Permit

Environmental Protection Act 1994

Environmental authority EPML00987013 - Grosvenor Coal Mine

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

Environmental authority number: EPML00987013

Environmental authority takes effect on 09 November 2022

Environmental authority holder(s)

Name(s)	Registered address
MORANBAH NORTH COAL PTY LTD	Level 11 201 Charlotte Street BRISBANE CITY QLD 4000
MITSUI MORANBAH NORTH INVESTMENT PTY LTD	Level 24 480 Queen Street BRISBANE CITY QLD 4000
JFEMA MORANBAH NORTH PTY LTD	Suite 3B Level 33 52 Martin Place SYDNEY NSW 2000
SHINSHO MORANBAH COAL PTY LTD	Level 12 124 Walker Street NORTH SYDNEY NSW 2060
NS COAL (MORANBAH NORTH) PTY LTD	Level 9 10 Market Street BRISBANE CITY QLD 4000
NS MORANBAH NORTH PTY LTD	Level 5 20 Hunter St SYDNEY NSW 2000 Australia

Environmentally relevant activity and location details

Environmentally relevant activity/activities	Location(s)
Schedule 3 08: A petroleum or GHG storage activity, other than items 1 to 7, that includes an activity from Schedule 2 with an AES	ML70378, PFL28
Schedule 3 13: Mining black coal	ML70378, PFL28
Ancillary 08 - Chemical Storage 1: Storing a total of 50t or more of chemicals of dangerous goods class 1 or class 2, division 2.3 under subsection (1)(a)	ML70378, PFL28
Ancillary 10 - Gas Producing Manufacturing, processing or reforming 200t or more of hydrocarbon gas in a year	ML70378, PFL28
Ancillary 33 - Crushing, milling, grinding or screening Crushing, grinding, milling or screening more than 5000t of material in a year	ML70378, PFL28
Ancillary 62 - Resource recovery and transfer facility operation 1: Operating a facility for receiving and sorting, dismantling, baling or temporarily storing- (c) category 2 regulated waste	ML70378, PFL28
Ancillary 62 - Resource recovery and transfer facility operation 1: Operating a facility for receiving and sorting, dismantling, baling or temporarily storing- (d) category 1 regulated waste	ML70378, PFL28

Environmentally relevant activity/activities	Location(s)
Ancillary 63 - Sewage Treatment 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of (b-i) more than 100 but not more than 1500EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme	ML70378, PFL28

Additional information for applicants

Environmentally relevant activities

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

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

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

Contaminated land

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

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

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

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

Take effect

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

a) if the authority is for a prescribed ERA and it states that it takes effect on the day nominated by the holder of the authority in a written notice given to the administering authority-on the nominated day; or

b) if the authority states a day or an event for it to take effect-on the stated day or when the stated event happens; or

c) otherwise-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.



Signature

09 November 2022

Date

Alison Cummings
Department of Environment and Science
Delegate of the administering authority
Environmental Protection Act 1994

Date issued: 09 November 2022

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Obligations under the *Environmental Protection Act 1994*

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

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

Other permits required

This permit only provides an approval under the *Environmental Protection Act 1994*. In order to lawfully operate you may also require permits / approvals from your local government authority, other business units within the department and other State Government agencies prior to commencing any activity at the site. For example, this may include permits / approvals with your local Council (for planning approval), the Department of Transport and Main Roads (to access state-controlled roads), the Department of Natural Resources and Mines (to clear vegetation), and the Department of Agriculture and Fisheries (to clear marine plants or to obtain a quarry material allocation).

Conditions of environmental authority

Schedule A: General	
Condition number	**Condition**
A1	This environmental authority authorises environmental harm referred to in the conditions. Where no condition exists or this environmental authority is silent on matter, the lack of a condition or silence does not authorise environmental harm.
A2	**Coal extraction** This environmental authority authorises: (a) a coal extraction rate of up to **10.5 million tonnes** per annum (mtpa) of run-of-mine (ROM) coal; and (b) Longwall mining within the area shown in **Appendix 2: Maximum Extent of Underground Mining and Subsidence**.
A3	**Activity** The only mining activities to be carried out under this environmental authority are the mining activities defined within the parameters in **Table A1: Mining Activities** and identified in **Appendix 1: Grosvenor Site Plan (Layout Plan), Appendix 2: Maximum Extent of Underground Mining and Subsidence, Appendix 3: Grosvenor Site Plan (Surface Facilities Conceptual Layout)** and **Appendix 4: Grosvenor Site Plan (Petroleum Facility Licence).**

Table A1: Mining Activities

Mine Domain	Mine Feature Name	Tenure Type and Number	Location (Lat, Long (GDA94))	Maximum disturbance area (ha)	Constraints
Dams	Worked Water Dam	ML70378	147.9969843 -21.95951144	25	Depth and volume
	MIA Dam		148.0132791 -21.96720006		
	ROM Dam		147.9960573 -21.95799737		
Run of Mine (ROM)	ROM stockpile		147.9939511 -21.96209903	6	Maximum annual ROM
Ancillary Infrastructure	Workshops Offices STP		148.0101042 -21.97356165	116	Scale and intensity
	OLC		N/A		
	Roads and tracks		N/A		
	Water Infrastructure		N/A	N/A	Scale and intensity
Longwall Mining Infrastructure	Gas Drainage Ventilation Goaf Dewatering		N/A	298	Scale and Intensity
Subsidence	Subsidence		N/A	4,313	Mine Plan
Gas Processing Facility	Grosvenor Gas Plant	PFL28	N/A	N/A	Scale and intensity - 15TJ/Day

A4	**Maintenance of measures, plant and equipment** The environmental authority holder 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; and (c) operate such measures, plant and equipment in a proper and efficient manner.
A5	**Monitoring and records** Except where specified otherwise in another condition of this authority, all monitoring records or reports required by this environmental authority must be kept for a period of not less than **five (5) years.**
A6	Upon request from the administering authority, copies of monitoring records and reports must be made available and/or provided to the administering authority's nominated office within **ten (10) business days** or by an alternative timeframe agreed between the administering authority and the holder.

A7	**Notification of emergencies, incidents and exceptions** The holder of this environmental authority must notify the administering authority by written notification within **twenty-four (24) hours**, after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this environmental authority.
A8	The holder of this environmental authority must notify the administering authority by written notification within **twenty-four (24) hours,** after becoming aware of any emergency, incident or information about circumstances which results or may result in environmental harm not in accordance with the conditions of this environmental authority or a contravention of the conditions of this environmental authority.
A9	Within **ten (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.
A10	**Complaints** 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.
A11	**Risk management** The holder of this environmental authority must develop and implement a risk management system for mining activities which conforms to the *Standard for Risk Management* (ISO31000:2009). NOTE: Implementation of a risk management system is not a defence against a breach of any other condition of this environmental authority.
A12	**Third party audit** The holder of the environmental authority must: (a) by **7 June 2017**, 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 three-yearly intervals, from the completion of the report referred to above; and (c) provide each report to the administering authority within **ninety (90) days** of completion.

A13	Where a condition of this environmental authority requires compliance with a standard published externally to this environmental authority and the standard is amended or changed subsequent to the issue of this environmental authority the holder of this environmental authority must: (a) comply with the amended or changed standard within **two (2) years** of the amendment or change being made, unless a different period is specified in the amended standard or relevant legislation, or where the amendment change relates specifically to regulated structures conditions referred to in condition(s) **H1** and **H37**, the time specified in that condition(s); and (b) until compliance with the amended or changed standard is achieved, continue to remain in compliance with the standard that was current immediately prior to the relevant amendment or change.

Schedule B: Air	
Condition number	**Condition**
B1	**Dust nuisance** The release of dust and/or particulate matter or both resulting from the mining activity must not cause an environmental nuisance at any sensitive or commercial place.
B2	Dust and particulate matter must not exceed any of the following levels when measured at any nuisance sensitive or commercial place: a) dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with the most recent version of Australian Standard AS3580.10.1 *Methods for sampling and analysis of ambient air – Determination of particulate matter – Deposited matter – Gravimetric method;* b) a concentration of particulate matter with an aerodynamic diameter of less than 10 micrometres (PM_{10}) suspended in the atmosphere of 50 micrograms per cubic metre over a 24 hour averaging time, can be exceeded no more than five (5) times per year at a sensitive or commercial place downwind of the operational land when monitored in accordance with the most recent version of Australian Standard AS3580.9.6 *Methods for sampling and analysis of ambient air - Determination of suspended particulate matter – PM (sub) 10 high volume sampler with size-selective inlet – Gravimetric method;* c) a concentration of particulate matter suspended in the atmosphere of 90 micrograms per cubic metre over a one (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.*
B3	Ongoing monitoring must be conducted in accordance with the standards and at the locations, specified in **Table B1: Air Quality Monitoring.**

Table B1: Air Quality Monitoring

Air Quality Determination	Monitoring Standard	Monitoring Point Description	Approximate Monitoring Point Location	
			Latitude (GDA94)	Longitude (GDA94)
PM_{10}[1]	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*	GDD04 – Golf Course	-21.99252211	148.0458523
Dust Deposition	AS 3580.10.1:2003: *Methods for sampling and analysis of ambient air - Determination of particulate matter - Deposited matter - Gravimetric method*	GDD01 – Dyno Nobel Camp	-21.95995737	147.9790246
		GDD02 – Arrow Camp	-21.97620022	148.0032967
		GDD03 – Golf Course	-21.99252211	148.0458523
Meteorological Data[2]	AS 2923:1987: *Ambient air - Guide for measurement of horizontal wind for air quality applications*	Weather Station	-21.96524100	148.0070582

[1] PM_{10} size selective inlet, dust deposition gauge

[2] Wind speed and direction, humidity, temperature and precipitation

B4	Where monitoring at locations identified in **Table B1: Air Quality Monitoring** indicates that the air quality objectives detailed in condition **B2** have been exceeded, the holder of this environmental authority must investigate the matter and report to the administering authority within **fourteen (14) days**: (a) the concentration of PM_{10} particulates or dust deposition rate recorded; (b) a description of meteorological conditions occurring at the time; and (c) the measures taken to reduce dust generated by the mining activities
B5	When requested by the administering authority or as a result of a complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer), additional dust and particulate monitoring (including dust deposition, total suspended particles (TSP), and PM_{10}) must be undertaken, and the results thereof notified to the administering authority within **fourteen (14) days** following completion of monitoring. This includes providing interim reports if the monitoring lasts for more than **one (1) month**. This monitoring must be carried out at a place(s) relevant to the potentially affected dust sensitive place. Monitoring must be conducted in accordance with the appropriate standards.
B6	If monitoring indicates the limits in condition **B2** have been exceeded resulting from Grosvenor Mine operations, the holder of this environmental authority must immediately implement dust abatement measures so that emissions of dust generated by the mining activities cease to exceed the limits in condition **B2**.

