely linked to rainfall patterns which are quite variable in the semi-arid climate of the region. As such, the catchment contributes comparatively less flow to the overall discharge from the Burdekin Basin than the other sub-catchments in the basin. Annual rainfall at the Project site is highly variable and subject to prolonged periods of above and below average rainfall. The mean monthly rainfall shows a distinct seasonal distribution with monthly rainfall totals greatest in the wet season extending from December through February and peaking in February at 95 mm. Evaporation is always in excess of rainfall and has a similar seasonal distribution peaking in December at 280 mm. Stream flows in the project area are characterised by large annual variations due to the seasonal and highly variable nature of rainfall. Stream flows generally occur during December to February when most of the region's rainfall occurs. The prolonged winter dry periods give rise to the ephemeral nature of the key watercourses.

There are no existing surface water licences for the use of water from the watercourse in close proximity to the Project area. The closest existing surface water licence is Licence Number 48434F approximately 150 km downstream of the Project area.

The existing watercourses have relatively small low flow (active) channels with wide floodplains. Sandy Creek is the master stream system with a distinctively anabranching channel system and channels 25 – 50 m wide. The 2 – 2.5 km wide floodplain is only active during floods larger than 1:50 annual exceedance probability (AEP) events. Well Creek and Rocky Creek are medium sized, predominantly single thread channels 5 – 25 m across, that carry significant sand bedload, and are aggrading in their upper reaches. Floodplains are only developed consistently along the lower reaches of Well Creek and are active during 1:10 to 1:20 AEP flood events. Little Sandy Creek and Rocky Creek are small streams with predominantly anastomosing channel systems 5 – 25 m across. They carry some medium sand bedload and show some evidence for current aggradation in their upper reaches.

The existing water quality of the watercourses and downstream receiving environment of the Project site was assessed to characterise the baseline water quality conditions using existing water quality monitoring data from DNRM gauging stations and baseline monitoring (undertaken as part of the EIS). The water quality data shows elevated turbidity which may be attributable to existing land uses in the catchment including open pasture and grazing which has historically involved widespread clearing and subsequently caused sediment mobilisation in waterways. Higher electrical conductivity (EC) values are also likely to be associated with land degradation, soil erosion and tree clearing from surrounding agricultural activities in the catchment. Inorganic nitrogen (NH₄) was consistently much lower than total nitrogen indicating that a significant proportion of the total nitrogen is attributable to organic sources. Elevated aluminium, copper, zinc and chromium concentrations may be attributable to existing agricultural activities in the area or may be naturally high.

Groundwater Resources

The Project coal deposit lies on the eastern side of the Galilee Basin. The geology consists of gently westerly dipping (generally 1 to 3° dip) sediments of Permian age, overlain by Tertiary and Quaternary sediments. Permian sedimentary deposits at the site comprise the Bandanna Formation and the underlying Colinlea Sandstone. The Bandanna Formation hosts the A and B coal seams, while the Colinlea Sandstone hosts the target C and D coal seams.

From a groundwater perspective, major hydrostratigraphic boundaries occur within MLA 70425 at the base of weathering, beyond which groundwater is often encountered under confined conditions in the B-C and C-D sandstone interburden, the coal seam aquifers, and at the base of the D coal seam. The sandstone unit directly below the D coal seam and above the E coal seam (D-E sands) will require depressurisation, while the overlying sandstone (B-C sandstone, C-D sandstone, and C and D coal seams) will need to be locally dewatered in order for mining to occur safely.

Below the D-E sands the Colinlea Sandstone coarsens with increasing depth. The sub-E sandstone (between the E and F coal seams) and sub-F sandstone (below the F coal seam and to the base of the Colinlea Sandstone) are regarded as containing significant groundwater resources.

Perched seasonal aquifers, with limited groundwater potential, can occur within the restricted alluvium deposits across MLA 70425, adjacent to the main creeks and rivers.

A review of the Nature Conservation and Heritage reports indicated that there are no Groundwater Dependent Ecosystems (GDEs) within the study area. Registered springs have been identified to the north of MLA 70425.

T.3.4.2 Environmental Values

Surface Water

Environmental values (EV's) for the project area have not been specified in Schedule 1 of the EPP Water. As no EVs have been identified by regulatory bodies, EV's for the receiving waters within the project area were derived from a desktop analysis of available information on the watercourses in the vicinity and data on downstream water uses.

The EVs identified for protection of water quality and quantity, include:

- Protection of slightly to moderately disturbed aquatic habitat;
- Suitable for visual recreation that does not involve contact;
- Protection of cultural and spiritual values; and



- Suitable for crop irrigation, stock water and farm use.

The available surface water quality data indicates that median physical-chemical parameters pH and EC are below trigger levels for aquatic ecosystem protection water quality objectives for most sites. However, elevated nutrient levels, turbidity and metals (copper, zinc, and aluminium, chromium, cadmium, boron) are evident compared with Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand (ANZECC & ARMCANZ; 2000) trigger values for protection of the aforementioned EVs.

The geomorphologic conditions of the watercourses to be protected include:

- The Sandy Creek anabranching channel system requires low channel stream powers and good vegetation cover to maintain stability;
- The reaches of the Little Sandy Creek, Rocky Creek, and Middle Creek in the vicinity of the mine generally have sandy beds in the existing channel and mature vegetation along the creek banks;
- The broader catchment in the broad transition between the source and transfer zones of the MLA watercourses, the mine reach can be considered as having a long-term equilibrium of erosion and sedimentation with a slight recent trend towards deposition arising from a phase of increased erosion triggered by land use changes;
- Rocky and Little Sandy Creeks have anastomosing channels the form of which is typically stable given they are formed in cohesive floodplain sediments; and
- Middle Creek is likely to have a more dynamic channel system as it is in a confined valley and lacks a well developed floodplain. Cycles of erosion and deposition are likely to occur naturally in such a system.

Groundwater

Based on the groundwater information compiled and assessed during the EIA, groundwater resources were assessed to have the following EV's:

- Domestic purposes – the bore survey results indicate that the majority of properties within and adjacent to the Project have a groundwater supply utilised for domestic purposes (some 10% of bores recorded during the bore survey). The bore survey does not provide details of household groundwater use but it is considered that groundwater (based on the limited surface water, reticulated water, and regular rainfall) is used for drinking, sanitation, laundry, and small scale (gardening) irrigation;
- Agricultural purposes - groundwater in the Project area is used predominantly for stock watering supply, and based on current usage patterns, groundwater has an environmental value for agricultural purposes, specifically watering of beef;
- Cultural and spiritual values – permanent or semi-permanent surface water features that are maintained to some degree by groundwater flow may have cultural significance in an area where surface water is normally ephemeral; and
- Surface water features (including those that may receive baseflow from groundwater) within and around the Project MLA 70425 are generally accessed by cattle for drinking water supply and in this respect the bed and banks of surface water features are degraded. Based on existing land use and



interaction of cattle with waterways, it is interpreted that surface water features in the area would have an EV applicable to moderately disturbed waters.

While groundwater in the area is used for domestic purposes levels of metals and metalloids can be above drinking water guideline values and generally is not suitable for drinking without treatment.

T.3.4.3 Potential Impacts on Environmental Values

Surface Water Impacts

The potential impacts on surface water values include:

- Impacts on hydrology (stream flows in the local water courses);
- Impacts on flooding;
- Impacts on surface water quality; and
- Impacts on stream stability (geomorphology).

These potential impacts are outlined in further detail below.

Impacts on Hydrology

The Project has the potential to cause changes to flows and drainage flow paths which in turn may impact on the existing geomorphology of the area. Additional impacts may arise from subsidence as the underground portion of the Project progresses.

The major factors that may cause changes to flows and drainage paths include:

- Changes in the catchment extents;
- Changes in the catchment runoff characteristics where the proposed mining operations would occur;
- Impacts on the timing of discharges from the mine to the natural system;
- Changes to flood discharge estimates through the Project area and downstream;
- Raised water levels upstream at the proposed Alpha Project; and
- Cumulative impacts from adjacent mining operations (existing and proposed).

Potential impacts to the catchment and channel system from subsidence include:

- Impacts to catchment boundaries, potentially resulting in self contained catchment areas where water that would have runoff to the creek channels prior to subsidence would now pool within the subsided area and be lost to groundwater due to percolation;
- Loss of surface water runoff through surface cracking;
- Change to stream bed profiles between long wall panels, resulting in erosion between adjacent long wall panels and sedimentation over the tops of the long wall panels;
- Potentially reduced flood capacity in channels due to increased sedimentation, resulting in more frequent inundation of floodplain areas; and
- Reduced stability of the proposed diversion channel due to subsidence.



Impacts on Surface Water Quality

The potential impacts on surface water quality include:

- Increased erosion and sediment mobilisation due to land disturbance during the construction;
- Activity during the operational and decommissioning phases that may lead to deleterious effects (turbidity, increased sediment bed load) on downstream water quality and aquatic habitats;
- Stream channel erosion and destabilisation if stream diversions are not adequately designed, constructed or rehabilitated;
- Uncontrolled or non-compliant release of potentially contaminated aqueous waste streams from refuelling facilities, chemical storage facilities and vehicle washdown areas could enter into drainage lines, altering the physical and chemical characteristics of the receiving waters;
- Increased salinity, dissolved metals and nutrient levels in receiving water courses from mine activities with consequent effects on environmental values for the aquatic ecosystem and livestock drinking water supply; and
- Failure of water storages, storage embankments, pipelines, levees or bunds has the potential to result in non-compliant discharge and environmental impacts for downstream receiving waters, ecosystems and landholders. These may include altered flow regimes in receiving waters; discharge of potentially contaminated water; alteration of riparian vegetation and aquatic species through changed environmental flows; and erosion and sedimentation at discharge points.

Impacts on Flood Hydraulics and Geomorphology

Hydraulic modelling results for the Project indicate that the proposed diversion should achieve the adopted design criteria and would not be expected to result in any significant detrimental hydraulic impacts to the Little Sandy Creek, Rocky Creek, and Middle Creek system. Notwithstanding the satisfactory model results there are some potential environmental impacts (risks) due to the diversion channel of Little Sandy Creek, Rocky Creek, and Middle Creek, which include:

- Erosion of the diversion channel due to flooding following construction of the diversion channel and before rehabilitation of the channel with vegetation that has had sufficient time to become established;
- Excessive sedimentation within the diversion channel due to a reduced longitudinal gradient, resulting in:
 - reduced flood capacity within the channel system, which reduces the flood immunity of the flood protection levees; and
 - a reduction in sediment supply to the Sandy Creek system for the more frequent floods and a higher sediment load during the less frequent events, possibly resulting in excessive deposition in Sandy Creek downstream of the confluence with Well Creek.
- Sedimentation at the confluence of each of the creeks and the diversion due to decreased velocities prior to entering the diversion channel;
- The formation of an unstable channel system with a wide floodplain resulting in a reduction in vegetation and riparian habitat; and

- Increased erosion in Middle Creek and Well Creek downstream of the diversion channel due to increased catchment area and potential increased frequency of flows in the creek channel.

Groundwater Impacts

Potential impacts of mining activities on the groundwater resources include:

- Groundwater level decline and alteration to groundwater flow patterns and gradients are likely due to mine dewatering activities. Based on modelling predictions, a decline in groundwater levels of 5 m or greater may be experienced at distances up to 10 km from the mine workings;
- If not adequately controlled, artificial recharge as a result of seepage from water and waste storage facilities can cause mounding (alteration of groundwater patterns and possible waterlogged areas) and off-site contaminant migration via shallow groundwater flow to the surface water system; and
- A final void maintains the presence of a groundwater sink (due to negative climate balance through evaporation) that will draw groundwater flow toward the void (both on-site and within the adjacent Alpha Coal Project).

The potential impacts of mining activities on the groundwater resources, and recognised EVs, are related to the decline in groundwater levels as a result in mine dewatering. Potential alteration in groundwater quality, due to possible poor quality seepage from water and waste storage facilities, will be limited as groundwater will flow towards the final void and not off-site. The impacts of reduced groundwater levels on the EVs include:

- Groundwater level drawdown in existing groundwater bores has the potential to impact on bore productivity, e.g. by limiting the available drawdown in the bore and hence reducing yield, or by drawing the water level down below the existing pump intake; and
- A cone of depression as a result of mine dewatering will alter groundwater flow directions towards the mine voids and potentially reduce the groundwater levels in the vicinity of Sandy Creek, effectively removing the potential for groundwater discharge to Sandy Creek in the vicinity of the operation.
- These impacts are to be assessed over time through optimum monitoring programs and mitigated through the make-good commitments, including the provision of alternative water supplies to affected water resources and end users.

All mine infrastructure water and waste storage facilities will be designed and constructed, according to industry standards, to include seepage mitigation. The existing groundwater monitoring network will be enhanced to allow for the monitoring of potential seepage adjacent (down gradient) from these facilities.

The groundwater monitoring network, installed for the EIS, will be enhanced to monitor the potential impacts of the mine infrastructure on the groundwater resources to the east of Sandy Creek. The proposed monitoring points are included in Figure T-9.

T.3.4.4 Environmental Protection Objectives

Surface Water Objectives

The environmental protection objectives for surface water values are to:

- Maintain the existing chemical, physical and biological integrity of downstream water quality to protect aquatic ecosystems;



- Ensure that the Project does not detrimentally impact on the suitability of water for irrigation, stock watering, farm use and visual recreation; and
- Ensure that the Project does not detrimentally impact on the sustainability of geomorphologic characteristics of the watercourses.

Groundwater Objectives

The environmental protection objectives for groundwater are to:

- Ensure the Project does not detrimentally impact on the suitability of groundwater for domestic use (including drinking) and agricultural use (stock watering);
- Ensure the alteration in direct recharge to the Colinlea Sandstone will be kept to a minimum;
- Protect cultural heritage or spiritual values associated with surface water features that are maintained by groundwater (if any); and
- Ensure the implementation of make-good commitments to mitigate any adverse effects on the groundwater resources.

T.3.4.5 Performance Criteria

The performance criteria for surface water resources are:

- Compliance with the requirements of the Project's Environmental Authority;
- Undertake surface water monitoring programs in accordance with the programs outlined within this EMP; and
- Implement surface water control strategies as outlined within this EMP.

The performance criteria for groundwater resources are:

- No adverse changes to groundwater quality as a direct result of the Project;
- Alteration of recharge in the Colinlea Sandstone outcrop area is to be kept to a minimum;
- No alteration of the diffuse recharge areas to the southwest along the Great Dividing Range so as to ensure recharge during the life of the mine and after mining ceases;
- A final void will remain at the end of mining to ensure the zone of influence, both groundwater level changes and hydrochemistry, will be managed and maintained and after mining ceases;
- Landholders concerns over impacts on their water supplies are assessed in a timely and prompt manner; and
- Mine infrastructure will be designed and constructed to manage any potential seepage from water and waste storage facilities in order to minimise the potential impact on groundwater aquifers during the life of the mine and after mining ceases.

T.3.4.6 Control Strategies

The following control strategies will be implemented to minimise the potential impacts identified above.

Surface Water

Diversion Controls

Specific diversion control strategies for the Project include:

- Construction of the diversion channel in stages and implementation of a rehabilitation plan; and
- Monitoring of deposition and erosion at fixed control locations with periodic (e.g. bi-annual) photographic surveys of the diversion channel; confluences with Little Sandy Creek, Rocky Creek, and Middle Creek; and existing Middle Creek and Well Creek channels downstream of the diversion channel. Evidence of impacts on the morphology of the creeks will trigger further investigations of the cause and identification of remedial strategies.

Subsidence Controls

A number of pre-subsidence measures will be implemented when applicable within the bed and banks of watercourses to minimise the potential for adverse subsidence impact to arise. These measures are detailed in the Subsidence Management Plan that has been prepared for the Project and include:

- Install timber groynes/pile field retards at the base of the channel banks (extending into the channel) to mitigate erosion undercutting the channel banks and to facilitate creation of in-channel benches;
- Proactive excavation of pillar zones from creek channel to facilitate natural drainage of ponded area as far as practicable (e.g. excavated trapezoidal drainage channels);
- Design local drainage works to prevent the uncontrolled flow of runoff from the subsided floodplain area over the channel banks. Small diversion bunds directing floodplain runoff to properly engineered rock chute structures will be installed to minimise bank erosion;
- Provide a cover of topsoil in a weathered rock matrix to create a stable substrate for revegetation of channel banks. Weathered rock provides temporary erosion protection by covering erodible soils and minimising topsoil loss;
- Topsoiling and revegetation on banks; and
- Cattle will be excluded to a width of at least 30 m from the top of bank and subsided floodplain areas in order to minimise further impacts on vegetation cover and land condition.

In addition, pre-subsidence monitoring of the proposed subsidence areas will be undertaken to ensure that any subsidence impacts are quickly identified and appropriate mitigation applied. These include:

- Photographic surveying;
- Offsetting of targeted flora in shallow cover areas; and
- Commitments to monitor for cracking and repair as soon as is practicable.

A Post-subsidence Drainage and Waterway Monitoring Program including mapping downstream and upstream of the active subsidence zone will be used to determine if any increased erosion, sedimentation is occurring in the channel to unsustainable level and/or surface flow losses into cracks is occurring between longwall blocks.

Post-subsidence control strategies for the Project may include:

- Replace sand across the channel bed, including higher sand deposits suitable for re-creation of in-channel benches;
- In areas where less active bank erosion develops, large woody debris will be placed in-stream to encourage the deposition of sediment and revegetation over time;



- Targeted revegetation will be undertaken in areas where surface water patterns have been affected;
- Ripping and seeding of persistent cracks. This will be supplemented with more expensive grouting treatments such as bentonite injection or placement of sand will be available as fall-back contingency measures in the event that losses continue to occur;
- If natural channel erosion and sedimentation does not reduce the volume of channel bed depressions (and consequent ponded water volumes), remedial works to reinstate an evenly graded bed profile (i.e. free draining channel) will be considered;
- Reaches of levee embankments would be assessed for cracking and reconstructed where cracking had the potential to reduce the 1:1,000 AEP flood immunity;
- Regrading and backfilling with mine spoil to minimise erosion and sedimentation; and
- Any additional mechanisms, as identified by the annual subsidence monitoring, will also be considered.
- At the end of the mine a detailed assessment of sediment sources and stream sediment transport will be undertaken, to determine whether mining-related impacts have been appropriately mitigated, and that the geomorphic systems can continue to function sustainably in the long term prior to the mining licence has been relinquished.

Surface Water Quality Controls during Construction

The following control strategies will be implemented to minimise potential surface water impacts during construction activities:

- The construction contractor will be required to prepare and implement a Construction Environmental Management Plan (including an Erosion and Sediment Control Plan SEIS Appendix T4.04 and a Surface Water Management Plan SEIS Appendix T4.11) prior to the commencement of construction activities;
- Construction activities that will affect existing drainage lines and control measures will only be carried out after suitable stormwater management infrastructure has been installed on-site.
- Specific construction activities should only be carried out in the dry season. Clearing or topsoil removal will not be carried out during heavy rainfall;
- Vegetation disturbance will be carried out in accordance with a permit to disturb the system and will be kept to a minimum, particularly riparian vegetation. The number of passes over water crossings and in riparian areas is to be kept to a minimum;
- Vehicle crossings will be adequately designed for a range of flow conditions in accordance with the DNRM guideline – *Activities in a watercourse, lake or spring carried out by an entity* (WAP/2010/4165);
- Dust suppression measures will be adopted such as water sprays or stockpile covers;
- Topsoil will be stripped and stockpiled away from drainage lines to protect them from sedimentation;
- Bunds will be constructed to restrict flow velocities across the site;
- Sedimentation dams will be constructed to capture dirty water runoff and used preferentially for dust suppression;

- Mitre drains will be used to divert runoff from road shoulders and table drains into sedimentation dams;
- Groundcovers will be established to rehabilitate areas disturbed by road crossings and slope protection material will be used on road batters;
- Temporary and permanent chemical and fuel storage areas will be appropriately bunded in accordance with AS 1940. All transfers of fuels and chemicals will be designed to prevent spillage outside bunded areas;
- Chemical storage and refuelling sites will be selected to minimise stormwater inundation and reduce the potential for clean runoff to mix with contaminated water;
- All refuelling activities will occur within bunded areas in accordance with AS1940;
- Bunds and sumps will be frequently drained and treated or disposed of by a licensed waste collection and transport contractor;
- Spill cleanup kits in accordance with Australian Standards (AS1940 and AS3780) will be located in appropriate locations, including inside machinery and vehicles;
- In the event of a spill occurring, the Proponent will ensure it is controlled, contained and cleaned up to prevent the mobilisation of pollutants in drainage lines or watercourses. Contaminants and major spillages will be collected by a licensed waste collection and transport contractor for disposal at an off-site licensed facility;
- Vehicle washdowns will be located away from drainage lines or watercourses and wastewater from washdowns will be directed through oil and grease separators; and
- Effluent will be recycled where practicable.

Surface Water Quality Controls during Operation

During operation of the Project, the following control strategies will be implemented to reduce the impact on surface water values:

- Design of water storages using a water balance model which considers all inputs and outputs which has run through a long term period of climatic data to test storage capacities particularly in high rainfall wet seasons;
- Water storages designed in accordance with the Queensland Manual for *Hazard Assessment and Hydraulic Performance of Regulated Dams* (DERM, 2012);
- Monitoring equipment will be installed to monitor storage volume during operation combined with a water management system to prevent overfilling;
- Design and construction supervision and regular inspections of dam embankments undertaken by a Registered Professional Engineer of Queensland (RPEQ);
- Regular inspections and maintenance to be undertaken during operation of water management infrastructure including water storages, tailings dam levels, integrity of embankment, spillways, pipeline, drain, bund, diversions and levees;
- The development and implementation of a Mine Water Management Plan (SEIS, Volume 2, Appendix T4.12) incorporating erosion and sedimentation control measures;



- Swales and buffer strips to be constructed to provide stormwater filtration (through vegetation) prior to discharge to receiving waters provide water treatment;
- Progressive rehabilitation of overburden spoil piles will be undertaken to reduce erosion and sedimentation potential; and
- Monitoring programs will be implemented as outlined in this EMP (Section T.3.4.7) to monitor the impacts of mine operations on the receiving watercourses. Site specific trigger values for assessing water quality will be developed based on the baseline monitoring program.

Storm Water Management

- The stormwater generated from facilities within the mine area to the west of Sandy Creek will be contained within the mine water management system and is not proposed to be separately released to the environment.
- Stormwater generated within the Light Industrial Area and the Accommodation Village which are located outside of the mining area will be managed through dedicated stormwater management systems using best practice water sensitive urban design principles. Excess stormwater will be discharged to the environment following an appropriate level of treatment in accordance with accepted practice.
- Stormwater generated within the Light Industrial Area will be treated and reused on-site wherever possible. Excess stormwater will be discharged to Sandy Creek.
- The design of this stormwater infrastructure will be developed and incorporated into the further conceptual design planning and final detailed design. Once this has occurred a revision of this EMP will be developed incorporating these updates and changes.

Control Strategies Specific to the Rail Loop

- Minimise the use of pesticides within the rail loop corridor and only use pesticides with low residual impacts; and
- Clean up any coal spills immediately.

Groundwater

Water Level Impacts

Under the *Water Act* (2000) DEHP has authority to direct the licensee to provide and maintain alternative water supplies for other holders of water entitlements who are materially impacted by the granting of a licence.

The Project will develop alternate water supply agreements with landholders who will potentially be impacted by mine dewatering. Landholders who have groundwater supplies that are materially impacted by the operation, to a degree where groundwater is not able to be used for its pre-mining beneficial use (in terms of quality and/or quantity) will be provided with an alternate water supply of comparable yield and quality.

It is expected that this may include strategies such as:

- Lowering pumps within an existing borehole, or supplying pumps with a greater head capacity if required;

- Drilling new bores to a greater depth, e.g. to intersect the sub-E sands or lower aquifers, which are not a target of dewatering by the operation; and
- The provision of replacement bores for affected landholders will be such that the new bores are able to continue to supply water for the maximum predicted impacts of mining on water level.

Additional issues to be included when developing the make-good agreements with affected groundwater users could include:

- Details regarding the baseline data compiled during the current bore survey of groundwater use;
- Access to groundwater monitoring sites;
- Groundwater level data trends and comparison to Environmental Authority condition trigger values;
- Details regarding the groundwater monitoring network and dewatering scheme(s);
- A commitment that all groundwater monitoring will be conducted and assessed by a suitably qualified independent expert;
- Provision for the repair or replacement of damaged bores or water supply infrastructure, if HGPL is proven to have caused the damage;
- Replacement of diminished groundwater with water of the same quality or better, and same volume;
- A subsidy to cover additional costs associated with:
 - larger pumps;
 - deeper depths;
 - additional water related infrastructure;
 - power costs; and
 - spare parts
- Financial provisions are to be made to ensure future costs are covered;
- A dispute resolution system; and
- In the absence of agreement, the provision for arbitration to settle the terms of agreement.

The presence of groundwater dependant ecosystems (GDE's) within the predicted area of impact of the operation is not expected. Nevertheless, groundwater level and water quality monitoring will be undertaken at the location of the registered springs to confirm that mine dewatering will not impact on the base flow from groundwater to these surface water features.

Groundwater Quality Impacts

The proposed out-of-pit TSF can act as a continuous seepage source, which could potentially impact on the groundwater resources. The TSF, to be used for the first 5 to 7 years (until sufficient void space is available within the Northern open-cut mine to facilitate co-disposal of tailings), is located on clay-rich weathered Tertiary sediments. This clay-rich material, the seepage prevention design and construction of the TSF and the limited groundwater potential of the weathered sediments, all indicate a manageable level of risk of seepage to groundwater from the TSF.

Seepage potential from the in-pit tailings will be limited as the compartments within the mine void, created to receive tailings, will include floor and wall linings.



Controls will be implemented to prevent seepage and to manage seepage should it occur. Potential seepage from tailings storage will be monitored using down-gradient groundwater monitoring bores.

In the event of groundwater impact being identified, mitigation measures could include:

- Investigation of the integrity of the containment systems and potential areas/sources of seepage; and/or
- Installation of systems to intercept groundwater (e.g. interception trenches or bores).

It is, however, considered that any potential seepage within the Project footprint will be located within the zone of depression (created by mine dewatering) during mining and post-mining (final void influence) thus any potential groundwater contamination will enter the mine and not migrate off-site.

Mine Closure

Control strategies to be implemented prior to mine cessation, to facilitate mine closure from a groundwater perspective, include:

- Reassess groundwater model predictions on an annual basis using groundwater monitoring data;
- Evaluate and assess the groundwater monitoring network, validity and enhancement, on an annual basis;
- Compilation and interrogation of long term groundwater monitoring data to facilitate long term impact predictions and assessment;
- Provision of agreements with landholders who are predicted to be affected after mining ceases, for alternative water supplies or other agreed rectification measures; and
- Strategies to mitigate long term adverse impacts on water quality.

T.3.4.7 Monitoring

The proposed surface water monitoring programs for the project will include surface water quality monitoring, monitoring of stream diversion performance and subsidence monitoring. The proposed monitoring programs are outlined in this section.

Surface Water Quality Monitoring

Two monitoring programs are described in the following section. A baseline monitoring program and an on-going surface water quality monitoring program are proposed to assess the impact of the project operations on the receiving environment. Both programs are to be undertaken in accordance with the *DEHP Monitoring and Sampling Manual 2009* which provides guidance on techniques, methods and standards for sample collection, sample handling, quality assurance and control, and data management.

Baseline Monitoring Program

The baseline monitoring program commenced as part of the EIS and is proposed to continue until construction commences. As limited site specific background water quality data is available, the monitoring program will be used to establish a data set for developing site specific water quality trigger values.

Data collected from reference sites are used to estimate percentile values, which in turn are used to derive guidelines. For slightly to moderately disturbed waters, the 20th and 80th percentiles are used. Reference



monitoring sites are considered to be a suitable benchmark for comparison of similar watercourses and are subject to minimal disturbance (QWQG 2009).

The proposed 25 sites are summarised in Table T-12 and include:

- Native Companion Creek at Violet Grove (E 470,132, N 7,384,603) (off-site reference). The surrounding land use is comparable to the Project area, being low intensity cattle grazing. No significant intensive activities have been identified upstream of this proposed reference site.
- Twenty sites have been selected as on-site references. The sites are situated upstream and downstream of the project area along Lagoon Creek, Sandy Creek, Middle Creek, Well Creek, Rocky Creek, Little Sandy Creek and Spring Creek. All locations meet the criteria for suitable reference sites and are currently undisturbed.
- Four DEHP gauging sites have also been selected as reference sites which are within approximately 100 km of the project site, have similar existing land uses to the project area and meet the Queensland Water Quality Guidelines criteria for reference sites. The gauging stations are Mistake Creek at Twin Hills (120309A), Mistake Creek at Charlton (120306A), Belyando River at Gregory Development Road (120301B) and Native Companion Creek at the Violet Grove (120305A). Available data from these sites will be sourced from DEHP at the end of the baseline monitoring program.

Table T-12 Water Quality Monitoring Reference Sites

Site ID	Site Description	Coordinates			
		Longitude	Latitude	Easting	Northing
Native	Off-site - Native Companion Creek at Highway	146.70713	-23.64900	470,132	7,384,603
1	Lagoon Creek Upstream	146.50753	-23.11128	449,572	7,444,077
2	Lagoon Creek	146.50587	-23.03964	449,375	7,452,007
3	Sandy Creek Downstream	146.51162	-22.99849	449,949	7,456,564
5	Well Creek Downstream of Little Sandy	146.50264	-23.04005	449,044	7,451,960
6	Middle Creek Upstream	146.38845	-23.06756	437,358	7,448,870
7	Middle Creek	146.42681	-23.08567	441,295	7,446,882
8	Middle Creek	146.43266	-23.07765	441,891	7,447,772
9	Well Creek Downstream	146.46482	-23.04502	445,172	7,451,396
10	Rocky Creek Upstream	146.35139	-23.10048	433,578	7,445,210
11	Rocky Creek Downstream	146.41766	-23.11379	440,370	7,443,765
12	Little Sandy Creek Upstream	146.34739	-23.13476	433,185	7,441,413
13	Little Sandy Creek Downstream	146.41697	-23.13110	440,307	7,441,848
14	Proposed Stream Gauging Station	146.49856	23.070781	448,639	7,448,028
A1	Lagoon Creek Upstream	146.48551	-23.33321	447,404	7,419,500
A4	Lagoon Creek Upstream	146.52091	-23.14202	450,953	7,440,678
A5	Greentree Creek	146.41934	-23.16079	440,563	7,438,562
A7	Rocky Creek	146.46379	-23.10169	445,089	7,445,122



Site ID	Site Description	Coordinates			
		Longitude	Latitude	Easting	Northing
A8	Little Sandy Creek Downstream	146.42358	-23.29371	441,055	7,423,849
A9	Spring Creek Upstream	146.40339	-23.28915	438,989	7,424,345
120309A	DEHP Gauge - Mistake Creek at Twin Hills	146.95000	-21.95000	494,837	7,572,706
120306A	DEHP Gauge - Mistake Creek at Charlton	147.10000	-22.50000	510,285	7,511,825
120301B	DEHP Gauge - Belyando River at Gregory Development Road	146.86667	-21.53334	486,193	7,618,819
120305A	DEHP Gauge - Native Companion Creek at the Violet Grove	146.66667	-23.56667	465,984	7,393,708

Parameters for Baseline Monitoring

The choice of measurement parameters is based on protection of EVs as identified in [Table T-13 Parameters for Baseline Monitoring Program](#). The parameters chosen are those that may be influenced by coal mining operations and in turn negatively impact on the EVs. [Table T-13](#) shows the monitoring parameters to be tested at each baseline monitoring site.

Table T-13 Parameters for Baseline Monitoring Program

Analyte Group	Parameter	Rationale
Physico-chemical	Alkalinity	Generic parameters for data analysis to indicate general stream condition
	Acidity	
	Electrical Conductivity (field & lab)	
	pH (field & lab)	
	Suspended Solids	
	Turbidity (field)	
	Flow rate	
	Dissolved Oxygen (field)	
	Temperature (field)	
	Fluoride	
	Sodium	
	Sulphate	
Metals (total & dissolved)	Aluminium	Indicators of naturally occurring metal contents in the region. During mine activities elevated metal concentrations could indicate uncontrolled mine drainage.
	Arsenic	
	Boron	
	Cadmium	
	Chromium	
	Cobalt	
	Copper	
	Iron	
	Lead	

Analyte Group	Parameter	Rationale
	Manganese	
	Mercury	
	Molybdenum	
	Nickel	
	Selenium	
	Silver	
	Uranium	
	Vanadium	
	Zinc	
Total Petroleum Hydrocarbons	C6 – C9	Indicators of fuels spills from vehicles and equipmen (excluding naturally occurring levels of TPH)t
	C10 – C36	
Nutrients	Ammonia	May vary as a result of contamination from mine activities
	Nitrate	

Baseline Monitoring Schedule

Sampling will be undertaken following rainfall events that generate sufficient runoff to cause stream flow. Sampling events will correspond with rainfall events that generate enough runoff to trigger sampling. Given that the watercourses are ephemeral and only flow after large rain events, it is recommended that the stream gauging station which has been installed on Lagoon Creek as part of the Alpha Bulk Sample Test Pit operations be used to alert monitoring staff of flow events that may trigger actions and the Safety and Health Management System (SHMS) flood response, and indicate that a grab sample should be collected. Given that the watercourses are ephemeral and only flow after large rain events, it is proposed that stream gauging stations with data loggers would be used at selected locations to record highly variable parameters such as dissolved oxygen (DO), pH and EC and stream height. The stream gauging stations would also be used to alert monitoring staff of flow events that may trigger actions and flood response, and indicate that a grab sample should be collected.

The proposed monitoring schedule for the baseline program is outlined in Table T-14 and would continue until construction activities commence.

Table T-14 Baseline Water Quality Monitoring Schedule

Monitoring Type	Sites	Parameter	Frequency
Event Sampling	1, 2, 3, 5, 6, 7, 8, 9, 10, 11, 12, 13, 14, A1, A4, A5, A7, A8, A9, Native	All parameters indicated in Table T-13 Parameters for Baseline Monitoring Program	Fortnightly during and after major rainfall events where flow is sufficient and access is available.

An on-going monitoring program will be implemented to measure the impact of mine operations by monitoring watercourses upstream and downstream of the mine site. The data will also allow performance reviews of various management plans and mitigation measures implemented to protect the values of the watercourses in the project area.



The locations for the on-going program have been chosen to assess whether the quality of water entering the site is the same as water leaving the mine site. The majority of the baseline monitoring sites are proposed to be maintained in the on-going program for event based sampling (Table T-15). The sites which will be discontinued are those that are currently located on the watercourse which will be diverted by the proposed creek diversion. The maintenance of the baseline monitoring sites for the operational phase will allow direct comparison of the water quality prior to, and during operations at identical sites. It is noted that some monitoring sites may become inaccessible or inundated as the mine is developed, and where this occurs alternative sites with similar characteristics would be established where practicable.

The on-going monitoring program is to be continued as per the baseline program. Sampling events will correspond with rainfall events that generate enough runoff to trigger sampling. Two stream gauging stations with probes for pH and EC will be established on Sandy Creek (Site 14) and on Middle Creek downstream of the proposed diversion (Site 8) as described in Table T-15.

Parameters for On-going Monitoring Program

The parameters to be analysed for the on-going monitoring program are identical to the baseline program as outlined in Table T-15. These water quality parameters are selected based on protecting the EVs of the watercourses and include parameters that may be impacted on by coal mining operations.

Monitoring Schedule for On-going Program

The on-going monitoring program is to be continued as per the baseline program. Sampling events will correspond with rainfall events that generate enough runoff to trigger sampling. Stream gauging stations with probes for pH and EC will be established to log these parameters and alert monitoring staff of flow events when grab samples should be collected.

The proposed monitoring schedule for the ongoing program is outlined in Table T-15 which should be undertaken during construction activities and throughout mine operation.

Table T-15 On-going Water Quality Monitoring Schedule

Monitoring Type	Sites	Parameter	Frequency
Stream Gauging Stations	8,14	pH, EC	Continuous
Event Sampling	1, 2, 3,4, 5, 8, 9, 10, 12, 13, 14, A4, A5,	All parameters indicated in Table T-13 Parameters for Baseline Monitoring Program	Fortnightly during and after major rainfall events where flow is sufficient and access is available AND Daily during the release

Diversion Monitoring Program

A proposed monitoring program for the Little Sandy Creek, Rocky Creek, and Middle Creek diversion is based on the report *Monitoring and Evaluation Program for Bowen Basin Diversions* (ID&A, 2000) undertaken for the Australian Coal Association Research Program (i.e. the ACARP Guidelines for Stream Diversions). The monitoring of the stream diversion would extend from pre-construction to licence relinquishment and comprises four components as shown in



Table T-16. The goal of the monitoring program is for the diversion to be considered as a reach or stream operating in dynamic equilibrium in order to achieve diversion license relinquishment. Application for diversion license relinquishment will occur at mine closure and depend on outcomes of the monitoring program.

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Table T-16 Diversion Monitoring Requirements

Monitoring Package Components	Objective
Baseline monitoring	To establish a baseline data set that can be used for comparison when applying for licence renewal and relinquishment. This occurs one year before construction and is to establish data that be used for comparison to assess the performance of the diversion.
Construction monitoring	To demonstrate works have been undertaken to specification.
Operations monitoring	To monitor and evaluate the diversion's performance to ensure it is operating in dynamic equilibrium. Occurs for ten years after construction.
Relinquishment monitoring	To attain licence relinquishment by demonstrating the diversion is operating in dynamic equilibrium and not adversely impacting on adjoining reaches. Occurs for ten years after operations preceding application for relinquishment.

Baseline and operational monitoring requirements are presented in Table T-17. Construction monitoring requirements are presented in Table T-18. Relinquishment (i.e. the decommissioning and rehabilitation period) monitoring requirements are shown in Table T-20 Relinquishment Monitoring Requirements. Relinquishment evaluation requirements are shown in Table T-21 Relinquishment Evaluation Requirements.

Following comparison of monitoring data post construction with the baseline data, an evaluation of the stability of the diversion channel (i.e. dynamic equilibrium) and sustainability of the diversion will be undertaken. The evaluation of the channel would include the performance of the diversion for small and large flood events.

If the diversion does not appear to have reached a dynamic equilibrium, mitigation measures will be identified and implemented towards a goal of achieving sustainable long term stability.

Table T-17 Baseline Monitoring Requirements

Baseline Monitoring Undertaken	
Index of Diversion Condition	Photographs will be taken to record the condition of the stream before works are initiated. Photographs will be taken of the Control reach, the reach to be diverted and the downstream reach. Photographs are to be taken from fixed points along the control and downstream reaches, to allow future comparisons. Refer to Appendix C of ACARP (2001) for an aerial photograph showing recommended photo locations and directions. Further details of fixed photo monitoring points are provided in Appendix C of ACARP – Monitoring and Evaluation Program for Bowen Basin River Diversions”.
Vegetation	The species, abundance and diversity of vegetation in the reach to be diverted will be recorded before the diversion is conducted. This information will be used for revegetating the new diversion and used for comparison during relinquishment monitoring.
Aerial Photographs	Take aerial photos displaying the existing condition of Little Sandy Creek, Rocky Creek, and Middle Creek and also the location of the new diversion before works begin. The scale of the aerial photo will be sufficient to allow accurate measurements of the diversion and adjoining creek. Further details of aerial photographs are provided in ACARP (2001).
Flow Events	Information regarding the size and frequency of flow events may be assessed by checking debris marks and hydrologic data compiled as part of the engineering design process should there not be a flow gauging station. This will be a key part

Baseline Monitoring Undertaken	
	of DEHP's assessment process as to what range of flow the diversion has been subjected to.
Survey	Cross-section and long-section surveys are required for all monitoring reaches. The sections generated will be included as part of the monitoring database and will be used to monitor the performance of the diversions during their operation by comparison with future sections. This will also contribute to relinquishment monitoring.

Table T-18 Construction Monitoring Requirements

Construction Monitoring Requirements	
Execution Outputs	An execution output database will be established to record descriptions of the construction activities completed. The date of activity completion should be noted along with details of any accompanying photographs. Construction activities not completed to specification will be recorded in the database along with an explanation and details of the modified design.
Photographs	Photographs will be taken during construction/rehabilitation and immediately after the work is finished. Photographs will be taken from fixed photo monitoring points (refer Appendix C of ACARP - <i>Monitoring and Evaluation Program for Bowen Basin River Diversions</i>).
Aerial Photographs	If practical, an aerial photo will be taken immediately after diversion construction or rehabilitation has been completed. These photographs will accurately display the extent of change and provide a baseline reference for changes that may occur in the future.
-Issued for Construction" Drawings	Design drawings issued to the contractor for construction are to be supplied.
-As Constructed" Drawings	As Constructed Drawings to be supplied upon completion of works to DEHP.

Table T-19 Operations Monitoring Requirements

Operations Monitoring Requirements						
Survival of Works	The survival of creek structures and works such as riprap and vegetation will be assessed during this phase of monitoring. Early detection of any damage is likely to increase the options for remedial action.					
Photographs	Photographs will be taken from fixed photo monitoring points along all of the reaches on an annual basis. Refer to Appendix C of ACARP - <i>Monitoring and Evaluation Program for Bowen Basin River Diversions</i> for more details.					
Aerial Photographs	Aerial photographs of the control reaches, diversion reaches and downstream reaches will be taken on an annual basis.					
Visual Assessment	The control reaches, diversion reaches and downstream reaches will be visually assessed using the IDC, which will be repeated in the following years after construction: <ul style="list-style-type: none"> 1st, 2nd, 5th, 10th, 15th, 20th years and after significant flow events. 					
Index of Diversion Condition	Inspection will include assessment of:					
	<table> <tr> <td>bank condition</td><td>stability of creek structures</td></tr> <tr> <td>piping</td><td>structural intactness of vegetation</td></tr> <tr> <td>bed condition</td><td>regeneration of vegetation</td></tr> </table>	bank condition	stability of creek structures	piping	structural intactness of vegetation	bed condition
bank condition	stability of creek structures					
piping	structural intactness of vegetation					
bed condition	regeneration of vegetation					

**Operations Monitoring Requirements**

	recovery proximity of spoil piles from bank	longitudinal continuity of vegetation
Survey	Longitudinal section and cross section surveys will be conducted in the Control reaches, Diversion reaches and Downstream reaches. These surveys will be repeated every 5 years or after a major flood event (e.g. 1:20 AEP event). Refer to Appendix C of ACARP – <i>Monitoring and Evaluation Program for Bowen Basin River Diversions</i> for more details.	
Flow events	Flow events will be monitored to determine the size of events the diversions have carried. Refer to Appendix C of ACARP – <i>Monitoring and Evaluation Program for Bowen Basin River Diversions</i> for more details.	

Table T-20 Relinquishment Monitoring Requirements

Relinquishment Monitoring Requirements

Survey	Long section and cross section surveys will be conducted during the first year of relinquishment monitoring. The surveys will include the Control reaches Diversion reaches and Downstream reaches. Final long section and cross section surveys will be conducted prior to application for licence relinquishment.
Vegetation Assessment	Detailed vegetation assessment will be conducted during the first year of relinquishment monitoring to determine key native species absent from the diversion reaches but present in control reaches where this is appropriate. The diversion reaches may therefore have different geomorphic and ecological characteristics than the reaches being replaced.
Photographs	Photographs will be taken from the fixed photo monitoring points in the control, diversion and downstream reaches.
Aerial Photographs	Aerial photos of diversions and controls, diversion and downstream reaches will continue to be taken on an annual basis.
Flow Events	Flow events will be monitored to determine the size of events the diversions have been subjected to.

Table T-21 Relinquishment Evaluation Requirements

Relinquishment Evaluation Requirements

Survey	Quantitative assessment of data. Assess against flow data and baseline data. This survey will be compared to the 'as constructed' long sections to assess the changes in bed elevation.
Vegetation Assessment	Qualitative assessment of all data. Assess against flow data and baseline data.
Photographs	Qualitative assessment of all data. Assess against flow data and baseline data. Compare visually with previous photographs.
Aerial Photographs	Qualitative assessment of all data. Assess against flow data and baseline data. Compare with previous years to detect changes in vegetation and topography.
Stage 1 Evaluation	Survey data from baseline and operation monitoring will be compared with data from relinquishment monitoring.
Stage 2 Evaluation	All data will be evaluated and photographs collated for presentation to regulators. An example of relinquishment monitoring and evaluation is presented in Appendix F of ACARP – <i>Monitoring and Evaluation Program for Bowen Basin River Diversions</i> .

Subsidence Monitoring Program

Baseline condition monitoring of all watercourses likely to be impacted through subsidence will be undertaken prior to the commencement of underground mining in accordance with the *Index of Diversion Condition* developed as a result of the ACARP Project C9068. Subsidence monitoring will also adhere to the DNRM guideline *Watercourse subsidence - Central Queensland Mining Industry*, Draft Version 7.0, 12 July 2011. Monitoring sites will be located on all pillar zones intersecting each watercourse or tributary.

Baseline monitoring will be supported by:

- Airborne LIDAR survey (accuracy ± 0.1 m);
- Dry season vertical aerial photography; and
- Helicopter-acquired high definition digital video of all major streamlines.

Reference watercourse and floodplain reaches of at least 300 m will be documented upstream, within, and downstream of the potentially affected areas. Data gathered will include ground surveyed cross sections, bedforms (pools/riffles/runs/sand sheets/bedrock controls), entry points of other watercourses and localised tributaries, and existing bed and bank scour points.

Land degradation types and distribution will be mapped across the MLA.

Post-subsidence surveys of watercourses will be undertaken at the following intervals:

- Within two months of the initial subsidence;
- Following a rainfall event of 1 in 2 average recurrence interval (ARI) for the duration equal to the time of concentration for the catchment at the location of the subsidence;
- Following a peak flow event of greater than a 1 in 2 year ARI; and,
- Annually

Post subsidence surveys will record the following:

- Erosion or deposition processes that have occurred as a result of subsidence;
- Migration of head cut erosion within watercourses and tributaries;
- Localised changes to stream bed slope;
- Localised widening of channels;
- Destabilisation of stream bed and banks including fracturing and incision;
- Localised changes to bank heights; and,
- Size of subsidence void created within the watercourse

Post subsidence surveys will be supplemented by detailed geomorphic assessments which will be undertaken on a 5 yearly basis throughout the mine life and will report on the nature and extent of geomorphic changes that have occurred since the previous survey and recommend remedial actions to address any mine-related adverse effects on the geomorphic environment. This assessment will cover channel and floodplain changes, the extent and effects of subsidence across the landscape, and changes in the nature and extent of the land degradation processes. An important part of these on-going assessments



will be appropriate documentation of rainfall, storms, floods and other land-forming processes that may have influenced geomorphic processes in the preceding years.

In order to appropriately document rainfall and flow conditions a weather station will be established adjacent to the proposed airport, and stream flow gauges will be established on Sandy Creek and on Middle Creek as described in this EMP.

The extent and type of mitigation measures that may be required to manage adverse subsidence impacts, and in so doing achieve the overall objective of this management plan, will be determined as part of the post subsidence assessment, using measures identified in the ISMP through the Subsidence Monitoring Program and the EMP.

At the completion of any restoration works, a detailed cross-sectional survey of each reach will be conducted and a photographic record of the condition of the bed and banks made, with ongoing condition monitoring also conducted.

This Subsidence Monitoring Program will be developed in more detail as part of each relevant Plan of Operation (PoO) and will include surveys, visual inspections and recording of direct and indirect effects of subsidence together with the objectives for land use and drainage in order to meet the criteria in the EMP.

Groundwater Monitoring

Monitoring of groundwater will be undertaken to:

- Assess whether discernible changes in surface water or groundwater quality down gradient of the site are occurring as a result of water discharge or groundwater seepage from the site;
- Ensure that the impacts of groundwater drawdown on existing groundwater users and other identified environmental values is minimised through consultation, and in the case of existing groundwater users, through the negotiation of alternate water supply agreements;
- Assess the extent of groundwater level drawdown attributable to the operation of the Project; and
- Assess potential changes to groundwater quality due to activities that are part of the Project.

As a water licence will be required for dewatering for the Project, groundwater monitoring, assessment, and reporting will be required for compliance with the licence conditions. If there is a requirement to submit a similar groundwater report as part of any term issued under a water licence under the *Water Act* (2000) then it is assumed that the relevant authorities will agree that the reports can be combined.

The monitored data to be reported to the relevant authority may contain the following criteria (to be agreed with the relevant authority):

- Data collected under the monitoring program will be forwarded to the relevant authority within 30 business days of being collected and in a format approved by the relevant authority.
- The proponent shall undertake an assessment of the impacts of mining on groundwater after the first 12 months of dewatering commencing and thereafter every subsequent calendar year.
- The report will be forwarded to the relevant authority by the first of March each calendar year.
- The report will include an assessment of impacts, any mitigation strategies as well as any recommendations for changes to the approved monitoring program.

Groundwater Assessment & Monitoring Program

Groundwater monitoring will be undertaken in the existing and expanded groundwater monitoring network to allow assessment of the potential water level and water quality impacts on the local and regional groundwater and surface water regimes. The groundwater monitoring will be required as part of the terms of any water licence issued for the mine and all monitoring results will be assessed and compiled in regular reports, in accordance with typical water licence terms.

The Groundwater Monitoring Program will include:

- Monthly groundwater level and quarterly groundwater quality monitoring. Sampling will be undertaken in accordance with the current edition of the DEHP *Water Quality Sampling Manual*, or subsequent updated versions;
- Annual reporting of groundwater level and groundwater quality results; and
- Notification to the regulating authority within 1 month of receiving water quality analysis results, should any parameters tested exceed agreed trigger levels⁹ (see comment regarding trigger levels below).

Additional groundwater monitoring bores will be established up and down gradient of sources of potential contaminants. A conceptual layout of the groundwater monitoring network is presented in [Figure T-9](#).

The initial baseline groundwater quality monitoring, required to increase current hydrochemistry data, will include:

- Field parameters, pH and EC;
- Major cations and ions, including calcium, magnesium, potassium, sodium, chloride, sulphate, alkalinity (hydroxide, carbonate, bicarbonate, total), fluoride and TDS,
- Metals/metalloids, including aluminium, arsenic, boron, cadmium, chromium, cobalt, copper, iron, lead, mercury, manganese, molybdenum, nickel, selenium, silver, uranium, and zinc;
- Nutrients (total N, NO_x, ammonia, phosphorous); and
- Total Petroleum Hydrocarbons (TPH) at selected monitoring points.

It is anticipated that the parameter list will be modified based on the compilation of at least 12 separate sampling events over a 24 month period. This will allow for the establishment of ambient hydrochemistry and seasonal trends. The groundwater level monitoring will include:

- The groundwater monitoring bores are to be equipped with automated groundwater level monitoring loggers, set to record groundwater level data at a maximum of 12 hour intervals. These data will be compiled on a monthly basis;
- Groundwater level trends and natural fluctuations will be determined; and
- Trigger levels.

Once sufficient groundwater quality and level data (from a statistical perspective) has been compiled trigger levels will be determined. These trigger levels will be based on arithmetic mean and standard deviations, set to support in assessing possible mine related impacts on the groundwater resources.

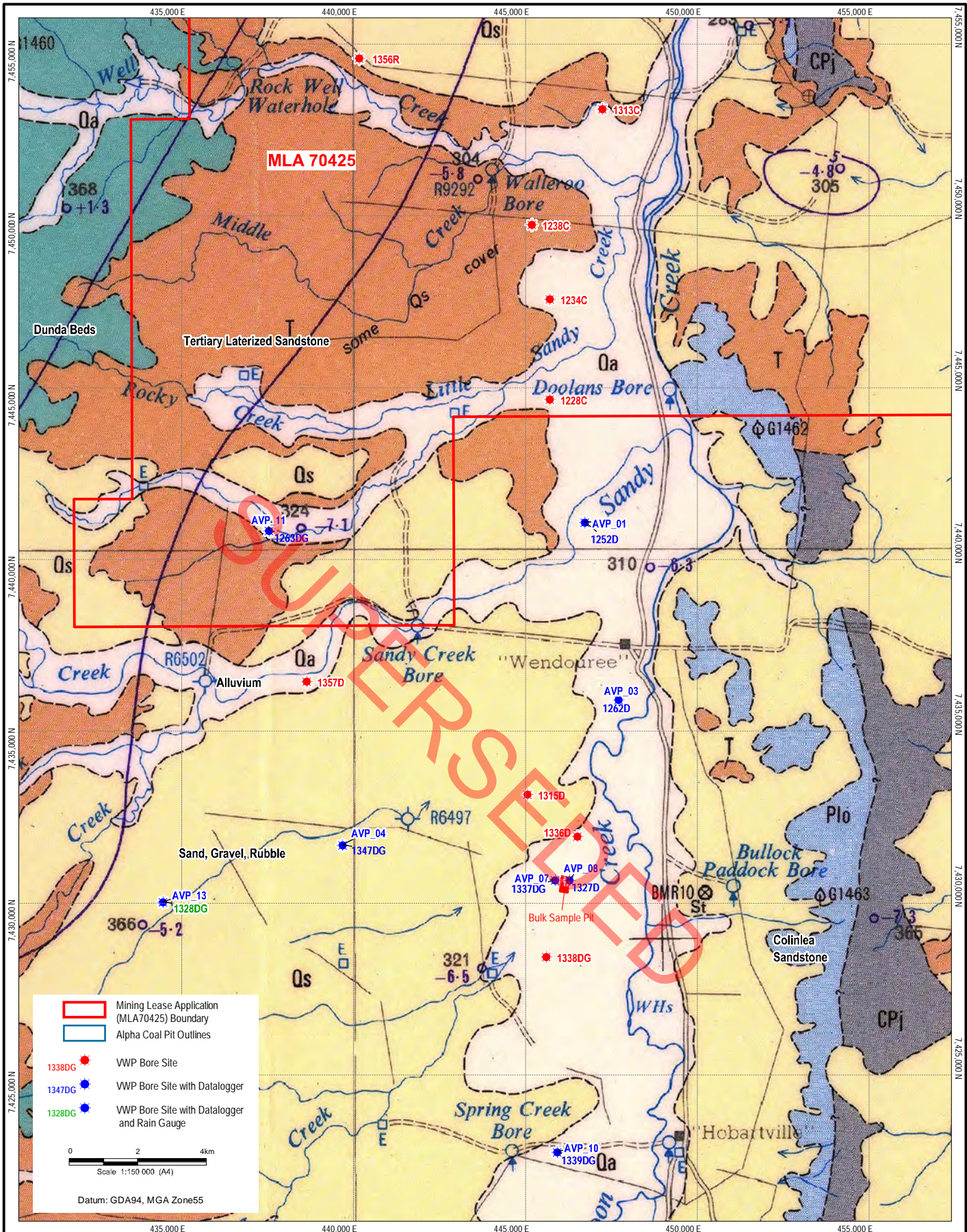
⁹ The trigger levels will be determined by the Proponent before the commencement of mining and forwarded to DEHP for approval. The trigger levels for water level and water quality will be mutually agreed and approved by DEHP.



Should trigger levels be exceeded, investigations will be undertaken to establish:

- Whether actual environmental harm has occurred;
- If required, immediate measures that should be taken to reduce the potential for environmental harm; and,
- Long-term mitigation measures required to address any existing contamination, and to prevent recurrence of contamination.

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HANCOCK GALILEE PTY LTD
Kevin's Corner Project
Supplementary Environmental Impact Statement

GROUNDWATER MONITORING BORE LOCATIONS FOR THE PROJECT AREA

URS

REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-9**

File No: 42626920-g-2108.wor

Drawn: **RG**

Approved: **RS**

Date: 14-09-2012

Rev. **A**

A4





T.3.4.8 Commitments

The following points provide a summary of surface water and groundwater commitments that HGPL will undertake as part of the Project.

Surface Water

- All sewage waste generated during the project is to be collected and treated to Class A+ effluent quality on-site;
- Storm water design (around the accommodation village) will be undertaken in accordance with the *Queensland Urban Drainage Manual* (DEHP 2007), *Australian Runoff Quality – A guide to water sensitive urban design* (2005), and requirements of the local Regional Council;
- The design of all fuel and chemical storages will be in accordance with relevant standards (eg. AS 1940) to minimise the potential for land and water contamination from spills and leaks.
- A diversion will be provided to divert stream flows around the open cut pit;
- Establishment of vegetation on disturbed areas of diversions will be undertaken as soon as practicable before commissioning;
- The diversion active channels will allow for replication of substrate conditions similar to the existing stream substrates of significance for geomorphic processes, water quality, vegetation, and aquatic habitat features as required;
- Hydraulic performance including channel velocities, stream power and shear stress will be guided by the ACARP (2002) *Maintenance of Geomorphic Processes in Bowen Basin River Diversions - Final Report*, Research Projects C8030 and C9068;
- Surface water related impacts of this project on adjoining projects will be addressed and where appropriate infrastructure designs will be modified;
- A comprehensive Stream Diversion Monitoring Program will be developed and implemented;
- Levees will be provided to protect the open cut pits from flooding for events up to 1:1000 AEP;
- A Water Management System will be implemented to manage water flows onto, within and from the site in order to safeguard mine operations and minimise the Project impacts on downstream water quality;
- Water storages will be sized using the Site Water Balance Model and be sized to contain mine affected water so that the probability of overflow is less than 1:100 AEP;
- All potential uncontrolled release points from the Project will be identified and regulated as release points into the receiving environment;
- A Water Quality Monitoring Program will be implemented to monitor and record the effects of the release of contaminants on the receiving environment with the aims of identifying and describing the extent of any adverse impacts to local environmental values, and monitoring any changes in the receiving water; and
- An Erosion and Sediment Control Plan will be developed and implemented prior to commencement of construction works.

Groundwater

- The existing groundwater monitoring network will be expanded over time to allow for groundwater impact evaluation across the site, as mining expands to the west;
- The frequency of monitoring and the suite of analytes sampled for will be sufficient to ensure early detection of contamination of local groundwater resources of the Great Artesian Basin and any associated groundwater dependent ecosystems;
- Groundwater monitoring and sampling will be conducted by a suitable qualified and experienced professional in accordance with the current edition of the DEHP *Water Quality Sampling Manual*, or subsequent updated versions; and the AS/NZS 5667.11:1998 *Australian/New Zealand Standard for water quality – sampling Part 11; guidance on sampling groundwater*;
- An annual review of the monitoring data will be conducted. The review will be conducted by a suitably qualified and experienced hydrogeologist and will include assessment of groundwater level and quality data, and the suitability of the monitoring network;
- All groundwater-based complaints will be investigated and a register kept of the nature of the complaint, the results of assessment, and any actions taken. The register will be made available to the regulating authority upon request;
- The Project will be designed based on the precautionary principle to ensure least possible impacts on groundwater resources;
- Mitigation will be developed for any adverse effects that may occur such as changes to water quality in both groundwater and surface water resources;
- Compliance with terms and conditions of any water licences;
- Trigger levels will be determined by the proponent before the commencement of mine operations;
- Make Good Agreements will be entered in to with landowners, prior to de-watering for coal extraction, where it is predicted that mining will impact on the registered bores belonging to those landowners; and
- Cumulative groundwater impacts from the Project and adjoining projects will be investigated, assessed and addressed (see SEIS, Volume 2, Appendix O; Interim Cumulative Impacts Assessment Report)

T.3.4.9 Proposed Environmental Authority Conditions

Schedule W - Water

Contaminant Release

- W1** Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters except as permitted under the conditions of the Environmental Authority.



- W2** Unless otherwise permitted under the conditions of this Environmental Authority, the release of mine affected water to receiving waters must only occur from the release points specified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters.

Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters

Name	Release point Latitude	Release point Longitude	Contaminant source and location	Monitoring point	Receiving water description
RP1	-23.0703	146.4299	MWD1	Outlet works direct into Middle Creek – from release point	Middle Creek
RP2	-23.0658	146.4994	MWD2	Outlet works direct into Sandy Creek – from release point	Sandy Creek
RP3	-23.0900	146.4991	MWD3	Outlet works direct into Sandy Creek – from release point	Sandy Creek
RP4	-23.1038	146.5046	MWD4	Outlet works direct into Sandy Creek – from release point	Sandy Creek
RP5	-23.0547	146.4194	MWD1	Spillway	Well Creek
RP6	-23.0736	146.5263	MWD2	Spillway	Sandy Creek
RP7	-23.0897	146.5048	MWD3	Spillway	Sandy Creek
RP8	-23.1031	146.5113	MWD4	Spillway	Sandy Creek
RP9	-23.0996	146.4270	Borefield Dam 1	Spillway	Little Sandy/Rocky Creek Diversion
RP10	-23.1200	146.4269	Borefield Dam 2	Spillway	Little Sandy/Rocky Creek Diversion
RP11	-23.1516	146.4404	Adit/ROM dam south	Spillway	Sandy Creek

- W3** The release of mine affected water to receiving waters in accordance with condition W2 must not exceed the release limits stated in Table W-2 Mine Affected Water Release Limits, when measured at the monitoring points specified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters.

Table W-2 Mine Affected Water Release Limits

Quality Characteristic	Release Limits	Monitoring Frequency
Electrical conductivity (uS/cm)	Release limits specified in Table W-4 for variable flow criteria.	Daily during release (the first sample must be taken within 2 hours of commencement of release)
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	Daily during release (the first sample must be taken within 2 hours of commencement of release)
Turbidity (NTU)	Limit derived from suspended solids limit and	Daily during release (first sample within

	demonstrated correlation between turbidity to suspended solids historical monitoring data for dam water	2 hours of commencement of release)
Suspended Solids (mg/L)	Limit to be determined based on receiving water reference data and achievable best practice sedimentation control and treatment*	Daily during release (first sample within 2 hours of commencement of release)
Sulphate (SO42-) (mg/L)	Release limits specified in Table W-4 for variable flow criteria.	Daily during release (first sample within 2 hours of commencement of release)

W4 The release of mine affected water to waters from the release points must be monitored at the locations specified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters for each quality characteristic and at the frequency specified in Table W-2 Mine Affected Water Release Limits and Table W-3 Release Contaminant Trigger Investigation Levels.

Table W-3 Release Contaminant Trigger Investigation Levels

Quality Characteristic	Trigger Levels (µg/L)	Comment on Trigger Value	Monitoring Frequency
Aluminium	1172	80th percentile of reference data	Monitoring to be commenced within 2 hours of commencement of the release, and then 24 hours thereafter.
Arsenic	13	For aquatic ecosystem protection, based on SMD guideline	
Cadmium	0.2	For aquatic ecosystem protection, based on SMD guideline	
Chromium	3	80th percentile of reference data	
Copper	4	80th percentile of reference data	
Iron	2234	80th percentile of reference data	
Lead	4	For aquatic ecosystem protection, based on SMD guideline	
Mercury	0.2	For aquatic ecosystem protection, based on SMD guideline	
Nickel	11	For aquatic ecosystem protection, based on SMD guideline	
Zinc	16	80th percentile of reference data	
Boron	370	For aquatic ecosystem protection, based on SMD guideline	
Cobalt	90	For aquatic ecosystem protection, based on SMD guideline	
Manganese	1900	For aquatic ecosystem protection, based on SMD guideline	
Molybdenum	34	For aquatic ecosystem protection, based on SMD guideline	
Selenium	10	For aquatic ecosystem protection, based on SMD guideline	
Silver	1	For aquatic ecosystem protection, based on SMD guideline	
Uranium	1	For aquatic ecosystem protection, based on SMD guideline	
Vanadium	10	For aquatic ecosystem protection, based on SMD guideline	
Ammonia	900	For aquatic ecosystem protection, based on SMD guideline	
Nitrate	1100	For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN	



Quality Characteristic	Trigger Levels (µg/L)	Comment on Trigger Value	Monitoring Frequency
Petroleum hydrocarbons (C6-C9)	20		
Petroleum hydrocarbons (C10-C36)	100		
Fluoride (total)	2000	<i>Protection of livestock and short term irrigation guideline</i>	
Sodium (ug/L)	18000	<i>For aquatic ecosystem protection, based on SMD guideline</i>	

W5 If quality characteristics of the release exceed any of the trigger levels specified in Table W-3 Release Contaminant Trigger Investigation Levels during a release event, the Environmental Authority holder must compare the downstream results in the receiving waters to the trigger values specified in Table W-3 Release Contaminant Trigger Investigation Levels and:

- where the trigger values are not exceeded then no action is to be taken; or
- where the downstream results exceed the trigger values specified in Table W-3 Release Contaminant Trigger Investigation Levels for any quality characteristics, compare the results of the downstream site to the data from background monitoring sites and:
 - if the result is less than the background monitoring site data, then no action is to be taken; or
 - 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 in the next annual return, outlining:
 - details of the investigations carried out; and
 - actions taken to prevent environmental harm

W6 If an exceedance in accordance with condition W5 (b)(ii) is identified; the holder of the authority must notify the administering authority within 14 days of receiving the result.

