

Permit

Environmental Protection Act 1994

Environmental authority EPML01470513

This environmental authority is issued by the administering authority under Chapter 5 of the Environmental Protection Act 1994.

Environmental authority number: EPML01470513

Environmental authority takes effect on 31 January 2019

Environmental authority holder(s)

Name(s)	Registered address
ADANI MINING PTY LTD	Level 25, AMP Place 10 Eagle Street BRISBANE QLD 4001

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Resource Activity, Schedule 2A, 13: Mining black coal	ML70505
Resource Activity, Schedule 2A, 13: Mining black coal	ML70441
Resource Activity, Schedule 2A, 13: Mining black coal	ML70506
Resource Activity, Ancillary 31 - Mineral processing, 2: Processing, in a year, the following quantities of mineral products, other than coke, (b) more than 100,000t	ML70505
Resource Activity, Ancillary 31 - Mineral processing, 2: Processing, in a year, the following quantities of mineral products, other than coke, (b) more than 100,000t	ML70441
Resource Activity, Ancillary 31 - Mineral processing, 2: Processing, in a year, the following quantities of mineral products, other than coke, (b) more than 100,000t	ML70506
Resource Activity, Ancillary 08 - Chemical Storage, 4: storing 200t or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	ML70505

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Environmentally relevant activity/activities	Location(s)
Resource Activity, Ancillary 08 - Chemical Storage, 4: storing 200t or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	ML70441
Resource Activity, Ancillary 08 - Chemical Storage, 4: storing 200t or more of chemicals that are solids or gases, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	ML70506
Resource Activity, Ancillary 08 - Chemical Storage, 5: storing 200 cubic metres or more of chemicals that are liquids, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	ML70505
Resource Activity, Ancillary 08 - Chemical Storage, 5: storing 200 cubic metres or more of chemicals that are liquids, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	ML70441
Resource Activity, Ancillary 08 - Chemical Storage, 5: storing 200 cubic metres or more of chemicals that are liquids, other than chemicals mentioned in items 1 to 3, under subsection (1)(d)	ML70506
Resource Activity, Ancillary 56 - Regulated Waste Storage, Receiving and storing regulated waste	ML70505
Resource Activity, Ancillary 56 - Regulated Waste Storage, Receiving and storing regulated waste	ML70441
Resource Activity, Ancillary 56 - Regulated Waste Storage, Receiving and storing regulated waste	ML70506
Resource Activity, Ancillary 63 - Sewage Treatment, 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of, (d) more than 4000 but not more than 10,000EP	ML70505
Resource Activity, Ancillary 63 - Sewage Treatment, 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of, (d) more than 4000 but not more than 10,000EP	ML70441
Resource Activity, Ancillary 63 - Sewage Treatment, 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of, (d) more than 4000 but not more than 10,000EP	ML70506

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Environmentally relevant activity/activities	Location(s)
Resource Activity, Ancillary 16 - Extraction and Screening, 2: Extracting, other than by dredging, in a year, the following quantity of material, (c) more than 1,000,000t	ML70441
Resource Activity, Ancillary 16 - Extraction and Screening, 2: Extracting, other than by dredging, in a year, the following quantity of material, (c) more than 1,000,000t	ML70505
Resource Activity, Ancillary 16 - Extraction and Screening, 2: Extracting, other than by dredging, in a year, the following quantity of material, (c) more than 1,000,000t	ML70506
Resource Activity, Ancillary 08 - Chemical Storage, 3: Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)	ML70505
Resource Activity, Ancillary 08 - Chemical Storage, 3: Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)	ML70441
Resource Activity, Ancillary 08 - Chemical Storage, 3: Storing more than 500 cubic metres of chemicals of class C1 or C2 combustible liquids under AS 1940 or dangerous goods class 3 under subsection (1)(c)	ML70506

Additional information for applicantsEnvironmentally relevant activities

The description of any environmentally relevant activity (ERA) for which an environmental authority (EA) is issued is a restatement of the ERA as defined by legislation at the time the EA is issued. Where there is any inconsistency between that description of an ERA and the conditions stated by an EA as to the scale, intensity or manner of carrying out an ERA, the conditions prevail to the extent of the inconsistency.

An EA authorises the carrying out of an ERA and does not authorise any environmental harm unless a condition stated by the EA specifically authorises environmental harm.

A person carrying out an ERA must also be a registered suitable operator under the Environmental Protection Act 1994 (EP Act).

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Contaminated land

It is a requirement of the EP Act that an owner or occupier of contaminated land give written notice to the administering authority if they become aware of the following:

- the happening of an event involving a hazardous contaminant on the contaminated land (notice must be given within 24 hours); or
- a change in the condition of the contaminated land (notice must be given within 24 hours); or
- a notifiable activity (as defined in Schedule 3) having been carried out, or is being carried out, on the contaminated land (notice must be given within 20 business days);

that is causing, or is reasonably likely to cause, serious or material environmental harm.

For further information, including the form for giving written notice, refer to the Queensland Government website www.qld.gov.au, using the search term 'duty to notify'.

Take effect

Please note that, in accordance with section 200 of the EP Act, an EA has effect:

- a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or
- b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or
- c) otherwise-on the day the authority is issued.

However, if the EA is authorising an activity that requires an additional authorisation (a relevant tenure for a resource activity, a development permit under the Sustainable Planning Act 2009 or an SDA Approval under the State Development and Public Works Organisation Act 1971), this EA will not take effect until the additional authorisation has taken effect.

If this EA takes effect when the additional authorisation takes effect, you must provide the administering authority written notice within 5 business days of receiving notification of the related additional authorisation taking effect.

If you have incorrectly claimed that an additional authorisation is not required, carrying out the ERA without the additional authorisation is not legal and could result in your prosecution for providing false or misleading information or operating without a valid environmental authority.

Wayne Boyd
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

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Date issued: 31 January 2019

Environmental authority

Obligations under the Environmental Protection Act 1994

In addition to the requirements found in the conditions of this environmental authority, the holder must also meet their obligations under the EP Act, and the regulations made under the EP Act. For example, the holder must comply with the following provisions of the Act:

- general environmental duty (section 319)
- duty to notify environmental harm (section 320-320G)
- offence of causing serious or material environmental harm (sections 437-439)
- offence of causing environmental nuisance (section 440)
- offence of depositing prescribed water contaminants in waters and related matters (section 440ZG)
- offence to place contaminant where environmental harm or nuisance may be caused (section 443)

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Conditions of environmental authority

The environmentally relevant activity(ies) conducted at the location as described above must be conducted in accordance with the following site specific conditions of approval.

This environmental authority consists of the following Schedules and Appendices:

Schedule A	General
Schedule B	Air
Schedule C	Waste
Schedule D	Noise
Schedule E	Groundwater
Schedule F	Water
Schedule G	Sewage treatment
Schedule H	Land and rehabilitation
Schedule I	Offsets and biodiversity
Schedule J	Subsidence
Schedule K	Dams and levees
Appendix 1	Definitions
Appendix 2	Rehabilitation requirements
Appendix 3	Subsidence guidance material
Appendix 4	Figures

¹ Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation



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Schedule A: General	
Condition number	Condition
A1	This environmental authority authorises the environmental harm referred to in the conditions. Where there is no condition or this environmental authority is silent on a matter, the lack of a condition or silence does not authorise environmental harm.
Scope of activity	
A2	The environmental authority holder is approved for a coal extraction rate of up to 74.5 million tonnes per annum (Mtpa) of run-of-mine (ROM) coal in accordance with this environmental authority.
A3	In carrying out the mining activity authorised by this environmental authority, the holder of this environmental authority must comply with <i>Table A1: Mining Domains</i> , and <i>Figures A1–A2</i> .

Table A1: Mining domains

Mine Domain	Location	Domain Area (ha)	Disturbance Areas			Maximum Disturbance Area (ha)
			Year 1–10	Year 11–20	Year 21–60	
Open-cut voids and slopes	See Figure A1	8331.55	3729.56	2011.95	2590.04	8331.55
Underground mining and subsidence boundary	See Figure A1	7786.76	1931.95	3030.16	2824.65	7786.76
Mine infrastructure	See Figure A1	1916.1	1794.46	110.42	11.22	1916.1
Out-of-pit spoil dumps	See Figure A1	8188.29	6482.7	1670.80	34.79	8188.29
Water storage areas, including MAW dams, raw water dams	See Figure A1	1054.59	1050.53	4.06	0	1054.59
Stream diversions	See Figure A1	472.68	412.34	60.34	0	472.68
Tailings drying cell	See Figure A1	216.17	216.17	0	0	216.17
Carmichael River corridor and levees	See Figure A1	1799.02	50.78	0	0	50.78
Carmichael River	See Figure A1	1748.24	0	0	0	0
Exploration*	See Figure A2	NA*	44	0	0	44
Total						28060.93

*The exploration domain is outside of domains in Figure A1.

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A4	The holder of this environmental authority must: a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority; b) maintain such measures, plant and equipment in a proper and efficient condition; c) operate such measures, plant and equipment in a proper and efficient manner; and d) ensure all instruments and devices used for the measurement or monitoring of any parameter under any condition of this environmental authority are properly calibrated.
Monitoring	
A5	Except where specified otherwise in another condition of this environmental authority, all monitoring records or reports required by this environmental authority must be kept for a period of not less than 5 years.
Financial assurance	
A6	The activity must not be carried out until the environmental authority holder has given financial assurance to the administering authority as security for compliance with this environmental authority and any costs or expenses, or likely costs or expenses, mentioned in section 298 of the Act.
A7	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 authority is amended.
Risk management	
A8	The holder of this environmental authority must develop and implement a risk management system for mining activities which mirrors the content requirement of the Standard for Risk Management (ISO31000:2009), or the latest edition of an Australian standard for risk management, to the extent relevant to environmental management, within 3 months from grant of Mining Leases 70505, 70506 and 70441.
Notification of emergencies, incidents and 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	Within 10 business days following the initial notification of an emergency or incident, or receipt of monitoring results, whichever is the latter, further written advice must be provided to the administering authority, including the following: a) results and interpretation of any samples taken and analysed; b) outcomes of actions taken at the time to prevent or minimise unlawful environmental harm; and c) proposed actions to prevent a recurrence of the emergency or incident.
Complaints	
A11	The holder of this environmental authority must record all environmental complaints received about the mining activities including: a) name, address and contact number of the complainant; b) time and date of complaint; c) reasons for the complaint; d) investigations undertaken; e) conclusions formed; f) actions taken to resolve the complaint; g) any abatement measures implemented; and h) person responsible for resolving the complaint.

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A12	The holder of this environmental authority must, when requested by the administering authority, undertake relevant specified monitoring within a reasonable timeframe nominated or agreed to by the administering authority to investigate any complaint of environmental harm. The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures, where implemented, must be provided to the administering authority within 10 business days of completion of the investigation, or no later than 10 business days after the end of the timeframe nominated by the administering authority to undertake the investigation.
Third party reporting	
A13	The holder of this environmental authority must: a) within 1 year from commencement of Project Stage 1, obtain from an appropriately qualified person a report on compliance with the conditions of this environmental authority; b) obtain further such reports at regular intervals, not exceeding 3 yearly intervals, from the completion of the report referred to above; and c) provide each report to the administering authority within 90 days of its completion.
A14	Where a condition of this environmental authority requires compliance with a standard, policy or guideline published externally to this environmental authority and the standard is amended or changed subsequent to the issue of this environmental authority, the holder of this environmental authority must: a) comply with the amended or changed standard, policy or guideline within 2 years of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation or another timeframe approved by the administering authority; and b) until compliance with the amended or changed standard, policy or guideline is achieved, continue to remain in compliance with the corresponding provision that was current immediately prior to the relevant amendment or change.
Schedule B: Air	
Condition number	Condition
B1	The release of dust or particulate matter or both resulting from mining activity authorised by this environmental authority must not cause an environmental nuisance at any nuisance sensitive or commercial place.

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B2	The holder of this environmental authority shall ensure that all reasonable and feasible avoidance and mitigation measures are employed so that the dust and particulate matter emissions generated by the mining activities do not cause exceedances of the following levels when measured at any sensitive or commercial place: a) Dust deposition of 120 milligrams per square metre per day, averaged over 1 month, when monitored in accordance with the most recent version of Australian Standard AS3580.10.1 Methods for sampling and analysis of ambient air—Determination of particulate matter—Deposited matter – Gravimetric method. b) A concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM₁₀) suspended in the atmosphere of 50 micrograms per cubic metre over a 24-hour averaging time, for no more than 5 exceedances recorded each year, when monitored in accordance with the most recent version of either: 1. Australian Standard AS3580.9.6 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM₁₀ high volume sampler with size-selective inlet – Gravimetric method; or 2. Australian Standard AS3580.9.9 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—PM₁₀ low volume sampler—Gravimetric method. 3. Australian Standard AS3580.9.8 Methods for sampling and analysis of ambient air – Determination of suspended particulate matter – PM₁₀ continuous direct mass method using a tapered element oscillating microbalance (TEOM) analyser c) A concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a 1 year averaging time, when monitored in accordance with the most recent version of AS/NZS3580.9.3:2003 Methods for sampling and analysis of ambient air—Determination of suspended particulate matter—Total suspended particulate matter (TSP)—High volume sampler gravimetric method or using an alternative sampling methodology determined in consultation with the administering authority. <i>Note: The exceedances of PM¹⁰ above 50 micrograms per cubic metre over a 24-hour averaging time as a result of bushfires, dust storms and fuel reduction burning for fire management purposes are not considered a breach of Condition B2 (b).</i>
Schedule C: Waste	
Condition number	Condition
C1	Unless otherwise permitted by the conditions of this environmental authority or with prior approval from the administering authority and in accordance with a relevant standard operating procedure, waste must not be burnt.
C2	The holder of this environmental authority may burn vegetation cleared in the course of carrying out extraction activities provided the activity does not cause environmental harm at any sensitive place or commercial place.

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Tailings disposal			
C3	Tailings must be managed in accordance with procedures contained within the current plan of operations. These procedures must include provisions for: a) containment of tailings; b) the management of seepage and leachates both during operation and the foreseeable future; c) the control of fugitive emissions to air; d) a program of progressive sampling and characterisation to identify acid producing potential and metal concentrations of tailings; e) maintaining records of the relative locations of any other waste stored within the tailings; f) rehabilitation strategy; and g) monitoring of rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of tailings, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.		
Acid sulphate soils			
C4	Treat and manage acid sulphate soils in accordance with the latest edition of the Queensland Acid Sulphate Soil Technical Manual.		
C5	Scrap tyres are authorised to be stored awaiting disposal or disposed of on the mining lease in a manner that minimises environmental harm. A record must be kept of the number and location of tyres disposed.		
Schedule D: Noise			
Condition number	Condition		
D1	The holder of this environmental authority must ensure that noise generated by the mining activities approved under this administering authority does not cause the criteria in <i>Table D1 – Noise limits</i> to be exceeded at a sensitive place or commercial place.		
Table D1—Noise limits			
Sensitive or commercial place			
Noise level dB(A) measured as:	Monday to Sunday		
	7am to 6pm	6pm to 10pm	10pm to 7am
LAeq, adj, 15 mins	41	41	33
LA1, adj, 15 mins	46	46	35

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Airblast overpressure nuisance		
D2	The holder of this environmental authority must ensure that blasting does not cause the limits for peak particle velocity and air blast overpressure in <i>Table D2—Blasting noise limits</i> to be exceeded at a sensitive place or commercial place.	
Table D2—Blasting noise limits		
Blasting noise limits	Sensitive or commercial place blasting noise limits	
	7am to 6pm (daylight hours)	6pm to 7am (non-daylight hours)
Airblast overpressure	115 dB (Linear) Peak for 4 out of 5 consecutive blasts initiated; and not greater than 120 dB (Linear) Peak for any single blast	No blasting to occur
Ground vibration peak particle velocity	10 mm/s for ground vibration of no more than 35 Hz; and 25 mm/s for ground vibration of more than 35Hz	No blasting to occur
Monitoring and reporting		
D3	Noise monitoring and recording must include the following descriptor characteristics and matters: a) LAN,T (where N equals the statistical levels of 1, 10 and 90 and T = 15 mins); b) background noise LA90; c) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels; d) atmospheric conditions including temperature, relative humidity and wind speed and directions; e) effects due to any extraneous factors such as traffic noise; f) location, date and time of monitoring; and g) if the complaint concerns low frequency noise, Max LpLIN,T and one third octave band measurements in dB(LIN) for centre frequencies in the 10–200 Hz range.	
Schedule E: Groundwater		
Condition number	Condition	
E1	The holder of this environmental authority must not release contaminants to groundwater.	
Monitoring and reporting		
E2	All determinations of groundwater quality, groundwater monitoring and biological monitoring must be performed by appropriately qualified person/s.	

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Baseline Monitoring Program	
E3	A baseline groundwater monitoring program must be developed by an appropriately qualified person, implemented and be provided to the administering authority. The baseline groundwater monitoring program must result in the holder of this environmental authority finalising a groundwater dataset that must be provided to the administering authority at least 90 days prior to commencement of box cut excavation. The groundwater dataset must: a) contain representative groundwater quality samples from the geological units identified as potentially affected by mining activities including Quaternary alluvium, Tertiary sediments, Bandanna Formation, Colinslea Sandstone, Clematis Sandstone, Rewan Formation, Dunda Beds, and Early Permian sediments; b) include at least 12 sampling events that are no more than 2 months apart over a 2 year period, so as to determine background groundwater quality; c) include background groundwater quality in hydraulically isolated background bore(s); and d) allow for the identification of natural groundwater level trends and groundwater contaminant trigger levels.
Groundwater Management and Monitoring Program	
E4	A Groundwater Management and Monitoring Program must be developed and certified by an appropriately qualified person which addresses all phases of the mining operation approved under this environmental authority. The groundwater management and monitoring program must be provided to the administering authority for approval no later than 90 days prior to commencement of box cut excavation with the finalised data obtained from the baseline monitoring program in condition E3. The groundwater management and monitoring program must be developed, implemented and meet the following objectives: a) Validation of groundwater numerical model (including review of boundary and recharge conditions) to refine and confirm accuracy of groundwater impacts predicted; b) Groundwater level monitoring in all identified geological units present across and adjacent to the mine site to confirm existing groundwater flow patterns and monitor drawdown impacts; c) Identification of groundwater drawdown level thresholds for monitoring the impacts to Groundwater Dependant Ecosystems (including spring complexes and Carmichael River alluvium); d) Monitoring of aquifers in the area to the south of the mining lease that may affect the Mellaluka springs; e) Identify and refine potential impacts on groundwater levels in the Great Artesian Basin Clematis Sandstone and Dunda Beds geological units; f) Estimation of groundwater inflow to mine workings and surface water ingress to groundwater from flooding events using the groundwater model; g) Monitoring in any identified source aquifers for alternative water supplies, relevant to any approval issued under the <i>Water Act 2000</i> for the project; h) Monitoring of geological units throughout all phases of project life including for the period post-closure in accordance with Appendix 1; i) Identifying monitoring bores that will be replaced due to mining activities; and j) To ensure all potential groundwater impacts from mine dewatering and mine water and waste storage facilities (artificial recharge) are identified, mitigated and monitored.