B7	**Dust management plan** As part of the Environmental Management Plan required for the project approval, the holder shall prepare and implement a Dust Management Plan to outline measures to minimise and manage any impacts from the operation of the project on local air quality. The Dust Management Plan shall include, but not necessarily be limited to: (a) identification of all major sources of dust emissions that may occur as result of the operation of the project; (b) description of the procedures to manage the dust emissions from the sources identified; (c) collection of air quality and meteorological data at location and using the methods described in **Table B1: Air Quality Monitoring**; (d) identifying adverse meteorological conditions likely to produce elevated levels of PM10 at a sensitive or commercial place due to the mining activities; (e) developing a weather forecasting system for the site; (f) integration of dust control strategy with the weather forecasting system that would activate the timely management of dust control in addition to the best practice dust control measures during the adverse meteorological conditions; (g) protocols for regular maintenance of plant and equipment, to minimise the potential for fugitive dust emissions; and (h) description of procedures to be undertaken if any non-compliance is detected.
B8	**Odour nuisance** The release of noxious or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the mining activity must not cause an environmental nuisance at any nuisance sensitive or commercial place.
B9	When requested by the administering authority odour monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.
B11	If the administering authority determines the odour released to constitute an environmental nuisance the environmental authority holder must: (a) address the complaint including the use of appropriate dispute resolution if required; and (b) immediately implement odour abatement measures so that emissions of odour from the activity do not result in further environmental nuisance.
B12	**Meteorological monitoring** The holder of this environmental authority must establish and maintain a permanent automatic meteorological station to continuously measure and record wind speed, wind direction, temperature, relative humidity and rainfall intensity. NOTE: If the meteorological station becomes inoperable due to circumstances beyond the control of the environmental authority holder, it is possible for the environmental authority holder to utilise relevant and available weather monitoring information collected by other parties as reference data for the purposes of this condition. The environmental authority holder must ensure that the meteorological station is operational again within three months of its failure.
B13	The holder must record, compile and keep all monitoring records obtained from the automatic meteorological station.

Schedule C: Water	
Condition number	**Condition**
C1	**Surface water** Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters as a result of the authorised mining activities, except as permitted under the conditions of this environmental authority.
C2	Unless otherwise permitted under the conditions of this environmental authority, the release of mine affected water to waters must only occur from the release points specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters** and depicted in **Appendix 5: Water Release Points and Monitoring Points** attached to this environmental authority.
C3	The release of mine affected water to internal water management infrastructure that is installed and operated in accordance with a water management plan that complies with condition **C24** is permitted.

Table C1: Mine Affected Water Release Points, Sources and Receiving Waters

Release Point (RP)	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Mine Affected Water Source and Location	Monitoring Point	Receiving Waters Description
RP 1	-21.95730158	148.0248990	Worked Water Dam	End of Pipe	Isaac River

C4	The release of mine affected water to waters in accordance with condition **C2** must not exceed the release limits stated in **Table C2: Mine Affected Water Release Limits** when measured at the monitoring points specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters** for each quality characteristic.

Table C2: Mine Affected Water Release Limits

Quality Characteristic	Release Limits	Monitoring frequency	Comment
Electrical conductivity (µS/cm)	Release limits specified in Table 6 for variable flow criteria.	Daily during release (the first sample must be taken within 2 hours of commencement of release).	
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	Daily during release (the first sample must be taken within 2 hours of commencement of release).	
Turbidity (NTU)	Current limit or limit derived from suspended solids limit and demonstrated correlation between turbidity to suspended solids historical monitoring data for dam water*	Daily during release* (first sample within 2 hours of commencement of release).	Turbidity is required to assess ecosystems impacts and can provide instantaneous results.
Suspended Solids (mg/L)	1000*	Daily during release* (first sample within 2 hours of commencement of release).	Suspended solids are required to measure the performance of sediment and erosion control measures.
Sulfate (SO_4^{2-}) (mg/L)	Release limits specified in Table 4 for variable flow criteria.	Daily during release* (first sample within 2 hours of commencement of release).	

* Suspended solids limit to be revised when sufficient reference data is available to derive site-specific limits or in a minimum of two years from the date of this approval.

C5	The release of mine affected water to waters from the release points must be monitored at the locations specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters** for each quality characteristics and at the frequency specified in **Table C2: Mine Affected Water Release Limits** and **Table C3: Release Contaminant Trigger Investigation Levels**.

Table C3: Release Contaminant Trigger Investigation Levels

Quality Characteristic	Trigger Levels (µg/L)	Comment on Trigger Level	Monitoring Frequency
Aluminium	55	*For aquatic ecosystem protection, based on SMD guideline*	Commencement of release and thereafter weekly during release
Arsenic	13	*For aquatic ecosystem protection, based on SMD guideline*	
Cadmium	0.2	*For aquatic ecosystem protection, based on SMD guideline*	
Chromium	1	*For aquatic ecosystem protection, based on SMD guideline*	
Copper	2	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Iron	300	*For aquatic ecosystem protection, based on low reliability guideline*	
Lead	4	*For aquatic ecosystem protection, based on SMD guideline*	
Mercury	0.2	*For aquatic ecosystem protection, based on LOR for CV FIMS*	
Nickel	11	*For aquatic ecosystem protection, based on SMD guideline*	
Zinc	8	*For aquatic ecosystem protection, based on SMD guideline*	
Boron	370	*For aquatic ecosystem protection, based on SMD guideline*	
Cobalt	90	*For aquatic ecosystem protection, based on low reliability guideline*	
Manganese	1900	*For aquatic ecosystem protection, based on SMD guideline*	
Molybdenum	34	*For aquatic ecosystem protection, based on low reliability guideline*	
Selenium	10	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Silver	1	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Uranium	1	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Vanadium	10	*For aquatic ecosystem protection, based on LOR for ICPMS*	
Ammonia	900	*For aquatic ecosystem protection, based on SMD guideline*	
Nitrate	1100	*For aquatic ecosystem protection, based on ambient Qld WQ Guidelines (2006) for TN*	
Petroleum hydrocarbons (C6-C9)	20	-	
Petroleum hydrocarbons (C10- C36)	100	-	
Fluoride (total)	2000	*Protection of livestock and short-term irrigation guideline*	

NOTE:

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.

2. The quality characteristics required to be monitored as per Table C3 can be reviewed once the results of two years monitoring data is available, or if sufficient data is available to adequately demonstrate negligible environmental risk, and it may be determined that a reduced monitoring frequency is appropriate or that certain quality characteristics can be removed from **Table C3: Release Contaminant Trigger Investigation Levels** by amendment.
3. SMD – slightly moderately disturbed level of protection; guideline refers ANZECC & ARMCANZ (2000).
4. LOR – typical reporting for method stated. ICPMS/CV FIMS – analytical method required to achieve LOR.

C6	If quality characteristics of the release exceed any of the trigger levels specified in **Table C3: Release Contaminant Trigger Investigation Levels** during a release event, the environmental authority holder must compare the downstream results in the receiving waters to the trigger values specified in **Table C3: Release Contaminant Trigger Investigation Levels** 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 **Table C3: Release Contaminant Trigger Investigation Levels** for any quality characteristic, compare the results of the downstream site to the data from background monitoring sites and; i) if the result is less than the background monitoring site data, then no action is to be taken; or ii) if the result is greater than the background monitoring site data, complete an investigation into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining: 1. details of the investigations carried out; and 2. actions taken to prevent environmental harm. Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with condition **C6 (b)(ii)** of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.
C7	If an exceedance in accordance with condition **C6 (b)(ii)** is identified, the holder of the authority must notify the administering authority within **fourteen (14) days** of receiving the result.
C8	**Mine affected water release events** 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 **Table C4: Mine Affected Water Release During Flow Events**.
C9	Notwithstanding any other condition of this environmental authority, the release of mine affected water to waters in accordance with condition **C2** must only take place during periods of natural flow events in accordance with the receiving water flow criteria for discharge specified in **Table C4: Mine Affected Water Release During Flow Events** for the release point(s) specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters** and **Table C4: Mine Affected Water Release During Flow Events**.
C10	The release of mine affected water to waters in accordance with condition **C2** must not exceed the electrical conductivity and sulfate release limits or the maximum release rate (for all combined release point flows) for each receiving water flow criteria for discharge specified in **Table C4: Mine Affected Water Release During Flow Events** when measured at the monitoring points specified in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters.**

Table C4: Mine Affected Water Release During Flow Events

Receiving Waters/ Stream	Release Point (RP)	Gauging Station	Gauging Station Latitude (decimal degree, GDA94)	Gauging Station Longitude (decimal degree, GDA94)	Receiving Water Flow Recording Frequency	Receiving Water Flow Criteria for Discharge	Maximum Release Rate (for all Combined RP Flows)	Electrical Conductivity and Sulfate Release Limits
Isaac River	RP1	Monitoring point 1 (Moranbah North Downstream Monitoring station Site No.331100)	-21.5592065	148.01695	Continuous (minimum daily)	Medium Flow >2m^3/s	<0.06m^3/s	Electrical conductivity <3,500µS/cm Sulfate (SO_4^{2-}) <1,600mg/L
							<0.16m^3/s	Electrical conductivity <1,500µS/cm Sulfate (SO_4^{2-}) <650mg/L
						High Flow >10m^3/s	<0.3m^3/s	Electrical conductivity <3,500µS/cm Sulfate (SO_4^{2-}) <1,650 mg/L
						Very High Flow >50m^3/s	<0.5m^3/s	Electrical conductivity <10,000µS/cm Sulfate (SO_4^{2-}) <5,000mg/L

C11	The daily quantity of mine affected water released from each release point must be measured and recorded at the monitoring points in **Table C1: Mine Affected Water Release Points, Sources and Receiving Waters.**
C12	Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build-up of sediment in such waters.