Contaminant Release Events

W7 The holder must ensure stream flow gauging stations are installed, operated and maintained to determine and record stream flows at the locations and flow recording frequency specified in Table W-4 Mine Affected Water Releases during Flow Events.

Table W-4 Mine Affected Water Releases during Flow Events

Receiving waters/ stream	Release Point (RP)	Gauging station	Gauging Station Latitude (decimal degree, GDA94)	Gauging Station Longitude (decimal degree, GDA94)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for discharge (m ³ /s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity and Sulphate Release Limits
Sandy Creek	RP2, RP3,	Sandy Creek Gauging	23.07555 7	146.4985 5	Continuous (minimum daily)	Low Flow <3.5 m ³ /s for a period of 28	< 0.2 m ³ /s	Electrical conductivity (µS/cm): 168



Receiving waters/ stream	Release Point (RP)	Gauging station	Gauging Station Latitude (decimal degree, GDA94)	Gauging Station Longitude (decimal degree, GDA94)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for discharge (m ³ /s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity and Sulphate Release Limits
	RP4	Station				days after natural flow events that exceed 3.5 m ³ /s		Sulphate (SO ₄ ²⁻): 250 mg/L
						Medium Flow > 3.5 m ³ /s	< 5.8 m ³ /s	Electrical conductivity (μS/cm): <1500 Sulphate (SO ₄ ²⁻) (mg/L) <2125 mg/L
							< 1.1 m ³ /s	Electrical conductivity (μS/cm): <3500 Sulphate (SO ₄ ²⁻) (mg/L) <5000
						High Flow > 10 m ³ /s	< 2 m ³ /s	Electrical conductivity (μS/cm): <5000 Sulphate (SO ₄ ²⁻) (mg/L) <5000 mg/L
Middle Creek	RP1	Middle Creek Gauging Station	-23.07765	146.4326 6	Continuous (minimum daily)	Low Flow <0.5 m ³ /s for a period of 28 after natural flow events that exceed 1 m ³ /s	<0.2 m ³ /s	Electrical conductivity (μS/cm): 168 Sulphate (SO ₄ ²⁻): 250 mg/L
						Medium Flow > 1 m ³ /s	< 1.7 m ³ /s	Electrical conductivity (μS/cm): <1500 Sulphate (SO ₄ ²⁻) (mg/L) <2125 mg/L
							< 0.34 m ³ /s	Electrical conductivity (μS/cm): <3500 Sulphate (SO ₄ ²⁻) (mg/L) <5000
						High Flow >4.5 m ³ /s	< 0.9 m ³ /s	Electrical conductivity (μS/cm): <5000 Sulphate (SO ₄ ²⁻) (mg/L) <5000 mg/L



- W8** Notwithstanding any other condition of this Environmental Authority, the release of mine affected water to waters in accordance with condition W2 must only take place during periods of natural flow events in accordance with the receiving water flow criteria for discharge specified in Table W-4 Mine Affected Water Releases during Flow Events when measured at the monitoring points specified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters.
- W9** The release of mine affected water to receiving waters in accordance with condition W2 must not exceed the Electrical Conductivity and Sulphate release limits or the Maximum Release Rate (for all combined release points flows) for each receiving water flow criteria for discharge specified in Table W-2 Mine Affected Water Release Limits when measured at the monitoring points specified in Table W-4 Mine Affected Water Releases during Flow Events.
- W10** The daily quantity of mine affected water released from each release point must be measured and recorded at the monitoring points in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters.
- W11** 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.
- W12** During the release of mine affected water to receiving waters from the release points, the receiving waters must be monitored at the locations specified in Table W-5 Receiving Waters Release Limits for each quality characteristic and at the frequency specified in Table W-5 Receiving Waters Release Limits.

Table W-5 Receiving Waters Release Limits

Monitoring Point	Latitude(GDA94)	Longitude (GDA94)	Quality Characteristic	Limit	Monitoring Frequency
Upstream					
MP1	-23.1113	146.5075	Electrical conductivity ($\mu\text{S}/\text{cm}$)	700	Continuously
Downstream					
MP3	-22.9985	146.5116	Electrical conductivity ($\mu\text{S}/\text{cm}$)	700	Continuously

- W13** Notwithstanding any other condition of this Environmental Authority, the release of mine affected water:
- (a) Must not commence if the water quality at the upstream site in Table W-5 Receiving Waters Release Limits exceeds the water quality characteristics; and
 - (b) Must cease if the water quality characteristics at the downstream or the upstream sites in Table W-5 Receiving Waters Release Limits are met and or exceeded.
- W14** In accordance with conditions W13(b), the release of mine affected water may recommence after a cessation if the water quality characteristics in Table W-5 Receiving Waters Release Limits are

below the water quality characteristics at the downstream and upstream sites in Table W-5 Receiving Waters Release Limits.

- W15** The Environmental Authority holder must notify the administering authority as soon as practicable, and no later than 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/time;
 - (b) Expected release cessation date/time;
 - (c) Release point/s;
 - (d) Release volume (estimated);
 - (e) Receiving water/s including the natural flow rate; and
 - (f) Details (including available data) regarding likely impacts on the receiving water(s).
- W16** If the release limits defined in Table W-2 Mine Affected Water Release Limits are exceeded, the holder of the Environmental Authority must notify the administering authority within 24 hours of receiving the results.
- W17** The authority holder must, within 28 days of a release that exceeds the conditions of this authority, provide a report to the administering authority detailing:
- (a) The reason of the release;
 - (b) The location of the release;
 - (c) All water quality monitoring results;
 - (d) Any general observations;

Water Storages

- W18** Water storage containing mine affected waters which are accessible to livestock must be monitored for the water quality characteristics and at the monitoring frequency specified in Table W-6 Onsite Water Storage Monitoring.
- W19** Water storages stated in Table W-6 Onsite Water Storage Monitoring, which are accessible to livestock are associated with the release points identified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters, must be monitored for the water quality characteristics specified in Table W-7 Onsite Water Storage Contaminant Limits at the monitoring locations and at the sampling frequency specified in Table W-6 Onsite Water Storage Monitoring.



Table W-6 Onsite Water Storage Monitoring

Water storage description	Longitude (GDA 94)	Latitude (GDA 94)	Monitoring location	Frequency of monitoring
Mine Water Dam 1	146.431914	-23.067382	Dam Wall	Quarterly
Mine Water Dam 2	146.53699	-23.073022	Dam Wall	Quarterly
Mine Water Dam 3	146.504322	-23.087455	Dam Wall	Quarterly
Mine Water Dam 4	146.51185	-23.10557	Dam Wall	Quarterly

W20 In the event that water storages defined in Table W-6 Onsite Water Storage Monitoring exceed the contaminant limits defined in Table W-7 Onsite Water Storage Contaminant Limits, the Environmental Authority holder must implement measures to prevent access to waters by all livestock.

Table W-7 Onsite Water Storage Contaminant Limits

Quality Characteristic	Test Value	Contaminant limit
pH (pH unit)	Range	Greater than 4, less than 9 ²
EC (µS/cm)	Maximum	5970 ¹
Sulphate (mg/L)	Maximum	1000 ¹
Fluoride (mg/L)	Maximum	2 ¹
Aluminium (mg/L)	Maximum	5 ¹
Arsenic (mg/L)	Maximum	0.5 ¹
Cadmium (mg/L)	Maximum	0.01 ¹
Cobalt (mg/L)	Maximum	1 ¹
Copper (mg/L)	Maximum	1 ¹
Lead (mg/L)	Maximum	0.1 ¹
Nickel (mg/L)	Maximum	1 ¹
Zinc (mg/L)	Maximum	20 ¹

Note:

¹ Contaminant limit based on ANZECC & ARM CANZ (2000) stock water quality guidelines.

² Page 4.2-15 of ANZECC & ARM CANZ (2000) "Soil and animal health will not generally be affected by water with pH in the range of 4–9".

Note: Total measurements (unfiltered) must be taken and analysed

W21 The quality of the receiving waters must be monitored at the locations specified in Table W-8 Receiving Waters Contaminant Trigger Levels for each quality characteristic and at the monitoring frequency stated in Table W-9 Receiving Water Upstream Background Sites & Downstream Monitoring Points.

Table W-8 Receiving Waters Contaminant Trigger Levels

Quality characteristic	Investigation trigger level*	Sampling frequency
pH	6.5 – 8.5	Daily during the release
Electrical Conductivity (µS/cm)	700	
Sulphate (SO ₄ ²⁻) (mg/L)	250	
Sodium (mg/L)	180	

Table W-9 Receiving Water Upstream Background Sites & Downstream Monitoring Points

Monitoring point	Receiving waters location description	Latitude* (GDA 94)	Longitude (GDA 94)	Monitoring frequency
Upstream background monitoring points				
MP1	Sandy Creek 1,100 m upstream of RP4/RP8 and 2600 m upstream of RP3/RP7	-23.1113	146.5075	Daily during a release into that creek system
MP7	Well Creek 7,700 metres upstream of RP 5	-23.0203	146.3909	
MP8	Middle Creek 800 metres upstream of RP 1	-23.0776	146.4327	
MP9	Sandy Creek 3200 metres upstream of RP11	-23.1608	146.4193	
Downstream monitoring points				
MP6	Middle Creek 2000 metres downstream of RP 1 and 5,600 downstream of RP5	-23.045	146.4648	Daily during a release into that creek system
MP2	Sandy Creek 1600 m downstream of RP3/RP7 and 3,300 meters downstream of RP4/RP8	-23.0756	146.4986	
MP3	Sandy Creek downstream of Well Creek Confluence	-23.0396	146.5059	
MP4	Sandy Creek at downstream lease boundary	-22.9985	146.5116	
MP5	Well Creek upstream of Sandy Creek Confluence	-23.0401	146.5056	

W22 If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in Table W-7 Onsite Water Storage Contaminant Limits during a release event, the Environmental Authority holder must compare the downstream results to the upstream results in the receiving waters and:

- i. 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
- ii. Where the downstream results exceed the upstream results, complete an investigation in accordance with the ANZECC & ARM CANZ 2000 methodology, into the potential for environmental harm and provide a written report to the administering authority in the next annual return outlining:

(a) Details of the investigation carried out; and

(b) Actions taken to prevent environmental harm.

(Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with this condition, no further reporting is required for subsequent trigger events for that quality characteristic).

Receiving Environment Monitoring Program

W23 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 mining affected water is being discharged from the site.

For the purpose of the REMP, the receiving environment is the waters of Sandy Creek and connected or surrounding waterways within 10km 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 directed affected by an authorised release of mine affected water.

W24 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;
- (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 W-9 Receiving Water Upstream Background Sites & Downstream Monitoring Points;
- (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* 2009. This should include monitoring during periods of natural flow irrespective of mine or other discharges;
- (e) Include monitoring and assessment of dissolved oxygen saturation, temperature and all water quality parameters listed in Table W-2 Mine Affected Water Release Limits and Table W-3 Release Contaminant Trigger Investigation Levels;
- (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*);
- (g) Include, where appropriate, monitoring of macroinvertebrates in accordance with the AusRivas methodology;
- (h) Apply procedures and/or guidelines from ANZECC and ARMCANZ 2000 and other relevant guidelines and documents;
- (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.

W25 A REMP Design Document that addresses each criterion presented in Conditions W23 and W24 must be prepared and submitted to the administering authority prior to commencement of activities.

Due consideration must be given to any comments made by the administering authority on the REMP Design Document and subsequent implementation of the program.

- W26** A report outlining the findings of the REMP, including all monitoring results and interpretations in accordance with conditions W23 and W24 must be prepared annually and made available on request to the administering 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.

Water General

- W27** 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 for a third party for the purpose of:
- (a) Supplying stock water subject to compliance with the quality release limits specified in Table W-10 Stock Water Release Limits;
 - (b) Supplying irrigation water to directly adjoining properties owned by the Environmental Authority holder or a third party subject to compliance with quality release limits in Table W-11 Irrigation Water Release Limits; or
 - (c) Supplying water for construction and/or road maintenance in accordance with the conditions of this Environmental Authority;
 - (d) Supplying water to the Alpha Mine in accordance with the conditions of this Environmental Authority. The volume, pH and electrical conductivity of the water transferred to the Alpha Coal Mine must be monitored and recorded.

Table W-10 Stock Water Release Limits

Quality characteristic	Units	Minimum	Maximum
pH	pH units	6.5	8.5
EC	µS/cm	N/A	5000

Table W-11 Irrigation Water Release Limits

Quality characteristic	Units	Minimum	Maximum
pH	pH units	6.5	8.5
EC	µS/cm	N/A	1000

- W28** If the responsibility of mine affected water is given or transferred to another person in accordance with W27:
- (a) The responsibility for the mine affected water must only be given or transferred in accordance with a written agreement (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 the *Environmental Protection Act* (1994), environmental sustainability of the water disposal and protection of environmental values; and
- (c) The third party agreement must be signed by both parties to the agreement.

W29 All determinations of water quality and biological monitoring must be:

- (a) Performed by a person or body possessing appropriate experience and qualifications to perform the required measurements;
- (b) Made in accordance with methods prescribed in the latest edition of the administering authorities Monitoring and Sampling Manual;
- (c) Collected from the monitoring locations identified within this Environmental Authority, with 6 hours of each other where possible;
- (d) Carried out on representative samples; and
- (e) Analysed at a laboratory accredited (e.g. NATA) for the method of analysis being used.

W30 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 of this Environmental Authority:

- (a) Must not produce and visible discolouration of receiving waters; and
- (b) Must not produce any slick or other visible or odourous evidence of oil, grease or petrochemicals nor contain visible floating oil. Grease, scum, litter or other objectionable matter.

W31 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 upon request:

- (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 quantity of the contaminants released from all release points;
- (e) The release flow rate at the time of sampling for each release point; and

- (f) The results of all monitoring and details of any exceedances with the conditions of this Environmental Authority.

Water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.

W32 All determinations of water quality must be:

- (a) Performed by a person or body possessing appropriate experience and qualifications to perform the required measurements;
- (b) Made in accordance with methods prescribed in the latest edition of the administering authority's Monitoring and Sampling Manual 2009, *Environmental Protection (Water)* (EPP (Water) 2009);
- (c) Collected from the monitoring locations identified within this Environmental Authority, within 10 hours of each other where possible;
- (d) Carried out on representative samples; and
- (e) Laboratory testing must be undertaken using a laboratory accredited (e.g. NATA) for the method of analysis being used.

Water Management Plan

W33 A Water Management Plan must be developed by a suitably qualified person within three (3) months of issue of the Environmental Authority that provides for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of the Environmental Authority. The Water Management Plan implementation should be implemented at the commencement of construction activities.

W34 The Water Management Plan must be developed in accordance with the administering authority's *Guideline for Preparation of Water Management Plans for Mining Activities* (2009) or any updates that become available from time to time and must include at the following components:

- (a) Contaminant Source Study.
- (b) Site Water Balance and Model.
- (c) Water Management System.
- (d) Saline Drainage Prevention and Management Measures.
- (e) Acid Rock Drainage Prevention and Management Measures (if applicable).
- (f) Emergency and Contingency Planning.
- (g) Monitoring and Review.



- W35** The Water Management Plan must be reviewed each calendar year and a report prepared by an appropriately qualified person. The report must:
- (a) Assess the plan against the requirements under condition W34;
 - (b) Include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; and
 - (c) Identify any amendments made to the water management plan following the review.
- W36** The holder of this Environmental Authority must attach to the review report required by condition W35, a written response to the report and recommended actions, detailing the actions taken or to be taken by the Environmental Authority holder on stated dates:
- (a) To ensure compliance with this Environmental Authority; and
 - (b) To prevent a recurrence of any non-compliance issues identified.
- W37** The review report required by condition W35 and the written response to the review report required by condition W36 must be submitted to the administering authority with the subsequent annual return under the signature of the appointed signatory for the annual return.
- W38** A copy of the Water Management Plan and/or revised Water Management Plan must be provide to the administering authority on request.
- W39** The holder of this Environmental Authority must ensure reasonable and practicable measures are taken to avoid or otherwise minimise the generation and/or release of saline drainage.

Stormwater & Waterborne Sediment Controls

- W40** An Erosion and Sediment Control Plan must be developed by a suitably qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to water and contamination of stormwater.
- W41** 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 W40; and
 - (b) Water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with W34, for the purpose of ensuring water does not become mine affected water.
- W42** The maintenance and cleaning of vehicles, plant and equipment must not be carried out in areas that would result in the release of wastes, contaminants or materials to any stormwater drainage system or waters.

- W43** Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable to minimise the release of wastes, contaminants or materials to any stormwater drainage system or waters.

Uncontrolled Releases

- W44** The overflow of mine affected water from one or more of the dams listed in Table G-1 Location of Regulated Structures to receiving waters is authorised if:
- (a) The holder has complied with ALL conditions listed in Schedule G – Regulated Structures of this Environmental Authority; and
 - (b) The overflow is a direct result of rainfall events which since November 1 have generated a total rainfall depth in excess of that determined under the Design Storage Allowance (DSA) annual exceedance probability (AEP) event listed in [Table G-1 Location of Regulated Structures](#) (or network of linked containment systems); and
 - (c) The holder has taken all reasonable and practicable measures to prevent an overflow from the relevant dam; and
 - (d) The holder has provided a report to the administering authority following an overflow release demonstrating compliance with conditions a, b and c above.
- W45** Any release of mine affected water resulting from an overflow from one or more of the dams listed in Table W-12 Overflow Release to the Receiving Environment must be monitored at the locations specified in Table W-13 Monitoring Locations for Overflow Releases for those quality characteristics and at the frequencies specified in Table W-14 Release Contaminant Investigation Levels – Overflow Releases.

Table W-12 Overflow Release to the Receiving Environment

Regulated Dam	Uncontrolled Discharge AEP	Mandatory reporting level	Receiving Water
MWD1	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Well Creek
MWD2	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Sandy Creek
MWD3	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Sandy Creek
MWD4	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Sandy Creek
Borefield Dam 1	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Little Sandy/ Rocky Creek Diversion
Borefield Dam 2	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Little Sandy/ Rocky Creek Diversion
Adit/Rom dam South	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Sandy Creek

Table W-13 Monitoring Locations for Overflow Releases

Name	Release point latitude	Release point longitude	Contaminant source and location	Monitoring point	Receiving water description
RP5	-23.0547	146.4194	MWD1	Spillway	Well Creek
RP6	-23.0736	146.5263	MWD2	Spillway	Sandy Creek



RP7	-23.0897	146.5048	MWD3	Spillway	Sandy Creek
RP8	-23.1031	146.5113	MWD4	Spillway	Sandy Creek
RP9	-23.0996	146.4270	Borefield Dam 1	Spillway	Little Sandy/Rocky Creek Diversion
RP10	-23.1200	146.4269	Borefield Dam 2	Spillway	Little Sandy/Rocky Creek Diversion
RP11	-23.1516	146.4404	Adit/ROM dam south	Spillway	Greentree Creek

Table W-14 Release Contaminant Investigation Levels – Overflow Releases

Quality Characteristic	Trigger Levels (µg/L)	Comment on trigger value	Monitoring Frequency
EC	700	For aquatic ecosystem protection, based on SMD guideline	Monitoring to be commenced within 2 hours of commencement of the release, and then 24 hours thereafter.
pH	6 – 8.5	For aquatic ecosystem protection, based on SMD guideline	
Turbidity	460	99th percentile of reference data	
Aluminium	7490	99th percentile of reference data	
Arsenic	13	For aquatic ecosystem protection, based on SMD guideline	
Cadmium	0.2	For aquatic ecosystem protection, based on SMD guideline	
Chromium	16	99th percentile of reference data	
Copper	40	99th percentile of reference data	
Iron	9700	99th percentile of reference data	
Lead	12	99th percentile of reference data	
Mercury	0.5	99th percentile of reference data	
Nickel	11	For aquatic ecosystem protection, based on SMD guideline	
Zinc	167	99th percentile of reference data	
Boron	370	For aquatic ecosystem protection, based on SMD guideline	
Cobalt	90	For aquatic ecosystem protection, based on SMD guideline	
Manganese	1900	For aquatic ecosystem protection, based on SMD guideline	
Molybdenum	34	For aquatic ecosystem protection, based on SMD guideline	
Selenium	10	For aquatic ecosystem protection, based on SMD guideline	
Silver	1	For aquatic ecosystem protection, based on SMD guideline	
Uranium	1	For aquatic ecosystem protection, based on SMD guideline	
Vanadium	20	99th percentile of reference data	

Quality Characteristic	Trigger Levels (µg/L)	Comment on trigger value	Monitoring Frequency
Ammonia	900	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
Nitrate	1100	<i>For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN</i>	
Petroleum hydrocarbons (C6-C9)	20		
Petroleum hydrocarbons (C10-C36)	100		
Fluoride (total)	2000	<i>Protection of livestock and short term irrigation guideline</i>	
Sodium (ug/L)	23000	<i>99th percentile of reference data</i>	

W46 If quality characteristics of the release exceed any of the trigger levels specified in Table W-14 Release Contaminant Investigation Levels – Overflow Releases during an overflow release, the holder must compare the downstream results in the receiving waters to the trigger values specified in Table W-14 Release Contaminant Investigation Levels – Overflow Releases and:

- (a) Where the trigger values are not exceeded at downstream locations then no action is to be taken; or
- (b) Where the downstream results exceed the trigger values specified in [Table W-14 Release Contaminant Investigation Levels – Overflow Releases](#) for any quality characteristics, compare the results of the downstream site to the data from upstream background monitoring sites and from the release point 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 the cessation of the release, outlining:
 - details of the investigations carried out; and
 - actions taken to prevent environmental harm.

W47 The holder must notify the administering authority as soon as practicable and no later than 24 hours after the commencement of an overflow release of mine affected water to the receiving environment in accordance with conditions W45, W46 and W47 of this Environmental Authority. Notification must include the submission of written advise to the administering authority of the following information:

- (a) Release commencement date/time;
- (b) Release points;
- (c) Receiving water/s; and



(d) Any details (including available data) regarding likely impacts on the receiving environment.

W48 The holder must notify the administering authority as soon as practicable and no later than 24 hours after the cessation of a release notified under condition W48. Notification must include the submission of written advise to the administering authority of the following information:

- (a) Release cessation date/time;
- (b) Volume of water released;
- (c) All in-situ water quality monitoring results; and
- (d) Any other matters pertinent to the water release event.

W49 Within 28 days of a release notified under condition W48, the holder must provide a report to the administering authority demonstrating compliance with condition W46 which should include as a minimum:

- (a) The time and date of the uncontrolled release event;
- (b) The location of the uncontrolled release;
- (c) The monitoring quality of the uncontrolled release waters; or if not available due to site access constraints in wet weather during the event, the quality of waters in the dam that contributed to the uncontrolled release before the event (from monitoring undertaken as part of condition W16 and quality in that dam after the release events;
- (d) The estimated quantity of uncontrolled release;
- (e) Downstream receiving water monitoring results;
- (f) Rainfall during, or that contributed to, the uncontrolled release event and dams levels prior to the rainfall event that caused uncontrolled release;
- (g) A determination of whether the uncontrolled release was caused by rainfall exceeding the design AEP events specified in Table W-12 Overflow Release to the Receiving Environment;
- (h) A determination of whether the uncontrolled release was caused in part or fully by failure to operate the integrated mine water system in accordance with Standard Operating Procedures for the integrated mine water system, or physical failure of one or more components of the integrated mine water system;
- (i) A determination of whether the uncontrolled release caused environmental harm, and

- (j) If determined that the uncontrolled release could have been reasonably prevented, actions that will be taken to ensure uncontrolled releases comply in all respects with this Environmental Authority.

Mine Water Management

- W50** In the event of failure of any component, or series of components, of the mine water management system, the holder of the Environmental Authority must utilise the mine water balance model to reassess the performance of the mine water management system in its failed state, and notify the administering authority if the assessment of the mine water management system shows that the probability of uncontrolled discharge would be greater than the AEP specified in Table G-3 Hydraulic Performance of Dams.
- W51** Notwithstanding the provisions for Mandatory Report Levels in Table G-3 Hydraulic Performance of Dams, the holder of the Environmental Authority must not allow any uncontrolled discharge to be caused by either failure to:
- (a) Stop transferring water to a dam where the transfer into that dam contributes in part, or full to the overflow (uncontrolled discharge) of that dam, or
 - (b) Start and continue transferring water from a mine water dam, where the Standard Operating Procedures require the water transfer from the dam to prevent overflow (uncontrolled discharges).

Groundwater

- W52** The holder of the environmental authority must develop and implement a groundwater monitoring program to be mutually agreed between the proponent and the administering authority.
- W53** The groundwater monitoring program must include a baseline groundwater monitoring as described in Table W-15 Background Groundwater Monitoring Program and the locations shown in Figure T-9 of the EMP to provide the following:
- (a) Representative groundwater samples from the aquifers potentially affected by mining activities.
 - (b) At least twelve (12) sampling events, no more than two (2) months apart over a 2 years period, where it is safe to access each site.
 - (c) Background groundwater quality in hydraulically isolated background bore(s) that have not been affected by any mining activities,
 - (d) Final groundwater contaminant trigger levels for the alluvium and tertiary sediments as required in condition W54, and,
 - (e) Natural water level fluctuations and trends.



Table W-15 Background Groundwater Monitoring Program

Monitoring sites	Parameter	Frequency	Aquifer
KMB--01A	Water Level pH, EC, TDS, CaCO ₃ , Alkalinity, SO ₄ , Cl, Ca, Mg, Na, K, Al, As, B, Cd, Cr, Co, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Se, Sr, V, Zn, ammonia, nitrogen, phosphorus, TPH	Water Level - At least one reading every 12 hours – electronic loggers	Alluvium
KMB--01B			Tertiary deposits
KMB--02A			Alluvium
KMB--02B			Tertiary deposits
KMB--03A			D-Seam
KMB--03B			Tertiary deposits
KMB--04		Existing Baseline monitoring as defined in the Groundwater Monitoring Program to continue until 12 samples have been collected from each monitoring bore	D-E sandstone
KMB--05			D-E sandstone
KMB--06			D-E sandstone
KMB--07			C-D sandstone
1635R			D-E sandstone
1636R			C-D sandstone
1637R			D-E sandstone
1638R			D-E sandstone
1680R			C-D sandstone
1681R			D-E sandstone
AVP-11	Water Level Only	At least one reading every 12 hours – electronic loggers	B-C, C-D, D-E, sub-E sandstone
KVP-01			B-C, C-D sandstone
KVP-02			B-C, C-D, D-E sandstone
KVP-03			B-C, C-D sandstone
KVP-04			B-C, C-D, D-E, sub-E sandstone
KVP-05			B-C, C-D, D-E sandstone
KVP-06			B-C, C-D, D-E, sub-E sandstone
KVP-07			B-C, C-D, D-E, sub-E sandstone
KVP-08			B-C, C-D, D-E, sub-E sandstone
KVP-09			B-C, C-D, D-E, sub-E sandstone
KVP-10			C-D, D-E, sub-E sandstone

W54 Groundwater contaminant trigger levels as per Table W-16 Groundwater Containment Trigger Levels (alluvium & tertiary sediments aquifers) must be finalised based on the baseline groundwater monitoring defined in condition W53 and submitted to the administering authority no more than 24 months from the date of issue of this environmental authority.

W55 Mining activities must not cause groundwater quality in alluvium and tertiary sediment aquifers potentially affected by mining activities to exceed any of the contaminant trigger levels in Table W-16 Groundwater Containment Trigger Levels (alluvium & tertiary sediments aquifers) as measured at the operational monitoring locations specified in Table W-15 Background Groundwater Monitoring Program.

Table W-16 Groundwater Containment Trigger Levels (alluvium & tertiary sediments aquifers)

Parameter	Units	Trigger Levels
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pH	pH Units	6.5 - 8.5
Electrical Conductivity	µS/cm	85 th percentile of background monitoring in accordance with condition W60
Total Dissolved Solids	mg/L	
Calcium	µg/L	
Magnesium	µg/L	
Sodium	µg/L	
Potassium	µg/L	
Chlorine	µg/L	
SO ₄	µg/L	
CO ₃	µg/L	
HCO ₃	µg/L	
Iron	µg/L	
Aluminium	µg/L	
Silver	µg/L	
Arsenic	µg/L	
Mercury	µg/L	
Antimony	µg/L	
Molybdenum	µg/L	
Selenium	µg/L	
Total Petroleum Hydrocarbons	µg/L	

W56 The holder of the environmental authority must undertake operational groundwater monitoring as detailed in Table W-17 Operational Groundwater Monitoring Program as a component of the groundwater monitoring program defined in condition W52. Operational monitoring points are shown in Figure T-9 of the EMP.

Table W-17 Operational Groundwater Monitoring Program

Monitoring sites	Parameter	Frequency	Purpose
KMB--01A	Water Level pH, EC, TDS, CaCO ₃ , Alkalinity, SO ₄ , Cl, Ca, Mg, Na, K, Al, As, B, Cd, Cr, Co, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Se, Sr, V, Zn, ammonia, nitrogen, phosphorus, TPH*	Water Level - At least one reading every 24 hours – electronic loggers Quarterly for first five years of operation and bi-annual thereafter	Background Monitoring
KMB--01B			
KMB--02A			
KMB--02B			
KMB--03B			
AIR1	Water Level	Water Level - At least one reading every 24 hours – electronic loggers	Spill Monitoring
KCTSF1	pH, EC, TDS, CaCO ₃ , Alkalinity, SO ₄ , Cl, Ca, Mg, Na, K, Al, As, B, Cd, Cr, Co, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Se, Sr, V, Zn, ammonia, nitrogen, phosphorus, TPH*	Quarterly water quality sampling for first five years of operation and bi-annual thereafter	Seepage and Spill Monitoring
KCTSF2			
In-Pit TSF1			
MWD1			
MWD2			
CHPP1			



CHPP2			
1	Water Level Only	Daily water level measurements electronically logged	Drawdown Monitoring
2			
3			
4			
5			
6			
7			
8			
9			
10			
11			

*The parameters analysed during the operational monitoring will be revised on the findings of the baseline monitoring.

W57 If the groundwater contaminant trigger levels defined in Table W-16 Groundwater Containment Trigger Levels (alluvium & tertiary sediments aquifers) are exceeded at the monitoring sites identified in Table W-17 Operational Groundwater Monitoring Program then the Environmental Authority holder must:

- (a) Resample the monitoring point
- (b) If second sample is also above the trigger level then complete an investigation into the potential for environmental harm and notify the administering authority within twenty eight (28) days of receiving the analysis results.

W58 Subject to condition W56 groundwater levels must be monitored and recorded. Groundwater drawdown fluctuations of 5 metres or more below the minimum levels recorded within the D-E sandstone during the background monitoring defined in W53, not resulting from the pumping of licensed bores, must be notified within fourteen (14) days to the administering authority following completion of monitoring.

The holder of the environmental authority must investigate the potential for a reduced groundwater supply for adjacent landholder water supply bores and where required instigate make-good agreements defined in W59.

W59 The proponent must reach mutually agreeable 'make-good' arrangements with landholders potentially affected by groundwater drawdown for the provision of alternative supplies throughout the mine life, and after mine closure. Alternative supplies should be put in place before supplies from relevant existing landholder bores are adversely affected. The costs associated with changes to landholder extraction of groundwater from bores on affected land must be covered by the proponent.

W60 The holder of the environmental authority must monitor and record water levels within the Rewan Formation as the basal aquitard unit of the Great Artesian Basin, in accordance with W56 at monitoring locations 3,4 and 5 as listed in Table W-17 Operational Groundwater Monitoring Program. Where groundwater drawdown fluctuations of 5 metres or more below the minimum levels recorded within the Rewan Formation during the background monitoring defined in W53 are

recorded, not resulting from the pumping of licensed bores, the holder of this environmental authority must undertake an assessment of the potential for induced flow from the Great Artesian Basin aquifers. The holder must notify the administering authority of the outcomes of this assessment within fourteen (14) days following completion of the assessment

- W61** The groundwater monitoring data must be reviewed on an annual basis by a suitably qualified and experienced hydrogeologist. 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.
- W62** The holder of the environmental authority must report the results and analysis of groundwater monitoring to the administering authority on request.
- W63** The method of water sampling required by the environmental authority must comply with that set out in the current edition of DEHP's Water Quality Sampling Manual, or subsequent updated versions. The following information must also be recorded in relation to all groundwater 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; and
 - (d) The results of all monitoring.

Schedule G - Regulated Structures

- G1** The holder of this Environmental Authority must ensure that each dam is designed, constructed, operated and maintained in accordance with accepted engineering standards and is fit for the purpose for which it is intended.

Design Plan, Hazard Assessment & Certification

- G2** In accordance with, and using the certification forms set out in the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* (DEHP, Feb 2012), the hazard category and the design plan of any regulated structure must be assessed and certified by a suitably qualified and experienced person prior to the detailed design and construction of the structure, and / or prior to any change in its purpose or the nature of its stored contents.
- G3** A hazard assessment report and certification must be prepared for any regulated structure assessed; the report may include a hazard assessment for more than one structure. The holder must, on receipt of a hazard assessment report and certification, provide to the administering authority one paper copy and one electronic copy of the hazard assessment report and certification.
- G4** The design plan for a regulated structure must be accompanied by a design report which provides:
 - (a) A description of all the documents which constitute the design plan;



(b) A statement of:

- i. the applicable standards including engineering criteria, industry guidelines, relevant legislation and regulatory documents, relied upon in preparing the design plan;
- ii. all relevant facts and data used in preparing the design plan, including any efforts made to obtain necessary facts and data, and any limitations or assumptions to facts and data used in preparing the design plan;
- iii. the hazard category of the regulated structure; and
- iv. justification of how the design plan provides the necessary required performance.

(c) Documentation of hydrological analyses and estimates required to determine all elements of the design including volumes and flow capacities;

(d) Detailed criteria for the design, operation, maintenance and decommissioning of the regulated structure, including any assumptions;

(e) Design, specification and operational rules for any related structures and systems used to prevent failure scenarios;

(f) Drawings showing the lines and dimensions, and locations of built structures and land forms associated with the regulated structure;

(g) Consideration of the interaction of the pit design with the levee or regulated dam design;

(h) An operational plan that includes:

- i. normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance);
- ii. 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.

(i) a plan for the decommissioning and rehabilitation of the regulated structure at the end of its operational life; and

(j) details of reports on investigations and studies done in support of the design plan.

G5 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.

- G6** Documentation required by the conditions in this schedule must be kept available for inspection by the regulating authority for a period of 5 years after the conclusion of the environmentally relevant activity in respect of which this Environmental Authority has been granted.

Water Management Systems

- G7** Where a regulated structure is to be managed as part of an integrated containment system and the Design Storage Allowance (DSA) volume is to be shared across the integrated containment system, the design and operating rules for the system as a whole must be documented in a system design plan that is certified by a suitably qualified and experienced person.
- G8** The system design plan must contain all of the following:
- (a) The design plans;
 - (b) The as constructed plans;
 - (c) The operational rules for each individual regulated dam that forms part of the integrated system;
 - (d) The standards of serviceability and accessibility of water transfer equipment or structures; and
 - (e) The operational rules for the system as a whole.

Construction of Regulated Structures

- G9** 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 Hazard Categories and Hydraulic Performance of Dams* (DEHP, Feb 2012).
- G10** Construction of a regulated structure is prohibited unless the holder has:
- (a) Submitted a hazard category assessment report and certification to the administering authority in accordance with condition G3;
 - (b) Commissioned a suitably qualified and experienced person to prepare a design plan and associated operation procedure for the structure in accordance with condition G4; and
 - (c) Received the certification from a suitably qualified and experienced person for the design plan and the associated operating procedures in compliance with the relevant condition of this authority.
- G11** Regulated structures must be designed and constructed to ensure that the design integrity would not be compromised on account of:
- (a) Floodwaters from entering the regulated dam from any watercourse or drainage line; and



- (b) Wall failure due to erosion by floodwaters arising from any watercourse or drainage line.

Operations

- G12** An Operations Plan must be kept current for each regulated structure.
- G13** The Operations Plan shall at least cover all matters relevant to the operations and maintenance of the regulated structure so that it is compliant in all respects with the Environmental Authority.
- G14** Where an Operational Plan covers decommissioning and rehabilitation, those operations are to be consistent with the design plan for the structure and the rehabilitation requirements of this Environmental Authority.
- G15** Operation of a regulated structure is prohibited unless the holder has submitted all of the following 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 G5;
 - (b) A set of as constructed drawings and specifications;
 - (c) Certification of as constructed drawings and specifications in accordance with condition G2; and
 - (d) A copy of the certified system design plan, 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.
- G16** Each regulated structure must be designed, constructed, operated and maintained in a manner that is consistent with the current design plan, the current operational plan, and the associated certified as constructed drawings, for the duration of its operational life; and the structure must be fit for the purpose for which it is intended until decommissioned and rehabilitated.
- G17** In the event of early signs of loss of structural or hydraulic integrity, the holder of this Environmental Authority must immediately take action to prevent or minimise any actual or potential environmental harm, and report in writing any findings and actions taken to the administering authority within 28 days of that event.
- G18** The holder must take reasonable and practicable control measures to prevent the causing of harm to persons, livestock or wildlife through the construction and operation of a regulated structure. Reasonable and practicable control measures may include, but are not limited to:
- (a) The secure use of fencing, bunding or screening; and
 - (b) Escape arrangements for trapped livestock and fauna.

Mandatory Reporting Levels

- G19** The Mandatory Reporting Level (the MRL) must be marked on a regulated structure in such a way that it is clearly visible during routine inspections.
- G20** The holder must notify the administering authority as soon as practicable, but within 48 hours, of the level in any regulated structure reaching the MRL and must act to prevent or minimise any actual or potential environmental harm.
- G21** 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 structure.

Inspections of Regulated Structures

- G22** Each regulated structure must be inspected every calendar year by a suitably qualified and experienced person.
- G23** At each annual inspection, the condition and adequacy of each regulated structure must be assessed for safety and against the necessary structural, geotechnical and hydraulic performance criteria, including assessment:
- (a) Against the most recent hazard assessment report and design plan (or system design plan);
 - (b) Against recommendations contained in previous annual inspections reports;
 - (c) Against recognised safety deficiency indicators;
 - (d) For changes in circumstances potentially leading to a change in hazard category;
 - (e) For conformance with the conditions of this authority;
 - (f) For conformance with the as constructed drawings;
 - (g) For the adequacy of the available storage in each regulated structure, 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 structure (or network of linked containment systems); and
 - (h) For evidence of conformance with the current operational plan.
- G24** The holder of this Environmental Authority must immediately act upon recommendations arising from an annual inspection on condition and adequacy of a regulated structure.
- G25** At each annual inspection, if a mandatory reporting level is required, it must be determined and marked on each regulated structure.
- G26** A final assessment of adequacy of available storage in each regulated structure must be based on water levels observed within the month of October and result in an estimate of the level as of 1 November.



- G27** On 1 November of each year, storage capacity must be available in each regulated structure (or network of linked containment systems with a shared DSA volume), to meet the Design Storage Allowance (DSA) volume for the structure (or network of linked containment systems).

The holder must, as soon as possible and within 48 hours of becoming aware that the regulated structure (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year:

- (a) Notify the administering authority; and
- (b) Act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.

- G28** The holder must assess the performance of each regulated structure (or linked containment system) over the preceding November to May period based on actual observations of the available storage in each regulated structure or linked containment system taken prior to 1 July of each year.

- G29** The holder must take action to modify its water management or linked containment system so as to ensure that the regulated structure or linked containment system will perform in accordance with the requirements of this authority, for the subsequent November to May period.

- G30** For each annual inspection, 2 copies of a report certified by a suitably qualified and experienced person and in accordance with the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*, (DEHP, Feb 2012) must be provided to the administering authority by 1 December. The report is to detail the adequacy of recommended actions to ensure the integrity of each regulated structure.

- G31** The holder of this Environmental Authority must, within one week of receipt of the annual inspection report, consider the report and its recommendations; and as soon as possible, but within one month of receipt of the annual inspection report, formulate and implement actions to ensure that each regulated structure safely performs its intended functions.

- G32** The holder must provide a copy of any reports, documentation and certifications prepared under the Environmental Authority, including but not limited to any Register of Regulated Structures, hazard assessment, design plan and other supporting documentation, to a new holder and the administering authority on transfer of this authority.

Decommissioning & Rehabilitation

- G33** On cessation of operation of any regulated structure, that structure must be maintained so as to avoid environmental harm until the structure is decommissioned. The holder of this Environmental Authority must not abandon any structure, but must decommission each structure such that ongoing environmental harm is prevented.

G34 Prior to the cessation of the environmentally relevant activity, each regulated structure must be decommissioned such that there is no ongoing environmental harm by:

- (a) Becoming a safe site for humans and animals at the completion of rehabilitation; or
- (b) Becoming a stable landform, that no longer contains flowable substances and minimises erosion impacts; or
- (c) Not allowing for acid mine drainage; or
- (d) Being approved or authorised under relevant legislation for a beneficial use; or
- (e) Being a void authorised by the administering authority to remain after decommissioning; and
- (f) The regulated structure being compliant with all other relevant rehabilitation requirements of this authority.

G35 The following regulated structures must be wholly located within the control points defined in Table G-1 Location of Regulated Structures.

Table G-1 Location of Regulated Structures

Name	Purpose	Easting	Northing	Unique Location ID (Levees Only)
MINE WATER DAM 1	Mine water dam	-23.056282	146.408652	NA
		-23.071451	146.408586	
		-23.071549	146.435383	
		-23.056380	146.435446	
MINE WATER DAM 2	Mine water dam	-23.071502	146.524189	NA
		-23.085049	146.524141	
		-23.085096	146.539781	
		-23.071549	146.539827	
MINE WATER DAM 3	Auxiliary Storage	-23.084418	146.504007	NA
		-23.092839	146.503976	
		-23.092878	146.516464	
		-23.084456	146.516494	
MINE WATER DAM 4	Auxiliary Storage	-23.098815	146.509653	NA
		-23.107560	146.509621	
		-23.107590	146.519461	
		-23.098845	146.519493	
TSF1	Tailings Storage Facility	-23.015268	146.473080	NA
		-23.007141	146.487554	
		-23.015641	146.493123	
		-23.023760	146.478649	
TSF2	Tailings Storage Facility	-23.024263	146.477808	NA
		-23.012515	146.498736	



Name	Purpose	Easting	Northing	Unique Location ID (Levees Only)
		-23.015887	146.502413	
		-23.021946	146.504489	
		-23.025288	146.504467	
		-23.032153	146.501689	
		-23.043137	146.487496	
		-23.043767	146.483980	
SOUTHERN OPENCUT LEVEE	Flood Protection	-23.117248	146.441638	Control Point 1
		-23.109902	146.441880	Control Point 2
		-23.109880	146.495437	Control Point 3
		-23.069841	146.495455	Control Point 4
		-23.057667	146.496782	Control Point 5
		-23.053902	146.493814	Control Point 6
		-23.052681	146.489997	Control Point 7
		-23.053240	146.484354	Control Point 8
		-23.051664	146.479413	Control Point 9
		-23.049578	146.474327	Control Point 10
NORTHERN OPENCUT LEVEE	Flood Protection	-23.032258	146.466888	Control Point 11
		-23.038382	146.469630	Control Point 12
		-23.040872	146.473461	Control Point 13
		-23.042170	146.478589	Control Point 14
		-23.045077	146.483364	Control Point 15
		-23.046807	146.485778	Control Point 16
		-23.047000	146.490477	Control Point 17
		-23.043745	146.498646	Control Point 18
		-23.038011	146.504534	Control Point 19
		-23.030391	146.503872	Control Point 20
		-23.023738	146.505437	Control Point 21
		-23.015407	146.503112	Control Point 22
		-23.012527	146.500023	Control Point 23
		-23.058461	146.504616	Control Point 24
STOCKPILE LEVEE	Flood Protection	-23.056108	146.505745	Control Point 25
		-23.054717	146.508634	Control Point 26
		-23.060902	146.512924	Control Point 27
		-23.063059	146.515409	Control Point 28
		-23.071526	146.426013	NA
LITTLE SANDY AND ROCKY CREEK DIVERSION	Clean Water Diversion	-23.116914	146.425820	
		-23.116952	146.436377	
		-23.071564	146.436566	
Spoil Dam 1	Collection of mine affected runoff	-23.010048	146.501204	NA
		-23.010041	146.499058	
		-23.006247	146.499072	



Name	Purpose	Easting	Northing	Unique Location ID (Levees Only)
		-23.006254	146.501218	
Spoil Dam 2	Collection of mine affected runoff	-23.043716	146.484975	NA
		-23.043729	146.488880	
		-23.045536	146.488873	
		-23.045523	146.484968	
Spoil Dam 3	Collection of mine affected runoff	-23.032550	146.468280	NA
		-23.032564	146.472379	
		-23.034551	146.472371	
		-23.034538	146.468272	
Spoil Dam 4	Collection of mine affected runoff	-23.098535	146.492383	NA
		-23.098541	146.494033	
		-23.095225	146.494046	
		-23.095220	146.492395	
Borefield dam 1	Groundwater Dewatering	-23.098551	146.425769	NA
		-23.100538	146.425760	
		-23.100543	146.427156	
		-23.098556	146.427165	
Borefield dam 2	Groundwater Dewatering	-23.119028	146.425681	NA
		-23.121016	146.425673	
		-23.121021	146.427070	
		-23.119033	146.427078	
Adit/ROM dam south	Collection of mine affected runoff.	-23.152318	146.439137	NA
		-23.152324	146.440788	
		-23.149009	146.440802	
		-23.149003	146.439151	
Adit/ROM dam central	Collection of mine affected runoff.	-23.100257	146.437889	NA
		-23.100269	146.441463	
		-23.098725	146.441469	
		-23.098712	146.437895	
Adit/ROM dam north	Collection of mine affected runoff.	-23.055920	146.484831	NA
		-23.055910	146.481708	
		-23.054347	146.481714	
		-23.054357	146.484837	
ROM dump dam	Collection of mine affected runoff.	-23.061167	146.487428	NA
		-23.061160	146.485280	
		-23.062452	146.485275	
		-23.062459	146.487423	
TLO dam	Collection of mine affected runoff.	-23.064795	146.517726	NA
		-23.067101	146.515843	
		-23.066158	146.514489	
		-23.063842	146.516372	



Name	Purpose	Easting	Northing	Unique Location ID (Levees Only)
CMIA dam & overflow basin	Collection of mine affected runoff.	-23.058215	146.496449	NA
		-23.054879	146.495309	
		-23.053069	146.491714	
		-23.052810	146.489685	
		-23.054002	146.489583	
		-23.055255	146.494488	
		-23.058336	146.494711	
Process water and decant dam	Collection of mine affected water.	-23.039857	146.475981	NA
		-23.039846	146.472858	
		-23.038284	146.472864	
		-23.038294	146.475987	
Pit dewatering dam north	Pit Dewatering.	-23.036856	146.475534	NA
		-23.036846	146.472411	
		-23.035283	146.472417	
		-23.035294	146.475540	
Pit dewatering dam south	Pit Dewatering	-23.082471	146.461190	NA
		-23.082483	146.464764	
		-23.080938	146.464770	
		-23.080926	146.461197	

G36 Regulated structures must be consistent with the details in Table G-2 Basic Details of Regulated Dams.

Table G-2 Basic Details of Regulated Dams

Regulated structure	Max surface areas (ha)	Max volume of dam (ML)	Max depth of dam (m)	Purpose of dam
MWD1	204.93 @ FSL	9,300 @ FSL	14.5 @ FSL	Mine water containment
MWD2	137.68 @ FSL	7,600 @ FSL	13.5 @ FSL	Mine water containment
MWD3	56.38 @ FSL	2,550 @ FSL	11.5 @ FSL	Auxillary storage
MWD4	27.71 @ FSL	830 @ FSL	9.0 @ FSL	Auxillary storage
Tailings Storage Facility	128.17 @ FSL	10,850@ FSL	12.6 @ FSL	Tailings Storage
Spoil Dam 1	5.5 @ FSL	300@ FSL	6.8 @ FSL	Collection of mine affected runoff
Spoil Dam 2	6.1 @ FSL	350@ FSL	6.8 @ FSL	Collection of mine affected runoff
Spoil Dam 3	6.9 @ FSL	400@ FSL	7.0 @ FSL	Collection of mine affected runoff
Spoil Dam 4	17.0 @ FSL	1,200@ FSL	8.3 @ FSL	Collection of mine affected runoff
Borefield dam 1	42.8 @ FSL	55@ FSL	6.0 @ FSL	Groundwater dewatering
Borefield dam 2	42.8 @ FSL	55@ FSL	6.0 @ FSL	Groundwater dewatering
Adit/ROM dam south	0.9 @ FSL	29@ FSL	6.4 @ FSL	Collection of mine affected runoff
Adit/ROM dam central	0.5 @ FSL	13@ FSL	4.4 @ FSL	Collection of mine affected runoff
Adit/ROM dam north	0.5 @ FSL	13@ FSL	4.4 @ FSL	Collection of mine affected runoff
ROM dump dam	0.3 @ FSL	7@ FSL	4.1 @ FSL	Collection of mine affected runoff
TLO dam	1.3 @ FSL	45@ FSL	4.6 @ FSL	Collection of mine affected runoff

Regulated structure	Max surface areas (ha)	Max volume of dam (ML)	Max depth of dam (m)	Purpose of dam
CMIA dam & overflow basin	5.3 @ FSL	280@ FSL	6.4 @ FSL	Collection of mine affected runoff
Process water and decant dam	2.9 @ FSL	150@ FSL	6.8 @ FSL	Collection of mine affected runoff
Pit dewatering dam north	7.7 @ FSL	200@ FSL	7.0 @ FSL	Collection of mine affected runoff
Pit dewatering dam south	3.7 @ FSL	450@ FSL	7.0 @ FSL	Collection of mine affected runoff

G37 All regulated dams must meet the hydraulic performance criteria specified in Table G-3 Hydraulic Performance of Dams.

Table G-3 Hydraulic Performance of Dams

Regulated structure	Hazard category for failure to contain	Hazard category for dam break	Adopted Hazard Classification	Uncontrolled Discharge AEP	Spillway critical design storm AEP	Mandatory reporting level
MWD1	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
MWD2	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
MWD3	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
MWD4	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Tailings Storage Facility 1	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Spoil Dam 1	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Spoil Dam 2	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Spoil Dam 3	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Spoil Dam 4	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Borefield dam 1	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Borefield dam 2	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Audit/ROM dam south	High	Low	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Audit/ROM dam central	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
Audit/ROM dam north	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
ROM dump dam	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm



Regulated structure	Hazard category for failure to contain	Hazard category for dam break	Adopted Hazard Classification	Uncontrolled Discharge AEP	Spillway critical design storm AEP	Mandatory reporting level
TLO dam	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
CMIA dam & overflow basin	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
Process water and decant dam	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Pit dewatering dam north	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Pit dewatering dam south	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm

G38 Each regulated levee named in column 1 of Table G-1 Location of Regulated Structures, must be consistent with the details noted in column 2 through to, and including column 4 of [Table G-4 Basic Details of Regulated Levees](#), for that levee.

Table G-4 Basic Details of Regulated Levees

Name	Design AEP	Minimum Levee Level	Unique Location ID (As per Table G1)
SOUTHERN OPENCUT LEVEE	1:1000	Flood Level plus 1m freeboard	Control Point 1
			Control Point 2
			Control Point 3
			Control Point 4
			Control Point 5
			Control Point 6
			Control Point 7
			Control Point 8
			Control Point 9
			Control Point 10
NORTHERN OPENCUT LEVEE	1:1000	Flood Level plus 1m freeboard	Control Point 11
			Control Point 12
			Control Point 13
			Control Point 14
			Control Point 15
			Control Point 16
			Control Point 17
			Control Point 18
			Control Point 19
			Control Point 20
			Control Point 21
			Control Point 22
			Control Point 23



Name	Design AEP	Minimum Levee Level	Unique Location ID (As per Table G1)
STOCKPILE LEVEE	1:1000	Flood Level plus 1m freeboard	Control Point 24
			Control Point 25
			Control Point 26
			Control Point 27
			Control Point 28

SUPERSEDED



T.3.5 Noise & Vibration

T.3.5.1 Background

The Project has the potential to generate noise and vibration impacts on nearby sensitive receptors. Operation and construction activities will vary and change in location throughout the various mine stages. The noise levels and potential noise and vibration impacts at the sensitive receptor locations will therefore vary accordingly.

Locations of the noise sensitive receptors in relation to the Project site are shown in Figure T-10 whilst Table T-22 sets out their respective distances from the nearest mining lease boundary and open-cut pit area boundary. The identified sensitive receptors include two proposed accommodation villages; Location F associated with the Project and Location G the accommodation facilities for the neighbouring Alpha Coal Project (Note: this information is provided for reference only, as impacts to on-lease receptors is not within the scope of this EMP).

Table T-22 Noise Sensitive Receptors

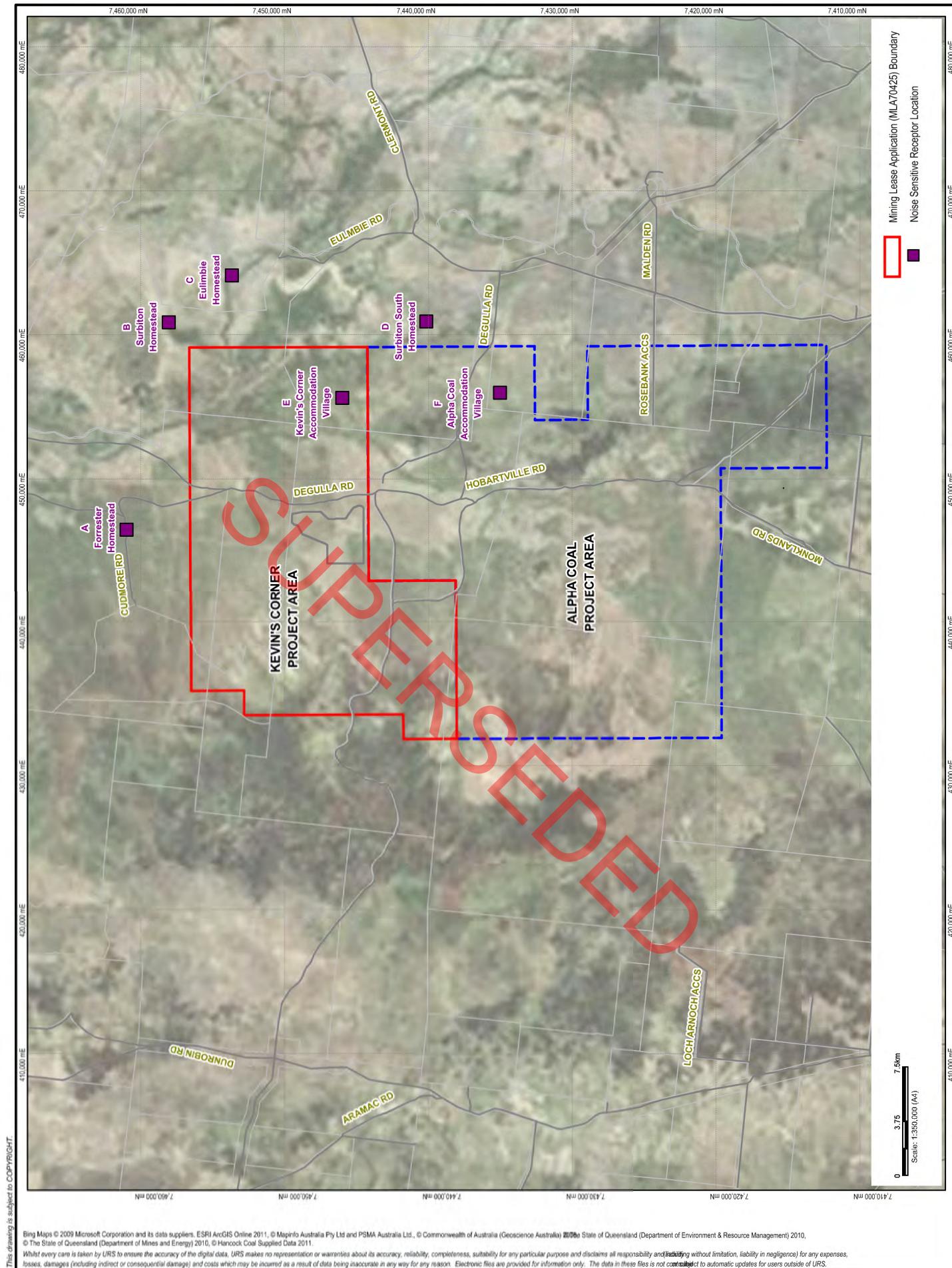
Receptor	Address	Approx. Distance from MLA70425 Mining Lease Boundary	Approx. Distance from Open Cut Pit Area Boundary
A	Forrester Homestead	4 km	7 km
B	Surbiton Homestead	1 km	10 km
C	Eulimbie Homestead	5 km	15 km
D	Surbiton South Station	4 km	12 km
E	KC Accommodation Village	n/a	8 km
F	ACP Accommodation Village	9 km	12 km

Background Noise Monitoring

Long-term unattended and short-term attended noise monitoring was conducted at the locations of three of the potentially most affected dwellings, namely Receptors A (Forrester Homestead), C (Eulimbie Homestead) and D (Surbiton South Homestead). The baseline monitoring took place between 13-24 September 2010 at Receptors A and C and between 13-26 September at Receptor D. Measurements were undertaken in accordance with AS1055:1997 *Acoustics – Description and Measurement of Environmental Noise* and the Queensland's DEHP document *Noise Measurement Manual 3rd edition*.

Given the very rural nature of the proposed mine site and far reaching surrounds, the measured noise levels obtained from the identified monitoring locations would be expected to be reasonably representative of the noise levels expected at the locations of Receptors A – G.

Rating Background Levels (RBL) for daytime, evening and night-time periods determined from the noise monitoring results are summarised in Table T-23. The median maximum LAeq,1hour noise levels measured at each location are also shown.



HANCOCK GALILEE PTY LTD
 Kevin's Corner Project
 Supplementary Environmental Impact Statement

NOISE SENSITIVE RECEPTOR LOCATIONS

Datum: GDA94, MGA Zone55

URS

REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: T-10



File No: 42626920-g-2109c.wor

Drawn: RG

Approved: RS

Date: 04-10-2012

Rev: C

A4



Table T-23 Noise Monitoring Results

Location	Rating Background Noise Level (RBL) L_{A90} dB(A)			Ambient Noise Level (AL) L_{Aeq} dB(A)		
	Day	Evening	Night	Day	Evening	Night
Forrester (A)	25	25	25	40	34	32
Eulimbie (C)	25	25	25	46	33	30
Surbiton South (D)	25	25	25	49	29	26

Note: RBLs set to the 25 dB(A) threshold level in accordance with EcoAccess Guideline, Planning for Noise Control.

Operational noise criteria for the Project are based on the levels set out in Table T-23 in accordance with provisions of the Queensland DEHP Ecoaccess Guideline: *Planning for Noise Control*.

Given the nearest receptors are located in a very rural area vibration monitoring of existing environment was not undertaken. It is considered unnecessary to undertake vibration monitoring in a rural area where no industry operation is currently present.

Noise Objectives

Whilst the Queensland EPP (Noise) does not include construction noise limits, it does provide acoustic quality objectives for the protection of amenity, human health and wellbeing, including sleep protection. Construction noise effects have been assessed against these criteria, which are set out in Table T-24.

Table T-24 Environmental Protection (Noise) Policy 2008 - Acoustic Quality Objectives

Sensitive Receptor	Time of Day	Acoustic Quality Objective dB(A)			Environmental Value
		$L_{Aeq,1hour}$	$L_{A10,1hour}$	$L_{A1,1hour}$	
Dwelling (external)	Daytime and Evening	50	55	65	Health & wellbeing
Dwelling (internal)	Daytime and Evening	35	40	45	Health & wellbeing
Dwelling (internal)	Night-time	30	35	40	Health & wellbeing in relation to the ability to sleep

As set out in Table T-24, for the protection of sleep, the EPP (Noise) recommends that internal noise levels do not exceed 40 dB(A) $L_{A1,1hour}$. Assuming a 10 dB(A) reduction through a partially opened window, this is approximately equivalent to an external level of 50 dB(A) L_{A1} ; a more stringent limit than the World Health Organisation (WHO) guideline of 55 dB(A) L_{Amax} . For the purposes of this assessment, the EPP (Noise) sleep protection criterion of 50 dB(A) L_{A1} has been adopted.

Predicted Construction Noise Levels

The noise levels at each receptor location generated by the construction activities have been predicted for three discrete construction stages by modelling of the anticipated construction noise sources located throughout the mine site. The noise modelling has been carried out considering neutral and adverse meteorological conditions.

Modelling results indicate that full compliance with the EPP (Noise) noise limits would be achieved for the construction of the proposed mine infrastructure during the day, evening or night time periods.

The predicted construction noise levels result from a conservative noise modelling approach where it has been assumed that all equipment would operate continuously and simultaneously during the assessment period.

The Queensland DEHP Ecoaccess Guideline: *Assessment of Low Frequency Noise* provides guidance for the assessment of low frequency noise impacts. Where a noise emission occurs exhibiting an unbalanced frequency spectra, the overall sound pressure level inside residences should not exceed 50 dB(Linear) to avoid complaints of low frequency annoyance. If the dB(Linear) measurement exceeds the dB(A) measurement by more than 15 dB, a one-third octave band analysis should be carried out.

Predictive noise modelling estimated the noise levels to be no more than 45 dB(L) at all existing receptor locations (A-E). Whilst linear noise levels of up to 51 dB(L) are predicted at Location F, no more than 15 dB difference between linear levels and A-weighted levels is predicted at this location.

On this basis it is concluded that low frequency noise would not be at a level to cause annoyance to these residential receptors and compliance with the relevant criterion inside these dwellings is predicted. Accordingly, no adjustment to the A-weighted operational noise criteria is deemed necessary.

Operational Noise

The potential operational noise impacts from the site have been assessed in accordance with the provisions of the *Environmental Protection Act* (1994) and the EPP (Noise) whilst the operational noise criteria for the Project have been set in accordance with the DEHP Ecoaccess Guideline: *Planning for Noise Control*.

The Ecoaccess Guideline: *Planning for Noise Control* prescribes a process, which takes account of:

- Control and prevention of background creep in the case of steady noise;
- Containment of variable noise levels and short term noise events; and
- Prevention of sleep disturbance.

The resultant assessment criteria applied for each sensitive receptor based on the noise monitoring results are set out in Table T-25. In accordance with the Ecoaccess Guideline, the most stringent of the Planning Noise Level and Specific Noise Level criteria are applied in setting the LAeq,1 hour limits for the purposes of this assessment.

Table T-25 Summary of Operational Noise Design Criteria

Location	Daytime		Evening		Night-time	
	L _{A90,1hour}	L _{Aeq,1hour}	L _{A90,1hour}	L _{Aeq,1hour}	L _{A90,1hour}	L _{Aeq,1hour}
Any Noise Sensitive Receptor	30	33	28	31	25	28

The guideline recommends that in order to achieve a good night's sleep, internal noise levels will not exceed 45 dB(A) LAmax more than 10 to 15 times per night. This corresponds to an external limit of 55 dB(A) LAmax assuming 10 dB(A) attenuation through windows. Based on the EPP(Noise) acoustic quality objectives for sleep protection, however, the more stringent external limit of 50 dB(A) LA1 as assessed at 4 m from the dwelling façade is applied for sleep protection; applicable during the night-time period only.

The Ecoaccess Guidelines: *Assessment of Low Frequency Noise*; and *Noise and Vibration from Blasting* has also been considered with respect to the proposed operation activities.



Predicted Operational Noise Levels

Exceedances of the $L_{Aeq,1hour}$ operational noise design criterion has been predicted at locations A (Forrester), B (Surbiton) and C (Eulimbie). Full compliance with the operational noise criteria is predicted at Receptors D and E.

The identified potential exceedances are generated by train movements within the mining lease. The following noise control measures are recommended:

- Applying effective track and track/wheel engineering techniques to reduce noise i.e. vibration isolated track sections; continuously welded rail wherever feasible; track friction reduction devices (rubber or electronic grease dispensers);
- Use of barriers in some sections of the alignment where sensitive receptors are in proximity; and
- Treating sensitive receptors' dwellings to reduce external noise intrusion.

Additionally, measures to effectively reduce operational noise from the site, including the re-direction of the northern underground mine's ventilation discharge are recommended. These are set out in Section T.3.5.6.

The primary functions of the Project Accommodation Villages (Receptors E and F) are to provide sleeping facilities for mine workers between shifts. On this basis, only the internal noise criteria are considered appropriate for the assessment of the accommodation villages. The intended inclusion of mechanical ventilation and air conditioning within the accommodation village rooms, allowing for windows to be kept normally closed, will ensure that these criteria will be met.

Low Frequency Noise

A low frequency noise criterion of 50 dB(L) is applicable to the Project.