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Monitoring Program Review	
E5	The Groundwater Management and Monitoring Program required under condition E4 must be reviewed by an appropriately qualified person with a report provided on the outcome of the review to the administering authority by 1st July 2020. After the initial review, the review must be conducted by 1 July every 5 years following, the report provided to the administering authority, and include: a) an assessment of the groundwater management and monitoring program against the objectives in condition E4 b) a review of the adequacy of the monitoring locations, frequencies and groundwater quality triggers specified in <i>Tables E1, E2 and E3</i> c) a review of the validity of the groundwater monitoring program against the regular model predictions.
Groundwater Model Review	
E6	The numerical groundwater model in the reports titled “Carmichael Coal Mine and Rail Project SEIS: Report for Mine Hydrogeology Report (13 November 2013)” and “Carmichael Coal Mine and Rail Project SEIS: Mine Hydrogeology Report Addendum (24 October 2013)” must be reviewed to incorporate groundwater monitoring data and measured mine dewatering volumes from the Groundwater Management and Monitoring Program in condition E4 and E5. The review must be conducted within two years of commencement of any mining activities associated with box cut excavation and at least every 5 years thereafter, or at other intervals specified by the administering authority in writing, if the observed groundwater levels and groundwater flow rates to surface water are not consistent with those predicted by the groundwater model. The review must provide a revised numerical groundwater model which is based on a transient calibration and includes additional model layers for aquifers below the D seam of the Colinslea Sandstone. The revised model must include: a) Review of the hydrogeological conceptualisation used in the previous model; b) An update of the predicted impacts; c) Revised water balance model; d) Review of assumptions used in the previous model; e) Predictions of changes in groundwater levels for a range of scenarios; f) Information about any changes made since the previous model review, including data changes; g) A report outlining the justification for the refined model and the outputs of the refined model; h) An evaluation of the accuracy of the predicted changes in groundwater levels, groundwater flow rates to surface water and recommended actions to improve the accuracy of the model predictions.
E7	A report outlining the findings and any recommendations from the review under condition E6 must be completed by an appropriately qualified person and submitted to the administering authority for approval no later than 3 months after the commencement of the model review.

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E8	Based on monitoring data collected in Condition E3 the holder of the environmental authority must provide the following to the administering authority for approval prior to any mining activities associated with box cut excavation: - A proposed groundwater monitoring network for detecting potential impacts of the mine operations on groundwater quality. <i>Note: this network is to inform Tables E1 and E2</i> - A groundwater monitoring network for detecting if: - Drawdown caused by the mining operation may exceed predictions in the numerical model referred to in condition E6. - Matters of State Environmental Significance may be impacted. <i>Note: this network is to inform Table E3</i>
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Groundwater quality monitoring

E9	Groundwater quality and levels must be monitored at the locations and frequencies defined in <i>Table E1 Groundwater monitoring locations and frequency for the mine site</i> for quality characteristics identified in <i>Table E2 - Groundwater quality triggers</i> . The monitoring must commence as soon as reasonably practical after approval by the administering authority in condition E8.
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Table E1—Groundwater monitoring locations and frequency for the mine site

Monitoring Point ¹	Location		Surface RL (m) ²	Monitoring Frequency
	Easting (GDA94—Zone 55K)	Northing (GDA94—Zone 55K)		
Groundwater Monitoring points to cover the Alluvium, Tertiary, Bandanna Formation, Colinlea Sandstone, Rewan Formation, Dunda Beds, Clematis Sandstone and Early Permian				At least 2 monthly

Notes:

- Monitoring is not required where a bore has been removed as a direct result of the mining activity.
- RL must be measured to the nearest 5cm from the top of the bore casing.
- Locations, monitoring frequency and surface RL to be finalised based on information provided to the administering authority under condition E8 (a)

Table E2 –Groundwater quality trigger levels

Parameter	Units	Contaminant Trigger Levels calculation to be based on	Contaminant Trigger Levels
Major anions and cations			
Calcium	mg/L Ca	85 th percentile of background	TBA
Magnesium	mg/L Mg	85 th percentile of background	TBA
Potassium	mg/L K	85 th percentile of background	TBA
Sodium	mg/L Na	85 th percentile of background	TBA
Chloride	mg/L Cl	85 th percentile of background	TBA
Sulphate	mg/L SO ₄	85 th percentile of background	TBA
Alkalinity	mg/L	85 th percentile of background	TBA
Sulphide	mg/L S ₂	85 th percentile of background	TBA
Fluoride	mg/L F	85 th percentile of background	TBA
Dissolved Metals			
Aluminium	µg/L Al	85 th percentile of background	TBA
Arsenic	µg/L As	85 th percentile of background	TBA
Boron	µg/L B	85 th percentile of background	TBA
Cadmium	µg/L Cd	85 th percentile of background	TBA
Chromium (Total)	µg/L Cr	85 th percentile of background	TBA
Cobalt	µg/L Co	85 th percentile of background	TBA
Copper	µg/L Cu	85 th percentile of background	TBA
Iron	µg/L Fe	85 th percentile of background	TBA
Lead	µg/L Pb	85 th percentile of background	TBA
Manganese	µg/L Mn	85 th percentile of background	TBA
Molybdenum	µg/L Mo	85 th percentile of background	TBA
Nickel	µg/L Ni	85 th percentile of background	TBA
Selenium	µg/L Se	85 th percentile of background	TBA
Silver	µg/L Ag	85 th percentile of background	TBA
Uranium	µg/L U	85 th percentile of background	TBA
Vanadium	µg/L V	85 th percentile of background	TBA
Zinc	µg/L Zn	85 th percentile of background	TBA
Mercury	µg/L Hg	85 th percentile of background	TBA
Nutrients			
Ammonia	mg/L N	85 th percentile of background	TBA
Nitrate	mg/L N	85 th percentile of background	TBA
Nitrite	mg/L N	85 th percentile of background	TBA
Total phosphorous	mg/L P	85 th percentile of background	TBA
Hydrocarbons			
Total Petroleum Hydrocarbons	ppb (C ₆ –C ₄₀)	85 th percentile of background	TBA
BTEX	ppb	85 th percentile of background	TBA
Physio-chemical			
pH	pH units	85 th percentile of background	TBA
Electrical Conductivity	µS/cm	85 th percentile of background	TBA
Total Dissolved Solids	mg/L	85 th percentile of background	TBA

Note: Contaminant trigger levels to be finalised for each aquifer type based on information provided to the administering authority under condition E8 (a)

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Trigger level investigation	
E10	If groundwater quality characteristics from groundwater monitoring bores identified as per <i>Table E1—Groundwater monitoring locations and frequency for mine site</i> reach any of the trigger levels stated in <i>Table E2—Groundwater quality trigger levels</i>, an investigation must be undertaken by the holder of this environmental authority within 14 days of detection to determine if the exceedance is a result of: a) mining activities authorised under this environmental authority; or b) natural variation; or c) neighbouring land use resulting in groundwater impacts. The holder of this environmental authority must provide a report of the investigation to the administering authority via WaTERS within 28 days of completion of the investigation under condition E10.
E11	If the investigation under condition E10 determines that the exceedance was the result of mining authorised under this environmental authority, then investigations must be undertaken by the holder of this environmental authority to establish whether environmental harm has occurred or may occur.
E12	If an investigation undertaken in accordance with condition E11 determines that environmental harm has or may occur, the holder of this environmental authority must a) Implement immediate measures to reduce the potential for environmental harm; and b) Develop long-term mitigation measures to address any existing groundwater contamination and prevent recurrence of groundwater contamination. The holder of this environmental authority must provide details of the measures implemented to reduce the potential for environmental harm as well as the long-term mitigation measures to the administering authority via WaTERS within 28 days after completing the investigation under condition E11.
Groundwater (water levels)	
E13	In the event that groundwater level fluctuations in excess of the groundwater level thresholds in <i>Table E3—Groundwater Thresholds</i> occur at the groundwater monitoring locations in <i>Table E3</i>, an investigation must be instigated within 14 days of detection to determine if the fluctuations are a result of: a) mining activities authorised under this environmental authority; b) pumping from licensed bores; c) seasonal variation; or d) neighbouring land use resulting in groundwater impacts. The holder of this environmental authority must provide a report of the investigation to the administering authority via WaTERS within 28 days of completion of the investigation under condition E13.

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Table E3 –Groundwater level thresholds

Monitoring location ¹	Unit	Easting (GDA94– Zone 55K)	Northing (GDA94– Zone 55K)	Groundwater level thresholds
Carmichael River Location				
TBA	Dunda Beds	TBA	TBA	To be determined ¹
TBA	Tertiary	TBA	TBA	
TBA	Alluvium	TBA	TBA	
TBA	Early Permian	TBA	TBA	
Great Artesian Basin to West of Mine Lease				
TBA	Rewan	TBA	TBA	To be determined
TBA	Dunda Beds	TBA	TBA	
TBA	Clematis	TBA	TBA	
Doongmabulla to West of Mine Lease				
TBA	D seam	TBA	TBA	To be determined
TBA	AB seam	TBA	TBA	
TBA	Rewan	TBA	TBA	
TBA	Dunda Beds	TBA	TBA	
TBA	Clematis	TBA	TBA	
Mellaluka Springs to the southeast of Mine Lease				
TBA	Tertiary	TBA	TBA	To be determined
TBA	Early Permian	TBA	TBA	
Early Warning Bores				
TBA	Early Permian	TBA	TBA	To be determined

Note: Locations and groundwater level thresholds to be finalised based on information provided to the administering authority under condition E8 (b) and the refined modelling under Condition E6.

E14	If the investigation under condition E13 concludes that the trigger exceedance is the result of mining activities authorised under this environmental authority, the holder of this environmental authority must: a) Notify the administering authority via WaTERS within 28 days of detection to describe 1. Whether actual environmental harm has occurred or is likely to occur. 2. Any proposed long-term mitigation measures required to address the affected groundwater resource; and 3. Proposed actions to reduce the potential for environmental harm and; a) Undertake an assessment of the associated impact to Matters of State Environmental Significance in accordance with condition I4.
E15	The monitoring data collected in accordance with this schedule must be submitted annually by 1 July to the administering authority via WaTERS.

Bore construction and maintenance and decommissioning					
E16	The construction, maintenance and decommissioning of groundwater bores (including groundwater monitoring bores) must be undertaken in a manner that prevents or minimises impacts to the environment and ensures the integrity of the bores to obtain accurate monitoring.				
Schedule F: Water					
Condition number	Condition				
Release of contaminants					
F1	Contaminants must not be released to any surface waters except as permitted under the conditions of this environmental authority.				
Discharge of Mine Affected Water					
F2	The release of mine affected water to waters must only occur from the release points specified in <i>Table F1 - Mine affected water release points, sources and receiving waters</i> , and depicted in <i>Figure F1: Water release/monitoring locations</i> attached to this environmental authority.				
Table F1—Mine Affected Water Release Points, Sources and Receiving Waters					
Release Point (RP)	Easting (GDA94—Zone 55K)	Northing (GDA94—Zone 55K)	Contaminant Source and Location	Monitoring Point	Receiving Waters Description
RP1—Central MAW North	441709.44	7558984.92	Mine Affected Water Dam Central - North	Outlet works to Carmichael River	Carmichael River
RP2—Central MAW South	435539.56	7553979.62	Mine Affected Water Dam Central—South	Outlet works to Carmichael River	Carmichael River
F3	The release of mine affected water to internal water management infrastructure installed and operated in accordance with a water management plan that complies with condition F28 is permitted.				
F4	The release of mine affected water to waters in accordance with condition F2 must not exceed the release limits stated in <i>Table F2 - Mine affected water release limits</i> when measured at the monitoring points specified in <i>Table F1 - Mine affected water release points, sources and receiving waters</i> for each quality characteristic.				
Table F2 - Mine affected water release limits					
Quality characteristic	Release limits		Monitoring frequency		
Electrical conductivity (µS/cm)	Release limits specified in Table F4 for variable flow criteria.		Continuous		
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)		Continuous		
Turbidity (NTU)	500 ¹		Continuous		
¹ Turbidity release limits may be reviewed once sufficient monitoring data is available to adequately characterise the baseline turbidity in the Carmichael River (including consideration of natural spatial and temporal variability).					

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F5	The release of mine affected water to waters from the release points must be monitored at the locations specified in <i>Table F1 - Mine affected water release points, sources and receiving waters</i> for each quality characteristic and at the frequency specified in <i>Table F2 - Mine affected water release limits</i> and <i>Table F3 - Release contaminant trigger investigation levels, potential contaminants</i> .
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Table F3 - Release contaminant trigger investigation levels, potential contaminants

Quality Characteristic	Trigger Levels (µg/L)	Monitoring frequency
Aluminium ¹	55	Commencement of release and thereafter weekly during release (first sample to be taken within 2 hours of commencement of release)
Arsenic ¹	13	
Cadmium ¹	0.2	
Chromium ¹	2	
Copper ¹	4	
Iron ¹	300	
Lead ¹	4	
Mercury ¹	0.2	
Nickel ¹	11	
Zinc ¹	30	
Boron ¹	370	
Cobalt ¹	90	
Manganese ¹	1900	
Molybdenum ¹	34	
Selenium ¹	10	
Silver ¹	1	
Uranium ¹	1	
Vanadium ¹	10	
Ammonia as N	900	
Nitrate as NO ₃	1100	
Total Nitrogen	590	
Total Phosphorus	200	
Petroleum hydrocarbons (C6-C9)	20	
Petroleum hydrocarbons (C10-C36)	100	
Fluoride	2000	
Sodium ¹	180,000	
Suspended Solids	106	
Sulphate (SO ₄ ²⁻) (mg/L)	1000	

¹ All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/ metalloids apply if dissolved results exceed trigger.

The quality characteristics required to be monitored as per **Table F3 - Release contaminant trigger investigation levels, potential contaminants** can be reviewed with the support of additional baseline monitoring data from the Carmichael River, or if it can be adequately demonstrated that there is negligible environmental risk. It may be determined that a reduced monitoring frequency is appropriate, that a trigger level be increased or reduced or that certain quality characteristics can be removed from **Table F3 - Release contaminant trigger investigation levels, potential contaminants** by amendment.

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F6	If quality characteristics of the release exceed any of the trigger levels specified in <i>Table F3 - Release contaminant trigger investigation levels, potential contaminants</i> during a release event, the environmental authority holder must compare the downstream results in the receiving waters to the trigger values specified in <i>Table F3 - Release contaminant trigger investigation levels, potential contaminants</i> and: a) where the trigger values are not exceeded then no action is to be taken; or b) where the downstream results exceed the trigger values specified in <i>Table F3 - Release contaminant trigger investigation levels, potential contaminants</i> for any quality characteristic, compare the results of the downstream site to the data from background monitoring sites and 1. if the result is less than the background monitoring site data, then no action is to be taken; or 2. 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 via WaTERS within 90 days of receiving the result, outlining i. details of the investigations carried out ii. actions taken to prevent environmental harm. <i>Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with F6 (b)(2) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.</i>
F7	If an exceedance in accordance with condition F6(b)(2) is identified, the holder of the environmental authority must notify the administering authority via WaTERS within 24 hours of receiving the result.
Mine Affected Water Release Events	
F8	The holder must ensure a stream flow gauging station/s is installed, operated and maintained to determine and record stream flows at the locations and flow recording frequency specified in <i>Table F4 - Mine affected water release during flow events</i>.
F9	The release of mine affected water to waters in accordance with condition F2 must only take place during periods of natural flow in accordance with the receiving water flow criteria for discharge specified in <i>Table F4 - Mine affected water release during flow events</i> for the release point(s) specified in <i>Table F1 - Mine affected water release points, sources and receiving waters</i>.
F10	The release of mine affected water to waters in accordance with condition F2 must not exceed the Maximum Release Rate (for all combined release point flows) for each receiving water flow criterion for discharge specified in <i>Table F4 - Mine affected water release during flow events</i> when measured at the monitoring points specified in <i>Table F1 - Mine affected water release points, sources and receiving waters</i>.

Table F4 - Mine affected water release during flow events

Receiving waters/ stream	Release Point (RP)	Gauging station	Gauging Station Easting (GDA94— Zone 55K)	Gauging Station Northing (GDA94— Zone 55K)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for discharge (m³/s)	Maximum release rate (for all combined RP flows)	Electrical Conductivity Release Limits
Carmichael River	RP1 (Central MAW North) RP2 (Central MAW South)	Carmichael River CAR04 Gauging station	433237.06	7554988.83	Continuous (minimum daily)	Low Flow <0.2 m³/s for a period of 28 days after natural flow events that exceed 0.2 m³/s	0.05 m³/s	Electrical conductivity: 168 µS/cm (maximum)
						Medium Flow 1 - 5 m³/s	0.25 m³/s	Electrical conductivity: 840 µS/cm (maximum)
						Medium Flow 5 - 10 m³/s	0.5 m³/s	Electrical conductivity: 1850 µS/cm (maximum)
						High Flow > 10 m³/s	0.5 m³/s	Electrical conductivity: 3,500 µS/cm (maximum)
F11	The daily quantity of mine affected water released from each release point must be measured, recorded and reported to the administering authority via WaTERS.							
F12	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.							

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Notification of Release Event	
F13	The environmental authority holder must notify the administering authority via WaTERS 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) details regarding the compliance of the release with the conditions of Department Interest: Water of this environmental authority (that is, contaminant limits, natural flow, discharge volume) c) release point/s d) release rate e) release salinity f) receiving water/s including the natural flow rate.
F14	The environmental authority holder must notify the administering authority via WaTERS as soon as practicable within twenty four (24) hours after cessation of a release notified under condition F13. The cessation notification must include the following information: a) release cessation date and time; b) details regarding the compliance of the release with the conditions of this environmental authority (that is, contaminant limits, natural flow, discharge volume); c) release point/s; d) release rate; e) release salinity; receiving water/s including natural flow rate. <i>Note: Successive or intermittent releases occurring within 24 hours of the cessation of any individual release can be considered part of a single release event and do not require individual notification for the purpose of compliance with conditions F13 and F14, provided the relevant details of the release are included within the notification provided in accordance with conditions F13 and F14.</i>
F15	The environmental authority holder must provide a report to the administering authority via WaTERS within twenty eight (28) days after cessation of a release event notified under Condition F13. The report must include: a) release commencement and cessation dates and times; a) natural flow rate in receiving water; b) volume of water released; c) details regarding the compliance of the release with the conditions of this environmental authority (i.e. contamination limits, natural flow, discharge volume); d) all continuous and in-situ water quality monitoring results (including laboratory analyses); e) any other matters pertinent to the water release event.
Notification of Release Event Exceedance	
F16	If the release limits defined in <i>Table F2 - Mine affected water release limits</i> are exceeded, the holder of the environmental authority must notify the administering authority via WaTERS within 24 hours of receiving the results.