C13	**Notification of release event** The holder of this environmental authority must notify the administering authority via WaTERS as soon as practicable and no later than **twenty-four (24) hours** after commencing to release mine affected water to the receiving environment. Notification must include the submission of written advice to the administering authority of the following information: (a) release commencement date/time; (b) expected release cessation date/time; (c) release point/s; (d) release volume (estimated); (e) receiving water/s including the natural flow rate; and (f) any details (including available data) regarding likely impacts on the receiving water(s).
C14	The holder of this environmental authority must notify the administering authority as soon as practicable (but within **twenty-four (24) hours** after cessation of a release event) of the cessation of a release notified under condition **C13** and within **twenty-eight (28) days** provide the following information in writing: (a) release cessation date/time; (b) natural flow volume in receiving water; (c) volume of water released; (d) details regarding the compliance of the release with the conditions of Agency Interest: Water of this environmental authority (i.e. contamination limits, natural flow, discharge volume); (e) all in-situ water quality monitoring results; and (f) any other matters pertinent to the water release event. Note: Successive or intermittent releases occurring within **twenty-four (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 **C13** and **C14,** provided the relevant details of the release are included within the notification provided in accordance with conditions **C13** and **C14**.
C15	**Notification of release event exceedance** If the release limits defined in **Table C2: Mine Affected Water Release Limits** are exceeded, the holder of the environmental authority must notify the administering authority within **twenty-four (24) hours** of receiving the results.
C16	The authority holder must, within **twenty-eight (28) days** of a release that exceeds the conditions of this authority, provide a report to the administering authority detailing: (a) the reason for the release; (b) the location of the release; (c) all water quality monitoring results; (d) any general observations; (e) all calculations; and (f) any other matters pertinent to the water release event.

C17	**Receiving environment monitoring and contaminant trigger levels** The quality of the receiving waters must be monitored at the locations specified in **Table C6: Receiving Water Upstream Background Sites and Down Stream Monitoring Points** for each quality characteristic and at the monitoring frequency stated in **Table C5: Receiving Waters Contaminant Trigger Levels.**

Table C5: Receiving Waters Contaminant Trigger Levels

Quality Characteristic	Trigger Level	Monitoring Frequency
pH	6.5 – 8.5	Daily during the release
Electrical Conductivity (µS/cm)	500	
Suspended solids (mg/L)	To be determined. Turbidity may be required to assess ecosystems impacts and can provide instantaneous results.	
Sulfate (SO_4^{2-}) (mg/L)	250 (Protection of drinking water Environmental Value)	
Sodium (mg/L)	180 (Australian Drinking Water Guidelines)	

Table C6: Receiving Water Upstream Background Sites and Downstream Monitoring Points

Monitoring Points	Receiving Waters Location Description	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)
Upstream Background Monitoring Points			
Monitoring Point 01	Isaac River 2500 metres upstream of RP01 (MNC downstream)	-21.91988593	148.0167256
Downstream Monitoring Points			
Monitoring Point 02	Isaac River 2500 metres downstream of RP01 (Rail Bridge)	-21.96400859	148.0453390

Note:

a) The upstream monitoring point should be within 10km the release point.

b) The downstream point should not be greater than 10km from the release point.

c) The data from background monitoring points must not be used where they are affected by releases from other mines.

C18	If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in **Table C5: Receiving Waters Contaminant Trigger Levels** during a release event the environmental authority holder must compare the downstream results to the upstream results in the receiving waters and: (a) where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no action is to be taken; or (b) where the downstream results exceed the upstream results complete an investigation into the potential for environmental harm and provide a written report to the administering authority within **28 days**, outlining: i) details of the investigations carried out; and ii) actions taken to prevent environmental harm. Note: Where an exceedance of a trigger level has occurred and is being investigated, in accordance with condition **C18 b)**, no further reporting is required for subsequent trigger events for that quality characteristic.
C19	All determinations of water quality and biological monitoring must be performed by an appropriately qualified person.
C20	**Receiving Environment Monitoring Program (REMP)** The holder of this environmental authority 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 Isaac River and connected or surrounding waterways within 10 km downstream of the release. The REMP should encompass any sensitive receiving waters or environmental values downstream of the authorised mining activity that will potentially be directly affected by an authorised release of mine affected water.
C21	A REMP Design Document that addresses the requirements of the REMP must be prepared and made available to the administering authority on request.
C22	A report outlining the findings of the REMP, including all monitoring results and interpretations must be prepared annually and made available on request to the administrating authority. This must include an assessment of background reference water quality, the condition of downstream water quality compared against water quality objectives, and the suitability of current discharge limits to protect downstream environmental values.
C23	**Water reuse** Mine affected water may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority and deposited into artificial water storage structures, such as farm dams or tanks, or used directly at properties owned by the environmental authority holder or a third party (with the written consent of the third party).
C24	**Water Management Plan** A Water Management Plan must be developed by an appropriately qualified person and implemented for all stages of mining activities.

C25	The Water Management Plan must: (a) provide for effective management of actual and potential environmental impacts resulting from water management associated with the mining activity carried out under this environmental authority; and (b) be developed in accordance with Department of Environment and Heritage Protection guideline 'Preparation of water management plans for mining activities' (ESR/2016/3111) and include: i) a study of the source of contaminants; ii) a water balance model for the site; iii) a water management system for the site; iv) measures to manage and prevent saline drainage; v) measures to manage and prevent acid rock drainage; vi) contingency procedures for emergencies; and vii) a program for monitoring and review of the effectiveness of the water management plan.
C26	**Annual water monitoring reporting** The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority to the WaTERS online reporting system by 1 April each calendar 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; and (f) the results of all monitoring and details of any exceedances of the conditions of this environmental authority.
C27	**Temporary interference with waterways** Temporarily destroying native vegetation, excavating, or placing fill in a watercourse, lake or spring necessary for and associated with mining operations must be undertaken in accordance with the most current version of the Department of Natural Resources and Mines (or its successor) guideline 'Activities in a Watercourse, Lake or Spring associated with Mining Activities' or its replacement and the conditions of this environmental authority.
C28	**Saline drainage** The holder of this environmental authority must ensure proper and effective measures are taken to avoid or otherwise minimise the generation of saline drainage.
C29	**Acid rock drainage** The holder of this environmental authority must ensure proper and effective measures are taken to avoid or otherwise minimise the generation and/or release of acid rock drainage.
C30	**Stormwater and water sediment controls** An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of stormwater.

C31	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 **C30**; and (b) water management infrastructure that is installed and operated, in accordance with a Water Management Plan that complies with condition **C24** and **C25**, for the purpose of ensuring water does not become mine affected water.

Schedule D: Groundwater	
Condition number	**Condition**
D1	The holder of this environmental authority must not release contaminants to groundwater.
D2	The holder of the environmental authority must develop and implement a groundwater monitoring and management program prior to the commencement of mining activities. The program must: (a) be able to detect a significant change to groundwater quality values due to activities that are part of this mining project; (b) include measures to minimise the impact of the mining activities on groundwater resources; (c) include contingency procedures for emergencies; and (d) include a program for monitoring and review of the effectiveness of the groundwater monitoring and management program.
D3	**Background groundwater monitoring program** A background groundwater monitoring program must be developed, as part of the groundwater monitoring and management program, to include bore(s) that are located an appropriate distance from potential sources of impact from mining activities to provide the following: (a) representative groundwater samples from the aquifers potentially affected by mining activities, (b) at least **twelve (12)** sampling events, no more than **one (1)** month apart, for each aquifer and groundwater monitoring location required in **Table D1: Groundwater monitoring locations and frequencies**; (c) background groundwater quality in hydraulically isolated background bore(s) that have not been affected by any mining activities; (d) final groundwater contaminant trigger levels and limits required in **Table D2: Groundwater investigation trigger levels**; (e) final groundwater monitoring locations required in **Table D1: Groundwater monitoring locations and frequencies** and **Table D3: Groundwater levels**; (f) groundwater RL's required under condition **Table D3: Groundwater levels**; and (g) sufficient information to allow the holder to determine predicted seasonal fluctuations of groundwater levels.
D4	Final groundwater contaminant trigger levels and monitoring locations as required by condition **D3(d)** and condition **D3(e)** must be determined and submitted to the administering authority by **30 November 2022.**

D5	**Groundwater monitoring and management** The groundwater monitoring and management program, including all data must be reviewed on an annual basis by an appropriately qualified and experienced person. The review must include: (a) the assessment of groundwater levels and quality data, and the suitability of the monitoring network; (b) assess the program against the requirements under condition **D2**; (c) include recommended actions to ensure actual and potential environmental impacts are effectively identified and managed for the coming year; and (d) identify any amendments to the groundwater monitoring and management program following the review.
D6	The assessment under condition **D5** must be submitted to the administering authority within **twenty-eight** (**28) days** of receiving the report, with a written response to the assessment report and recommended actions, detailing the actions taken or to be taken by the environmental authority holder to ensure compliance with this environmental authority and minimise impacts on groundwater resources by the mining activity.
D7	**Groundwater monitoring** Groundwater affected by the mining activities must be monitored at the locations and frequencies defined in **Table D1: Groundwater Monitoring Locations and Frequencies** for the parameters identified in **Table D2: Groundwater Investigation Trigger Levels.**

Table D1: Groundwater Monitoring Locations and Frequencies

Monitoring Points	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Frequency
Tertiary Basalt and Basal Sands Aquifer			
RDG066	-21.96016741	148.0280131	Quarterly
RDG093MB	-21.93125809	147.9804025	Quarterly
GRO_02	-21.932844	147.992712	Quarterly
To be determined in accordance condition **D3** and **D5**.	To be determined in accordance with condition **D4**	To be determined in accordance with condition **D4**	To be determined in accordance with condition **D3** and **D5**

D8	Subject to requirements of condition **D7**, if the groundwater investigation trigger levels defined in **Table D2: Groundwater Investigation Trigger Levels** are exceeded then the holder of this environmental authority must complete an investigation into the potential for environmental harm and notify the administering authority within **twenty-eight (28) days** of receiving the analysis results.