The mining equipment noise sources under assessment typically emit noise of a broadband nature and have not been known to generate the very low frequencies that the *Ecoaccess Guideline for the Assessment of Low Frequency Noise* (2004) was intended to address. The assessment of low frequency noise, in accordance with the Ecoaccess Guideline, has determined that low frequency noise would not be at a level to cause annoyance to these residential receptors. Accordingly, no adjustment to the A-weighted operational noise criteria is required.

Combined Noise

The site-wide combined noise impacts are controlled through the background creep (L90) and specific/intrusive (Leq) criteria contained in the Planning for Noise Control guideline. Both criteria take into account the existing ambient noise level in an area from all existing industry and other noise sources such as road and railway traffic.

The assessment methodology prescribed by the *Ecoaccess Guideline Planning for Noise Control* is based on the existing ambient noise monitoring and comparison to recommended ambient noise levels. The combined effect of the existing industry and other noise sources, together with the Project, is assessed not to exceed the recommended ambient noise levels. If the existing noise level is already above the recommended noise levels, the associated noise levels of the Project are set between 8 and 10 dB(A) below the existing ambient noise level so as the combined effects of existing and proposed industry will not increase above existing noise levels.

No exceedance of the recommended ambient noise levels are predicted at Receptors A – G due to the combined noise contribution from existing industry or any other noise sources, in addition to the Project.

Blasting Noise & Vibration

Criteria

Table T-26 presents a summary of the overpressure and ground vibration criteria and the time of blasting applicable to the Project.

Table T-26 Blasting Overpressure & Ground Vibration Design Criteria

Airblast Overpressure and Vibration Parameter	Daylight hours Monday to Saturday (0900 – 1300 on Sundays and public holidays)
Airblast Overpressure	115 dB(L) for 9 out of any 10 consecutive blasts regardless of interval between blasts. Any single blast must not exceed 120 dB(L).
Peak Particle Velocity	5 mm/s for 9 out of any 10 consecutive blasts regardless of interval between blasts. Any single blast must not exceed 10 mm/s.

When a temperature inversion or a heavy low cloud cover is present, values of airblast overpressure will be higher than normal in surrounding areas. Accordingly, blasting will be avoided if predicted values of airblast overpressure in noise-sensitive places exceed acceptable levels. If this is not practicable, blasting will be scheduled to minimise noise annoyance. An appropriate period is generally between 11 am and 1 pm. Similarly, blasting will be avoided at times when strong winds are blowing from the blasting site towards noise sensitive places.

Blasting will be carried out in accordance with the relevant Australian Standards, AS 2187 *Explosives – Storage, Transport and Use* and the *Explosive Act* (1999).

All blast holes will be confined and standard central Queensland strip mining blasting techniques will be used. Controlled initiation will be used to optimise blast performance and to limit the maximum instantaneous charge (MIC) values. The maximum range of MIC is 350 kg – 1,300 kg, whilst the likely range of MIC is 550 kg – 1,000 kg. No overburden blasting will occur beyond the open-cut pit areas.

Predicted Overpressure

Receptors A – G: Calculations indicate that blasts requiring up to the maximum 1,300 kg MIC would not exceed the most stringent 115 dB(L) overpressure at any sensitive receptor location based on minimum setback distance to the closest open-cast pit area. Location A (Forrester Homestead) is the closest receptor to the pit area boundary at a setback distance of approximately 7 km. At this location overpressure levels of no more than 113 dB(L) are predicted.

Predicted Ground Vibration

No ground vibration impacts are predicted and therefore, with respect to ground vibration, the proposed blasting schedule may be undertaken in compliance with the established criteria, without risk of damage to the receptor properties or community annoyance.

Standard DIN 4150.3-1999 recommends offset distances for buried pipelines constructed from various materials for the prevention of damage from vibration effects. Masonry or plastic pipes are most susceptible; for these pipeline types an offset distance of 510 m is recommended. There are no known buried pipelines



within 510 m of the proposed blasting areas and therefore no adverse effects on pipelines due to blasting are expected.

Optic fibre cables would supply communications to the site, and would likely enter the mine site along the Powerlink powerline easement and/or the rail corridor. It is understood that the cable network would not be sited within 500 m of the proposed blasting areas and therefore no adverse effects on communications networks due to blasting are expected.

T.3.5.2 Environmental Values

The environmental values to be enhanced or protected, as set out in the Queensland *Environmental Protection (Noise) Policy* (EPP (Noise), 2008), are:

- The qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems;
- The qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following:
 - sleep;
 - study or learning;
 - be involved in recreation, including relaxation and conversation.
- The qualities of the acoustic environment that are conducive to protecting the amenity of the community.

T.3.5.3 Potential Impacts on Environmental Values

Open cut mining at the Project will involve overburden removal and strip mining of coal. Overburden removal will occur during the pre-strip process and will utilise truck and shovel fleets, as well as draglines in pit areas. There is potential to utilise in-pit crushing and conveying (IPCC) systems, which are deemed to have a lower impact than the current noise modelling. The exposed coal will be loaded by excavators and front end loaders into trucks for hauling either to the coal stockpiles or to the ROM stockpiles for screening, crushing and processing.

Train movements within the mining lease would have potential for noise impact at noise sensitive receptors.

The key noise component associated with the underground mining activities will be the ventilation equipment.

The mine will operate on a 24 hour, 7 days per week basis during the construction and operational phases, with blasting limited to the daytime period only each day.

Noise and Vibration Impacts on Wildlife

Apart from the possibility of noise from blasting startling birds (there is a possibility that a repeated disturbance of this nature may permanently exclude an area as a preferred nesting site for certain bird species, however no conclusive information could be found to confirm this), no irreversible adverse impacts on animals arising from noise or vibration generated by the project are predicted.

T.3.5.4 Environmental Protection Objectives

The environmental protection objectives for noise and vibration are:

- To avoid causing nuisance noise levels at sensitive receptors; and
- To avoid causing nuisance airblast overpressure and ground vibration impacts at sensitive receptors.

T.3.5.5 Performance Criteria

The performance criteria for noise and vibration are:

- Compliance with the requirements of the Project's Environmental Authority.
- Noise and vibration monitoring in accordance with the control strategies outlined below.
- The number of substantiated noise or vibration complaints from the community.

T.3.5.6 Control Strategies

Construction - Receptors A – D:

No adverse construction noise levels are predicted at the closest existing receptor locations therefore specific construction noise mitigation measures with respect to these receptors are not warranted.

Operations

Receptors A – C:

- Exceedances were predicted at these receptor locations principally due to train movements within the mining lease. Rail noise reduction could be achieved through a combination of measures, including:
 - Applying effective track and track/wheel engineering techniques to reduce noise i.e. vibration isolated track sections; continuously welded rail wherever feasible; track friction reduction devices (rubber or electronic grease dispensers);
 - Use of barriers in some sections of the alignment where sensitive receptors are in proximity;
 - Treating sensitive receptors' dwellings to reduce external noise intrusion.

Receptor D

- No operational noise mitigation measures are required at these receptor locations as full compliance with the operational noise limits is predicted.

Receptor F (Project Accommodation Village):

- In order to ensure that satisfactory internal noise levels are achieved, based on the predicted external noise levels, the accommodation building envelope design will be required to achieve an attenuation of 30 dB(A). Walls and roofs can be readily designed to provide at least this level of attenuation with the use of appropriate materials. The overall noise reduction through the buildings' façades will, therefore, be dependent upon the type of glazing used in windows and doors.
- The accommodation village sleeping quarters will be fitted with windows specified to achieve at least 30 dB(A) in noise attenuation. Additionally, all windows and doors will be fitted with high quality compression seals capable of achieving an air-tight seals as required.
- Mechanical ventilation and air conditioning will be required within the sleeping areas of the accommodation village. These systems will be designed to achieve a noise level of no more than LAeq 30 dB(A) at 1 m from any diffuser.



- Incorporation of these recommended noise control measures will ensure satisfactory internal noise levels of LAeq 35 dB(A) in sleeping areas with windows closed. These levels are within the maximum recommended internal levels identified by AS/NZS 2107:2000.

General Noise & Vibration Management Measures

The following general noise and vibration management measures will be implemented:

- The Proponent will maintain all plant and equipment in good working order to ensure compliance with the noise criteria;
- The Proponent will site and design noise generating plant to comply with the applicable noise criteria at receptor locations outside of the mining lease boundary;
- The Proponent will develop a Noise, Vibration and Overpressure Monitoring Program, making results of this monitoring available to the relevant authority upon request;
- In the event of any exceedance of the established noise, vibration or overpressure criteria, the Proponent will take immediate action to investigate and remedy the situation; and
- The Proponent will develop a complaints handling protocol to respond to any complaints in relation to noise, vibration or overpressure and investigate these, where necessary.

The following control strategies for blasting will be implemented:

- Carry out blasting only during daylight hours.
- Where monitoring or complaints indicate airblast overpressure or ground vibration levels of impact consistently above the environmental protection objectives, the following mitigations measures will be considered:
 - Reducing the maximum instantaneous charge (MIC) by using delays, reduced hole diameter and/or deck loading;
 - Changing the burden and spacing by altering the drilling pattern and/or delay layout, or altering the hole inclination;
 - Ensuring stemming depth and type is adequate; and
 - Restricting blasts to favourable weather conditions.

T.3.5.7 Monitoring

Ongoing Monitoring Program

A combination of permanent and short-term attended noise and vibration monitoring will be undertaken at the following locations:

- Receptor A: Forrester Homestead;
- Receptor B: Surbiton Homestead;
- Receptor C: Eulimbie Homestead; and
- Receptor D: Project Accommodation Village

Complaints Based Monitoring

In the event of a community member registering a complaint regarding excessive noise or vibration levels, a two-phase response regime will be implemented:

- First complaint: Remote Response - Data from the permanent monitoring site, mine site activities and weather data will be interrogated to determine justification of the complaint.
- Second complaint: Site Response - An acoustic professional will visit the area where the complaint was registered for a 48-hour period to undertake continuous logging as well as short-term noise and/or vibration monitoring to determine impacts.

T.3.5.8 Commitments

- Noise and vibration monitoring will be carried out in accordance with the Environmental Authority.
- The Proponent will investigate all substantiated noise and vibration related complaints.
- The Proponent will implement corrective action resulting from complaints investigations as required.

T.3.5.9 Proposed Environmental Authority Conditions

Schedule D – Noise and Vibration

Noise Nuisance

- D1** Noise from the mining activity must not cause a noise nuisance at any sensitive receptor.
- D2** All noise from the mining activity must not exceed the levels specified in Table D-1 Noise Limits (sensitive place).
- D3** Noise is not considered to be a nuisance under condition D1 if monitoring shows that noise from the mining activity does not exceed the following levels in the time periods specified in Table D-1 Noise Limits (sensitive place).

Table D-1 Noise Limits (sensitive place)

Noise Level dB(A) (outside) at a Sensitive Place	Monday to Sunday		
	7 am – 6 pm	6 pm – 10 pm	10 pm – 7 am
L _{Aeq} , adj 15 mins	30	30	30
L _{A1} , adj 15 mins	-	-	55

Noise Monitoring

- D4** Unattended monitoring of the receiving acoustic environment shall be conducted at the locations described in Table D-2 Noise Monitoring Locations for the duration shown or alternative locations as agreed with the administering authority. Attended monitoring will be conducted if a noise related complaint is received from the occupant of the sensitive receptor.

Table D-2 Noise Monitoring Locations

Ref.	Location	Receiving area	Duration	Type
A	Forrester Homestead	Outside the dwelling, 6 m off the southern facade (on free field).	A minimum of 7-day, monthly during construction and every 3 months during operations.	Unattended noise logging, 15-minute averaging continuously throughout the day.
			- 15-minute daytime, evening and night-time measurements.	Attended measurements (3 spot measurements) in response to a noise related



			Undertaken during the same periods of unattended noise logging	complaint received from the occupant..
B	Surbiton Homestead	Outside the dwelling, 6 m off the south-western facade (on free field).	A minimum of 7-day, monthly during construction and every 3 months during operations	Unattended noise logging, 15-minute averaging continuously throughout the day.
			15-minute daytime, evening and night-time measurements. Undertaken during the same periods of unattended noise logging.	Attended measurements (3 spot measurements) in response to a noise related complaint received from the occupant...
C	Eulimbie Homestead	Outside the dwelling, 6 m off the western facade (on free field)	A minimum of 7-day, monthly during construction and every 3 months during operations	Unattended noise logging, 15-minute averaging continuously throughout the day.
			15-minute daytime, evening and night-time measurements. Undertaken during the same periods of unattended noise logging.	Attended measurements (3 spot measurements) in response to a noise related complaint received from the occupant...

NOTE: that the monitoring will not be conducted for residential properties acquired by the project.

- D5** 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 noise nuisance at any sensitive place, and the results must be notified within fourteen (14) days to the administering authority following completion of monitoring. Monitoring must include:
- (a) LAeq,adj,15 mins (external);
 - (b) LA1,15 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 date and time of recording.
- D6** If the monitoring required by condition D5 is undertaken for over one month, then monthly interim reports should be provided to the administering authority.
- D7** The method of measurement and reporting of noise levels must comply with the current edition of the DEHP *Noise Measurement Manual* (3rd Edition, 1 March, 2000) and any subsequent versions.
- D8** If monitoring indicates exceedance of the relevant limits in Table D-1 Noise Limits (sensitive place), then the Environmental Authority holder must:

- (a) Address the complaint (if the monitoring is relevant to 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.

Vibration Nuisance

- D9** Vibration from the mining activity must not cause an environmental nuisance at any sensitive place.
- D10** If the Environmental Authority holder can provide evidence through monitoring that the limits defined in Table D-3 Airblast Overpressure & Peak Particle Velocity Levels, are not being exceeded then the holder is not in breach of condition D9.

Airblast Overpressure Nuisance

- D11** If monitoring indicates exceedance of the relevant limits in Table D-3 Airblast Overpressure & Peak Particle Velocity Levels, then the Environmental Authority holder must address the complaint including the use of appropriate dispute resolution if required, and immediately implement vibration abatement measures so that vibration from the activity does not result in further environmental nuisance.

Table D-3 Airblast Overpressure & Peak Particle Velocity Levels

Blast Noise and Vibration Parameter	Daylight hours – Monday to Saturday Between 0900 – 1300 on Sundays and public holidays
Airblast Overpressure Level [dB(L)]	115dB (linear) peak for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts; and No more than 120dB (linear) peak for any blast.
Peak Particle Velocity (mm/s)	The ground-borne vibration must not exceed a peak particle velocity of 5mm per second for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts; and Must not exceed a peak particle velocity of 10mm per second for any blast.

- D12** If requested by the administering authority, vibration monitoring must be undertaken for a stated period at a specified sensitive place and the results provided to the administering authority within fourteen (14) days following completion of monitoring.
- D13** The method of measurement and reporting of vibration levels must comply with Appendix J of AS 2187.2-2006 – *Explosives Use and Storage*.
- D14** If the monitoring required by condition D12 is undertaken for over one month, then monthly interim reports should be provided to the administering authority.
- D15** Subject to conditions D16 and D17, airblast overpressure level from blasting operations must not cause environmental nuisance, at any sensitive place.
- D16** If the Environmental Authority holder can provide evidence through monitoring that the limits defined in Table D-3 Airblast Overpressure & Peak Particle Velocity Levels are not being exceeded then the holder is not in breach of condition D15.



- D17** If monitoring indicates exceedance of the relevant limits in Table D-3 Airblast Overpressure & Peak Particle Velocity Levels, 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 do not result in further environmental nuisance.
- D18** 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 14 days to the administering authority following completion of monitoring.
- D19** 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
 - (c) Direction location, date and time of recording.
- D20** The method of measurement and reporting of airblast overpressure levels must comply with Appendix J of AS 2187.2-2006 – *Explosives Use and Storage*.



T.3.6 Waste Management

T.3.6.1 Background

Waste generation will occur throughout construction, operation and decommissioning of the Project. On the basis of estimated waste generation and characterisation, an Interim Waste Management Plan has been developed (SEIS, Volume 2, Appendix T4.01) and will be implemented to avoid the impacts of waste generation and disposal on the environment or health of the Project workforce or local community. Waste is generally split into two types, mining waste and general (non-mining) waste. Mining waste is considered to be materials disturbed in the course of mining which do not have marketable value (rather than being a contaminated by-product).

Waste management strategies developed for the Project consider waste management from the concept and planning stages through design, construction and operation. The main strategies that will be adopted for the Project include waste minimisation (including waste segregation for reuse or recycling), cleaner production and appropriate waste disposal.

General (non-mining) Waste Streams

The general wastes generated by construction and operations activities are shown Table T-27 and



Table T-28.

Table T-27 Estimated Waste Generation & Management Strategies (Construction)

Waste	Source	Quantity	Management Strategy
Green waste	Vegetation clearing during construction of mine and associated industrial facilities and amenities.	390,000 t	Suitable material to be used on-site to provide fauna habitat. Remaining material to be chipped and mulched for reuse during progressive rehabilitation and revegetation. Burning of green wastes will only occur as a last resort, subject to obtaining necessary permits and approvals.
Concrete and bricks	Waste from new construction activities (e.g. ROM, OLC external MIAs and rail sleepers), airstrip, access and circulating roadways and car parking areas.	3,000 t	Concrete and brick will be stockpiled in designated storage areas for reuse (e.g. crushed for road base) or alternatively disposed on-site. Contaminated material will be disposed to landfill, or off-site for registered waste materials.
Processed wood products	Waste from new construction activities or temporary structures.	3,000 t	Stockpiled in designated storage area for reuse on-site or alternatively removed by licensed contractor for reuse, reprocessing or final disposal.
Electrical wastes	Waste from new construction activities or temporary structures.	1,000 t	Stockpiled in designated storage area to be removed by licensed contractor for reuse, reprocessing or final disposal.
Sealers, resins, solvents and paints	Waste from new construction activities.	2 t	Stockpiled in designated storage area to be removed by licensed contractor for reuse, reprocessing or final disposal.
Metals	Waste from new construction activities or temporary structures.	900 t	Metals will be source-separated for removal by a licensed operator for recycling. Residual (non-recyclable or contaminated) material would be disposed of to landfill – initially at either Alpha or Emerald until the on-site engineered landfill is operational.
Plastic	Waste from new construction activities or from offices, crib rooms or accommodation.	800 t	Where feasible, these wastes will be segregated to facilitate reuse on site or recycling off-site. Residual (non-recyclable) material would be disposed of to landfill – initially at either Alpha or Emerald until the on-site engineered landfill is operational.
Paper and cardboard	Waste from new construction activities or from offices, crib rooms or accommodation.	2,500 t	Source-separated for removal by a licensed operator for recycling. Residual (non-recyclable) material would be disposed of to landfill – initially at either Alpha or Emerald until the on-site engineered landfill is operational.
Glass	Waste from new construction activities or from offices, crib rooms or accommodation.	260 t	Where feasible, these wastes will be segregated for recycling off-site. Residual (non-recyclable) material would be disposed of to landfill – initially at either Alpha or Emerald until the on-site engineered landfill is operational.

Waste	Source	Quantity	Management Strategy
Putrescible waste	Waste from offices, crib rooms or accommodation.	18,000 t	General refuse is to be collected in covered bins and removed regularly (at least once per week) for recycling off-site or final disposal – initially to landfill at either Alpha or Emerald until the on-site engineered landfill is operational.
Batteries	Wet cell batteries from vehicles and dry cell batteries from phones, radios and other equipment.	60 t	Source-separated for removal and recycling by licensed operator.
Waste electrical and electronic equipment (WEEE)	Administration buildings or maintenance activities.	2 t	Set up WEEE collection service with licensed WEEE recycling operator.
Printer cartridges	Administration buildings.	Nil	Used or empty laser and inkjet printer cartridges can be recycled.
Oils	Routine servicing of plant, equipment and vehicles in workshop.	9,000 t	Waste oil to be collected and stored in bunded holding tanks for collection by a licensed contractor for reuse, reprocessing, recycling or disposal. Where possible, pneumatic pumps should be used to transfer waste oil from machinery to bunded storage.
Grease trap waste	Accommodation village kitchen.	10 t	Waste grease to be placed in a bunded storage container. Waste grease to be collected periodically by a licensed waste contractor for reuse, reprocessing, recycling or disposal.
Other regulated waste (including hydrocarbon and hydrocarbon contamination)	Routine servicing of plant, equipment and vehicles in workshop. Demolition, maintenance or construction activities.	9,000 t	Regulated waste to be stored appropriately for collection and removal by a licensed contractor for treatment. Regulated wastes will be tracked via an approved waste tracking system.
Drums	Small and bulk drums and other containers that typically contained oils and greases.	20 t	Empty drums to be stored in a covered, secure bunded area for periodic collection by a licensed contractor for reuse, reprocessing, recycling or disposal.
Explosives (blasting residue from use of Ammonium Nitrate / Fuel Oil explosive, boosters and detonator)	Defective explosives or packaging.	Nil	Explosive materials are to be treated in accordance with AS2187.2-2006 - Explosives Storage, Transport and Use, Part 2, Use of Explosives. Disposal to landfill is not suitable method of disposal. It is likely that waste explosive materials will be detonated/ burnt by emergency response officers. Following detonation, stainless steel casings will be recycled or disposed to landfill. Cardboard packaging can not be removed from



Waste	Source	Quantity	Management Strategy
			site for recycling due to potential explosive residues.
Asbestos	Removal of asbestos-containing materials discovered during excavation.	TBD	Asbestos to be removed and disposed by specialist contractor.
Tyres	Tyre failure and routine servicing of plant, equipment and vehicles in workshop.	1,500 t	Tyres to be removed by tyre supplier for reprocessing. Alternatively, tyres will be stored for disposal once mine operations commence by burying in overburden at a designated location to be recorded on Environmental Management Register (EMR) administered by DEHP.
Sewage and domestic effluent	Sewage effluent from offices, crib rooms, accommodation, kitchen and amenities.	up to 750 kL/day	Dedicated package sewage treatment plant (pump out system) to be provided during construction until pipeline connected to permanent sewage treatment plant (STP) on-site. Effluent treated to Class A+ quality and reused on-site.
Sewage sludge	STP	up to 1.5 t/day	Dewater on-site in package STP. Prior to on-site facilities being operational, off-site processing or disposal option to be set up. Once package composting plant is established, use as feedstock to produce soil conditioner for reuse on-site.

Table T-28 Estimated Waste Generation & Management Strategies (Operation)

Waste	Source	Annual Quantity	Management Strategy
Green waste	Vegetation clearing during ongoing development of mine, according to mine plan.	42,750 t	Suitable material to be used on-site to provide fauna habitat. Remaining material to be chipped and mulched for reuse during progressive rehabilitation and revegetation. Burning of green wastes will only occur as a last resort, subject to obtaining necessary permits and approvals.
Concrete, brick and bitumen	Waste from minor maintenance of buildings, airstrip and roadways.	TBD	Stockpiled in designated storage area for reuse on-site (e.g. road base) or alternatively removed by licensed contractor for reuse or disposal.
Processed wood products	Waste from minor maintenance of buildings and pallets.	1 t	Stockpiled in designated storage area for reuse on-site or alternatively removed by licensed contractor for reuse or disposal. Where possible, pallets should be returned to supplier.
Electrical wastes	Maintenance of electrical systems within mine industrial area, administration and accommodation buildings.	1 t	Stockpiled in designated storage area to be removed by licensed contractor for reuse or disposal at a licensed facility.
Sealers, resins, solvents and paints	Maintenance workshop.	1 t	Stockpiled in designated storage area to be removed by licensed contractor for reuse or disposal at a licensed facility.
Metals	Maintenance workshop; or general waste from accommodation village, mess or administration building.	2,000 t	Source-separated for removal and recycling by licensed operator.
Glass, plastic, paper and cardboard	Maintenance workshop; or general waste from accommodation village, mess or administration building.	300 t	Source-separated for removal and recycling by licensed operator.
Putrescible waste	Accommodation village, mess, crib room or administration building.	5,000 t	General refuse to be collected in covered bins and removed to the on-site landfill at least once per week. General refuse bins will be presented with recycling bins to promote segregation of recoverable materials.
Batteries	Wet cell batteries from vehicles and dry cell batteries from phones, radios and other equipment collected in accommodation village or administration buildings.	40 t	Source-separated for removal and recycling by licensed operator.
Waste electrical	Administration buildings	1 t	Set up WEEE collections services with



Waste	Source	Annual Quantity	Management Strategy
and electronic equipment (WEEE)	or maintenance activities.		suppliers.
Printer cartridges	Administration buildings.	Nil	Used or empty laser and inkjet printer cartridges will be collected for recycling.
Oils	Routine servicing of plant, equipment and vehicles in workshop.	2,000 t	Waste oil to be collected and stored in bunded holding tanks for collection by a licensed contractor for reuse, reprocessing, recycling or disposal. Where possible, pneumatic pumps should be used to transfer waste oil from machinery to bunded storage.
Grease trap waste	Accommodation village kitchen, workshop, shutdowns and dragline maintenance.	3 t	Waste grease to be placed in a bunded storage container. Waste grease to be collected periodically by a licensed waste contractor for reuse, reprocessing, recycling or disposal.
Other regulated waste	Assembly of draglines and other mining and processing equipment. Routine servicing of plant, equipment and vehicles in workshop.	2,000 t	Regulated waste to be stored appropriately for collection and removal by a licensed contractor for treatment. Regulated wastes will be tracked via an approved waste tracking system.
Drums	Small and bulk drums and other containers that typically contained oils and greases from industrial area or workshop.	5 t	Empty drums to be stored in a covered, secure bunded area for periodic collection by a licensed contractor for reuse, reprocessing, recycling or disposal.
Explosives	Defective explosives and packaging.	2,000 t	Explosive materials are to be treated in accordance with AS2187.2-2006 - Explosives Storage, Transport and Use, Part 2, Use of Explosives. Disposal to landfill is not suitable method of disposal. It is likely that waste explosive materials will be detonated/ burnt by emergency response officers. Following detonation, stainless steel casings will be recycled or disposed to landfill. Cardboard packaging can not be removed from site for recycling due to potential explosive residues.
Asbestos	Removal of asbestos-containing materials discovered during excavation.	TBD	Asbestos to be removed and disposed by specialist contractor.
Tyres	Tyre failure and routine servicing of plant, equipment and vehicles in workshop.	650 t	Tyre disposal to be in accordance with the DEHP (2012) Operational Policy for the Disposal and Storage of Scrap Tyres at Mine Sites. Tyres to be removed by tyre supplier for reprocessing. Alternatively, tyres will be

Waste	Source	Annual Quantity	Management Strategy
			stored for disposal once mine operations commence by burying in overburden at a designated location to be recorded on the EMP administered by DEHP.
Sewage domestic effluent	Sewage effluent from offices, crib rooms, accommodation, kitchen and amenities. Industrial waste waters from industrial areas.	65 ML	Collected and diverted to sewage treatment plant on-site for processing to Class A+ effluent quality for reuse on-site.
Sewage sludge	Wastewater treatment plant.	20 t	Sludge to be disposed of off-site (dependent on availability/final design of dewatering equipment in STP). Alternatively, sludge will be collected by a licensed contractor for disposal at an existing sewage treatment works at Alpha or Emerald.

Recycling, Landfill & Sewage Infrastructure

The scale of the Project demands a suitable waste disposal solution for long-term effective treatment of wastes generated by the Project. On-site waste and recycling infrastructure and services will be developed within 3-6 months of commencing early works, including:

- Appropriate waste management area, providing for adequate bulk containment of source separated waste materials, including recyclable and regulated wastes;
- Engineered landfill for disposal of residual general waste;
- Shredder/grinder for chipping and mulching greenwaste and waste timber processing;
- A packaged composting facility for processing greenwaste, waste timber, food waste and dewatered sewage sludge;
- A crushing facility for recycling concrete and brick into road base material;
- A compactor and baler for pre-treatment of cardboard to maximise transport efficiency; and
- A packaged sewage treatment plant (STP) and sludge dewatering facility.

Mining Waste Streams

Project waste generated through mining (overburden and interburden) and coal processing (coarse rejects and fine rejects) has been defined for the EMP as mining waste. The coarse reject as the name implies is the larger pieces of overburden that are not suitable for product sale. The fine reject material is the fine component of this waste material and is typically too high in ash or moisture to be of marketable value. Both coarse reject and fine reject are segregated from the coal product in the CHPP. The Project coal rejects (coarse and fine) are expected to comprise in the order of 7% of all mining waste produced by the Project.

The Project is expected to generate up to 30 Mtpa of product coal from open cut pit and longwall underground operations with the scheduled 30 year operational life of mine.



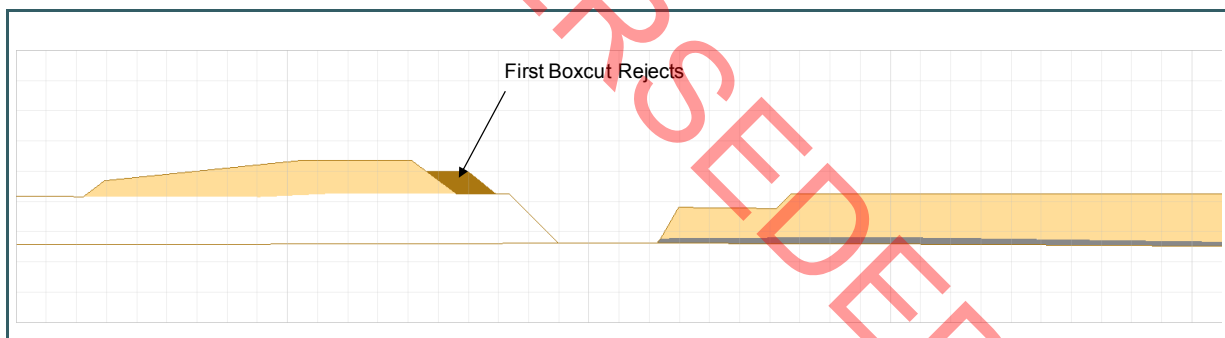
Overburden & Interburden

Overburden and interburden are the waste rock materials required to be mined to access underlying coal resources. When overburden/interburden is emplaced following mining it is known as spoil. The open pits will cover an area of approximately 21 km² and the total mined overburden volume is expected to approximate over 3.15 billion tonnes over a 30 year life of mine (LOM); that is, approximately 110 Mtpa. At the Project, overburden will be stored predominantly within the open pit, although an out-of-pit overburden emplacement area will be constructed adjacent to the Northern and Southern open pits using a truck-shovel operation to accommodate material from the initial box-cut developed during the first two years of mining. Mining will evolve into a dragline stripping operation with truck-shovel pre-strip. The actual distance of the northern extent of the waste rock dumps is approximately 1 km from the mining lease boundary.

Coarse Reject

The coarse reject generated from the CHPP will be dewatered and discharged onto the CHPP rejects conveyor, which reports to the rejects bin. During the first two years of mining, the coarse reject will be truck-hauled and placed adjacent to the low-wall edge of the box cut area of the Open Cut pits as shown in Figure T-11 (cross-section).

Figure T-11 Coarse Reject Placement Location (cross section)



All coarse reject materials disposed of within the Open cut spoil dumps. Should any of the coarse reject material be identified as potentially acid forming then it will be treated with lime and compacted as part of the mine waste management.

From around the start of Year 4 to until the end of mine life, the coarse reject material is planned to be placed in the in-pit voids between the dragline overburden (spoil) in the Central Open Cut pit. Truck-shovel pre-strip spoil materials will be used to cap cover the reject areas. Coarse reject placement will be sequenced such that capping covering of the rejects will be completed progressively as the working face progresses down dip.

Fine reject

Fine reject will initially report to the fine reject storage facility (FRSF) in a piped slurry form containing approximately 30% solids and excess water will be recycled from the FRSF using a decant system for reuse at the CHPP. The fine reject material has been identified as having a potential to be acid forming and as such pH levels could deviate below the predicted pH range of 5-6, if this is additional risk management methods such as selective placement, early encapsulation or lime amendment will be undertaken. Given the arid climate of the region, the fine reject surface is expected to dry out relatively quickly and form a dense

compact solid material, which will facilitate a cover placement and rehabilitation at the end of mine life of the FRSF. A cover system will be utilised for FRSF closure and topsoil will be placed onto the re-profiled final landform slopes. After approximately 5-7 years, an in-pit storage system will be implemented in the Northern open cut, which will cater for fine reject storage until the end of mine life. The in-pit fine reject storage system will also be covered and topsoiled at the end of mine life.

T.3.6.2 Environmental Values

Environmental values at the Project site that may potentially be impacted upon by mine waste include:

- The life, health and wellbeing of people;
- The biological integrity and diversity of ecosystems and processes surrounding the Project site;
- The integrity of receiving environments such as land, air, surface water and groundwater (including the suitability of water for agricultural use);
- The stability of disturbed land and ensuring it is non-polluting;
- The suitability of land for beneficial post mining land use; and
- Visual amenity.

T.3.6.3 Potential Impacts on the Environmental Values

Environmental harm could potentially occur in and around the Project site if wastes are not managed properly according to the planned management strategies. Sensitive receptors including residences and ecosystems surrounding the Project site could be impacted if waste streams entered waterways and groundwater systems and migrated off-site. Similarly, air emissions, such as dust, have the potential to impact off-site sensitive receptors. The following waste streams from the Project have the potential to impact on the above mentioned environmental values:

- Solid waste (other than mining waste) including regulated waste, general waste and sewage;
- Coal and mining wastes;
- Waste water from the mining operations and CHPP;
- Air emissions including particulates, fumes and odour from the Project during construction and operation; and
- Sewage effluent.

General Waste

Environmental impacts from waste treatment and disposal may include odours, noise, dust, leachate and vermin/pests.

Environmental impacts from handling, storage and collection will be managed through designated storage and collection locations, designated traffic routes, covered storage vessels, good housekeeping practices and monitoring.

Environmental impacts from any on-site landfill will be managed through daily and intermediate cover (typically soil) and environmental management systems including:

- Leachate management system (e.g. leachate barrier, collection and treatment system);



- Groundwater monitoring system;
- Final capping system;
- Landfill gas management system; and
- Dust and odour management.

Nuisances such as noise and dust can pose a health and safety risk to personnel on the Project site. Site personnel, contractors and visitors will utilise personal protective equipment (PPE) as appropriate to protect themselves against the hazards of dust and noise emissions in high exposure areas.

Environmental impacts to receiving waterways and aquatic habitats could arise if sewage effluent is improperly treated or contained on the site. The release of improperly treated effluent in to the receiving environment may result in deterioration in water quality.

Coal & Mining Waste

Coal

Coal will generally be stockpiled on-site for relatively short periods of time; however some coal may have a relatively low capacity generate reduced pH conditions in surface runoff and seepage. Any water in contact with coal stockpiles will be contained in sediment ponds and segregated from clean site water. Contact water in sediment ponds will undergo lime treatment to control pH, if required (trigger value = pH 5).

Overburden and Interburden

The sedimentary genesis of the Project coal deposit and information contained in the geological and geostatistical models and geochemical assessment reports (RGS, 2012) indicates that the overwhelming majority of overburden and interburden materials are likely to have negligible sulphide content and be NAF. A small proportion (1%) of overburden/interburden materials located close to coal seams may have some potential to generate acid and these will either be managed in the open pit by covering with NAF spoil where they occur, or report to coarse reject storage locations. Placement of any highly saline or highly sodic (dispersive) materials at the final top surface and final outer slopes and batters of storage facilities will be avoided.

Coarse Reject

Coarse reject materials generated on the Project may have elevated total sulphur content and little Acid Neutralising Capacity (ANC) and therefore may be Potentially Acid Forming (PAF) and will need to be carefully managed by compaction, possible liming, isolation with reduced permeability NAF spoil material and encapsulation with at least 5m of NAF spoil material.

Tailings

Geochemical test results indicate that some tailings may have a low capacity to generate acid. If there is an increase in the acid generating capacity of the tailings due to tailings being less benign than predicted, and pH levels deviate below the predicted pH range of 5-6, consideration will be given to additional risk management methods such as lime amendment.

If there is an increase in AMD potential due to greater than predicted PAF quantities or lower than predicted tailings pH levels, consideration will be given to additional risk management methods such as selective placement, early encapsulation or lime amendment.



T.3.6.4 Environmental Protection Objectives

The environmental protection objectives for waste are:

- Avoid impacting land, surface water or groundwater through poor waste and mining waste management practices;
- Manage waste through the use of licensed contractors, transporters and disposal facilities;
- Manage and monitor potential impacts from mining wastes using the measures described in a Waste Management Plan; and
- Minimise the generation of waste in accordance with the waste management hierarchy listed in the *Environmental Protection (Waste Management) Policy* (EPP (Waste), 2000).

T.3.6.5 Performance Criteria

- Prevent adverse environmental impacts from general and mining waste management during the construction and operational phases;
- Adherence to waste minimisation principles;
- Management of mining waste in accordance with the Waste Management Plan; and
- Adhere to waste management hierarchy.

T.3.6.6 Control Strategies

General Waste

Specific control strategies for the identified waste streams are presented in Table T-27 and



Table T-28 above for both construction and operational waste.

Waste Minimisation

Waste minimisation has been considered throughout the initial planning and conceptual design stages of the Project and will continue during detailed design, construction and operation. The waste management hierarchy has been considered when selecting the waste management strategies for each waste stream.

Cleaner Production

Cleaner production is designed to provide environmental, economic and other, less tangible benefits. It forms an important component of the continual improvement approach to management adopted by the Proponent. Cleaner production focuses on implementing ways to improve a production process (or processes) to improve resource efficiency. The principles of cleaner production will be adopted where possible throughout the Project life cycle.

In general, cleaner production can be achieved through a selection of one or more of the following techniques:

- Input substitution (e.g. fuels, solvents);
- Product reformulation (e.g. raw coal markets);
- Production process modification (selection of the best available practicable technologies e.g. conveyors, CHPP optimisation);
- Improved operation and maintenance (selection and use of the most appropriate processes and equipment and management practices e.g. comprehensive maintenance programs);
- Reuse of resources that are otherwise wastes (e.g. putrescible waste, tailings, concrete formwork); and
- Closed-loop recycling (where a product is recycled and used again in the same form e.g. water).

Waste Management Plan (Construction)

Construction wastes will be managed in line with the Waste Management Plan (Construction). A detailed Waste Management Plan (Construction) will be prepared as part of the Environmental Management System (EMS) prior to the commencement of Project construction and will address the following:

- Identification of waste streams;
- Consideration of the waste management hierarchy when selecting waste management strategies, with emphasis on minimising any regulated waste;
- Identification of solid, liquid or hazardous waste collection, storage and or disposal strategies;
- Training of all personnel on procedures concerning waste minimisation, handling, storage, reuse, segregation, collection and disposal;
- Concept design of engineered landfill on-site for safe disposal of general solid waste, including putrescible, non-regulated and non-recyclable wastes;

- Waste not suitable for on-site disposal to be removed and transported from site by appropriately licensed contractor/s with disposal only to licensed recyclers or waste disposal facilities;
- Transport of any regulated waste to comply with all relevant legislation including waste tracking requirements; and
- Monitoring of waste streams and auditing against the Waste Management Plan (Construction) to track performance against overall objectives.

Waste Management Plan (Operations)

Operational wastes will be managed in accordance with the procedures outlined in the Waste Management Plan (Operation). A detailed Waste Management Plan (Operations) will be prepared as part of the EMS and Plan of Operations prior to the commencement of operations and updated annually to reflect current project activities. It will address the following.

- Identification of waste streams and establishment of a baseline measurement for each stream;
- Consideration of the waste management hierarchy when selecting waste management strategies, with emphasis on minimising waste;
- Identification of solid, liquid or hazardous waste collection, storage and or disposal strategies;
- Training of all personnel on procedures concerning waste minimisation, handling, storage, reuse, segregation, collection and disposal;
- Waste removal and transport from site by appropriately licensed contractors with disposal only to licensed reprocessing, recycling or waste disposal facilities;
- Transport of any hazardous or regulated waste to comply with all relevant legislation including waste tracking requirements;
- Monitoring waste streams and identifying opportunities for reduction and reuse of wastes; and
- Auditing against the Waste Management Plan (Operations) to track performance against waste management strategy objectives.

Waste Management Plan (Decommissioning)

At the end of the Project life, remaining infrastructure will be decommissioned and removed from site in accordance with the appropriate Waste Management Plan (Decommissioning), to be defined closer to the time of decommissioning.

Sewage Treatment

A Sewage Treatment Plant (STP) has been designed for the site with capacity sufficient to balance the site potable water system usage. The design criteria assumes that all potable water will enter the sewage collection and management system. The sewage management system is designed to be expandable to accommodate future operations and any resultant volume increases.

The STP is designed as a closed system in that no surface run-off water will enter the system. Sewage receptacles will be located at each major infrastructure area, i.e.:



- Accommodation Village
- Airport
- Light Industrial Area
- CPP / opencut MIA
- Northern underground MIA
- Central Underground MIA
- Southern Underground MIA

From each of the operational centres, sewage effluent will be captured in a buried, pre-cast, package well system interconnected by rising mains, similar to that of a municipal collection system. From the collection points, sewage will be pumped back to the central treatment plant located in the LIA. Sewage treatment for the whole of the mine site will occur at the LIA.

The STP will be located in the LIA eastern side process equipment zone and has been sized to treat the sewage discharge from the whole of the mine site, including the LIA facilities, and will have a treatment capacity of approximately 760 kilolitres per day. This capacity equates to the total estimated daily load from all mine areas with a thirty percent (30%) contingency allowed for extraordinary operating conditions and an additional future expansion of up to another 30%. The STP design is a 'packaged' modular design that allows expansion or contraction with minimal future effort and zero interruption to operation.

Class A+ effluent quality will be achieved from the STP allowing a variety of uses for the water being expelled. The treated water is then pumped from the treatment plant into the mine water management system for reuse as process and operations water.

The dried, treated waste product from the STP will be safely stockpiled at the nursery and rehabilitation centre for use in mine site remediation and as a nutrient rich feed for the site landscaping services. An estimated 1.5 Tonnes of recycled bio-organic solid waste will be retrieved each day. Any excessive bio-organic waste will be sent to the landfill.

Details of the STP design and effluent treatment measures will be provided in the Sewage Treatment Management Plan (SEIS Appendix T4.10) that will be developed for the site.

Mining Waste

HGPL will adopt the material characterisation and management measures described in Table T-29 to effectively manage coal and mining wastes generated by the construction, operation and decommissioning of the Project. Coal and mining wastes will be effectively managed by material type to minimise potential operational and longer term residual impacts on the environment.

Development and implementation of a site-specific Overburden and CHPP Rejects Management Plan and effective monitoring and reporting will ensure that the management of coal and mining wastes at the Project is consistent with relevant legislation and guidelines and leading mining industry practice.

Table T-29 Summary of Management Measures for Coal and Mining Waste Materials

Material Type	Management Strategy
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Material Type	Management Strategy
Coal	<ul style="list-style-type: none"> • Contact water contained and segregated from clean site water; • Any acidic contact water (trigger value = pH 5) will undergo lime treatment to control pH
Bulk overburden/interburden <ul style="list-style-type: none"> • NAF; and • Low-salinity and low sodicity 	<ul style="list-style-type: none"> • In-pit and out-of-pit overburden emplacement facilities. No geochemical management required.
Bulk overburden/interburden <ul style="list-style-type: none"> • NAF; and • High salinity and/or sodicity 	<ul style="list-style-type: none"> • Report to core (internal) of storage facilities. • Avoid placement at the final top surface and final outer slopes and batters of storage facilities.
Uneconomic coal close to economic coal units <ul style="list-style-type: none"> • Coal ply partings <30 cm thick • Coal seam roof and floor materials 	<ul style="list-style-type: none"> • Report to CHPP for processing and become part of coarse reject and tailing material streams.
Uneconomic coal away from economic coal units <ul style="list-style-type: none"> • Coal ply partings >30 cm thick: <ul style="list-style-type: none"> ○ NAF ○ PAF-LC 	<ul style="list-style-type: none"> • Remain at floor of pit (if pit floor capacity is available) and cover with reduced permeability NAF overburden/interburden within four weeks. • If pit floor capacity is unavailable, report to alternative on-pit storage location, or to coarse reject storage area.
Uneconomic coal away from economic coal units <ul style="list-style-type: none"> • Coal ply partings >30 cm thick: <ul style="list-style-type: none"> ○ PAF 	<ul style="list-style-type: none"> • Delineation of PAF units through geological control and ongoing geochemical sampling and testing. • Selectively handling, then report to: <ul style="list-style-type: none"> ○ Year 1-2: Out-of-pit coarse reject storage areas; ○ Year 2+: In-pit coarse reject storage areas.
Coarse reject during Years 1 and 2	<ul style="list-style-type: none"> • Report to low wall edge of the boxcut area. • Compact in approximate 1 to 2 m layers using dozing and compaction equipment. • Cover with reduced permeability NAF overburden within 4 weeks. • Encapsulate with a thick layer (>5m) of NAF overburden/interburden within 3 months. • Cap with truck-shovel pre-strip overburden and topsoil materials.
Coarse reject from Year 2+	<ul style="list-style-type: none"> • Report to in-pit voids (coarse reject storage areas); • Compact in approximate 1 to 2 m layers using dozing and compaction equipment. • Cover with reduced permeability NAF overburden within 4 weeks. • Encapsulate with a thick layer (>5m) of NAF overburden/interburden within 3 months. • Cap with truck-shovel pre-strip overburden and topsoil materials.
Tailings	<ul style="list-style-type: none"> • Placement as piped slurry to the TSF. • If TSF decant pH or TSF seepage collection pH becomes less than pH 5 add sufficient lime to tailings to increase pH to 6.



T.3.6.7 Monitoring

Monitoring of waste streams and their management will be undertaken as part of the waste management plans described above. As part of these plans, a system of waste tracking will be undertaken in accordance with legislative requirements.

T.3.6.8 Commitments

General Waste

- All regulated waste will be segregated, handled, stored in accordance with regulatory requirements;
- All regulated wastes will use the DEHP waste tracking system and be transported by appropriately licensed waste transporters and disposed of to a facility licensed to receive such wastes;
- As part of the staff awareness and induction program, re-use and recycling will be encouraged;
- A comprehensive Landfill Operations Plan and a Landfill Environmental Management Plan in accordance with DNRm's Guideline *Landfill siting, design, operation and rehabilitation* (revision 17 September 2010) will be developed.
- A comprehensive Sewage Treatment Management Plan which contains details on the adequacy of the plant and its wet weather capacity will be developed for the site.

Mining Waste

- An Overburden and CHPP Rejects Management Plan will be developed for the Project prior to construction and will detail the mining waste management strategies developed for the Project and will focus on managing and monitoring the AMD potential and saline/sodic characteristics of coal and mining waste materials.
- The Proponent will continue ongoing infill drilling programs and operational geochemical characterisation of coal and mining waste materials from the Project area to verify the predicted geochemical characteristics of these materials.
- Acquired geochemical data will be used to refine the management strategies adopted for coal and mining waste materials. For future work, in addition to standard acid-base and metals/metalloids testing (static tests) and kinetic leach column tests, geochemical characterisation of overburden materials will include assessing the general soil properties (sodicity, exchangeable cations) of selected mined waste materials to confirm their suitability for use in surface revegetation and rehabilitation activities.
- Surface water and leachate derived from, or in contact with, coal and mining waste materials will be monitored to ensure that water quality is being managed and not significantly compromised by proposed site management practices. Potentially impacted surface waters will be primarily managed by retaining water on-site. This water will be reused in the site water management system. This will be particularly important in the CHPP and open pit areas where stored materials may produce brackish run-off water.
- Coal and mining waste materials will be monitored for geochemical characteristics (pH, EC, acidity, alkalinity, sulfur species [total sulfur and chromium reducible sulphur] and ANC) on a monthly basis until such time as the variability of the geochemical characteristics of these materials is well defined (approximately 12 months).

- Surface and seepage water at coal and mining waste storage areas will also be monitored on a monthly basis (as well as opportunistically during rainfall events when access is available) and tested for pH, EC. On a quarterly basis (for 12 months) Total Dissolved Solids (TDS), acidity and alkalinity. major anions (sulphate (SO₄), chloride (Cl), fluoride (F)), major cations (calcium (Ca), magnesium (Mg), sodium (Na) and potassium (K)) and trace metals (aluminium (Al), arsenic (As), antimony (Sb), boron (B), cadmium (Cd), chromium (Cr), cobalt (Co), copper (Cu), iron (Fe), lead (Pb), manganese (Mn), molybdenum (Mo), nickel (Ni), selenium (Se), uranium (U), vanadium (V) and zinc (Zn)) will be included in the range of parameters tested in these water samples, and then on an annual basis throughout the life of mine.
- Open-pit mining geological control coupled with pre-mining and ongoing geochemical sampling and testing of mining materials will be used to delineate the extent of any minor amounts of PAF overburden materials located near the coal units and ensure that these are selectively handled and covered in the open pit or in a similar manner to PAF coarse coal reject materials.
- Future sampling and geochemical testing of mining materials at the Project will be completed to align the infill drilling and future drilling programs.

T.3.6.9 Proposed Environmental Authority Conditions

Schedule E – Waste

Tyres

- E1** Scrap tyres stored awaiting disposal or transport for take-back and recycling, or waste-to-energy options must be stored in stable stacks less than 3 m high, and at least 10 m from any other scrap tyre storage area, combustible or flammable material or vegetation.
- E2** All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a 10 m radius of the scrap tyre storage area.
- E3** Disposing of scrap tyres resulting from the authorised activities in spoil emplacements is acceptable, provided tyres are placed as deep in the spoil as reasonably practicable. A record must be kept of the number and location for tyres disposed. These details must be recorded on the Environmental Management Register (EMR).
- E4** Disposing scrap tyres resulting from the authorised activities must be consistent with the requirements of DEHP's operational policy *Disposal & Storage of Scrap Tyres at Mine Sites* (2006) or any later versions.

Mining Waste Management

- E5** An Overburden and CHPP Rejects Management Plan, certified by an appropriately qualified person(s) must be developed and implemented within twelve months of the issue of the Environmental Authority.
- E6** The Overburden and CHPP Rejects Management Plan must at a minimum include:
 - (a) Characterisation programs to ensure that all mining waste is progressively characterised during disposal.
 - (b) Characterisation programs to ensure that the physical properties of the mining waste is progressively characterised during disposal.



- (c) The quality of potentially acid forming (PAF) mining waste;
 - (d) Review potential impacts of PAF mining waste on the success of proposed rehabilitation methods;
 - (e) Management actions for mining wastes that have been defined as PAF.
 - (f) Identification of actual and potential environmental impacts;
 - (g) Control measures for routine operations to minimise likelihood of environmental harm;
 - (h) Contingency plans and emergency procedures for non-routine situations; and
 - (i) Periodic review of environmental performance and continual improvement.
- E7** Records of trade and regulated wastes or material leaving the mining lease for recycling or disposal, including the final destination and method of treatment, must be in accordance with the *Environmental Protection (Waste Management) Policy* (2000).
- E8** Design plans for the authorised spoil disposal facility(s) must include the following performance indicators:
- (a) During operations the spoil disposal facility(s) will be operated with minimal or no potential for adverse environmental harm resulting from collapse of any component of the facility;
 - (b) The potential for leachate generation will be minimal or non-existent; and
 - (c) Adequate drainage structures, erosion protection and storage are provided to manage seasonal and rare rainfall events with minimal or no environmental harm.

Schedule I – Sewage Treatment

General

- I1** 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.
- I2** Pipelines and fittings associated with the sewage treatment plant must be clearly identified. Lockable valves or removable handles must be fitted to all release pipelines situated in public access areas.
- I3** Effluent from the sewage treatment plant must only be discharged from the authorised discharge points for the purpose of irrigation, as specified in Table I-1 Effluent Discharge Locations to the areas shown in Table I- 3 Effluent Irrigation Locations, in compliance with the levels stated in Table I-2 Effluent Release Limits to Land and the conditions of this authority.

Table I-1 Effluent Discharge Locations

Authorised discharge point	Location	Latitude (GDA 94)	Longitude (GDA 94)
Construction Treatment Plant	Airport area; East side of Light Industrial Area	Approx. -23.06015 (Easting 458236)	Approx. 146.59229 (Northing 7449763)

Table I-2 Effluent Release Limits to Land

Release Limits	
Quality Characteristics (A+ Effluent Limits)	Maximum
Pathogens (E. Coli <1cfu/1—ml)	5 log
BOD5	20 mg/L
Turbidity	2 NTU (95%ile) 5 max
Nitrates	20mg/L
Phosphates	7 mg/L
Ammonia	5 mg/L
Suspended Solids	30 mg/L
pH	6.0-8.5
Faecal Coliforms	1000 cfu/100 ml
Free Chlorine	0.5 – 0.9 ppm (after 20 minutes contact; if chlorination is the adopted disinfection method)

Table I- 3 Effluent Irrigation Locations

Authorised discharge point	Location	Latitude (GDA 94)	Longitude (GDA 94)
Airport area	East side of Light Industrial Area	Approx. -23.06015 (Easting 458236)	Approx. 146.59229 (Northing 7449763)

- 14** Notwithstanding the quality characteristic limits specified in Table I-2 Effluent Release Limits to Land releases of effluent must not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm.
- 15** Effluent from the sewage treatment plant, for the purposes of dust suppression, must only be discharged from the authorised discharge points, as specified in Table I-1 Effluent Discharge Locations in compliance with the limits levels stated in Table I-2 Effluent Release Limits to Land and the conditions of this authority.
- 16** Effluent must not be released from the site to any waters or the bed and banks of any waters.
- 17** Water or stormwater contaminated by sewage treatment activities must not be released to any waters or the bed and banks of any waters.
- 18** Water or stormwater contaminated by sewage treatment activities must not be released to land.

Land Disposal – Irrigation

- 19** The irrigation of effluent must be carried out in a manner such that:
 - (a) Vegetation is not damaged;
 - (b) Soil erosion and soil structure damage is avoided;



- (c) There is no surface ponding of effluent;
 - (d) Percolation of effluent beyond the plant root zone is minimised.
 - (e) The capacity of the land to assimilate nitrogen, phosphorous, salts, organic matter as measured by oxygen demand is not exceeded; and
 - (f) The quality of groundwater is not adversely affected.
- I10** Notices must be prominently displayed on areas undergoing effluent irrigation, warning the public that the area is irrigated with effluent and not to use or drink the effluent. These notices must be maintained in a visible and legible condition.
- I11** The daily volume of contaminants released to land must be determined or estimated by an appropriate method, for example a flow meter, and records kept of such determinations and estimates.
- I12** When conditions prevent the irrigation of treated effluent to land (such as during or following rain events), the contaminants must be directed to a wet weather storage or alternative measures must be taken to store/ lawfully dispose of effluent (such as wet weather storage or tanking off-site to another treatment plant or sewer). A record must be kept of any removal or discharge off-site, including destination, transporter, dates and volumes.
- I13** Effluent must only be irrigated to places that have implemented an Irrigation Management Plan, which adequately addresses the following:
- (a) Efficiency of application;
 - (b) Control of sodicity in the soil;
 - (c) Minimisation of degradation of soil structure;
 - (d) Control of build ups of nutrients and heavy metals in the soil and subsoil from effluent and other sources;
 - (e) Preventing impacts on the groundwater resource through infiltration;
 - (f) Preventing subterranean flows of effluent to waters;
 - (g) Method of application; and
 - (h) Health and safety in relation to effluent handling and irrigation.
- I14** A minimum area of 5 ha of land, excluding any buffer zones, must be utilised for the irrigation of treated sewage effluent.

Treated Effluent Removal



I15 If treated effluent is removed from the site, a record of the removal of treated effluent from site must be kept detailing the following information:

- (a) Date of pick-up of treated effluent;
- (b) Volume of treated effluent removed from site;
- (c) Destination of treated effluent; and
- (d) The transporter.

SUPERSEDED



T.3.7 Land Management

T.3.7.1 Background

The proposed mining lease will directly impact upon parts of 5 separate private land holdings as well as part of the protected area known as Cudmore Resources Reserve. The dominant land use within the boundaries of MLA 70425 is cattle grazing. Surrounding the mining lease area, ten homesteads are located within a 25 km radius of MLA 70425 and are all involved in the rearing of livestock as their primary use. The impacted properties are described in Table T-30; Figure T-12 shows the surrounding land uses.

Table T-30 Affected Properties

Property Name	Real property Description	Tenure Type	Size (ha)	Affected Lands (ha)	Primary Use
Forrester	Lot 1788 on PH886	Leasehold	42,475	11,406	Cattle Grazing and Breeding
Surbiton	Lot 681 on PH406	Leasehold	20,719	3,523	Cattle Grazing and Fattening
Surbiton South	Lot 3533 on PH56	Leasehold	19,165	2,918	Cattle Grazing and Breeding
Wendouree	Lot 4994 on PH2232	Leasehold	38,800	17,518	Cattle Grazing and Breeding
Hobartville	Lot 649 on PH1981	Leasehold	56,200	461	Cattle Grazing and Breeding
Cudmore Resources Reserve	Lot 1007 on NPW632	Resources Reserve	6,900	1,673	Protected Area

The Proponent is currently liaising with the owners of the abovementioned properties to inform them about the proposed mine and to discuss appropriate compensation agreements.

Cudmore Resources Reserve extends into the north-western corner of the Project area. This reserve has been created recognising its ecological and cultural values as well as the interest in the land for mining purposes. 1,673.5 ha (out of a total of 6,900ha) of the north-western corner of MLA 70425 ingresses into land identified as the Cudmore Resources Reserve. Cudmore Resources Reserve is properly described as Lot 1007 on NPW632 and provides an extension to the ecological values present within Cudmore National Park located west of the Project area.

Field visits to the area undertaken in March 2011 identified land uses within MLA 70425 as:

- bushland;
- nature conservation (Cudmore Resources Reserve);
- cattle grazing;
- coal and mineral resource exploration;
- formed and unformed roads;
- areas of Indigenous and non-Indigenous cultural heritage; and
- farming infrastructure (including access tracks, fences, stockyards and sheds).

Sections of the landscape across the Project area have previously been cleared and maintained for grazing. Remnant mid-height woodland dominated by Boxwood and Ironbark also remains in various locations throughout the Project area.

Evidence of mining and mineral resource exploration in the Project area is evident. An airstrip used for the transportation of personnel and equipment to and from the Project area during times of early exploration is located on Wendouree Station.

There are other mining projects proposed for the Galilee Basin that are in various stages of planning. These include:

- The Carmichael Coal Mine and Rail Project proposed by Adani Mining Pty Ltd, a wholly owned subsidiary of Adani Group;
- The Galilee Basin Power Station proposed by Galilee Power Pty Ltd which is a fully owned subsidiary of Waratah Coal Pty Ltd;
- The Waratah Galilee Coal Mine proposed by Waratah Coal Inc, also known as China First;
- The South Galilee Coal Project (SGCP) which is a joint venture between AMCI (Alpha) Pty Ltd and Alpha Coal Pty Ltd; and
- The Alpha Coal Project proposed by Hancock Coal Pty Ltd.

From a land use planning perspective, the Project will have a range of land use and tenure impacts that:

- Directly impact on the land owners and existing agricultural activities within the Project area;
- May impact on the ecological values of the Cudmore Resource Reserve unless appropriately managed; and
- May result in land use changes outside the Project area and surrounds as a result of the proposed development.

Direct impacts on land owners and existing agricultural activities are being addressed by HGPL through negotiations with land owners which will include the acquisition of land and appropriate compensation for losses incurred as a result of the Project. These negotiations are ongoing.

Supporting infrastructure off lease include changes to local roads and stock routes to accommodate the proposed development and allow for a continuation of the existing networks. These are managed under the Off Lease EMP (SEIS Appendix T2).

Land Use & Tenure Management Strategies

The management of impacts associated with these land use and land tenure changes will mostly occur through the approvals processes. Government agencies, including Barcaldine Regional Council will have an important role to play in ensuring that appropriate management measures are secured through those processes. A list of approvals has been provided in the SEIS. This list includes the approvals that may be required to allow the Project and associated infrastructure to proceed. They include approvals to allow changes to the local road network and stock-routes, various approvals for operational works Material change of use (MCU) and reconfiguration of lots (ROL) as well as any required approvals for building, plumbing and drainage works. Careful management will also be required over that part of Cudmore Resource Reserve directly impacted by the mining Project to ensure that the ecological values associated with the Reserve are



preserved. During early 2011 HGPL commenced discussions with DEHP seeking approval for an "Interest in a Protected Area" in accordance with Section 34 of the *Nature Conservation Act* (NC Act, 1992). The provision prescribes that a lease, agreement, licence, permit or other authority over, or in relation to, land in a protected area, may only be granted by the Chief Executive or trustees of the area with the consent of the Chief Executive.

As part of the application for an Interest in a Protected Area, HGPL will prepare a specific Cudmore Resources Reserve Operations Plan (SEIS Appendix T3). The purpose of the Operations Plan is to outline the proposed establishment and operation of the mine, identify potential environmental impacts to the ecological and cultural values present within the Reserve and outline the proposed mitigation and management measures currently proposed. The Operations Plan will assist the joint trustees in the drafting of a Management Plan for the Cudmore Resources Reserve as required by the provisions of the NC Act and associated Regulations.

Soil Classes & Management Approach

The landscape characteristics and soil types within the Project site were distinguished in a staged approach. An initial broad scale reconnaissance soil map for the Study Area was developed using the Desert Upland Land Resource Assessment (Lorimer 2005) and a reconnaissance level field investigation undertaken in late 2010. The Study Area consisted of 5 Landscapes, 8 Land Systems and 23 Land units as described on Lorimer (2005). Field investigations distinguished 26 representative soil types for the land units previously mapped, using field and laboratory analysis.

The project area is dominated by Sodosols (26%) and Kandosols (23%), with Rudosols (16%), Chromosols (15%) and Dermosols (15%). Small areas of Tenosols (4%) are located along creek lines, and very small pockets of Vertosols (1%) are also present.

Investigations show a range of usable topsoils for rehabilitation activities within the proposed disturbance areas. The soil types likely to undergo surface disturbance and be stripped of topsoil detailed in the Soil and Land Suitability Report (SEIS Volume 2, Appendix I) where volumes have been calculated and classified per disturbance area. There is a high presence of sandy soil throughout Project site, and therefore many soil types are not recommended for stripping, without treatment. However, a total of 16,871,000m³ of soil is recommended to be stripped for re-use.

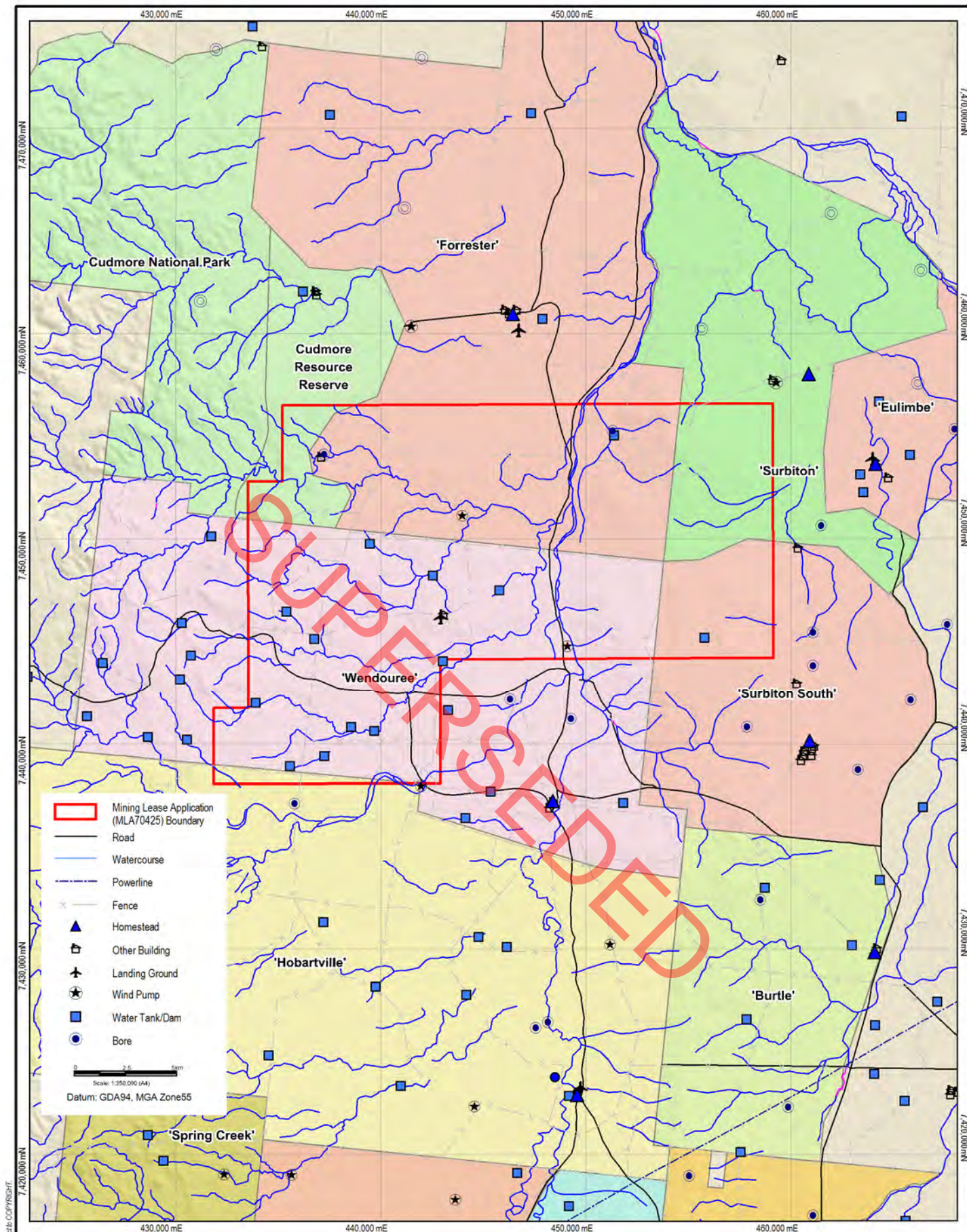
Where possible, the stripped topsoil should be re-spread directly onto reshaped areas. Where topsoil resources allow, topsoil should be spread to a nominal depth of 0.1m on all re-graded spoil or disturbance areas. Topsoil should be spread, treated with fertiliser and seeded in one consecutive operation, to reduce the potential for topsoil loss to wind and water erosion.