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F17	The environmental authority holder must, within 28 days of a release that is not compliant with the conditions of this environmental authority, provide a report to the administering authority via WaTERS detailing: a) the reason for the release b) the location of the release c) the total volume of the release and which (if any) part of this volume was non-compliant d) the total duration of the release and which (if any) part of this period was non-compliant e) all water quality monitoring results (including all laboratory analyses) f) identification of any environmental harm as a result of the non-compliance g) all calculations h) any other matters pertinent to the water release event.
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Receiving Environment Monitoring and Contaminant Trigger Levels

F18	The quality of the receiving waters must be monitored at the locations specified in <i>Table F6 - Receiving water upstream background sites and downstream monitoring points</i> for each quality characteristic and at the monitoring frequency stated in <i>Table F5 - Receiving waters contaminant trigger levels</i> .
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Table F5—Receiving waters contaminant trigger levels

Quality Characteristic	Trigger Level	Monitoring Frequency
Electrical Conductivity (µS/cm)	270	Continuous during release
Turbidity (NTU)	660	
pH	6.5–9.0	Daily during the release
Sulphate (SO ₄ ²⁻) (mg/L)	250	
Sodium (mg/L)	180	

Table F6 - Receiving water upstream background sites and downstream monitoring points

Monitoring Points	Receiving Waters Location Description	Easting (GDA94—Zone 55K)	Northing (GDA94—Zone 55K)
Upstream Background Monitoring sites			
CAR04	Carmichael River at US GS	433237.06	7554988.83
BEL02	Belyando River at Bygana Waterhole	451391.30	7549162.75
Downstream Monitoring sites			
CAR01	Carmichael River far DS mining lease	445073.13	7558878.15
BEL01	Belyando River at Carmichael/Moray Rd	464566.35	7571620.56

Table F6 - Receiving water upstream background sites and downstream monitoring points notes:

- (a) The upstream monitoring point should be within 5 km of the nearest release point.
- (b) The downstream point should not be greater than 3 km from the nearest release point.
- (c) The data from background monitoring points must not be used where they are affected by releases from other mines.

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F19	If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in <i>Table F5 - Receiving waters contaminant trigger levels</i> during a release event, the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and: a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic, then no action is to be taken; or b) where the downstream result exceeds the upstream results, complete an investigation into the potential for environmental harm and provide a written report to the administering authority via WaTERS within 90 days, outlining: 1. details of the investigations carried out 2. actions taken to prevent environmental harm.
F20	Instantaneous continuous monitoring data of flow rate, EC and turbidity during release events from downstream compliance monitoring locations must be submitted to the administering authority via WaTERS together with all in situ and any water quality monitoring results (including all laboratory analyses) in accordance with condition F15.
F21	All continuous environmental monitoring systems required by this environmental authority must have an instrument availability of at least 80% except for the continuous monitoring of release points specified in <i>Table F1 - Mine affected water release points, sources and receiving waters</i> which must have an instrument availability of at least 90%.
F22	All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.
Receiving Environment Monitoring Program (REMP)	
F23	The environmental authority holder must develop and implement a Receiving Environment Monitoring Program (REMP) to monitor, identify and describe any adverse impacts to surface water environmental values, quality and flows due to the authorised mining activity. This must include monitoring the effects of the mine on the receiving environment periodically (under natural flow conditions) and while mine affected water is being discharged from the site. For the purposes of the REMP, the receiving environment is the waters of the Carmichael River and connected or surrounding waterways within 12 km downstream of the release (this includes the Belyando River, immediately downstream of the confluence with the Carmichael River). The REMP should encompass any sensitive receiving waters or environmental values downstream of the authorised mining activity that will potentially be directly affected by an authorised release of mine affected water.
F24	A REMP Design Document that addresses the requirements of the REMP must be prepared and made available to the administering authority upon request.
F25	A report outlining the findings of the REMP, including all monitoring results and interpretations must be prepared annually and provided to the administering authority by 1 July every year. 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 reuse	
F26	Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as farm dams or tanks, or used directly at properties owned by the environmental authority holder or a third party (with the written consent of the third party).

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Annual Water Monitoring Reporting				
F27	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 via WaTERS by 1 July each year: a) the date on which the sample was taken b) the time at which the sample was taken c) the monitoring point at which the sample was taken d) the measured or estimated daily quantity of mine affected water released from all release points e) the release flow rate at the time of sampling for each release point f) the results of all monitoring and details of any exceedances of the conditions of this environmental authority g) water quality monitoring data.			
Water Management Plan				
F28	A Water Management Plan must be developed by an appropriately qualified person and implemented, prior to commencement of Project Stage 2. The Water Management Plan must be submitted to the administering authority upon request.			
Stormwater and Water Sediment Controls				
F29	An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.			
F30	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 F29 b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with condition F28, for the purpose of ensuring water does not become mine affected water.			
Schedule G: Sewage Treatment				
Condition number	Condition			
G1	The only contaminant permitted to be released to land or to mine affected water storages is treated sewage effluent in compliance with the release limits stated in <i>Table G1 - Contaminant release limits to land or mine affected water storages</i> .			
Table G1 - Contaminant release limits to land or mine affected water storages				
Contaminant	Unit	Release limit	Limit type	Monitoring Frequency
5 day Biochemical oxygen demand (BOD)1	mg/L	20	Maximum	Monthly
Total suspended solids	mg/L	30	Maximum	Monthly
Nitrogen	mg/L	30	Maximum	Monthly
Phosphorus	mg/L	15	Maximum	Monthly
E-coli	Organisms/100ml	10	Maximum	Monthly

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G2	All effluent released from the treatment plant must be monitored at the frequency and for the parameters specified in <i>Table G1 - Contaminant release limits to land or mine affected water storages</i> .
G3	The daily volume of effluent release to land or mine affected water storages must be measured and records kept of the volumes of effluent released.
Schedule H: Land and Rehabilitation	
Condition number	Condition
Rehabilitation	
H1	Land disturbed by mining activities authorised under the Environmental Authority must be rehabilitated in accordance with <i>Table H1 – Rehabilitation Acceptance Criteria</i> (Appendix 2) and <i>Figures H1, H2, H3 and H4</i> .
H2	The rehabilitation completion criteria outlined in <i>Table H1 – Rehabilitation Acceptance Criteria</i> (Appendix 2) must be reviewed by an appropriately qualified person by the 2 nd February 2021 and from then on every 5 years with any proposed amendments or changes submitted to the administering authority for approval.
Rehabilitation Monitoring Program	
H3	A Rehabilitation Monitoring Program must be developed and certified by an appropriately qualified person and implemented by the 2nd February 2017. The Monitoring Program must contain a schedule for gathering baseline data from agreed reference sites and conducting rehabilitation trials to support the rehabilitation outcomes detailed in <i>Table H1 – Rehabilitation Acceptance Criteria</i>. Baseline monitoring and rehabilitation trials under this plan must be undertaken at a suitable frequency to ensure that the holder of this Environmental Authority has a representative dataset to enable: • Progressive certification of rehabilitation under chapter 5A of the <i>Environmental Protection Act 1994</i>. • Surrender of the Environmental Authority under Chapter 5 of the <i>Environmental Protection Act 1994</i>. A copy of the Rehabilitation Monitoring Program must be made available to the administering authority upon request.
H4	Rehabilitation must commence progressively in accordance with the plan of operations.
H5	Self-sustaining vegetation and native ecosystem, as per <i>Table H1 – Rehabilitation Acceptance Criteria</i> (Appendix 2), must be consistent with the reference sites identified in <i>Table H2 – Reference Sites</i> and <i>Figure H5: Reference Sites</i> .

Table H2: Reference Sites

Reference Site ID	Final Land Use Objective	Easting (GDA94—Zone 55)	Northing (GDA94—Zone 55)	Regional Ecosystem Reference
1	Pasture	435015.03	7555606.11	Not Applicable
2	Pasture	443025.57	7556465.56	Not Applicable
3	Pasture	440270.90	7555837.51	Not Applicable
4	Woodland and Pasture	444416.00	7554892.00	11.3.7/11.3.10/11.5.3
5	Woodland	420464.05	7462197.97	10.5.5a, 10.5.5a/10.3.6ax1
6	Woodland	426136.73	7577685.88	10.5.5a/10.3.6ax1
7	Woodland	424019.29	7578271.57	10.5.5a/10.3.6ax1
8	Woodland and Pasture	437811.00	7548031.00	10.3.28a/10.3.6a
9	Woodland	444040.04	7541770.08	10.5.5a
10	Pasture	445500.99	7544738.92	Not Applicable
11	Woodland and Pasture	434750.95	7554579.43	10.3.6a

Residual Void Outcome

H6	Residual voids must not cause any serious environmental harm to land, surface waters or any recognised groundwater aquifer, other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority.
H7	Residual voids, as detailed and presented in <i>Figure H1: Reference Sites</i> for Open Cut Pits B, C, D, E, F and G are authorised in accordance with <i>Table H3 – Residual Voids</i> .

Table H3 – Residual Voids

Open Cut Pit	Residual Void Treatment
B	Residual void authorised to the depth of the top of the D1 Seam at the highwall face
C	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
D	Residual void authorised to the depth of the top of the D1 Seam at the highwall face
E	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
F	Residual void authorised to the depth of the top of the AB1 Seam at the highwall face
G	Residual void authorised to the depth of the top of the D1 Seam at the highwall face

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Topsoil Management Plan	
H8	A topsoil management plan must be developed by an appropriately qualified person and implemented.
Mining Waste and Rejects Management	
H9	A waste rock, spoil and rejects disposal plan must be developed and include, where relevant, at least: a) effective characterisation of the waste rock, spoil and rejects to predict under the proposed placement and disposal strategy the quality of runoff and seepage generated concerning potentially environmentally significant effects including salinity, acidity, alkalinity and dissolved metals, metalloids and non-metallic inorganic substances; b) a program of progressive sampling and characterisation to identify dispersive and nondispersive spoil and the salinity, acid and alkali producing potential and metal concentrations of waste rock, spoil and rejects; c) a materials balance and disposal plan demonstrating how potentially acid forming and acid forming waste rock, spoil and rejects will be selectively placed and/or encapsulated to minimise the potential generation of acid mine drainage; d) where relevant, a sampling program to verify encapsulation and/or placement of potentially acid-forming and acid-forming waste rock, spoil and rejects; e) how often the performance of the plan will be assessed; f) the indicators or other criteria on which the performance of the plan will be assessed; g) rehabilitation strategy. h) Monitoring or rehabilitation, research and/or trials to verify the requirements and methods for decommissioning and final rehabilitation of the placed materials, including the prevention and management of acid mine drainage, erosion minimisation and establishment of vegetation cover.
H10	Reject disposal areas must be designed and constructed to ensure that any runoff or seepage from the reject disposal area is contained within the mine water management system.
Contaminated Land	
H11	Before applying for surrender of a mining lease, the holder of this environmental authority must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the mining lease which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use.
H12	Before applying for progressive rehabilitation certification for an area, the holder of this environmental authority must (if applicable) provide to the administering authority a site investigation report under the Act, in relation to any part of the area the subject of the application which has been used for notifiable activities or which the holder is aware is likely to be contaminated land, and also carry out any further work that is required as a result of that report to ensure that the land is suitable for its final land use under condition H1.
H13	Minimise the potential for contamination of land by hazardous contaminants.
Chemicals and Flammable and Combustible Liquids	
H14	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 edition of AS 1940— <i>Storage and Handling of Flammable and Combustible Liquids</i> .

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H15	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 waters or land. Where no relevant Australian standard exists, such materials must be stored within an effective on-site containment system. The holder of this environmental authority must minimise the potential for contamination of land and waters by diverting stormwater around contaminated areas and facilities used for the storage of chemicals and flammable or combustible liquids.
Schedule I: Offsets and Biodiversity	
Condition number	Condition
I1	The holder of this environmental authority must provide an offset for impacts on applicable Matters of State Environmental Significance, in accordance with the Carmichael Coal Project Biodiversity Offset Strategy, as approved. The biodiversity offset must be provided: a) prior to impacting on Matters of State Environmental Significance; or b) where a land based offset is to be provided, within 36 months of the later of either of the following: 1. the date of issue of this environmental authority; or 2. the relevant stage identified in the Biodiversity Offset Strategy; or c) where an offset payment is to be provided, within 4 months of the later of either of the following: 1. the date of issue of this environmental authority; or 2. the relevant stage identified in the Biodiversity Offset Strategy.
Review of Biodiversity Offset Delivery	
I2	The Biodiversity Offset Strategy must be reviewed by the 2nd February 2021, and from then on every 5 years with a report prepared by an appropriately qualified person. The report must: a) Assess the area of Matters of State Environmental Significance proposed to be impacted by the mining activities in the Biodiversity Offset Strategy; and b) Identify the actual on ground areas of Matters of State Environmental Significance impacted by the mining activities.
I3	If an investigation conducted under conditions E13 or E14 of this environmental authority indicates that there is a risk of impacting a Matter of State Environmental Significance, or condition J11 is triggered, the Biodiversity Offset Strategy must be reviewed and a report must be prepared within 3 months by an appropriately qualified person. The report must: a) Assess the area of Matter of State Environmental Significance proposed to be impacted by the mining activities in the Biodiversity Offset Strategy; and b) Identify the actual on ground areas of Matter of State Environmental Significance impacted by the mining activities.
I4	If the review under condition I3 or I4 finds that the actual areas of disturbance to Matters of State Environmental Significance is different from the area of disturbance as detailed in the Biodiversity Offset Strategy, the holder of the environmental authority must amend the Biodiversity Offset Strategy as per condition I5 and deliver the amended offset requirement within 12 months.
I5	In response to condition I4 the holder of this environmental authority may apply to the administering authority to amend the Biodiversity Offset Strategy within either 30 days, or a lesser period agreed to by the administering authority, prior to impacting on the applicable Matter of State Environmental Significance.

Black-throated finch (BTF) Species Management Plan (SMP) at Carmichael project	
I6	The holder of this environmental authority must submit a Black-throated finch (BTF) Species Management Plan (SMP) prepared and certified by a suitably qualified person to the administering authority for approval prior to commencement of Project Stage 2. The holder must publish the BTF SMP on its website within 10 business days of receiving the administering authority's approval in writing. The approved BTF SMP must be implemented. The holder must align the SMP with any Bioregional BTF Management Plan and relevant documentation requirements under the <i>Environmental Protection and Biodiversity Conservation Act 1999</i> including the BTF Recovery Plan, conservation advice and the threat abatement plan. The submitted BTF SMP must include: - a baseline research program on the specific nesting and feeding requirements of the species that will be undertaken prior to and during Project Stage 1; - a baseline research program to establish whether the BTF at the project site are sedentary, locally migratory or regionally migratory; - a description of how the results of baseline research program are to be used to determine any changes of classification of and/or impact on BTF habitat; - details of proposed impacts to BTF habitat from each Project Stage including impacts from clearing, subsidence, ecological function changes, hydrological changes and weed and pest infestation changes; - mitigation measures to be undertaken to avoid, mitigate and manage impact resulting from each stage of the project, including rehabilitation of habitat; - monitoring of watering points that must be conducted for a minimum six (6) hour period commencing from dawn, to accurately capture BTF utilisation of watering points; - detailed botanical assessment that must occur at all BTF sighting locations in the project area to record habitat values at those locations; - detailed surveys that must occur across the mining lease area and approved offset areas and must include information on BTF movements. The survey method and effort must be sufficient to accurately describe the BTF home range and detail BTF resource usage patterns between seasons and years (for up to 10 years) and allow robust management actions to be developed for the maintenance of a viable local BTF population; - survey work that should incorporate the usage of call playback and identify all birds present when BTF are encountered; - specific surveys that must be undertaken during the BTF breeding season and include nest location and assessment of the habitat attributes associated with the breeding locations. The survey method and effort must be sufficient to accurately describe the BTF breeding requirements with consideration to spatial and temporal variation of resources of up to 10 years; and - survey and monitoring that must be undertaken by experienced ecologists.
I7	The BTF SMP under condition I6 must be reviewed by an appropriately qualified person annually and a report prepared on 1 July each year. The report must: - assess the plan against the requirements under condition I6; - include recommended actions to ensure actual and potential environmental impacts are effectively managed for the coming year; - identify any amendments made to the BTF SMP following the review; - all revisions of the survey and monitoring program must be carried out in consultation with the BTF recovery team; and - any revisions must be independently peer reviewed.
I8	The baseline research program must fund a research project to determine the relationship between water sources, woody habitat and the BTF food sources within the mining lease area and approved offset areas to determine the inter-relationships among these factors.

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I9	The baseline research program under I6 must: a) establish whether the Ten Mile Bore and surrounds are high value habitat for the species; and b) establish management actions to maintain the current BTF population of Ten Mile Bore and surrounds.
I10	The holder of this environmental authority must maintain water troughs for BTF within undisturbed areas and surface areas of underground mining footprint, and repair where necessary troughs, pipes and tanks to a standard that maintains a constant source of water.
Groundwater Dependent Ecosystems Management Plan	
I11	The proponent must develop and implement a Groundwater Dependent Ecosystems Management Plan (GDEMP) to detail the management of threats to defined environmental values and to report results and corrective actions for each GDE over the full period of mining activities and for a period of five years post mining rehabilitation.
I12	The GDEMP must be approved by the administering authority in writing and the GDEMP published on a website before the commencement of Project Stage 2.
I13	For the purposes of conditions I11 and I12, the GDEs include the affected Carmichael River riparian zone (ecosystems associated with the Carmichael River between Doongmabulla Springs and the Belyando River, including populations of Waxy Cabbage Palm), the Lignum, Stories and Mellaluka springs and the Doongmabulla, Spring complex.
I14	A report of the findings of the GDEMP, including all monitoring results and interpretations, must be prepared annually and made available on request to the administering authority. The report must include: a) an assessment of background reference groundwater levels (see condition E9) b) the condition of each GDE compared with previous monitoring results c) the suitability of current groundwater trigger thresholds (as defined in condition E13) d) detail on the effectiveness of avoidance, mitigation and management actions in curtailing adverse impacts on GDE ecosystems e) a description of any adaptive management initiatives implemented f) any offsets required for residual impacts
Schedule J: Subsidence	
Condition number	Condition
J1	Subsidence is authorised within the subsidence impact area identified in <i>Figure A3</i> .
J2	A Subsidence Management Plan must be developed and certified by an appropriately qualified person and implemented by the holder of this environmental authority prior to the commencement of activities that result in subsidence.