Table D2: Groundwater Investigations Trigger Levels

Parameter	Unit	Trigger Levels	Limit Type
pH	pH Units		Minimum/Maximum

Parameter	Unit	Trigger Levels	Limit Type
Electrical Conductivity	µS/cm	To be supplied to the administration authority in accordance with condition **D4** for RDG066, RDG093MD and GRO_02 as defined in **Table D1: Groundwater Monitoring Locations and Frequencies.**	Maximum
Total Dissolved Solids	mg/L		Maximum
Aluminium	m g/L		Maximum
Antimony	m g/L		Maximum
Arsenic	m g/L		Maximum
Calcium	m g/L		Maximum
Chlorine	mg/L		Maximum
CO_3	mg/L		Maximum
HCO_3	mg/L		Maximum
Iron	mg/L		Maximum
Magnesium	m g/L		Maximum
Mercury	m g/L		Maximum
Molybdenum	m g/L		Maximum
SO_4	m g/L		Maximum
Potassium	m g/L		Maximum
Selenium	mg/L		Maximum
Silver	m		Maximum
Sodium	mg/L		Maximum
Total Petroleum Hydrocarbons (C10-14)	mg/L		Maximum
Total Petroleum Hydrocarbons (C15-28)	m g/L		Maximum
Total Petroleum Hydrocarbons (C29-36)	mg/L		Maximum

D9	Groundwater levels affected by the mining activities must be monitored at the locations and frequencies defined in **Table D3: Groundwater Levels.**

Table D3: Groundwater Levels

Monitoring Points	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Surface RL (m)	Frequency
RDG066	-21.96016741	148.0280131	224.1	Monthly
RDG093MB	-21.93125809	147.9804025	263.2	Monthly
GRO_02	-21.932844	147.992712	244.32	Monthly

D10	In the event that groundwater fluctuations in excess of two metres per year beyond predictable seasonal fluctuations as determined by condition **D3** are detected at the groundwater monitoring locations nominated in **Table D3: Groundwater Levels,** an investigation must be undertaken within **fourteen (14) days** of detection to determine if the fluctuations are a result of: (a) mining activities; (b) pumping from licensed bores; or (c) seasonal variation.
D11	If the results of the investigation identify that the groundwater fluctuations are a result of mining activities, the holder of the environmental authority must notify the administering authority and provide a copy of a report detailing the findings and outcomes of the investigation within **seven (7) days** of receiving the result.
D12	**Groundwater monitoring** The following information must be recorded in relation to all groundwater water sampling: (a) the date on which the sample was taken; (b) the time at which the sample was taken; (c) the monitoring point at which the sample was taken; and (d) the results of all monitoring.
D13	The method of water sampling required by this environmental authority must comply with that set out in the latest edition of the administering authority's *Water Quality Sampling Manual*.

Schedule E: Noise	
Condition number	**Condition**
E1	The holder of this environmental authority must ensure that noise generated by the mining activities does not cause the criteria in **Table E1: Noise Limits** to be exceeded at a sensitive place or commercial place.
E2	**Noise monitoring** When requested by the administering authority, noise monitoring must be undertaken to investigate any compliant of noise nuisance, and the results notified within **fourteen (14) days** to the administering authority. Monitoring must include: (a) L_A eq, adj, 1 hr; (b) $L_{A\ max;}$ (c) the level and frequency of occurrence of impulsive or tonal noise; (d) atmospheric conditions including wind speed and direction; (e) effects due to extraneous factors such as traffic noise; and (f) location date and time of recording.

Table E1: Noise Limits

Noise Level dB(A)	Monday to Sunday		
	7am - 6pm	6pm - 10pm	10pm - 7am
	Noise measured at a 'Noise sensitive place'		
$L_{Aeq, adj, 1 hr}$	B/g + 3	B/g + 3	B/g + 3
L_{Amax}	N/A	N/A	52 dBA
	Noise measured at a 'Commercial place'		
$L_{Aeq, adj, 1 hr}$	50 dBA	45 dBA	40 dBA

E3	The method of measurement and reporting of noise monitoring must comply with the current edition of the administering authority's Noise Measurement Manual.
E4	If monitoring indicates exceedance of the relevant limits in condition **E1**, then the holder of the environmental authority must: (a) address the complaint including the use of appropriate dispute resolution if required; and (b) immediately implement noise abatement measures so that emissions of noise from the activity do not result in further environmental nuisance.
E5	**Vibration and airblast overpressure nuisance** Vibration and airblast overpressure from the licensed activities must not cause an environmental nuisance, at any sensitive or commercial place.
E6	When requested by the administering authority, vibration and / or airblast overpressure monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within **fourteen (14) days** to the administering authority following completion of monitoring.
E7	Vibration and airblast overpressure monitoring must include the following descriptors, characteristics and conditions: (a) location of the blast(s) within the mining area; (b) atmospheric conditions including temperature, relative humidity and wind speed and direction; and (c) location, date and time of recording.
E8	If monitoring indicates exceedance of the relevant limits in **Table E2: Vibration and Airblast Overpressure Limits**, then the environmental authority holder must: (a) address the complaint including the use of appropriate dispute resolution if required; and (b) immediately implement vibration abatement measures so that vibration from the activity does not result in further environmental nuisance.

Table E2: Vibration and Airblast Overpressure Limits

Blasting noise limits	Sensitive or commercial place blasting noise limits
Ground vibration peak particle velocity	5mm/second peak particle velocity for 9 out of 10 consecutive blasts and not greater than 10 mm/second peak particle velocity at any time.
Airblast overpressure	115db (Linear peak) for nine (9) out of ten (10) consecutive blasts initiated and not greater than 120db (Linear peak) at any time.

E9	The method of measurement and reporting of airblast overpressure levels must comply with the current edition of the administering authority's Noise Measurement Manual.

Schedule F: Waste	
Condition number	**Condition**
F1	Unless otherwise permitted by the condition of this environmental authority or with prior approval from the administering authority and in accordance with a relevant standard operating procedure, waste must not be burnt.
F2	The holder of this environmental authority may burn vegetation cleared in the course of carrying out extraction activities provided the activity does not cause environmental harm at any sensitive place or commercial place.
F3	The holder of this environmental authority must develop, implement and maintain a waste management program in accordance with the *Environmental Protection Act 1994* and subordinate legislation for this site. The waste management program must include: (a) the waste management control strategies must consider: i) the types and amounts of wastes generated by the mining activities; ii) segregation of the wastes; iii) storage of the wastes; iv) transport of the wastes; v) monitoring and reporting matters concerning the waste; (b) the hazardous characteristics of the wastes generated including disposal procedures for hazardous wastes; (c) a program for reusing, recycling or disposing of all wastes; (d) how the waste will be dealt with in accordance with the waste management hierarchy, including a description of the types and amounts of waste that will be dealt with under each of the waste management practices in the waste management hierarchy (i.e. avoidance, reuse, recycling, energy recovery, disposal); (e) procedures for identifying and implementing opportunities to minimise the amount of waste generated, promote efficiency in the use of resources and improve the waste management practices employed; (f) procedures for dealing with accidents, spills and other incidents; (g) details of any accredited management system employed, or planned to be employed, to deal with waste; (h) how often the performance of the waste management program will be assessed; (i) the indicators or other criteria on which the performance of the waste management program will be assessed; and (j) staff training and induction to the waste management program.

Schedule G: Land	
Condition number	**Condition**
G1	**Topsoil** Topsoil must be strategically stripped ahead of mining in accordance with a Topsoil Management Plan.
G2	Topsoil and subsoils must be managed to ensure stability and minimise the release contaminants. Measures must include: (a) vegetating stockpiles; (b) minimising the height of stockpiles; and (c) re-using stockpiles as soon as possible.
G3	A topsoil inventory that identifies the topsoil requirements for the Grosvenor Coal Mine project and availability of suitable topsoil on site, must be developed and: (a) maintained for all stages of the mining activities carried out under this environmental authority; and (b) provided to the administering authority upon request.
G4	**Preventing contaminant release to land** Contaminants must not be released to land in manner, which constitutes nuisance, material or serious environmental harm.
G5	The environmental authority holder must take all practicable actions necessary to secure loads prior to transporting materials off site to minimise emissions or spillage of any material from vehicles or other transport infrastructure.
G6	**Infrastructure** All infrastructure constructed by or for the environmental authority holder during the licensed activities including water storage structures, must be removed from the site prior to surrender, except were agreed in writing by the post mining landowner / holder. Note: This is not applicable where the landowner / holder is also the environmental authority holder.
G7	**Subsidence** A Subsidence Management Plan must be developed by an appropriately qualified person and implemented by the holder of this environmental authority prior to the commencement of activities that result in subsidence.

G8	The Subsidence Management Plan must: (a) provide for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of this environmental authority; (b) be developed in accordance with *Appendix 8: Watercourse Subsidence* attached to this environmental authority; (c) detail the proposed impacts of subsidence on any land, watercourse and floodplain including but not limited to: i) physical condition of surface drainage: 1. erosion; 2. areas susceptible to higher levels of erosion such as watercourse confluences; 3. incision processes; 4. stream widening; 5. tension cracking; 6. lowering of bed and banks; 7. creation of instream waterholes; 8. changes to local drainage patterns; ii) overland flow; 1. capture of overland flow by subsided long-wall panels; 2. increased overbank flows due to lowering of high bank of watercourses; 3. the portion of local and large scale catchment likely to be captured by subsided long- wall panels and the associated impacts on downstream users; iii) water quality: 1. surface water; 2. groundwater; 3. overland flow water detained in subsided long-wall panels; iv) land condition: current land condition to be impacted by subsidence; v) infrastructure: detail of existing infrastructure (pipelines, railway, powerlines and haul roads) should be identified where there is a potential impact from effects of land subsidence; (d) proposed options for mitigating any impacts associated with subsidence and how these mitigation methods will be implemented; (e) cumulative impacts on watercourses or catchments; (f) impacts on groundwater; (g) contingency procedures for emergencies; and (h) a program for monitoring and review of the effectiveness of the Subsidence Management Plan.
G9	The Subsidence Management Plan must be reviewed each calendar year and a report prepared by an appropriately qualified person. The report must: (a) assess the plan against the requirements under condition **G8**; (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.
G10	The holder of this environmental authority must attach to the review report required by condition **G9**, a written response to the report and recommended actions, detailing the actions taken or to be taken by the environmental authority on stated dates: (a) to ensure compliance with this environmental authority; and (b) to prevent a recurrence of any non-compliance issues identified.