Erosion calculations show the disturbance level during mining, at highest risk of severe erosion rates will be the unshaped overburden scenario. The key factor to observe in this result is the topographic factor where the overburden is free dumped and left at the angle of repose albeit benched in some cases. This practice is unlikely to be modified due to cost effectiveness and practicalities of dumping activities. However, it is recommended that these areas at times of highest risk should have adequate sedimentation controls in place downstream to capture any material eroded from these slopes. The shaped overburden dumps with graded banks (but without topsoil or vegetation) was the second highest predicted rate of erosion which indicates the need for the reshaping, grading, topdressing and seeding of overburden dumps to be



undertaken in the quickest possible timeframe in order to minimise the risk of severe rainfall events impacting on these exposed slopes over a long period of time.

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SURROUNDING LAND USES

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REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-12**

File No: 42626920-g-2110.wor

Drawn: **RG**

Approved: **RS**

Date: 14-09-2012

Rev A

A4



Best practice principles and recommendations for the construction of post-mining landforms focus on designing slope angles, lengths and shapes that are compatible with the proposed land use and not prone to an unacceptable rate of erosion. Engineering considerations such as drains and dams as well as the use of suitable erosion and sediment control strategies will be necessary throughout the life of the Project, and the main objective of regrading will be to produce slope angles, lengths and shapes that are compatible with the proposed land use and not prone to an unacceptable rate of erosion. Integrated with this is a drainage pattern that is capable of conveying runoff from the newly created catchments whilst minimising the risk of erosion and sedimentation. Final slope gradient should not exceed 17%.

Disturbed Lands & Land Classification

Preliminary results using the *Classification of Agricultural Class Land* mapping as published by DEHP (2010), show that the Study Area is largely covered by Class C1 land with some areas of Class C3, and minor patches of Class D.

These classifications are generally associated with land that is suitable for Beef Cattle Grazing and not Rainfed Cropping (as described in the *Land Suitability Assessment Techniques*; DME, 1995). Land suitability can be tentatively inferred from Agricultural Land Classification (ALC). The Study Areas, based on this inference, is composed largely of Land Suitability (LS) Class 3 for Beef Cattle Grazing (which is associated with ALC C1), contains an area of LS 4 for Beef Cattle Grazing (which is associated with ALC C3) as well as a minor area of Land Suitability (LS) 5 for Beef Cattle Grazing (which is associated with ALC D).

The post mining land suitability continues to be dominated by Class C1 land; however the overburden emplacement slopes will be Class C3 land and final voids, tailings dam, fresh water dams and detention basins, and the rail loop are expected to be Class D.

The areas that will be disturbed as a result of the project are as follows:

- *Areas subsided by underground mining.* These areas will not be subject to any major earthworks, but will be prone to surface subsidence effects resulting from underground mining operations. The surface subsidence effects will result in the development of an undulating land surface with gentle slopes (refer Provisional Assessment of Subsidence Behaviour (SCT 2010) for further detail). Most subsidence will not alter the land suitability and the area can continue to be used for grazing. Furthermore conservation works will be implemented to ensure a free draining landscape is maintained.
- *Open Cut Pits and Stockpile areas.* These areas will undergo major earthworks and will not be returned to original condition. The post mining land use for stockpile areas is intended to be grazing, however the Land Suitability of this area will be reduced to Class 4, or ALC C3, while the void of the pits will remain as permanent features incapable of supporting grazing activity, resulting in a land suitability Class 5 with ALC of D
- *Surface infrastructure.* Surface infrastructure will be constructed within the Project area. As described in the rehabilitation section of the main volume of the EIS, these areas will be rehabilitated and restored to grazing land post-mining. Their post-mining land suitability will therefore not be changed by the Project.
- *Water Dams and related infrastructure.* Water dams and related infrastructure will be constructed within the Project area. These dams will likely remain as depressions in the landscape with a ponding capacity, and may have possible uses associated with the post mining land use of grazing.



- *Out of Pit Tailings Dam.* The tailings dam will be used for the disposal of tailings. Given the sensitive nature of the capping and rehabilitation endeavours, and the consequences of impacting on the integrity and stability of the capping layer, the post mining land use will be limited to vegetative cover for erosion protection. No grazing is recommended for this area and therefore will have a Land Suitability Class 5 for cropping and grazing with ALC of D.
- *Construction of railway.* A 20 m wide strip of land will be required for the operational railway line, which may increase to up to 60 m wide during construction of the line or in areas where sidings or loading facilities are located. The railway will be a permanent feature and therefore not suitable for any other use. The post mining Land Suitability class will therefore be Class 5, an ALC of D, for both cropping and grazing assessments.

Additionally, an assessment of the potential for the Project to impact upon strategic cropping land (SCL) was undertaken using the Protecting Queensland's strategic cropping land: A policy framework as guidance. Consultation with SCL Draft Trigger Maps C3 and C5 indicates that the Project site does not lie within a potential SCL area. No further assessment is therefore required under SCL policy.

Sensitive Environmental Areas

The Project site is located in the south-eastern corner of the Desert Uplands bioregion in Central Queensland.

A review of the Queensland DEHP Environmentally Sensitive Areas (ESA) mapping for the Project site revealed the existence of a protected area, the Cudmore Resources Reserve, within the north eastern section of the site. Resources Reserves are protected and managed under the NC Act to protect and provide for the 'controlled use' of cultural and natural resources and ensure that the area is maintained predominantly in its natural condition' (Part 4, Schedule 21 of the NC Act). The Cudmore Resources Reserve has been under the joint trusteeship of the Queensland Department of Mines and Energy (now the Department of Employment, Economic Development and Innovation - DEEDI) and Queensland National Parks and Wildlife Service (NPWS) since 1999.

Environmentally sensitive areas surrounding the Project site include the Cudmore National Park, located approximately 700 m west of the Project boundary. The Cudmore Resources Reserve adjoins Cudmore National Park to the southeast and is properly described as Lot 1007 on NPW632 and measures approximately 6,900 ha in area. 1,673.5 ha of the north-western corner of MLA 70425 ingresses into land identified as the Cudmore Resources Reserve. Cudmore Resources Reserve is listed under Schedule 4 Resource Reserve of the *Nature Conservation (Protected Areas) Regulation* (1994). Direct impacts on Cudmore Resources Reserve may include the establishment of isolated mine infrastructure such as a downcast shaft and associated access routes. The establishment of such infrastructure will change the existing land use in the immediate vicinity of the infrastructure in question, and ultimately change the high conservation value of the immediate locality approximately 20 to 30 years into the Project life.

No conservation parks, declared fish habitat areas, wilderness areas, aquatic reserves, heritage or historic areas, national estates, world heritage listings, sites listed by international treaties or agreements, or areas of cultural significance relating to biodiversity were located on the Project site.

Designations of interest are:

- Environment Protection and Biodiversity Conservation (EPBC) listed communities: a single vegetation community has been discovered within the proposed transport a corridor to the east of

the site is listed under the *Environment Protection and Biodiversity Conservation Act* (EPBC Act, 1999) as an Endangered Ecological Community'. The Bluegrass Grassland (RE 11.8.11) is included within the EPBC listed Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin ecological community. This community has been listed as Endangered due to a severe decrease in area and condition (64% decline in area since European settlement and over 60% of remaining vegetation in a degraded state), as well as its small geographic distribution, ongoing threats, and the loss or decline of species important to its ongoing integrity (Threatened Species Scientific Committee, 2008).

- An additional three ecological communities listed as Endangered under the EPBC Act have been identified in database searches as potentially inhabiting the Project site (however none of these particular REs occur on the Project site):
 - Brigalow (*Acacia harpophylla* dominant and co-dominant) woodlands';
 - Semi-evergreen vine thickets of the Brigalow Belt (North and South) and the Nandewar Regions'; and
 - The community of native species dependent on natural discharge of groundwater from the Great Artesian Basin'.
- DEHP listed communities: An ESA was located on-site in an area mapped as an Endangered Regional Ecosystem (ERE). Brigalow Open Woodland (RE 10.9.3) is an ERE located in small, disjunct patches in the southwest portion of the site. The reasons behind its listing include its rarity for the bioregion (800 ha in total area) and its scattered distribution along with its susceptibility to salinity, weed infestation and the risk of extinction from localised events such as tree clearing and fire.
- Nine Regional Ecosystems (REs) located on-site are listed as Of Concern (Biodiversity Status).
- No flora species listed under the EPBC Act or NC Act were identified in the Queensland Herbarium's HERBREC database search for the Project site and adjacent area nor on site during field surveys.
- The squatter pigeon (southern) (*Geophaps scripta scripta*) was recorded from the Project area. This species is listed as Vulnerable under the NC Act and EPBC Act.

Contaminated Land

The Project comprises six land parcels (see Figure T-13), the majority of which are currently utilised for cattle grazing. A review of current and historical titles as well as historical aerial photographs indicated the majority of the Project area has been vacant grasslands used for cattle grazing. The remaining area is remnant bushland, and the north-western corner is an open space and recreation zoned area (Cudmore Resources Reserve).

A search of DEHP's EMR and Contaminated Land Register (CLR) was carried out for the site. The results of the register search indicated no lots were listed on either register.

A site inspection was conducted between 9 and 12 October 2010, indicated that there are a few minor contaminated areas resulting from fuel storage, waste oil storage and minor pesticide and herbicide use. There were no other recognised significant potential contamination concerns observed during the site visit or review of historical site data. The Project site appeared generally well maintained and few potential sources of contamination were identified over relatively small portions of the site.

Areas of interest identified during the site inspection are shown on Figure T-13 and include:



- AOPC 1 - Stockyard located on Wendouree – a pneumatic crush was identified in this location, and evidence of minor pesticide use was noted;
- AOPC 3, 4 and 5 - Stock watering areas, in particular Wallaroo Bore;
- AOPC 2, 7 and 8 - Mineral exploration activities (old mineral exploration core shed and Hancock Bore);
- defunct farming equipment; and
- creeks – infrequent spraying along the creek lines is undertaken for parthenium and rubbervine.

T.3.7.2 Environmental Values

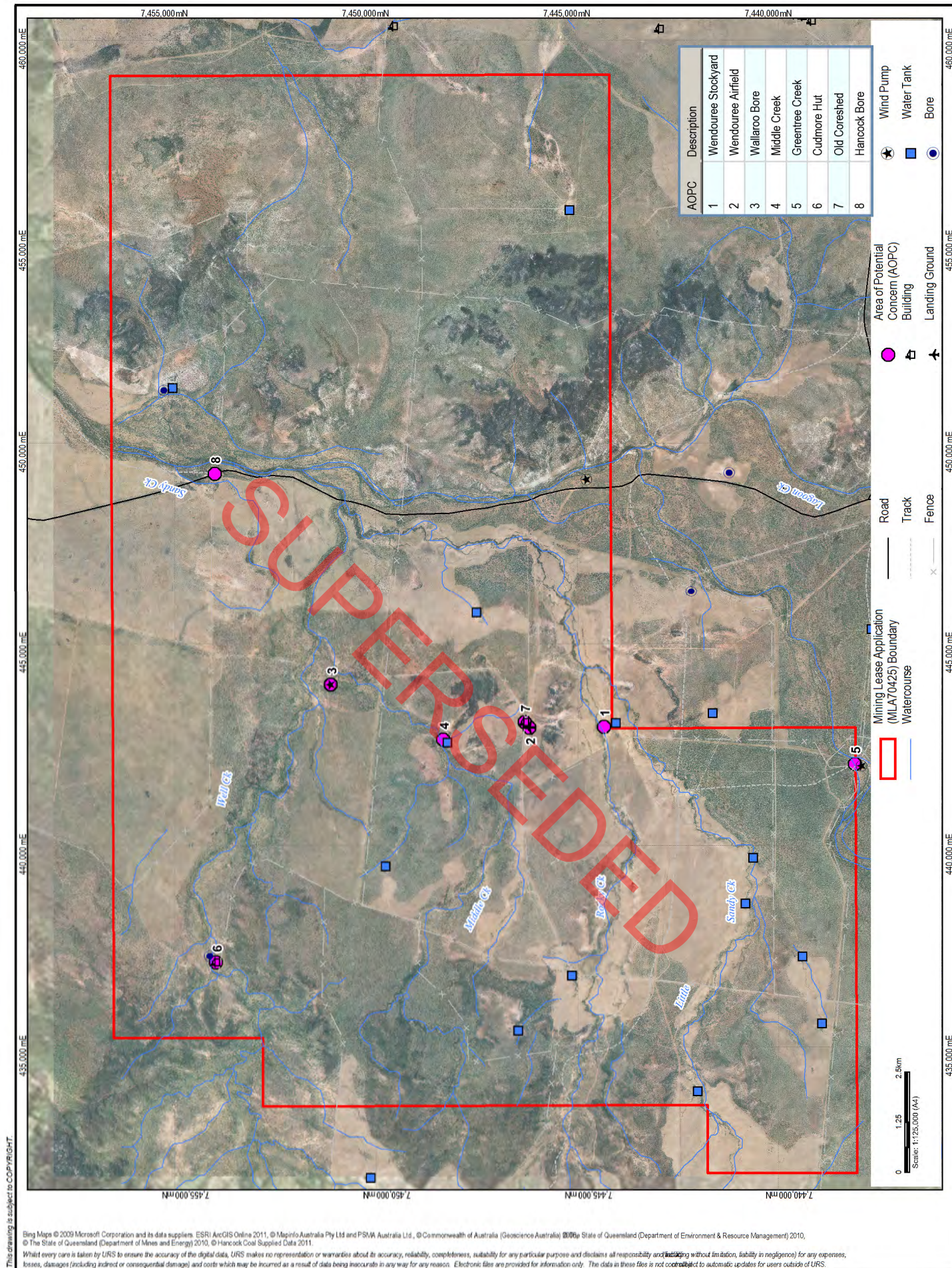
The environmental values of the land at the Project site that are to be protected or enhanced are:

- Cudmore Resources Reserve;
- The integrity of undisturbed land and ecosystems on the Project site;
- The integrity of topsoil as a resource to be used in rehabilitation;
- The stability of disturbed land and ensuring it is non-polluting; and
- The suitability of land to support beneficial post mining land uses such as agriculture and native ecosystems.

T.3.7.3 Potential Impacts on Environmental Values

Site activities with potential to impact on the land environmental values are:

- Land disturbance (vegetation clearance, topsoil stripping, stockpile management) causing erosion and degradation of topsoil resources;
- Land disturbance resulting in a reduction in agricultural land suitability, and capacity to support native ecosystems;
- Construction of overburden emplacement areas and potential AMD generation;
- Construction of access tracks, haul roads and pits;
- Disposal of coarse rejects and tailings;
- Creation of final voids; and
- Potential land contamination from the inadequate management of hazardous materials including fuels, oils and chemicals.



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LAND AREAS OF INTEREST

Datum: GDA94, MGA Zone55

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REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-13**



File No: 42626920-g-2111.wor

Drawn: RG

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Land Use

The Project MLA 70425 is used for broad scale cattle grazing. Much of the area is either cleared or partially cleared. Several isolated areas have been cropped for fodder species to supplement grazing on native and introduced pastures. Post-mining, rehabilitation of the Project site will return a stable landform capable of uses similar to those prior to disturbance. To achieve this, the nominated post-mine land use for the site is a mix of bushland and grazing land. This will link remnant native vegetation where possible and will aim to return some conservation values.

T.3.7.4 Environmental Protection Objectives

The objectives to protect the environmental values of the Project site are:

- To provide a stable, non-polluting landform:
 - Land disturbed by mining activities will be made stable (geotechnically and erosionally) to ensure that the post mine landform are not compromised by instability;
- To provide a beneficial post mining land use:
 - The post-mine land uses for areas disturbed by mining will be a mosaic of self sustaining vegetation communities and grazing land, using appropriate native tree, shrub and grass species, and native pasture species as appropriate;
- To minimise the extent and degree of disturbance on land and remnant vegetation as mining continues and will continue to rehabilitate land disturbed by mining;
- To maximise the recovery and reuse of topsoil;
- To minimise land contamination and to continue to remediate areas of contamination, as appropriate within the constraints of the continuing operations;
- To minimise pre-mining disturbance and to continue to rehabilitate exploration areas; and
- No impacts to Cudmore Resources Reserve.

T.3.7.5 Performance Criteria

The performance criteria for land management are:

- Compliance with the requirements of the Project's Environmental Authority;
- No off-site impacts (including impacts from AMD); and
- Stable landforms once rehabilitated with no visible rill or gully erosion.

T.3.7.6 Control Strategies

The strategies discussed below will be implemented to minimise and manage potential impacts on soils at the Project site, along with other control strategies to be implemented as part of the Cudmore Reserve Operations Plan (SEIS Appendix T3) and the rehabilitation and decommissioning of the site.

Topsoil

A Topsoil Management Plan (TMP; SEIS, Volume 2, Appendix T4.13) will be developed, implemented and regularly updated. This will include:

- All relevant aspects for topsoil retrieval such as stripping, stockpiling and re-spreading procedures, stockpile locations and inventory;
- Topsoil stripping quantities formulated from pre-mining soil survey information; and
- Stripping and stockpile methodology.

Specific requirements for different post mining landform elements will be specified in the Project's TMP and Erosion and Sediment Control Plan.

Seedbed Preparation

Strategies include:

- Thorough seedbed preparation will be undertaken to ensure optimum establishment and growth of vegetation;
- All topsoiled areas will be lightly contour ripped (after topsoil spreading) to create a "key" between the soil and the subsoil/capping materials;
- Topsoil resources for rehabilitation works will be selected to minimise potential soil sodicity effects; and
- Soil supplements will lead to elevated organic carbon levels in the Project site's soils improving structural stability; fertiliser additions will be undertaken upon routine receipt of soil test results during a proposed progressive soil testing program.

Post Disturbance Regrading

Re-grading will be undertaken to produce slope angles, lengths and shapes that are compatible with the proposed post-mine land use and not prone to an unacceptable rate of erosion. A drainage system will be installed that is capable of conveying runoff from the newly created catchments whilst minimising the risk of erosion and sedimentation. Contour furrows or contour banks will be constructed at intervals down the slope to divide long slopes into a series of short slopes with the catchment area commencing at each bank or furrow. This will prevent runoff from reaching a depth of flow or velocity that would cause erosion. As the slope angle increases, the banks or furrows will be spaced closer together until a point is reached where they are no longer effective.

Contour ripping across the grade (to minimise erosion and cultivate the surface in readiness for sowing) will be constructed away from the true contour, at a designed gradient (0.5% to 1%) to drain water towards the sediment control structures. The use of engineered waterways using erosion blankets, ground-cover vegetation and/or rip rap will be used to safely dispose of runoff downslope. Sediment control basins will be constructed to capture sediment laden runoff prior to off-site release.



Erosion & Sediment Control

A detailed Erosion and Sediment Control Plan (ESCP; SEIS, Volume 2, Appendix T4.04) will be developed prior to the commencement of construction works.

Rail Loop Specific Measures

Design Phase

- Undertake a detailed geotechnical investigation prior to construction of the rail loop;
- Develop an earthworks schedule that:
 - achieves a cut/fill balance
 - minimises changes to topography, particularly where this results in changes to drainage patterns; and
 - minimises construction footprint wherever possible;
- Identify areas where problem soils (highly dispersive, saline, cracking clays, potential acid sulfate soils) may impact on construction;
- Ensure the design and construction of the rail loop line takes into account issues arising from cracking clays and highly dispersive soils as relevant, including:
 - allowing for expansion joints;
 - encapsulating soils by placing and compacting swelling clays within embankment cores to minimize exposure to drying/wetting;
 - incorporating moisture control barriers with foundation swelling clays to control lateral seasonal migration of moisture;
 - applying lime stabilisation to reduce plasticity and shrinkage potential;
 - where the shrink/swell ratio is unacceptable, identifying appropriate disposal locations for these soils; and
 - avoiding disturbance of highly dispersive soils where possible;
- Include drainage requirements in design such that concentration of flow does not occur and erosion is avoided;

Construction Phase

- Implement an erosion and sediment control plan during construction, and until post-construction rehabilitation has been completed, with a particular emphasis on controlling drainage across dispersive soils;
- Encapsulate, seal or cap dispersive soils so that the soils are not exposed to running water;
- Rehabilitate after construction, including replacement of topsoil and re-vegetation to minimise exposure of dispersive soils to erosive forces;

Operations & Decommissioning Phase

- Develop and implement a rail loop specific Decommissioning and Rehabilitation Plan;
- Use only low residual pesticides such as glyphosate;



- Use licenced operators for pesticide application;
- Clean up coal spillage adjacent to the track promptly.
- Ensure access roads to the rail corridor are free of dust and mud as far as reasonably practicable;
- Transport dangerous goods and potential contaminants in accordance with Australian Code for Transport of Dangerous Goods by Road and Rails (ADG) Code.

Cudmore Resources Reserve

An Operations Plan will be prepared by the Proponent and will deal specifically with those activities proposed to occur within and beneath Cudmore Resources Reserve. This plan will detail:

- The ecological and cultural values of the area of Cudmore Resources Reserve subject to ML 70425;
- The mining and associated activities which are proposed to occur within the area of Cudmore Resources Reserve subject to ML 70425;
- The likely impacts to the identified ecological and cultural values which may be caused by the proposed mining and associated activities within the area of Cudmore Resources Reserve subject to ML 70425;
- Environmental objectives and commitments for the area of Cudmore Resources Reserve subject to ML 70425; and
- Control strategies and indicators to measure and ensure environmental objectives and commitments are being achieved.

T.3.7.7 Commitments

The land use commitments and proposed Environmental Authority conditions are addressed in Section T.3.8 - Rehabilitation and Decommissioning.



T.3.8 Rehabilitation & Decommissioning

T.3.8.1 Background

The construction and operation of the Project will inevitably have an impact on the land. In order to minimise and mitigate this impact, the rehabilitation and decommissioning of the MLA has been addressed.

A description of the land use and processes requiring rehabilitation is provided in Section T.2 (Process Description) and Section T.3.7 (Land Use) of this EMP.

Planning for Decommissioning

A decommissioning and demolition strategy will be developed for the site at closure by a suitably qualified (Class 1) demolition specialist. This would include engaging structural engineers, appropriate technical experts and the application of relevant standards and guidelines. A detailed investigation of all structures would be completed to determine the appropriate techniques, equipment required, and the sequence for decommissioning and removal.

Investigation of the Site

An investigation of the site will be conducted to confirm the following:

- The type, location and extent of underground services such as conduits, cables, pipe work;
- The location and extent of underground structures to be retained and those to be removed;
- The location, type and extent of overhead services and structures such as power cables, conveyors, light poles and pipe work, etc;
- The location and condition of all pipework, tanks and vessels (with emphasis on remaining combustible materials and methods required for their clean up and removal);
- The presence of contaminated and hazardous materials and the classification of these materials;
- The general condition of adjacent structures; and
- Any infrastructure to remain (including roads and tracks) following decommissioning.

An investigation of the structures will be completed to identify the following:

- The structures' current condition with regard to their state of disrepair or deterioration;
- The presence of heavy steel within structures that may require specialized demolition equipment and/or techniques;
- Potential imposed loads or changes in the centre of gravity of structures during demolition works; and
- Confined spaces and/or techniques required to be implemented in order to avoid entering such spaces.

Site Preparation

Prior to the commencement of any demolition activities the following tasks will be undertaken:

- All sumps will be dewatered and the excess coal material removed from around the CHPP;

- All items will be decommissioned, de-oiled, depressurised and isolated; and
- All hazardous materials will be removed and transported to appropriately licensed disposal facilities.

Site Services

All buildings, including the main administration building, workshop, CHPP and fixed plant (including stacker / reclaimers, reclaim tunnels, conveyors & gantries, transfer points, thickener tank, coarse reject hopper, vehicle wash, etc.) and other surface infrastructure (including vent fans, portals, services to the underground mine, traffic control structures and signs etc.) will be managed in line with the waste hierarchy. Opportunities for the sale and/or re-use of assets and recycling of scrap steel will be maximised where possible, where items cannot be recycled, they may be disposed of in a suitable location (i.e. an approved landfill off-site).

Concrete footings and pads will be broken up to at least 1.5 m below the surface and removed. Options for the re-use of this material (i.e. crushed and used as for road and track stabilisation) will be investigated as the operation approaches closure. If re-use/recycle opportunities are not available, all "non-contaminated" waste material will be disposed of.

Contaminated Materials

At closure, a preliminary sampling and analysis program (Phase 1) will be implemented to determine whether an assessment (i.e. Phase 2 – detailed investigation of contamination involving drilling, etc.) should be conducted to quantify the amount of contaminated material that will need to be remediated on-site.

Additional Decommissioning Works Prior to Rehabilitation

At the cessation of operations, decommissioning activities are required in the following areas prior to rehabilitation works and revegetation:

- Infrastructure areas (including hardstands, parking areas, airstrips etc.);
- Roads and tracks including diversions;
- Stock route diversions;
- Dams and Creek diversions;
- The control and management of mine waste (i.e. overburden, coarse and fine reject (tailings));
- Open cut mining areas;
- Shafts, portals/adits and boreholes; and
- Underground mining and subsidence areas.

The specific activities required for each area are covered in greater detail in the following sections.

T.3.8.2 Environmental Values

The environmental values of the land at the Project site are detailed in Section T.3.7

T.3.8.3 Potential Impacts on Environmental Values

Site activities with potential to impact on the land environmental values are detailed in Section T.3.7.3. Impacts are also possible from ineffective rehabilitation.



T.3.8.4 Environmental Performance Objectives

Post-mining, rehabilitation of the Project site will return a stable landform capable of uses similar to those prior to disturbance. To achieve this, the nominated post-mine land use for the site is a mix of bushland and low density cattle grazing land. This will link remnant native vegetation where possible and will aim to return some conservation values. A conceptual Rehabilitation & Final Landform plan is shown as Figure T-15.

The objectives of rehabilitating disturbed land include:

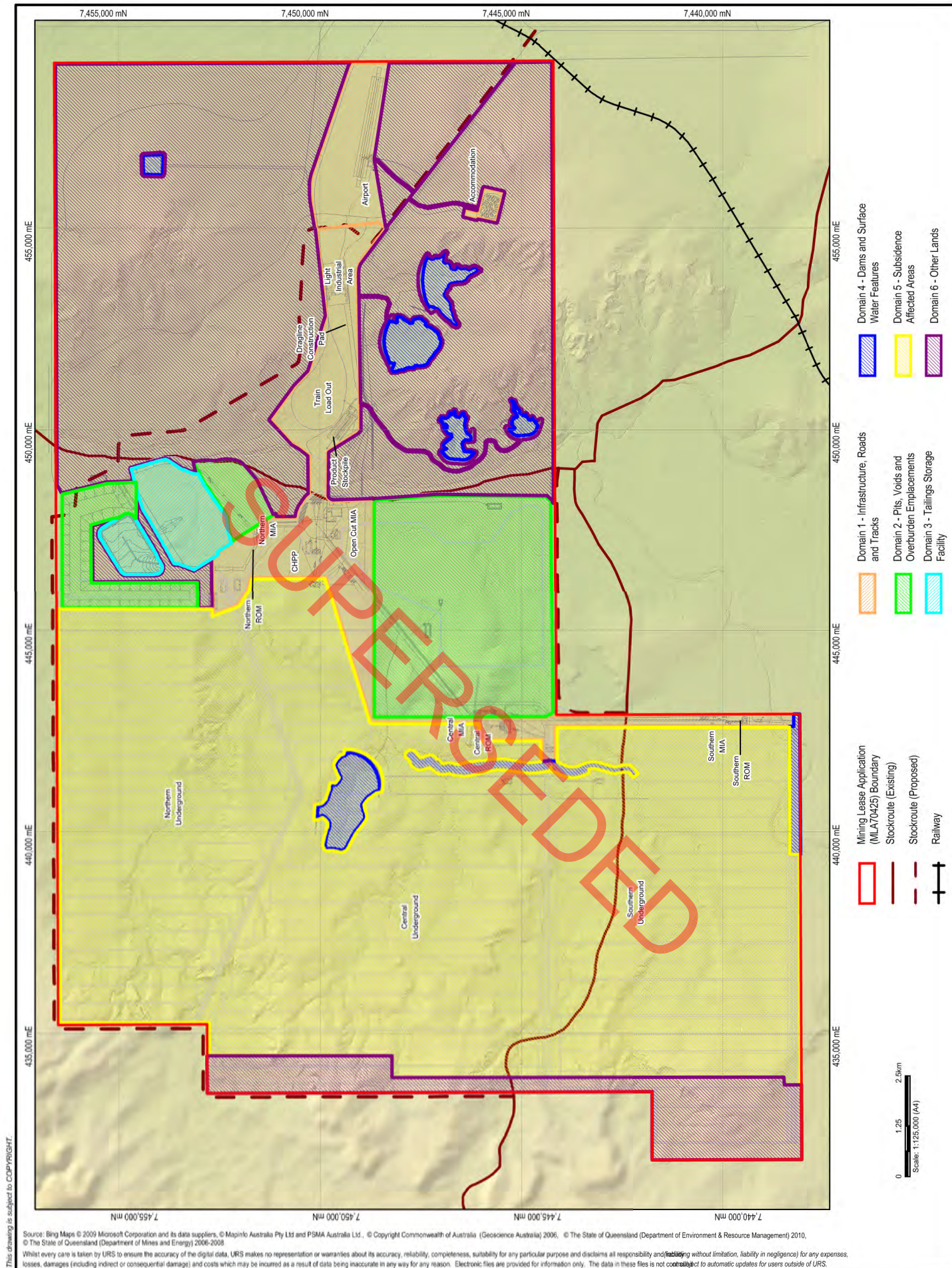
- Progressively undertaken rehabilitation on areas that cease to be used for mining or mine-related activities within two years of becoming available.
- Achievement of acceptable post-disturbance land use suitability – mining and rehabilitation will aim to create a stable landform with land use capability and/or suitability similar to that prior to disturbance, unless other beneficial land uses are pre-determined and agreed. That is the land will be rehabilitated to a condition that will sustain low density grazing land and native bushland, unless otherwise agreed with relevant stakeholders. This will be achieved by setting clear rehabilitation success criteria and outlining the monitoring requirements that assess whether or not these criteria are being accomplished.
- Post-disturbance grazing land will be rehabilitated to a Land Suitability Class 3, which has moderate limitations, and Good Quality Agricultural Land Class C2 and C3 Pasture Land. The objective of the post-disturbance grazing land is to accomplish and remain as sustainable low density cattle grazing.
- Native vegetation will be revegetated using existing vegetation communities where appropriate, for example Brigalow Open Woodland, Silver-leaved Ironbark Open Woodland, Poplar Box Open Woodland, Gidgee Open Woodland, Natural Grasslands of the Central Highlands and the northern Fitzroy Basin or other appropriate vegetation communities identified at the Project Site during the pre-mining assessment. The objective of the rehabilitation for the post-disturbance land use of native vegetation is to accomplish and remain a sustainable native bushland.
- Creation of stable post-disturbance landform - mine wastes and disturbed land will be rehabilitated to a condition that is self-sustaining, or to a condition where maintenance requirements are consistent with an agreed post-mining land use.
- Preservation of downstream water quality – surface and ground waters that leave the mining leases should not be degraded to a significant extent. Current and future water quality will be maintained at levels that are acceptable for users downstream of the site.

The rehabilitation of disturbed land at the mine site will be conducted so that:

- Suitable native vegetation species are used to achieve the nominated post-mine land uses;
- The potential for water and wind induced erosion is minimised, including the likelihood of environmental impacts being caused by the release of dust;
- The quality of surface water released from the site is such that releases of contaminants are not likely to cause environmental harm;
- The water quality of any residual water bodies (other than the final void) is suitable for the nominated use and does not have the potential to cause environmental harm; and

- The final landform is stable and not subject to slumping or erosion which would result in the agreed post mining landform not being achieved.

SUPERSEDED



Datum: GDA94, MGA Zone55

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 Kevin's Corner Project
 Supplementary Environmental Impact Statement

OVERALL SITE LAYOUT DOMAIN PLAN

URS

REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: T-14



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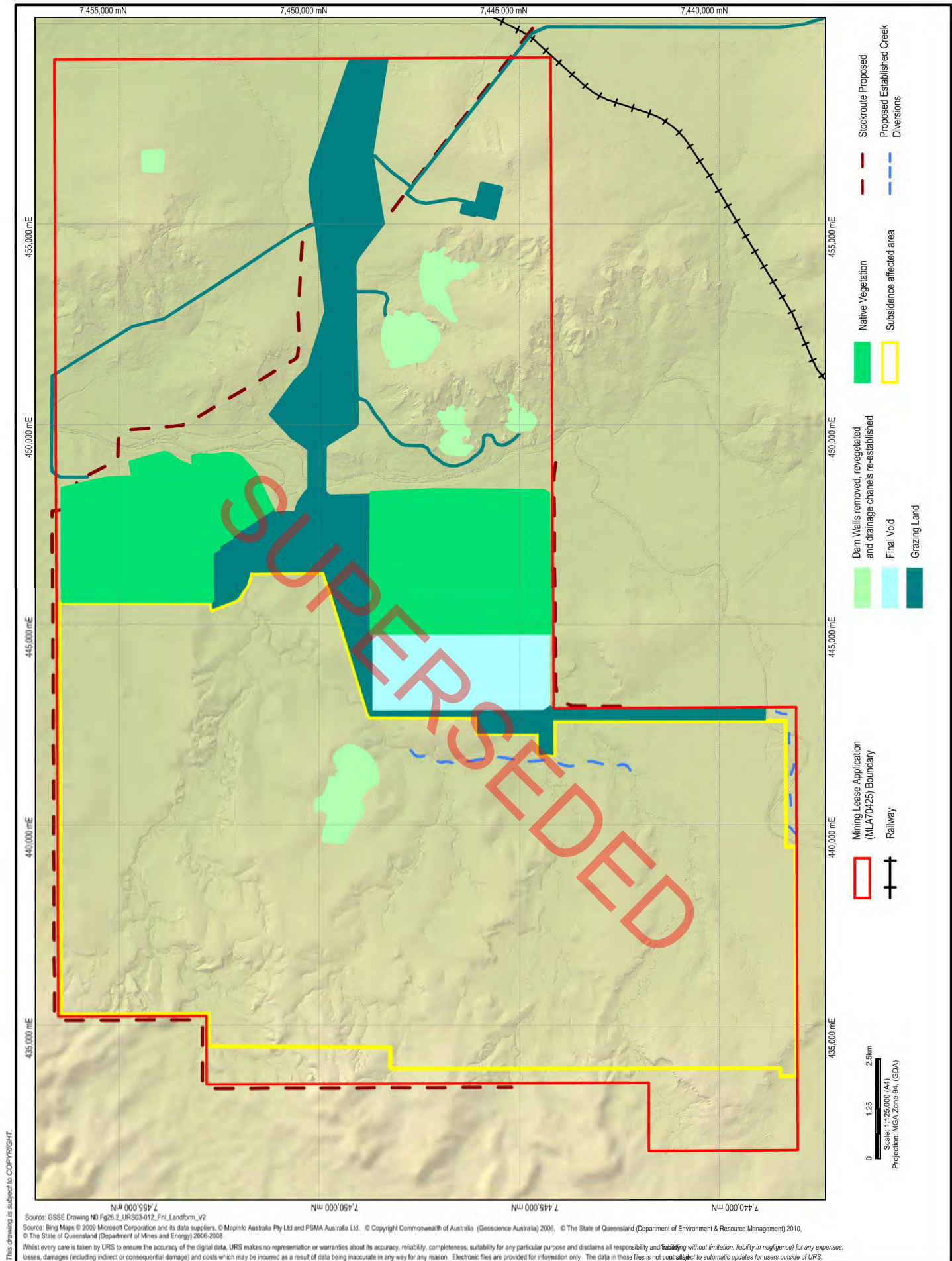
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REHABILITATION AND FINAL LANDFORM

URS

REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-15**

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T.3.8.5 Performance Criteria

The mine area has been divided into six domains and preliminary performance criteria are provided for each domain. The rehabilitation domains are shown on Figure T-14 and include:

- Domain 1: Infrastructure;
- Domain 2: Pits, voids and overburden emplacements;
- Domain 3: Tailings storage facilities;
- Domain 4: Dams and surface water infrastructure;
- Domain 5: Subsidence affected areas; and
- Domain 6: Other lands.

Preliminary performance (or closure) criteria for the rehabilitation of the mine areas are provided in Table T-31 below. The success criteria are performance objectives or standards against which rehabilitation success in achieving a sustainable system for the proposed post-mine land use is demonstrated.

The success criteria will be reviewed every 3 to 5 years with stakeholder participation to ensure the criteria remain realistic and achievable.

Table T-31 Rehabilitation Success Criteria

Rehabilitation Element	Indicator	Criteria
1. Infrastructure		
Landform stability	Slope gradient	Area has gradient of $<2^{\circ}$.
Landform stability	Erosion control	Erosion mitigation measures have been applied.
Landform stability	Surface Water Drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality		Ensure receiving waters affected by surface water runoff have contaminant limits of electrical conductivity maximum of 2,000 $\mu\text{S}/\text{cm}$ and pH range of 5.5 to 9.5, or as determined to be sustainable subject to future investigations and setting water quality objectives.
Water Storages, Creek Diversions		Clean water storages and diversions to be stabilised and left as required. Dirty water storages to be cleaned out and rehabilitated to a stable non-polluting condition.
Topsoil	Physical and chemical soil parameters	Soil salinity content is $<0.6 \text{ dS}/\text{m}$. Soil pH is between 5.5 and 8.5. Soil Exchange Sodium Percentage (ESP) is $<15\%$. Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present
Vegetation	Land use	Buildings, water storage, roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Areas are readily accessible and conducive to safe cattle management activities. Predicted economics and /or benefits have been defined and agreed by the stakeholders.



Rehabilitation Element	Indicator	Criteria
Vegetation	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m ² in area or >10 m in length down slope.
Vegetation	Species composition	Palatable, nutritious native pasture grass species are present.
Vegetation	Community structure	Desirable native grass species comprise at least 60% of total grass cover. Tree density and height of >25 stems per 5 ha each being >2 m in height.
Vegetation	Resilience to disturbance	Established native species survive and/or regenerate after disturbance. 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.
Vegetation	Sustainability	Native species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of tree/shrub species. Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons Nitrogen fixing grass species present. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
Fauna	Vertebrate species	Representation of a range of species characteristics (e.g. activity pattern, habitat usage, diet, dispersal character etc (WBM, 2003; Kimber et. al., 1999)) from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the grassland ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine lease relinquishment. The number of vertebrate species does not decrease by more than 25% in the successive seasons prior to mine closure or by more than 40% over the two successive seasons prior to mine lease relinquishment.
Fauna	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different pastoral ecological processes (including termites for soil structure, Collembola for decomposition, Hemiptera for herbivory and predatory groups such as arachnids, centipedes, earwigs, cockroaches and ants as indicators of a range of other processes (Bisevac and Majer, 1999).
Fauna	Habitat structure	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of pastoral ecosystem type are present, including: a variety of food plants and signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders. Closure documentation includes the contaminated sites register which identifies contaminated sites and the treatment applied.

2. Pits, Voids and Overburden Emplacement

Overburden Emplacement

Landform stability	Slope gradient	No less than 75% of the area has slopes <10° and up to 25% of the area has slopes >10°. Where reject layers are present and exposed,
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Rehabilitation Element	Indicator	Criteria
		the landform is capped.
Landform stability	Erosion control	Erosion control structures are installed commensurate with the slope of the landform.
Landform stability	Surface Water Drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality		Ensure receiving waters affected by surface water runoff have contaminant limits of electrical conductivity maximum of 2,000 $\mu\text{S}/\text{cm}$ and pH range of 5.5 to 9.5, or as determined to be sustainable subject to future investigations and setting water quality objectives.
Water Storages, Creek Diversions		Clean water storages and diversions to be stabilised and left as required. Dirty water storages to be cleaned out and rehabilitated to a stable non-polluting condition.
Topsoil	Salinity (electrical conductivity)	Soil salinity content is $<0.6 \text{ dS}/\text{m}$.
Topsoil	pH	Soil pH is between 5.5 and 8.5.
Topsoil	Sodium content	Soil Exchange Sodium Percentage (ESP) is $<15\%$.
Topsoil	Nutrient cycling	Nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer, mycorrhizae and/or other microsymbionts. Adequate macro and micro-nutrients are present.
Vegetation	Land use	Area accomplishes and remains as a healthy working bushland ecosystem.
Vegetation	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces $>20 \text{ m}^2$ in area or $>10 \text{ m}$ in length down slope.
Vegetation	Species composition	Comprise a mixture of native trees, shrubs and grasses representative of regionally occurring woodland to open forest where possible.
Vegetation	Community structure	Groundcover, understorey and overstorey structure similar to that of appropriate reference site(s)*.
Vegetation	Resilience to disturbance	Established species survive and/or regenerate after disturbance. 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.
Vegetation	Sustainability	Species are capable of setting viable seed, flowering or otherwise reproducing. Evidence of second generation of tree/shrub species. Vegetation develops and maintains a litter layer evidenced by a consistent mass and depth of litter over subsequent seasons. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
Fauna	Vertebrate species	Representation of a range of species characteristics (e.g. activity pattern, habitat usage, diet, dispersal character etc (WMB, 2003; Kimber et. al., 1999)) from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period



Rehabilitation Element	Indicator	Criteria
		preceding mine lease relinquishment. Sighting of species of conservation significance or indicators of the presence of species of conservation significance (e.g. tracks) likely to be present in the established ecosystem type within the three-year period preceding mine closure (assuming non-mine related disturbance has not eliminated local populations thereby removing the colonising source). The number of vertebrate species does not decrease by more than 25% in the successive seasons prior to mine lease relinquishment or by more than 40% over the two successive seasons prior to mine lease relinquishment.
Fauna	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes (including termites for soil structure, Collembola for decomposition, Hemiptera for herbivory and predatory groups such as arachnids, centipedes, earwigs, cockroaches and ants as indicators of a range of other processes (Bisevac and Majer, 1998).
Fauna	Habitat structure	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of that ecosystem type are present, including: a variety of food plants; evidence of active use of habitat provided during rehabilitation such as nest boxes, stags and logs and signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.
Final Voids (including ramps)		
Landform stability	Slope gradient	Final void batter slopes will be designed and excavated to exhibit permanent geotechnical stability. Prior to closure, further investigations will be undertaken to specify design criteria and appropriate action will be taken to ensure effective long term safety, stability and management of the void.
Landform stability	Erosion control	Erosion mitigation measures have been applied to ensure slope stability
Landform stability	Surface Water Drainage	Use of contour banks and diversion drains to direct water into stable areas or sediment control basins.
Water quality		Electrical conductivity of any void water may exceed 2,000 $\mu\text{S}/\text{cm}$ if an ecological assessment shows the long-term ecological stability and groundwater quality is not adversely affected.
Water Storages, Creek Diversions		As for 1.
Topsoil		As for 1.
Vegetation	Land use	Where ramps and in-pit spoil design allow, area accomplishes and remains as a healthy working bushland ecosystem.
Vegetation	Surface cover	As for 1.
Vegetation	Species composition	Comprise a mixture of native grasses, shrubs and trees (where possible) suitable for establishment on steeper slopes.



Rehabilitation Element	Indicator	Criteria
Vegetation	Community structure	Groundcover and understorey structure to that of appropriate reference site(s)*.
Vegetation	Resilience to disturbance	As for 1.
Vegetation	Sustainability	More than 75% of individual grasses and shrubs are healthy when ranked healthy, sick or dead.
Safety		<p>Risk assessment has been completed and risk mitigation measures have been implemented.</p> <p>Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected generally in accordance with relevant guidelines and Australian Standards.</p>
3. Tailings Storage Facility		
Landform stability	Erosion control	Tailings are capped to a depth to be defined in field trials, which includes a minimum topsoil depth of 200mm on the cap. Erosion mitigation measures have been applied. Average soil loss per annum per domain unit is <40 tonnes/ha/yr (sheet erosion).
Landform stability	Surface Water Drainage	Drainage control measures are installed. No water is observed leaching from the facility.
Water quality		As for 1. Area accomplishes and remains as native vegetation.
Topsoil		As for 1.
Vegetation	Land use	Area accomplishes and remains as sustainable grazing.
Vegetation	Surface cover	Minimum of 70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present). No bare surfaces >20 m ² in area or >10 m in length down slope.
Vegetation	Species composition	Grasses, shrubs and trees representative of regionally occurring vegetation communities where possible.
Vegetation	Resilience to disturbance	Established native species survive and/or regenerate after disturbance. 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.
Vegetation	Sustainability	Native species are capable of setting viable seed, flowering or otherwise reproducing.
Fauna	Vertebrate species	Representation of a range of species characteristics from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine lease relinquishment. The number of vertebrate species does not show a decrease over a number of successive seasons prior to mine lease relinquishment.
Fauna	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different ecological processes.
Safety		As for 1.
4. Dams and Surface Water Infrastructure		
Landform stability	Surface Water	Use of contour banks and diversion drains to direct water into stable



Rehabilitation Element	Indicator	Criteria
	Drainage	areas or sediment control basins.
Water quality		Ensure receiving waters affected by surface water runoff have contaminant limits of electrical conductivity maximum of 2,000 $\mu\text{S}/\text{cm}$ and pH range of 5.5 to 9.5, or as determined to be sustainable subject to future investigations and setting water quality objectives.
Water Storages, Creek Diversions		Clean water storages and diversions to be stabilised and left as required. Dirty water storages to be cleaned out and rehabilitated to a stable non-polluting condition.
5. Subsidence Areas		
Landform stability	Erosion control	Erosion mitigation measures have been applied.
Landform stability	Subsidence Impacts	<p>Perform regular inspections over subsidence areas to identify any surface cracks and/or sinkholes.</p> <p>Undertake minimal clearing, if required, of areas around cracks and/or sinkholes to allow for ripping and seeding.</p> <p>Ripping and seeding of areas where required. Following initial ripping and seeding, if trees are to be planted, they will not be planted until enough rain has fallen.</p> <p>Seed and/or plant appropriate native species of vegetation to achieve a post-subsidence land use the same as that pre-subsidence (i.e. low intensity cattle grazing).</p> <p>Regrade subsidence areas and where necessary backfill with mine spoil to control surface water flow and minimise erosion and sedimentation.</p> <p>Undertake drainage works, such as graded banks and diversion drains, to partially drain larger subsidence voids and direct water into stable areas or sediment control areas.</p> <p>If ripping is not feasible due to the width of the cracks, topsoil will be stripped and stockpiled. Clay material will be imported to fill and seal cracks and the topsoil will be respread once the cracks have sealed. The area will then be reseeded with appropriate plant native species.</p>
Landform stability	Surface Water Drainage	Design local drainage works to prevent the uncontrolled flow of runoff from the subsided floodplain area over the channel banks. Small diversion bunds directing floodplain runoff to properly engineered rock chute structures will be installed to minimise bank erosion.
Water quality		As for 1.
Water Storages, Creek Diversions		As for 1.
Water Storages, Creek Diversions		<p>Provide a cover of topsoil in a weathered rock matrix to create a stable substrate for revegetation of channel banks. Weathered rock provides temporary erosion protection by covering erodible soils and minimising topsoil loss.</p> <p>Replace sand across the channel bed, including higher sand deposits suitable for re-creation of in-channel benches.</p> <p>Install timber groynes/pile field retards at the base of the channel banks (extending into the channel) to mitigate erosion undercutting the channel banks and to facilitate creation of in-channel benches.</p>



Rehabilitation Element	Indicator	Criteria
		<p>The structures will be built between each of the subsided panels affecting the river before subsidence occurs.</p> <p>In areas where less active bank erosion develops, large woody debris will be placed in-stream to encourage the deposition of sediment and revegetation over time.</p> <p>Local drainage works will be designed to prevent the uncontrolled flow of runoff from the subsided floodplain area over the channel banks. Small diversion bunds directing floodplain runoff to properly engineered rock chute structures will be installed to minimise bank erosion.</p> <p>Topsoil will be placed on banks and and banks will be revegetate. Stock will be excluded to a width of at least 30 metres from the top of bank and subsided floodplain areas in order to minimise further impacts on vegetation cover and land condition.</p> <p>A targeted revegetation will be undertaken in areas where surface water patterns have been affected</p>
Topsoil		As for 1.
Vegetation	Land use	<p>Roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention.</p> <p>Areas are readily accessible and conducive to safe cattle management activities.</p> <p>Stock will be excluded to a width of at least 30 metres from the top of bank and subsided floodplain areas in order to minimise further impacts on vegetation cover and land condition.</p>
Vegetation	Surface cover	As for 1.
Vegetation	Species composition	<p>Palatable, nutritious pasture grass species are present.</p> <p>Suitable species will be used for the revegetation of riparian zones.</p>
Vegetation	Community structure	Desirable native grass species comprise at least 60% of total grass cover. Tree density and height of >25 stems per 5 ha each being >2 m in height.
Vegetation	Resilience to disturbance	As for 1.
Vegetation	Sustainability	Nitrogen fixing grass species present. More than 75% of shrubs and/or trees are healthy when ranked healthy, sick or dead.
Fauna	Vertebrate species	<p>Representation of a range of species characteristics (e.g. activity pattern, habitat usage, diet, dispersal character etc (WBM, 2003; Kimber et. al., 1999)) from each faunal assemblage group (e.g. reptiles, birds, mammals), present in the grassland ecosystem type, based on pre-mine fauna lists and sighted within the three-year period preceding mine lease relinquishment.</p> <p>The number of vertebrate species does not decrease by more than 25% in the successive seasons prior to mine closure or by more than 40% over the two successive seasons prior to mine lease relinquishment.</p>
Fauna	Invertebrate species	Presence of representatives of a broad range of functional indicator groups involved in different pastoral ecological processes (including termites for soil structure, Collembola for decomposition, Hemiptera

Rehabilitation Element	Indicator	Criteria
		for herbivory and predatory groups such as arachnids, centipedes, earwigs, cockroaches and ants as indicators of a range of other processes (Bisevac and Majer, 1998).
Fauna	Habitat structure	Typical food, shelter and water sources required by the majority of vertebrate and invertebrate inhabitants of pastoral ecosystem type are present, including: a variety of food plants and signs of natural generation of shelter sources including leaf litter.
Safety		Risk assessment has been undertaken in accordance with relevant guidelines and Australian Standards and risks reduced to levels agreed with the stakeholders.
6. Other Lands		
Vegetation	Land use	<p>Roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Areas are readily accessible and conducive to safe cattle management activities. Predicted economics and /or benefits have been defined and agreed by the stakeholders.</p> <p>Minor dozer reshaping work will be undertaken to ensure surface level consistency with the surrounding areas.</p> <p>Any creek crossings (i.e. culverts, etc) will be removed and the pre-existing drainage line re-instated where applicable. If required the area will be deep ripped to loosen compacted material.</p> <p>A light vehicle access road is to be maintained to enable inspections of the site following closure of the mine.</p> <p>Fertiliser and native pasture/tree seed will be applied to assist establish native pasture post-mine land use.</p>
Water Quality	Physical and chemical parameters	A ground and surface water monitoring program will remain in place to closely monitor any changes to water chemistry within the site boundary.
Safety	State and federal OH&S requirements	Risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include safety fences and warning signs, these have been erected generally in accordance with relevant guidelines and Australian Standards.

Proposed Post Mining Land Classification

Additional land classification performance criteria are discussed below:

- **Land Suitability:** The pre-mining agricultural land suitability classification for the proposed disturbance area is predominantly Class C3. Areas along creek lines and small patches land were classified as Class 4. In addition, minor areas of steep rocky country in the west were classified as Class 5. The pre-mining good quality agricultural land assessment showed that the maximum Agricultural Land Class at the site was C2. The post mining landform will be constructed and rehabilitated to ensure that a similar proportion of land suitability classification as the pre-mining landscape is attained.
- **Good Quality Agricultural Land:** Based on the Queensland strategic cropping land trigger maps, good quality agricultural land has not been identified within the Project boundary. This was verified during the



Soils and Land Suitability Assessment, which demonstrated that all of the soil types identified at the site were classified as unsuitable for cropping, due to climatic and taxonomic characteristics.

- Landform Design and Planning: Rehabilitation planning at the Project site will aid in minimising the total area of disturbance at any one time, so reducing the potential for wind-blown dust, visual impacts and increased sediment-laden run-off.

Staged Rehabilitation Approach

Rehabilitation will be progressively undertaken. Table T-32 below shows the total area of progressive rehabilitation throughout the life of the Project.

Table T-32 Progressive Rehabilitation Throughout the life of the Project

Year from Commencement of Operations	Total Area of Rehabilitation Completed (ha)
Year 6	319.5
Year 11	464.2
Year 16	147.3
Year 21	198.9
End of Mine Life	714.0

T.3.8.6 Control Strategies

This section outlines the overall decommissioning strategy for the Project including the planning process and management of waste resulting from infrastructure demolition.

A closure strategy will be developed in consultation with the State regulators. Key objectives of the closure strategy will include:

- Providing a stable landform;
- Providing a landform surface that is resistant to erosion;
- Providing a surface cover that minimises the risk of infiltration, promotes shedding of surface water and promotes growth of vegetation; and
- Minimises the risk of environmental harm from seepage.

Void Management

On closure of the mine, a void management strategy will be implemented targeting several key environmental issues for the long term management of the void. These are outlined below.

The primary objectives of the void management strategy are to:

- Propose mitigation measures to minimise potential impacts associated with the final void;
- Propose measures for the management and monitoring the potential impacts of the void over time; and
- Present options for the final land use of the void following the cessation of mining.

Prior to closure, further investigations will be undertaken to confirm the criteria above and appropriate action will be taken to ensure effective long term safety, stability and management of the void.

Revegetation Program Implementation

A revegetation strategy has been developed for the Project disturbance area that seeks to complement desirable post-mining land-use objectives whilst maintaining effective erosion and weed controls.

Plant selection for areas to be rehabilitated as bushland will focus on those species that will successfully establish on the available growth medium, bind the soil and will result in a variety of structure and food/habitat resources. Table T-33 provides an indication of the species likely to be used for revegetation of the disturbance areas at within the Project area. The species likely to be used for revegetation has been provided for each of the predominant pre-mining land uses, including woodlands, grasslands and riparian zones.

Where appropriate, native pasture species (warm season perennial, cool season perennial, yearlong green perennial and annual) will be sown. If steep slopes are present and it is not practicable to re shape the area and/or there is a high risk of erosion, native stoloniferous grass species (e.g. *Brachyachne convergens* (native couch/spider grass), *Chloris pectinata* (comb chloris) and *Iseilema vaginiflorum* (red flinders grass)) will be sown (if seed is available) as their growth provides more extensive coverage in a shorter time (Ashwath *et al* 2006). If native species are unsuccessful or seed is not available, discussions will be held with DEHP regarding implementation of conditions for the use of introduced species, including buffer zones. The use of buffer zones will be site specific and should be considered prior to any revegetation activities. However, buffer zones should be established around any areas of remnant vegetation which are relatively undisturbed and where exotic species are not present.

Buffer zones maybe established by initially seeding with a non-invasive cover crop (eg millet, oats or barley) to achieve rapid ground cover and to minimise soil erosion. Native grass seed (eg Mitchell Grasses or Bluegrass) will be included in the cover crop seed mix. Inclusion of the native grass seed will allow the native species to germinate through the protective cover crop. This will provide rapid surface coverage and erosion protection for the surface soil and provide a buffer from exotic pasture species.

Appropriate buffer zones should be evaluated when considering the used of introduced species and introduced species will only be used on the condition that;

- The area does not border an area allocated for natural area rehabilitation of either woodland, grassland or riparian areas; or
- Border any area of uncleared vegetation (unless this is also buffel pasture).

Special Treatment Areas

Additional erosion control measures such as the application of 'hydromulch' will be considered, particularly in drainage lines and steeper batter areas (e.g. infrastructure "cut and fill" batters). Opportunities for the use of potential soil ameliorants (biosolids) to accelerate the rehabilitation process will also be investigated as appropriate.

Pest & Weed Management

Weeds will be managed across the site as per the Pest and Weed management Plan (SEIS Appendix T4.02) through a series of control measures, including:

- Hosing down at risk equipment in an approved wash down area before entry to site;
- Scalping weeds off topsoil stockpiles prior to re-spreading topsoil;



- Regular inspections of rehabilitation to identify potential weed infestations;
- Identifying and spraying existing weed populations on-site together with ongoing weed spraying over the life of the mine; and
- The use of agricultural herbicides in the areas to be stripped and on topsoil stockpiles.

Table T-33 Plant Species to be Used for Revegetation of Disturbed Areas

Scientific Name	Common Name
Woodlands	
<i>Acacia cambagei</i>	Gidgee
<i>Acacia coriacea</i> subsp <i>sericophylla</i>	Desert oak
<i>Acacia excelsa</i>	Ironwood
<i>Acacia harpophylla</i>	Brigalow
<i>Acacia holosericea</i>	Soap bush
<i>Acacia lazaridis</i>	Lazarides wattle
<i>Acacia oswaldii</i>	Milijee
<i>Acacia salicina</i>	Sally wattle
<i>Acacia shirleyi</i>	Lancewood
<i>Aeschynomene indica</i>	Budda pea
<i>Alphitonia excelsa</i>	Red ash
<i>Aristida bigandulosa</i>	Dark wiregrass
<i>Aristida</i> sp.	Wiregrass
<i>Atalaya hemiglauc</i>	Whitewood
<i>Bothriochloa ewartiana</i>	Desert bluegrass
<i>Brachychiton populneus</i>	Kurrajong
<i>Chloris divaricata</i>	Slender chloris
<i>Chrysopogon fallax</i>	Golden beard grass
<i>Corymbia dallachiana</i>	Dallachy's gum
<i>Corymbia setosa</i>	Rough-leaved bloodwood
<i>Dactyloctenium radulans</i>	Button grass
<i>Dichanthium sericeum</i> subsp <i>sericeum</i>	Bluegrass
<i>Digitaria brownii</i>	Cotton panic grass
<i>Dodonaea lanceolata</i> var. <i>lanceolata</i>	Hopbush
<i>Enchylaena tomentosa</i>	Ruby saltbush
<i>Eragrostis</i> sp.	Lovegrass
<i>Eremophila latrobei</i>	Crimson turkey bush
<i>Eremophila mitchellii</i>	False sandalwood
<i>Erythrina vespertilio</i>	Bat's wing coral tree
<i>Eucalyptus brownii</i>	Reid river box
<i>Eucalyptus camaldulensis</i>	River red gum
<i>Eucalyptus cambageana</i>	Dawson gum

Scientific Name	Common Name
<i>Eucalyptus coolabah</i>	Coolabah
<i>Eucalyptus melanophloia</i>	Silver-leaved ironbark
<i>Eucalyptus populnea</i>	Poplar box
<i>Eucalyptus tessellaris</i>	Moreton Bay ash
<i>Eucalyptus thozetiana</i>	Thozet's box
<i>Lysiphyllum carronii</i>	Red bauhinia
<i>Melaleuca tamariscina</i>	Weeping bottlebrush
<i>Panicum decompositum</i>	Native millet
<i>Paspalidium caespitosum</i>	Brigalow grass
<i>Setaria surgens</i>	Annual pigeon grass
<i>Themeda triandra</i>	Kangaroo grass
Grasslands	
<i>Astrebla elymoides</i>	Hoop Mitchell grass
<i>Astrebla pectinata</i>	Barley Mitchell grass
<i>Astrebla squarrosa</i>	Bull Mitchell grass
<i>Dichanthium sericeum subsp sericeum</i>	Bluegrass
<i>Panicum decompositum</i>	Native millit
<i>Sporobolus caroli</i>	Fairy grass
<i>Themeda triandra</i>	Kangaroo grass
Riparian Zones	
<i>Aristida inaequiglumis</i>	Feathertop Three-awn
<i>Aristida latifolia</i>	Feather top wiregrass
<i>Atalaya hemiglauc</i>	Whitewood
<i>Brachychiton populneus</i>	Kurrajong
<i>Chloris divaricata</i>	Slender chloris
<i>Corymbia dallachiana</i>	Dallachy's gum
<i>Enchylaena tomentosa</i>	Ruby saltbush
<i>Eragrostis elongata</i>	Clustered lovegrass
<i>Eragrostis lacunaria</i>	Purple lovegrass
<i>Eragrostis parviflora</i>	Weeping lovegrass
<i>Eucalyptus camaldulensis</i>	River red gum
<i>Eucalyptus cambageana</i>	Dawson gum
<i>Eucalyptus coolabah</i>	Coolabah
<i>Eucalyptus melanophloia</i>	Silver-leaved Ironbark
<i>Eucalyptus tessellaris</i>	Moreton bay ash
<i>Heteropogon contortus</i>	Black speargrass
<i>Lysiphyllum carronii</i>	Red bauhinia
<i>Paspalidium caespitosum</i>	Brigalow grass



Scientific Name	Common Name
<i>Sporobolus caroli</i>	Fairy grass
<i>Themeda triandra</i>	Kangaroo grass
Steep Slopes / High Erosion	
<i>Brachyachne convergens</i>	Native couch/spider grass
<i>Chloris pectinata</i>	Comb chloris
<i>Iseilema vaginiflorum</i>	Red flinders grass

T.3.8.7 Monitoring

Post Closure Monitoring and Environmental Management

Following closure of the mine, the environmental monitoring program established for the operations phase of the Project will be maintained until all decommissioning and rehabilitation works have been completed.

The type and location of this monitoring will be determined by the outcomes from the Phase 1 and/or Phase 2 contamination assessment and other relevant inputs identified during the closure planning and decommissioning phase of the site.

Rehabilitation Monitoring

The proposed Rehabilitation Monitoring Program details are provided in the Table T-34 below. Monitoring of the rehabilitated areas will broadly involve the following:

- Ongoing chemical analysis of topsoil;
- Comparison of soil erosion rates and rill and gully dimensions with measurements taken from reference sites;
- Comparison of vegetation measurements with measurements taken from reference sites;
- Ongoing analysis of water quality parameters in accordance with the development consent and environmental protection licence conditions from data collected monthly at water storages, ramps and pits, sedimentation dams and sewage effluent outfalls on-site, and continually from creeks (upstream and downstream of mine); and
- Visual surveillance including the use of digital photogrammetry / low level oblique or vertical aerial photography to monitor changes over time in the rehabilitation (e.g. changes in vegetation structure, erosion rates and landform drainage).

Monitoring of the following specific parameters will be undertaken to determine the level of achievement of success criteria.

Table T-34 Rehabilitation monitoring parameters

Aspect of Rehabilitation	Elements to be Monitored
Ecosystem Establishment	
Ground cover	Percentage of ground covered by vegetation, rocks, logs and other obstructions.