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J3	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 authorised by this environmental authority and to ensure compliance with the conditions of this environmental authority; b) include baseline data; c) describe the proposed impacts of subsidence on any land, Black Throated Finch (BTF) habitat, watercourse and floodplain including but not limited to: 1. physical condition of surface drainage: i. erosion; ii. areas susceptible to higher levels of erosion such as watercourse confluences; iii. incision processes; iv. stream widening; v. tension cracking; vi. lowering of bed and banks; vii. creation of instream waterholes; viii. changes to local drainage patterns; ix. BTF habitat 2. overland flow: i. capture of overland flow by subsided long-wall panels; ii. increased overbank flows due to lowering of high bank of watercourses; iii. the portion of local and large scale catchment likely to be captured by subsided long-wall panels and the associated impacts on downstream users; 3. water quality: i. surface water; ii. groundwater; 4. land condition: current land condition to be impacted by subsidence; 5. infrastructure: detail of existing infrastructure (pipelines, railway, powerlines and haul roads) should be identified where there is a potential impact from effects of land subsidence; d) propose options for mitigating any impacts associated with subsidence, how these mitigation methods will be implemented, and the extent to which these measures will impact a Matter of State Environmental Significance(s); e) describe cumulative impacts on watercourses, diversions or catchments; f) describe impacts on groundwater; g) quantify the area of on ground impacts to Matters of State Environmental Significance; and h) include a program for monitoring and review of the effectiveness of the Subsidence Management Plan. Guidance material has been provided in Appendix 3 to assist with the development of the Subsidence Management Plan.
J4	The Subsidence Management Plan must be reviewed each calendar year and a report prepared on 1 July each year and certified by an appropriately qualified person. The report must: a) assess the plan against the requirements under condition J3 and the certified reports required under J10; 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.

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J5	The holder of this environmental authority must attach a written response and recommended actions to the review report required by condition J4. The response must detail the actions taken and/or proposed to be taken in order to ensure continuing compliance with this environmental authority.
J6	The review report required by condition J4 and the written response to the review report required by condition J5 must be submitted to the administering authority upon request.
Annual Inspection of Subsidence	
J7	The holder of this environmental authority must arrange for each subsided longwall panel to be inspected annually by an appropriately qualified person, in accordance with conditions J8 through to J10 inclusive. If the appropriately qualified person deems and records under J9 that a subsided longwall no longer has an associated environmental risk, the longwall panel does not need to be reinspected in the future annual inspections under condition J7 to J9.
J8	The annual inspection must be conducted between 1 April and 1 November each year.
J9	At each annual inspection, the condition of each subsided longwall panel must be assessed by an appropriately qualified person. The inspection must include assessments of the structural, geotechnical and hydraulic adequacy of the subsided longwall panel and the adequacy of the works with respect to the Subsidence Management Plan.
J10	For each inspection required under condition J9, copies of a report certified by the an appropriately qualified person, including any recommendations to ensure the integrity of each subsided longwall panel, must be provided to the administering authority upon request.
J11	If the review under J4 or J7 indicates that the impact to Matters of State Environmental Significance caused by mining activities authorised under this environmental authority differs from the area of disturbance detailed in the Biodiversity Offset Strategy, the holder of this environmental authority must undertake a review in accordance with conditions I4 and I5.
Schedule K: Dams and Levees	
Condition number	Condition
Consequence Category	
K1	The consequence category of any regulated structure must be assessed by a suitably qualified and experienced person in accordance with the <i>Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)</i> at the following times: a) prior to the design and construction of the structure, if it is not an existing structure; or b) if it is an existing structure, prior to the adoption of this schedule; or c) prior to any change in its purpose or the nature of its stored contents.
K2	A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.
K3	Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the <i>Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)</i> .
Design and Construction of a Regulated Structure	
K4	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 <i>Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)</i> .

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K5	Construction of a regulated structure is prohibited unless the holder of this environmental authority has submitted a consequence category assessment report and certification to the administering authority which has been certified by a suitably qualified and experienced person for the design and design plan and the associated operating procedures in compliance with the relevant condition of this authority.
K6	Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the <i>Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)</i> , and must be recorded in the Register of Regulated Structures.
K7	Regulated structures must: a) be designed and constructed in accordance with and conform to the requirements of the <i>Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)</i>; b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of: 1. floodwaters from entering the regulated dam from any watercourse or drainage line; and 2. wall failure due to erosion by floodwaters arising from any watercourse or drainage line. c) For dams associated with a failure to contain; have the floor and sides of the dam designed and constructed to prevent or minimise the passage of the wetting front and any entrained contaminants through either the floor or sides of the dam during the operational life of the dam and for any period of decommissioning and rehabilitation of the dam.
K8	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; b) construction of the regulated structure is in accordance with the design plan.
Operation of a regulated structure	
K9	Operation of a regulated structure, except for an existing structure, is prohibited unless: a) the holder of this environmental authority has submitted to the administering authority: 1. one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition K6; 2. a set of 'as constructed' drawings and specifications; 3. certification of those 'as constructed drawings and specifications' in accordance with condition K8; and 4. where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, a copy of the certified system design plan; b) the requirements of this environmental authority relating to the construction of the regulated structure have been met; c) the holder has entered the details required under this environmental authority into a Register of Regulated Structures; and d) there is a current operational plan for the regulated structure.
K10	Each regulated structure must be maintained and operated, for the duration of its operational life until decommissioned and rehabilitated, in a manner that is consistent with the current operational plan and, if applicable, the current design plan and associated certified 'as constructed' drawings.

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Mandatory Reporting Level	
K11	Conditions K11 to K15 inclusive only apply to Regulated Structures which have not been certified as low consequence category for 'failure to contain—overtopping'.
K12	The Mandatory Reporting Level (the MRL) must be marked on a regulated dam in such a way that during routine inspections of that dam, it is clearly observable.
K13	The holder of this environmental authority must, as soon as practical and within forty-eight (48) hours of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
K14	The holder of this environmental authority must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated dam.
K15	The holder of this environmental authority must record any changes to the MRL in the Register of Regulated Structures.
Design Storage Allowance	
K16	The holder of this environmental authority must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken prior to 1 July of each year.
K17	By 1 November of each year, storage capacity must be available in each regulated dam (or network of linked containment systems with a shared DSA volume), to meet the Design Storage Allowance (DSA) volume for the dam (or network of linked containment systems).
K18	The holder of this environmental authority must, as soon as possible and within forty-eight (48) hours of becoming aware that the regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, notify the administering authority.
K19	The holder of this environmental authority must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on 1 November of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.
Annual Inspection	
K20	Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.
K21	At each annual inspection, the condition and adequacy of all components of the regulated structure must be assessed and a suitably qualified and experienced person must prepare an annual inspection report containing details of the assessment and include recommended actions to ensure the integrity of the regulated structure.
K22	The suitably qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the <i>Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)</i> .
K23	The holder of this environmental authority must: a) Within 20 business days of receipt of the annual inspection report, provide to the administering authority: 1. The recommendations section of the annual inspection report; and 2. If applicable, any actions being taken in response to those recommendations; and b) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this to the administering authority within 10 business days of receipt of the request.

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Transfer Arrangements	
K24	The holder of this environmental authority must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.
Decommissioning and Rehabilitation	
K25	Dams must not be abandoned but must be either: a) decommissioned and rehabilitated to achieve compliance with condition (K26); or b) be left in-situ for a beneficial use(s) provided that: 1. it no longer contains contaminants that will migrate into the environment; and 2. it contains water of a quality that is demonstrated to be suitable for its intended beneficial use(s); and 3. the administering authority, the holder of this environmental authority and the landholder agree in writing that the dam will be used by the landholder following the cessation of the environmentally relevant activity(ies).
K26	After decommissioning, all significantly disturbed land caused by the carrying out of the environmentally relevant activity(ies) must be rehabilitated to meet the following final acceptance criteria: a) the landform is safe for humans and fauna; b) the landform is stable with no subsidence or erosion gullies for at least three (3) years; c) any contaminated land (e.g. contaminated soils) is remediated and rehabilitated; d) not allowing for acid mine drainage; e) there is no ongoing contamination to waters (including groundwater); f) rehabilitation is undertaken in a manner such that any actual or potential acid sulfate soils on the area of significant disturbance are treated to prevent or minimise environmental harm in accordance with the Instructions for the treatment and management of acid sulfate soils (2001); g) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class; h) for land that is not being cultivated by the landholder: 1. groundcover, that is not a declared pest species is established and self-sustaining; 2. vegetation of similar species richness and species diversity to pre-selected analogue sites is established and self-sustaining; and 3. the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance caused by carrying out the resource activity(ies); and i) for land that is to be cultivated by the landholder, cover crop is revegetated, unless the landholder will be preparing the site for cropping within 3 months of resource activities being completed.
Register of Regulated Structures	
K27	A Register of Regulated Structures must be established and maintained by the holder for each regulated dam.
K28	The holder must provisionally enter the required information in the Register of Regulated Structures when a design plan for a regulated dam is submitted to the administering authority.
K29	The holder must make a final entry of the required information in the Register of Regulated Structures once compliance with condition K9 has been achieved.
K30	The holder must ensure that the information contained in the Register of Regulated Structures is current and complete on any given day.
K31	All entries in the Register of Regulated Structures must be endorsed by the chief executive officer for the holder of this authority, or their delegate, as being accurate and correct.

K32	The holder must, at the same time as providing the annual return, supply to the administering authority a copy of the records contained in the Register of Regulated Structures, in the electronic format required by the administering authority.
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END OF CONDITIONS

Appendix 1: Definitions

Words and phrases used throughout this environmental authority are defined below. Where a definition for a term used in this environmental authority is not provided within this environmental authority, but is provided in the EP Act 1994 or subordinate legislation, the definition in the EP Act or subordinate legislation must be used.

‘acid rock drainage’ means any contaminated discharge emanating from a mining activity formed through a series of chemical and biological reactions, when geological strata is disturbed and exposed to oxygen and moisture.

‘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).

‘annual exceedance probability’ or **‘AEP’** the probability that at least one event in excess of a particular magnitude will occur in any given year.

‘annual inspection report’ means an assessment prepared by a suitably qualified and experienced person containing details of the assessment against the most recent consequence assessment report and design plan (or system design plan);

- a) against recommendations contained in previous annual inspections reports;
- b) against recognised dam safety deficiency indicators;
- c) for changes in circumstances potentially leading to a change in consequence category;
- d) for conformance with the conditions of this authority;
- e) for conformance with the ‘as constructed’ drawings;
- f) for the adequacy of the available storage in each regulated dam, based on an actual observation or observations taken after 31 May each year but prior to 1 November of that year, of accumulated sediment, state of the containment barrier and the level of liquids in the **dam** (or network of linked containment systems);
- g) for evidence of conformance with the current operational plan.

‘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 relating to the subject matter using the relevant protocols, standards, methods or literature.

‘assessed’ or **‘assessment’** by a suitably qualified and experienced person in relation to a consequence 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 of the assessment:

- a) exactly what has been assessed and the precise nature of that determination;
- b) the relevant legislative, regulatory and technical criteria on which the assessment has been based;
- c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
- d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.

‘associated works’ in relation to a dam, means:

- a) operations of any kind and all things constructed, erected or installed for that dam; and
- b) any land used for those operations.

‘authority’ means an environmental authority.

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‘background’, with reference to the water schedule means the average of samples taken prior to the commencement of mining from the same waterway that the current sample has been taken.

‘blasting’ means the use of explosive materials to fracture:

- a) rock, coal and other minerals for later recovery; or
- b) structural components or other items to facilitate removal from a site or for reuse.

‘BTF Management Plan’ refers to the plan prepared in accordance with the conditions of the environmental authority for the project’s mining activities issued under the *Environmental Protection Act 1994* (Qld)

‘Carmichael Coal Project Biodiversity Offset Strategy’ means the Biodiversity Offset Strategy approved by the Coordinator-General in accordance with the imposed conditions under Section 54B of the *State Development and Public Works Organisation Act 1971* for the Carmichael Coal Mine and Rail project.

‘certifying, certify, certification or certified relating to regulated structures’ means assessment and approval must be undertaken by a suitably qualified and experienced person in relation to any assessment or documentation required by this Manual, including design plans, ‘as constructed’ drawings and specifications, construction, operation or an annual report regarding regulated structures, undertaken in accordance with the Board of Professional Engineers of Queensland Policy Certification by RPEQs (ID: 1.4 (2A)).

In all other cases **‘certifying, certify, certification or certified’** means by an appropriately qualified and experienced person in relation to any program, plan or report, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

- a) exactly what is being certified and the precise nature of that certification;
- b) the relevant legislative, regulatory and technical criteria on which the certification has been based;
- c) 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
- d) the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

‘chemical’ means:

- a) an agricultural chemical product or veterinary chemical product within the meaning of the *Agricultural and Veterinary Chemicals Code Act 1994* (Commonwealth); or
- b) a dangerous good under the Australian Code for the Transport of Dangerous Goods by Road and Rail approved by the Australian Transport Council; or
- c) a lead hazardous substance within the meaning of the Workplace Health and Safety Regulation 1997;
- d) 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
- e) any substance used as, or intended for use as:
 - i. a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product; or
 - ii. a surface active agent, including, for example, soap or related detergent; or
 - iii. a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide; or
 - iv. a fertiliser for agricultural, horticultural or garden use; or
 - v. a substance used for, or intended for use for mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater; or

- vi. manufacture of plastic or synthetic rubber.

‘commercial place’ means a workplace 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.

Note: A ‘sensitive place’ and ‘commercial place’ is based on Schedule 1 of EPP Noise. That is a commercial place is inside or outside a commercial or retail activity.

‘consequence’ in relation to a structure as defined, means the potential for environmental harm resulting from the collapse or failure of the structure to perform its primary purpose of containing, diverting or controlling flowable substances.

‘consequence category’ means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

‘construction’ or **‘constructed’** in relation to a regulated structure includes building a new regulated structure and lifting or otherwise modifying an existing regulated structure, but does not include investigations and testing necessary for the purpose of preparing a design plan.

‘dam’ means a land-based structure or a void that contains, diverts or controls flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and **associated works**.

‘dam crest volume’ means the volume of material (liquids and/or solids) that could be within the walls of a dam at any time when the upper level of that material is at the crest level of that dam. That is, the instantaneous maximum volume within the walls, without regard to flows entering or leaving (for example, via spillway).

‘design document’ for the purposes of a REMP is a document that demonstrates compliance with condition F21. The document should also address each criterion on what a REMP should be as outlined in the guide.

‘design plan’ is a document setting out how all identified consequence scenarios are addressed in the planned design and operation of a regulated structure.

‘design storage allowance’ or **‘DSA’** means an available volume, estimated in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority, must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an **annual exceedance probability** (AEP) specified in that Manual.

‘designer’ for the purposes of a regulated dam, means the certifier of the design plan for the regulated dam.

‘disturbance’ of land includes:

- a) compacting, removing, covering, exposing or stockpiling of earth;
- b) removal or destruction of vegetation or topsoil or both to an extent where the land has been made susceptible to erosion;
- c) carrying out mining within a watercourse, waterway, wetland or lake;
- d) the submersion of areas by tailings or hazardous contaminant storage and dam/structure walls;
- e) temporary infrastructure, including any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc.) which is to be removed after the mining activity has ceased; or
- f) releasing of contaminants into the soil, or underlying geological strata.

However, the following areas are not included when calculating areas of ‘disturbance’:

- a) areas off lease (e.g. roads or tracks which provide access to the mining lease);
- b) areas previously disturbed which have achieved the rehabilitation outcomes;
- c) by agreement with the administering authority, areas previously disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions);

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- d) areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dam/structures, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc.) which is to be left by agreement with the landowner.
- e) disturbance that pre-existed the grant of the tenure.

‘EC’ means electrical conductivity.

‘effluent’ treated waste water released from sewage treatment plants.

‘emergency action plan’ means documentation forming part of the operational plan held by the holder or a nominated responsible officer, that identifies emergency conditions that sets out procedures and actions that will be followed and taken by the dam owner and operating personnel in the event of an emergency. The actions are to minimise the risk and consequences of failure, and ensure timely warning to downstream communities and the implementation of protection measures. The plan must require dam owners to annually update contact.

‘existing structure’ means a structure that was in existence prior to the adoption of this schedule of conditions under the authority.

‘extreme storm storage’—means a storm storage allowance determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority

‘Groundwater Dependent Ecosystem Management Plan (GDEMP)’

A GDEMP is a plan developed by a suitably qualified and experienced person that is consistent with any Bioregional Management Plan for the bioregion, the Water Resource (Great Artesian Basin) Plan and relevant threat abatement plans, conservation advice and project species management plans. The plan must include:

- (1) A description and map of each GDE potentially or indirectly impacted by mining activities
- (2) Detailed baseline monitoring (using QuickBird imagery or similar) to be undertaken on the specific ecology of each GDE, groundwater level, groundwater and surface water quality, threatened species and ecosystem function
- (3) Detailed baseline research to establish:
 - (a) the extent and ecological composition of each GDE, in accordance with the Wetland Monitoring Methodology for springs in the Great Artesian Basin (R. Fensham, 2009) where applicable
 - (b) the source aquifer(s) for groundwater supply to the GDE
 - (c) the natural variation of the groundwater level/pressure
 - (d) GDE ecosystem pressure response to groundwater level/pressure fluctuation
- (4) A description of how the results of baseline research and annual monitoring are to be used to determine any changes in GDE ecology attributable to mining activities
- (5) A description of the potential impact on each GDE from each project stage including impacts from subsidence, mine dewatering of aquifers, water discharge, hydrological changes and weed and pest infestation
- (6) Mitigation measures to be undertaken to avoid, mitigate, offset and manage impacts to GDE environmental values resulting from each stage of the project

‘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 *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*.

‘holder’ means:

- a) where this document is an environmental authority, any person who is the holder of, or is acting under, that environmental authority; or
- b) where this document is a development approval, any person who is the registered operator for that development approval.

‘incident’ means a set of circumstances arising as a result of activities carried out under an environmental authority which cause or threaten to cause environmental harm

‘infrastructure’ means water storage dams, levees,, roads and tracks, buildings and other structures built for the purpose of the mining activity.

‘land’ in the ‘land schedule’ of this document means land excluding waters and the atmosphere, that is, the term has a different meaning from the term as defined in the *Environmental Protection Act 1994*. For the purposes of the *Acts Interpretation Act 1954*, it is expressly noted that the term ‘land’ in this environmental authority relates to physical land and not to interests in land.