G11	The review report required by condition **G9** and the written response to the review report required by condition **G10** must be submitted to the administering authority by the **1 April** following each report. .
G11	Areas impacted by subsidence, or proposed to be impacted by subsidence, in the coming year must be provided with each written response required by condition **G9**.
G13	With each Estimated Rehabilitation Cost (ERC) application made to the administering authority, the following, regarding subsidence, must be provided, at a minimum: (a) identify pre-subsidence management actions to be undertaken during the ERC period; (b) identify post-subsidence management actions to be undertaken during the ERC period; and (c) identify the subsidence monitoring proposed to be undertaken during the ERC.
G14	The holder of this environmental authority must not commence subsidence of a longwall panel that will result in the subsidence of a watercourse or adjoining floodplain unless: (a) the holder has submitted to the administering authority two copies of the Subsidence Management Plan detailing the subsidence activities for the watercourse or adjoining floodplain together with certification of a suitable qualified and experienced person that the plan is compliant in all respects with this environmental authority and in accordance with engineering best practice; and (b) at least **twenty-eight (28) days** has passed since the submission of the subsidence management plan. Note: Due consideration must be given to any comments made by the administering authority about the Subsidence Management Plan and subsequent implementation of the plan.
G15	The holder of this environmental authority must arrange for each subsided longwall panel to be inspected annually by a suitably qualified and experienced person, in accordance with conditions **G16** to **G20.**
G16	The annual inspection required under condition **G15** must be conducted between **1 April** and **1 November** each year.
G17	At each annual inspection, the condition of each subsided longwall panel must be assessed, including the structural, geotechnical and hydraulic adequacy of the subsided longwall panel and the adequacy of the works with respect to the Subsidence Management Plan.
G18	A report, by the suitably qualified and experienced person, must be prepared for each annual inspection conducted in accordance with condition **G17**, including any recommendations to ensure the integrity of each subsided longwall panel.
G19	The holder of this environmental authority must attach to the inspection report required by condition **G18**, a written response to the report and recommended actions, detailing the actions taken or to be taken by the environmental authority on stated dates: (a) to ensure compliance with this environmental authority; and (b) to prevent a recurrence of any non-compliance issues identified.
G20	The report required by condition **G18** and the written response required by condition **G19** to the inspection report must be submitted to the administering authority by **1 April** following each annual inspection**.**

G21	**Rehabilitation landform criteria** Land disturbed by mining must be rehabilitated in accordance with **Table G1: Rehabilitation Requirements.**

Table G1: Rehabilitation Requirements

Goal	Objectives	Mine Domain	Indicators	Completion Criteria
Safe	Site is safe for humans and animals now and in the foreseeable future	Exploration	All exploration drill holes undertaken have been rehabilitated or converted to water bores	Evidence of written landholder agreement for the retention of any exploration drill holes to be converted to a water bore.
				Certification that all exploration drill holes not agreed to in writing with the post-mining landholder to be converted to either a water bore or groundwater monitoring bore have been made safe and stable, and will remain safe and stable.
				Certification that all aquifers have been isolated where exploration drill holes have intersected more than one water bearing strata, in accordance with the 'Minimum Construction Requirements for Water Bore in Australia' (Australian Government, February 2012) or latest edition.
				Certification that all exploration drill holes agreed to in writing with the post-mining landholder to be converted to a water bore, have been converted in accordance with the 'Minimum Construction Requirements for Water Bore in Australia' (Australian Government, February 2012) or latest edition.
				Certification that all exploration drill holes converted to water bores as per the written landholder agreement, are compliant with the Water Act 2000.
			All monitoring bores undertaken have been rehabilitated	Certification that all monitoring bores have been rehabilitated in accordance with the 'Minimum Construction Requirements for Water Bore in Australia' (Australian Government, February 2012) or latest edition.

Goal	Objectives	Mine Domain	Indicators	Completion Criteria
Non-Polluting	Water quality is not impacted post mining.	Surface Facilities, Subsidence (Riverine), Subsidence (Non Riverine), Exploration	Surface Water Quality and Monitoring	Certified evidence that receiving water affected by surface water runoff has contaminant levels that comply with Table C5 – Receiving Waters Contaminant Trigger Levels of the environmental authority and that protects environmental values at the completion of mining and into the future.
			Groundwater quality	Certified evidence that groundwater quality is not negatively impacted by the rehabilitated landform and will continue to not be negatively impacted.
	Areas contaminated by hydrocarbons or other chemicals used during the life of the mine have been treated in-situ or excavated and disposed of appropriately.	Surface Facilities	Site Investigation Report	Certification that contaminated lands do not pose an ongoing risk or require further remedial works.
				Certified evidence that, if deemed necessary by a certified person, measures required by the site contaminated land investigation report(s) have been implemented.
Stable	All tension cracking and/or buckling has been remediated in accordance with the methodology described within the Subsidence Management Plan	Subsidence (Riverine), Subsidence (Non Riverine)	Subsidence Monitoring and Rehabilitation Records	Certified evidence that no subsidence cracks greater than 25mm occur and that appropriate remediation works for all subsidence cracks greater than the 25mm threshold have been undertaken.
				Certified evidence that ponding and subsidence has been managed as per conditions G7 to G20 of the environmental authority.
	Landform design achieves appropriate erosion rates	Surface Facilities, Subsidence (Riverine), Subsidence (Non Riverine), Exploration	Erosion	Certification that all land disturbed by mining activities does not exhibit any signs of continued erosion greater than that exhibited at the reference site(s).

Goal	Objectives	Mine Domain	Indicators	Completion Criteria
			Design and stability of drainage lines	Certified evidence that any required contour banks, channel linings, surface armour, engineered drop structures and other required water and drainage management measures are in place and functioning and will continue to satisfactorily function in the foreseeable future.
				Certified evidence that shows whether, and if so how, drainage diversions have changed over the life of mine; that they are stable at closure; and are likely to remain stable into the foreseeable future
	Vegetation growth is promoted to minimise erosion	Surface Facilities, Subsidence (Riverine), Subsidence (Non Riverine), Exploration	Growing medium facilitates vegetation growth	Certified evidence that vegetation species and density are suited to the site's characteristics including soil type, topography and climate.
				Certified evidence that vegetation species and density are appropriate to achieve the ongoing management of erosion on site.
			Ground Cover	Certification that as per Table G2 of the environmental authority, there is minimum of 70% groundcover present, inclusive of leaf litter and timber, and the presence of bare surfaces comparable to the reference site(s).
	Geomorphological processes of the Isaac River are maintained	Subsidence (Riverine)	River/Creek Stability	Certified evidence in the rehabilitation report that riparian areas and watercourse(s) impacted by mining activities have geomorphological conditions and processes comparable to the reference site(s).
Sustainable Land Use	Maintain or improve agricultural productivity	Surface Facilities, Subsidence (Riverine), Subsidence (Non Riverine), Exploration	Landform can sustain post-mining land use	Certification that grass species present are desirable, perennial, palatable, productive and of good health.
				Certification that the rehabilitated landform can support the post mining land use defined in **Table G2** and will continue to do so in the future.

Goal	Objectives	Mine Domain	Indicators	Completion Criteria
			Access to water sources	Certification that stock have access to water that meets accepted livestock drinking water guidelines as defined in Table 4.3.1 of Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZECC 2000) or the most up to date version of this guideline.
	Soil properties support the desired land use	Surface Facilities, Subsidence (Riverine), Subsidence (Non Riverine), Exploration	Soil site characteristics	Certification that soil site characteristics have acceptable levels of surface roughness, infiltration capacity, aggregate stability and surface condition as defined in the Australian Soil and Land Survey Field Handbook (National Committee on Soil and Terrain 2009) or the most up to date version of this handbook.
				Certification in rehabilitation report that the soil chemical properties do not limit the suitability of the land for the intended post-mining land use and are consistent with comparable reference site(s) for salinity, pH and exchangeable sodium percentage.
				Certification that nutrient accumulation and recycling processes are occurring as evidenced by the presence of a litter layer and adequate macro and micro- nutrients which are consistent with the relevant comparable reference site(s).
	Establishing self-sustaining natural vegetation or habitat	Surface Facilities, Subsidence (Riverine), Subsidence (Non Riverine), Exploration	Presence of predominant plant species	Certification that predominant plant species identified in the reference site(s) occur on the areas of rehabilitation.
			Density of predominant plant species	Certification that the density of predominant plant species in the rehabilitated sites is consistent with the reference site(s).
			Composition of predominant plant species	Certification that the composition of predominant plant species in the rehabilitated sites are consistent with the reference site(s).

Goal	Objectives	Mine Domain	Indicators	Completion Criteria
	Self-sustaining natural vegetation or habitat that supports the intended post-mining land use	Surface Facilities, Subsidence (Riverine), Subsidence (Non Riverine), Exploration	Abundance and diversity of native fauna species.	Certification 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 that indicators of these species or habitat elements are developing within the rehabilitated areas.
			bundance and health of desired plant species	Certified evidence that plants in rehabilitated areas show flowering, viable seed setting, germination and emergence.
			Abundance of declared plants (weeds) identified through surveys	Certification that the abundance of declared plants (weeds) identified in rehabilitated areas is no greater the reference site(s).
				Certified evidence to demonstrate that action has been taken to eradicate declared plants (weeds) under local or State legislation should they occur on the site.
				Certified evidence indicating that all machinery, plant and equipment used for rehabilitation was free of declared plant seed and reproductive material prior to entering the site.
			Abundance of declared animal identified through surveys	Certification in rehabilitation report that the abundance of declared animals identified in rehabilitated areas is no greater than the reference site(s).
				Certified evidence to demonstrate that action has been taken to control declared animals under local or State legislation should they occur on the site.

[1] Completion Criteria must be measurable. Certification from a suitably qualified and experienced person is not a completion criterion.

[2] Appendix 2 – Maximum Extent of Underground Mining and Subsidence

[3] Appendix 3 – Grosvenor Site Plan (Surface Facilities Conceptual Layout)

[4] Appendix 6 – Surface Facilities – Workshops and Administration

[5] Appendix 7 – Surface Facilities – Surface and Coal Handling

G22	All areas significantly disturbed by mining activities must be rehabilitated to a stable landform with a self-sustaining vegetation cover in accordance with **Table G1: Rehabilitation Requirements** and **Table G2: Final Land Use and Rehabilitation Approval Schedule**.

Table G2: Final Land Use and Rehabilitation Approval Schedule

	Disturbance Type					
	Subsided Areas	**Ponded Areas (>1.25m)**	**Worked Water Dam/s**	**Infrastructure**	**ROM, Topsoil Material Stockpiles**	**Road(s) and Tracks**
Projective surface area (ha)	4,313	25.7	23.1	106.7	5.7	8.2
Pre-mine land use	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
Post-mine land use	Grazing	Grazing	Grazing	Grazing	Grazing	Grazing
Post-mine land capability classification	Class C Agricultural Land Class 3/4 Land Suitability (Grazing)	Class D Agricultural Land Class 5 Land Suitability (Grazing)	Class C Agricultural Land Class 4 Land Suitability (Grazing)	Class C Agricultural Land Class 4 Land Suitability (Grazing)	Class C Agricultural Land Class 4 Land Suitability (Grazing)	Class C Agricultural Land Class 4 Land Suitability (Grazing)
Minimum Foliage Projective Cover	70%	N/A	70%	70%	70%	70%

G23	Progressive rehabilitation must commence within **twelve (12) months** when areas become available within the operational land.
G24	Self-sustaining vegetation, as per **Table G1: Rehabilitation Requirements** must be consistent with the reference sites identified in **Table G3: Reference Sites**.