Aspect of Rehabilitation	Elements to be Monitored
	Obstruction lengths and widths (indicates the amount of ground cover that is present to collect, hold and disseminate available resources necessary for ecosystem function) for use in Landscape Function Analysis (LFA). Fetch lengths (measure of distances of soil surface that is bare of matter that could slow water velocity) for use in LFA.
Community structure and composition	Species composition. Number and form of ground cover and understorey species per plot. Density, height, canopy cover and DBH of tree and large shrub species. Numbers, heights, native/introduced and species identity (where able to be determined) of any seedlings. Evidence of reproduction/regeneration (e.g. flower heads, fruits/seeds, germination of seedlings etc.). Assessment of individual plant health (healthy, sick or dead).
Habitat	Availability and variety of food sources (e.g. flowering/fruited trees, presence of invertebrates etc.). Availability and variety of shelter (e.g. depth of leaf litter, presence of logs, hollows etc.). Presence/absence of free water.
Fauna	Presence and approximate abundance and distribution of functional indicator invertebrate species. General observations of vertebrate species (including species of conservation significance). Detailed fauna surveys including presence and approximate abundance and distribution of vertebrate species (focussing on species of conservation significance).
Weeds and pests	Species identity. Approximate numbers/level of infestation. Observations of impact on rehabilitation (if any).
Erosion Monitoring and Soil Characteristics	
Soil	Stability, infiltration and nutrient cycling undertaken according to LFA procedure. Electrical Conductivity, as a measure of salinity. pH. Soil exchangeable Na potential.
Erosion	Location and extent of sheet wash. Location and extent of rill and gully erosion including measurements of depth, width and length. Extent of bare areas with potential to erode. Sediment movement and runoff.
Geotechnical Stability	
	Stability of batter and surface settlements, in particular where these features could impact on the performance of any surface water management system. Surface integrity of landform cover/capping (measurement of extent of integrity failure). Landform slumping (distance of material movement and extent).
Surface and Ground Water	
	Groundwater quality and depth. Efficiency of landform surface water drainage systems. Presence and quality of any surface water and seepage at selected locations at the



Aspect of Rehabilitation	Elements to be Monitored
	lower part of any potentially acid producing landforms such as spoil dumps containing coarse rejects. Water quality including pH, EC and total suspended solids of water in water storages, ramps and pits, sediment basins and sewage effluent outfalls onsite. Water quality including pH, salinity and turbidity of water entering creek/river systems on-site.
Creeks and Diversions	
	Vegetation density, diversity and vigour Structural stability of channel Water quality including pH, salinity and turbidity of water entering creek/river systems on-site.

Rehabilitation Maintenance

Maintenance of rehabilitated areas will be undertaken where necessary and in response to results of the monitoring program,

Post-mining surveys of the rehabilitation will be progressively undertaken across the site to determine whether the site meets success criteria and whether the results are maintained over time. Once maintenance and rehabilitation are no longer required, the area will be relinquished to the relevant stakeholders.

T.3.8.8 Commitments

- A Post Mine Land Use Plan (PMLUP) will be developed for the site;
- Progressive rehabilitation of the disturbed areas will be undertaken on an availability basis;
- An ongoing Rehabilitation Monitoring Program will be undertaken against the agreed criteria;
- Prior to closure information to support final void configuration will be developed;
- The final voids will be designed to render them safe, stable and sustainable;
- A Subsidence Management Plan will be developed for the site;
- Low impact crack remediation measures will be implemented within the Cudmore Resources Reserve;
- A Vegetation Management Schedule will be developed for subsided areas.

T.3.8.9 Proposed Environmental Authority Conditions

Schedule F – Land

Preventing Contaminant Release to Land

- F1** Contaminants must not be released to land in a manner which constitutes nuisance, material or serious environmental harm.

- F2** The Environmental Authority holder must take all practicable actions necessary to secure loads prior to transporting materials off-site to minimise emissions or spillage of any material from vehicles or other transport infrastructure.

Topsoil

- F3** A Top Soils Management Plan must be developed for the site. All topsoil must be strategically stripped ahead of mining in accordance with this Plan.
- F4** Topsoil and subsoils must be managed to ensure stability and minimise the release of contaminants. Measures include:
- (a) Vegetating stockpiles;
 - (b) Minimising height of stockpiles; and
 - (c) Reusing stockpiles as soon as possible.
- F5** A Topsoil Inventory which identifies the topsoil requirements for the mining Project and availability of suitable topsoil on-site must be detailed in the Mine Operational Manual.

Storage & Handling of Hazardous Substances

- F6** All flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with the current version of AS 1940 – *Storage and Handling of Flammable and Combustible Liquids*.
- F7** Spillage of all flammable and combustible liquids must be controlled in a manner that prevents environmental harm.
- F8** All explosives, corrosive substances, toxic substances, gases and dangerous goods must be stored and handled in accordance with the relevant Australian Standard (i.e. latest version of AS 2187 *Explosives - Storage, Transport and Use*; AS 3780 *The Storage and Handling of Corrosive Substances*; AS 4452 *The Storage and Handling of Toxic Substances*);
- F9** All chemicals and flammable or combustible liquids stored on-site that have the potential to cause environmental harm must be stored in or serviced by an effective containment system that is impervious to the materials stored and managed to prevent the release of liquids to water or land. Where no relevant Australian Standard is available, the following must be applied:
- (a) Storage tanks must be banded so that the capacity and construction of the band is sufficient to contain at least 110% of a single storage tank or 100% of the largest storage tank plus 10 % of the second largest storage tank in multiple storage areas; and
 - (b) Permanent Drum storages must be banded so that the capacity of the band is sufficient to contain at least 25% of the maximum design storage volume within the band.
- F10** 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 on-site.



F11 Anyone operating with wastes, chemicals or flammable and combustible liquids under the Environmental Authority be trained in the use of the spill kit.

F12 Regulated structures must be designed and constructed to ensure that the design integrity would not be compromised on account of:

(a) Floodwaters from entering the regulated dam from any watercourse or drainage line; and

(b) Wall failure due to erosion by floodwaters arising from any watercourse or drainage line.

Infrastructure

F13 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 land owner/holder.

(Note: Not applicable where the landowner/ holder is also the Environmental Authority holder).

Subsidence

F14 A Subsidence Management Plan must be developed by an appropriately qualified person and implemented by the holder of the Environmental Authority prior to the commencement of activities that result in subsidence.

F15 The Subsidence Management Plan must:

(a) Provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of the Environmental Authority;

(b) Address the proposed impacts of subsidence on any land, watercourse and floodplain, including but not limited to:

i. Physical condition of surface drainage:

- Erosion
- Areas susceptible to higher levels of erosion such as watercourse confluences;
- Incision processes
- Stream widening;
- Tension cracking;
- Lowering of bed and banks;
- Creation of instream waterholes; and
- Changes to local drainage patterns.

ii. Overland flow:

- Capture of overland flow by subsided long wall panels;

- Increased overbank flows due to lowering of high bank of watercourses; and
- The portion of local and large scale catchment likely to be captured by subsided long wall panels and the associated impacts on downstream users.

iii. Water quality

- Surface water
- Groundwater; and
- Overland flow water detained in subsided long wall panels;

iv. Land condition: current land condition to be impacted by subsidence;

v. Infrastructure: Detail of existing infrastructure (pipelines, railway, powerlines and haul roads) should be identified where there is a potential impact from the effects of land subsidence;

- (c) Proposed options for mitigating any impacts associated with subsidence and how these mitigation methods will be implemented;
- (d) Cumulative impacts on watercourses or catchments;
- (e) Impacts on groundwater;
- (f) Contingency procedures for emergencies; and
- (g) A program for monitoring and review of the effectiveness of the Subsidence Management Plan.

F16 The Subsidence Management Plan must be reviewed each calendar year and a report prepared by an appropriately qualified person. The report must:

- (a) Assess the plan against the requirements under condition F15.
- (b) Include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; and
- (c) Identify any amendments made to the Subsidence Management Plan following the review.

F17 The holder of the Environmental Authority must attach to the review report required by condition F16, a written response to the report and the recommended actions, detailing the actions taken or to be taken by the Environmental Authority holder on stated dates:

- (a) To ensure compliance with this Environmental Authority; and
- (b) To prevent a recurrence of any non-compliance issues identified.

F18 The review report required by condition F16 and the written response to the review report required by condition F17 must be submitted to the administering authority with the subsequent annual return under the signature of the appointed signatory for the annual return.



- F19** Areas impacted by subsidence, or proposed to be impacted by subsidence must be identified within the Plan of Operations.
- F20** The Plan of Operations must as a minimum:
- (a) Identify pre-subsidence management actions to be undertaken during the period of the plan.
 - (b) Identify post – subsidence management actions to be undertaken during the period of the plan.
 - (c) Identify the subsidence monitoring proposed to be undertaken during the period of the plan.
- F21** The holder of this Environmental Authority must not commence subsidence of a longwall panel that will result in the subsidence of a watercourse or adjoining floodplain unless:
- (a) The holder has submitted to the administering authority two copies of the Subsidence Management Plan detailing the subsidence activities for the watercourse or adjoining floodplain together with certification of a suitable qualified and experienced person that the plan is compliant in all respects with this Environmental Authority and in accordance with engineering best practice; and
 - (b) At least 28 days has passed since the submission of the subsidence management plan.
- Due consideration must be given to any comments made by the administering authority about the Subsidence Management Plan and subsequent implementation of the plan.
- F22** The holder of this Environmental Authority must arrange for each subsided longwall panel to be inspected annually by a suitably qualified and experienced person, in accordance with conditions F23 through F27, until such time that the person is satisfied that the total subsidence has occurred.
- F23** At each annual inspection, the condition of each subsided longwall panel must be assessed, including the structural, hydraulic adequacy of the subsided longwall panel and the adequacy of the works with respect to the Subsidence Management Plan.
- F24** For each inspection, two copies of a report certified by the suitably qualified and experienced person, including any recommendations to ensure the integrity of each subsided longwall panel must be provided to the administering authority within 28 days of inspection.
- F25** The holder of this Environmental Authority must attach to the inspection report required by condition F25, a written response to the report and the recommended actions, detailing the actions taken or to be taken by the Environmental Authority on stated dates:
- (a) To ensure compliance with this Environmental Authority; and
 - (b) To prevent a recurrence of any non-compliance issues identified.



- F26** The written response required by condition F26 to the inspection report must be submitted to the administering authority within 28 days of the submission of the inspection report required under condition F25.

Rehabilitation

- F27** Progressive rehabilitation must commence within two (2) years of when areas become available within the operational land.
- F28** All areas significantly disturbed by mining activities must be rehabilitated in accordance with [Table F-1 Final Land Use and Rehabilitation Requirements](#) and [Table F-2 Landform Design Criteria](#).

Table F-1 Final Land Use and Rehabilitation Requirements

Land Use Element	Domains				
	Pits and Mine Waste		Tailings Storage Facility	Infrastructure	Remainder of Mining Lease Area
	Pits	Mine Waste			
Approximate surface area (ha)	897	2,418	420	2,566	30,802
Pre-mine land use	Combination of low intensity cattle grazing and bushland.				
Post-mine land use	Voids to reach a stable water level over time for storage and stock watering.	Combination of low intensity cattle grazing and bushland.	Low intensity cattle grazing.	Low intensity cattle grazing.	Combination of low intensity cattle grazing and bushland.
Post-mine land capability classification	Voids – Class V ¹	Land Suitability (Low Intensity Grazing). All other areas – Class III ¹ or IV ¹ .			
Projective cover range (%)	Not applicable	>70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).	>70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).	>70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).	Consistent with existing vegetation as these areas are going to have minimal disturbance.

Table F-2 Landform Design Criteria

Domains		Target Slope Range (Degrees)	Approximate Surface Area (ha)
Pits and Mine Waste	Void – Pit ¹	Final void batter slopes will be designed and excavated to exhibit permanent geotechnical stability. Prior to closure, further investigations will be undertaken to specify design criteria and appropriate action will be taken to ensure effective long term safety, stability and management of the void	897
	Void – Pit ²		
	Borrow Pit	No less than 75% of the rehabilitated area has slopes of less than 10° and up to 25% of the rehabilitated area has slopes greater than 10°.	



Domains		Target Slope Range (Degrees)	Approximate Surface Area (ha)
	Overburden	No less than 75% of the rehabilitated area has slopes of less than 10° and up to 25% of the rehabilitated area has slopes greater than 10°.	2,418
Tailings Storage Facility	Tailings Dam	No less than 75% of the rehabilitated area has slopes of less than 5° and up to 25% of the rehabilitated area has slopes greater than 5°.	420
Infrastructure	Including CHPP, ROM Stockpiles, workshops, landfill, raw water dam, administration areas, etc	No less than 75% of the rehabilitated area has slopes of less than 5° and up to 25% of the rehabilitated area has slopes greater than 5°.	2,566
Remainder of Mining Lease Area	Roads and tracks	As required	30,802
	Exploration and groundwater monitoring bores	As required	

- F29** The Proponent will complete an investigation into the planned rehabilitation of disturbed areas and submit a report to the administering authority proposing acceptance criteria to meet the outcomes in condition F29 and [Table F-1 Final Land Use and Rehabilitation Requirements](#) and [Table F-2 Landform Design Criteria](#) within twelve months of the issue of the Environmental Authority.

Residual Voids

- F30** Residual voids must comply with the following outcomes:

- Residual voids must not cause any serious environmental harm to land, surface waters or any recognised ground water aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within the Environmental Authority; and
- Final void batter slopes must be designed and excavated to exhibit permanent geotechnical stability. Prior to closure, further investigations must be undertaken to specify design criteria and appropriate action to ensure effective long term safety, stability and management of the void

Rehabilitation Management Plan

- F32** The Proponent will complete a rehabilitation management plan for disturbed areas and submit a report to the administering authority proposing acceptance criteria prior to the commencement of mining activities. The rehabilitation management plan must at a minimum:

- Develop design criteria for each domain.
- Identify success factors and completion criteria for each domain.

- (c) Identify three (3) reference sites to be used to develop rehabilitation success criteria.
- (d) Describe the monitoring of reference sites inclusive of statistical design.
- (e) Detail rehabilitation methods applied to each domain.
- (f) Contain landform design criteria including end of mine design.
- (g) Detail how landform design will be consistent with the surrounding topography.
- (h) Provide schematic representation of the final landform inclusive of:
 - Drainage design and features;
 - Slope designs;
 - Cover design; and
 - Erosion controls proposed on reformed land.
- (i) Explain planned native vegetation rehabilitation areas and corridors.
- (j) Describe rehabilitation monitoring and maintenance requirements to be applied to all areas of disturbance.
- (k) Develop a contingency plan for rehabilitation maintenance or redesign.
- (l) Describe end of mine landform design plan and post mining land uses across the mine.

Rehabilitation Monitoring Program

- F33** Once rehabilitation has commenced, the Environmental Authority holder must conduct a annual Rehabilitation Monitoring Program, which must include sufficient spatial and temporal replication to enable statistically valid conclusions on rehabilitation success to be established.
- F34** The Rehabilitation Monitoring Program must be developed and implemented by a person possessing appropriate qualifications and experience in the field of rehabilitation management.
- F35** Verification of rehabilitation success, determined by the rehabilitation success criteria developed as per condition F33 is to be carried out as follows:
- (a) The minimum sampling intensity must be specified for the monitoring of progressive rehabilitation;
 - (b) Justification of the suitability of the minimum sampling intensity must be provided;
 - (c) Monitoring must include sufficient replication to enable statistical analysis of results at an acceptable power; and
 - (d) Undertaken at twelve month intervals.



F36 The Rehabilitation Monitoring Program must be included in the Plan of Operations and updated with each subsequent Plan of Operations, describing:

(a) How the rehabilitation objectives as per the Rehabilitation Management Plan will be achieved; and

(b) Verification of rehabilitation success as per condition F35.

F37 For rehabilitated areas, self-sustaining vegetation as per Table F-1 Final Land Use and Rehabilitation Requirements must be consistent with the reference sites identified in Table F-3 Reference Sites.

Table F-3 Reference Sites

Reference site	Domain	Latitude	Longitude	Description
1	5	146.3627	-23.0208	10.3.27a
2	5	146.4148	-22.9769	10.3.27a
3	5	146.4979	-22.9249	10.3.27a
4	5	146.5066	-22.9395	10.5.12
5	5	146.4172	-22.953	10.5.12
6	5	146.4346	-22.9187	10.5.12
7	5	146.3982	-22.9514	10.3.13a
8	5	146.4826	-22.8723	10.3.13a
9	5	146.4902	-22.9006	10.3.13a
10	5	146.3644	-23.0334	10.3.14
11	5	146.5063	-23.1039	10.3.14
12	5	146.3875	-22.9901	10.3.14
13	5	146.3996	-22.9826	10.3.28a
14	5	146.3497	-23.0288	10.3.28a
15	5	146.4846	-22.9376	10.3.28a
16	5	146.3341	-23.0382	10.3.3a
17	5	146.3504	-23.0052	10.3.3a
18	5	146.295	-23.027	10.3.3a
19	5	146.5266	-23.0922	10.7.7
20	5	146.562	-23.103	10.7.7
21	5	146.5198	-23.0728	10.7.7
22	5	146.3657	-22.9483	10.7.3b
23	5	146.5217	-23.1053	10.7.3b
24	5	146.5543	-23.0907	10.7.3b
25	5	146.4082	-22.9899	10.5.5a
26	5	146.5833	-23.1055	10.5.5a
27	5	146.5951	-23.0198	10.5.5a

Post Mine Land Use



F38 The holder must develop and submit to the administering authority a Post Mine Land Use Plan (PMLUP) with the initial Plan of Operations and update and resubmit the plan with each subsequent Plan of Operations. The PMLUP must describe how the rehabilitation objectives in Table F-1 Final Land Use and Rehabilitation Requirements will be achieved:

- (a) Schematic representation of final land form inclusive of drainage features;
- (b) Drainage design
- (c) Erosion controls proposed on reformed land;
- (d) Geotechnical, geochemical and hydrological studies;
- (e) Chemical, physical and biological properties of soil and water;
- (f) Proposed revegetation methods inclusive of plant species selection, re-profiling, resspreading soil, soil ameliorants/ amendments, surface preparation and method of propagation; and
- (g) A Rehabilitation Monitoring Program as specified in condition F36.

Post Closure Management Plan

F39 A Post Closure Management Plan for the site must be developed and submitted to the administering authority at least 18 months prior to the final coal processing on-site and implemented for a nominal period of:

- (a) At least 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 can harm the environment.

F40 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 final cover systems of spoil dumps; and
 - v. Vegetative cover;
- and
- (b) Monitoring of:
 - i. Surface water quality;
 - ii. Groundwater quality;
 - iii. Seepage rates;
 - iv. Erosion rates;
 - v. The integrity and stability of slopes, ramps and voids; and
 - vi. The health and resilience of native vegetation cover.



Cudmore Resources Reserve

- F41** Prior to commencement of mining or associated activities within the Cudmore Resources Reserve, the proponent must develop an Operations Plan for that area detailing the mitigation and management measures to be implemented to manage the impacts as a result of the mining activities. The Operations Plan will be subject to a periodic review to allow consideration of all relevant environmental, economic resource and operational considerations with potential to impact on the values of Cudmore Resources Reserve.

SUPERSEDED

T.3.9 Terrestrial Ecology

This section of the EMP describes the ecology identified on-site in terms of the terrestrial flora and fauna for the Project.

T.3.9.1 Environmental Values

Flora

A total of 458 flora species and 25 mappable vegetation communities were identified on and adjacent to the Project site. One EPBC listed threatened ecological community (TEC) was identified on the site access road. No threatened flora species were identified on the Project site. Species listed under the *Land Protection (Pest and Stock Route) Management Act* (LP Act, 2002) include the common pest pear (*Opuntia stricta*), velvety tree pear (*Opuntia tomentosa*) and Parkinsonia (*Parkinsonia aculeata*). No plants are listed under State or Commonwealth legislation as species of conservation significance nor recognised as plants of commercial, horticultural or cultural significance. However, one of the identified RE's is categorised as Endangered (Brigalow Open Woodland RE 10.9.3) and nine RE's are deemed Of Concern by the Queensland DEHP Biodiversity Status. Two of these REs are also listed Of Concern within the *Vegetation Management Act* (VM Act, 1999).

Vegetation community-specific values include:

- One EPBC listed TEC, Natural grasslands of the central highlands and northern Fitzroy basin;
- The Fringing Riparian Woodland (RE 10.3.14) that offers refuge for fauna by providing water, shade and mature, hollow bearing tree species;
- Vegetation communities that exhibit a high diversity of floral structure (in particular the Fringing Riparian Woodland (RE 10.3.14), Silver-leaved Ironbark Open Woodland (RE 10.3.28a, 10.5.5a, 10.7.11a and 11.8.4), Weeping Bottlebrush Heath (RE 10.7.7) and Queensland Yellowjacket low open woodland (RE 10.5.1)) add value to the regional integrity of each community;
- Landscapes such as floodplains (in particular the Poplar Box Open Woodland (RE 10.3.27a), skeletal hills (represented by the Lancewood Woodland (RE 10.7.3b) and tertiary sand plains (best represented by the Queensland Yellowjacket Low Open Woodland (RE 10.5.1) are intact and devoid of degradation by grazing; and
- A range of vegetation communities including an Endangered (Biodiversity Status) RE of Brigalow Open Woodland (RE 10.9.3) and nine Of Concern (Biodiversity Status) REs including Bluegrass Grasslands (also termed natural grasslands of the central highlands and northern Fitzroy basin) (RE 11.8.11), Poplar Box (RE 10.3.27a), Gidgee Open Woodland (RE 10.3.4b, 10.4.5, 11.3.5), Fringing Riparian Woodland (RE 10.3.13a and 10.3.14), *Eucalyptus populnea* woodlands (RE 11.3.2), Thozet's Box (RE 10.7.5) and Brigalow Open Woodland (RE 10.9.3) listed under DEHP's Biodiversity Status, have the potential to contribute to the overall preservation of threatened ecosystems.

Fauna

A total of 163 vertebrate fauna species were identified on the Project site during the surveys. This figure is comprised of 92 birds, 35 mammals (four introduced), 26 reptiles and 10 amphibians (one introduced). One species of conservation significance was observed; the squatter pigeon (southern subspecies) (*Geophaps*



scripta scripta). This species is listed under both the EPBC Act and the NC Act as 'Vulnerable'. There are also a number of avian species listed under the EPBC Act as migratory and / or marine.

Faunal values associated with the Project site include:

- The existence of suitable habitat on the Project site for threatened species likely to occur in the area. Fallen timber within the Brigalow Open Woodland and Gidgee Open Woodland has the potential to provide a distinct microhabitat for certain fauna, including the EPBC-listed yakka skink (*Egernia rugosa*) and brigalow scaly foot (*Paradelma orientalis*). A permanent water source with open woodland and surrounding grassland has the potential to provide habitat for the star finch (*Neochmia ruficauda ruficauda*) and black-throated finch (*Poephila cincta cincta*);
- The good representation of small to medium-sized mammals on the Project site. The abundance of these species are low, which is normal due to the decline of fauna in this weight range following the introduction of pest fauna such as the feral cat (*Felis catus*), dingo (*Canis lupus dingo*) and red fox (*Vulpes vulpes*); and
- The avian species recorded on the Project site are mostly typical woodland birds, and represent a healthy population and diversity of species within the region.

Matters of National Significance

A Supplementary Matters of National Ecological Significance (MNES) Report was developed for the site in June 2012. This report is an update on the first MNES report presented in the Kevin's Corner EIS and provides more clarity around the proposed Project, a revised list of MNES relevant to the Project area, the potential residual impacts that may occur to MNES as a result of the Project and proposed mitigation measures. In particular the areas of groundwater, surface water and subsidence have been assessed in greater depth as a result of further modelling that has been undertaken.

The environmental values identified in the MNES Report, in addition to those discussed above include those species identified in Table T-35.

Table T-35 MNES Known of Likely to Occur in the Project Area

MNES	Common Name	EPBC Status	Occurrence
Known to Occur			
Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin	Natural Grasslands TEC	Endangered	Known
Brigalow (<i>Acacia harpophylla</i> dominant and co-dominant)	Brigalow TEC	Endangered	Known
<i>Geophaps scripta scripta</i>	Squatter pigeon – southern	Vulnerable	Known
<i>Phascolarctos cinereus</i>	Koala	Vulnerable	Known
<i>Ardea modesta</i>	Eastern great egret	Migratory	Known
<i>Merops ornatus</i>	Rainbow bee-eater	Migratory	Known
Likely to Occur			
<i>Dichanthium queenslandicum</i>	King Blue-grass	Vulnerable	Likely
<i>Corymbia clandestina</i>		Vulnerable	Likely

MNES	Common Name	EPBC Status	Occurrence
<i>Poephila cincta cincta</i>	Black throated finch	Endangered	Likely
<i>Denisonia maculata</i>	Ornamental snake	Vulnerable	Likely
<i>Egernia rugosa</i>	Yakka skink	Vulnerable	Likely
<i>Erythrotriorchis radiatus</i>	Red goshawk	Vulnerable	Likely
<i>Paradelma orientalis</i>	Brigalow scaly-foot	Vulnerable	Likely
<i>Apus pacificus</i>	Fork-tailed swift	Vulnerable	Likely
<i>Ardea ibis</i>	Cattle egret	Vulnerable	Likely

T.3.9.2 Potential Impacts on Environmental Values

Flora

The areas subject to the greatest disturbance on the Project site include large areas of non-remnant grassland, Silver-leaved Ironbark Open Woodland (RE 10.5.5a) and Poplar Box / Silver-leaved Ironbark mixed woodland (RE 10.3.27a, 10.3.28a, 10.5.5a, 10.7.11a and 11.8.4). This is where much of the mine infrastructure is proposed including the open cut pits and the tailings storage facility. Other significant disturbances include the diversion of Sandy and Middle Creek and the associated impact of this diversion on the creeks' Fringing Riparian Woodland (RE 10.3.12a, 10.3.13a and 10.3.14).

Some areas of riparian woodland are also located directly under the disturbance footprint leading to further impacts on this vegetation type. A total of 10 remnant vegetation communities comprised of 17 REs are directly affected by the Project. These include the Silver-leaved Ironbark Open Woodlands (comprised of 4 REs), Brigalow Open Woodlands (2 REs), Poplar Box Open Woodland (3 REs), Fringing Riparian Woodland (3 REs previously mentioned), and individual REs of Weeping Bottlebrush Heath, Lancewood Woodland, Queensland Yellowjacket Low-Woodland, Thozet's Box Open Woodland, and Natural Grasslands of the Central Highlands and Northern Fitzroy Basin. Large areas of non-remnant grassland also lie within the proposed disturbance footprint.

Seven of the 10 REs of Conservation Significance are located within the proposed surface disturbance footprint. This does not include the 'Endangered' RE 10.9.3; however this RE is within the area to be disturbed by subterranean mining activities. The REs listed 'Of Concern' within DEHP's Biodiversity Status and situated inside the proposed disturbance footprint include the following:

- Brigalow Open Woodland (RE 11.3.5) – 5.7ha or 16.6% of area found on-site;
- Poplar Box Open Woodland (RE 10.3.27a and RE 11.3.2) – 174.3ha and 4.5ha or 19.5% and 22.3 % of the total area on-site respectively;
- Fringing Riparian Woodlands (RE 10.3.13a and 10.3.14) – 146.8ha and 541.2ha respectively, or 25.5% and 49.2% of the total area on-site;
- Thozet's Box Open Woodland (RE 10.7.5) – 62.3ha or 27.2% of area found on-site; and
- Natural grasslands of the central highlands and northern Fitzroy basin (RE 11.8.11) – 22.3ha or 13.1% of this vegetation located on-site.

The RE listed as endangered by the EPBC Act and 'Of Concern' within the VM Act is the natural grasslands of the central highlands and northern Fitzroy basin (RE 11.8.11).



Direct habitat loss and fragmentation as a result of clearing activities can potentially limit the ongoing viability of ecosystems and their associated biodiversity. This can be exacerbated over time when the cumulative effects of multiple impacts outside the Project boundary become substantial.

Apart from the loss of suitable habitat for flora (and fauna) species, vegetation clearing produces edge effects whereby remaining areas of intact vegetation are exposed to outside impacts. Edge effects resulting from the proposed works can include the establishment of weeds, alteration to microclimatic conditions (such as greater light intensity, more wind penetration, lower humidity) and a reduction in plant health through loss of photosynthetic potential (as a result of plants being covered by dust generated from vehicle movement on unsealed tracks).

In the absence of appropriate control measures, the Project has the potential to cause impacts in relation to edge effects, particularly with reference to the introduction and / or spread of weed species throughout the Project site.

Earthmoving activity, particularly along watercourses, can promote weed invasion and may increase sedimentation in riparian woodlands downstream of the mine. Higher levels of erosion can lead to a loss of morphological diversity in streams which in turn reduces habitat quality and may result in biodiversity losses in affected areas.

Any importation of seeds as well as the use of earthmoving equipment in conjunction with land disturbance will provide an opportunity for the introduction of invasive weed species, until native species become established. If invasive weeds were to establish at the Project site, these may outcompete native vegetation recruitment and reestablishment.

The alteration of natural fire regimes will also pose a threat to the ongoing health of the ecosystems found on-site. Many native flora species rely on fire to release seeds and replenish nutrient levels. Suppressing fire in these ecosystems may prevent fire-dependent species from releasing their seeds, however, too frequent fire episodes can lead to weed infiltration and establishment. Both fire frequency and intensity are important factors when considering the viability of native ecosystems over long periods.

Fauna

The majority of impacts on flora will naturally result in impacts on fauna communities. Habitat loss and fragmentation will remove areas suitable for foraging and nesting for many species whilst also impeding fauna movement throughout the landscape. The impacts on riparian vegetation are of particular concern for species reliant on these watercourses. The construction of the open pit and other mine infrastructure in close proximity to Sandy Creek will result in a loss of some Fringing Riparian Woodland. Such development will remove some surface pools on the Project site, which persist longer than the smaller watercourses and provide a freshwater source for fauna as well as nesting habitat for a number of migratory bird species.

The diversion of Sandy and Middle Creek will further disrupt riparian systems, as these areas no longer receiving water flows during rain periods; they will ultimately lose their riparian vegetation. The disturbance along Sandy and Middle Creek also has the potential to disrupt habitat connectivity, affecting the ability of some small species to move along the riparian corridor.

Barrier effects on fauna occur when a species is unable or unwilling to move between suitable habitats. This is caused by increased habitat fragmentation due to roadways and other mine infrastructure. Species most vulnerable to barrier effects are habitat-specific fauna and low-mobility species. Low-mobility species utilising the Project site have the potential to become genetically isolated. This occurs when individuals from a population within one fragment are unable to breed with individuals from populations in adjoining fragments.

This isolation reduces the ability of the species to survive in the area and they may become locally extinct. Species least vulnerable to barrier effects tend to be those that are highly mobile, including birds and larger mammals, although even these species can vary in their response to barriers.

Noise, vibration and dust associated with the construction and operational phases of the Project may cause some species to avoid habitats which they currently utilise. Noise effects can be highly species dependent and may vary widely. These impacts will be concentrated around the open pit, tailings storage facility, overburden emplacements and mine infrastructure area, leaving most of the Project site and some important habitat areas unaffected. These impacts are therefore not considered significant.

Artificial lighting can affect both nocturnal and diurnal animals as it disrupts light-induced activity patterns. The effect of artificial lighting varies with different species. The attraction of predator species to insects around lights tends to occur, whilst the illumination of bat-roosting habitats can influence bat emergence development in young bats. Higher light intensity can also affect frog behaviour, preventing their ability to call and reproduce under the cover of darkness.

Matters of National Environmental Significance

The supplementary MNES Report includes an assessment of what the threatening processes to the MNES are expected to be from the Project, how those impacts can be avoided or mitigated and the extent of unavoidable impacts that may occur. This process has identified that vegetation clearing associated with the two open-cut pits and to a minor degree supporting infrastructure such as the dams and rail spur are likely to result in the largest impacts on MNES. Subsidence from underground mining also has the potential to negatively impact MNES through changes to surface water hydrology and the loss of native vegetation and fauna habitats as a result of cracking, ponding and to a minor degree mitigation works.

T.3.9.3 Environmental Protection Objectives

The key environmental protection objective is to avoid or minimise significant Project impacts upon any MNES, and any other species or community of flora and fauna on the Project site.

T.3.9.4 Performance Criteria

The Project is in a semi-arid region where ecosystems are limited by water availability and can have extremely weathered soil profiles. There is limited nutrient cycling potential and limited natural topsoil. Rehabilitation of these areas, particularly after long periods of disturbance, can take an extended time frame and have limited initial success. The preliminary rehabilitation success criteria for the Project have been developed with reference to Ecoaccess Guideline 18: *Rehabilitation Requirements for Mining Projects* (DNRM, 2007).

If sectors of rehabilitated land are to be returned to a pre-mining native ecosystem, suitable rehabilitation performance criteria should include populations of specific species, species diversity, wildlife corridors or fauna re-population. These criteria would be compared against both the results of the pre-mining baseline studies and vegetation reference sites. Comparable data can include tree density (trees/ha), shrub density (shrubs/ha), herb/grass density (grasses/ha), groundcover (%) and species composition. Each rehabilitation site should ensure the re-created landform is stable with little to no progressive erosion.

If the desired outcome is not related to native woodland and the rehabilitated land use is low-intensity stock grazing, native vegetation criteria are likely to have limited value in assessing whether rehabilitation has been completed at each monitoring site. Criteria such as agricultural productivity, chemical and geotechnical stability and water runoff quality and quantity, as well as native species density and weediness, are more



applicable in determining rehabilitation success. Surface soil quality, including sulphate, cation exchange capacity, pH and electrical conductivity at vegetation reference sites should be compared with rehabilitation sites.

T.3.9.5 Control Strategies

Flora

Suggested strategies to minimise the impacts on native flora and recommendations regarding rehabilitation of the Project site, are outlined below:

- To maintain the integrity of vegetated land that is not cleared, appropriate erosion and sediment controls will be developed to prevent sediment deposition in remaining habitat;
- Appropriate, adaptive fire management regimes should be developed to allow for natural vegetation cycles to continue;
- Methodologies for the rehabilitation / re-vegetation works of the Project will use the most appropriate species for the landscape elements of the site. Such methodologies will include habitat matching of species to ensure rehabilitation success. Species chosen for revegetation will be selected from the dominant flora of each community. Seeding of as many species as possible will be undertaken at each rehabilitated site, in order to promote more rapid recovery of the local vegetation and lasting groundcover;
- The maintenance of retained native-vegetation areas could provide a source of seed for mine rehabilitation works;
- Watercourse buffers will be based on the widths prescribed by DNRM in vegetation clearing codes for the Desert Uplands. These widths vary based on stream order, the higher the stream order the larger the buffer;
- Recreated landforms will be contoured to resemble original regional topography where possible;
- Flora habitat requirements will be considered during the rehabilitation of subsided areas;
- Reference monitoring sites will be established and maintained, prior to any disturbance taking place.
- A number of pest and weed management strategies will be developed by HGPL in order to minimise the potential of future weed infestations:
- Monitoring for weeds of management concern will be undertaken, via annual observations by site personnel;
- A Pest and Weed Management Plan will be developed (SEIS, Volume 2, Appendix T4.02) to limit the spread of these species on and surrounding the Project site;
- If weeds of management concern are identified, they should be eradicated from the site in accordance with local best management practice from the Barcaldine Regional Council (formerly Jericho Shire) Pest Management Plan (Maunsell, 2008) and / or the DEEDI Pest Fact sheets (DEEDI 2007);
- Observations of treated areas to determine the success of the declared-weed eradication program will be performed; and

- Awareness of weed management issues will be promoted by inclusion of weed management processes and systems in the Project's Site Induction Program.

Fauna

Strategies that help to minimise and mitigate the impacts of Project activities on native and non-native fauna are discussed below.

- Recognition of the intrinsic value of ecological habitat requires that, despite its regional representation, every effort should be made to keep proposed disturbance areas to a minimum. This is particularly important for areas of Conservation Significance that provide unique habitat for fauna and along riparian areas such as Sandy Creek, Middle Creek, Well Creek and Little Sandy Creek. These watercourses provide an over storey with a mixed age structure and a habitat refuge for fauna seeking shelter and water.
- Clearing of vegetation in Sandy Creek should be minimised, in order to maintain habitat connectivity across the site and provide a movement corridor for small, terrestrial fauna species. Whilst this community will be physically fragmented, the degree of isolation is highly dependent on the mobility of the organism in question (McIntyre and Hobbs 1999). Disconnected areas may continue to be utilised by some species if kept intact and this needs to be considered, however minimising fragmentation will allow more species to utilise the remaining strands of vegetation.
- Native vegetation removal should be conducted only after the areas to be disturbed have been clearly delineated and identified to equipment operators and supervisors. Care should be taken to minimise harm to affected fauna communities by employing environmental staff to inspect the vegetation to be disturbed prior to clearing, in order to determine whether or not any fauna are present. If fauna are present, they should be given the opportunity to move on, before vegetation clearing occurs. Clearance from environmental staff should be obtained prior to disturbance in any area.
- Fauna habitat requirements will be considered during the rehabilitation of subsided areas;

The southern squatter pigeon (*Geophaps scripta scripta*) was recorded during the surveys in Non-remnant grassland habitat within the Project site. This species is listed as Vulnerable under both the EPBC Act and Schedule 3 of the *Nature Conservation (Wildlife) Regulation* (NCWR, 2006). Impact mitigation measures include:

- Care should be taken to ensure no mortality occurs due to vehicle strike. Persons operating vehicles in and adjacent to the Project site should be made aware of the presence of this threatened species and the potential for this species to be encountered on vehicle tracks;
- Fauna spotters should conduct a thorough survey of the site prior to any vegetation clearing to determine the location of any squatter pigeon nests. Particular attention should be given to areas of short dry grass, grass tussocks and under bushes and fallen logs;
- If nests are located, translocation of the eggs / young should be conducted by qualified personnel to a suitable nearby habitat; and
- It is recommended that a section of the Staff Induction Program is dedicated to raising awareness of this species, including photos, descriptions and preferred habitat.



The little pied bat (*Chalinolobus picatus*) is listed as Near Threatened under Schedule 5 of the NCWR. This species was identified in areas surrounding the Project site and is known to occur in woodland habitats located on-site. They forage for insects among the canopy and primarily roost in tree hollows and occasionally caves. Bat-specific impact mitigation measures can include:

- Fauna spotters should conduct a thorough survey of the site prior to any vegetation clearing;
- Vegetation clearing should be staggered and follow a protocol specific to bats;
- Remaining roost sites should be supplemented by artificial roost sites, such as bat boxes;
- A Little Pied Bat Monitoring Program should be undertaken to assess presence of the bat in areas adjacent to the proposed blasting areas;
- A range of blasting regimes / methods should be employed, that takes into consideration the location of little pied bat roost sites and aim to direct the blast / vibration front away from the roost location;
- Blasting should occur in intensive bursts, so that there is no permanent impact (e.g. relocation) to roosting little pied bats as a result of noise or vibration from the Project;
- Where possible, consider using plant machinery (scraper, D10 bulldozer etc.) instead of blasting; and
- A section of the Staff Induction Program should be dedicated to raising awareness of this species, including photos, descriptions and preferred habitat.

Seven non-native fauna species were identified on the Project site. These include the feral goat (*Capra hircus*), feral cat (*Felis catus*), dingo / wild dog (*Canis lupus dingo*), feral pig (*Sus scrofa*), European rabbit (*Oryctolagus cuniculus*), house mouse (*Mus musculus*) and cane toad (*Rhinella marina*). A site-specific feral-animal control plan will be created and implemented for the Project site in order to manage such non-native fauna species.

Control Strategies for MNES

Species Management Plans are required to address threats associated with the Project, and identify the proposed mitigation measures for each impacted MNES in greater detail. The plans will also be clear in what mitigation measures will be implemented during key project phases of pre-construction, during construction and post construction. Greater detail on proposed mitigation measures for each MNES is included in Supplementary MNES Report (SEIS Volume 2, Appendix Q).

Measures to mitigate the impacts of vegetation clearing, subsidence and changes to hydrology described in the relevant sections of this EMP are also applicable to MNES.

Control Strategies Specific to the Rail Loop

- Ensure train operations are conducted in accordance with a Coal Dust Management Plan;
- Ensure coal loading and unloading procedures minimise effect on the environment;
- Ensure train cleaning is undertaken regularly;
- Ensure trains are not overloaded;
- Apply the Pest and Weed Management Plan (SEIS Appendix T4.02) for the rail loop corridor.

T.3.9.6 Monitoring

Monitoring data shall be assessed and documented for future and current applications including advancements in mitigation measures and current adaptive management practices. Monitored data shall be reported to the relevant authority, particularly DNRM, who plays a major role in environmental regulation and management within the mining industry. The Rehabilitation Plan (SEIS Appendix T4.09) will document the basis for the program.

Rehabilitation Monitoring Program

The monitoring program should include the following aspects:

- Provision of undisturbed benchmark data;
- Provision for feedback for improving rehabilitation techniques; and
- Demonstration of achieved rehabilitation acceptance criteria.

Components of Rehabilitation

The following components will be included in the rehabilitation program:

- Control sites;
- Trial sites;
- Rehabilitation monitoring; and
- Long term monitoring.

Rehabilitation Monitoring

The rehabilitation program will include the following elements:

- Two monitoring sites established in each area to be rehabilitated and permanently marked;
- A minimum of two 50 m x 20 m transects randomly located within each site;
- Vegetation reference sites consisting of 50 m transect lines will be established and monitored on an annual basis.
- Site data recorded for each transect (slope, aspect, soil type etc.), with ten 2 x 2 m quadrats established at 5 m intervals along the transect;
- An area of approx. 1 ha will be surveyed around each transect using the random meander technique, in order to identify less common species which are not present in the transect;
- Photo monitoring sites to be established at each site, in order to provide a qualitative assessment of the local area;
- Data should be recorded for each transect as per control sites; Pre-rehabilitation treatment and ongoing annual monitoring of soil geochemistry for EC, pH, Exchangeable Sodium Potential (ESP) and nutrient levels should be conducted at rehabilitation sites, in order to identify any potential problems restricting vegetation re-establishment;

All vegetation data that is collected will be based upon the Queensland Herbarium's Methodology for Survey and Mapping of Regional Ecosystems and Vegetation Communities in Queensland Version 3.1 (2010).

Vegetation Monitoring



Vegetation reference sites are used to create a comparable benchmark for rehabilitated sites to determine rehabilitative success. Vegetation reference sites must be representative of the land under disturbance, with similar topography, soil characteristics, vegetation type and structure.

Rehabilitation sites will be chosen as appropriate and whenever possible. Data recorded will include:

- Tree Density (trees/ha);
- Crown Cover Percentage (%);
- Shrub Density (shrubs/ha);
- Herb / Grass Density (grasses/ha);
- Groundcover (%);
- Species Composition;
- Erosion indicators (depth of rills or erosion lines, surface crusting, slopes); and
- Photographic records of the site.

Weed Monitoring

A component of the Pest and Weed Management Plan will include monitoring of pest floral species, in particular species listed under Queensland's LP Act. Local Government Area Pest Management Plans and Regional Pest Management Plans, where appropriate, shall also be considered to help aid consistency within pest management on-site. Once the site-specific pest management plans have been implemented, the following monitoring results can be employed to assess the effectiveness of these plans;

- Estimated pest population increases and / or decreases;
- The optimal times to carry out particular actions;
- Effects that pests may be having on the Project site; and
- Mitigate biosecurity risks concerning the potential spread of pests via plant and equipment.

Monitoring should include the establishment of a set area of the Project site or area which includes LP Act listed pest species. The area should be described, the pest density and pre-management action infestation priority recorded and any change in pest populations, ground cover or vegetative health over time noted.

Monitoring should be conducted via a series of photographs that are taken at the end of each wet season. Both photographic and handwritten documentation should be employed to compare infestations between years and conclusions concerning the effectiveness of pest management actions drawn from this data.

The following factors should be included in monitoring events:

- Date of monitoring event;
- Recent weather conditions;
- Individual pest sizes;
- Approximate pest density;
- Whether seeding or flowering is noticeable; and
- Notes of any pest management actions and re-occurrence of pests to any areas which have been previously treated.

Monitoring records should be kept for a period of at least 5 years, to aid in the assessment of the long-term success of the Project's pest management program.

T.3.9.7 Commitments

A summary of the Proponent commitments that are necessary to minimise Project impacts upon the local terrestrial ecology has been developed and is summarised in the following sections.

Flora Commitments

The following flora commitments will assist with minimising the potential impacts of Project activities upon local terrestrial ecology:

- The impacts of mining activities on RE's of Conservation Significance will be minimised wherever possible. This includes the consideration of alternative disturbance footprints that allow for a higher degree of clearing operations in non-remnant vegetation;
- In order to maintain the integrity of vegetated land that is not cleared, appropriate erosion and sediment controls will be implemented in order to prevent sediment erosion or deposition in any remaining habitat;
- A Pest and Weed Management Plan (SEIS Appendix T4.02) has been developed that will be implemented prior to the commencement of construction activities. The Pest and Weed Management Plan describes how weeds are to be managed in accordance with the LP Act and / or local government requirements for weeds that are not declared under State legislation;
- Species Management Plans will be developed as required (refer Supplementary MNES Report, SEIS Volume 2, Appendix Q);
- An adaptive fire management regime will be developed to allow for fire-dependent species to persist and natural vegetation cycles to continue;
- Species that are chosen for re-vegetation will be selected from the dominant native flora of communities present before clearing and matched with the intended final land-use. Seeding and seedling establishment of as many native species as possible will be undertaken at each rehabilitated site in order to maximize the rapid recovery of the local vegetation and provide lasting groundcover;
- Recreated landforms will be contoured to resemble original regional topography where possible;
- Vegetation reference monitoring sites will be established and maintained prior to any site disturbance taking place. Rehabilitation sites will be established and monitored until the agreed completion criteria have been met. Assessment of the vegetation reference and rehabilitation sites in regards to weed infiltration and the extent of erosion will occur on an annual basis; and
- Cleared vegetation from the site must be managed in accordance with the following hierarchy:
 - reuse, e.g. use of logs and tree stumps as shelter for fauna in rehabilitated areas;
 - recycle, e.g. mulching of vegetation for use during on-site rehabilitation; and
 - other alternative management options implemented in a way that causes the least amount of environmental harm.

Fauna Commitments



The following fauna commitments will assist with minimising the potential impacts of Project activities upon local terrestrial ecology:

- Caution will be taken to minimise the clearing of riparian vegetation, particularly along Sandy Creek, to allow fauna species to move along the riparian corridor and effectively traverse the site. The maintenance of habitat corridors to prevent isolation of less-mobile fauna species will also be considered when clearing patterns are developed;
- Native vegetation removal will be conducted only after the areas to be cleared have been obviously delineated and identified to equipment operators and supervisors. Care will be taken to minimise harm to affected fauna communities by employing environmental staff to inspect the vegetation to be disturbed prior to clearing in order to identify any fauna that may be present;
- Particular attention will be given to areas that may be utilised by the squatter pigeon including grassland and under bushes and fallen logs. If fauna is present, the individual or group will be given the opportunity to move on before clearing occurs, with the translocation of any eggs / young conducted by qualified personnel to a suitable nearby habitat;
- A bat survey conducted by qualified personnel will be employed prior to clearing, in order to discover if the little pied bat utilises the area. If bats are encountered, vegetation clearing will be staggered and follow bat-specific protocols. Blasting methods will be modified in order to minimise the impacts of blasting upon bat species;
- Species Management Plans will be developed as required (refer Supplementary MNES Report, SEIS Volume 2, Appendix Q);
- Artificial lighting will be confined to areas of site operations, with measures adopted to prevent light pollution in adjacent vegetated areas; and
- Site-specific feral animal control is managed as part of the Pest and Weed Management Plan (SEIS Appendix T4.02).

Pest & Weed Management Commitments

A Pest and Weed Management Plan (SEIS, Volume 2, Appendix T4.02) has been developed for the site which includes detailed information on the pest and weed management strategies that will be implemented throughout the Project, including:

- The present location of weeds will be highlighted and a comprehensive Weed Spraying Program be implemented, prior to the commencement of works. Declared weed species will be treated per the relevant Queensland DEEDI fact sheet for each particular species;
- Monitoring in the form of annual observations by site personnel for weeds of management concern will be undertaken. These will also be conducted following significant rainfall events, particularly in disturbed areas, roadsides, riparian zones and wash down facilities, once safe access can be provided;
- Wash down facilities will be constructed at access points for vehicles arriving and departing from the Project site. These facilities will be bunded and located away from drainage lines, in order to minimise the risk of weed spread;

- All vehicles entering the Project site and leaving properties known to contain declared weeds will be thoroughly washed down before entering clean areas; ensuring wheels, wheel arches and the undercarriage are free of mud and plant material;
- Radiators, grills and vehicle interiors will be cleaned for accumulated seed and plant material;
- Soil and fill material from weed-affected areas will not be transported to clean sites. Minimising any soil disturbance has the potential to limit the ability of weeds to become established; and
- If weeds of management concern are identified, they will be eradicated from the site in accordance with local best management practice from the Burdekin Dry Tropics Regional Pest Management Strategy (Maunsell Australia Pty Ltd, 2008) and / or the DEEDI Pest Fact Sheets (DEEDI, 2007).

T.3.9.8 Proposed Environmental Authority Conditions

Schedule J – Flora & Fauna

- J1** The impacts of mining activities on RE's of Conservation Significance will be minimised wherever possible.
- J2** A Pest and Weed Management Plan must be developed in accordance with the LP Act and / or local government requirements for weeds that are not declared under State legislation. The Plan must be developed prior to the commencement of construction activities.
- J3** Species Management Plans must be developed for all potentially impacted species identified as MNES.
- J4** A qualified spotter catch is to be engaged to work ahead of the site clearing works at the commencement of the vegetation clearing activity.



T.3.10 Aquatic Ecology & Stygofauna

T.3.10.1 Background

Aquatic Ecology

This section of the EIS considers the environmental aspects of on-site surface waterways in terms of aquatic flora and fauna and aquatic ecosystem function for the Project. Aquatic ecology field surveys (employing standard aquatic ecology methodologies) were conducted from 16th to 21st March 2009 and 15th to 22nd March 2010.

Stygofauna

Stygofauna are species of subterranean, aquatic fauna that live in groundwater, mainly near the soil vadose zone / groundwater interface and are most abundant in alluvial aquifers (Hancock and Boulton, 2008). A survey of the presence and abundance of stygofauna both within and surrounding the Project impact area (MLA 70425) was conducted in March / June (within MLA 70425) and November 2010 (outside MLA 70425).

The Western Australia Environmental Protection Authority (WA EPA) Guidance for the Assessment of Environmental Factors No. 54 (EPA, 2003) and Technical Appendix No. 54a (EPA 2007) documents were employed to guide the design and implementation of the stygofauna survey. An initial stygofauna pilot study was conducted on the Project site, in order to determine whether or not a full stygofauna survey would be required.

T.3.10.2 Environmental Values

Aquatic Ecology

The Project site lies within the Burdekin Catchment. This catchment includes the Burdekin River and its tributaries north from Greenvale and south to Alpha, with coastal catchments between Giru and Bowen (Tropical Savannas CRC 2008). The Burdekin Catchment is divided into sub-catchments, with the Project site falling in to the Belyando-Suttor sub-catchment, which extends from south of Alpha north to the Belyando Crossing. The Belyando-Suttor sub-catchment is the largest within the Burdekin River Basin, covering 73,335 square kilometres (km²) (Australian Natural Resources Atlas [ANRA], 2007).

The Native Companion Creek (which, at its closest point is 7 km east of the Project site) flows in a northerly direction to join the Belyando River and then into the lower reaches of the Suttor River (ANRA, 2007). Significant tributaries to the Belyando River include Alpha Creek, Mistake Creek, and Native Companion Creek.

The Project site is traversed by a number of ephemeral drainage lines and creeks (see Figure T-16). Sandy Creek flows in a northerly direction the entire length of the site, with the tributaries Well Creek, Middle Creek, Little Sandy Creek and Rocky Creek entering it from the west.

A total of 5 amphibian species (one introduced), 12 birds (nine of which are listed under the EPBC Act as Migratory and / or Marine), one mammal (introduced), one reptile and 7 fish species were identified during the survey.

A review of the DEHP interactive Wetland Maps (2009) database (<http://www.epa.qld.gov.au/wetlandinfo/site/MappingFandD/WetlandMapsAndData.html>) revealed the presence of riverine wetland systems and lacustrine water bodies within the Project site. These wetlands however, are not outlined within the

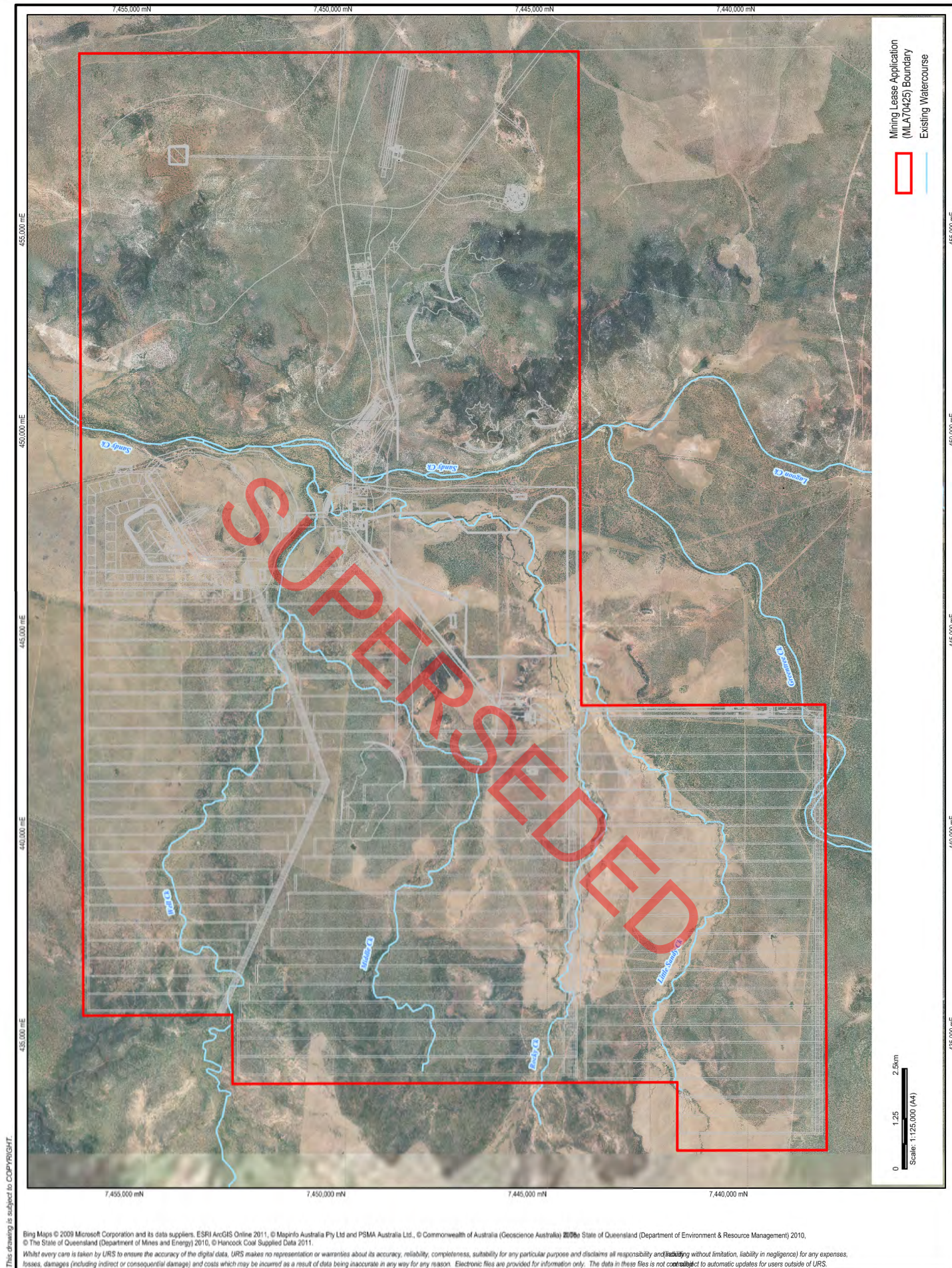
Environmentally Sensitive Areas mapping for the Project. Environmentally Sensitive Areas mapping shows Category B (Endangered Regional Ecosystems) and C (Resource Reserves) areas lie within the Project site.

Two Class-2 and one Class-3 declared weed species under the LP Act were identified or are known within riparian habitats.

No rare or threatened animal or plant species, listed under the EPBC Act or the NC Act were identified during the survey. Many of the creeks are fringed by Regional Ecosystem 10.3.14 (*Eucalyptus camaldulensis* woodland), which has an 'Of Concern' DEHP Biodiversity Status due to weed infestation by species including buffel grass (*Cenchrus ciliaris*) parkinsonia (*Parkinsonia aculeata*) and habitat degradation by stock and feral pigs.

Stygofauna

Surveys conducted in March and June 2010 found no stygofauna on the project site; however a population was found in an adjacent off-site groundwater system. Since the initial surveys were conducted, additional groundwater surveys and subsequent drawdown modelling has been developed for the site which gives a more accurate prediction of the cone of depression (i.e. impact zone) of the Project. This modelling indicates that there is a hydraulic disconnect between the off-site groundwater system in which stygofauna population was found and the system being impacted by the Project. Under such circumstances additional stygofauna surveys are not deemed necessary; as *The Western Australian EPA Guidance for the Assessment of Environmental Factors No. 54 and its technical appendix No. 54a* (used as a surrogate in the absence of a QLD specific guideline) states that a clear definition and delineation of the impact zone should be considered in designing the pilot survey, and more extensive investigations are only required should this survey produce significant subterranean fauna. This was not the case for the surveys conducted at the Kevin's' Corner site.



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HAZARD HANCOCK GALILEE PTY LTD
 Kevin's Corner Project
 Supplementary Environmental Impact Statement

WATER COURSES IDENTIFIED ON THE PROJECT SITE

Datum: GDA94, MGA Zone55

URS

REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-16**



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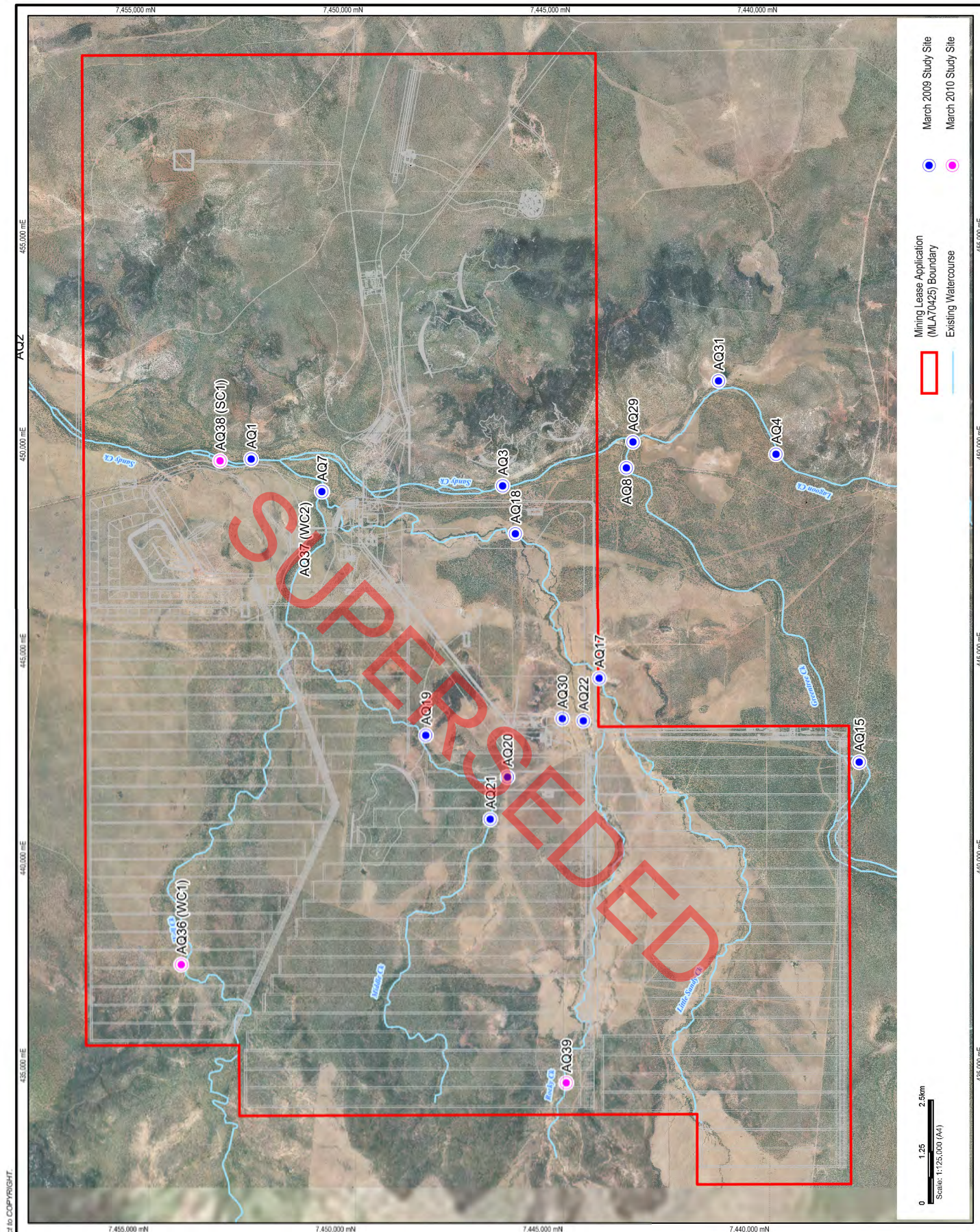
Drawn: RG

Approved: RS

Date: 21-09-2012

Rev: C

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 Kevin's Corner Project
 Supplementary Environmental Impact Statement

AQUATIC STUDY SITE LOCATIONS

Datum: GDA94, MGA Zone55



REVISED ENVIRONMENTAL MANAGEMENT PLAN

Figure: **T-17**



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T.3.10.3 Potential Impacts on Environmental Values

Aquatic Ecology

The following potential impacts on the aquatic environment may occur as a result of Project activities:

- Land clearing and mining activities - may reduce the available habitat for native aquatic flora and fauna species;
- Riparian zone clearing - may lead to a loss of habitat connectivity across the mine, and habitat fragmentation;
- Clearing of large trees within the riparian zone - may impact on species which roost in tree hollows near water;
- Noise, vibration and dust (associated with construction and operational phases) - may mean some species avoid areas they currently utilise;
- Earthworks - may result in potential weed invasion, particularly along watercourses and increased sedimentation in riparian woodlands downstream of the mine. Higher levels of erosion can lead to a loss of morphological diversity in streams, thereby reducing habitat quality and resulting in biodiversity losses in affected areas;
- Human occupation - will often facilitate an increase in feral animal numbers (e.g. exposed landfill sites providing food for feral pigs, feral cats, etc), which may then impact on native animal populations; and
- Potential spills of chemicals and hydrocarbons - may enter waterways, resulting in environmental harm.

The planned diversion of Little Sandy and Rocky Creek into Middle Creek is approximately 250 m wide, and extends for approximately 5 km. Flood protection levees will be installed along Sandy Creek and Well Creek as well as along the length of the diversion. Proposed levee bank developments will predominantly be away from existing waterways, as it is intended to protect operational areas from significant flooding events. However, the proposed diversion of Little Sandy and Rocky Creeks into Middle Creek may result in a number of impacts on the environmental values of the aquatic flora and fauna, including:

- Riparian vegetation clearing may result in erosion and sedimentation-related impacts, especially in the early years after the diversion prior to re-establishment of groundcover, shrubs and trees;
- Such clearing may also result in fragmentation of a valuable wildlife corridor which includes Non-remnant Grassland, Silver-leaved Ironbark (RE 10.5.5a), Fringing Riparian Woodland (RE 10.3.14) and Poplar Box / Silver-leaved Ironbark Open Woodland. Whilst not a major issue for mobile species (birds, bats), can be detrimental to the smaller terrestrial species; and
- Land subsidence that occurs as a result of underground mining may indirectly impact flows in creeks to the west of the Project site causing ponding and restricting flows. However creek flows will be re-established, following mining activities.

Stygofauna

No impacts are anticipated as no stygofauna communities were found on the site.

T.3.10.4 Environmental Protection Objectives

The key environmental protection objective is to defend and minimise significant Project impacts upon any aquatic species or aquatic community on the Project site.

T.3.10.5 Performance Criteria

In order to protect aquatic environmental values, including ecological and biological values, as far as possible during the Project construction, operational and decommissioning phases, the following aquatic-protection performance indicators and standards are recommended to be employed on the Project site:

- Indicators:
 - physico-chemical water quality: implement a surface-water quality monitoring program for all phases of the Project, with reference sites established upstream, downstream, and midstream of the Project site. Consideration should also be given to wet weather events with additional monitoring to take place;
 - flora and fauna population health – monitor the health of both flora and fauna populations during all phases of the Project via a bi-annual monitoring program (pre- and post-wet season) for each reference site; and
 - development of weed and pest populations.
- Standards:
 - physico-chemical water quality - The surface water quality guidelines presented in the Queensland Water Quality Guidelines (2009) and (where data is not available for reference in the Queensland Guidelines) the ANZECC (2000) water quality guidelines, will be used as standards by which are determined;
 - macro-invertebrate health - SIGNAL bi-plots (Chessman, 2003) of the macro-invertebrate populations present both upstream and downstream of the Project site, allows changes in macro-invertebrate communities to be determined, that are caused either by seasonality and / or Project activities; and
 - implementation of Pest and Weed Control programs in line with the local shire council pest control strategies and the strategies proposed by the QLD Pest Fact Sheets (DEEDI 2008).