‘land use’ –means the selected post mining use of the land, which is planned to occur after the cessation of mining activities.

‘leachate’ means a liquid that has passed through or emerged from, or is likely to have passed through or emerged from, a material stored, processed or disposed of at the operational land which contains soluble, suspended or miscible contaminants likely to have been derived from the said material.

‘levee’ means an embankment that only provides for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from releases from other works, during the progress of those stormwater or flood flows or those releases; and does not store any significant volume of **water** or **flowable substances** at any other times.

‘low consequence dam’ means any dam that is not a high or significant consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)*; and

‘m’ means metres.

‘mandatory reporting level’ or **‘MRL’** means a warning and reporting level determined in accordance with the criteria in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

‘manual’ means the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

‘measures’ includes any measures to prevent or minimise environmental impacts of the mining activity such as bunds, silt fences, diversion drains, capping, and containment systems.

‘mine affected water’:

- a) means the following types of water:
 - i. pit water, tailings dam water, processing plant water;
 - ii. water contaminated by a mining activity which would have been an environmentally relevant activity under Schedule 2 of the Environmental Protection Regulation 2008 if it had not formed part of the mining activity;
 - iii. rainfall runoff which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated, excluding rainfall runoff discharging through release points associated with erosion and sediment control structures that have been installed in accordance with the standards and requirements of an Erosion and Sediment Control Plan to manage such runoff, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water;
 - iv. groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated;
 - v. groundwater from the mine’s dewatering activities;
 - vi. a mix of mine affected water (under any of paragraphs i)-v) and other water.
- b) does not include surface water runoff which, to the extent that it has been in contact with areas disturbed by mining activities that have not yet been completely rehabilitated, has only been in contact with:

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- i. land that has been rehabilitated to a stable landform and either capped or revegetated in accordance with the acceptance criteria set out in the environmental authority but only still awaiting maintenance and monitoring of the rehabilitation over a specified period of time to demonstrate rehabilitation success; or
- ii. land that has partially been rehabilitated and monitoring demonstrates the relevant part of the landform with which the water has been in contact does not cause environmental harm to waters or groundwater, for example:
 - 1. areas that are been capped and have monitoring data demonstrating hazardous material adequately contained with the site;
 - 2. evidence provided through monitoring that the relevant surface water would have met the water quality parameters for mine affected water release limits in this environmental authority, if those parameters had been applicable to the surface water runoff; or both.

‘mine site’ means the area of land on which the project is located

‘modification’ or **‘modifying’** (see definition of ‘construction’)

‘NATA’ means National Association of Testing Authorities, Australia.

‘natural flow’ means the flow of water through waters caused by nature.

‘non-polluting’ means having no adverse impacts upon the receiving environment.

‘operational plan’ includes:

- a) normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA allowance);
- b) contingency and emergency action plans including operating procedures designed to avoid and/or minimise environmental impacts including threats to human life resulting from any overtopping or loss of structural integrity of the regulated structure.

‘peak particle velocity (ppv)’ means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mm/s).

‘project’ means the Carmichael Coal Mine located within Mining Lease (applications) 70441, 70505 and 70506

‘project stage 1’ means project activities carried out prior to commencement of significant ground disturbance including:

- a) pre-construction surveying and technical assessment including geotechnical, establishment of site security arrangements (including signs, fences, safety barriers, and temporary security personnel facilities) and maintenance of existing roads and tracks;
- b) installation of facilities for the purpose of environmental monitoring compliance; and
- c) other works limited to the existing site facilities and access roads.

‘project stage 2’ means project activities, other than activities carried out under project stage 1, leading to the production of coal including:

- a) removal of existing structures, site clearance
- b) construction of access roads, potable water treatment and sewage treatment plants, new power plants, mine administrative buildings, water storage infrastructure and hardstanding
- c) removal and stockpiling of overburden and excavation of box cuts for open pit or underground mining
- d) commencement of dewatering operations.

‘protected area’ means—a protected area under the *Nature Conservation Act 1992*; or

- a) a marine park under the Marine Parks Act 1992; or

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- b) a World Heritage Area.

‘receiving environment’ in relation to an activity that causes or may cause environmental harm, means the part of the environment to which the harm is, or may be, caused. The receiving environment includes (but is not limited to):

- a) a watercourse;
- b) groundwater; and
- c) an area of land that is not specified in Schedule # – Table # (Authorised Activities) of this environmental authority.

The term does not include land that is specified in Table A1 of this environmental authority.

‘receiving waters’ means the waters into which this environmental authority authorises releases of mine affected water.

‘Register of Regulated Dams’ includes:

- a) Date of entry in the register;
- b) Name of the dam, its purpose and intended/actual contents;
- c) The consequence category of the dam as assessed using the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635);
- d) Dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam;
- e) Name and qualifications of the suitably qualified and experienced person who certified the design plan and 'as constructed' drawings;
- f) For the regulated dam, other than in relation to any levees—
 - i. The dimensions (metres) and surface area (hectares) of the dam measured at the footprint of the dam;
 - ii. Coordinates (latitude and longitude in GDA94) within five metres at any point from the outside of the dam including its storage area
 - iii. Dam crest volume (megalitres);
 - iv. Spillway crest level (metres AHD).
 - v. Maximum operating level (metres AHD);
 - vi. Storage rating table of stored volume versus level (metres AHD);
 - vii. Design storage allowance (megalitres) and associated level of the dam (metres AHD);
 - viii. Mandatory reporting level (metres AHD);
- g) The design plan title and reference relevant to the dam;
- h) The date construction was certified as compliant with the design plan;
- i) The name and details of the suitably qualified and experienced person who certified that the constructed dam was compliant with the design plan;
- j) Details of the composition and construction of any liner;
- k) The system for the detection of any leakage through the floor and sides of the dam;
- l) Dates when the regulated dam underwent an annual inspection for structural and operational adequacy, and to ascertain the available storage volume for 1 November of any year;
- m) Dates when recommendations and actions arising from the annual inspection were provided to the administering authority;
- n) Dam water quality as obtained from any monitoring required under this authority as at 1 November of each year.

‘regulated dam’ means any dam in the significant or high consequence category as assessed using the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EM635)* published by the administering authority.

‘regulated structure’ includes land-based containment structures, levees, bunds and voids, but not a tank or container designed and constructed to an Australian Standard that deals with strength and structural integrity.

‘rehabilitation’ the process of reshaping and revegetating land to restore it to a stable landform

‘rejects’ means all coal waste material generated from the washing of coal at the Coal Preparation Plant.

‘release event’ means a surface water discharge from mine affected water storages or contaminated areas on the mine site.

‘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.

‘RL’ means reduced level, relative to mean sea level as distinct from depths to water.

‘saline drainage’ The movement of waters, contaminated with salts, as a result of the mining activity.

‘sensitive place’ means:

- a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or
- b) a motel, hotel or hostel; or
- c) an educational institution; or
- d) a medical centre or hospital; or
- e) a protected area under the Nature Conservation Act 1992, the Marine Parks Act 1992 or a World Heritage Area; or
- f) a public park or gardens.

A sensitive place does not include a mining camp (i.e., accommodation and ancillary facilities for mine employees or contractors or both, associated with the mine the subject of the environmental authority), whether or not the mining camp is located within a mining tenement that is part of the mining project which is the subject of the environmental authority. For example, the mining camp might be located on neighbouring land owned or leased by the same company as one of the holders of the environmental authority for the mining project, or a related company. Accommodation for mine employees or contractors is not a sensitive place if the land is held by a mining company or related company, and if occupation is restricted to the employees, contractors and their families for the particular mine or mines which are held by the same company or a related company.

In contrast, a township (occupied by the mine employees, contractors and their families for multiple mines that are held by different companies) would be a sensitive place, even if part or all of the township is constructed on land owned by one or more of the companies.

Note: A ‘sensitive place’ and ‘commercial place’ is based on Schedule 1 of EPP Noise. That is, a sensitive place is inside or outside on a dwelling, library & educational institution, childcare or kindergarten, school or playground, hospital, surgery or other medical institution, commercial & retail activity, protected area or an area identified under a conservation plan under *Nature Conservation Act 1992* as a critical habitat or an area of major interest, marine park under *Marine Parks Act 2004*, park or garden that is outside of the mining lease and open to the public for the use other than for sport or organised entertainment. A commercial place is inside or outside a commercial or retail activity.

‘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.

‘structure’ means dam or levee.

‘suitably qualified and experienced person’ in relation to the BTF species management plan means a person who has professional qualifications, training or skills or experience relevant to bird ecology and can give authoritative assessment, advice and analysis about performance relevant to the subject matters using relevant protocols, standards, methods or literature.

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‘suitably qualified and experienced person’ in relation to regulated structures means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 2002*, and has demonstrated competency and relevant experience:

- for regulated dams, an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design.
- for regulated levees, an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments.

Note: It is permissible that a suitably qualified and experienced person obtain subsidiary certification from an RPEQ who has demonstrated competence and relevant experience in either geomechanics, hydraulic design or engineering hydrology.

‘system design plan’ means a plan that manages an integrated containment system that shares the required DSA and/or ESS volume across the integrated containment system.

‘the Act’ means the *Environmental Protection Act 1994*.

‘ $\mu\text{S/cm}$ ’ means micro siemens per centimetre.

‘void’ means any constructed, open excavation in the ground.

‘water quality’ means the chemical, physical and biological condition of water.

‘watercourse’ has the meaning in Schedule 4 of the *Environmental Protection Act 1994* and means a river, creek or stream in which water flows permanently or intermittently—

(a) in a natural channel, whether artificially improved or not; or

(b) in an artificial channel that has changed the course of the watercourse.

Watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing 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 the time of year, covering one or more months, when most of the average annual rainfall in a region occurs. For the purposes of DSA determination this time of year is deemed to extend from 1 November in one year to 31 May in the following year inclusive.

Appendix 2: Rehabilitation requirements

Table H1 – Rehabilitation acceptance criteria

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
Open cut voids and slopes	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards.
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation ¹ .
			Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
			Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
			Stream bank erosion.	Evidence in the Rehabilitation Report that creek diversions are stable at closure and exhibit characteristics for long term stability.

¹ Mine Closure and Rehabilitation Strategy (March 2014), available on the proponent's website

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Site is safe for humans and animals now and in the foreseeable future.	Safety assessment of landform stability (geotechnical studies).	An appropriately qualified person certifies the long-term geotechnical stability of the residual slopes and faces in the voids and evidence of this is documented in the Rehabilitation Report.
			Adequacy and predicted long-term performance of safety barriers.	Evidence in the Rehabilitation Report that a safety risk assessment of the open-cut voids and slopes has been completed and proposed mitigation measures are documented in a Safety Plan.
			Installation of safety barriers and human/wildlife exclusion fencing of open-cut void.	If required, mitigation measures documented in a Safety Plan, e.g. fencing or other suitable barrier around the open-cut void and slopes are installed to restrict access.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform. Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
			Open-cut voids protected from flooding.	Certification by a suitably qualified and experienced person in the Rehabilitation Report that the open-cut voids have an adequate protection system to prevent inundation from a 1: 1,000 year annual exceedance probability flood event.
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
	Stable landform	Very low probability of rock falls with serious environmental consequences.	Past record of rock falls.	Evidence in the Rehabilitation Report that appropriate control measures are in place to prevent recurrence.
		Landform design achieves appropriate erosion rates.	Slope angle and length.	Evidence in the Rehabilitation Report that the rehabilitated slopes have been designed to the specifications outlined in Table 4.1 Summary of final land use and rehabilitation.
			Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the Rehabilitation Report that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
		Very low probability of rock falls with serious environmental consequences.	Geotechnical studies.	Evidence in the Rehabilitation Report that a risk assessment has been done and mitigation measures (if any) have been documented and implemented.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Sustainable land-use	Soil properties support the desired land-use.	Past record of rock falls.	Evidence in the Rehabilitation Report that appropriate controls measures have put in place to prevent rock falls.
			Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: - soil salinity content is <0.6 dS/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; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Underground mining areas.	Long term safety	Rehabilitation or conversion of exploration drill holes and groundwater monitoring bores.	All non-artesian exploration drill holes undertaken on the mining lease have been rehabilitated or converted to water bores.	Certification by an appropriately qualified person that all non-artesian exploration drill holes that are not converted to either a water bore or a groundwater monitoring bore have been rehabilitated.
				Certification by an appropriately qualified person that all sub-artesian aquifers have been isolated where non-artesian exploration drill holes have intersected more than one sub-artesian water bearing strata, in accordance with <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to a water bore have been converted in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to water bores are compliant with the <i>Water Act 2000</i> (QLD).
		Structurally safe with no hazardous materials.	All monitoring bores undertaken on the mining lease have been rehabilitated.	Certification by an appropriately qualified person that all monitoring bores have been rehabilitated in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
			Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards
			Stream bank erosion.	Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.
				Evidence in the rehabilitation report that stream banks and creek diversions in the domain are currently stable and exhibit characteristics for long term stability.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
	Stable landform	Landform design achieves appropriate erosion rates.	Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report regarding how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
		Surface water drainage	Stable drainage works.	Certification by an appropriately qualified person that local drainage works, e.g. small diversion bunds and engineered rock chute structures work as intended and are stable.
		Minimal changes to hydrological conditions.	Ponding	Evidence in the Rehabilitation Report to demonstrate unimpeded drainage/flows of subsidence ponds and creek channels.
			Cracking	Evidence in the Rehabilitation Report that no subsidence cracks greater than 25 mm occur (that are attributable to subsidence).

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: - soil salinity content is <0.6 dS/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; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Mining infrastructure area	Long term safety	Rehabilitation or conversion of exploration drill holes and groundwater monitoring bores.	All non-artesian exploration drill holes undertaken on the mining lease have been rehabilitated or converted to water bores.	Certification by an appropriately qualified person that all non-artesian exploration drill holes that are not converted to either a water bore or a groundwater monitoring bore have been rehabilitated.
				Certification by an appropriately qualified person, that all sub-artesian aquifers have been isolated where non-artesian exploration drill holes have intersected more than one sub-artesian water bearing strata, in accordance with <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to a water bore have been converted in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to water bores are compliant with the <i>Water Act 2000</i> (QLD).
			All monitoring bores undertaken on the mining lease have been rehabilitated.	Certification by an appropriately qualified person that all monitoring bores have been rehabilitated in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
		Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Non-polluting	Site is safe for humans and animals now and in the foreseeable future. Mine affected water contained on site.	Appropriate decommissioning of infrastructure.	Certification by an appropriately qualified person in the site Rehabilitation Report that the infrastructure has been decommissioned and rehabilitated. Buildings, water storage(s), roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Access to the area is conducive of the intended purpose of the post-mining land use including pastoral farming.
			Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
	Stable landform	Landform design achieves appropriate erosion rates.	Slope angle and length.	Evidence in the Rehabilitation Report that the rehabilitated slopes have been designed to the specifications outlined in Table 4.1 Summary of final land use and rehabilitation.
			Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
		Very low probability of rock falls with serious environmental consequences.	Geotechnical studies.	Evidence in the Rehabilitation Report that appropriate geotechnical risk assessment has been done and control measures put in place.
			Past record of rock falls.	Evidence in the Rehabilitation Report that appropriate control measures are in place to prevent recurrence.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: - soil salinity content is <0.6 dS/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; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Out-of-pit spoil dump areas	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.
			Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
			Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
			Stream bank erosion.	Evidence in the Rehabilitation Report that creek diversions are stable at closure and exhibit characteristics for long term stability.
		Site is safe for humans and animals now and in the foreseeable future.	Safety assessment of landform stability (geotechnical studies).	An appropriately qualified person certifies the long-term geotechnical stability of the residual slopes and faces and evidence of this is documented in the Rehabilitation Report.
			Adequacy and predicted long-term performance of safety barriers.	Evidence in the Rehabilitation Report that a safety risk assessment of the slopes has been completed and proposed mitigation measures are documented in a Safety Plan.
			Installation of safety barriers and human/wildlife exclusion fencing.	If required, mitigation measures documented in a Safety Plan, e.g. fencing or other suitable barrier around the slopes are installed to restrict access.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person .
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Acid mine drainage will not cause serious environmental harm.	Technical design of tailings emplacement cells.	Certification by suitably qualified person in the Rehabilitation Report that the tailings emplacement cells is in accordance with recommendations in the Acid Mine Drainage Assessment report.
		Landform design achieves appropriate erosion rates.	Slope angle and length.	Evidence in the Rehabilitation Report that the rehabilitated slopes have been designed to the specifications outlined in Table 4.1 Summary of final land use and rehabilitation.
	Stable landform		Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning as intended.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the Rehabilitation Report that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Vegetation types and densities are comparable with the relevant reference site.
				Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Sustainable land-use	Soil properties support the desired land-use.		To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
			Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: - soil salinity content is <0.6 dS/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; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth. Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Establish self-sustaining natural vegetation or habitat.	Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).
			Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
		Self-sustaining natural vegetation or habitat.	Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
			Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Water storage areas	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards.
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Non-polluting	Site is safe for humans and animals now and in the foreseeable future. Mine affected water contained on site.	Appropriate decommissioning of regulated dams.	Certification by a suitably qualified and experienced person in the site Rehabilitation Report that regulated dams and structures have been decommissioned and rehabilitated.
			Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
			Voids protected from flooding.	Certification by a suitably qualified and experienced person in the Rehabilitation Report that the voids have an adequate protection system to prevent inundation from a 1: 1,000 year annual exceedance probability flood event.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
	Stable landform	Landform design achieves appropriate erosion rates.	Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the Rehabilitation Report that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: - soil salinity content is <0.6 dS/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; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth.
				Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.