Table G3: Reference Sites

Reference Site	Domain Reference	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Description
Rehab R1	Subsidence – Riverine	-21.92864221	148.0220905	Isaac River – Upstream
Rehab R2	Subsidence - Riverine	-21.93171635	148.0187431	Isaac River – Upstream
Rehab W1	Subsidence – Non Riverine	-21.96370698	148.0114786	Woodland – RE 11.3.2
Rehab W2	Subsidence – Non Riverine	-21.94340750	148.0160603	Woodland – RE 11.4.9
Rehab W3	Subsidence – Non Riverine	-21.91572518	148.0511030	Woodland – RE 11.5.3

Reference Site	Domain Reference	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)	Description
Rehab G1	Surface Facilities, Exploration and Subsidence – Non Riverine	-21.93015031	148.0256626	Grassland
Rehab G2	Surface Facilities, Exploration and Subsidence – Non Riverine	-21.93363423	148.0275129	Grassland

G25	**Post mine land use plan** The holder must develop and submit to the administering authority a Post Mine Land Use Plan (PMLUP) with the initial Plan of Operations and update and resubmit the plan with each subsequent Plan of Operations. The PMLUP must describe how the rehabilitation objectives in **Table G1: Rehabilitation Requirements** will be achieved: (a) schematic representation of final landform inclusive of drainage features; (b) drainage design; (c) erosion controls proposed on reformed land; (d) geotechnical, geochemical and hydrological studies; (e) chemical, physical and biological properties of soil and water; (f) proposed revegetation methods inclusive of plant species selection, re-profiling, respreading soil, soil ameliorants/amendments, surface preparation and method of propagation; and (g) a rehabilitation monitoring program.
G26	**Rehabilitation management plan** Complete a rehabilitation management plan for disturbed areas and submit a report to the administering authority proposing acceptance criteria prior to the commencement of mining activities. The rehabilitation management plan must, at a minimum: (a) develop design criteria for rehabilitation of each domain; (b) identify success factors and completion criteria for each domain; (c) identify **three (3)** reference sites to be used to develop rehabilitation success criteria; (d) describe the monitoring of reference sites inclusive of statistical design; (e) detail rehabilitation methods applied to each domain; (f) contain landform design criteria including end of mine design; (g) detail how landform design will be consistent with the surrounding topography; (h) provide schematic representation of final landform inclusive of: i) drainage design and features; ii) slope designs; iii) cover design; iv) erosion controls proposed on reformed land; (i) explain planned native vegetation rehabilitation areas and corridors; (j) describe rehabilitation monitoring and maintenance requirements to be applied to all areas of disturbance; (k) develop a contingency plan for rehabilitation maintenance or redesign; and (l) describe end of mine landform design plan and post mining land uses across the mine.

G27	**Rehabilitation monitoring program** Once rehabilitation has commenced, the holder of the environmental authority must conduct a Rehabilitation Monitoring Program on a yearly basis, which must include sufficient spatial and temporal replication to enable statistically valid conclusions as established under the rehabilitation program.
G28	The Rehabilitation Monitoring Program must be developed and implemented by a person possessing appropriate qualifications and experience in the field of rehabilitation management, nominated by the holder of the environmental authority.
G29	Verification of rehabilitation success, determined by the rehabilitation success criteria developed as per condition **G21** is to be carried out as follows: (a) the minimum sampling intensity must be specified for the monitoring of progressive rehabilitation; (b) justification of the suitability of the minimum sampling intensity must be provided; (c) monitoring must include sufficient replication to enable statistical analysis of results at an acceptable power; and (d) undertaken at **twelve (12)** monthly intervals.
G30	The Rehabilitation Monitoring Program must be provided on the **1 April** following each period required by condition **G29(d)**, describing: (a) how the rehabilitation objectives as per the Rehabilitation Management Plan will be achieved; and (b) verification of rehabilitation success as per condition **G29.**
G31	**Post closure management plan** A Post Closure Management Plan for the site must be developed and submitted to the administering authority at least **eighteen (18) months** prior to the final coal processing on site and implemented for a nominal period of: (a) at least **thirty (30) years** following final coal processing on site; or (b) a shorter period if the site is proven to be geotechnically and geochemically stable and it can be demonstrated to the satisfaction of the administering authority that no release of contaminants from the site will result in environmental harm.

G32	The Post Closure Management Plan must include the following elements: a) operation and maintenance of: i) wastewater collection and reticulation systems; ii) wastewater treatment systems; iii) the groundwater monitoring network; iv) final cover systems of spoil dumps; and v) vegetative cover; and b) monitoring of: i) surface water quality; ii) groundwater quality; iii) seepage rates; iv) erosion rates; v) the integrity and stability all slopes, ramps and voids; and vi) the health and resilience of native vegetation cover.
G33	Before applying for surrender of a mining lease, the holder 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.
G34	Before applying for progressive rehabilitation certification for an area, the holder must (if applicable) provide to the administering authority a site investigation report under the *Environmental Protection Act 1994*, 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 **G21**.
G35	Minimise the potential for contamination of land by hazardous contaminants.
G36	**Biodiversity offsets – Queensland Biodiversity Offset Policy** The holder of this environmental authority must provide an offset for impacts on 17.7 ha of applicable state significant biodiversity values, in accordance with the *Queensland Biodiversity Offset Policy 2011*. The biodiversity offset must be consistent with the requirements for an offset as identified in the Biodiversity Offset Strategy (as per condition **G39**) and must be provided: (a) prior to impacting on state significant biodiversity values; or (b) where a land based offset is to be provided, within the later of either of the following; i) by **29 May 2016**; or ii) the relevant stage identified in the Biodiversity Offset Strategy submitted under condition **G36**; or (c) where an offset payment is to be provided, within the later of either of the following: i) by **29 May 2016**; or ii) the relevant stage identified in the Biodiversity Offset Strategy submitted under condition **G36**.
G37	A Biodiversity Offset Strategy, only for the 17.7ha identified within condition **G36**, must be developed and submitted to the administering authority within either **thirty (30) days**, or a lesser period agreed to by the administering authority, prior to impacting on the applicable state significant biodiversity values.

G38	**Biodiversity offsets – Environmental Offset Strategy** Conditions **G39** to **G46** are exclusive of the 17.7ha identified within condition **G36**
G39	Significant residual impacts to prescribed environmental matters, other than if the impacts were authorised by an existing authority issued before the commencement of the *Environmental Offsets Act 2014*, are not authorised under this environmental authority or the *Environmental Offsets Act 2014* unless the impacts are specified in **Table G4: Significant residual impacts to prescribed environmental matters**.
G40	Records demonstrating that each impact to a prescribed environmental matter not listed in **Table G4: Significant residual impacts to prescribed environmental matters** did not, or is not likely to, result in a significant residual impact to that matter and must be: (a) completed by an appropriately qualified person; and (b) kept for the life of the environmental authority.
G41	An environmental offset made in accordance with the *Environmental Offsets Act 2014* and Queensland Environmental Offsets Policy, as amended from time to time, must be undertaken for the maximum extent of impact to each prescribed environmental matter authorised in **Table G4: Significant residual impacts to prescribed environmental matters**, unless: (a) a lesser extent of the impact has been approved in accordance with condition **G44**; or (b) the same or substantially the same impact has been assessed under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth).

Table G4: Significant residual impacts to prescribed environmental matters

Prescribed environmental matter		Location of impact	Maximum extent of impact (hectares)
REGULATED VEGETATION			
Endangered regional ecosystem	RE 11.3.1 (Endangered)	ML70378	0.37
	RE 11.4.9 (Endangered)	ML70378	1.44
	RE 11.4.8 (Endangered) – Brigalow TEC[a]	ML70378	10.4
	RE 11.4.9 (Endangered) – Brigalow TEC[a]	ML70378	5.4
	RE 11.9.1 (Endangered) – Brigalow TEC[a]	ML70378	1.1
Of concern regional ecosystem (not within an urban area)	RE 11.3.4 (Of concern)[b]	ML70378	7.75
	RE 11.4.2 (Of concern)	ML70378	85.06
	RE 11.3.2 (Of concern)[b]	ML70378	56.07
Regional ecosystems (not within an urban area) that intersect a wetland on the vegetation management wetlands map	RE 11.3.27f (Least concern) – Palustrine wetland	ML70378	1.65
	RE 11.5.3b (Least concern) – Palustrine wetland	ML70378	1.11
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map	RE 11.3.25 (Least concern)[b] – Riverine wetland / fringing riverine wetland	ML70378	23.97
	RE 11.3.2 (Of concern) – Palustrine wetland	ML70378	1.85
	RE 11.3.4 (Of concern)[b] – Floodplain (other than floodplain wetlands)	ML70378	2.62
	RE 11.5.3 (Least concern)	ML70378	0.91
	RE 11.3.27f (Least concern) – Palustrine wetland	ML70378	0.02
	RE 11.5.9c (Least concern)	ML70378	0.86

Prescribed environmental matter		Location of impact	Maximum extent of impact (hectares)
	RE 11.4.2 (Of concern)	ML70378	0.69
	RE 11.3.7 (Least concern)	ML70378	0.08
	RE 11.4.9 (Endangered)	ML70378	0.02
CONNECTIVITY AREAS			
Connectivity area that is a regional ecosystem (not in an urban area)	RE 11.3.1 (Endangered) RE 11.3.2 (Of concern) – Palustrine wetland RE 11.3.2 (Of concern) – Palustrine wetland / RE 11.3.4 (Of concern) – Floodplain (other than floodplain wetlands) RE 11.3.2 (Of concern) – Palustrine wetland / RE 11.3.7 (Least concern)	ML70378	211.65
	RE 11.3.2 (Of concern) – Palustrine wetland / RE 11.5.3 (Least concern) RE 11.3.25 (Least concern) – Riverine wetland / fringing riverine wetland RE 11.3.27f (Least concern) – Palustrine wetland RE 11.3.7 (Least concern) / RE 11.3.2 (Of concern) – Palustrine wetland RE 11.4.2 (Of concern) RE 11.4.8 (Endangered) – Palustrine wetland RE 11.4.9 (Endangered) – Palustrine wetland RE 11.5.3 (Least concern) RE 11.5.3 (Least concern) / RE11.3.2 (Of concern) – Palustrine wetland RE 11.5.3b (Least concern) – Palustrine wetland RE 11.5.9c (Least concern) RE 11.5.9c (Least concern) / RE 11.5.3 (Least concern) RE 11.7.2 (Least concern)		

Note: [a] These prescribed environmental matters are also matters of national environmental significance under the *Environment Protection and Biodiversity Conservation Act 1999* (Cwlth). [b] Includes provision for G200 series offsets as per the Major EA amendment approved 15th May 2017.