T.3.10.6 Control Strategies

The proposed diversion of Middle Creek may result in impacts upon the environmental values of the aquatic flora and fauna. In addition the measures to minimise the impacts of the diversions on water quality, hydrology and geomorphology described in Section T.3.4.6, the following measures will also be implemented:

- Clearing of riparian vegetation for the proposed creek diversion will be conducted in a staged manner, in order to allow fauna to migrate to adjacent habitat areas;
- Works to divert Middle Creek will be conducted during the dry season when minimal (if any) water is present, so as to reduce Project impacts upon fish movements; and
- The creek diversion rehabilitation will be monitored to ensure that the rehabilitated vegetation is stable and self-sustaining.

General management strategies devised to reduce potential aquatic environmental harm that is associated with the Project include:



- Any mine and process water will (where possible) be contained within a closed-loop system and recycled. No contaminated mine water or process water will be discharged from the Project site;
- Sediments traps will be designed and installed downstream of all land disturbances (such as water storage dams) in order to remove sediment from storm water which flows over such land disturbances; and
- A water quality, sediment quality and aquatic-fauna monitoring program will be initiated and continued throughout the life of the Project. This program will ensure the early detection and recording of project impacts upon local surface water courses, thereby allowing mitigation strategies to be altered or developed.

Control Strategies Specific to the Rail Loop

- Provide culverts at key areas within floodplain habitats;
- Minimise introduction of oil and fuel through cleaning and maintaining trains;
- Construct ballast top bridges over aquatic habitats to minimise waterway contamination;
- Ensure train operations are conducted in accordance with a Coal Dust Management Plan;
- Ensure coal loading and unloading procedures minimise effect on the environment;
- Ensure train cleaning is undertaken regularly;
- Ensure trains are not overloaded; and
- Ensure operational lights are not located within or adjacent to aquatic habitats.

T.3.10.7 Monitoring

The following monitoring programs are recommended:

- A water quality monitoring program, which entails:
 - annual sampling of aquatic fauna species (both vertebrate and invertebrate) following a significant rainfall event;
 - documentation of aquatic diversity and abundance;
 - inclusion of both downstream and upstream sampling locations, plus representative lacustrine and riverine wetlands. Results from these locations will be compared;
 - collection and analysis of water quality at pre-determined monitoring locations including all identified aquatic environments; and
 - identification of sensitive species / habitat that could be used as indicators of stream health.
- An aquatic fauna monitoring program, which includes:
 - annual sampling of aquatic fauna species (both vertebrate and invertebrate) following a significant rainfall event;
 - documentation of aquatic diversity and abundance;
 - inclusion of both downstream and upstream sampling locations, plus representative lacustrine and palustrine wetlands. Results from these locations will be compared;
 - collection and analysis of water quality at pre-determined monitoring locations including all identified aquatic environments; and
 - identification of sensitive species / habitat that could be used as indicators of stream health.



- Pest and weed management programs, which ensure that:
 - staff are informed of the species of weeds and pests that are likely to be encountered on the Project site;
 - the location of known weed infestations (particularly Parthenium, Parkinsonia and Lantana) are identified and the presence of new infestations correctly reported; and
 - pests are managed effectively in line with the local shire council and State pest-control strategies.

T.3.10.8 Commitments

In order to protect environmental values of the local aquatic ecology, the following commitments are required:

- Works to divert Middle Creek will be conducted during the dry season;
- Flood protection levees will be installed along Sandy Creek and Well Creek as well as along the length of the diversion;
- Clearing of riparian vegetation for the proposed creek diversion will be conducted in a staged manner;
- Creek diversion rehabilitation will be monitored to ensure the vegetation is stable and self-sustaining;
- Post-subsidence control strategies will be implemented as described in Section T.3.8;
- No contaminated mine water or process water will be discharged from the Project site;
- Any mine and process water should (where possible) be contained within a closed-loop system;
- Sediment traps will be designed and installed downstream of all land disturbances (such as water storage dams) in order to remove sediment from storm water which flows over such land disturbances;
- A water quality monitoring program will be implemented and continued throughout the life of the Project;
- A Sediment Monitoring Program will be initiated and continued for the duration of the Project; and
- An Aquatic Fauna Monitoring Program will be implemented and continued throughout the life of the Project.

T.3.10.9 Proposed Environmental Authority Conditions

No specific conditions are proposed for the protection of environmental values associated with Aquatic Ecology and Stygofauna as these values will be protected with implementation of the EA's specified for Water Resources (section T.3.4.9), Rehabilitation and Decommissioning (section T.3.8.9) and Terrestrial Ecology (section T.3.9.8).



T.3.11 Cultural Heritage

T.3.11.1 Background

Non-Indigenous Cultural Heritage

The identification of known and potential non-Indigenous cultural heritage (NICH) resources within the study area was based on historical research, an analysis of historical plans, aerial photographs, review of heritage registers and databases, and consultation with a number of local historical societies and museums.

Six non-Indigenous cultural heritage sites were identified during the field survey of the study area. A summary description of these sites is presented in Table T-36, the location of the sites are shown in Figure T-18.

Table T-36 Summary of NICH Sites within Study Area

Site No.	Name	Description
KC01	Burgess Hotel	Site comprised of artefactual material (surface scatter) in blade-ploughed paddock. Highly impacted (Wendouree).
KC02	Rocky Creek Camp	Rocky Creek artefact scatter reassessed as part of larger camp scatter (Wendouree).
KC03	Borehole and Sheep trough	Sheep-watering infrastructure, plus bores, dam and windmill (Wendouree).
KC04	Cudmore Cottage	Small drover's shack on Wells Creek gorge (Cudmore Resources Reserve).
KC05	Wallaroo Complex	Possible shearing station / operation including former house site, bore and dam (Forrester).
KC06	Gate post	Possible association with former yards or stock route (Forrester).

A Marsupial-proof boundary fence (KC07) and an early to mid-twentieth-century homestead site at 'Six Mile' (KC08) were also identified during the field survey. Whilst both sites fall outside the MLA boundary for the Project, the proposed Project rail corridor is in close proximity to the site. KC07 & KC08 have been identified as cultural heritage sites which may be impacted by off-site project infrastructure (rail corridor). Details are provided in Table T-37.

Table T-37 Summary of NICH Sites Close to Study Area

Site No.	Name	Description
KC07	Marsupial-proof boundary fence	Sections identified on shared boundaries of Surbiton and Surbiton South and Wendouree.
KC08	Six Mile homestead complex	Former house site (house relocated to Surbiton), extant meat house, two dumps, dam and windmill, marsupial-proof fencing along pastoral boundary shared with Surbiton

These six identified sites within the Project can be considered temporally and thematically within three categories, as follows:

- At least one site (KC01) is directly associated with a late nineteenth century coach route network;

- At least one site (KC02) has potential indirectly association with the late nineteenth century coach route network and one likely to be associated with the late 19th and early twentieth century stock route network;
- Two twentieth century outstation sites (KC04 and KC05) are related to twentieth century pastoral activity (sheep shearing and droving); and
- Two sites relating to twentieth century pastoral activity and improvements (KC03 and KC06) with no identified association with the coach route network.

The two sites (KC07 and KC08) located outside, but in close proximity to, the study area, are associated with twentieth century pastoral activity.

No sites of historical mining heritage were located during the field survey.

Archaeological Potential

The term 'archaeological potential' is defined as the likelihood that a site may contain physical evidence related to an earlier phase of occupation, activity or development. There is a generally high potential for archaeological remains to exist across the majority of the identified sites within the study area, as presented in Table T-38.

Table T-38 Summary of Identified NICH Sites within Study Area

Site No.	Name	Archaeological Potential
KC01	Burgess Hotel	High- surface scatter Low - subsurface remains (highly impacted by pastoral activities)
KC02	Rocky Creek Camp	High – surface scatter Low - subsurface remains
KC04	Cudmore Cottage	Moderate - Site of ancillary structures - sheds, stables; rubbish dump, privy
KC05	Wallaroo Complex	Moderate - Site of ancillary structures - sheds, stables; rubbish dump, privy

Furthermore, there is high potential for archaeological remains in the form of artefactual surface scatter and possible 'rest stop' areas between hotel sites to exist along the entire coach route alignment(s).



Figure T-18 Location of Non-Indigenous Cultural Heritage Sites

SUPERSEDED

Indigenous Cultural Heritage

Indigenous cultural heritage has been organised in a phased approach, commencing with the development of Cultural Heritage Management Plans (CHMP) and Indigenous Land Use Agreements (ILUA), then proceeding on to cultural heritage surveys and the development of management plans that will encapsulate survey results and provide direction on management.

Desktop searches of the following registers and databases were also undertaken: the DEHP register and database; the (former) Register of the National Estate; World Heritage List; National Heritage List, the Commonwealth Heritage List and the Queensland Heritage Register.

The Queensland Heritage Register may list sites that hold cultural significance to both Indigenous and non-Indigenous people such as contact sites and massacre sites. There were no sites listed on the Queensland Heritage Register for the area.

One site was found to be located within Mining Development Licence (MDL) 333 (see Table T-39). This was a ceremonial area on Wendouree Station. In line with the process developed to manage all cultural heritage impacted on by the Project, a management plan is being developed for the site in conjunction with appropriate representatives of the Wangan & Jagalingou People, and the site will be protected from direct impact from planned mining.

Table T-39 Location of DEHP Registered Sites (within MDL 333)

Tenement	Site ID	Datum: Geocentric Datum of Australia 1994 Datum WGS84	Attribute
MDL 333	FF:A05	55 K 443032 7445534	Ceremony

The nature and distribution of many forms of Indigenous cultural heritage in a landscape is in part associated with environmental factors such as geology, climate and landforms which affect the availability of plants, animals and water, the location of suitable camping places and suitable surfaces upon which rock art could be performed. Such environmental factors also affect the degree to which cultural remains have survived natural and human-induced processes. In addition, non-Indigenous land-use practices often disturb or destroy cultural heritage.

As per the CHMP agreement, the Indigenous cultural heritage survey of the mine site commenced in March 2011, and it is predicted that this survey will result in the identification of a variety of Indigenous cultural heritage areas and objects.

Considering this information, it may be extrapolated that the study area, when intensively surveyed, will contain a number of areas and objects of Aboriginal cultural heritage. The types of areas and objects predicted to be contained within the study area include:

- Isolated stone artefacts consisting of individual find spots of a single artefact that have been assessed by the archaeologist and the survey team as being separated and unrelated to other artefacts and/or archaeological features;
- Stone artefact scatters incorporating a group of 2 or more artefacts located on the ground surface within an arbitrary linear distance nominated by the archaeologist that is subject to factors such as artefact type, environment, visibility, integrity and previously recorded site characteristics occurring within the larger study area;



- Scarred trees incorporating trees where the bark has been removed for a variety of reasons including for use in the preparation of bark sheets for shelters, making canoes, shields and coolamons (containers), or to gain access to possums, honey and other food sources. Due to extensive historic clearing combined with bushfires scarred trees are becoming an increasingly rare cultural resource, and living scarred trees are even rarer;
- Carved trees featuring carvings that were often associated with burial and ceremonial areas. As so many trees have been lost to bushfires, clearing and natural attrition, any carved trees should be regarded as having high levels of both cultural and scientific significance;
- Camp sites incorporating archaeological features such as hearths (fireplaces) and stone artefact scatters that represent occupation areas. Hearths are not common in most areas, but where located have the potential to contain important datable organic material (charcoal, burnt seeds, etc) which may assist in determining the age of the campsite. If a number of fireplaces are found, then the potential to find dates through periods of time is potentially of scientific significance;
- Natural features in the landscape that hold cultural significance for the Wangan & Jagalingou People. These may include creeks or billabongs carrying permanent water, mountains or rock features;
- Quarries and stone resource areas where stone utilised in the production of stone tools were being sourced; and
- Ceremonial areas in addition to the known bora ground at Wendouree Station.

Detailed cultural heritage survey reports will be prepared for the Wangan & Jagalingou People. Each report will culminate in a management plan established through consultation between the endorsed parties and their technical advisers, and accepted by HGPL, which will provide guidance for the way in which Aboriginal cultural heritage defined by the cultural heritage survey will be managed before construction commences and during the Project.

T.3.11.2 Environmental Values

The environmental values to be protected are the sites and places of cultural heritage significance (i.e. aesthetic, historic, scientific and social) of Indigenous and non-Indigenous use and occupation of the Project site. Sites and places of Indigenous cultural heritage significance are determined within the CHMP process.

T.3.11.3 Potential Impacts on the Environmental Values

Non-Indigenous Cultural Heritage

Potential impact on recognised and potential cultural heritage sites by the Project will generally be in the nature of subsidence relating to the proposed underground workings, vegetation clearance related to the mine's development of associated infrastructure, and the consequent destruction and/or removal of the structures/features which form the non-Indigenous cultural heritage of the area. Table T-40 provides analysis of the proposed Project's impact on identified sites of non-Indigenous cultural heritage.

Table T-40 Project Impacts on Non-Indigenous Cultural Heritage Sites

Site ID	Name	Significance Grading	Impact Assessment
KC01	Burgess Hotel	Low – Moderate	Likely to be directly impacted

Site ID	Name	Significance Grading	Impact Assessment
KC02	Rocky Creek Camp	Low	Likely to be impacted by subsidence
KC03	Borehole and Sheep trough	Low	Likely to be impacted by subsidence
KC04	Cudmore Cottage	Low	Likely to be impacted by subsidence
KC05	Wallaroo Complex	Low	Likely to be impacted by subsidence
KC06	Gate post	Low	Directly impacted
KC07	Boundary fence	Low	Outside study area (<i>but in close proximity to proposed rail corridor = potential impact</i>)
KC08	Six Mile complex	Low	Outside study area (<i>but in close proximity to proposed rail corridor = potential impact</i>)

Indigenous Cultural Heritage

All potential impacts are assessed in regards to the value or significance of the cultural heritage place. Cultural heritage significance relates to people's perspective of place and sense of value, within the context of history, environment, aesthetics and social organisation. The scientific and Aboriginal assessments of significance and impacts will be carried out as part of the CHMP process. Protection, management and mitigation measures will be discussed and incorporated into the cultural heritage survey report, following the completion of cultural heritage surveys, which will include Wangan & Jagalingou traditional owners and archaeologists to ensure that all areas of significance are identified, commencing in March 2011.

The study area will potentially be the site of an underground mine with associated open cut pits, and as such it is reasonable to predict that areas and objects of Aboriginal cultural heritage in that study area will be directly impacted on by mining operations and subsidence.

It is also reasonable to predict that during the Project, further Aboriginal cultural heritage will also become apparent. The CHMP has a 'New Finds' section that provides the Wangan & Jagalingou and Hancock with guidance on what courses of action to follow in the event that this occurs. This process, in conjunction with cultural awareness training, will provide appropriate management of all new finds of cultural heritage during construction and mining operations.

T.3.11.4 Environmental Protection Objective

The environmental protection objective is to preserve the cultural heritage values (Indigenous and non-Indigenous) of the Project study area.

T.3.11.5 Performance Criteria

The performance criteria for cultural heritage management are:

- Avoidance where possible of all heritage sites and places. A particular focus should be made to ensure that no disturbance of any place of State and National significance, including archaeological places or sites and places listed on the Queensland Heritage Register in accordance with the requirements of the *Queensland Heritage Act* (QHA Act, 1992);
- Archaeological Management Plans (AMPs) to be developed and administered for non-Indigenous sites and places of archaeological significance potentially impacted by the Project;



- Archival recording, including detailed photography, site plans and related drawings, should be undertaken for built heritage sites of cultural heritage significance potentially affected by the Project;
- Bi-Annual monitoring of known sites of non-Indigenous cultural heritage significance; and
- Compliance with the requirements of the *Aboriginal Cultural Heritage Act* (ACH Act, 2003) and the CHMP for Indigenous heritage matters.

T.3.11.6 Control Strategies

Non-Indigenous Cultural Heritage

Where possible the Project design will take into account each of the significant heritage sites and places identified within the study area, and, where possible, avoid impacting these sites. If avoidance of these areas is not possible, the Proponent will implement relevant mitigation measures.

The following control strategies are envisaged:

Strategy 1 – Coach Route AMP

An Archaeological Management Plan (AMP) be completed to manage the heritage values associated with the nineteenth century coach route. The AMP will provide clear management and mitigation measures to protect and conserve cultural heritage values associated with the coach route network within the mining lease for the life of the Project. The AMP would also include site-specific guidelines and management protocols for each of the previously identified sites, as well as for incidental finds.

Strategy 2 - Archival Recording of Site KC04

An archival recording, including detailed photography, site plans and related drawings, should be undertaken for the Cudmore Cottage site (KC04) prior to disturbance in the area.

Strategy 3 - Unexpected Finds

The study area has the potential to contain non-Indigenous cultural heritage material, particularly in the vicinity of the nineteenth century coach route and homestead complexes. Accordingly, the following procedure for managing unexpected cultural heritage material or sites that may be encountered has been prepared.

Strategy 5 - Archaeologist “On-Call”

A historical archaeologist should be appointed during construction phases of the Project, so that a call-out can be made if potential archaeological material is noted.

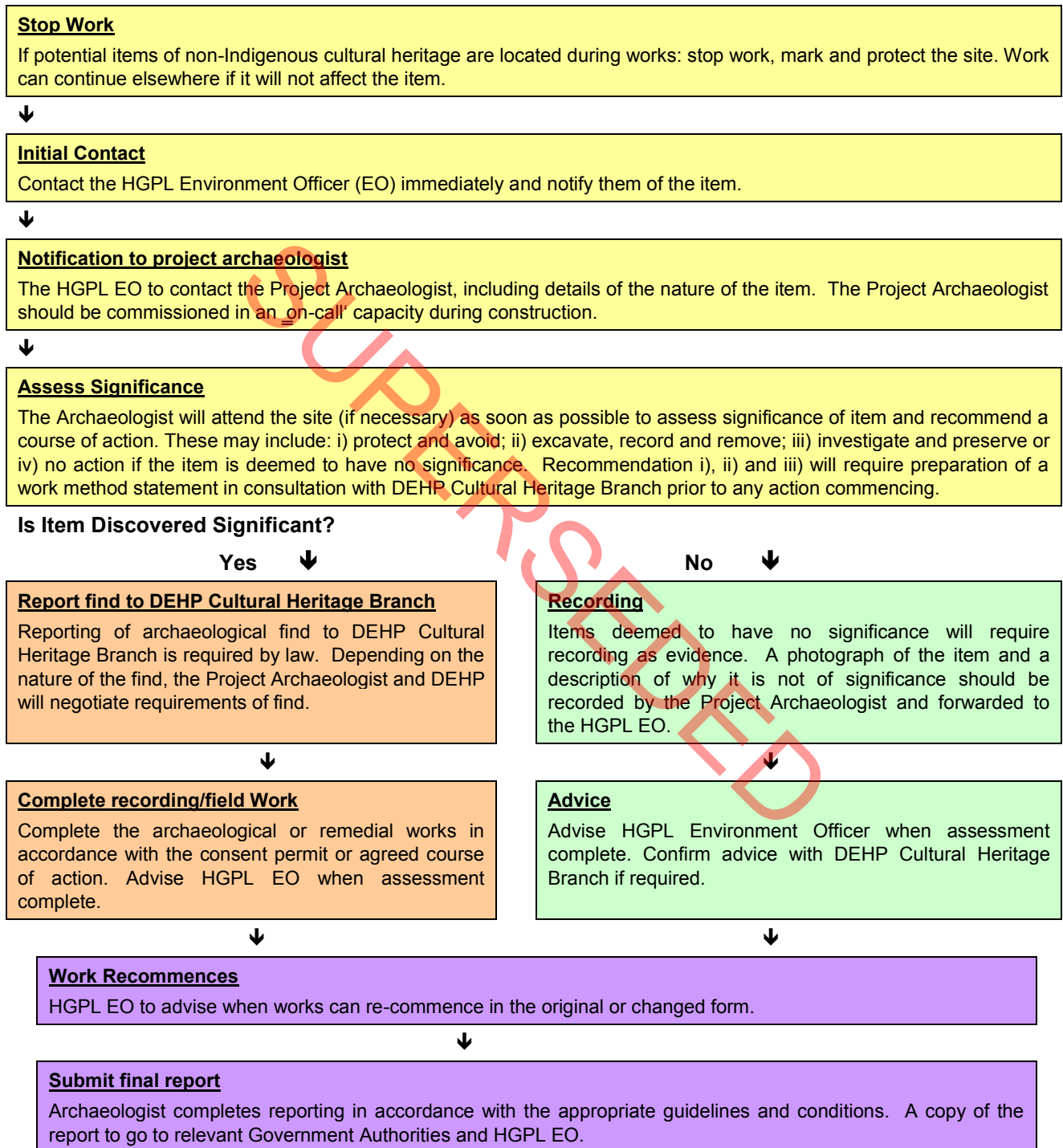
Strategy 6 - Regular Monitoring

The Proponent will undertake 5 year survey of all heritage items identified on the study area. Any damage to items can be catalogued and actions taken to ensure that the process that caused the damage is not repeated and that training material for site personnel can be updated with current information. The Project will develop forms and databases, similar to those it has for Indigenous heritage, to monitor the condition, management and protection of the heritage sites.

Strategies to mitigate potential impacts on unexpected cultural heritage material or sites found during the construction and pre-clearing activities include the following:



Figure T-19 Procedure for Discovery of Items of Potential Cultural Heritage Significance





- All new employees will be provided with suitable training in how to identify cultural heritage sites or objects and report the find to the Site Environmental Advisor;
- All employees will be informed of their obligations to notify the Site Environmental Advisor of any cultural heritage finds;
- Cultural heritage policies will be developed for the management of existing cultural heritage sites or finds;
- Site Environmental Advisor will be informed of their obligations to notify the DEHP of any relevant finds; and
- Regular cultural heritage educational sessions will be conducted and educational material distributed as appropriate. This material should inform the employees of what cultural heritage material may look like, and give them clear instructions on what to do if they find any such material.

Indigenous Cultural Heritage

Measures for the management of potential impacts range from avoidance and total protection through to a number of different mitigation methods that include the systematic recording, collection and removal and analysis of identified artefactual material from development areas. Avoidance of direct impact and long-term protection is the preferred form of management for the Wangan & Jagalingou People, and also offers the best way in which scientific significance can be preserved. However, the development of an open cut mine by implication suggests that avoidance and protection of many of the areas and objects that will be found during the cultural heritage survey will not be possible.

The Wangan & Jagalingou People have already recognised this situation in the CHMP that exists between them and HGPL. The CHMP states that the parties agree that the principles of effective recognition, protection and conservation of Aboriginal cultural heritage depend on avoidance where possible, but if it cannot reasonably be avoided, minimisation of harm through mitigation measures will be acceptable. The CHMP also accepts that disturbance of the ground during the development of the Project is a necessary component of the Project.

Under these circumstances, scientific advice to the Wangan & Jagalingou People will be to undertake mitigation methods that maximise protection of the values of Aboriginal cultural heritage found during the cultural heritage survey of the study area. Protection of values in this situation is dependent on a combination of cultural and archaeological approaches that may include:

- Detailed recording of areas and objects;
- Systematic collection and removal from the area of disturbance;
- Collection of any information (inclusive of archaeological excavation where appropriate) from the context of the area or object (e.g., material that could lead to more information through dating, pollen, residue and use wear analysis);
- Where potential exists for sub-surface cultural heritage, the development of a monitoring program during earth disturbance; and
- Preparation of detailed site-specific management plans prepared by the archaeologists to the Project that may recommend other measures such as sub-surface investigation through test-pitting or excavation and analysis of outcomes.



In addition, where avoidance is possible, the preparation of site-specific management plans that provide clear directions and processes for protection of the area or object will be drawn up so that accidental harm during project activities is avoided.

Cultural awareness training will be a crucial element of management, with the intention of training people involved in the Project in avoidance and protection of known cultural heritage sites, what cultural heritage may reasonably be in the landscape, and what to do in the event of a find of cultural heritage not previously defined during the cultural heritage survey.

Fossils

If fossils are located during the development and operation phases of the Project, HGPL will advise the Queensland Museum.

T.3.11.7 Commitments

Control strategies will be implemented to manage known and potential cultural heritage sites and values located within the Project site. This will include:

- Conducting regular cultural heritage education sessions/trainings for employees.
- The implementation of the requirements of the agreed CHMP in consultation with the traditional owners, and in accordance with the requirements of the ACH Act.



T.4 Environmental Management

T.4.1 Monitoring

Environmental monitoring will continue to occur in accordance with the requirements of the Environmental Authority.

The environmental monitoring will include rehabilitation success, surface water quality, groundwater quality and level, particulate and dust deposition and noise. Commitments and Environmental Authority conditions have been included in the relevant sections of this EMP.

This EMP has been developed as part of the Environmental Management System for the Project. The monitoring plans developed for the site will outline the environmental monitoring to be undertaken, including monitoring sites, parameters and their frequency of measurement and also make reference to monitoring procedures and records. The EMP will be made available to the administering authority on request.

T.4.2 Reporting

T.4.2.1 External

The Proponent aims to provide timely, relevant and appropriately presented information to government authorities, the local community and the general public on the environmental performance of the Project.

Reporting commitments under the Environmental Authority and other legislation will be complied with and includes:

- Prepare Annual Returns as required under the *Environmental Protection Act* (1994);
- Submit National Pollutant Inventory (NPI) reports as necessary; and
- Report incidents that may potentially compromise compliance with the conditions of the Environmental Authorities immediately to operations management.

T.4.2.2 Internal

The site Environmental Manager will (in a timely manner) report any incidents or breaches of the EMP or EA conditions to key site personnel and report to the DEHP in accordance with the requirements of the Project's Environmental Authority.

T.4.3 Environmental Management System

The Project operations will take place under an EMS. HGPL's approach will be to certify the EMS against the ISO14001 Standard within the first years of operation.

The EMS is the cornerstone of the operation's due-diligence approach to environmental management, and encompasses the measures used to prevent or minimise environmental harm, ensure compliance and promote continuous improvement.

T.4.4 Research

Mining in the Galilee Basin is only just developing and HGPL is committed to developing areas of research, in particular in land rehabilitation, to enhance knowledge in this area.

T.4.5 Roles & Responsibilities

A number of parties have responsibilities in relation to the implementation of the EMP. Broadly, responsibility for environmental management will be assigned as shown in Table T-41. All Project staff have a responsibility under the General Duty of Care of the *Environmental Protection Act* (1994) and must adhere to the procedures outlined in the EMP at all times. HGPL will incorporate environmental management requirements into job descriptions at all levels of operations. Importantly, the General Manager will hold ultimate responsibility for environmental compliance and implementation of HGPL's Environmental Policy. This is consistent with Sections 492 and 493 of the *Environmental Protection Act* (1994).

Table T-41 Roles & Responsibilities with regard to EMP Implementation & Compliance

Role	Responsibilities
HGPL	<p>Implementation and monitoring of the EMP.</p> <p>Ensure all supervisory and management staff are aware of and understand their responsibilities under this EMP.</p> <p>Ensure that appropriate and adequate resources are allocated to allow for the effective implementation and maintenance of the EMP.</p> <p>Ensure periodic reviews of environmental performance are conducted.</p> <p>Report any major environmental incidents that may have a significant impact on the surrounding environment.</p> <p>Ensure that its employees and contractors receive the relevant environmental instruction in relation to the EMP and be made aware of and understand their obligations and duties.</p>
Construction Contractor	<p>Be aware of and understand the contents of and the reason for implementing the elements of the EMP and ensure all personnel including subcontractors adhere to these requirements.</p> <p>Ensure adequate training in the elements of the EMP is provided to all personnel, including contractors.</p> <p>Ensure that personnel involved in the Project, including subcontractors and visitors, have received any environmental training required to ensure they are aware and understand their responsibilities under the EMP and environmental approvals adhere to the strategies outlined in the EMP.</p> <p>Carry out all work in accordance with the procedures outlined in the EMP.</p> <p>Make sure that all environmental safeguards and precautions are in place and adhered to at all times at the site and activity.</p> <p>Regularly inspect and monitor all activities for adherence to proper environmental safeguards.</p> <p>Ensure that all equipment used is properly serviced and that all precautions are in place to prevent the likelihood of an environmental incident occurring.</p> <p>Report all environmental incidents to the Superintendent's representative within 24 hours.</p>
Superintendent's Representative	<p>Be aware of and understand the contents of and the reason for implementing the elements of the EMP.</p>
All employees and sub-contractors	<p>Exercise environmental due diligence and achieve compliance with the EMP.</p> <p>Report all environmental incidents to the Principal within 24 hours of them occurring.</p>



T.4.6 Staff Training

HGPL will ensure that employees, contractors and visitors receive appropriate environmental awareness training. This is achieved through a variety of methods including induction training, formal presentations, and impromptu meetings.

Specifically, HGPL will require that employees, contractors and visitors are aware of:

- Their roles and responsibilities (including environmental incident reporting);
- The environmental impacts, potential or actual, of their activities on-site;
- The potential consequences of poor environmental performance; and
- Site emergency procedures.

Environmental awareness training will occur at induction and will be a regular feature of site-wide training. Records of training content and attendance will be maintained. Employees and contractors required to undertake work at the site will undergo an environmental, health and safety induction. Relevant environmental topics include:

- Environmental Policy;
- Duty of Care and Duty to Notify;
- Hazard / Incident Reporting;
- Environmental Awareness (Your Responsibility);
- Risk Management;
- Chemicals and Hydrocarbon management;
- Land Management;
- Water Management; and
- Waste Management

A Training Needs Assessment and Training Plan will be developed for the proposed mining and related activities. This will incorporate environmental and cultural heritage awareness training as shown in



Table T-42.

SUPERSEDED



Table T-42 Training Requirements Matrix

Position	General environmental and cultural heritage induction	Short environmental and cultural heritage induction	Spill avoidance and response	Incident response	Incident investigation, reporting and follow up	Compliance and General Environmental Duty	Environmental degree qualification	Task specific training	Cultural awareness training	Environmental auditing	Fire fighting	Fauna spotting
HGPL Project Manager and Senior Management	✓			✓	✓	✓			✓			
Contractor's Project Manager and Senior Staff	✓			✓	✓	✓			✓			
Environmental Manager	✓		✓	✓	✓	✓	✓		✓	✓		
Administration team	✓		✓	✓				✓	✓			
Supervisors	✓		✓	✓	✓			✓	✓		✓	
Environmental Officers	✓		✓	✓	✓		✓	✓	✓	✓		✓
General employees and contractors (1)	✓		✓	✓				✓	✓		✓	
Visitors		✓										

(1) Requirements for contractors may be varied based on a risk assessment of work to be undertaken.

T.4.7 Communications

Internal reporting and communication systems and requirements will be developed as follows:

- Environmental sections in weekly and monthly Project reports, reporting performance against objectives, targets and key indicators
- Environment as an agenda item at all management and supervisor meetings
- Environmental monitoring results reported monthly, quarterly and annually.
- Incident reporting including environmental incident reporting requirements
- Complaints recording and management
- Environmental risk assessment incorporated into job safety and environmental analysis and pre-start checklists
- Environmental notice boards at key locations around the site
- Environmental topics at tool box talks.

External reporting requirements are expected to include:

- Statutory environmental reporting requirements under the *Environmental Protection Act* (1994) and associated Environmental Authority including:
 - Annual return

- Incidents causing or likely to cause material environmental harm
- Any non-compliances with the Environmental Authority
- Any environmental reporting requirements agreed in the Indigenous Land Use Agreement, for example regular reporting on vegetation clearing, aquatic ecosystem health and rehabilitation progress.
- National Pollutant Inventory reporting
- National Greenhouse Emissions Reporting (or equivalent system that may be introduced in future)
- Complaints.

T.4.8 Documentation

Documentation relating to the EMS will be maintained on-site. Documentation will be made available and accessible to all those with assigned environmental responsibilities under the EMP/EMS.

T.4.9 Document Control

All documentation developed in relation to the EMS will be managed in accordance with the site-wide document control system.

T.4.10 Environmental Auditing & Review

HGPL will conduct environmental audits to assess compliance with regulatory requirements and the performance of the site EMS.

The objectives of the Environmental Auditing and Review programs are to:

- Monitor and report on compliance with statutes, the EMP commitments and Plan of Operations, environmental policy, company standards, best practice guidelines and signatory codes;
- Monitor the EMS for consistency with the principles of ISO14001; and
- Ensure a senior management review of performance via consideration of the audit reports.

An Environmental Auditing Program will continue to be implemented at the Mine. The program will include:

- Internal Environmental Audits - annually;
- Environmental Management System Review – annually;
- Plan of Operations Audits – with each Plan of Operations (usually annually); and
- Administering Authority Audits - at a frequency determined by DEHP.

T.4.10.1 Monitoring & Measurements

Monitoring and measurement requirements in relation to elements of this EMP. The key monitoring tool will be daily and weekly inspection checklists that will be completed in relation to the range of environmental impacts identified.

Additional monitoring requirements in relation to social and socio-economic aspects and impacts are contained in a separate Social Impact Monitoring Plan (SIMP; SEIS, Volume 2, Appendix D).



T.4.10.2 Evaluation of Compliance

Evaluation of compliance will be achieved by internal and external auditing as specified in Section T.4.10.5 below.

T.4.10.3 Non-Conformity, Corrective Action & Preventive Action

Non-conformities and corrective actions will be recorded on environmental management checklists. Where items can be closed out promptly, the checklists shall be used to record this. Where items cannot be closed out promptly, or require more widespread management response, these will be entered into a Corrective Action register. Any identified non-conformances that cannot be addressed immediately, or that require changes to procedures or systems will be entered into the register. Corrective actions arising from incident investigations will also be included in the corrective action register.

The register will include:

- The actual non-conformance, including a root cause analysis
- Actions required to address the non conformance, including:
 - Actions required to repair any environmental damage
 - Actions to prevent recurrence
 - Changes to procedures, systems or practices to prevent recurrence; and
 - Training and awareness requirements related to any of the above, for example tool box talks
- The person(s) assigned to undertake the actions, with an automatic notification system
- Time frames in which the actions will be undertaken
- Close out.

T.4.10.4 Control of Records

All records generated through implementation of the EMS/EMP will be maintained on-site using a centralised records and data management system.

The Proponent and the construction contractor must maintain all environmental communications including reports, audits, complaints, minutes of meetings, records of non-conformances, corrective actions and site inspections such that they are readily retrievable.

T.4.10.5 Internal & External Audits

An internal and external auditing program will be established including:

- Legal compliance audits conducted (external);
- EMS certification and maintenance audits (external);
- Internal daily, weekly and rain event inspections of key aspects of the activity;
- Internal EMS compliance audits;
- Internal monitoring results reviews; and
- External EMS compliance audits.

Audit results will be reported to the site Management Team. Recommendations from audits will be incorporated into the Corrective Action Register.

T.4.11 Management Review

During construction, management review will be incorporated into contract review processes. During operations, management review will be carried out annually, or more frequently if significant compliance issues arise.

The Environmental Manager will prepare documentation for Management Review as follows:

- Results of internal audits and evaluations of compliance with legal requirements and with other requirements to which the organization subscribes;
- Communication(s) from external interested parties, including complaints;
- The environmental performance of the organization;
- The extent to which objectives and targets have been met;
- Status of corrective and preventive actions;
- Follow-up actions from previous management reviews;
- Changing circumstances, including developments in legal and other requirements related to its environmental aspects; and
- Recommendations for improvement.

The Management Review team will then be asked to review and discuss documentation and adopt recommendations for improvement or amend such recommendations as it sees fit, before adopting the amended recommendations.

T.4.12 Management Plans & Monitoring Programs

A number of supporting management plans and monitoring programs have been identified by this EMP as being required at various stages of the Project. A preliminary schedule for the development and implementation of these plans and programs is provided in Table T-43. This table shows the name of the section of the EMP in which the requirement to develop the plan or program has been identified and an indication of the phase of the project in which the plan will be developed (dark shading) and implemented (light shading). As the planning phase of the Project proceeds specific dates can be identified for the delivery of each item.



Table T-43 Schedule for the Development & Implementation of Supporting Plans & Programs

Plan / Program	Relevant Section of EMP	Project Phase				
		PLANNING	PRE-CONSTRUCTION	CONSTRUCTION	OPERATIONS	DECOMMISSIONING
Management Plans						
Air Quality Management Plan	T.3.3.9					
Archaeological Management Plan	T.3.11.5					
Blasting Plan	T.3.3.10					
Coal Dust Management Plan	T.3.3.6					
Cudmore Resources Reserve Management Plans (x3)	T.3.7.1					
Cultural Heritage Management Plan	T.3.11.1					
Design Plans (multiple)	T.3.6.9					
Environmental Management Plan (Construction)	T.3.4.6					
Environmental Management System (Operations)	T.3.6.6					
Erosion & Sediment Control Management Plan (Construction)	T.3.4.6					
Erosion & Sediment Control Management Plan (Operations)	T.3.4.9					
Final Landform & Rehabilitation Plan	T.3.8.4					
Landfill Operations Plan	T.3.6.8					
Landfill Environmental Management Plan	T.3.6.8					
Mine Water Management Plan	T.3.4.6					
Overburden and CHPP Rejects Management Plan	T.3.6.3					
Noise, Vibration and Overpressure Monitoring Program	T.3.5.6					
Operational Management Plan	T.3.3.7					
Overburden Emplacement Facility Operational Plan	T.3.6.9					
Weed and Pest Management Plan	T.3.9.5					
Plan of Operations	T.4.6					
Post-closure Management Plan	T.3.8.9					
Post Mine Land Use Plan (PMLUP)	T.3.8.8.8					
Rehabilitation Management Plan	T.3.8.9					
Rehabilitation Plan	T.3.3.7					
Staff Training Plan	T.4.6					
Surface Water Management Plan	T.3.4.6					
Top Soil Management Plan	T.3.7.6					
Waste Management Plan (Construction)	T.3.6.6					
Waste Management Plan (Operations)	T.3.6.6					



Plan / Program	Relevant Section of EMP	Project Phase				
		PLANNING	PRE-CONSTRUCTION	CONSTRUCTION	OPERATIONS	DECOMMISSIONING
Monitoring / Maintenance Programs						
Ambient Air Monitoring Program	T.3.3.8					
Aquatic Fauna Monitoring Program	T.3.10.8					
Dust Monitoring Program	T.3.3.8					
Environmental Auditing Program	T.4.6					
Little Pied Bat Monitoring Program	T.3.9.5					
Post-subsidence Drainage & Waterway Monitoring Program	T.3.4.6					
Receiving Environment Monitoring Program	T.3.4.9					
Rehabilitation Monitoring program	T.3.8.7					
Sediment Monitoring Program	T.3.10.8					
Staff Induction Program	T.3.9.5					
Stream Diversion Monitoring Program	T.3.4.8					
Surface Water Quality Monitoring Program	T.3.4.7					
Weed Spraying Program	T.3.9.7					



T.5 Environmental Authority Definitions

Words and phrases to be used throughout the Environmental Authority are defined below except where identified in the *Environmental Protection Act* (1994) or subordinate legislation. Where a word or term is not defined, the ordinary English meaning applies, and regard should be given to the Macquarie Dictionary.

'acceptance criteria' means the measures by which actions implemented are deemed to be complete. The acceptance criteria indicate the success of the decommissioning and rehabilitation outcomes or remediation of areas which have been significantly disturbed by the environmentally relevant activities. Acceptance criteria may include information regarding:

- Stability of final land forms in terms of settlement, erosion, weathering, pondage and drainage;
- Control of geochemical and contaminant transport processes;
- Quality of runoff waters and potential impact on receiving environment;
- Vegetation establishment, survival and succession;
- Vegetation productivity, sustained growth and structure development;
- Fauna colonisation and habitat development;
- 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;
- Microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;
- Effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;
- Resilience of vegetation to disease, insect attack, drought and fire; and
- Vegetation water use and effects on ground water levels and catchment yields.

'administering authority' means the Department of Environment and Heritage Protection or its successor.

'Annual Exceedance Probability' or 'AEP' means the probability that at least one event in excess of a particular magnitude will occur in any given year.

'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 (dBL).

'ambient (or total) noise' at a place, means the level of noise at the place from all sources (near and far), measured as the Leq for an appropriate time interval.

'ANZECC & ARMCANZ' means the Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) 2000, Australian and New Zealand Guidelines for Fresh Marine Water Quality.

'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.



'assess' 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:

- Exactly what has been assessed and the precise nature of that assessment;
- The relevant legislative, regulatory and technical criteria on which the assessment has been based;
- 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
- 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:

- Operations of any kind and all things constructed, erected or installed for that dam; and
- Any land used for those operations.

'bed and banks' for a waters, river, creek, stream, lake, lagoon, pond, swamp, wetland or dam means land over which the water of the waters, lake, lagoon, pond, swamp, wetland or dam normally flows or that is normally covered by the water, whether permanently or intermittently; but does not include land adjoining or adjacent to the bed and banks that is from time to time covered by floodwater.

'beneficial use' in respect of dams means that the current or proposed owner of the land on which a dam stands, has found a use for that dam that is:

- Of benefit to that owner in that it adds real value to their business or to the general community;
- In accordance with relevant provisions of the *Environmental Protection Act* (1994);
- Sustainable by virtue of written undertakings given by that owner to maintain that dam; and
- The transfer and use have been approved or authorised under any relevant legislation.

'biosolids' means the treated and stabilised solids from sewage.

'blasting' means the use of explosive materials to fracture:

- Rock, coal and other minerals for later recovery, or
- Structural components or other items to facilitate removal from a site or for reuse.

'bunded' means within bunding consistent with Australian Standard 1940.

'certification', 'certifying' or 'certified' by a suitably qualified and experienced person in relation to a design plan or an annual report regarding dams, 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:

- Exactly what is being certified and the precise nature of that certification;
- The relevant legislative, regulatory and technical criteria on which the certification has been based;
- The relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and



- The reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

'chemical' means:

- An agricultural chemical product or veterinary chemical product within the meaning of the *Agricultural and Veterinary Chemicals Code Act* (1994) (Commonwealth); or
- A dangerous good under the dangerous goods code; or
- A lead hazardous substance within the meaning of the *Workplace Health and Safety Regulation* (1997); or
- A drug or poison in the Standard for the Uniform Scheduling of Drugs and Poisons prepared by the Australian Health Ministers' Advisory Council and published by the Commonwealth; or
- Any substance used as, or intended for use as:
 - a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product; or
 - a surface active agent, including, for example, soap or related detergent; or
 - a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide; or
 - a fertiliser for agricultural, horticultural or garden use; or
- a substance used for, or intended for use for:
 - mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater; or
 - manufacture of plastic or synthetic rubber.

'commercial place' means a work place used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees accommodation or public roads.

'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 purposes of preparing a design plan.

contaminate means to render impure by contact or mixture.

contaminated means the substance has come into contact with a contaminant.

contaminant A contaminant can be:

- A gas, liquid or solid; or
- An odour; or
- An organism (whether alive or dead), including a virus; or
- Energy, including noise, heat, radioactivity and electromagnetic radiation; or

- A combination of contaminants.

control measure means any action or activity that can be used to prevent or eliminate a hazard or reduce it to an acceptable level.

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 is designed to contain, divert or control flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works. A dam does not mean a fabricated or manufactured tank or container designed to an Australian Standard that deals with strength and structural integrity of that tank or container.

design plan is the documentation required to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, and the criteria to be used for operating the dam. The documents must include all investigation and design reports, plans and specifications sufficient to hand to a contractor for construction, and planned decommissioning and rehabilitation outcomes; so as to address all hazard scenarios that would be identified by a properly conducted hazard assessment for the structure. Documentation must be such that a **suitable qualified and experience person** could conduct an independent review without seeking further information from the designer.

design storage allowance or **DSA** means an available volume, estimated in accordance with the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995), that must be provided in a dam as at the first of November each year in order to prevent a discharge from that dam to a probability (AEP) specified in that guideline. The DSA is estimated based on 100% runoff of wet season rainfall at the relevant AEP, taking account of process inputs during that wet season, with no allowance for evaporation.

development approval means a development approval under the *Integrated Planning Act* (1997) in relation to a matter that involves an environmentally relevant activity under the *Environmental Protection Act* (1994).

domestic waste means waste, other than domestic clean-up waste, green waste, recyclable waste, interceptor waste or waste discharged to a sewer, produced as a result of the ordinary use or occupation of domestic premises.

dwelling means any of the following structures or vehicles that is principally used as a residence:

- A house, unit, motel, nursing home or other building or part of a building, or
- A caravan, mobile home or other vehicle or structure on land, or
- A water craft in a marina.

effluent treated waste water discharged from sewage treatment plants.

end-of-pipe means the location at which water is released to waters or land.

Environmental Authority means an Environmental Authority under Chapter 5 of the *Environmental Protection Act* (1994).

Environmental Authority holder means the holder of the Environmental Authority.

dry season means April to September in the relevant year.



environmental nuisance means causing an unreasonable interference with or likely interference with an environmental value in a way mentioned in subsections (a), (b) or (c) of Section 15 of the *Environmental Protection Act* (1994).

environmentally relevant activity means an environmentally relevant activity as defined under Section 18 of the *Environmental Protection Act* (1994) and listed under Schedule 1 of the *Environmental Protection Regulation* (1998).

financial assurance means a security required under the *Environmental Protection Act* (1994) by the Administering Authority to cover the cost of rehabilitation or remediation of disturbed land or to secure compliance with the Environmental Authority.

floodwater means water overflowing, or that has overflowed, from waters, river, creek, stream, lake, pond, wetland or dam onto or over riparian land that is not submerged when the watercourse or lake flows between or is contained within its bed and banks.

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.

foreseeable future is the period used for assessing the total probability of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a 150 year foreseeable future with an acceptable probability of failure before that time.

general waste means waste other than regulated waste.

hazard in relation to a dam as defined, means the potential for environmental harm resulting from the collapse or failure of the dam to perform its primary purpose of containing, diverting or controlling flowable substances.

hazard 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 Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland (DME 1995).

hazardous waste means a substance, whether liquid, solid or gaseous that, if improperly treated, stored, disposed of or otherwise managed, is likely to cause environmental harm.

holder means the holder of this Environmental Authority.

hydraulic performance means the capacity of a regulated dam to contain or safely pass flowable substances based on a probability (AEP) of performance failure specified for the relevant hazard category in the Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland (DME 1995).

infrastructure means water storage dams, roads and tracks, buildings and other structures built for the purpose and duration of the conduct of the environmentally relevant activities, but does not include other facilities required for the long term management of the impact of those activities or the protection of potential resources. Such other facilities include dams other than water storage dams, waste dumps, voids, or stockpiles and assets, that have been decommissioned, rehabilitated, and lawfully recognised as being subject to subsequent transfer with ownership of the land.

LA 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.

LA 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.

LA, 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.

LAr,1 hour' means the rating level, equal to LAeq,adj,1 hour.

lake' includes:

- Lagoon, swamp or other natural collection of water, whether permanent or intermittent, and
- The bed and banks and any other element confining or containing the water.

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 DME (1995) *Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland*.

land use' term to describe the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

landfill' means land used as a waste disposal site for lawfully putting solid waste on the land.

levee', **dyke'** or **bund'** means a long embankment that is designed only to provide 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.

mandatory reporting level' or **MRL'** means a warning and reporting level determined in accordance with the Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland (DME 1995). An MRL is the lowest level required in a regulated dam to allow either of the following to be retained:

- The runoff from a 72 hour duration storm at the AEP, or
- A wave allowance at that AEP as estimated using a recognised engineering method.

mg/L' means milligrams per litre.

mineral' means a substance which normally occurs naturally as part of the earth's crust or is dissolved or suspended in water within or upon the earth's crust and includes a substance which may be extracted from such a substance, and includes:

- Clay if mined for use for its ceramic properties, kaolin and bentonite;
- Foundry sand;
- Hydrocarbons and other substances or matter occurring in association with shale or coal and necessarily mined, extracted, produced or released by or in connection with mining for shale or coal or for the purpose of enhancing the safety of current or future mining operations for coal or the extraction or production of mineral oil therefrom;



- Limestone if mined for use for its chemical properties;
- Marble;
- Mineral oil or gas extracted or produced from shale or coal by in situ processes;
- Peat;
- Salt including brine;
- Shale from which mineral oil may be extracted or produced;
- silica, including silica sand, if mined for use for its chemical properties; and
- Rock mined in block or slab form for building or monumental purposes;

But does not include:

- Living matter;
- Petroleum within the meaning of the *Petroleum Act* (1923);
- Soil, sand, gravel or rock (other than rock mined in block or slab form for building or monumental purposes) to be used or to be supplied for use as such, whether intact or in broken form; and
- Water.

mine water means process water and contaminated storm water.

natural flow means the flow of water through waters caused by nature.

nature includes:

- Ecosystems and their constituent parts;
- All natural and physical resources; and
- Natural dynamic processes.

noxious means harmful or injurious to health or physical wellbeing.

nuisance sensitive place includes –

- A dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- A motel, hotel or hostel; or
- A kindergarten, school, university or other educational institution; or
- A medical centre or hospital; or
- A protected area; or
- A public thoroughfare, park or gardens; or
- A place used as a workplace, an office or for business or commercial purposes and includes a place within the curtilage of such a place reasonably used by persons at that place,

but excludes the land to which the approval relates.

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 associated with the Project for which the Environmental Authority has been granted.

operational plan means a document that amongst other things sets out procedures and criteria to be used for operating a dam during a particular time period. The operational plan as defined herein may form part of a plan of operations or plan otherwise required in legislation.

palletised means stored on a movable platform on which batteries are placed for storage or transportation.

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).

protected area means:

- A protected area under the *Nature Conservation Act* (1992), or
- A marine park under the *Marine Parks Act* (1992), or
- A World Heritage Area.

progressive rehabilitation means rehabilitation (defined below) undertaken progressively or a staged approach to rehabilitation as mining operations are ongoing.

process water means water used or produced during the mineral development activities.

receiving environment means all groundwater, surface water, land, and sediments that are not disturbed areas authorised by the Environmental Authority.

receiving waters means all groundwater and surface water that are not disturbed areas authorised by the Environmental Authority.

recycled water means appropriately treated effluent and urban stormwater suitable for further use.

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.

regulated dam means any dam in the significant or high hazard category as assessed using the Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland (DME 1995).

regulated waste means non-domestic waste mentioned in schedule 7 of the *Environmental Protection Regulation* (1998) (whether or not it has been treated or immobilised), and includes:

- For an element – any chemical compound containing the element, and
- Anything that has contained the waste.

rehabilitation the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in the Environmental Authority and, where relevant, includes remediation of contaminated land.

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.



residual void means an open pit resulting from the removal of ore and/or waste rock which will remain following the cessation of all mining activities and completion of rehabilitation processes.

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 dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- A motel, hotel or hostel; or
- An educational institution; or
- A medical centre or hospital; or
- A protected area under the *Nature Conservation Act* (1992), the *Marine Parks Act* (1992) or a World Heritage Area; or
- A public park or gardens.

sewage means the used water of person's to be treated at a sewage treatment plant.

spillway means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the dam, normally under flood conditions or in anticipation of flood conditions.

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.

stormwater means all surface water runoff from rainfall.

suitably qualified and experienced person in relation to dams means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act* (1988), OR registered as a National Professional Engineer (NPER) with the Institution of Engineers Australia, OR holds equivalent professional qualifications to the satisfaction of the administering authority for the Act; AND the administering authority for the Act is satisfied that person has knowledge, suitable experience and demonstrated expertise in relevant fields, as set out below:

- (a) Knowledge of engineering principles related to the structures, geomechanics, hydrology, hydraulics, chemistry and environmental impact of dams; and
- (b) A total of 5 years of suitable experience and demonstrated expertise in the geomechanics of dams with particular emphasis on stability, geology and geochemistry; and
- (c) A total of 5 years of suitable experience and demonstrated expertise each, in three of the following categories:
 - i. Investigation and design of dams.
 - ii. Construction, operation and maintenance of dams.

- iii. Hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology.
- iv. Hydraulics with particular reference to sediment transport and deposition, erosion control, beach processes.
- v. Hydrogeology with particular reference to seepage, groundwater.
- vi. Solute transport processes and monitoring thereof.
- vii. Dam safety.

trivial harm means environmental harm which is not material or serious environmental harm and will not cause actual or potential loss or damage to property of an amount of, or amounts totalling more than \$5,000.

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.

void means any constructed, open excavation in the ground.

waste as defined in Section 13 of the *Environmental Protection Act* (1994).

waste management hierarchy has the meaning given by the *Environmental Protection (Waste Management) Policy* (2000).

waste management principles has the meaning given by the *Environmental Protection (Waste Management) Policy* (2000).

waste water means used water from the activity, process water or contaminated storm water.

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.

wet season means October to March in the relevant year.

µg/L means micrograms per litre.

µS/cm means microsiemens per centimetre.



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Attachment A – Environmental Risk Assessment

SUPERSEDED

Hancock Galilee Pty Ltd

Kevin's Corner Project

Environmental Impact Statement

Risk Register

Final Report

June 2012

HMS1135



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Hancock Galilee Pty. Ltd.

Kevin's Corner Project

Environmental Impact Statement

Risk Register

Final Report

June 2012

HMS1135

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This Report was prepared on the basis of information recorded by HMS Consultants Australia Pty Ltd on the 29th, 30th and 31st May 2012, based on participants' opinion of the environmental risks associated with the Kevin's Corner Project.

File	Report	Prepared By	Reviewed By	Date
20120608 HMS1135 HGPL, GVK – Kevin's Corner EIS RA Draft Report	Draft	J Smith & C Allanson	M Clarke	9 June 2012
20120614 HMS1135 HGPL, GVK – Kevin's Corner EIS RA Final Report	Final	J Smith	L Gracias & M Clarke	14 June 2012

TABLE OF CONTENTS

1	EXECUTIVE SUMMARY	2
2	INTRODUCTION	1
3	CONTEXT.....	1
3.1	BACKGROUND	1
3.2	PURPOSE	1
3.3	SCOPE	2
3.4	OBJECTIVES.....	2
3.5	ASSUMPTIONS, LIMITATIONS AND EXCLUSIONS OF THE KC RISK REGISTER.....	2
4	DEFINITIONS.....	3
5	METHODOLOGY	4
5.1	PARTICIPANTS	5
5.2	ASPECTS AND CONSIDERATIONS OF THE RISK REGISTER.....	6
5.3	MEASUREMENT OF RISK.....	8
5.4	RISK REDUCTION STRATEGY	8
6	RESULTS.....	9
6.1	SUMMARY OF RISKS	9
6.2	SUMMARY OF IMPORTANT RISKS.....	11
Appendix A –	Hancock Galilee Pty Ltd – Kevin's Corner Project - Environmental Impacts Risk Register, Assessment Order – June 2012	
Appendix B –	Kevin's Corner Project, Risk and Opportunity Management Plan – Risk Rating Tools	

1 EXECUTIVE SUMMARY

In March 2012, HMS Consultants Australia Pty. Ltd. (HMS) was engaged by Hancock Galilee Pty. Ltd. (HGPL) to facilitate the development of the Kevin's Corner (KC) Project Environmental Impact Statement (EIS) Risk Register.

This report details the methods used and the recommendations resulting from the development of the risk register, which was compiled in Brisbane with the input of Project participants and URS from the 29th May until the 8th June, 2012.

The risk register was compiled in accordance with the KC Risk and Opportunity Management Plan (ROMP), which has been developed to achieve systematic and consistent evaluation of risks in all aspects of the Project. The ROMP requires that both the worst case scenario (maximum foreseeable loss) and the residual risk, assuming implementation of planned controls, are evaluated. This method maintains focus on potentially high consequence, low probability events even if they are thought to be well controlled.

The reader should refer to Section 3 of this report for details regarding the context (objectives, scope, assumptions and limitations) of the risk register development process.

Seventy eight (78) risks are defined in the KC EIS Risk Register. Forty one (41) of these were rated on their potential impact on the natural environment, while others were rated on their impact to safety, reputation, project delay, production and financial loss.

Nil (0) risks were thought to have a "Critical" residual risk rating and only one (1) was thought to have a "High" residual risk rating. This risk is summarised as follows.

- Risk #3.02.01, Residual impacts to vegetative communities after completion of final rehabilitation of the mine. This risk was rated high because at this stage of the Project, without verified rehabilitation success in the area, it is considered that the relinquishment of the lease could possibly be delayed due to additional time required to establish acceptable revegetation standards.

Nil (0) residual risk ratings were recorded on the basis of a "Catastrophic" consequence severity, while ten (10) residual risk ratings were recorded that could result in a "Major" consequence severity.

Section 6 provides a more detailed summary of the Risk Register and full details are provided in Appendix A, Hancock Galilee Pty Ltd – Kevin's Corner Environmental Impact Statement Risk Register, Assessment Order – May 2012.

2 INTRODUCTION

In March 2012, HMS Consultants Australia Pty. Ltd. (HMS) was engaged by Hancock Galilee Pty. Ltd. (HGPL) to facilitate the development of the Kevin's Corner (KC) Project Environmental Impact Statement (EIS) Risk Register.

This report details the methods used and the recommendations resulting from the development of the risk register, which was compiled in Brisbane with the input of Project participants and URS from the 29th May until the 8th June, 2012.

3 CONTEXT

3.1 Background

Kevin's Corner is a proposed mining project, consisting of two open cut mines and three underground longwall mines to be developed in the late Permian Colinlea and Bandanna Formations of the Galilee Basin, Queensland, Australia. The JORC compliant coal resource for KC is approximately 4.3 billion tonnes and the proposed mine is being planned to produce approximately 30Mtpa of thermal quality coal by 2020 from 5m to 8m thick coal seams.

Kevin's Corner is located adjacent to the Hancock Coal/ GVK owned Alpha Coal Project (ACP), a 30Mtpa open cut mine, and the two will share important infrastructure. It is planned that coal from KC will be transported via a rail spur line to connect to the ACP Rail Alignment to provide port and rail access. The ACP port and rail infrastructure includes a 495km railway and upgrade to Abbott Point. The Abbott Point coal loader is currently being upgraded from 20Mtpa to 50Mtpa.

The KC Project construction is currently scheduled to commence in late 2014. The construction phase will employ up to 2500 people during its peak activity. During operations it is estimated mine population will reduce to 1500 people.

On the 11th September 2009, the Coordinator General declared KC a "significant project" under Section 26(1)(a) of the Sustainable Development and Public Works Organisation Act 1971 (SDPWO Act), which ultimately requires the proponent to prepare an environmental impact statement (EIS) for the Project. The Terms of Reference (TOR) for an environmental impact statement for the KC Project were drawn up and issued in February 2010. Since that time HGPL has prepared and submitted the KC EIS to the Coordinator General and is now in the process of preparing a supplementary EIS (SEIS) to address concerns that have been raised.

An EIS risk assessment was recommended to be undertaken to ensure that all relevant impacts and issues regarding the KC Project are properly identified and documented for follow-up and inclusion in the SEIS and Environmental Management Plan (EMP) documents. In addition the KC ROMP processes encourage the application of high level controls to eliminate or mitigate operating risks as much as possible.

Therefore the KC EIS Risk Register was compiled. The Risk Register is a compilation of previously identified risks extracted from the body of the EIS and Draft EMP, followed by a series of independently facilitated risk assessment workshops that focussed on reviewing those previously identified risks and recording and assessing newly identified risks.

3.2 Purpose

The purpose of the EIS Risk Register is to identify and evaluate potential environmental impacts that could arise at any point in time during the KC project lifecycle and devise risk control strategies to ensure those risks are properly controlled in accordance with stakeholder expectations.

3.3 Scope

The scope of the KC EIS risk register development task was to compile and review previously identified environmental impacts into a worksheet and to engage the knowledge and experience of specialist Project participants to review and rate the environmental risks in the Project.

The scope of the risk assessment process was to align with the KC ROMP and to focus on impacts on the environment. However it is inevitable in any risk assessment of this nature that other risk types will be identified and recorded. In addition to risks to the natural environment, risks to the reputation of the proponent, the health and safety of people, financial loss, project delay and production loss were all identified.

The general scope of aspects considered aligns with the TOR topics. The detailed scope / discussion list of aspects and considerations of the risk assessment is provided in Table 2 of this report.

3.4 Objectives

The objective of developing the KC EIS Risk Register was to facilitate a systematic process to enable critical and objective challenge of the subject area to assist the KC EIS Project team to categorise and understand the full range of potential environmental impacts and risks of the KC project so they can be more effectively controlled. Supplementary objectives were to:

- Engage the knowledge and experience of specialist participants in an interactive workshop to discuss impacts and issues
- Identify the potential environmental, social and economic risks issues relating to development and operation of the KC Project
- Ensure the proposed controls are sufficiently high-order and robust to eliminate, prevent occurrence and / or mitigate impacts
- Validate the content of the EIS and / or identify control strategies for inclusion in the SEIS
- Conform to the requirements of the TOR for an environmental impact statement of the Kevin's Corner Project.

The development of the risk register was undertaken in conformance with ISO AS/NZS 31000:2009 – Risk Management and the KC ROMP.

3.5 Assumptions, Limitations and Exclusions of the KC Risk Register

The KC Risk Register development process specifically excluded evaluation of a number of risks associated with the shared ACP infrastructure. For example it was assumed that the KC coal volume impacts along the ACP Rail Alignment and port facility (30Mtpa by ACP and 30Mtpa by KC) was the subject of the ACP EIS process (including risk assessment) and therefore these items were not included in the KC EIS risk register.

Social impacts were specifically excluded from the Risk Register at this time to provide greater focus on impacts to the natural environment and indigenous and non-indigenous cultural heritage issues. Transport impacts were also excluded from the Risk Register as transport issues were addressed in the Kevin's Corner Social Impacts Assessment Plan.

The KC risk register has been compiled and risks rated based on the current state of knowledge and understanding of the Project and its environment by the various participants, given the studies undertaken and their perception of the risk and appropriate controls. The KC EIS Risk Register is intended to be a live document and the KC ROMP requires that as the Project matures all risks are reviewed and updated to reflect the refinement of knowledge and data and the detailed design process, and to verify the control strategies first envisaged are achievable or flag requirement for additional controls/ further actions.

4 DEFINITIONS

Risk

The chance of something happening or circumstances arising or changing that will have an impact upon Hancock objectives, measured in terms of likelihood and consequence. It encompasses both positive and negative impacts.

Cause

The factors that must be present for identified risk issue/ loss to occur – includes direct and indirect causes.

Impact

Impacts are specific adverse effects resulting from an incident and may be related to the organisation's strategic, business, operational or project objectives (including people, the environment, plant or property) or a combination of these.

Consequence Severity

The extent to which the risk impacts on the strategic, business, operations or Project related objectives.

Exposure

The proportion of time that a window of opportunity exists where the impacts of the selected type and level of severity could be experienced.

Probability

The probability of an occurrence is taken as the chance of experiencing the selected type and severity (consequence) of occurrence, during the window of opportunity (selected exposure).

Residual Risk Rating

The rating applied to a risk determined from the Kevin's Corner Risk Matrix, by multiplying the Consequence, Exposure and Probability factors.

In this risk assessment the Key Stakeholders are identified as:

- Hancock Galilee Pty Ltd and GVK as the Project proponents
- Queensland Department of Infrastructure and Planning and the Commonwealth Government
- Indigenous and non-indigenous communities the Alpha region and the state of Queensland

Consequence Severity Abbreviations

Severity Type	Abbreviation
Health & Safety	(S)
Environment	(E)
Reputation	(R)
Financial Loss / Gain (\$US)	(F)
Irrecoverable Business Plan Production Loss	(PL)
Project Delay	(PD)
Legal	(L)
Opportunities	(O)

5 Methodology

The method used for compiling the risk register, involved the following steps:

- Compiling previously identified risks from the KC EIS and draft EMP
- Categorisation of those risks in conformance with the categories defined by the KC EIS TOR
- Reviewing the list of risks with the various Project environmental study participants to:
 - Check the risk issue is correctly defined and identify the underlying causes and latent conditions that could result in the particular risk event occurring
 - Defining what is believed to be the worst credible risk event scenario and how it would impact the natural environment, surrounding community and Company reputation
 - Recording the current control plan for eliminating or mitigating the severity and likelihood of occurrence. This information was categorised in terms of:
 - Studies and relevant findings
 - Engineering design proposed to eliminate or mitigate the risk
 - Operating processes to maintain effective control throughout the various phases of the project
 - Monitoring systems proposed to measure the effectiveness of the proposed controls
 - Adaptive management strategies, which could be used to respond to situations where monitoring indicates the proposed control systems are not effectively controlling the risk to the desired level
- Participants were also asked whether any additional risks within the TOR scope needed to be included in the Risk Register and where necessary these were added
- Having adequately defined each risk and proposed controls, the residual risk was then evaluated using the KC ROMP risk rating tools (see Appendix B) to determine whether risk levels would be controlled by the proposed means to levels acceptable to the Project Stakeholders. Wherever this was not being achieved additional controls / further actions to achieve this were recorded
- The risk register was developed in spreadsheet format and this report prepared to provide a durable record of the process. High level environmental risks from this risk register will be transferred to the KC Project Risk Register to ensure they continue to be monitored throughout the Project lifecycle.