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Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is not greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Stream diversions	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.
		Site is safe for humans and animals now and in the foreseeable future.	Appropriate decommissioning of regulated dams.	Certification by a suitably qualified and experienced person in the site Rehabilitation Report that regulated structures have been decommissioned and rehabilitated.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by an appropriately qualified person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
	Stable landform	Landform design achieves appropriate erosion rates.	Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
				Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		The diversions and run-off drainage lines mirror natural stream functions.	Design and stability of drainage diversions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.
				To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
	Sustainable land-use	Soil properties support the desired land-use.	Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: - soil salinity content is <0.6 dS/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; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth. Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.
			Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).
		Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
		Self-sustaining natural vegetation or habitat.	Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Tailings drying cells	Long term safety	Structurally safe with no hazardous materials.	Safety assessment of landform stability (geotechnical studies).	Certification by an appropriately qualified person in the Rehabilitation Report that slopes are now safe and exhibit characteristics for long term stability.
				A risk assessment has been completed and risk mitigation measures have been implemented. Where risk mitigation measures include bunds, safety fences and warning signs, these have been erected in accordance with relevant guidelines and Australian Standards.
				Landform design meets the design requirements of Table 4.1: Summary of final land use and rehabilitation.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Non-polluting	Site is safe for humans and animals now and in the foreseeable future. Mine affected water contained on site.	Appropriate decommissioning of infrastructure.	Certification by an appropriately qualified person in the site Rehabilitation Report that the infrastructure has been decommissioned and rehabilitated. Buildings, water storage(s), roads (except those used by the public) and other infrastructure have been removed unless stakeholders have entered into formal written agreements for their retention. Access to the area is conducive of the intended purpose of the post-mining land use including pastoral farming.
			Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials.	Certification by an appropriately qualified person that the Rehabilitation Report includes predictions about future changes and that the specified cover thickness is in place.
				Evidence in the Rehabilitation Report that monitoring results for dust and particulate matter indicates compliance with the limits in the environmental authority.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
		Acid mine drainage will not cause serious environmental harm.	Technical design of tailings emplacement cells.	Certification by suitably qualified person in the Rehabilitation Report that the tailings drying cells were in accordance with recommendations in the Acid Mine Drainage Assessment Report.
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
		Hazardous materials adequately managed.	Exposure to and availability of heavy metals and other toxic materials	Evidence that surface water quality for the 5 years post mine closure has complied with the surface water contaminant limits in the environmental authority.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Stable landform	Landform design achieves appropriate erosion rates.	Slope angle and length.	Evidence in the Rehabilitation Report that the rehabilitated slopes have been designed to the specifications outlined in Table 4.1 Summary of final land use and rehabilitation.
			Engineered structures to control water flow.	Evidence in the Rehabilitation Report that required contour banks, channel linings, surface armour, engineered drop structures and other required measures are in place and functioning.
			Rates of soil loss.	Certification by an appropriately qualified person that land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at a comparable reference site. The comparable reference site must have similar chemical and physical characteristics including slope as the rehabilitated landform.
			Dimensions and frequency of occurrence of erosion of rills and gullies.	Evidence in the Rehabilitation Report that the dimensions and frequency of occurrence of erosion rills and gullies are no greater than that in comparable reference site(s).
		Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
			The diversions and run-off drainage lines mirror natural stream functions.	Documentation in the Rehabilitation Report how drainage diversions have changed over the life of mine and that they are stable at closure and are likely to remain that way into the foreseeable future.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
	Sustainable land-use	Soil properties support the desired land-use.		To be designed and constructed in accordance with the Queensland Government Natural Resources and Mines, <i>Central West Water Management and Use Regional Guideline: Watercourse Diversions-Central Queensland Mining Industry</i> (2008) and with consideration of contemporary research, i.e. the ACARP report <i>Maintenance of Geomorphic Processes in Bowen Basin River diversions</i> (Project number C8030-C9068).
			Chemical properties, e.g. pH, salinity, nutrient content, sodium content of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the topsoil chemical properties do not limit the suitability of the land for the intended land use and are consistent with the following: - soil salinity content is <0.6 dS/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; and - adequate macro and micro-nutrients are present.
			Physical properties of topsoil to support the proposed vegetation and land-use.	Certification in the Rehabilitation Report that the soil physical properties, e.g. rockiness, depth of soil, wetness and plant available water capacity are adequate for plant growth. Certification in the Rehabilitation Report of suitability for beef cattle grazing land use in accordance with Department of Minerals and Energy (DME) 1995 <i>Land Suitability Assessment Techniques in Technical Guidelines for the Environmental Management of Exploration and Mining</i> .
			Topsoil thickness.	Certification in the Rehabilitation Report that topsoil has been respread according to the depths required in the Topsoil Management Plan.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
		Establish self-sustaining natural vegetation or habitat (remnant vegetation areas).	Site soil characteristics.	Certification in the Rehabilitation Report that the site's soil characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the <i>Australian Soil and Land Survey Field Handbook</i> (National Committee on Soil and Terrain 2009).
			Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.
		Self-sustaining natural vegetation or habitat.	Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.
			Plant regeneration.	Certification by an appropriately qualified person that plants in rehabilitated areas show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during rehabilitation.
		Agricultural grazing.	Livestock stocking rates.	An appropriately qualified person has predicted and defined the economics/ benefits and these have been agreed with relevant stakeholders.
			Landform stability when grazed.	Land maintenance requirements are comparable to comparable reference sites.
			Stock access to water sources.	Stock has access to water that meet accepted livestock drinking water guidelines.
Carmichael River corridor	Long term safety	Rehabilitation or conversion of exploration drill holes and groundwater monitoring bores.	All non-artesian exploration drill holes undertaken on the mining lease have been rehabilitated or converted to water bores.	Certification by an appropriately qualified person that all non-artesian exploration drill holes not converted to either a water bore or a groundwater monitoring bore have been rehabilitated.
				Certification by an appropriately qualified person, that all sub-artesian aquifers have been isolated where non-artesian exploration drill holes have intersected more than one sub-artesian water bearing strata, in accordance with <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to a water bore have been converted in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to water bores are compliant with the <i>Water Act 2000</i> (QLD).
			All monitoring bores undertaken on the mining lease have been rehabilitated.	Certification by an appropriately qualified person that all monitoring bores have been rehabilitated in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
	Non-polluting	Mine affected water contained on site.	Downstream surface water quality.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
			Final landform water storages are contained on-site, with no over flows into external surface water systems.	Certification by an appropriately qualified person that surface water quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
				Receiving water affected by surface water runoff has contaminant limits in accordance with the environmental authority.
			All permanent stream diversion will meet approved design criteria.	Certification by an appropriately qualified person that all stream diversions have been constructed and are operating in accordance with approved design criteria.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All permanent regulated structures will meet approved design criteria.	The regulated structures are certified by a suitably qualified and experienced person.
			All non-permanent regulated structures decommissioned appropriately.	Regulated structures are decommissioned in accordance with the administering authority requirements.
		Diversion design and maintenance.	The administering authority of the water licence under the <i>Water Act 2000</i> (QLD) has determined that the water licence is no longer required.	Confirmation in writing from the administering authority that the water licence under the <i>Water Act 2000</i> (QLD) is no longer required.
		Removal of potential sources of contamination.	Results of site contaminated land investigation report.	Evidence in the Rehabilitation Report that measures required in site contaminated land investigation report have been implemented.
	Sustainable land-use	Self-sustaining natural vegetation or habitat.	Native fauna species.	Certification by an appropriately qualified person that native fauna species identified in pre-mining baseline studies and the five years of reference site monitoring prior to the completion of rehabilitation are present or indicators of these species or habitat elements are developing within the rehabilitated areas.
			Plant regeneration.	Certification by an appropriately qualified person that plants in the area show evidence of flowering, seed setting and seed germination.
			Abundance of declared plants (weeds) identified through surveys.	Certification by an appropriately qualified person that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater than comparable reference sites.
			Actions taken to eradicate plants declared under local or State legislation.	Evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Abundance of declared animals identified through surveys.	Certification by an appropriately qualified person that the abundance of declared animals identified in rehabilitated areas is no greater than comparable reference sites.
			Management actions taken to control animals declared under local or State legislation.	Evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.
			Weed hygiene procedures.	Records indicating that appropriate weed and seed hygiene procedures were implemented during works in the area.
Exploration disturbance as per Figure A2.	Long-term safety	Rehabilitation or conversion of exploration drill holes and groundwater monitoring bores.	All non-artesian exploration drill holes undertaken on the mining lease have been rehabilitated or converted to water bores.	Certification by an appropriately qualified person that all non-artesian exploration drill holes not converted to either a water bore or a groundwater monitoring bore have been rehabilitated.
				Certification by an appropriately qualified person, that all sub-artesian aquifers have been isolated where non-artesian exploration drill holes have intersected more than one sub-artesian water bearing strata, in accordance with <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to a water bore have been converted in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
				Certification by an appropriately qualified person that all non-artesian exploration drill holes converted to water bores are compliant with the <i>Water Act 2000</i> (QLD).

Environmental authority EPML01470513 – Carmichael Coal Mine

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			All monitoring bores undertaken on the mining lease have been rehabilitated.	Certification by an appropriately qualified person that all monitoring bores have been rehabilitated in accordance with the <i>Minimum Construction Requirements for Water Bores in Australia</i> (Australian Government February 2012) or latest edition.
	Non-polluting	Mine affected water contained on site	Groundwater quality.	Certification by an appropriately qualified person that groundwater quality at monitoring locations is not negatively impacted when trends indicated by results from baseline monitoring and the 5 years previous to mine closure are compared to monitoring results for the rehabilitated landform.
	Stable landform	Vegetation cover sufficient for a self-sustaining community and to minimise erosion.	Vegetation type and density.	Evidence that the vegetation type and density are of species suited to the sites characteristics including soil type, topography and climate and that soil erosion meets the goals set in this plan.
				Vegetation types and densities are comparable with the relevant reference site.
			Foliage cover.	Minimum of 70% groundcover is present (or 50% if rocks, logs or other features are present). No bare surfaces >20 m ² in area or > 10 m in length down slope.
	Sustainable land-use	Establish self-sustaining natural vegetation or habitat.	Presence of key plant species.	Certification by an appropriately qualified person that key plant species identified in the comparable reference site occur on the rehabilitation site. The presence of key plant species may also be guided by future vegetation trials for rehabilitation.
			Density of key plant species.	Certification by an appropriately qualified person that the density of key plant species in comparable reference sites is similar to the rehabilitation site. The density of key plant species may also be guided by future vegetation trials for rehabilitation.

Domain	Rehabilitation goals	Rehabilitation objectives	Indicators	Completion criteria
			Structure of vegetation habitat.	Certification by an appropriately qualified person that the structure of vegetation, i.e. groundcover, shrub and canopy structure is trending towards being similar to comparable reference sites.

Appendix 3: Subsidence guidance material

When to use

This appendix is to be used by the Environmental Authority (EA) holders in the preparation of a Subsidence Management Plan (SMP) where a watercourse, as defined under the *Water Act 2000*, is to be impacted as a result of underground longwall mining. For a feature to be defined as a watercourse under Chapter 1, Part 2 of the *Water Act 2000*, the feature must possess particular characteristics. Watercourse determinations are regularly undertaken across Central Queensland by authorised departmental officers as it is the determining factor in the requirement for approvals under the *Water Act 2000*.

In addition, this appendix is to be used by the Department when providing advice and assessing Subsidence Management Plans submitted by EA holders or proposed EA holders.

Purpose

The purpose of this appendix is to detail the information to be provided in a SMP and the legislative basis of the requirement for approval. The SMP forms the major reference document regarding subsidence impacts on watercourses as a result of underground longwall mining and is required to accompany proposals for watercourse subsidence.

The objective of the SMP is to ensure that the impacts of subsidence are properly managed. Where surface subsidence intersects a watercourse, it is important for the situation to be managed effectively to ensure no long-term maintenance is required within the watercourse, and to ensure that naturally occurring processes are not impaired.

A SMP should include the following information:

- Location of proposed longwall panels and modelled subsidence effects on the watercourse;
- Pre-subsidence management of watercourses proposed to be subsided;
- Monitoring methods pre and post-subsidence to detect and document any impacts on watercourses;
- Post-subsidence management of impacted watercourses through remediation and rehabilitation;
- Agreed outcome for proposed future landscape between the Department and the EA holder.

Background

Throughout the Bowen Basin, economically viable coal deposits frequently extend beneath watercourses. Consequently, underground mining operations targeting the associated coal seams often also extend beneath watercourses. Underground mining is not a new concept in the extraction of coal throughout the Bowen Basin. This form of mining is preferred when economic constraints reduce the feasibility of mining using open cut methods. Whilst coal deposits located beneath watercourses contribute to total extractable coal, more importantly, extraction of this coal facilitates underground mining activities to continue along a coal seam uninterrupted across both sides of a watercourse. This provides for a more cost effective extraction of coal that might otherwise be uneconomic to mine.

Technological improvements in underground mining methods have provided the ability to extract coal in areas previously inaccessible for mining. Modern day underground coal mining operations commonly utilise longwall mining techniques which allow extraction of more of the coal seam. Longwall mining allows access to the coal seam via a shaft, a decline or a highwall portal and system of underground workings, without the need to remove overburden. This technique is used to extract the coal seam via a series of “panels”, which can be hundreds of metres wide and kilometres in length. As the coal shearer removes the coal in the seam along the length of a panel, the overlying strata is collapsed behind, filling the void (goaf) left by the extracted coal. The collapse and settlement of the overlying strata can extend to the land surface above, resulting in localised lowering of the surface profile, and depressions in the landscape (commonly referred to as subsidence troughs).

Where a watercourse is located above a longwall panel, extraction of the coal seam causes subsidence of the panel can have a number of impacts on the watercourse. Some of these impacts include:

- Lowering of bed and banks
- Creation of in-stream waterholes

- Changes to local drainage patterns
- Incision processes
- Stream widening
- Erosion
- Increased overbank flows due to lowering of the high banks
- Tension cracking through both shallow and deeper underlying strata (including aquifers)
- Root shear and loss of riparian vegetation
- Changes to water quality (surface water and groundwater).

The degree of subsidence is generally a function of thickness of coal extracted, depth of overburden, strata type and panel width. The point of maximum subsidence generally occurs along the centreline of an extracted panel, whilst the pillar zones located between panels remain at natural surface level. Experience gained through widespread adoption of longwall mining processes in the Bowen Basin has seen advancement in the modelling and ability to predict the likely impacts of a subsidence event. This technology has also facilitated improved design and implementation of mitigation measures (engineered structures and associated earthworks) and highlighted potential short and long term maintenance issues which may require specific management intervention.

Subsidence Management Plan

The objective of the SMP is to ensure that the impacts of subsidence are properly managed. Where surface subsidence intersects a watercourse, effective management is required to ensure no long-term maintenance is required within the watercourse, and to ensure that naturally occurring processes are not unduly impaired. Consideration must be given for potential impacts on erosion, groundwater and surface water as a result of a proposed subsidence event.

A Subsidence Management Plan must address the following issues:

- (1) Description of Pre Subsidence Situation & Survey
 - (a) A general description of the area pre subsidence including photographic record should be provided.
 - (b) Survey of cross-section and longitudinal profiles should be undertaken on all watercourses with potential to be impacted through subsidence. Permanent transects should be detailed within the proposed Subsidence Management Plan. Surveys should include the confluence with any other watercourses in the impacted area as well as any infrastructure spanning the watercourse. Surface drainage patterns should be investigated to determine current paths of water movement through the landscape. This path of water movement should be maintained where possible post-subsidence.
- (2) Predicted Subsidence

The degree of anticipated subsidence should be provided, including the length of watercourse to be impacted and the average depth of subsidence across individual panels. The predicted subsidence should be modelled to indicate the change in surface elevations expected. The volumes of water expected to be captured within the bed of the watercourse due to creation of waterholes should be provided. Consequences of any lowering of the high banks of the watercourse should be discussed, including impacts associated with greater floodplain interaction and potential for creation of new channels.
- (3) Infrastructure

Prior to mining, the anticipated impacts from subsidence should be determined on all infrastructure located within or above the watercourse to be subsided along with measures to be implemented to mitigate any impacts. Priority should be given to infrastructure which provides services to external parties (other mines, towns, industry). Measures for dealing with any interruption to such services should be outlined. Relocation of infrastructure may be necessary should the proposed subsidence pose sufficient risk.
- (4) Preventative Works

Where preventative measures are required to ensure the stability of the bed and banks of the watercourse (establishment of pile fields, exclusion of cattle, bentonite treatment) these should be

discussed in the Subsidence Management Plan, including supporting evidence outlining the legitimacy of such works. These works may be required where self-repair by natural processes will not provide adequate remediation of impacted areas. Where there is potential for root shear to result in significant loss of riparian vegetation, mitigation measures may be required.

(5) Engineered Structures

Engineered works may be required to maintain the stability and function of a watercourse impacted by subsidence. These works are often constructed prior to subsidence occurring within the watercourse. Such works can include timber pile fields, rock revetment, reshaping of existing stream banks, and river bed treatment to prevent increased ingress of surface water into underground aquifers. Where subsidence mitigation measures require engineered structures be installed, the design, monitoring and maintenance of these structures should be detailed in the Subsidence Management Plan. The plan should detail the purpose of each structure and any consequences should the structure fail to be installed. Appropriate design plans including the location of each structure will be required. As a minimum, fourth and fifth order watercourse will require the installation of engineered structures. Works undertaken within the bed and banks of a watercourse aimed at mitigating or remediating any physical impacts pre or post-subsidence are authorised under the conditions of the Environmental Authority. Where a separate report has been produced for engineered structures, this should be included as an appendix to the Subsidence Management Plan.

(6) Erosion

The Subsidence Management Plan should detail the current watercourse condition to be impacted by subsidence. Identification of erosion zones which are likely to be exacerbated through tension cracking should be stabilised using appropriate methods. Such areas may include reaches with elevated rates of bed and bank erosion, access tracks and areas with poor quality, sparsely populated riparian vegetation. Sufficient riparian vegetation should be established prior to subsidence to assist with initial stabilisation of the bed and banks. Removal of grazing animals to allow establishment or recovery of riparian vegetation may be required for an extended period prior to subsidence.

(7) Groundwater

Where groundwater aquifers exist beneath the mine plan area, investigations should be undertaken regarding the potential for impacts on these aquifers as a result of subsidence. The Subsidence Management Plan should discuss these aquifers, any anticipated impacts on each aquifer and proposed measures for mitigating these impacts. Any anticipated movement of surface water into underlying aquifers should be discussed, as this can result in loss of surface water from the system and impacts on water quality in these aquifers. Geotechnical assessment across the bed and banks of the watercourse should be undertaken to provide an indication of potential permeability issues related to sub-surface cracking and interaction with local groundwater tables. Monitoring bores should be established in each aquifer prior to subsidence and monitored for a period of time sufficient for obtaining background water levels and trends. Monitoring of these bores should continue post-subsidence to aid the detection of impacted aquifers.

(8) Surface Water

(a) Baseline Monitoring

The Subsidence Management Plan should detail baseline condition monitoring of all watercourses likely to be impacted through subsidence. The preferred monitoring assessment technique for stream condition in the Bowen Basin is the Index of Diversion Condition. This methodology was established as a result of the Australian Coal Association Research Program (ACARP) Project C9068. Monitoring of watercourses should extend a minimum of 1km upstream and downstream of the proposed area to be impacted and should include a geomorphic assessment of the entire reach. Where a baseline monitoring assessment has been undertaken as part of an Environmental Impact Statement (EIS) process, this may be considered sufficient provided there has been no subsequent modification or interference to the watercourse. The condition of riparian vegetation should also be detailed.