G42	**Staged impacts** The significant residual impacts to prescribed environmental matter authorised in condition **G41** for which an environmental offset is required by condition **G43** may be carried out in stages. An environmental offset can be delivered for each stage of the impacts to prescribed environmental matters.

G43	Prior to the commencement of each stage, a report that includes an analysis of the following must be provided to the administering authority: (a) for the forthcoming stage – the estimated significant residual impact to each prescribed environmental matter; and (b) for the previous stage, if applicable – the actual significant residual impact to each prescribed environmental matter, to date.
G44	The report required by condition **G43** must be approved by the administering authority before a notice of election for the forthcoming stage, if applicable, is given to the administering authority
G45	A notice of election for the staged environmental offset referred to in condition **G46**, if applicable, must be provided to the administering authority no less than **three (3) months** before the proposed commencement of that stage, unless a lesser timeframe has been agreed to by the administering authority.
G46	Within **six (6) months** from the completion of the final stage of the project, a report that includes the following matters must be provided to the administering authority: (a) an analysis of the actual impacts on prescribed environmental matters resulting from the final stage; and (b) if applicable, a notice of election to address any outstanding offset debits for the authorised impacts.

Schedule H: Regulated Structures	
Condition number	**Condition**

H1	**Assessment of consequence category** The consequence category of any structure must be assessed by a suitably qualified and experienced person in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933) at the following times: (a) prior to the design and construction of the structure, if it is not an existing structure; or (b) prior to any change in its purpose or the nature of its stored contents.
H2	A consequence assessment report and certification must be prepared for each structure assessed and the report may include a consequence assessment for more than one structure.
H3	Certification must be provided by the suitably qualified and experienced person who undertook the assessment, in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933).
H4	**Design and construction of a regulated structure** Conditions **H5** to **H9** inclusive do not apply to existing structures. Note: Construction of a dam includes modification of an existing dam—refer to the definitions.
H5	All regulated structures must be designed by, and constructed under the supervision of, a suitably qualified and experienced person in accordance with the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933). Note: Certification of design and construction may be undertaken by different persons.
H6	Construction of a regulated structure is prohibited unless: (a) the holder has submitted a consequence category assessment report and certification to the administering authority; and (b) has been certified by a suitably qualified and experienced person for the design and design plan and the associated operating procedures in compliance with the relevant condition of this authority.
H7	Certification must be provided by the suitably qualified and experienced person who oversees the preparation of the design plan in the form set out in the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933), and must be recorded in the Register of Regulated Structures.
H8	Regulated structures must: (a) be designed and constructed in accordance with and conform to the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933); (b) be designed and constructed with due consideration given to ensuring that the design integrity would not be compromised on account of: i) floodwaters from entering the regulated dam from any watercourse or drainage line; an ii) wall failure due to erosion by floodwaters arising from any watercourse or drainage line. for dams that are associated with a failure to contain – seepage: 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.

H9	Certification by the suitably qualified and experienced person who supervises the construction must be submitted to the administering authority on the completion of construction of the regulated structure, and state that: (a) the 'as constructed' drawings and specifications meet the original intent of the design plan for that regulated structure; and (b) construction of the regulated structure is in accordance with the design plan.
H10	**Notification of affected persons** All affected persons must be provided with a copy of the emergency action plan in place for each regulated structure: a) for existing structures that are regulated structures, by **22 June 2016**; b) prior to the operation of the new regulated structure; and c) if the emergency action plan is amended, within **five (5) business days** of it being amended.
H11	**Operation of a regulated structure** Operation of a regulated structure, except for an existing structure, is prohibited unless the holder has submitted to the administering authority in respect of all regulated structures, all of the following: (a) one paper copy and one electronic copy of the design plan and certification of the 'design plan' in accordance with condition **H6**; (b) a set of 'as constructed' drawings and specifications; (c) certification of those 'as constructed drawings and specifications' in accordance with condition **H9**; (d) where the regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the design storage allowance (DSA) volume across the system, a copy of the certified system design plan; (e) the requirements of this authority relating to the construction of the regulated structure have been met; (f) the holder has entered the details required under this authority, into a Register of Regulated Structures; and (g) there is a current operational plan for the regulated structures.
H12	For existing structures that are regulated structures: (a) where the existing structure that is a regulated structure is to be managed as part of an integrated containment system for the purpose of sharing the DSA volume across the system, the holder must submit to the administering authority within **twelve (12)** months of the commencement of this condition a copy of the certified system design plan including that structure; and (b) there must be a current operational plan for the existing structures.
H13	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.
H14	**Mandatory reporting level** Conditions **H15** to **H18** inclusive only apply to Regulated Structures which have not been certified as low consequence category for 'failure to contain – overtopping'.

H15	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.
H16	The holder must, as soon as practical and within **forty-eight (48) hours** of becoming aware, notify the administering authority when the level of the contents of a regulated dam reaches the MRL.
H17	The holder must, immediately on becoming aware that the MRL has been reached, act to prevent the occurrence of any unauthorised discharge from the regulated dam.
H18	The holder must record any changes to the MRL in the Register of Regulated Structures.
H19	**Design storage allowance** The holder must assess the performance of each regulated dam or linked containment system over the preceding November to May period based on actual observations of the available storage in each regulated dam or linked containment system taken prior to **1 July** of each year.
H20	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).
H21	The holder must, as soon as possible and within **forty-eight (48)** hours of becoming aware that the regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on **1 November** of any year, notify the administering authority.
H22	The holder must, immediately on becoming aware that a regulated dam (or network of linked containment systems) will not have the available storage to meet the DSA volume on **1 November** of any year, act to prevent the occurrence of any unauthorised discharge from the regulated dam or linked containment systems.
H23	**Annual inspection report** Each regulated structure must be inspected each calendar year by a suitably qualified and experienced person.
H24	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, with any recommended actions to ensure the integrity of the regulated structure or a positive statement that no recommendations are required.
H25	The suitably qualified and experienced person who prepared the annual inspection report must certify the report in accordance with the *Manual for Assessing Consequence Categories and Hydraulic Performance of Structures* (ESR/2016/1933).
H26	The holder must: (a) within **twenty (20) business days** of receipt of the annual inspection report, provide to the administering authority; i) the recommendations section of the annual inspection report; and ii) if applicable, any actions being taken in response to those recommendations; and (b) If, following receipt of the recommendations and (if applicable) actions, the administering authority requests a full copy of the annual inspection report from the holder, provide this to the administering authority within **ten (10) business days** of receipt of request.

H27	**Transfer arrangements** The holder must provide a copy of any reports, documentation and certifications prepared under this authority, including but not limited to any Register of Regulated Structures, consequence assessment, design plan and other supporting documentation, to a new holder on transfer of this authority.
H28	**Decommissioning and rehabilitation** Dams must not be abandoned but be either: (a) decommissioned and rehabilitated to achieve compliance with condition **G21**; or (b) be left in-situ for a beneficial use(s) provided that: i) it no longer contains contaminants that will migrate into the environment; and ii) it contains water of a quality that is demonstrated to be suitable for its intended beneficial use(s); and iii) the administering authority, the holder of the environmental authority and the landholder agree in writing that the dam will be used by the landholder following the cessation of the environmentally relevant activity(ies).
H29	**Register of Regulated Structures** A Register of Regulated Structures must be established and maintained by the holder for each regulated structure.
H30	The holder must provisionally enter the required information in the Register of Regulated Structures when a design plan for a regulated structure is submitted to the administering authority.
H31	The holder must make a final entry of the required information in the Register of Regulated Structures once compliance with conditions **H11** and **H12** has been achieved.
H32	The holder must ensure that the information contained in the Register of Regulated Structures is current and complete on any given day.
H33	All entries in the Register of Regulated Structures must be approved by the chief executive officer for the holder of this authority, or their delegate, as being accurate and correct.
H34	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.
H35	**Transitional arrangements** All existing structures must comply with the timetable for any further assessments in accordance with the Manual specified in **Table H1: Transitional requirements for existing structures**, depending on the consequence category for each existing structure assessed in the most recent previous certification for that structure.

Table H1: Transitional requirements for existing structures

Transition period required for existing structures to achieve the requirements of the *Manual for Assessing Consequence Categories and Hydraulic Performance of Dams*			
Compliance with criteria	**High**	**Significant**	**Low**
90% and a history of good compliance performance in last 5 years	No transition required	No transition required	No transitional conditions apply. Review consequence assessment every 7 years.
>70%-≤90%	Within 7 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Within 10 years, unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	No transitional conditions apply. Review consequence assessment every 7 years.
>50-≤70%	Within 5 years unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Within 7 years unless otherwise agreed with the administering authority, based on no history of unauthorised releases.	Review consequence assessment every 7 years.
≤50%	Within 5 years or as per compliance requirements (e.g. TEP timing)	Within 5 years or as per compliance requirements (e.g. TEP timing)	Review consequence assessment every 5 years.

H36	**Table H1: Transitional requirements for existing structures** ceases to apply for a structure once any of the following events has occurred: (a) it has been brought into compliance with hydraulic performance criteria applicable to the structure under the Manual; or (b) it has been decommissioned; or (c) it has been certified as no longer being assessed as a regulated structure.

Schedule J: Sewage Treatment	
Condition number	**Condition**
J1	**Sewage treatment** The only contaminant permitted to be released to land is treated sewage effluent in compliance with the release limits stated in **Table J1: Contaminant release limits to land.**

Table J1: Contaminant release limits to land

Contaminant	Unit	Release Limit	Limit Type	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
Phosphorous	mg/L	15	Maximum	Monthly
E-coli	Organisms/100ml	1000	Maximum	Monthly
pH	pH units	6.0 – 9.0	Range	Monthly

J2	Treated sewage effluent may only be released to land in accordance with the conditions of this approval at the following locations: (a) within the nominated areas(s) identified in **Table J2: Effluent Discharge Locations**; (b) only to places that have implemented an Irrigation Management Plan; and (c) other land for the purpose of dust suppression and/or firefighting.