The risk assessment process was coordinated by an independent facilitator, with experience in facilitating many mining and environmental risk assessments and with a good understanding of the correct application of the KC ROMP and its methodologies.

Prior to commencing the workshop sessions with the Project environmental study participants, the facilitator explained the risk assessment process and the correct use of the KC ROMP risk rating tools (see Appendix B).

5.1 Participants

The people involved in the process of compiling the KC EIS Risk Register were people having appropriate qualifications and experience in their particular field of expertise and in many cases participated in baseline studies and/ or are currently working on the Project. Table 1 – Workshop Participants following details the people engaged in the risk register compilation and risk assessment process and their position in relation to the Project and field of expertise.

Name	Position	Organisation	Yrs in Field of Expertise	29/05/2012	30/5/2012	31/05/2012
Luke Gracias	Approvals Manager – Kevin's Corner	HGPL	18	✓	-	✓
Michael Clarke	Environmental	SG Environmental	20	✓	✓	✓
Stuart Bennett	Kevin's Corner – Air Quality Impacts	URS	12	-	✓	-
Julian Long	Kevin's Corner – Surface Water Impacts	URS		-	-	✓
Benjamin Gall	Kevin's Corner – Cultural Heritage Impacts	Converge		-	✓	-
Robert Storrs	Kevin's Corner – Waste Impacts / Ecology / Terrestrial	URS	15	-	✓	✓
Elisha Keighly	Kevin's Corner – Waste Impacts	URS	10	-	✓	-
Sarah Connelly	Approvals – Assistant Manager for Kevin's Corner	HGPL	7	✓	✓	✓
Mark Stewart	Groundwater Study Lead	URS		✓	-	-
Miguel Del Maata	Noise / Vibration / Overpressure	URS		-	-	✓
Chris Allanson	Risk Manager for Kevin's Corner	HMS	30	✓	✓	✓

Table 1 – Workshop Participants

5.2 Aspects and Considerations of the Risk Register

The risk register systematically discussed the aspects and considerations presented in *Table 2 – Aspects and Considerations*, following. A review of the KC EIS TOR verified that the Aspects covered are aligned with the TOR.

Aspects	Ref#	Considerations
Landscape Character	1.01	View shed
	1.02	Night Time Lighting
Land Contamination	2.01	Pre-existing Contamination
	2.02	Hydrocarbons and chemicals
Terrestrial Ecology	3.01	Listed Vegetative Communities
	3.02	Residual impacts to vegetative communities
	3.03	Weeds
	3.04	Rehabilitation Success
	3.05	Environmental Offsets
	3.06	Terrestrial Fauna Habitat
	3.07	Fauna species of conservation significance
	3.08	Pest Fauna Species
Topography & Land Disturbance	4.01	Subsidence due to underground pits
	4.02	Surface Operations Areas
	4.03	Water dams
	4.04	Out of pit tailings dams
	4.05	Construction of railway
	4.06	Strategic Cropping Land
Soils	5.01	Acid Sulphate Soils
	5.02	Soils Stock
	5.03	Landform design
Geology	6.01	The D-E sandstone below the D seam
	6.02	Final pit walls
	6.03	The AMD potential of the units
	6.04	The sandstone unit between the C and D coal seams, the C-D aquifer
	6.05	Resource sterilisation
	6.06	The coal seam propensity for spontaneous combustion
	6.07	The potential impacts of blasting using ANFO
	6.08	The management of Fossils
	6.09	The management of fine rejects & tailings
	6.10	The geological implications for rehabilitation and mine closure planning
Indigenous Cultural Heritage	7.01	Ceremonial sites, other sites and / or artefacts
Non-Indigenous Cultural Heritage	8.01	Six non-indigenous cultural heritage sites identified in the mine area
Surface Water	9.01	Surface Water - Construction and Commissioning Phase
	9.02	Surface Water - Operations Phase
	9.03	Surface Water - Decommissioning Phase
	9.04	Hydrology
	9.05	Geomorphic Impacts

Aspects	Ref#	Considerations
	9.06	Subsidence Impact
GHG's	10.01	Direct (Scope 1) & indirect (Scope 2) GHG emissions from the project
Climate Change	11.01	Increased rainfall intensity.
	11.02	Decreased rainfall and increased evaporation.
	11.03	More severe storm / cyclone events.
Waste	12.01	General Waste - Construction
	12.02	General Waste - Operation, including; decommissioning and landfill
	12.03	Residual Waste - Offsite Disposal
	12.04	Mining Waste
Noise & Vibration	13.01	Noise during construction or operations of KC site
	13.02	Operational Blasting Noise & Vibration
	13.03	Off-site traffic noise
	13.04	Noise & vibration during operation of KC Rail Spur Line
	13.05	Noise & vibration during construction of KC Rail Spur Line
	13.06	Noise Impacts on Fauna
Air Quality	14.01	Dust - Particulate Matter
	14.02	Emissions
	14.03	Cumulative impacts with Alpha Mine
Aquatic Ecology	15.01	Diversion of Little Sandy Creek
	15.02	Aquatic Habitat
	15.03	Aquatic Flora & Fauna
	15.04	Aquatic Weeds
	15.05	Stygofauna
Land Use & Tenure	16.01	Surrounding Homesteads & Agricultural Pursuits
	16.02	Key Resource Areas
	16.03	Residential, Rural & Industrial Land Uses & Zoning
	16.04	Native Title
	16.05	Nearest Residences
	16.06	Areas of High Ecological Significance
	16.07	Water Storage Catchment Impacts
Ground Water	17.01	Dewatering in advance of mining
	17.02	Mining impacts on / interaction with groundwater
	17.03	Post mining/ long term groundwater effects

Table 2 – Aspects and Considerations

5.3 Measurement of Risk

The measurement of risk in this risk assessment process is qualitative, relying on the expert judgement of participants who have knowledge and experience in their particular field and familiarity with the proposed Project.

The KC ROMP requires two points to be identified on the risk curve; the worst credible case (maximum foreseeable loss, or MFL) and the residual risk given the perceived effectiveness and efficiency of proposed controls for the particular risk. These two points are depicted in the Figure 1, following. The purpose of identifying these two points is to maintain management focus on the high consequence, low probability events, even though they may be well controlled. The residual risk rating is based on the severity of the most likely impact with the proposed controls implemented, and the point above which impacts are not sustainable for the Stakeholders.

The residual risk rating may be made on the catastrophic or MFL severity, if in the opinion of the participants they consider this more appropriate for managing the risk. It may often be necessary to rate on the MFL during the early stage of a project when control strategies are not well developed.

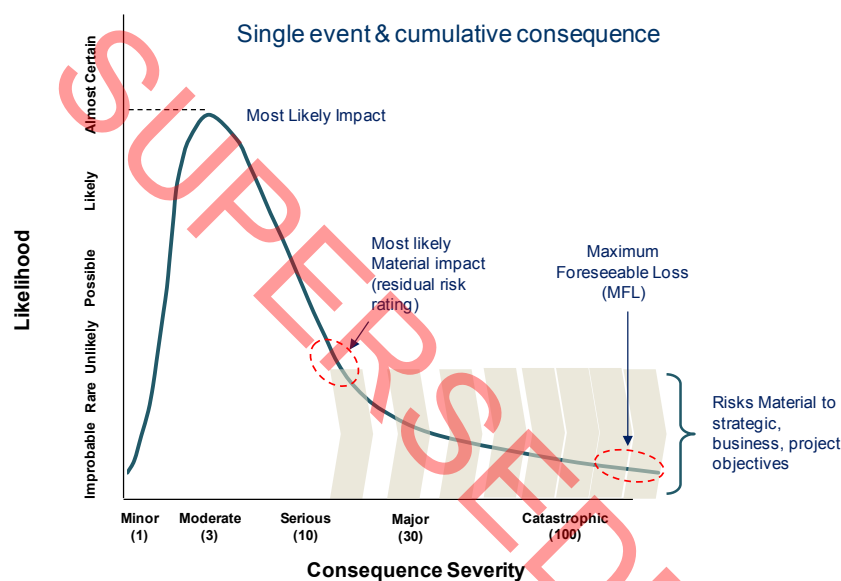


Figure 1 – Relationship of consequence and likelihood of risks

Having selected the MFL and consequence severity which will be used for residual risk rating the ROMP risk assessment process requires analysis of the proportion of time the project is exposed to the risk and the probability of incurring the actual severity of impact during that exposure time.

The exposure selected took into account the proposed controls which are both preventative and mitigating in nature.

The probability selected was the probability of the selected risk consequence severity occurring, based on the expert judgement of the participants, drawing on their knowledge and experience of the effectiveness and efficiency of similar controls applied in other projects.

5.4 Risk Reduction Strategy

Depending upon the risk level determined from the residual risk rating, additional controls / further actions were identified to reduce unacceptable risks to a level acceptable to the Stakeholders. The additional controls / further actions must be assigned to the appropriate people for completion.

6 RESULTS

6.1 Summary of Risks

Seventy eight (78) risks are defined in the KC EIS Risk Register. Forty one (41) of these were rated on their potential impact on the natural environment, while others were rated on their impact to safety, reputation, project delay, production and financial loss.

Nil (0) risks were thought to have a "Critical" residual risk rating and only one (1) was thought to have a "High" residual risk rating. This risk is summarised as follows.

- Risk #3.02.01, Residual impacts to vegetative communities after completion of final rehabilitation of the mine. This risk was rated high because at this stage of the Project, without verified rehabilitation success in the area, it is considered that the relinquishment of the lease could possibly be delayed due to additional time required to establish acceptable revegetation standards.

Nil (0) residual risk ratings were recorded on the basis of a "Catastrophic" consequence severity.

Figure 2, following provides the distribution of all risks by residual risk level currently on the risk register.

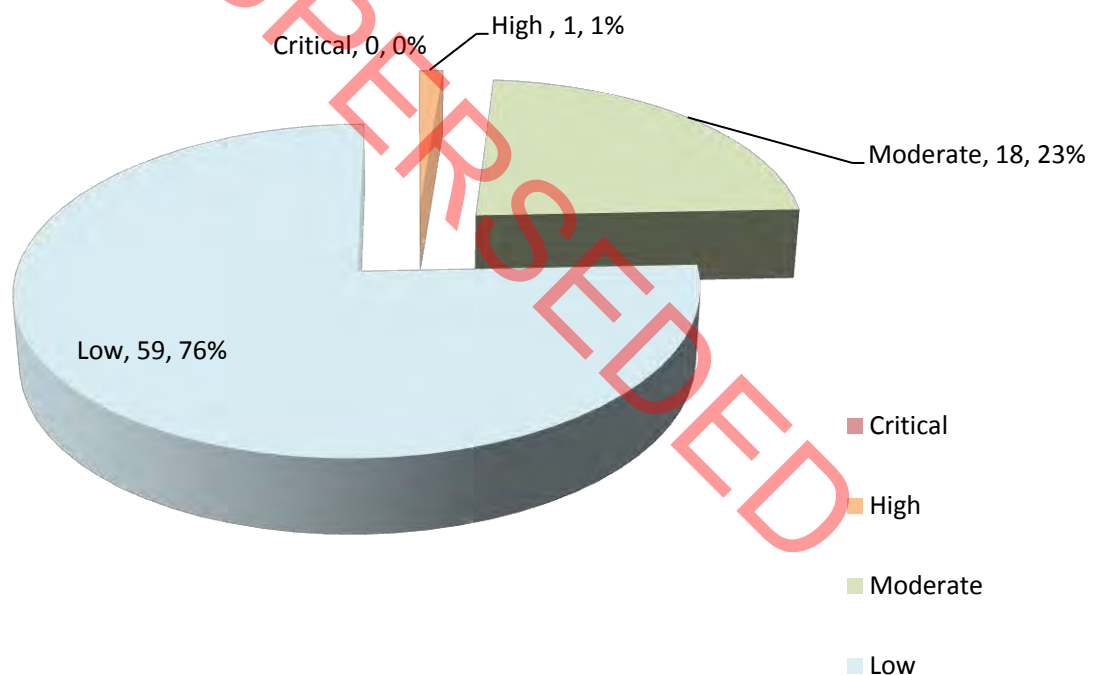


Figure 2 – Residual risk distribution

Figure 3, following provides the distribution of the number of risks in each Aspect considered by residual risk level.

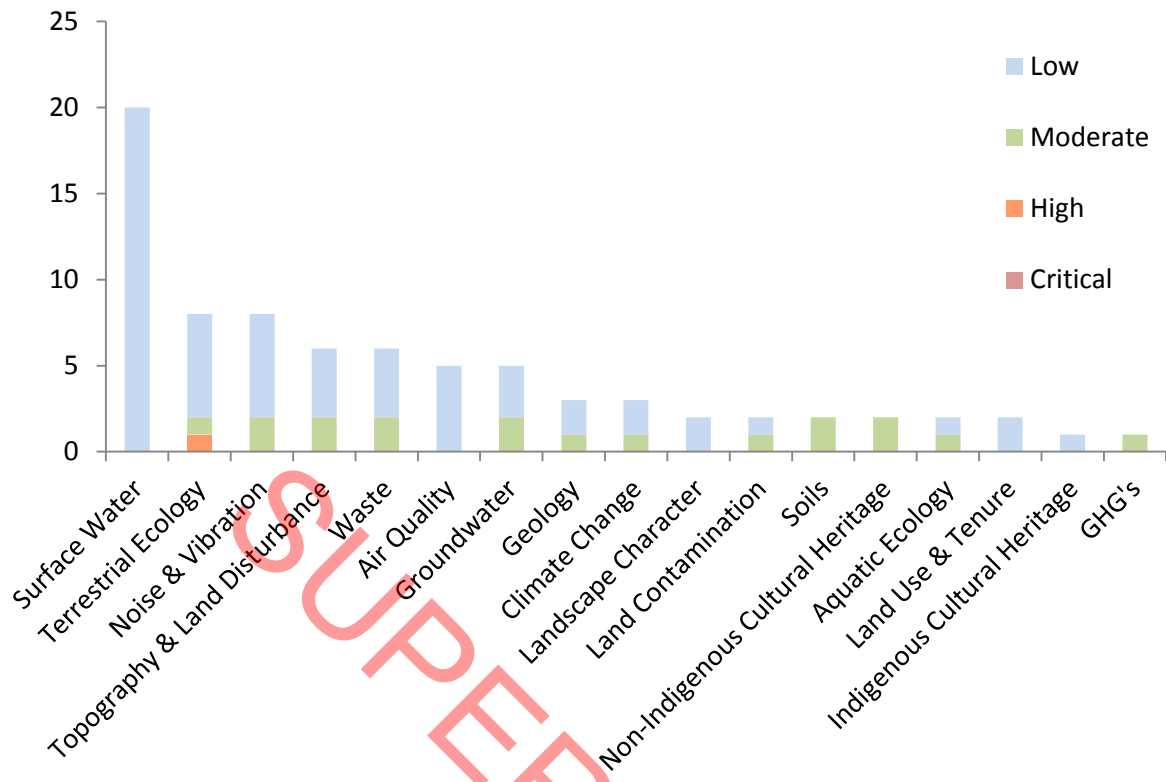


Figure 3 – Number of risks in each aspect by residual risk level

Figure 4, following provides the distribution of residual risks by severity type.

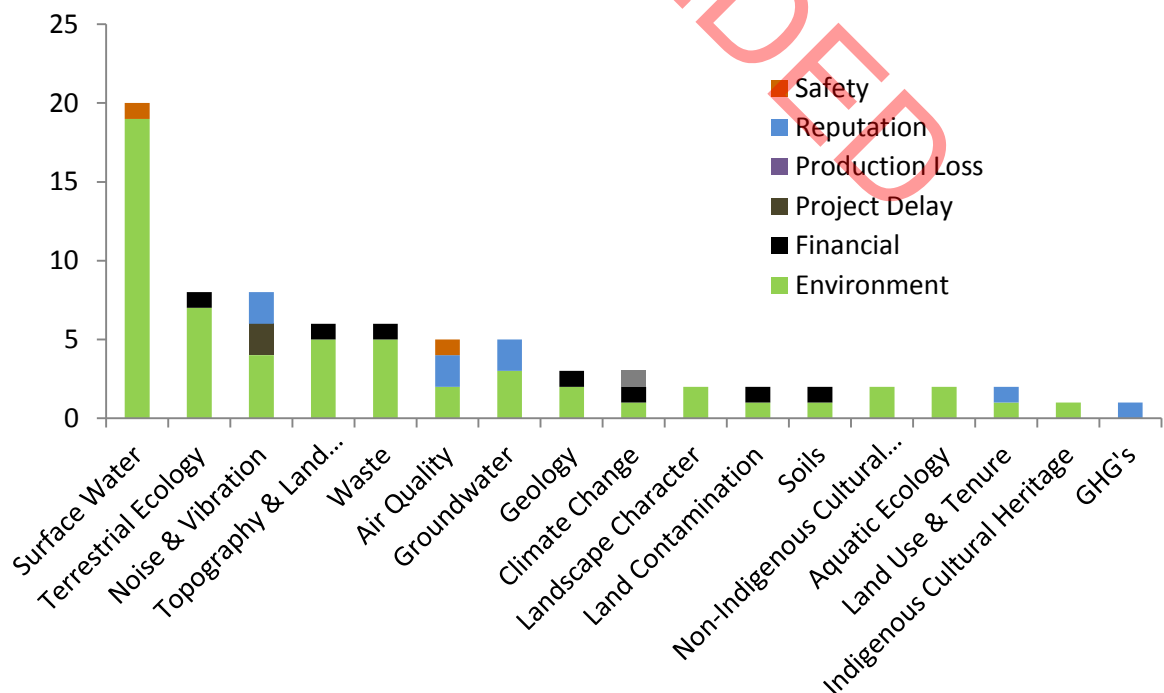


Figure 4 – Residual risks by risk severity type

6.2 Summary of Important Risks

The following table summarises the most important risks from the current KC EIS Risk Register. The table presents the risks with a maximum foreseeable loss (MFL) severity of "Major" or "Catastrophic" or those with "Critical" and "High" Residual risk rating (RRR) levels.

Risk	Maximum Foreseeable Loss	Residual Risk
3.02.01, Residual impacts to vegetative communities after completion of final rehabilitation of the mine	Failure to meet rehab criteria and fail to/ delays to relinquish lease. - Major Long term localised reduction in species habitat - Serious	High
4.02.01, Permanent degradation of previous land class/ quality in surface operations areas	Failure to meet rehabilitation criteria and fail to/ delays to relinquish lease - Major Long term reduction in species habitat	Moderate
5.02.01, Soils rendered unsuitable for rehabilitation of the site, due to poor stripping, handling and storage of soils	Loss of soil creating a topsoil deficit and creating a rehabilitation failure - Major Increased cost for rehabilitation - Serious Inability to/ delays to relinquish lease - Major	Moderate
11.02.01, Inadequate rainfall for rehabilitation due to climate change	Delay in achieving effective rehabilitation leading to increased costs and longer time to relinquish lease - Major	Moderate
12.04.01, Acid metalliferous discharge (AMD) from overburden storage areas, due to poor PAF materials identification placement capping or operational cost-based decisions to deviate from Mine Waste Management Plan	Contamination of groundwater and surface water - Major Rehabilitated land failure - Serious Inability to relinquish lease at end of mining - Major Loss of bank guarantee could be more than \$50M	Moderate
9.02.07, Loss of hazardous load in transit	Fuel tanker accident leading to hydrocarbon spill into receiving environment - Serious Subsequent safety hazard to people and other road user - Serious Potential loss of life - Major	Low
7.01.01, Disturbance to Aboriginal cultural heritage, e.g. ceremonial site and / or artefacts	Breach of CHMP could in worst case trigger a 30 day cessation of operations, which would need to be resolved through the courts - Major	Low
9.04.02, Changes in flood hydrology downstream due to newly constructed diversion channels and levees	Changes to the flooding regime downstream - Major	Low
12.04.02, Generation / release of acid metalliferous discharge (AMD), salinity. trace metals from tailings storage areas	Failure of tailings storage facility, contaminating receiving environment - Major Associate clean up costs, fines. Serious reputational impact. Serious environmental impact. Major disruption to production	Low
14.03.01, Cumulative air quality impacts of KC and other mines in area	Restrictive Conditions too onerous limit production potential of the project - Major	Low

Table 3 – "Major" or "Catastrophic" MFL and "Critical" or "High" RRR Level

The bars in Figure 5, following present the relative proportion of consequence severity used in residual risk ratings by consequence severity type.



Figure 5 – Relative consequence severity in residual risks of each risk type

The full details in the KC EIS Risk Register are presented in Appendix A of this report.

Attachment B – Proposed EA Conditions Summary Table

For sections of the EMP for which Environmental Authority Conditions have been developed, the commitments, actions and monitoring requirements to fulfil the conditions have been summarised in to a tabular Site Based Management Plan (SBMP). The intent of this SBMP is to act as a practical, condensed source of essential information which is an initial point of reference for workers in the field who are charged with implementing the EA Conditions. The SBMP is back-referenced to the main EMP document and the EIS, directing the reader to sources of containing more detail on EA related topics as required. The SBMP will be updated to reflect ongoing changes in the EIS, main EMP and EA Conditions.

SCHEDULE A – GENERAL ENVIRONMENT	
Financial Assurance	
A1	Provide to the administering authority financial assurance for the amount and in the form acceptable to the administering authority in accordance with the most recent edition of the DEHP guideline - <i>Calculating Financial Assurance for Mining Projects</i> (120822-EM585) before the proposed mining activities can commence or be varied. <i>(Note: The calculation of financial assurance for condition (A1) must be in accordance with Guideline 17 as referred to in s. 364(4) of the EP Act, and may include a performance discount. The amount is defined as the maximum total rehabilitation cost for complete rehabilitation of all disturbed areas, which may vary on an annual basis due to progressive rehabilitation. The amount required for the financial assurance must be the highest Total Rehabilitation Cost calculated for any year of the Plan of Operations and calculated using the formula: (Financial Assurance = Highest Total Annual Rehabilitation Cost x Percentage Required).</i>
A2	The financial assurance is to remain in force until the administering authority is satisfied that no claim on the assurance is likely. <i>(Note: Where progressive rehabilitation is completed and acceptable to the administering authority, progressive reductions to the amount of financial assurance will be applicable where rehabilitation has been completed in accordance with the acceptance criteria defined within this Environmental Authority).</i>
A3	The amount of financial assurance must be reviewed by the holder of this Environmental Authority when a plan of operations is amended or replaced or the Environmental Authority is amended.
Coal Extraction	
A4	The Environmental Authority holder is approved for a coal extraction rate of up to 30 million tonnes per annum (mtpa) of product coal in accordance with this Environmental Authority.
Maintenance Of Measures, Plant & Equipment	
A5	The Environmental Authority holder must ensure that: <ul style="list-style-type: none"> (a) All measures, plant and equipment necessary to ensure compliance with the conditions of this Environmental Authority are installed; (b) Such measures, plant and equipment are maintained in a proper condition; and (c) Such measures, plant and equipment are operated in a proper manner.
Monitoring & Records	
A6	Except where specified otherwise in another condition of this authority, all monitoring records and reports required by this Environmental Authority must be kept for a period of not less than five (5) years.

**SCHEDULE A – GENERAL ENVIRONMENT**

A7	Upon request from the administering authority, copies of monitoring records and reports must be made available and/ or provided to the administering authority's nominated office within 10 business days or by an alternative timeframe agreed between the administering authority and the holder.
A8	Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this Environmental Authority must be reviewed for effectiveness in minimising the likelihood of environmental harm on an annual basis, and amended promptly if required, unless a particular review date and amendment program is specified in the plan system or program.

Notification Of Emergencies, Incidents & Exceptions

A9	The holder of this Environmental Authority must notify the administering authority by written notification within 24 hours, after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this Environmental Authority.
A10	The holder of this Environmental Authority must notify the administering authority by written notification within 24 hours, after becoming aware of any emergency, incident or information about circumstances which results or may result in environmental harm not in accordance with the conditions of this Environmental Authority of a contravention of the conditions of this Environmental Authority.
A11	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, written advice must be provided to the administering authority in relation to: <ul style="list-style-type: none">(a) Proposed actions to prevent a recurrence of the emergency or incident;(b) The outcomes of actions taken at the time to prevent or minimise environmental harm; and(c) Proposed actions to respond to the information about circumstances which result or may result in environmental harm.
A12	The notification in conditions A10-A12 must include, but not be limited to, the following: <ul style="list-style-type: none">(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:<ul style="list-style-type: none">iv. the estimated quantity and type of substance involved in the emergency or incident;v. the actual or potential cause of the emergency or incident;vi. 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.

SCHEDULE A – GENERAL ENVIRONMENT

Risk Management

A13	<p>The holder of this Environmental Authority must develop and implement a risk management system for mining activities which conforms to the Standard for Risk Management (ISO31000:2009) within three months of issue of this Environmental Authority.</p> <p><i>(Note: Implementation of a risk management system is not a defence against a breach of any condition of this Environmental Authority)</i></p>
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Emergency Response & Contingency Planning

A14	An emergency response/ contingency plan must be developed and implemented within the current plan of operations to manage unacceptable risks identified in the risk management system or the associated monitoring.
A15	<p>The emergency response / contingency plan must address the following matters:</p> <ul style="list-style-type: none"> (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 the 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 circumstances and nature of incidents to the administering authority.

Third Party Audit

A16	The holder of the Environmental Authority must nominate an appropriate third party auditor to audit compliance with the conditions of this Environmental Authority within 1 year of the commencement of the Environmental Authority and then at regular intervals not exceeding 3 years.
A17	The holder must at its cost, arrange for independent certification of a third party auditor of findings of the audit report required under condition A17.
A18	<p>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:</p> <ul style="list-style-type: none"> (a) Actions taken by the holder of this Environmental Authority to ensure compliance with this Environmental Authority; and (b) Actions taken to prevent the recurrence of non- compliance.

Activity

A19	Contaminants must not be released to the receiving environment unless they are in accordance with the contaminant limits authorised by this Environmental Authority.
A20	This Environmental Authority authorises environmental harm referred to in the conditions. Where no condition exists or this Environmental Authority is silent on matter, the lack of condition or silence does not authorise environmental harm.

**SCHEDULE B – AIR QUALITY****General**

- | | |
|-----------|---|
| B1 | The release of noxious and offensive odours, or any other noxious or offensive airborne contaminants resulting from the activities to which this Environmental Authority relates, must not cause a nuisance at any sensitive place. |
|-----------|---|

Dust Nuisance

- | | |
|-----------|--|
| B2 | The holder must implement and maintain best practice dust control procedures that incorporates a program for continuous improvement for the management of dust resulting from mining activities with respect to, but not limited to equipment selection, mine planning, engineering design and operation and staff training. |
| B3 | Dust and particulate matter must not exceed any of the following levels when measured at any nuisance sensitive place: <ul style="list-style-type: none">(a) A level of deposited dust of 120 milligrams per square metre per day based on a monthly average;(b) A concentration of total particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time. |
| B4 | The holder must take all reasonable and practicable measures to limit the concentration of particulate matter generated by the mining activities with an aerodynamic diameter of less than 10 micrometres, to 50 micrograms per cubic metre suspended in the atmosphere over a 24 hour averaging time with not more than 5 exceedances recorded over 12 months in any sensitive place. |

Dust Monitoring Program

- | | |
|-----------|---|
| B5 | The holder of the Environmental Authority must develop and implement a dust and particulate matter monitoring and control program. |
| B6 | The Program shall include, but not necessarily be limited to: <ul style="list-style-type: none">(a) The collection of air quality and meteorological data at locations specified in(b) Table B-1 Ambient Dust Monitoring Program and using the combination of monitoring methods described in Table B- 2 Air Quality Monitoring Methods specified by the administering authority for each of the locations and included in the Plan of Operations for operational activities.(c) A system to identify adverse meteorological conditions likely to produce elevated levels of PM10 at a sensitive place due to mining activities; and(d) A dust control strategy that would activate the timely implementation of high management dust control actions (listed in Table B- 3 Supplementary Particulate Control Measures) in addition to the best practice dust control measures during periods identified in (b). |


SCHEDULE B – AIR QUALITY

TB-1 Ambient Dust Monitoring Program	Air Quality Determination	Sampling Frequency	Relevant upwind location	Monitoring point location (GDA 94)		Monitoring point description
				Lat	Long	
	PM ₁₀	Hourly	NA	-22.9578	146.4778	AQMS(1): Forrester Homestead
	Dust Deposition	Monthly	DDG(U1): Upwind Gauge 1	-22.9578	146.4778	DDG(1): Forrester Homestead
			DDG(U2): Upwind Gauge 2	-22.9823	146.6076	DDG(2): Surbiton Station
			DDG(U3): Upwind Gauge 3	-22.9995	146.6005	DDG(3): Eulimbie Homestead
			DDG(U3): Upwind Gauge 3	-23.0254	146.6500	DDG(3): Eulimbie Homestead
			DDG(U3): Upwind Gauge 3	-23.0450	146.6001	DDG(3): Eulimbie Homestead
	NA	-22.9994	146.3688	DDG(4): Cudmore Resources Reserve		
	Meteorological data	Hourly	NA	-23.0658	146.5769	M(A): Kevin's Corner Coal Mine Project Airport
-22.9578				146.4778	AQMS(1): Forrester Homestead	
TB-2 Air Quality Monitoring Methods	Method			Standard		
	Concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre PM ₁₀ suspended in the atmosphere over a 24 hour averaging time.			AS 3590.9.8: 2008		
	Concentration of particulate matter suspended in the atmosphere in micrograms per cubic metre over a 24 hour averaging time.			AS/NZS 3580.9.3: 2003		
	Deposited dust			AS 3580.10.1: 2003		
	Meteorological data			AS 2923- 1987		
	Siting of monitoring equipment			AS/NZS 3580.1.1: 2007		
TB-3 Additional Dust & Particulate Control Options	Activity		High management control			
	Dragline – overburden		Check operators are working to standards (e.g. drop height), modification of swing pattern			
	Truck and shovel		Additional watering, relocation (partial or full)			
	Truck loading coal		Additional watering, relocation (partial or full)			
	Bulldozing-overburden		Reschedule operations or relocate			
	Truck dumping – overburden		Additional watering, rescheduling, reposition			
	Tailings disposal area		Additional watering, rescheduling, reposition, within spoil dump			
	ROM-erosion active stockpile		Regular water sprays			
	Truck dumping coal		Regular water sprays			
	Loading trains		Operation of the veneering system			

**SCHEDULE B – AIR QUALITY**

	Conveyor	Application of additional water
	Blasting-overburden	Redesign of Blasting Plan or rescheduling of blast
	Drilling-overburden	Redesign of Blasting Plan, additional watering, rescheduling, relocation
	Haul roads	Additional watering, treatment with suppressant or modify operation
	Grader	Additional watering or rescheduling
B7	The dust and particulate matter monitoring program must be submitted to the administering authority with the Plan of Operations.	
B8	<p>Where monitoring at locations identified in Table B-1 Ambient Dust Monitoring Program indicates that the air quality objectives detailed in condition B3 have been exceeded, the holder must investigate the matter and report to the administering authority within fourteen (14) days of receipt of monitoring results:</p> <ul style="list-style-type: none">(a) The concentration of PM₁₀ particulates or dust deposition rate recorded;(b) A description of meteorological conditions occurring at the time; and(c) The measures taken to reduce dust generated by the mining activities.	
B9	If requested by the administering authority, dust and particulate monitoring must be undertaken for a stated period at a specified sensitive place, and the results provided to the administering authority within fourteen (14) days following completion of monitoring.	
B10	<p>If monitoring conducted pursuant to condition B9 indicates an exceedance of the levels detailed in condition B3, the holder must:</p> <ul style="list-style-type: none">(a) Address the complaint through the use of appropriate dispute resolution if required; and(b) Implement dust abatement measures as soon as reasonably practicable.	
B11	The results of PM ₁₀ , dust deposition and meteorological monitoring must be reported to the administering authority on request. If requested, the results of PM ₁₀ , dust deposition and meteorological monitoring will be made available for use in any air quality monitoring network in the region operated independently of mining operations.	
B12	<p>The holder of the Environmental Authority must report annually to the administering authority:</p> <ul style="list-style-type: none">(a) The results and an analysis of dust and particulate matter monitoring, including consideration of the relevant meteorological data.(b) Details of the use of high management control measures including the dust and atmospheric conditions that triggered the action, when, where and what action was applied, and the effectiveness of the action meeting the requirements of conditions B3 and B4.(c) Identification of any trends (daily and seasonally) that should be considered in management of the mining activities and dust management practices; and(d) Any changes to the dust and particulate control actions and monitoring resulting from an analysis of a, b and c.	
Dust Management Plan		
B13	<p>As part of the Environmental Management Plan required for the project approval, the holder shall prepare and implement a Dust Management Plan to outline measures to minimise and manage any impacts from the operation of the project on local air quality. The Plan shall include, but not necessarily be limited to:</p> <ul style="list-style-type: none">(a) Identification of all major sources of dust emissions from the sources identified;(b) Description of the procedures to manage the dust emissions from the sources identified;	

SCHEDULE B – AIR QUALITY

- (c) Collection of air quality and meteorological data at each location;
- (d) Identifying adverse meteorological conditions likely to produce elevated levels of PM10 at a sensitive or commercial place due to the mining activities;
- (e) Developing a weather forecasting system for the site;
- (f) Integration of dust control strategy with the weather forecasting system that would activate the timely management of dust control in addition to the best practice dust control measures during adverse meteorological conditions;
- (g) Protocols for regular maintenance of plant and equipment, to minimise the potential for fugitive dust emissions; and
- (h) Description of procedures to be undertaken if any non-compliance is detected.

General Dust Control

- | | |
|------------|---|
| B14 | The holder must design, construct, commission, operate and maintain the project in a manner that minimises or prevents the emission of dust from the site including wind-blown and traffic generated dust. |
| B15 | The holder must design, construct, operate and maintain the project in a manner that minimises the potential generation of fugitive dust emissions from plant and equipment, including where relevant and practicable, design of the project to minimise the number of coal transfer points, minimise the drop height from stackers to stockpiles, full or partial enclosure of conveyers and installation of wind shields and belt cleaning systems to conveyers. |
| B16 | <p>For the purpose of avoiding any release of dust or particulate matter from the approved place which could cause environmental nuisance, the following measures must be taken:</p> <ul style="list-style-type: none"> (a) Stockpiles must be maintained using all reasonable and practicable measures to minimise the release of wind-blown or particulate matter to the atmosphere. Reasonable and practicable measures may include but are not limited to, anemometer switching systems which trigger operation of effective water spray systems during winds likely to generate such releases, uses of approved dust suppressants, shielding and storage in bunkers. (b) Trafficable areas must be maintained using all reasonable and practicable measures to minimise the release of windblown dust or traffic generated dust to the atmosphere. Reasonable and practicable measures may include but are not limited to, sealing with bitumen or other suitable material; keeping surfaces clean; use of water sprays; adoption and adherence to speed limits (e.g. less than 50 kmph for unsealed road); use of approved dust suppressants and wind breaks. (c) External transfer conveyers must be operated and maintained using all reasonable and practicable measures to minimise the release of wind-blown dust or particulate matter to the atmosphere. Reasonable and practicable measures may include, but are not limited to, transfer of materials in a moist state; enclosure or sealing of conveyers; use of water sprays at transfer points; shielding and wind breaks; and (d) Water sprays must be installed at all major dust emission sources. |

Odour Nuisance

- | | |
|------------|--|
| B17 | The release of noxious and offensive odours or any other noxious or offensive air borne contaminants resulting from the mining activity must not cause an environmental nuisance at any nuisance sensitive or commercial place. |
| B18 | 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 14 days to the |

**SCHEDULE B – AIR QUALITY**

	administering authority following completion of monitoring.
B19	<p>If the administering authority determines the odour released to constitute an environmental nuisance the Environmental Authority holder must:</p> <p>(a) Address the complaint including the use of appropriate dispute resolution if required; and</p> <p>(b) Immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental nuisance.</p>
Meteorological Monitoring	
B20	<p>The Environmental Authority holder must establish and maintain a permanent automatic meteorological station to continuously measure and record wind speed, wind direction, temperature, relative humidity and rainfall intensity.</p> <p><i>(Note: It is possible for the Environmental Authority holder to use relevant and available weather monitoring information collected by other parties as reference data for the purposes of this condition).</i></p>
B21	The holder must record, compile and keep all monitoring records obtained from the automatic meteorological station.

SCHEDULE W – WATER

Contaminant Release						
W1	Contaminants that will or have the potential to cause environmental harm must not be released directly or indirectly to any waters except as permitted under the conditions of this Environmental Authority.					
W2	Unless otherwise permitted under the conditions of this Environmental Authority, the release of mine affected water to receiving waters must only occur from the release points specified in Table TW-1 Mine Affected Water Release Points, Sources & Receiving Waters					
TW-1 Mine Affected Water Release Points, Sources & Receiving Waters	Name	Release point Latitude	Release point Longitude	Contaminant source and location	Monitoring point	Receiving water description
	RP1	-23.0703	146.4299	MWD1	Outlet works direct into Middle Creek – from release point	Middle Creek
	RP2	-23.0658	146.4994	MWD2	Outlet works direct into Sandy Creek – from release point	Sandy Creek
	RP3	-23.0900	146.4991	MWD3	Outlet works direct into Sandy Creek – from release point	Sandy Creek
	RP4	-23.1038	146.5046	MWD4	Outlet works direct into Sandy Creek – from release point	Sandy Creek
	RP5	-23.0547	146.4194	MWD1	Spillway	Well Creek
	RP6	-23.0736	146.5263	MWD2	Spillway	Sandy Creek
	RP7	-23.0897	146.5048	MWD3	Spillway	Sandy Creek
	RP8	-23.1031	146.5113	MWD4	Spillway	Sandy Creek

**SCHEDULE W – WATER**

	RP9	-23.0996	146.4270	Borefield Dam 1	Spillway	Little Sandy/Rocky Creek Diversion
	RP10	-23.1200	146.4269	Borefield Dam 2	Spillway	Little Sandy/Rocky Creek Diversion
	RP11	-23.1516	146.4404	Adit/ROM dam south	Spillway	Sandy Creek
W3	The release of mine affected water to receiving waters in accordance with condition W2 must not exceed the release limits stated in Table W-2 Mine Affected Water Release Limits, when measured at the monitoring points specified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters.					
TW-2 Mine Affected Water Release Limits	Quality Characteristic	Release Limits			Monitoring frequency	
	Electrical conductivity (uS/cm)	Release limits specified in Table W-4 for variable flow criteria.			Daily during release (the first sample must be taken within 2 hours of commencement of release)	
	pH (pH Unit)	6.5 (minimum) 9.0 (maximum)			Daily during release (the first sample must be taken within 2 hours of commencement of release)	
	Turbidity (NTU)	Limit derived from suspended solids limit and demonstrated correlation between turbidity to suspended solids historical monitoring data for dam water			Daily during release (first sample within 2 hours of commencement of release)	
	Suspended Solids (mg/L)	Limit to be determined based on receiving water reference data and achievable best practice sedimentation control and treatment*			Daily during release (first sample within 2 hours of commencement of release)	
	Sulphate (SO42-) (mg/L)	Release limits specified in Table W-4 for variable flow criteria.			Daily during release (first sample within 2 hours of commencement of release)	
W4	The release of mine affected water to waters from the release points must be monitored at the locations specified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters for each quality characteristic and at the frequency specified in Table W-2 Mine Affected Water Release Limits and Table W-3 Release Contaminant Trigger Investigation Levels.					
TW-3 Release Contaminant Trigger Levels	Quality Characteristic	Trigger Levels (µg/L)	Comment on Trigger Value			Monitoring Frequency
	Aluminium	1172	80th percentile of reference data			Monitoring



SCHEDULE W – WATER

	Arsenic	13	For aquatic ecosystem protection, based on SMD guideline	to be commenced within 2 hours of commencement of the release, and then 24 hours thereafter.
	Cadmium	0.2	For aquatic ecosystem protection, based on SMD guideline	
	Chromium	3	80th percentile of reference data	
	Copper	4	80th percentile of reference data	
	Iron	2234	80th percentile of reference data	
	Lead	4	For aquatic ecosystem protection, based on SMD guideline	
	Mercury	0.2	For aquatic ecosystem protection, based on SMD guideline	
	Nickel	11	For aquatic ecosystem protection, based on SMD guideline	
	Zinc	16	80th percentile of reference data	
	Boron	370	For aquatic ecosystem protection, based on SMD guideline	
	Cobalt	90	For aquatic ecosystem protection, based on SMD guideline	
	Manganese	1900	For aquatic ecosystem protection, based on SMD guideline	
	Molybdenum	34	For aquatic ecosystem protection, based on SMD guideline	
	Selenium	10	For aquatic ecosystem protection, based on SMD guideline	
	Silver	1	For aquatic ecosystem protection, based on SMD guideline	
	Uranium	1	For aquatic ecosystem protection, based on SMD guideline	
	Vanadium	10	For aquatic ecosystem protection, based on SMD guideline	
	Ammonia	900	For aquatic ecosystem protection, based on SMD guideline	
	Nitrate	1100	For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN	
	Petroleum hydrocarbons (C6-C9)	20		
	Petroleum hydrocarbons (C10-C36)	100		
	Fluoride (total)	2000	Protection of livestock and short term irrigation guideline	
	Sodium (ug/L)	18000	For aquatic ecosystem protection, based on SMD guideline	
W5	If quality characteristics of the release exceed any of the trigger levels specified in Table W-3 Release Contaminant Trigger Investigation Levels during a release event, the Environmental Authority holder must compare the downstream results in the receiving waters to the trigger values specified in Table W-3 Release Contaminant Trigger Investigation Levels and:			

SCHEDULE W – WATER

	<div>(a) where the trigger values are not exceeded then no action is to be taken; or</div> <div>(b) where the downstream results exceed the trigger values specified in Table W-3 Release Contaminant Trigger Investigation Levels for any quality characteristics, compare the results of the downstream site to the data from background monitoring sites and:<div><div>iii. if the result is less than the background monitoring site data, then no action is to be taken; or</div><div>iv. 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 in the next annual return, outlining:<div><div>- details of the investigations carried out; and</div><div>- actions taken to prevent environmental harm</div></div></div></div></div>								
W6	If an exceedance in accordance with condition W5 (b)(ii) is identified; the holder of the authority must notify the administering authority within fourteen (14) days of receiving the result.								
Contaminant Release Events									
W7	The holder must ensure stream flow gauging stations are installed, operated and maintained to determine and record stream flows at the locations and flow recording frequency specified in Table W-4 Mine Affected Water Releases during Flow Events.								
TW-4 Mine Affected Water Releases during Flow Events	Receiving waters/ stream	Release Point (RP)	Gauging station	Gauging Station Latitude (decimal degree, GDA94)	Gauging Station Longitude (decimal degree, GDA94)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for discharge (m ³ /s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity and Sulphate Release Limits
	Sandy Creek	RP2, RP3, RP4	Sandy Creek Gauging Station	23.075557	146.49855	Continuous (minimum daily)	Low Flow <3.5 m3/s for a period of 28 after natural flow events that exceed 3.5 m3/s	< 0.2 m ³ /s	EC (µS/cm): 168 Sulphate (SO4 ²⁻): 250 mg/L
							Medium Flow > 3.5 m ³ /s	< 5.8 m ³ /s	EC (µS/cm): <1500 Sulphate (SO4 ²⁻) (mg/L) <2125 mg/L
								High Flow > 10 m ³ /s	< 1.1 m ³ /s

**SCHEDULE W – WATER**

	Middle Creek	RP1	Middle Creek Gauging Station	-23.07765	146.43266	Continuous (minimum daily)	Low Flow <0.5 m3/s for a period of 28 after natural flow events that exceed 1 m3/s	<0.2 m3/s	EC (µS/cm): 168 Sulphate (SO42-): 250 mg/L
							Medium Flow > 1 m3/s	< 1.7 m3/s	EC (µS/cm): <1500 Sulphate (SO42-) (mg/L) <2125 mg/L
								< 0.34 m3/s	EC (µS/cm): <3500 Sulphate (SO42-) (mg/L) <5000
							High Flow >4.5 m3/s	< 0.9 m3/s	EC (µS/cm): <5000 Sulphate (SO42-) (mg/L) <5000 mg/L
W8	Notwithstanding any other condition of this Environmental Authority, the release of mine affected water to waters in accordance with condition W2 must only take place during periods of natural flow events in accordance with the receiving water flow criteria for discharge specified in Table W-4 Mine Affected Water Releases during Flow Events when measured at the monitoring points specified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters.								
W9	The release of mine affected water to receiving waters in accordance with condition W2 must not exceed the Electrical Conductivity and Sulphate release limits or the Maximum Release Rate (for all combined release points flows) for each receiving water flow criteria for discharge specified in Table W-2 Mine Affected Water Release Limits when measured at the monitoring points specified in Table W-4 Mine Affected Water Releases during Flow Events.								
W10	The daily quantity of mine affected water released from each release point must be measured and recorded at the monitoring points in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters.								
W11	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.								
W12	During the release of mine affected water to receiving waters from the release points, the receiving waters must be monitored at the locations specified in Table W-5 Receiving Waters Release Limits for each quality characteristic and at the frequency specified in Table W-5 Receiving Waters Release Limits.								
TW-5 Receiving Waters Release Limits	Monitoring Point	Latitude(G DA94)	Longitude (GDA94)	Quality Characteristic		Limit	Monitoring Frequency		
	Upstream								
	MP1	-23.1113	146.5075	Electrical conductivity (µS/cm)		700	Continuously		

SCHEDULE W – WATER

	Downstream					
	MP3	-22.9985	146.5116	Electrical conductivity (µS/cm)	700	Continuously
W13	Notwithstanding any other condition of this Environmental Authority, the release of mine affected water: <div><div>(a) Must not commence if the water quality at the upstream site in Table W-5 Receiving Waters Release Limits exceeds the water quality characteristics; and</div><div>(b) Must cease if the water quality characteristics at the downstream or the upstream sites in Table W-5 Receiving Waters Release Limits are met and or exceeded.</div></div>					
W14	In accordance with conditions W13(b), the release of mine affected water may recommence after a cessation if the water quality characteristics in Table W-5 Receiving Waters Release Limits are below the water quality characteristics at the downstream and upstream sites in Table W-5 Receiving Waters Release Limits.					
W15	The Environmental Authority holder must notify the administering authority as soon as practicable, and no later than 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: <div><div>(a) Release commencement date/time;</div><div>(b) Expected release cessation date/time;</div><div>(c) Release point/s;</div><div>(d) Release volume (estimated);</div><div>(e) Receiving water/s including the natural flow rate; and</div><div>(f) Details (including available data) regarding likely impacts on the receiving water(s).</div></div>					
W16	If the release limits defined in Table W-2 Mine Affected Water Release Limits are exceeded, the holder of the Environmental Authority must notify the administering authority within 24 hours of receiving the results.					
W17	The authority holder must, within 28 days of a release that exceeds the conditions of this authority, provide a report to the administering authority detailing: <div><div>(a) The reason of the release;</div><div>(b) The location of the release;</div><div>(c) All water quality monitoring results;</div><div>(d) Any general observations;</div></div>					
Water Storages						
W18	Water storage containing mine affected waters which are accessible to livestock must be monitored for the water quality characteristics and at the monitoring frequency specified in Table W-6 Onsite Water Storage Monitoring.					
W19	Water storages stated in Table W-6 Onsite Water Storage Monitoring, which are accessible to livestock are associated with the release points identified in Table W-1 Mine Affected Water Release Points, Sources & Receiving Waters, must be monitored for the water quality characteristics specified in Table W-7 Onsite Water Storage Contaminant Limits at the monitoring locations and at the sampling frequency specified in Table W-6 Onsite Water Storage Monitoring.					



SCHEDULE W – WATER

TW-6 Onsite Water Storage Monitoring	Water storage description	Longitude (GDA 94)	Latitude (GDA 94)	Monitoring location	Frequency of monitoring
	Mine Water Dam 1	146.431914	-23.067382	Dam Wall	Quarterly
	Mine Water Dam 2	146.53699	-23.073022	Dam Wall	Quarterly
	Mine Water Dam 3	146.504322	-23.087455	Dam Wall	Quarterly
	Mine Water Dam 4	146.51185	-23.10557	Dam Wall	Quarterly
W20	In the event that water storages defined in Table W-6 Onsite Water Storage Monitoring, exceed the contaminant limits defined in Table W-7 Onsite Water Storage Contaminant Limits, the Environmental Authority holder must implement measures to prevent access to waters by all livestock.				
TW-7 Onsite Water Storage Contaminant Limits	Quality Characteristic		Test Value	Contaminant limit	
	pH (pH unit)		Range	Greater than 4, less than 9 ²	
	EC (µS/cm)		Maximum	5970 ¹	
	Sulphate (mg/L)		Maximum	1000 ¹	
	Fluoride (mg/L)		Maximum	2 ¹	
	Aluminium (mg/L)		Maximum	5 ¹	
	Arsenic (mg/L)		Maximum	0.5 ¹	
	Cadmium (mg/L)		Maximum	0.01 ¹	
	Cobalt (mg/L)		Maximum	1 ¹	
	Copper (mg/L)		Maximum	1 ¹	
	Lead (mg/L)		Maximum	0.1 ¹	
	Nickel (mg/L)		Maximum	1 ¹	
	Zinc (mg/L)		Maximum	20 ¹	
	<i>Note:</i> ¹ Contaminant limit based on ANZECC & ARMCANZ (2000) stock water quality guidelines. ² Page 4.2-15 of ANZECC & ARMCANZ (2000) “Soil and animal health will not generally be affected by water with pH in the range of 4–9”. <i>Note: Total measurements (unfiltered) must be taken and analysed</i>				
W21	The quality of the receiving waters must be monitored at the locations specified in Table W-8 Receiving Waters Contaminant Trigger Levels for each quality characteristic and at the monitoring frequency stated in Table W-9 Receiving Water Upstream Background Sites & Downstream Monitoring Points.				
TW-8 Receiving Waters Contaminant Trigger Levels	Quality characteristic		Investigation trigger level*	Sampling frequency	
	pH		6.5 – 8.5	Daily during the release	
	Electrical Conductivity (µS/cm)		700		
	Sulphate (SO ₄ ²⁻) (mg/L)		250		
	Sodium (mg/L)		180		

SCHEDULE W – WATER

TW-9 Receiving Water Upstream Background Sites & Downstream Monitoring Points	Monitoring point	Receiving waters location description	Latitude* (GDA 94)	Longitude (GDA 94)	Monitoring frequency
	Upstream background monitoring points				
	MP1	Sandy Creek 1,100 m upstream of RP4/RP8 and 2600 m upstream of RP3/RP7	-23.1113	146.5075	Daily during a release into that creek system
	MP7	Well Creek 7,700 metres upstream of RP 5	-23.0203	146.3909	
	MP8	Middle Creek 800 metres upstream of RP 1	-23.0776	146.4327	
	MP9	Sandy Creek 3200 metres upstream of RP11	-23.1608	146.4193	
	Downstream monitoring points				
	MP6	Middle Creek 2000 metres downstream of RP 1 and 5,600 downstream of RP5	-23.045	146.4648	Daily during a release into that creek system
	MP2	Sandy Creek 1600 m downstream of RP3/RP7 and 3,300 meters downstream of RP4/RP8	-23.0756	146.4986	
	MP3	Sandy Creek downstream of Well Creek Confluence	-23.0396	146.5059	
	MP4	Sandy Creek at downstream lease boundary	-22.9985	146.5116	
	MP5	Well Creek upstream of Sandy Creek Confluence	-23.0401	146.5056	
W22	<p>If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in Table W-7 Onsite Water Storage Contaminant Limits during a release event, the Environmental Authority holder must compare the downstream results to the upstream results in the receiving waters and:</p> <p>(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</p> <p>(b) Where the downstream results exceed the upstream results, complete an investigation in accordance with the ANZECC & ARM CANZ 2000 methodology, into the potential for environmental harm and provide a written report to the administering authority in the next annual return outlining:</p> <p>i. Details of the investigation carried out; and</p> <p>ii. Actions taken to prevent environmental harm.</p> <p><i>(Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with this condition, no further reporting is required for subsequent trigger events for that quality characteristic).</i></p>				
Receiving Environment Monitoring Program					
W23	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				

**SCHEDULE W – WATER**

	<p>the receiving environment periodically (under natural flow conditions) and while mining affected water is being discharged from the site.</p> <p>For the purpose of the REMP, the receiving environment is the waters of Sandy Creek and connected or surrounding waterways within 10km 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 directed affected by an authorised release of mine affected water.</p>
W24	<p>The Receiving Environment Monitoring Program (REMP) must:</p> <ul style="list-style-type: none">(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;(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 W-9 Receiving Water Upstream Background Sites & Downstream Monitoring Points;(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 2009. This should include monitoring during periods of natural flow irrespective of mine or other discharges;(e) Include monitoring and assessment of dissolved oxygen saturation, temperature and all water quality parameters listed in Table W-2 Mine Affected Water Release Limits and Table W-3 Release Contaminant Trigger Investigation Levels;(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);(g) Include, where appropriate, monitoring of macroinvertebrates in accordance with the AusRivas methodology;(h) Apply procedures and/or guidelines from ANZECC and ARMCANZ 2000 and other relevant guidelines and documents;(i) Describe sampling and analysis methods and quality assurance and control;(j) Incorporate stream flow and hydrological information in the interpretations of water quality and biological data.
W25	<p>A Receiving Environment Monitoring Program (REMP) Design Document that addresses each criterion presented in Conditions W23 and W24 must be prepared and submitted to the administering authority prior to commencement of activities. Due consideration must be given to any comments made by the administering authority on the REMP Design Document and subsequent implementation of the program.</p>
W26	<p>A report outlining the findings of the Receiving Environment Monitoring Program, including all monitoring results and interpretations in accordance with conditions W23 and W24 must be prepared annually and made available on request to the administering 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</p>

SCHEDULE W – WATER

downstream environmental values.

Water General

W27

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 for a third party for the purpose of:

- Supplying stock water subject to compliance with the quality release limits specified in Table W-11 Irrigation Water Release Limits;
- Supplying irrigation water to directly adjoining properties owned by the Environmental Authority holder or a third party subject to compliance with quality release limits in Table W-11 Irrigation Water Release Limits. or
- Supplying water for construction and/or road maintenance in accordance with the conditions of this Environmental Authority;
- Supplying water to the Alpha Mine in accordance with the conditions of this Environmental Authority. The volume, pH and electrical conductivity of the water transferred to the Alpha Coal Mine must be monitored and recorded.

TW-10 Stock Water Release Limits

Quality characteristic	Units	Minimum	Maximum
pH	pH units	6.5	8.5
EC	µS/cm	N/A	5000

TW-11 Irrigation Water Release Limits

Quality characteristic	Units	Minimum	Maximum
pH	pH units	6.5	8.5
EC	µS/cm	N/A	1000

W28

If the responsibility of mine affected water is given or transferred to another person in accordance with W27:

- The responsibility for the mine affected water must only be given or transferred in accordance with a written agreement (third party agreement); and
- 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 the *Environmental Protection Act* (1994), environmental sustainability of the water disposal and protection of environmental values; and
- The third party agreement must be signed by both parties to the agreement.

W29

All determinations of water quality and biological monitoring must be:

- Performed by a person or body possessing appropriate experience and qualifications to perform the required measurements;
- Made in accordance with methods prescribed in the latest edition of the administering authorities Monitoring and Sampling Manual;
- Collected from the monitoring locations identified within this Environmental Authority, with 6 hours of each other where possible;
- Carried out on representative samples; and
- Analysed at a laboratory accredited (e.g. NATA) for the method of analysis being used.

W30

The release of any contaminants as permitted by this Environmental Authority, directly or indirectly to waters, other than internal water management infrastructure

**SCHEDULE W – WATER**

	<p>that is installed and operated in accordance with a water management plan that complies with conditions of this Environmental Authority:</p> <ul style="list-style-type: none">(a) Must not produce and 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.
W31	<p>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 upon request:</p> <ul style="list-style-type: none">(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 quantity of the contaminants released from all release points;(e) The release flow rate at the time of sampling for each release point; and(f) The results of all monitoring and details of any exceedances with the conditions of this Environmental Authority.(g) Water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.
W32	<p>All determinations of water quality must be:</p> <ul style="list-style-type: none">(a) Performed by a person or body possessing appropriate experience and qualifications to perform the required measurements;(b) Made in accordance with methods prescribed in the latest edition of the administering authority's Monitoring and Sampling Manual 2009, <i>Environmental Protection (Water) Policy</i> (2009);(c) Collected from the monitoring locations identified within this Environmental Authority, within ten (10) hours of each other where possible;(d) Carried out on representative samples; and(e) Laboratory testing must be undertaken using a laboratory accredited (e.g. NATA) for the method of analysis being used.
Water Management Plan	
W33	<p>A Water Management Plan must be developed by a suitably qualified person within three (3) months of issue of the Environmental Authority that provides for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of the Environmental Authority. The Water Management Plan implementation should be implemented at the commencement of construction activities.</p>
W34	<p>The Water Management Plan must be developed in accordance with the administering authority's Guideline for Preparation of Water Management Plans for Mining Activities 2009 or any updates that become available from time to time and must include at the following components:</p> <ul style="list-style-type: none">(a) Contaminant Source Study.(b) Site Water Balance and Model.(c) Water Management System.(d) Saline Drainage Prevention and Management Measures.(e) Acid Rock Drainage Prevention and Management Measures (if applicable).(f) Emergency and Contingency Planning, and(g) Monitoring and Review.

**SCHEDULE W – WATER**

W35	The Water Management Plan must be reviewed each calendar year and a report prepared by an appropriately qualified person. The report must: <ul style="list-style-type: none">(a) Assess the plan against the requirements under condition W34;(b) Include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; and(c) Identify any amendments made to the water management plan following the review.
W36	The holder of this Environmental Authority must attach to the review report required by condition W35, a written response to the report and recommended actions, detailing the actions taken or to be taken by the Environmental Authority holder on stated dates: <ul style="list-style-type: none">(a) To ensure compliance with this Environmental Authority; and(b) To prevent a recurrence of any non-compliance issues identified.
W37	The review report required by condition W35 and the written response to the review report required by condition W36 must be submitted to the administering authority with the subsequent annual return under the signature of the appointed signatory for the annual return.
W38	A copy of the Water Management Plan and/or revised Water Management Plan must be provided to the administering authority on request.
W39	The holder of this Environmental Authority must ensure reasonable and practicable measures are taken to avoid or otherwise minimise the generation and/or release of saline drainage.
Stormwater & Waterborne Sediment Controls	
W40	An Erosion and Sediment Control Plan must be developed by a suitably qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to water and contamination of stormwater.
W41	Stormwater, other than mine affected water, is permitted to be released to waters from: <ul style="list-style-type: none">(a) Erosion and sediment control structures that are installed and operated in accordance with the Erosion and Sediment Control Plan required by condition W40;(b) Water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with W34, for the purpose of ensuring water does not become mine affected water.
W42	The maintenance and cleaning of vehicles, plant and equipment must not be carried out in areas that would result in the release of wastes, contaminants or materials to any stormwater drainage system or waters.
W43	Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable to minimise the release of wastes, contaminants or materials to any stormwater drainage system or waters.
Uncontrolled Releases	
W44	The overflow of mine affected water from one or more of the dams listed in Table TG1 – Regulated Structures to receiving waters is authorised if: <ul style="list-style-type: none">(a) The holder has complied with ALL conditions listed in Schedule G – Regulated Structures of this Environmental Authority; and(b) The overflow is a direct result of rainfall events which since November 1 have generated a total rainfall depth in excess of that determined under the Design Storage Allowance (DSA) annual exceedance probability (AEP)

**SCHEDULE W – WATER**

	event listed in Table TG1 – Regulated Structures for the relevant dam (or network of linked containment systems); and (c) The holder has taken all reasonable and practicable measures to prevent an overflow from the relevant dam; and (d) The holder has provided a report to the administering authority following an overflow release demonstrating compliance with conditions a, b and c above.					
W45	Any release of mine affected water resulting from an overflow from one or more of the dams listed in Table W-12 Overflow Release to the Receiving Environment must be monitored at the locations specified in Table W-13 Monitoring Locations for Overflow Releases Releases for those quality characteristics and at the frequencies specified in Table W-14 Release Contaminant Investigation Levels – Overflow Releases.					
TW-12 Overflow Release to the Receiving Environment	Regulated Dam	Uncontrolled Discharge AEP	Mandatory reporting level	Receiving Water		
	MWD1	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Well Creek		
	MWD2	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Sandy Creek		
	MWD3	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Sandy Creek		
	MWD4	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Sandy Creek		
	Borefield Dam 1	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Little Sandy/ Rocky Creek Diversion		
	Borefield Dam 2	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Little Sandy/ Rocky Creek Diversion		
	Adit/Rom dam South	1:100 AEP 3 month wet season	1:100 AEP 72 hour storm	Sandy Creek		
TW-13 Monitoring Locations for Overflow Releases	Name	Release point latitude	Release point longitude	Contaminant source and location	Monitoring point	Receiving water description
	RP5	-23.0547	146.4194	MWD1	Spillway	Well Creek
	RP6	-23.0736	146.5263	MWD2	Spillway	Sandy Creek
	RP7	-23.0897	146.5048	MWD3	Spillway	Sandy Creek
	RP8	-23.1031	146.5113	MWD4	Spillway	Sandy Creek
	RP9	-23.0996	146.4270	Borefield Dam 1	Spillway	Little Sandy/Rocky Creek Diversion
	RP10	-23.1200	146.4269	Borefield Dam 2	Spillway	Little Sandy/Rocky Creek Diversion
	RP11	-23.1516	146.4404	Adit/ROM dam south	Spillway	Greentree Creek

SCHEDULE W – WATER

TW-14 Release Contaminant Investigation Levels – Overflow Releases	Quality Characteristic	Trigger Levels (µg/L)	Comment on trigger value	Monitoring Frequency
	EC	700	<i>For aquatic ecosystem protection, based on SMD guideline</i>	Monitoring to be commenced within 2 hours of commencement of the release, and then 24 hours thereafter.
	pH	6 – 8.5	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Turbidity	460	<i>99th percentile of reference data</i>	
	Aluminium	7490	<i>99th percentile of reference data</i>	
	Arsenic	13	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Cadmium	0.2	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Chromium	16	<i>99th percentile of reference data</i>	
	Copper	40	<i>99th percentile of reference data</i>	
	Iron	9700	<i>99th percentile of reference data</i>	
	Lead	12	<i>99th percentile of reference data</i>	
	Mercury	0.5	<i>99th percentile of reference data</i>	
	Nickel	11	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Zinc	167	<i>99th percentile of reference data</i>	
	Boron	370	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Cobalt	90	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Manganese	1900	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Molybdenum	34	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Selenium	10	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Silver	1	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Uranium	1	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Vanadium	20	<i>99th percentile of reference data</i>	
	Ammonia	900	<i>For aquatic ecosystem protection, based on SMD guideline</i>	
	Nitrate	1100	<i>For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN</i>	
	Petroleum hydrocarbons (C6-C9)	20		
	Petroleum hydrocarbons (C10-C36)	100		

**SCHEDULE W – WATER**

	Fluoride (total)	2000	<i>Protection of livestock and short term irrigation guideline</i>	
	Sodium (ug/L)	23000	<i>99th percentile of reference data</i>	
W46	<p>If quality characteristics of the release exceed any of the trigger levels specified in Table W-14 Release Contaminant Investigation Levels – Overflow Releases during an overflow release, the holder must compare the downstream results in the receiving waters to the trigger values specified in Table W-14 Release Contaminant Investigation Levels – Overflow Releases and:</p> <ul style="list-style-type: none">(a) Where the trigger values are not exceeded at downstream locations then no action is to be taken; or(b) Where the downstream results exceed the trigger values specified in Table W-14 Release Contaminant Investigation Levels – Overflow Releases for any quality characteristics, compare the results of the downstream site to the data from upstream background monitoring sites and from the release point and:<ul style="list-style-type: none">i. If the result is less than the background monitoring site data, then no action is to be taken; orii. 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 the cessation of the release, outlining:<ul style="list-style-type: none">• details of the investigations carried out; and• actions taken to prevent environmental harm.			
W47	<p>The holder must notify the administering authority as soon as practicable and no later than 24 hours after the commencement of an overflow release of mine affected water to the receiving environment in accordance with conditions W44, W45 and W46 of this Environmental Authority. Notification must include the submission of written advise to the administering authority of the following information:</p> <ul style="list-style-type: none">(a) release commencement date/time;(b) release points;(c) receiving water/s; and(d) any details (including available data) regarding likely impacts on the receiving environment.			
W48	<p>The holder must notify the administering authority as soon as practicable and no later than 24 hours after the cessation of a release notified under condition W47. Notification must include the submission of written advise to the administering authority of the following information:</p> <ul style="list-style-type: none">(a) release cessation date/time;(b) volume of water released;(c) all in-situ water quality monitoring results; and(d) any other matters pertinent to the water release event.			
W49	<p>Within 28 days of a release notified under condition W48, the holder must provide a report to the administering authority demonstrating compliance with condition W46 which should include as a minimum:</p> <ul style="list-style-type: none">(a) The time and date of the uncontrolled release event;(b) The location of the uncontrolled release;(c) The monitoring quality of the uncontrolled release waters; or if not			

SCHEDULE W – WATER

	<p>available due to site access constraints in wet weather during the event, the quality of waters in the dam that contributed to the uncontrolled release before the event (from monitoring undertaken as part of condition W16 and quality in that dam after the release events.</p> <ul style="list-style-type: none"> (d) The estimated quantity of uncontrolled release. (e) Downstream receiving water monitoring results. (f) Rainfall during, or that contributed to, the uncontrolled release event and dams levels prior to the rainfall event that caused uncontrolled release. (g) A determination of whether the uncontrolled release was caused by rainfall exceeding the design AEP events specified in Table W-12 Overflow Release to the Receiving Environment. (h) A determination of whether the uncontrolled release was caused in part or fully by failure to operate the integrated mine water system in accordance with Standard Operating Procedures for the integrated mine water system, or physical failure of one or more components of the integrated mine water system. (i) A determination of whether the uncontrolled release caused environmental harm, and (j) If determined that the uncontrolled release could have been reasonably prevented, actions that will be taken to ensure uncontrolled releases comply in all respects with this Environmental Authority.
Mine Water Management	
W50	<p>In the event of failure of any component, or series of components, of the mine water management system, the holder of the Environmental Authority must utilise the mine water balance model to reassess the performance of the mine water management system in its failed state, and notify the administering authority if the assessment of the mine water management system shows that the probability of uncontrolled discharge would be greater than the AEP specified in Table TG-3 Hydraulic Performance of Dams.</p>
W51	<p>Notwithstanding the provisions for Mandatory Report Levels in Table TG-3 Hydraulic Performance of Dams, the holder of the Environmental Authority must not allow any uncontrolled discharge to be caused by either failure to:</p> <ul style="list-style-type: none"> (a) Stop transferring water to a dam where the transfer into that dam contributes in part, or full to the overflow (uncontrolled discharge) of that dam, or (b) Start and continue transferring water from a mine water dam, where the Standard Operating Procedures require the water transfer from the dam to prevent overflow (uncontrolled discharges).
Groundwater	
W52	<p>The holder of the environmental authority must develop and implement a groundwater monitoring program to be mutually agreed between the proponent and the administering authority.</p>
W53	<p>The groundwater monitoring program must include a baseline groundwater monitoring as described in Table TW-15 and the locations shown in Figure T-9 of the EMP to provide the following:</p> <ul style="list-style-type: none"> (a) Representative groundwater samples from the aquifers potentially affected by mining activities. (b) At least twelve (12) sampling events, no more than two (2) months

**SCHEDULE W – WATER**

	apart over a 2 years period, where is it safe to access each site.			
	(c)	Background groundwater quality in hydraulically isolated background bore(s) that have not been affected by any mining activities,		
	(d)	Final groundwater contaminant trigger levels for the alluvium and tertiary sediments as required in condition W54, and,		
	(e)	Natural water level fluctuations and trends.		
TW-15 Background Groundwater Monitoring Program	Monitoring sites	Parameter	Frequency	Aquifer
	KMB--01A	Water Level pH, EC, TDS, CaCO3, Alkalinity, SO4, Cl, Ca, Mg, Na, K, Al, As, B, Cd, Cr, Co, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Se, Sr, V, Zn, ammonia, nitrogen, phosphorus, TPH	Water Level - At least one reading every 12 hours – electronic loggers	Alluvium
	KMB--01B			Tertiary deposits
	KMB--02A			Alluvium
	KMB--02B			Tertiary deposits
	KMB--03A			D-Seam
	KMB--03B			Tertiary deposits
	KMB--04			D-E sandstone
	KMB--05			D-E sandstone
	KMB--06			D-E sandstone
	KMB--07			C-D sandstone
	1635R			D-E sandstone
	1636R			C-D sandstone
	1637R			D-E sandstone
	1638R			D-E sandstone
	1680R			C-D sandstone
	1681R			D-E sandstone
	AVP-11	Water Level Only	At least one reading every 12 hours – electronic loggers	B-C, C-D, D-E, sub-E sandstone
	KVP-01			B-C, C-D sandstone
	KVP-02			B-C, C-D, D-E sandstone
	KVP-03			B-C, C-D sandstone
	KVP-04			B-C, C-D, D-E, sub-E sandstone
	KVP-05			B-C, C-D, D-E sandstone
	KVP-06			B-C, C-D, D-E, sub-E sandstone
	KVP-07			B-C, C-D, D-E, sub-E sandstone
	KVP-08			B-C, C-D, D-E, sub-E sandstone
	KVP-09			B-C, C-D, D-E, sub-E sandstone
KVP-10	C-D, D-E, sub-E sandstone			
W54	Groundwater contaminant trigger levels as per Table TW-16 must be finalised based on the baseline groundwater monitoring defined in condition W53 and submitted to the administering authority no more than 24 months from the date of issue of this environmental authority.			
W55	Mining activities must not cause groundwater quality in aquifers potentially affected by mining activities to exceed any of the contaminant trigger levels in Table TW-16 as measured at the operational monitoring locations specified in Table TW-15.			