(9) Cumulative Impacts on Watercourses

- (a) With an increasing number of mines being established in close proximity to watercourses, a EA holder utilising longwall mining methods may be requested to investigate the cumulative impact of these activities on the watercourse.

Monitoring and Reporting Requirements

The following criteria have been developed to provide detailed direction regarding monitoring and reporting requirements associated with subsidence of watercourses.

These criteria are outlined in a four step approach:

- Monitoring
- Assessment
- Reporting
- Mitigation

Monitoring

- Representative sites need to be identified that allow the impacts of subsidence to be assessed in a particular watercourse with particular attention to the following:
 - Sites must be located at all pillar zones intersecting a watercourse or tributary.
 - Sites must include representative locations at the interface of natural ground level and observed changes in surface elevation from subsidence within a watercourse.
- Control sites beyond proposed mining extents should be established to verify pre-mining conditions. In watercourses, the sites should extend a minimum of 1km both upstream and downstream of the subsidence reach.
- Assessment of watercourse condition: Specific monitoring assessment techniques for watercourse condition should include but not be limited to the Index of Diversion Condition, as outlined in the ACARP Project C9068.
- Vegetation and ecological condition assessments should form part of the baseline dataset.
- Rainfall monitoring should be undertaken within areas proposed to be impacted by subsidence. In addition, flow event monitoring should occur in watercourses proposed to be impacted by subsidence. The type of monitoring devices and locations to be installed should be detailed in the Subsidence Management Plan.
- Where preventative works are undertaken pre-subsidence, subsequent monitoring assessments should include the integrity and effectiveness of these works in reducing the impact of subsidence within the watercourse.
- Surveys must include cross-sectional area and bed slope throughout all monitored reaches of impacted watercourses.
- Annual aerial photography and Digital Terrain Mapping is required to verify predicted subsidence surface profiles, and to identify potential short and long term erosion issues resulting from subsidence of watercourses.
- Surveys pre-subsidence should quantify the following features within watercourses:
 - pool/riffle sequences
 - bed controls
 - entry points of other watercourses and localised tributaries
 - existing bed and bank scour points
 - infrastructure located within the watercourse.
- Surveys post-subsidence should quantify any changes to the pre-mining conditions including:
 - 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

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- size of subsidence void created within the watercourse.
- The subsidence monitoring program for groundwater must include the following information:
 - Sites must include representative locations at the interface of natural ground surface and observed changes in surface elevation from subsidence.
 - Monitoring bores should be established in each aquifer at each monitoring site.
 - Monitoring must include both water level measurements and water quality sampling in accordance with the following:
 - water level measurement to be taken quarterly
 - water quality field conductivity measurement to be taken 6 monthly
 - full chemical analysis of water samples to be taken annually.

Frequency of Monitoring

A proposed timeframe should be provided by the EA holder in relation to the monitoring outlined in the Subsidence Management Plan. The Department, upon review of the proposed Subsidence Management Plan will determine a suitable monitoring timeframe based on the information provided. Monitoring requirements will depend on a number of factors, including the stream order of the watercourse proposed to be impacted. As a guide:

Stream Order 1, 2 and 3

Monitoring must be undertaken at the following intervals:

- immediately prior to subsidence,
- within two (2) months of the initial subsidence,
- following a rainfall event of **1 in 2 year** 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.

Stream Order 4 and higher

Monitoring (including surveys) must be undertaken at the following intervals:

- immediately prior to subsidence,
- within two (2) months of the initial subsidence,
- following a rainfall event of **1 in 5 year** 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 5 year** ARI, and
- annually.

Cumulative Impacts

Where subsidence is proposed in a Subsidence Management Plan, and the watercourse has already been subsided upstream or downstream, the monitoring assessment must determine not only the localised impacts on the watercourse resulting from the proposed subsidence, but also any cumulative impacts on the watercourse as a result of all other subsidence events.

Assessment

The design and assessment of engineered structures should be performed by a Registered Professional Engineer of Queensland (RPEQ). All other assessments should be performed by suitably qualified and experienced persons in the fields that they are assessing.

- The results of all monitoring activities should be reviewed by an appropriately qualified person and detailed in the associated monitoring report.
- Recommendations should be made after assessment of the results regarding any specific treatment, remediation works, or engineered structures required post-subsidence to achieve stability in the watercourse.

Reporting

An annual report will be requested by the administering authority post-subsidence. The report should detail mining activities and all monitoring and rehabilitation activities as outlined within the Subsidence Management Plan. The reporting date will be determined in consultation with the administering authority.

- A monitoring report should contain the results of all monitoring activities, the assessment of these results, and recommendations for any remedial works required. The report should comment on the following:
 - Watercourse condition and geomorphic processes;
 - The condition of vegetation in riparian zones;
 - Examination of pillar zones in watercourses with particular attention to potential for tension cracking;
 - The creation of in-stream waterholes;
 - Any impacts on groundwater.
- Where preventative works were undertaken pre-subsidence, subsequent monitoring assessments should include assessment of the integrity and effectiveness of these works in mitigating the impacts of subsidence.
- An annual report in the form of two (2) hard copies and one electronic copy shall be furnished to the administering authority. The report should in addition to addressing specific monitoring requirements provide comment on:
 - The current state of the groundwater and surface water resources;
 - Any impacts on these features;
 - Any remedial works required to be undertaken including a timetable for implementation.
 - Commitment from the EA holder to addressing the recommendations in the report.

Mitigation

Where recommendations are made regarding specific treatment, remediation works, or engineered structures required post-subsidence to achieve stability in the watercourse, the EA holder must ensure this work is undertaken.

Rehabilitation

The holder of the EA, if directed by the administering authority, will carry out additional remedial works deemed necessary to minimise the impacts of subsidence on the physical integrity of the watercourse.

Relinquishment

Relinquishment of monitoring and rehabilitation responsibilities conditional under a EA holder's EA can only occur after the subsidence and approved mitigation and rehabilitation measures have been subjected to a suitable range of rainfall and flow events, and are deemed by the administering authority to be in a stable and functional condition. Any request for relinquishment will be negotiated with the administering authority and will require a submission containing monitoring data demonstrating stability and functionally in the watercourse over a suitable range of rainfall and flow events.

Acknowledgement

In 2007, BMA and Anglo Coal instigated discussions with the Department into a proposed assessment on the cumulative impacts of longwall mining beneath the Isaac River in Central Queensland. A final report was produced by Alluvium Consulting in July 2009 documenting the outcomes of the study. The Department greatly acknowledges the findings from this report and the assistance provided in the development of this guideline.

R Lucas, J Crerar, R Hardie, J Merritt and B Kirsch, 2009. Isaac River Cumulative Impact Assessment of Mining Developments. Report by Alluvium Consulting. ACARP for Diversion assessment guideline ex C9068.

Appendix 4: Figures

Figure A1: Overall Site Layout Domain Plan

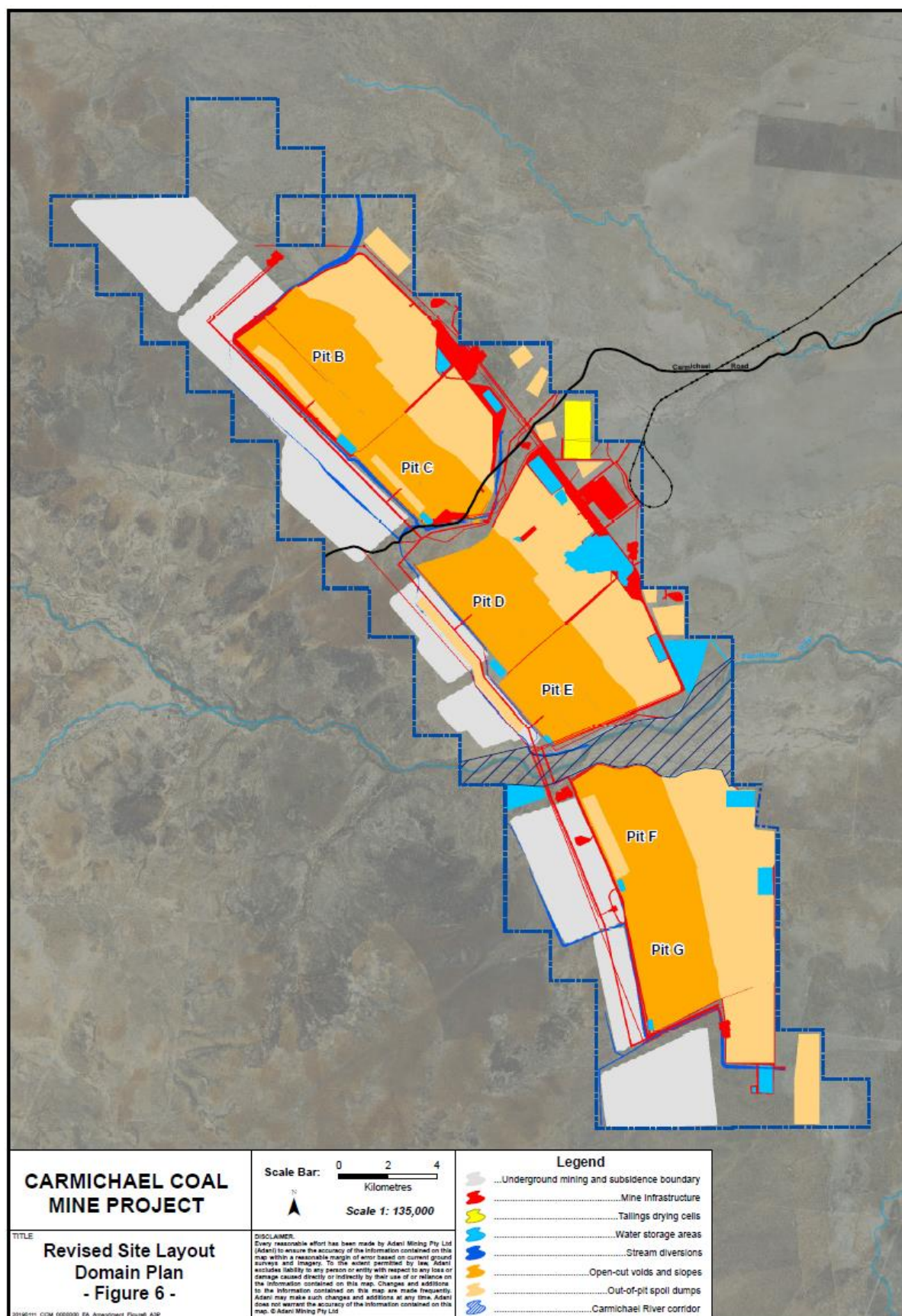


Figure A2: Exploration Disturbance

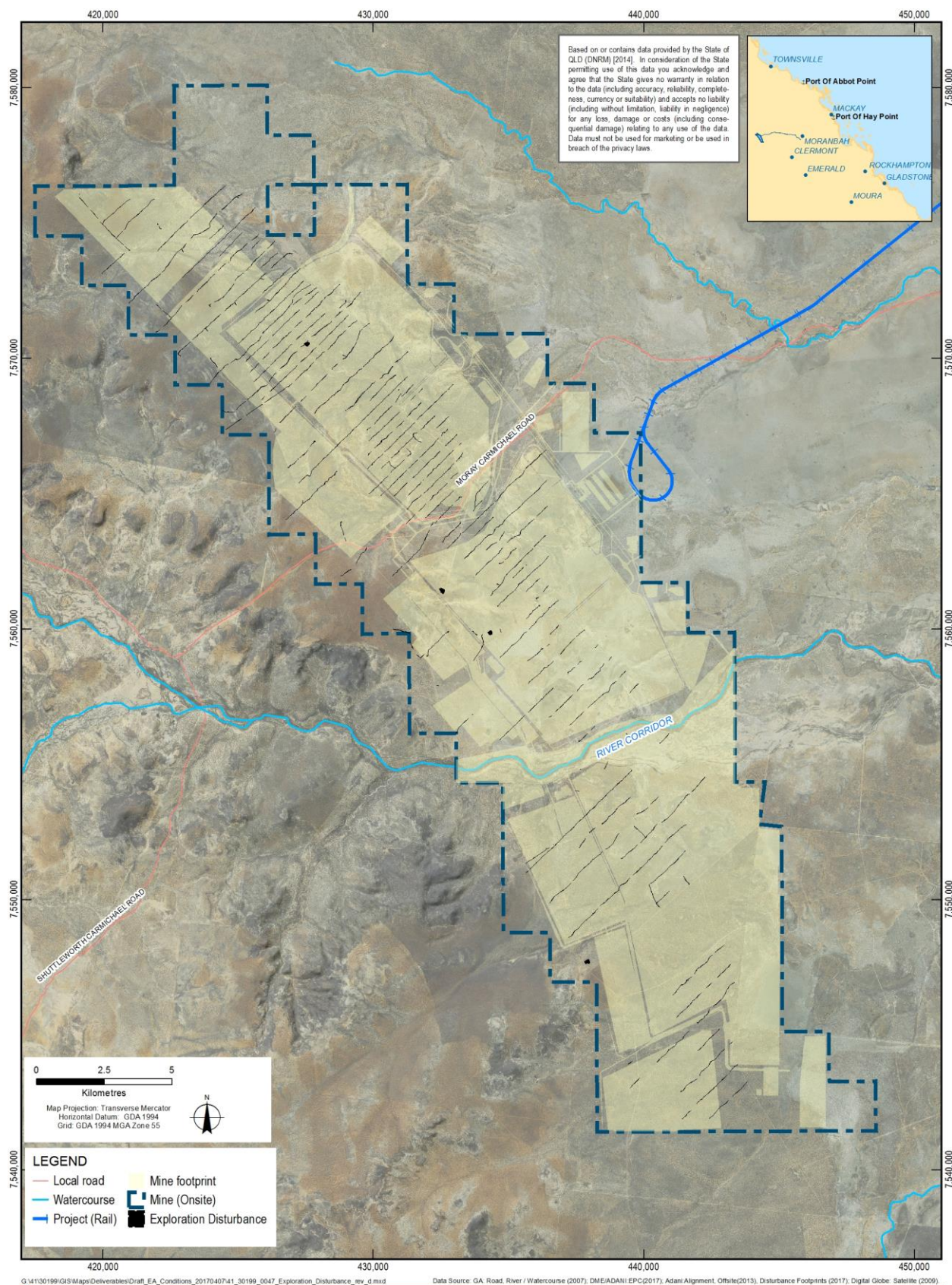


Figure F1: Water Release and Monitoring Locations

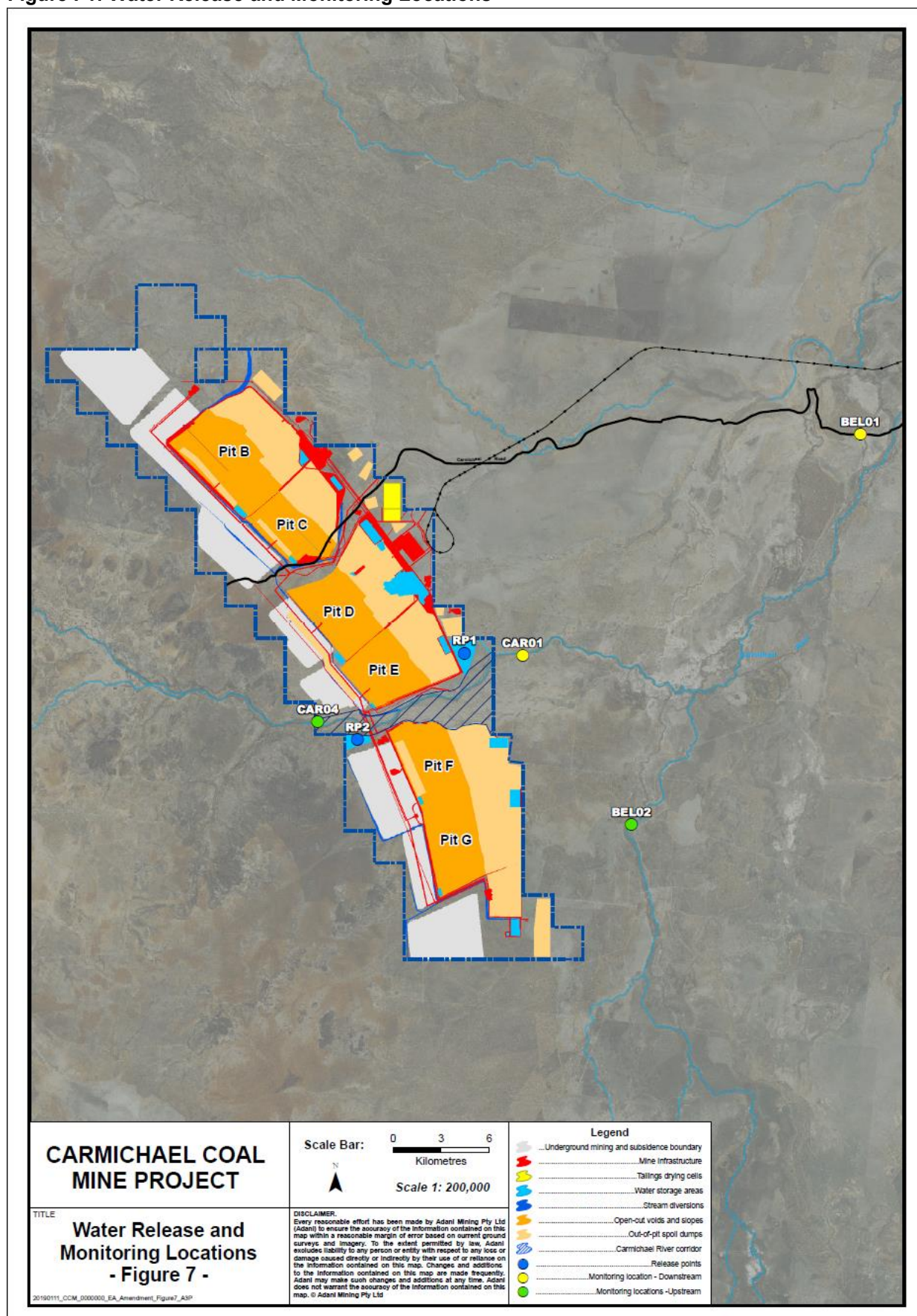


Figure H1: Cross Sections of Residual Voids

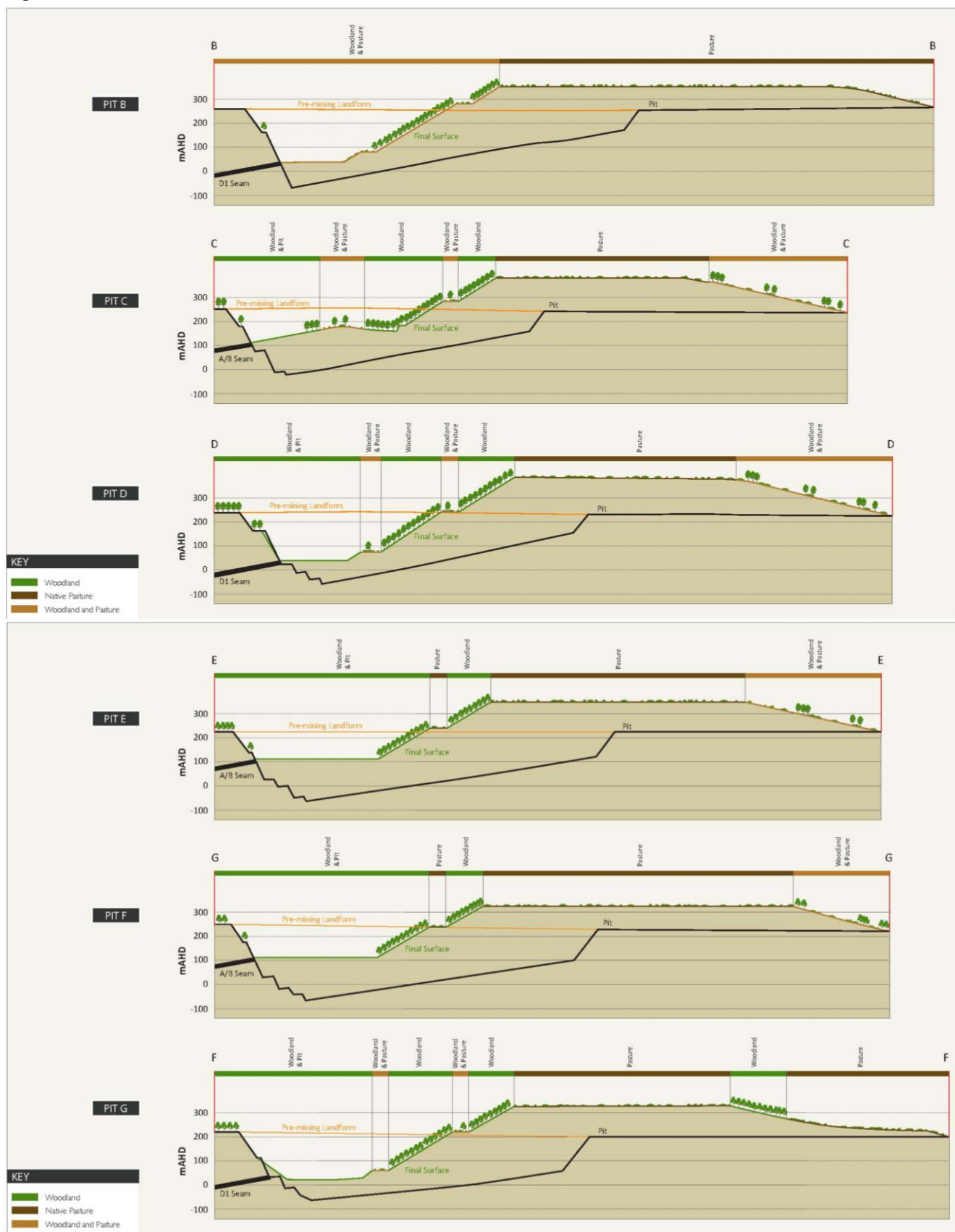


Figure H2: Final Landform (Northern Section)

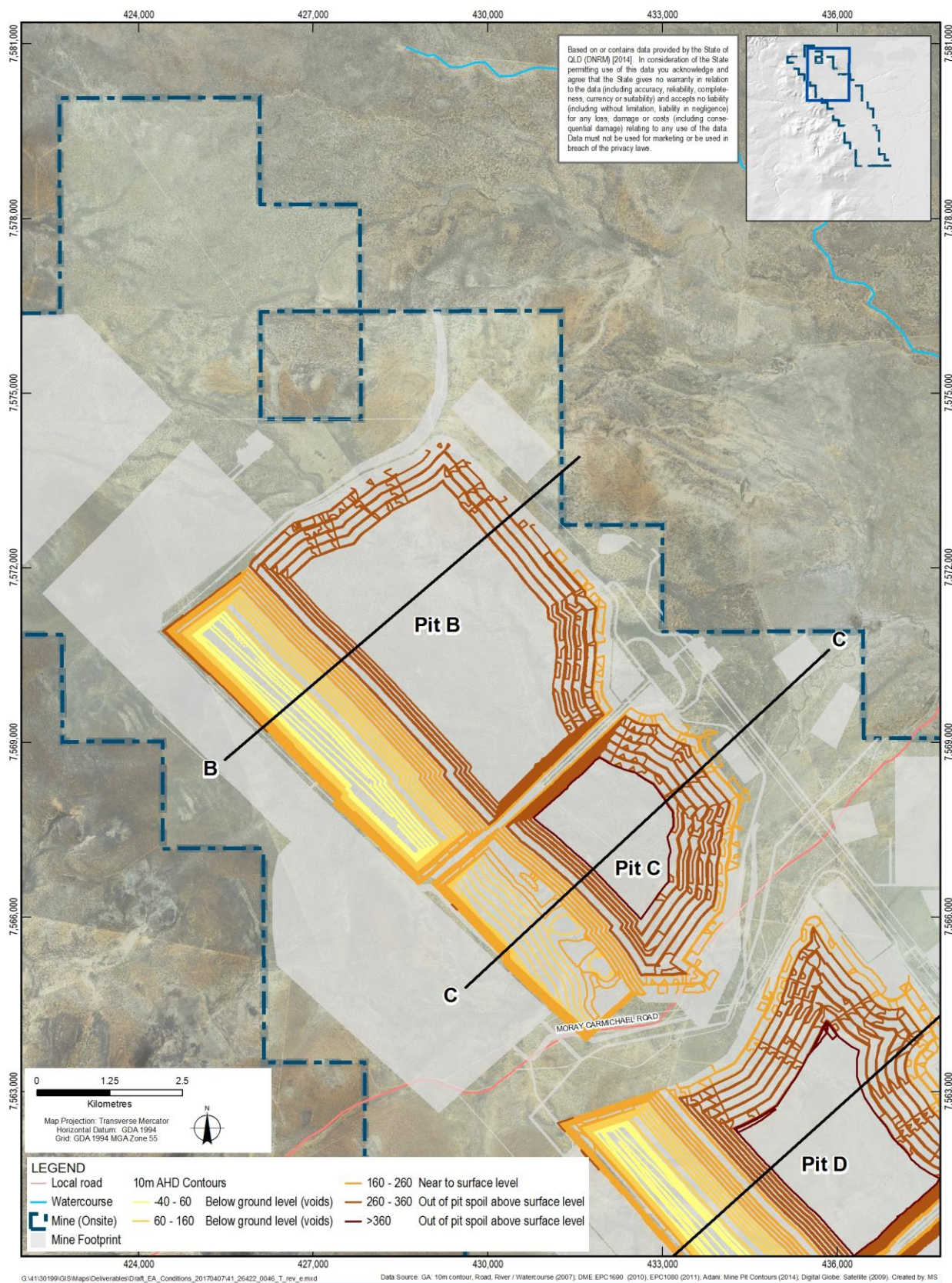


Figure H3: Final Landform (Central Section)

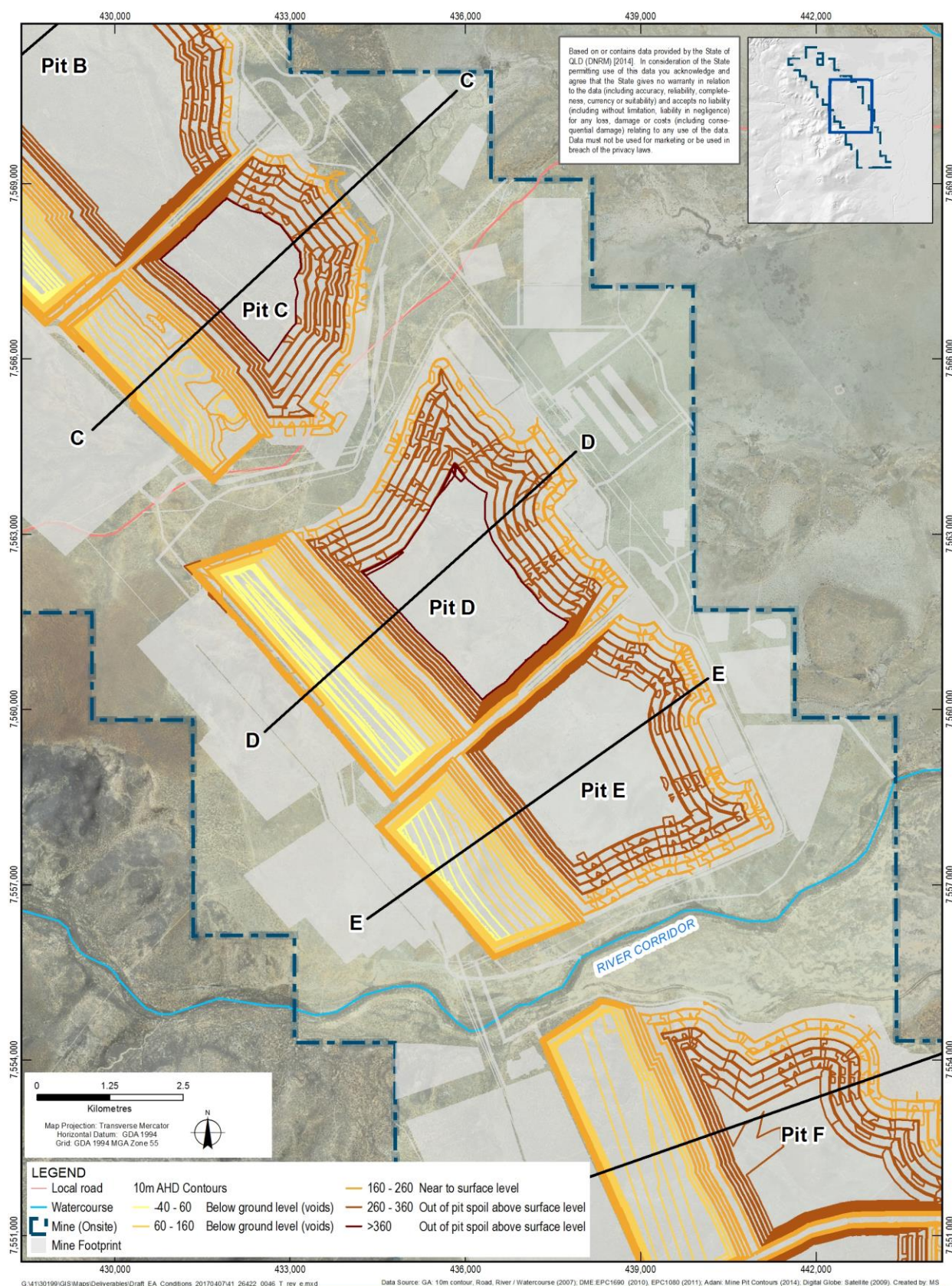
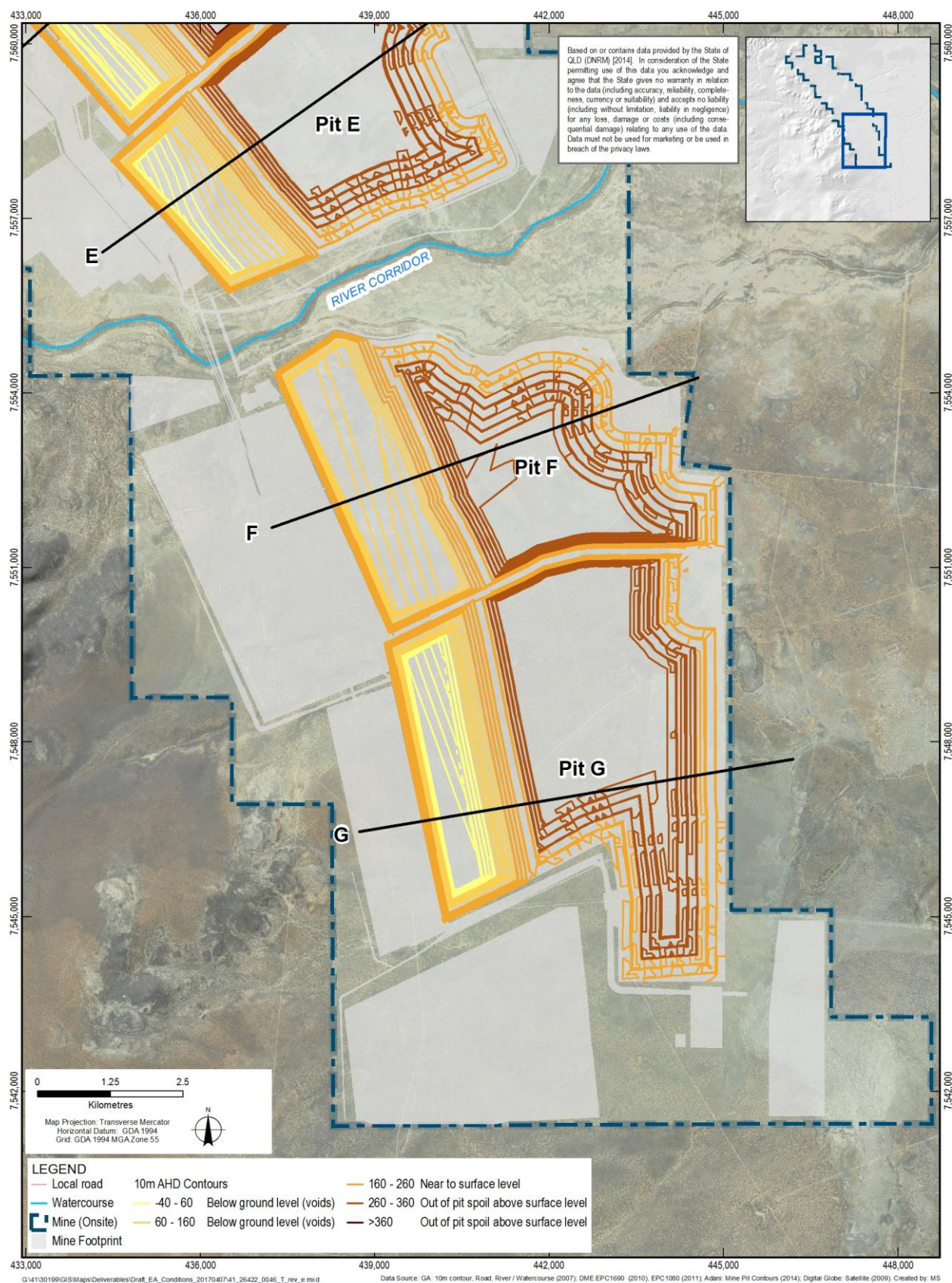
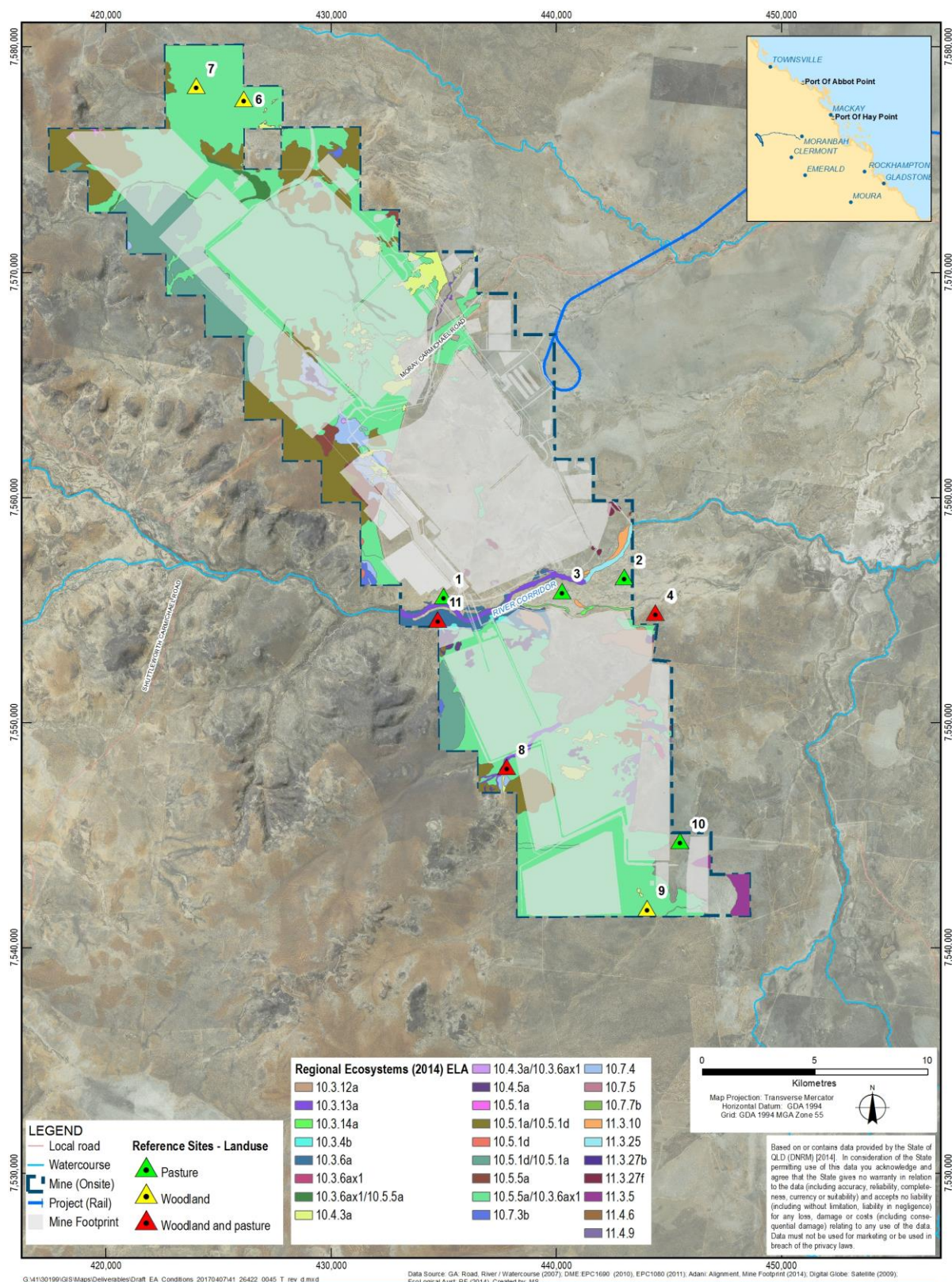


Figure H4: Final Landform (Southern Section)



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Figure H5: Reference Sites



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