**SCHEDULE W – WATER**

TW-16 Groundwater Contaminant Limits & Trigger Levels	Parameter	Units	Trigger Levels	
	pH	pH Units	6.5 - 8.5	
	Electrical Conductivity	µS/cm	85 th percentile of background monitoring in accordance with condition W60	
	Total Dissolved Solids	mg/L		
	Calcium	µg/L		
	Magnesium	µg/L		
	Sodium	µg/L		
	Potassiu	µg/L		
	Chlorine	µg/L		
	SO ₄	µ /L		
	CO ₃	µg/L		
	HCO ₃	µg/L		
	Iron	µg/L		
	Aluminium	µg/L		
	Silver	µg/L		
	Arsenic	µg/L		
	Mercury	µg/L		
	Antimony	µg/L		
	Molybdenum	µg/L		
	Selenium	µg/L		
	Total Petroleum Hydrocarbons	µg/L		
W56	The holder of the environmental authority must undertake operational groundwater monitoring as detailed in Table TW-17 as a component of the groundwater monitoring program defined in condition W52. Operational monitoring points are shown in Figure T-9 of the EMP.			
TW17 Operational Groundwater Monitoring Program	Monitoring sites	Parameter	Frequency	Purpose
	KMB--01A	Water Level	Water Level - At least one reading every 24 hours – electronic loggers Quarterly for first five years of operation and bi-annual thereafter	Background Monitoring
	KMB--01B	pH, EC, TDS, CaCO3, Alkalinity, SO4, Cl, Ca, Mg, Na, K, Al, As, B, Cd, Cr, Co, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Se, Sr, V, Zn, ammonia, nitrogen, phosphorus, TPH*		
	KMB--02A			
	KMB--02B			
	KMB--03B			
	AIR1	Water Level	Water Level - At least one reading every 24 hours – electronic loggers	Spill Monitoring
	KCTSF1	pH, EC, TDS, CaCO3, Alkalinity, SO4, Cl, Ca, Mg, Na, K, Al, As, B, Cd, Cr, Co, Cu, Fe, Hg, Mn, Mo, Ni, Pb, Se, Sr, V, Zn, ammonia, nitrogen, phosphorus, TPH*	Quarterly water quality sampling for first five years of operation and bi-annual thereafter	Seepage and Spill Monitoring
	KCTSF2			
	In-Pit TSF1			
	MWD1			
	MWD2			
	CHPP1			

**SCHEDULE W – WATER**

	CHPP2			
	1	Water Level Only	Daily water level measurements electronically logged	Drawdown Monitoring
	2			
	3			
	4			
	5			
	6			
	7			
	8			
	9			
	10			
	11			
*The parameters analysed during the operational monitoring will be revised on the findings of the baseline monitoring.				
W57	If the groundwater contaminant trigger levels defined in Table TW-16 are exceeded at the monitoring sites identified in Table TW-17 then the Environmental Authority holder must: <div><div>(a)</div>Resample the monitoring point <div>(b)</div>If second sample is also above the trigger level then complete an investigation into the potential for environmental harm and notify the administering authority within twenty eight (28) days of receiving the analysis results.</div>			
W58	<p>Subject to condition W56 groundwater levels must be monitored and recorded. Groundwater drawdown fluctuations of 5 metres or more below the minimum levels recorded within the D-E sandstone during the background monitoring defined in W53, not resulting from the pumping of licensed bores, must be notified within fourteen (14) days to the administering authority following completion of monitoring.</p> <p>The holder of the environmental authority must investigate the potential for a reduced groundwater supply for adjacent landholder water supply bores and where required instigate make-good agreements defined in W59.</p>			
W59	The proponent must reach mutually agreeable 'make-good' arrangements with landholders potentially affected by groundwater drawdown for the provision of alternative supplies throughout the mine life, and after mine closure. Alternative supplies should be put in place before supplies from relevant existing landholder bores are adversely affected. The costs associated with changes to landholder extraction of groundwater from bores on affected land must be covered by the proponent.			
W60	The holder of the environmental authority must monitor and record water levels within the Rewan Formation as the basal aquitard unit of the Great Artesian Basin, in accordance with W56 at monitoring locations 3,4 and 5 as listed in Table W-17 Operational Groundwater Monitoring Program. Where groundwater drawdown fluctuations of 5 metres or more below the minimum levels recorded within the Rewan Formation during the background monitoring defined in W53 are recorded, not resulting from the pumping of licensed bores, the holder of this environmental authority must undertake an assessment of the potential for induced flow from the Great Artesian Basin aquifers. The holder must notify the administering authority of the outcomes of this assessment within fourteen (14) days following completion of			

SCHEDULE W – WATER

	the assessment
W61	The groundwater monitoring data must be reviewed on an annual basis by a suitably qualified and experienced hydrogeologist. 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.
W62	The holder of the environmental authority must report the results and analysis of groundwater monitoring to the administering authority on request.
W63	<p>The method of water sampling required by the environmental authority must comply with that set out in the current edition of DEHP's Water Quality Sampling Manual, or subsequent updated versions. The following information must also be recorded in relation to all groundwater sampling.</p> <ul style="list-style-type: none"> (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; and (d) The results of all monitoring.

SCHEDULE G – REGULATED STRUCTURES

G1	The holder of this Environmental Authority must ensure that each dam is designed, constructed, operated and maintained in accordance with accepted engineering standards and is fit for the purpose for which it is intended.
Design Plan, Hazard Assessment & Certification	
G2	In accordance with, and using the certification forms set out in the <i>Manual for Assessing Hazard Categories and Hydraulic Performance of Dams</i> (DEHP, Feb 2012), the hazard category and the design plan of any regulated structure must be assessed and certified by a suitably qualified and experienced person prior to the detailed design and construction of the structure; and / or prior to any change in its purpose or the nature of its stored contents.
G3	A hazard assessment report and certification must be prepared for any regulated structure assessed; the report may include a hazard assessment for more than one structure. The holder must, on receipt of a hazard assessment report and certification, provide to the administering authority one paper copy and one electronic copy of the hazard assessment report and certification.
G4	<p>The design plan for a regulated structure must be accompanied by a design report which provides:</p> <ul style="list-style-type: none"> (a) A description of all the documents which constitute the design plan; (b) A statement of: <ul style="list-style-type: none"> i. the applicable standards including engineering criteria, industry guidelines, relevant legislation and regulatory documents, relied upon in preparing the design plan; ii. all relevant facts and data used in preparing the design plan, including any efforts made to obtain necessary facts and data, and any limitations or assumptions to facts and data used in preparing the

**SCHEDULE G – REGULATED STRUCTURES**

	<p>design plan;</p> <p>iii. the hazard category of the regulated structure; and</p> <p>iv. justification of how the design plan provides the necessary required performance;</p> <p>(c) Documentation of hydrological analyses and estimates required to determine all elements of the design including volumes and flow capacities;</p> <p>(d) Detailed criteria for the design, operation, maintenance and decommissioning of the regulated structure, including any assumptions;</p> <p>(e) Design, specification and operational rules for any related structures and systems used to prevent failure scenarios;</p> <p>(f) Drawings showing the lines and dimensions, and locations of built structures and land forms associated with the regulated structure;</p> <p>(g) Consideration of the interaction of the pit design with the levee or regulated dam design;</p> <p>(h) An operational plan that includes:</p> <p>i. normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance);</p> <p>ii. 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.</p> <p>(i) A plan for the decommissioning and rehabilitation of the regulated structure at the end of its operational life;</p> <p>(j) Details of reports on investigations and studies done in support of the design plan.</p>
G5	<p>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:</p> <p>(a) The 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure; and</p> <p>(b) Construction of the regulated structure is in accordance with the design plan.</p>
G6	<p>Documentation required by the conditions in this schedule must be kept available for inspection by the regulating authority for a period of five (5) years after the conclusion of the environmentally relevant activity in respect of which this Environmental Authority has been granted.</p>
Water Management Systems	
G7	<p>Where a regulated structure is to be managed as part of an integrated containment system and the DSA volume is to be shared across the integrated containment system, the design and operating rules for the system as a whole must be documented in a system design plan that is certified by a suitably qualified and experienced person.</p>
G8	<p>The system design plan must contain all of the following:</p> <p>(a) The design plans;</p> <p>(b) The 'as constructed' plans;</p> <p>(c) The operational rules for each individual regulated dam that forms part of the integrated system;</p> <p>(d) The standards of serviceability and accessibility of water transfer equipment or structures; and</p>

SCHEDULE G – REGULATED STRUCTURES

	(e) The operational rules for the system as a whole.
Construction of Regulated Structures	
G9	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 Hazard Categories and Hydraulic Performance of Dams (DEHP, Feb 2012).
G10	Construction of a regulated structure is prohibited unless the holder has: <ul style="list-style-type: none"> (a) Submitted a hazard category assessment report and certification to the administering authority in accordance with condition G3; (b) Commissioned a suitably qualified and experienced person to prepare a design plan and associated operation procedure for the structure in accordance with condition G4; and (c) Received the certification from a suitably qualified and experienced person for the design plan and the associated operating procedures in compliance with the relevant condition of this authority.
G11	Regulated structures must be designed and constructed to ensure that the design integrity would not be compromised on account of: <ul style="list-style-type: none"> (a) Floodwaters from entering the regulated dam from any watercourse or drainage line; and (b) Wall failure due to erosion by floodwaters arising from any watercourse or drainage line.
Operations	
G12	An Operations Plan must be kept current for each regulated structure.
G13	The Operations Plan shall at least cover all matters relevant to the operations and maintenance of the regulated structure so that it is compliant in all respects with this Environmental Authority.
G14	Where an Operational Plan covers decommissioning and rehabilitation, those operations are to be consistent with the design plan for the structure and the rehabilitation requirements of this Environmental Authority.
G15	Operation of a regulated structure is prohibited unless the holder has submitted all of the following to the administering authority: <ul style="list-style-type: none"> (a) One paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition G5; (b) A set of 'as constructed' drawings and specifications; (c) Certification of 'as constructed drawings and specifications' in accordance with condition G2; (d) A copy of the certified system design plan, 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.
G16	Each regulated structure must be designed, constructed, operated and maintained in a manner that is consistent with the current design plan, the current operational plan, and the associated certified 'as constructed' drawings, for the duration of its operational life; and the structure must be fit for the purpose for which it is intended until decommissioned and rehabilitated.
G17	In the event of early signs of loss of structural or hydraulic integrity, the holder of this Environmental Authority must immediately take action to prevent or minimise any actual or potential environmental harm, and report in writing any findings and actions taken to the administering authority within 28 days of that event.

**SCHEDULE G – REGULATED STRUCTURES**

G18	<p>The holder must take reasonable and practicable control measures to prevent the causing of harm to persons, livestock or wildlife through the construction and operation of a regulated structure. Reasonable and practicable control measures may include, but are not limited to:</p> <ul style="list-style-type: none">(a) The secure use of fencing, bunding or screening; and(b) Escape arrangements for trapped livestock and fauna.
Mandatory Reporting Levels	
G19	<p>The Mandatory Reporting Level (the MRL) must be marked on a regulated structure in such a way that it is clearly visible during routine inspections.</p>
G20	<p>The holder must notify the administering authority as soon as practicable, but within 48 hours, of the level in any regulated structure reaching the mandatory reporting level (MRL) and must act to prevent or minimise any actual or potential environmental harm.</p>
G21	<p>The holder must, immediately on becoming aware that the Mandatory Reporting Level has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated structure.</p>
Inspections of Regulated Structures	
G22	<p>Each regulated structure must be inspected every calendar year by a suitably qualified and experienced person.</p>
G23	<p>At each annual inspection, the condition and adequacy of each regulated structure must be assessed for safety and against the necessary structural, geotechnical and hydraulic performance criteria, including assessment:</p> <ul style="list-style-type: none">(a) Against the most recent hazard assessment report and design plan (or system design plan);(b) Against recommendations contained in previous annual inspections reports;(c) Against recognised safety deficiency indicators;(d) For changes in circumstances potentially leading to a change in hazard category;(e) For conformance with the conditions of this authority;(f) For conformance with the 'as constructed' drawings;(g) For the adequacy of the available storage in each regulated structure, 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 structure (or network of linked containment systems);(h) For evidence of conformance with the current operational plan.
G24	<p>The holder of this Environmental Authority must immediately act upon recommendations arising from an annual inspection on condition and adequacy of a regulated structure.</p>
G25	<p>At each annual inspection, if a mandatory reporting level is required, it must be determined and marked on each regulated structure.</p>
G26	<p>A final assessment of adequacy of available storage in each regulated structure must be based on water levels observed within the month of October and result in an estimate of the level as of 1 November.</p>
G27	<p>On 1 November of each year, storage capacity must be available in each regulated structure (or network of linked containment systems with a shared DSA volume), to meet the Design Storage Allowance (DSA) volume for the structure (or network of</p>

SCHEDULE G – REGULATED STRUCTURES

	<p>linked containment systems).</p> <p>The holder must, as soon as possible and within forty-eight hours of becoming aware that the regulated structure (or network of linked containment systems) will not have the available storage to meet the Design Storage Areas volume on 1 November of any year:</p> <ul style="list-style-type: none"> (a) Notify the administering authority; and (b) Act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.
G28	The holder must assess the performance of each regulated structure (or linked containment system) over the preceding November to May period based on actual observations of the available storage in each regulated structure or linked containment system taken prior to 1 July of each year.
G29	The holder must take action to modify its water management or linked containment system so as to ensure that the regulated structure or linked containment system will perform in accordance with the requirements of this authority, for the subsequent November to May period.
G30	For each annual inspection, two (2) copies of a report certified by a suitably qualified and experienced person and in accordance with the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams, (DEHP, Feb 2012) must be provided to the administering authority by 1 December. The report is to detail the adequacy of recommended actions to ensure the integrity of each regulated structure.
G31	The holder of this Environmental Authority must, within one week of receipt of the annual inspection report, consider the report and its recommendations; and as soon as possible, but within one month of receipt of the annual inspection report, formulate and implement actions to ensure that each regulated structure safely performs its intended functions.
G32	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, hazard assessment, design plan and other supporting documentation, to a new holder and the administering authority on transfer of this authority.
Decommissioning & Rehabilitation	
G34	On cessation of operation of any regulated structure, that structure must be maintained so as to avoid environmental harm until that structure is decommissioned. The holder of this Environmental Authority must not abandon any structure, but must decommission each structure such that ongoing environmental harm is prevented.
G35	<p>Prior to the cessation of the environmentally relevant activity, each regulated structure must be decommissioned such that ongoing environmental harm caused by the regulated structure is minimised by:</p> <ul style="list-style-type: none"> (a) Becoming a safe site for humans and animals at the completion of rehabilitation; or (b) Becoming a stable landform, that no longer contains flowable substances and minimises erosion impacts; or (c) Not allowing for acid mine drainage; or (d) Being approved or authorised under relevant legislation for a beneficial use; or (e) Being a void authorised by the administering authority to remain after decommissioning; and

**SCHEDULE G – REGULATED STRUCTURES**

	(f) The regulated structure being compliant with all other relevant rehabilitation requirements of this authority.				
G36	The following regulated structures must be wholly located within the control points defined in Table G-1 Location of Regulated Structures.				
TG-1 Location of Regulated Structures	Name	Purpose	Easting	Northing	Unique Location ID (Levees Only)
	MINE WATER DAM 1	Mine water dam	-23.056282	146.408652	NA
			-23.071451	146.408586	
			-23.071549	146.435383	
			-23.056380	146.435446	
	MINE WATER DAM 2	Mine water dam	-23.071502	146.524189	NA
			-23.085049	146.524141	
			-23.085096	146.539781	
			-23.071549	146.539827	
	MINE WATER DAM 3	Auxiliary Storage	-23.084418	146.504007	NA
			-23.092839	146.503976	
			-23.092878	146.516464	
			-23.084456	146.516494	
	MINE WATER DAM 4	Auxiliary Storage	-23.098815	146.509653	NA
			-23.107560	146.509621	
			-23.107590	146.519461	
			-23.098845	146.519493	
	TSF1	Tailings Storage Facility	-23.015268	146.473080	NA
			-23.007141	146.487554	
			-23.015641	146.493123	
			-23.023760	146.478649	
	TSF2	Tailings Storage Facility	-23.024263	146.477808	NA
			-23.012515	146.498736	
			-23.015887	146.502413	
			-23.021946	146.504489	
			-23.025288	146.504467	
			-23.032153	146.501689	
			-23.043137	146.487496	
			-23.043767	146.483980	
	SOUTHERN OPENCUT LEVEE	Flood Protection	-23.117248	146.441638	Control Point 1
			-23.109902	146.441880	Control Point 2
			-23.109880	146.495437	Control Point 3
			-23.069841	146.495455	Control Point 4
			-23.057667	146.496782	Control Point 5
			-23.053902	146.493814	Control Point 6
			-23.052681	146.489997	Control Point 7
			-23.053240	146.484354	Control Point 8
			-23.051664	146.479413	Control Point 9
			-23.049578	146.474327	Control Point 10
	NORTHERN OPENCUT LEVEE	Flood Protection	-23.032258	146.466888	Control Point 11
			-23.038382	146.469630	Control Point 12
			-23.040872	146.473461	Control Point 13
			-23.042170	146.478589	Control Point 14
			-23.045077	146.483364	Control Point 15
			-23.046807	146.485778	Control Point 16
			-23.047000	146.490477	Control Point 17
			-23.043745	146.498646	Control Point 18
			-23.038011	146.504534	Control Point 19
			-23.030391	146.503872	Control Point 20
			-23.023738	146.505437	Control Point 21

**SCHEDULE G – REGULATED STRUCTURES**

			-23.015407	146.503112	Control Point 22
			-23.012527	146.500023	Control Point 23
			-23.058461	146.504616	Control Point 24
	STOCKPILE LEVEE	Flood Protection	-23.056108	146.505745	Control Point 25
			-23.054717	146.508634	Control Point 26
			-23.060902	146.512924	Control Point 27
			-23.063059	146.515409	Control Point 28
	LITTLE SANDY AND ROCKY CREEK DIVERSION	Clean Water Diversion	-23.071526	146.426013	NA
			-23.116914	146.425820	
			-23.116952	146.436377	
			-23.071564	146.436566	
	Spoil Dam 1	Collection of mine affected runoff	-23.010048	146.501204	NA
			-23.010041	146.499058	
			-23.006247	146.499072	
			-23.006254	146.501218	
	Spoil Dam 2	Collection of mine affected runoff	-23.043716	146.484975	NA
			-23.043729	146.488880	
			-23.045536	146.488873	
			-23.045523	146.484968	
	Spoil Dam 3	Collection of mine affected runoff	-23.032550	146.468280	NA
			-23.032564	146.472379	
			-23.034551	146.472371	
			-23.034538	146.468272	
	Spoil Dam 4	Collection of mine affected runoff	-23.098535	146.492383	NA
			-23.098541	146.494033	
			-23.095225	146.494046	
			-23.095220	146.492395	
	Borefield dam 1	Groundwater Dewatering	-23.098551	146.425769	NA
			-23.100538	146.425760	
			-23.100543	146.427156	
			-23.098556	146.427165	
	Borefield dam 2	Groundwater Dewatering	-23.119028	146.425681	NA
			-23.121016	146.425673	
			-23.121021	146.427070	
			-23.119033	146.427078	
	Aduit/ROM dam south	Collection of mine affected runoff.	-23.152318	146.439137	NA
			-23.152324	146.440788	
			-23.149009	146.440802	
			-23.149003	146.439151	
	Aduit/ROM dam central	Collection of mine affected runoff.	-23.100257	146.437889	NA
			-23.100269	146.441463	
			-23.098725	146.441469	
			-23.098712	146.437895	
	Aduit/ROM dam north	Collection of mine affected runoff.	-23.055920	146.484831	NA
			-23.055910	146.481708	
			-23.054347	146.481714	
			-23.054357	146.484837	
	ROM dump dam	Collection of mine affected runoff.	-23.061167	146.487428	NA
			-23.061160	146.485280	
			-23.062452	146.485275	
			-23.062459	146.487423	
	TLO dam	Collection of mine affected runoff.	-23.064795	146.517726	NA
			-23.067101	146.515843	
			-23.066158	146.514489	
			-23.063842	146.516372	
	CMIA dam & overflow basin	Collection of mine affected runoff.	-23.058215	146.496449	NA
			-23.054879	146.495309	

**SCHEDULE G – REGULATED STRUCTURES**

			-23.053069	146.491714	
			-23.052810	146.489685	
			-23.054002	146.489583	
			-23.055255	146.494488	
			-23.058336	146.494711	
	Process water and decant dam	Collection of mine affected water.	-23.039857	146.475981	NA
			-23.039846	146.472858	
			-23.038284	146.472864	
			-23.038294	146.475987	
	Pit dewatering dam north	Pit Dewatering.	-23.036856	146.475534	NA
			-23.036846	146.472411	
			-23.035283	146.472417	
			-23.035294	146.475540	
	Pit dewatering dam south	Pit Dewatering	-23.082471	146.461190	NA
			-23.082483	146.464764	
			-23.080938	146.464770	
			-23.080926	146.461197	
G37	Regulated structures must be consistent with the details in Table G-2 Basic Details of Regulated Dams.				

**SCHEDULE G – REGULATED STRUCTURES**

TG-2 Basic Details of Regulated Dams	Regulated structure	Max surface areas (ha)	Max volume of dam (ML)	Max depth of dam (m)	Purpose of dam
	MWD1	204.93 @ FSL	9300 @ FSL	14.5 @ FSL	Mine water containment
	MWD2	137.68 @ FSL	7600 @ FSL	13.5 @ FSL	Mine water containment
	MWD3	56.38 @ FSL	2550 @ FSL	11.5 @ FSL	Auxillary storage
	MWD4	27.71 @ FSL	830 @ FSL	9.0 @ FSL	Auxillary storage
	Tailings Storage Facility	128.17 @ FSL	10850@ FSL	12.6 @ FSL	Tailings Storage
	Spoil Dam 1	5.5 @ FSL	300@ FSL	6.8 @ FSL	Collection of mine affected runoff
	Spoil Dam 2	6.1 @ FSL	350@ FSL	6.8 @ FSL	Collection of mine affected runoff
	Spoil Dam 3	6.9 @ FSL	400@ FSL	7.0 @ FSL	Collection of mine affected runoff
	Spoil Dam 4	17.0 @ FSL	1,200@ FSL	8.3 @ FSL	Collection of mine affected runoff
	Borefield dam 1	42.8 @ FSL	55@ FSL	6.0 @ FSL	Groundwater dewatering
	Borefield dam 2	42.8 @ FSL	55@ FSL	6.0 @ FSL	Groundwater dewatering
	Adit/ROM dam south	0.9 @ FSL	29@ FSL	6.4 @ FSL	Collection of mine affected runoff
	Adit/ROM dam central	0.5 @ FSL	13@ FSL	4.4 @ FSL	Collection of mine affected runoff
	Adit/ROM dam north	0.5 @ FSL	13@ FSL	4.4 @ FSL	Collection of mine affected runoff
	ROM dump dam	0.3 @ FSL	7@ FSL	4.1 @ FSL	Collection of mine affected runoff
	TLO dam	1.3 @ FSL	45@ FSL	4.6 @ FSL	Collection of mine affected runoff
	CMIA dam & overflow basin	5.3 @ FSL	280@ FSL	6.4 @ FSL	Collection of mine affected runoff
	Process water and decant dam	2.9 @ FSL	150@ FSL	6.8 @ FSL	Collection of mine affected runoff
	Pit dewatering dam north	7.7 @ FSL	200@ FSL	7.0 @ FSL	Collection of mine affected runoff
	Pit dewatering dam south	3.7 @ FSL	450@ FSL	7.0 @ FSL	Collection of mine affected runoff
G38	All regulated dams must meet the hydraulic performance criteria specified in Table G-3 Hydraulic Performance of Dams.				

**SCHEDULE G – REGULATED STRUCTURES****TG-3
Hydraulic
Performance
of Dams**

Regulated structure	Hazard category for failure to contain	Hazard category for dam break	Adopted Hazard Classification	Uncontrolled Discharge AEP	Spillway critical design storm AEP	Mandatory reporting level
MWD1	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
MWD2	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
MWD3	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
MWD4	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Tailings Storage Facility 1	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Spoil Dam 1	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Spoil Dam 2	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Spoil Dam 3	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Spoil Dam 4	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Borefield dam 1	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Borefield dam 2	High	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Adit/ROM dam south	High	Low	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
Adit/ROM dam central	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
Adit/ROM dam north	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
ROM dump dam	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
TLO dam	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
CMIA dam & overflow basin	Low	Low	Significant (EC >4000µS/cm)	1:20 AEP 3 month wet season	1:1,000	1:10 AEP 72 hour storm
Process	Low	High	High	1:100 AEP 3 month	1:100,000	1:100 AEP 72



SCHEDULE G – REGULATED STRUCTURES

	water and decant dam				wet season		hour storm
	Pit dewatering dam north	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
	Pit dewatering dam south	Low	High	High	1:100 AEP 3 month wet season	1:100,000	1:100 AEP 72 hour storm
G39	Each regulated levee named in column 1 of Table G-1 Location of Regulated Structures, must be consistent with the details noted in columns 2 through to and including 4 of Table TG4 Basic Details of Regulated Levees, below, for that levee.						
TG-4 Basic Details of Regulated Levees	SOUTHERN OPENCUT LEVEE	1:1000	Flood Level plus 1m freeboard	Control Point 1			
				Control Point 2			
				Control Point 3			
				Control Point 4			
				Control Point 5			
				Control Point 6			
				Control Point 7			
				Control Point 8			
				Control Point 9			
				Control Point 10			
	NORTHERN OPENCUT LEVEE	1:1000	Flood Level plus 1m freeboard	Control Point 11			
				Control Point 12			
				Control Point 13			
				Control Point 14			
				Control Point 15			
				Control Point 16			
				Control Point 17			
				Control Point 18			
				Control Point 19			
				Control Point 20			
				Control Point 21			
				Control Point 22			
				Control Point 23			
	STOCKPILE LEVEE	1:1000	Flood Level plus 1m freeboard	Control Point 24			
				Control Point 25			
				Control Point 26			
				Control Point 27			
				Control Point 28			

**SCHEDULE D – NOISE & VIBRATION****Noise Nuisance**

D1	Noise from the mining activity must not cause a noise nuisance at any sensitive receptor.				
D2	All noise from the mining activity must not exceed the levels specified in Table D-1 Noise Limits (sensitive place).				
D3	Noise is not considered to be a nuisance under condition D1 if monitoring shows that noise from the mining activity does not exceed the following levels in the time periods specified in Table D-1 Noise Limits (sensitive place).				
TD-1 Noise Limits (sensitive places)					
	Noise Level dB(A) (outside) at a Sensitive Place	Monday to Sunday			
		7 am – 6 pm	6 pm – 10 pm	10 pm – 7 am	
		L _{Aeq} , adj 15 mins	30	30	30
		L _{A1} , adj 15 mins	-	-	55

Noise Monitoring

D4	Monitoring of the receiving acoustic environment shall be conducted at the locations described in Table D-2 Noise Monitoring Locations for the duration shown or alternative locations as agreed with the administering authority.				
TD-2 Noise Monitoring Locations	Ref.	Location	Receiving area	Duration	Type
	A	Forrester Homestead	Outside the dwelling, 6 m off the southern facade (on free field).	A minimum of 7-day, monthly during construction and every 3 months during operations.	Unattended noise logging, 15-minute averaging continuously throughout the day.
				15-minute daytime, evening and night-time measurements. Undertaken during the same periods of unattended noise logging	Attended measurements (3 spot measurements).
	B	Surbiton Homestead	Outside the dwelling, 6 m off the south-western facade (on free field).	A minimum of 7-day, monthly during construction and every 3 months during operations	Unattended noise logging, 15-minute averaging continuously throughout the day.
				15-minute daytime, evening and night-time measurements. Undertaken during the same periods of unattended noise logging.	Attended measurements (3 spot measurements).
	C	Eulimbie Homestead	Outside the dwelling, 6 m off the western facade (on free field)	A minimum of 7-day, monthly during construction and every 3 months during operations	Unattended noise logging, 15-minute averaging continuously throughout the day.

SCHEDULE D – NOISE & VIBRATION

				15-minute daytime, evening and night-time measurements. Undertaken during the same periods of unattended noise logging.	Attended measurements (3 spot measurements).
	D	Project Accommodation Village	Western end of the village. At least 6 m from any reflective facade (on free field)	A minimum of 7-day, monthly during construction and every 3 months during operations	Unattended noise logging, 15-minute averaging continuously throughout the day.
				15-minute daytime, evening and night-time measurements. Undertaken during the same periods of unattended noise logging.	Attended measurements (3 spot measurements).
D5	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 noise nuisance at any sensitive place, and the results must be notified within fourteen (14) days to the administering authority following completion of monitoring. Monitoring must include: <ul style="list-style-type: none">(a) LAeq,adj, 15 mins (external);(b) LA1,15 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 date and time of recording.				
D6	If the monitoring required by condition D5 is undertaken for over one month, then monthly interim reports should be provided to the administering authority.				
D7	The method of measurement and reporting of noise levels must comply with the current edition of the DEHP <i>Noise Measurement Manual</i> (3 rd Edition, 1 March, 2000) and any subsequent versions.				
D8	If monitoring indicates exceedance of the relevant limits in Table D-1 Noise Limits (sensitive place), then the Environmental Authority holder must: <ul style="list-style-type: none">(a) Address the complaint (if the monitoring is relevant to 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.				
Vibration Nuisance					
D9	Vibration from the mining activity must not cause an environmental nuisance at any sensitive place.				

**SCHEDULE D – NOISE & VIBRATION**

D10	If the Environmental Authority holder can provide evidence through monitoring that the limits defined in Table D-3 Airblast Overpressure & Peak Particle Velocity Levels, are not being exceeded then the holder is not in breach of condition D9.	
Airblast Overpressure Nuisance		
D11	If monitoring indicates exceedance of the relevant limits in Table D-3 Airblast Overpressure & Peak Particle Velocity Levels, then the Environmental Authority holder must address the complaint including the use of appropriate dispute resolution if required, and immediately implement vibration abatement measures so that vibration from the activity does not result in further environmental nuisance.	
TD-3 Airblast Overpressure & Peak Particle Velocity Levels	Blast Noise and Vibration Parameter	Daylight hours – Monday to Saturday Between 0900 – 1300 on Sundays and public holidays
	Airblast Overpressure Level [dB(L)]	115dB (linear) peak for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts; and No more than 120dB (linear) peak for any blast.
	Peak Particle Velocity (mm/s)	The ground-borne vibration must not exceed a peak particle velocity of 5mm per second for nine out of any 10 consecutive blasts initiated, regardless of the interval between blasts; and Must not exceed a peak particle velocity of 10mm per second for any blast.
D12	If requested by the administering authority, vibration monitoring must be undertaken for a stated period at a specified sensitive place and the results provided to the administering authority within fourteen (14) days following completion of monitoring.	
D13	The method of measurement and reporting of vibration levels must comply with Appendix J of AS 2187.2-2006.	
D14	If the monitoring required by condition D12 is undertaken for over one month, then monthly interim reports should be provided to the administering authority.	
D15	Subject to conditions D16 and D17, airblast overpressure level from blasting operations must not cause environmental nuisance, at any sensitive place.	
D16	If the Environmental Authority holder can provide evidence through monitoring that the limits defined in Table D-3 Airblast Overpressure & Peak Particle Velocity Levels are not being exceeded then the holder is not in breach of condition D14.	
D17	If monitoring indicates exceedance of the relevant limits in Table D-3 Airblast Overpressure & Peak Particle Velocity Levels, then the Environmental Authority holder must: <div><div>(a)</div><div>Address the complaint including the use of appropriate dispute resolution if required, and</div><div>(b)</div><div>Immediately implement airblast overpressure abatement measures so that airblast overpressure from the activity do not result in further environmental nuisance.</div></div>	

SCHEDULE D – NOISE & VIBRATION

D18	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.
D19	Airblast overpressure monitoring must include the following descriptors, characteristics and conditions: <ul style="list-style-type: none"> (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 (c) Direction location, date and time of recording.
D20	The method of measurement and reporting of airblast overpressure levels must comply with Appendix J of AS 2187.2-2006.

SCHEDULE E – WASTE

Tyres	
E1	Scrap tyres stored awaiting disposal or transport for take-back and recycling, or waste-to-energy options must be stored in stable stacks less than 3 m high, and at least 10 m from any other scrap tyre storage area, combustible or flammable material or vegetation.
E2	All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a 10 m radius of the scrap tyre storage area.
E3	Disposing of scrap tyres resulting from the authorised activities in spoil emplacements is acceptable, provided tyres are placed as deep in the spoil as reasonably practicable. A record must be kept of the number and location for tyres disposed. These details must be recorded on the Environmental Management Register (EMR).
E4	Disposing scrap tyres resulting from the authorised activities must be consistent with the requirements of DERM's operational policy Disposal & Storage of Scrap Tyres at Mine Sites (2006) or any later versions.
Mining Waste Management	
E5	An Overburden and CHPP Rejects Management Plan, certified by an appropriately qualified person(s) must be developed and implemented within twelve months of the issue of the Environmental Authority.
E6	The Overburden and CHPP Rejects Management Plan must at a minimum include: <ul style="list-style-type: none"> (a) Characterisation programs to ensure that the physical properties of the mining waste is progressively characterised during disposal. (b) The quality of potentially acid forming (PAF) mining waste; (c) Review potential impacts of PAF mining waste on the success of proposed rehabilitation methods; (d) Management actions for mining waste that have been defined as PAF.

**SCHEDULE E – WASTE**

	<ul style="list-style-type: none">(e) Identification of environmental impacts and potential environmental impacts;(f) Control measures for routine operations to minimise likelihood of environmental harm;(g) Contingency plans and emergency procedures for non-routine situations; and(h) Periodic review of environmental performance and continual improvement.
E7	Records of trade and regulated wastes or material leaving the mining lease for recycling or disposal, including the final destination and method of treatment, must be in accordance with the <i>Environmental Protection (Waste Management) Policy</i> (2000).
E8	Design plans for the authorised spoil disposal facility(s) must include the following performance indicators: <ul style="list-style-type: none">(a) During operations the spoil disposal facility(s) will be operated with minimal or no potential for adverse environmental harm resulting from collapse of any component of the facility;(b) The potential for leachate generation will be minimal or non-existent; and(c) Adequate drainage structures, erosion protection and storage are provided to manage seasonal and rare rainfall events with minimal or no environmental harm.

SCHEDULE I – SEWAGE TREATMENT

I1	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.			
I2	Pipelines and fittings associated with the sewage treatment plant must be clearly identified. Lockable valves or removable handles must be fitted to all release pipelines situated in public access areas.			
I3	Effluent from the sewage treatment plant must only be discharged from the authorised discharge points for the purpose of irrigation, as specified in Table TI-1 Effluent Discharge Locations to the areas shown in Table TI-3 Effluent Irrigation Locations in compliance with the limit levels stated in Table TI-2 Effluent Release Limits to Land, and the conditions of this authority.			
TI-1 Effluent Discharge Locations	Authorised discharge point	Location	Latitude (GDA 94)	Longitude (GDA 94)
	Temporary Treatment Plant	Airport area; East side of Light Industrial Area	Approx. -23.06015 (Easting 458236)	Approx. 146.59229 (Northing 7449763)

SCHEDULE I – SEWAGE TREATMENT

TI-2 Effluent Release Limits to Land	Release Limits			
	Quality Characteristics (A+ Effluent Limits)		Maximum	
	Pathogens (E. Coli <1cfu/1—ml)		5 log	
	BOD5		20 mg/L	
	Turbidity		2 NTU (95%ile) 5 max	
	Nitrates		20mg/L	
	Phosphates		7 mg/L	
	Ammonia		5 mg/L	
	Suspended Solids		30 mg/L	
	pH		6.0-8.5	
	Faecal Coliforms		1000 cfu/100 ml	
	Free Chlorine		0.5 – 0.9 ppm (after 20 minutes contact; if chlorination is the adopted disinfection method)	
TI-3 Effluent Irrigation Locations	Authorised discharge point	Location	Latitude (GDA 94)	Longitude (GDA 94)
	Airport area	East side of Light Industrial Area	Approx. -23.06015 (Easting 458236)	Approx. 146.59229 (Northing 7449763)
I4	Notwithstanding the quality characteristic limits specified in Table TI-2 Effluent Release Limits to Land, releases of effluent must not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm.			
I5	Effluent from the sewage treatment plant, for the purposes of dust suppression, must only be discharged from the authorised discharge points, as specified in Error! Reference source not found. in compliance with the limits levels stated in Table TI-2 Effluent Release Limits to Land, and the conditions of this authority.			
I6	Effluent must not be released from the site to any waters or the bed and banks of any waters.			
I7	Water or stormwater contaminated by sewage treatment activities must not be released to any waters or the bed and banks of any waters.			
I8	Water or stormwater contaminated by sewage treatment activities must not be released to land.			
Land Disposal – Irrigation				
I9	The irrigation of effluent must be carried out in a manner such that: (a) Vegetation is not damaged. (b) Soil erosion and soil structure damage is avoided; (c) There is no surface ponding of effluent; (d) Percolation of effluent beyond the plant root zone is minimised. (e) The capacity of the land to assimilate nitrogen, phosphorous, salts, organic matter as measured by oxygen demand is not exceeded; and			

**SCHEDULE I – SEWAGE TREATMENT**

	(f) The quality of groundwater is not adversely affected.
I10	Notices must be prominently displayed on areas undergoing effluent irrigation, warning the public that the area is irrigated with effluent and not to use or drink the effluent. These notices must be maintained in a visible and legible condition.
I11	The daily volume of contaminants released to land must be determined or estimated by an appropriate method, for example a flow meter, and records kept of such determinations and estimates.
I12	When conditions prevent the irrigation of treated effluent to land (such as during or following rain events), the contaminants must be directed to a wet weather storage or alternative measures must be taken to store/ lawfully dispose of effluent (such as wet weather storage or tanking off site to another treatment plant or sewer). A record must be kept of any removal or discharge offsite, including destination, transporter, dates and volumes.
I13	Effluent must only be irrigated to places that have implemented an Irrigation Management Plan, which adequately addresses the following: <ul style="list-style-type: none">(a) Efficiency of application;(b) Control of sodicity in the soil(c) Minimisation of degradation of soil structure;(d) Control of build ups of nutrients and heavy metals in the soil and subsoil from effluent and other sources(e) Preventing impacts on the groundwater resource through infiltration;(f) Preventing subterranean flows of effluent to waters;(g) Method of application; and(h) Health and safety in relation to effluent handling and irrigation.
I14	A minimum area of five (5) hectares of land, excluding any buffer zones, must be utilised for the irrigation of treated sewage effluent.
Treated Effluent Removal	
I15	If treated effluent is removed from the site, a record of the removal of treated effluent from site must be kept detailing the following information: <ul style="list-style-type: none">(a) Date of pick-up of treated effluent.(b) Volume of treated effluent removed from site.(c) Destination of treated effluent; and(d) The transporter.

SCHEDULE F – LAND**Preventing Contaminant Release to Land**

F1	Contaminants must not be released to land in a manner which constitutes nuisance, material or serious environmental harm.
F2	The Environmental Authority holder must take all practicable actions necessary to secure loads prior to transporting materials off site to minimise emissions or spillage of any material from vehicles or other transport infrastructure.
Topsoil	

**SCHEDULE F – LAND**

F3	A Top Soils Management Plan must be developed for the site. All topsoil must be strategically stripped ahead of mining in accordance with this Plan.
F4	Topsoil and subsoils must be managed to ensure stability and minimise the release of contaminants. Measures include: <ul style="list-style-type: none">(a) Vegetating stockpiles;(b) Minimising height of stockpiles; and(c) Reusing stockpiles as soon as possible.
F5	A Topsoil Inventory which identifies the topsoil requirements for the mining Project and availability of suitable topsoil on site must be detailed in the Mine Operational Manual.
Storage & Handling of Hazardous Substances	
F6	All flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm and maintained in accordance with the current version of <i>AS 1940 – Storage and Handling of Flammable and Combustible Liquids</i> .
F7	Spillage of all flammable and combustible liquids must be controlled in a manner that prevents environmental harm.
F8	All explosives, corrosive substances, toxic substances, gases and dangerous goods must be stored and handled in accordance with the relevant Australian Standard (<i>i.e. latest version of AS 2187 Explosives - Storage, Transport and Use; AS 3780 The Storage and Handling of Corrosive Substances; AS 4452 The Storage and Handling of Toxic Substances</i>).
F9	All chemicals and flammable or combustible liquids stored on site that have the potential to cause environmental harm must be stored in or serviced by an effective containment system that is impervious to the materials stored and managed to prevent the release of liquids to water or land. Where no relevant Australian Standard is available, the following must be applied: <ul style="list-style-type: none">(a) Storage tanks must be bunded so that the capacity and construction of the bund is sufficient to contain at least 110% of a single storage tank or 100% of the largest storage tank plus 10 % of the second largest storage tank in multiple storage areas; and(b) Drum storages must be bunded so that the capacity of the bund is sufficient to contain at least 25% of the maximum design storage volume within the bund.
F10	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 on site.
F11	Anyone operating with wastes, chemicals or flammable and combustible liquids under this Environmental Authority be trained in the use of the spill kit.
F12	Regulated structures must be designed and constructed to ensure that the design integrity would not be compromised on account of: <ul style="list-style-type: none">(a) Floodwaters from entering the regulated dam from any watercourse or drainage line; and(b) Wall failure due to erosion by floodwaters arising from any watercourse or drainage line.

**SCHEDULE F – LAND****Infrastructure****F13**

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 land owner/holder.

(Note: Not applicable where the landowner/ holder is also the Environmental Authority holder).

Subsidence**F14**

A Subsidence Management Plan must be developed by an appropriately qualified person and implemented by the holder of this Environmental Authority prior to the commencement of activities that result in subsidence.

F15

The Subsidence Management Plan must:

- (a) Provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of this Environmental Authority;
- (b) Address the proposed impacts of subsidence on any land, watercourse and floodplain, including but not limited to:
 - iii. Physical condition of surface drainage:
 - Erosion
 - Areas susceptible to higher levels of erosion such as watercourse confluences;
 - Incision processes
 - Stream widening;
 - Tension cracking;
 - Lowering of bed and banks;
 - Creation of instream waterholes;
 - Changes to local drainage patterns.
 - iv. Overland flow:
 - Capture of overland flow by subsided long wall panels;
 - Increased overbank flows due to lowering of high bank of watercourses;
 - The portion of local and large scale catchment likely to be captured by subsided long wall panels and the associated impacts on downstream users.
 - iv. Water quality
 - Surface water
 - Groundwater;
 - Overland flow water detained in subsided long wall panels;
 - vi. Land condition: current land condition to be impacted by subsidence.
 - vii. Infrastructure: Detail of existing infrastructure (pipelines, railway, powerlines and haul roads) should be identified where there is a potential impact from the effects of land subsidence.

SCHEDULE F – LAND

	<ul style="list-style-type: none"> (c) Proposed options for mitigating any impacts associated with subsidence and how these mitigation methods will be implemented; (d) Cumulative impacts on watercourses or catchments; (e) Impacts on groundwater; (f) Contingency procedures for emergencies; and (g) A program for monitoring and review of the effectiveness of the Subsidence Management Plan.
F16	<p>The Subsidence Management Plan must be reviewed each calendar year and a report prepared by an appropriately qualified person. The report must:</p> <ul style="list-style-type: none"> (a) Assess the plan against the requirements under condition F15. (b) Include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; and (c) Identify any amendments made to the Subsidence Management Plan following the review.
F17	<p>The holder of this Environmental Authority must attach to the review report required by condition F16, a written response to the report and the recommended actions, detailing the actions taken or to be taken by the Environmental Authority holder on stated dates:</p> <ul style="list-style-type: none"> (a) To ensure compliance with this Environmental Authority; and (b) To prevent a recurrence of any non-compliance issues identified.
F18	<p>The review report required by condition F16 and the written response to the review report required by condition F17 must be submitted to the administering authority with the subsequent annual return under the signature of the appointed signatory for the annual return.</p>
F19	<p>Areas impacted by subsidence, or proposed to be impacted by subsidence must be identified within the Plan of Operations.</p>
F20	<p>The Plan of Operations must as a minimum:</p> <ul style="list-style-type: none"> (a) Identify pre-subsidence management actions to be undertaken during the period of the plan. (b) Identify post – subsidence management actions to be undertaken during the period of the plan. (c) Identify the subsidence monitoring proposed to be undertaken during the period of the plan.
F21	<p>The holder of this Environmental Authority must not commence subsidence of a longwall panel that will result in the subsidence of a watercourse or adjoining floodplain unless:</p> <ul style="list-style-type: none"> (a) The holder has submitted to the administering authority two copies of the Subsidence Management Plan detailing the subsidence activities for the watercourse or adjoining floodplain together with certification of a suitable qualified and experienced person that the plan is compliant in all respects with this Environmental Authority and in accordance with engineering best practice; and (b) At least 28 days has passed since the submission of the subsidence management plan. <p>Due consideration must be given to any comments made by the</p>

**SCHEDULE F – LAND**

	administering authority about the Subsidence Management Plan and subsequent implementation of the plan.
F22	The holder of this Environmental Authority must arrange for each subsided longwall panel to be inspected annually by a suitably qualified and experienced person, in accordance with conditions F23 through F27.
F23	The annual inspection must be conducted between 1 April and 1 November each year.
F24	At each annual inspection, the condition of each subsided longwall panel must be assessed, including the structural, geotechnical and hydraulic adequacy of the subsided longwall panel and the adequacy of the works with respect to the Subsidence Management Plan.
F25	For each inspection, two copies of a report certified by the suitably qualified and experienced person, including any recommendations to ensure the integrity of each subsided longwall panel must be provided to the administering authority within twenty eight (28) days of inspection.
F26	The holder of this Environmental Authority must attach to the inspection report required by condition F25, a written response to the report and the recommended actions, detailing the actions taken or to be taken by the Environmental Authority on stated dates: (a) To ensure compliance with this Environmental Authority; and (b) To prevent a recurrence of any non-compliance issues identified.
F27	The written response required by condition F26 to the inspection report must be submitted to the administering authority within 28 days of the submission of the inspection report required under condition F25.
Rehabilitation	
F28	Progressive rehabilitation must commence within two (2) years of when areas become available within the operational land.
F29	All areas significantly disturbed by mining activities must be rehabilitated in accordance with Table F-1 Final Land Use and Rehabilitation Requirements and Table F-2 Landform Design Criteria.



SCHEDULE F – LAND

TF-1 Final Land Use & Rehabilitation Requirements	Land Use Element	Domains				
		Pits and Mine Waste		Tailings Storage Facility	Infrastructure	Remainder of Mining Lease Area
		Pits	Mine Waste			
	Approximate surface area (ha)	897	2,418	420	2,566	30,802
	Pre-mine land use	Combination of low intensity cattle grazing and bushland.				
	Post-mine land use	Voids to reach a stable water level over time for storage and stock watering.	Combination of low intensity cattle grazing and bushland.	Low intensity cattle grazing.	Low intensity cattle grazing.	Combination of low intensity cattle grazing and bushland.
	Post-mine land capability classification	Voids – Class V ¹	Land Suitability (Low Intensity Grazing). All other areas – Class III ¹ or IV ¹ .			
	Projective cover range (%)	Not applicable	>70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).	>70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).	>70% vegetative cover is present (or 50% if rocks, logs or other features of cover are present).	Consistent with existing vegetation as these areas are going to have minimal disturbance.

**SCHEDULE F – LAND**

TF-2 Landform Design Criteria	Domains		Target Slope Range (Degrees)	Approximate Surface Area (ha)
	Pits and Mine Waste	Void – Pit ¹	Final void batter slopes will be designed and excavated to exhibit permanent geotechnical stability. Prior to closure, further investigations will be undertaken to specify design criteria and appropriate action will be taken to ensure effective long term safety, stability and management of the void	897
		Void – Pit ²		
		Borrow Pit	No less than 75% of the rehabilitated area has slopes of less than 10° and up to 25% of the rehabilitated area has slopes greater than 10°.	2,418
		Overburden	No less than 75% of the rehabilitated area has slopes of less than 10° and up to 25% of the rehabilitated area has slopes greater than 10°.	
	Tailings Storage Facility	Tailings Dam	No less than 75% of the rehabilitated area has slopes of less than 5° and up to 25% of the rehabilitated area has slopes greater than 5°.	420
	Infrastructure	Including CHPP, ROM Stockpiles, workshops, landfill, raw water dam, administration areas, etc	No less than 75% of the rehabilitated area has slopes of less than 5° and up to 25% of the rehabilitated area has slopes greater than 5°.	2,566
	Remainder of Mining Lease Area	Roads and tracks	As required	30,802
		Exploration and groundwater monitoring bores	As required	
F30	The Proponent will complete an investigation into the planned rehabilitation of disturbed areas and submit a report to the administering authority proposing acceptance criteria to meet the outcomes in condition F29 and Table F-1 Final Land Use and Rehabilitation Requirements and Table F-2 Landform Design Criteria within twelve months of the issue of the Environmental Authority.			
Residual Voids				
F31	Residual voids must comply with the following outcomes: (a) Residual voids must not cause any serious environmental harm to land, surface waters or any recognised ground water 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; and			

**SCHEDULE F – LAND**

	(b) Final void batter slopes must be designed and excavated to exhibit permanent geotechnical stability. Prior to closure, further investigations must be undertaken to specify design criteria and appropriate action to ensure effective long term safety, stability and management of the void
Rehabilitation Management Plan	
F32	<p>The Proponent will complete a rehabilitation management plan for disturbed areas and submit a report to the administering authority proposing acceptance criteria prior to the commencement of mining activities. The rehabilitation management plan must at a minimum:</p> <ul style="list-style-type: none">(a) Develop design criteria for each domain.(b) Identify success factors and completion criteria for each domain.(c) Identify three (3) reference sites to be used to develop rehabilitation success criteria.(d) Describe the monitoring of reference sites inclusive of statistical design.(e) Detail rehabilitation methods applied to each domain.(f) Contain landform design criteria including end of mine design.(g) Detail how landform design will be consistent with the surrounding topography.(h) Provide schematic representation of the final landform inclusive of:<ul style="list-style-type: none">• Drainage design and features• Slope designs• Cover design• Erosion controls proposed on reformed land.(i) Explain planned native vegetation rehabilitation areas and corridors(j) Describe rehabilitation monitoring and maintenance requirements to be applied to all areas of disturbance.(k) Develop a contingency plan for rehabilitation maintenance or redesign.(l) Describe end of mine landform design plan and post mining land uses across the mine.
Rehabilitation Monitoring Program	
F33	Once rehabilitation has commenced, the Environmental Authority holder must conduct a annual Rehabilitation Monitoring Program, which must include sufficient spatial and temporal replication to enable statistically valid conclusions as established.
F34	The Rehabilitation Monitoring Program must be developed and implemented by a person possessing appropriate qualifications and experience in the field of rehabilitation management.
F35	<p>Verification of rehabilitation success, determined by the rehabilitation success criteria developed as per condition F33 is to be carried out as follows:</p> <ul style="list-style-type: none">(a) The minimum sampling intensity must be specified for the monitoring of progressive rehabilitation;

**SCHEDULE F – LAND**

	<p>(b) Justification of the suitability of the minimum sampling intensity must be provided;</p> <p>(c) Monitoring must include sufficient replication to enable statistical analysis of results at an acceptable power; and</p> <p>(d) Undertaken at twelve month intervals.</p>																																																																																																																																												
F36	<p>The Rehabilitation Monitoring Program must be included in the Plan of Operations and updated with each subsequent Plan of Operations, describing:</p> <p>(a) How the rehabilitation objectives as per the Rehabilitation Management Plan will be achieved; and</p> <p>(b) Verification of rehabilitation success as per condition F35.</p>																																																																																																																																												
F37	<p>For rehabilitated areas, self-sustaining vegetation as per Table F-1 Final Land Use and Rehabilitation Requirements must be consistent with the reference sites identified in Table F-3 Reference Sites.</p>																																																																																																																																												
TF-3 Reference Sites	<table><tr><th>Reference site</th><th>Domain</th><th>Latitude</th><th>Longitude</th><th>Description</th></tr><tr><td>1</td><td>5</td><td>146.3627</td><td>-23.0208</td><td>10.3.27a</td></tr><tr><td>2</td><td>5</td><td>146.4148</td><td>-22.9769</td><td>10.3.27a</td></tr><tr><td>3</td><td>5</td><td>146.4979</td><td>-22.9249</td><td>10.3.27a</td></tr><tr><td>4</td><td>5</td><td>146.5066</td><td>-22.9395</td><td>10.5.12</td></tr><tr><td>5</td><td>5</td><td>146.4172</td><td>-22.953</td><td>10.5.12</td></tr><tr><td>6</td><td>5</td><td>146.4346</td><td>-22.9187</td><td>10.5.12</td></tr><tr><td>7</td><td>5</td><td>146.3982</td><td>-22.9514</td><td>10.3.13a</td></tr><tr><td>8</td><td>5</td><td>146.4826</td><td>-22.8723</td><td>10.3.13a</td></tr><tr><td>9</td><td>5</td><td>146.4902</td><td>-22.9006</td><td>10.3.13a</td></tr><tr><td>10</td><td>5</td><td>146.3644</td><td>-23.0334</td><td>10.3.14</td></tr><tr><td>11</td><td>5</td><td>146.5063</td><td>-23.1039</td><td>10.3.14</td></tr><tr><td>12</td><td>5</td><td>146.3875</td><td>-22.9901</td><td>10.3.14</td></tr><tr><td>13</td><td>5</td><td>146.3996</td><td>-22.9826</td><td>10.3.28a</td></tr><tr><td>14</td><td>5</td><td>146.3497</td><td>-23.0288</td><td>10.3.28a</td></tr><tr><td>15</td><td>5</td><td>146.4846</td><td>-22.9376</td><td>10.3.28a</td></tr><tr><td>16</td><td>5</td><td>146.3341</td><td>-23.0382</td><td>10.3.3a</td></tr><tr><td>17</td><td>5</td><td>146.3504</td><td>-23.0052</td><td>10.3.3a</td></tr><tr><td>18</td><td>5</td><td>146.295</td><td>-23.027</td><td>10.3.3a</td></tr><tr><td>19</td><td>5</td><td>146.5266</td><td>-23.0922</td><td>10.7.7</td></tr><tr><td>20</td><td>5</td><td>146.562</td><td>-23.103</td><td>10.7.7</td></tr><tr><td>21</td><td>5</td><td>146.5198</td><td>-23.0728</td><td>10.7.7</td></tr><tr><td>22</td><td>5</td><td>146.3657</td><td>-22.9483</td><td>10.7.3b</td></tr><tr><td>23</td><td>5</td><td>146.5217</td><td>-23.1053</td><td>10.7.3b</td></tr><tr><td>24</td><td>5</td><td>146.5543</td><td>-23.0907</td><td>10.7.3b</td></tr><tr><td>25</td><td>5</td><td>146.4082</td><td>-22.9899</td><td>10.5.5a</td></tr><tr><td>26</td><td>5</td><td>146.5833</td><td>-23.1055</td><td>10.5.5a</td></tr><tr><td>27</td><td>5</td><td>146.5951</td><td>-23.0198</td><td>10.5.5a</td></tr></table>	Reference site	Domain	Latitude	Longitude	Description	1	5	146.3627	-23.0208	10.3.27a	2	5	146.4148	-22.9769	10.3.27a	3	5	146.4979	-22.9249	10.3.27a	4	5	146.5066	-22.9395	10.5.12	5	5	146.4172	-22.953	10.5.12	6	5	146.4346	-22.9187	10.5.12	7	5	146.3982	-22.9514	10.3.13a	8	5	146.4826	-22.8723	10.3.13a	9	5	146.4902	-22.9006	10.3.13a	10	5	146.3644	-23.0334	10.3.14	11	5	146.5063	-23.1039	10.3.14	12	5	146.3875	-22.9901	10.3.14	13	5	146.3996	-22.9826	10.3.28a	14	5	146.3497	-23.0288	10.3.28a	15	5	146.4846	-22.9376	10.3.28a	16	5	146.3341	-23.0382	10.3.3a	17	5	146.3504	-23.0052	10.3.3a	18	5	146.295	-23.027	10.3.3a	19	5	146.5266	-23.0922	10.7.7	20	5	146.562	-23.103	10.7.7	21	5	146.5198	-23.0728	10.7.7	22	5	146.3657	-22.9483	10.7.3b	23	5	146.5217	-23.1053	10.7.3b	24	5	146.5543	-23.0907	10.7.3b	25	5	146.4082	-22.9899	10.5.5a	26	5	146.5833	-23.1055	10.5.5a	27	5	146.5951	-23.0198	10.5.5a
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21	5	146.5198	-23.0728	10.7.7																																																																																																																																									
22	5	146.3657	-22.9483	10.7.3b																																																																																																																																									
23	5	146.5217	-23.1053	10.7.3b																																																																																																																																									
24	5	146.5543	-23.0907	10.7.3b																																																																																																																																									
25	5	146.4082	-22.9899	10.5.5a																																																																																																																																									
26	5	146.5833	-23.1055	10.5.5a																																																																																																																																									
27	5	146.5951	-23.0198	10.5.5a																																																																																																																																									

SCHEDULE F – LAND

Post Mine Use

F38

The holder must develop and submit to the administering authority a Post Mine Land Use Plan (PMLUP) with the initial Plan of Operations and update and resubmit the plan with each subsequent Plan of Operations. The PMLUP must describe how the rehabilitation objectives in Table F-1 Final Land Use and Rehabilitation Requirements will be achieved:

- (a) Schematic representation of final land form inclusive of drainage features;
- (b) Drainage design
- (c) Erosion controls proposed on reformed land;
- (d) Geotechnical, geochemical and hydrological studies;
- (e) Chemical, physical and biological properties of soil and water;
- (f) Proposed revegetation methods inclusive of plant species selection, re-profiling, resspreading soil, soil ameliorants/ amendments, surface preparation and method of propagation; and
- (g) A Rehabilitation Monitoring Program as specified in condition F36.

Post Closure Management Plan

F39

A Post Closure Management Plan for the site must be developed and submitted to the administering authority at least 18 months prior to the final coal processing on site and implemented for a nominal period of:

- (a) At least 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 can harm the environment.

F40

The Post Closure Management Plan must include the following elements:

- (a) Operation and maintenance of:
 - vi. Wastewater collection and reticulation systems;
 - vii. Wastewater treatment systems;
 - viii. The groundwater monitoring network;
 - ix. The final cover systems of spoil dumps; and
 - x. Vegetative cover;
- (b) Monitoring of:
 - vii. Surface water quality;
 - viii. Groundwater quality;
 - ix. Seepage rates
 - x. Erosion rates
 - xi. The integrity and stability of slopes, ramps and voids; and
 - xii. The health and resilience of native vegetation cover.

Cudmore Resources Reserve

F41

Prior to commencement of mining or associated activities within the Cudmore Resources Reserve, the proponent must develop an Operations Plan for that area detailing the mitigation and management measures to be implemented to manage the impacts as a result of the mining activities. The Operations Plan will be subject to a periodic review to allow consideration of

**SCHEDULE F – LAND**

all relevant environmental, economic resource and operational considerations with potential to impact on the values of Cudmore Resources Reserve.

SCHEDULE J – Flora & Fauna

J1	The impacts of mining activities on RE's of Conservation Significance will be minimised wherever possible.
J2	A Pest and Weed Management Plan must be developed in accordance with the LP Act and / or local government requirements for weeds that are not declared under State legislation. The Plan must be developed prior to the commencement of construction activities
J3	Species Management Plans must be developed for all potentially impacted species identified as MNES.
J4	A qualified spotter catch is to be engaged to work ahead of the site clearing works at the commencement of the vegetation clearing activity.