Table J2: Effluent Discharge Locations

Authorised Discharge Points	Location	Latitude (decimal degree, GDA94)	Longitude (decimal degree, GDA94)
Effluent Discharge Point 1	Effluent Irrigation Area	-21.97045479	148.0037142

J3	The application of treated effluent to land must be carried out in a manner such that: (a) vegetation is not damaged; (b) there is no surface ponding of effluent; and (c) there is no run-off of effluent.
J4	If areas irrigated with effluent are accessible to employees or the general public, prominent signage must be provided advising that effluent is present and care should be taken to avoid consuming or otherwise coming into unprotected contact with the effluent.

J5	All sewage effluent released to land must be monitored at the frequency and for the parameters specified in **Table J1: Contaminant release limits to land**.
J6	The daily volume of effluent release to land must be measured and records kept of the volumes of effluent released.
J7	When circumstances prevent the irrigation or beneficial reuse of treated sewage effluent such as during or following rain events, waters must be directed to a wet weather storage or alternative measures must be taken to store/lawfully dispose of effluent.
J8	A minimum area of **five (5)** hectares of land, excluding any necessary buffer zones, must be utilised for the irrigation and/or beneficial reuse of treated sewage effluent.
J9	Treated sewage effluent must only be supplied to another person or organisation that has a written plan detailing how the user of the treated sewage effluent will comply with their general environmental duty under section 319 of the *Environmental Protection Act 1994* whilst using the treated sewage effluent.

Schedule K: Stimulation Activities	
Condition number	**Condition**
K1	Stimulation activities must not cause the connection of the target gas producing formation and another aquifer.
K2	Practices and procedures must be in place to detect, as soon as practicable, any fractures that cause the connection of a target gas producing formation and another aquifer.
K3	The use of restricted stimulation fluids is prohibited.
K4	Polycyclic aromatic hydrocarbons or products that contain polycyclic aromatic hydrocarbons must not be used in stimulation fluids in concentrations above the reporting limit.
K5	Stimulation activities must not negatively affect water quality, other than that within the stimulation impact zone of the target gas producing formation.
K6	The internal and external mechanical integrity of the well system prior to and during stimulation must be ensured such that there is: (a) no significant leakage in the casing, tubing, or packer; and (b) there is no significant fluid movement into another aquifer through vertical channels adjacent to the well bore hole.
K7	**Stimulation Risk Assessment** Prior to undertaking stimulation activities, a risk assessment must be developed to ensure that stimulation activities are managed to prevent environmental harm.

K8	The stimulation risk assessment must be carried out for every well to be stimulated prior to stimulation being carried out at that well and address issues at a relevant geospatial scale such that changes to features and attributes are adequately described and must include, but not necessarily be limited to: (a) a process description of the stimulation activity to be applied, including equipment and a comparison to best international practice; (b) provide details of where, when and how often stimulation is to be undertaken on the tenures covered by this environmental authority; (c) a geological model of the field to be stimulated including geological names, descriptions and depths of the target gas producing formation(s); (d) naturally occurring geological faults; (e) seismic history of the region (e.g. earth tremors, earthquakes); (f) proximity of overlying and underlying aquifers; (g) description of the depths that aquifers with environmental values occur, both above and below the target gas producing formation; (h) identification and proximity of landholder' active groundwater bores in the area where stimulation activities are to be carried out; (i) the environmental values of groundwater in the area; (j) an assessment of the appropriate limits of reporting for all water quality indicators relevant to stimulation monitoring in order to accurately assess the risks to environmental values of groundwater; (k) description of overlying and underlying formations in respect of porosity, permeability, hydraulic conductivity, faulting and fracture propensity; (l) consideration of barriers or known direct connections between the target gas producing formation and the overlying and underlying aquifers; (m) a description of the well mechanical integrity testing program; (n) process control and assessment techniques to be applied for determining extent of stimulation activities (e.g. microseismic measurements, modelling etc.); (o) practices and procedures to ensure that the stimulation activities are designed to be contained within the target gas producing formation; (p) groundwater transmissivity, flow rate, hydraulic conductivity and direction(s) of flow; (q) a description of the chemical compounds used in stimulation activities (including estimated total mass, estimated composition, chemical abstract service numbers and properties), their mixtures and the resultant compounds that are formed after stimulation; (r) a mass balance estimating the concentrations and absolute masses of chemical compounds that will be reacted, returned to the surface or left in the target gas producing formation subsequent to stimulation; (s) an environmental hazard assessment of the chemicals used to include their mixtures and the resultant chemicals that are formed after stimulation including: i) toxicological and ecotoxicological information of chemical compounds used; ii) information on the persistence and bioaccumulation potential of the chemical compounds used; and iii) identification of the chemicals of potential concern in stimulation fluids derived from the risk assessment. (t) an environmental hazard assessment of use, formation of, and detection of polycyclic aromatic hydrocarbons in stimulation activities;

	(u) identification and an environmental hazard assessment of using radioactive tracer beads in stimulation activities; (v) an environmental hazard assessment of leaving chemical compounds in stimulation fluids in the target gas producing formation for extended periods subsequent to stimulation; (w) human health exposure pathways to operators and the regional population; (x) risk characterisation of environmental impacts based on the environmental hazard assessment; (y) potential impacts to landholder bores as a result of stimulation activities; (z) an assessment of cumulative underground impacts, spatially and temporally of the stimulation activities to be carried out on the tenures covered by this environmental authority; (aa) potential environmental or health impacts which may result from stimulation activities including but not limited to water quality, air quality (including suppression of dust and other airborne contaminants), noise and vibration; and (bb) Ensure there is a sufficient groundwater monitoring network available for the purposes of background monitoring as per condition **K9**.
K9	**Water quality baseline monitoring** Prior to undertaking any stimulation activity, a baseline bore assessment must be undertaken of the water quality of: (a) all landholder's active groundwater bores (subject to access being permitted by the landholder) that are spatially located within a **two (2)** kilometre horizontal radius from the location of the stimulation initiation point within the target gas producing formation; and (b) all landholders' active groundwater bores (subject to access being permitted by the landholder) in any aquifer that is within **two hundred (200) metres** above or below the target gas producing formation and is spatially located with a **two (2) kilometre** radius from the location of the stimulation initiation point; (c) all monitoring bores listed in **Table D1: Groundwater Monitoring Locations and Frequencies**; and (d) any other bore that could potentially be adversely impacted by the stimulation activities in accordance with the findings of the risk assessment required by conditions **K7** and **K8**.
K10	Prior to undertaking stimulation activities at a well, there must be sufficient water quality data to accurately represent the water quality in the well to be stimulated. The data must include as a minimum the results of analyses for the parameters in condition **K11**.

K11	Baseline bore assessments required by condition **K9** and well assessments required by condition **K10** must include relevant analytes and physico-chemical parameters to be monitored in order to establish baseline water quality and must include, but not necessarily be limited to: (a) pH; (b) electrical conductivity [µS/m]; (c) turbidity [NTU]; (d) total dissolved solids [mg/L]; (e) temperature [ºC]; (f) dissolved oxygen [mg/L]; (g) dissolved gases (methane, chlorine, carbon dioxide, hydrogen sulfide) [mg/L]; (h) alkalinity (bicarbonate, carbonate, hydroxide and total as CaCO3) [mg/L]; (i) sodium adsorption ratio (SAR); (j) anions (bicarbonate, carbonate, hydroxide, chloride, sulfate) [mg/L]; (k) cations (aluminium, calcium, magnesium, potassium, sodium) [mg/L]; (l) dissolved and total metals and metalloids (including but not necessarily being limited to aluminium, arsenic, barium, borate (boron), cadmium, total chromium, copper, iron, fluoride, lead, manganese, mercury, nickel, selenium, silver, strontium, tin and zinc) [µg/L]; (m) total petroleum hydrocarbons [µg/L]; (n) BTEX (as benzene, toluene, ethylbenzene, ortho-xylene, para- and meta-xylene, and total xylene) [µg/L]; (o) polycyclic aromatic hydrocarbons (including but not necessarily being limited to naphthalene, phenanthrene, benzo[a]pyrene) [µg/L]; (p) sodium hypochlorite [mg/L]; (q) sodium hydroxide [mg/L]; (r) formaldehyde [mg/L]; (s) ethanol [mg/L]; and (t) gross alpha + gross beta or radionuclides by gamma spectroscopy [Bq/L].
K12	**Stimulation Impact Monitoring Program** A Stimulation Impact Monitoring Program must be developed prior to the carrying out of stimulation activities which must be able to detect adverse impacts to water quality from stimulation activities and must consider the findings of the risk assessment required by conditions **K7** and **K8** that relate to stimulation activities and must include, as a minimum, monitoring of: (a) the stimulation fluids to be used in stimulation activities at sufficient frequency and which sufficiently represents the quantity and quality of the fluids used; (b) flow back waters from stimulation activities at sufficient frequency and which sufficiently represents the quality of that flow back water; (c) flow back waters from stimulation activities at sufficient frequency and accuracy to demonstrate that: i) 150% of the volume used in stimulation activities has been extracted from the stimulated well; or ii) all additives used in stimulation activities have been removed. (d) all bores in accordance with condition **K9**.

K13	The Stimulation Impact Monitoring Program must provide for monitoring of: (a) analytes and physico-chemical parameters relevant to baseline bore and well assessments to enable data referencing and comparison including, but not necessarily being limited to the analytes and physicochemical parameters in condition **K11**; and (b) any other analyte or physico-chemical parameters that will enable detection of adverse water quality impacts and the inter-connection with a non-target aquifer as a result of stimulation activities including chemical compounds that are actually or potentially formed by chemical reactions with each other or coal seam materials during stimulation activities.
K14	The Stimulation Impact Monitoring Program must provide for monitoring of the bores in condition **K12 d)** at the following minimum frequency: a) monthly for the first **six (6)** months subsequent to stimulation activities being undertaken; then; b) annually for the first **five (5)** years subsequent to stimulation being undertaken or until analytes and physico-chemical parameters listed in conditions **K11 a)** to **K11 t)** inclusive, are not detected in concentrations above baseline bore monitoring data on **two (2)** consecutive monitoring occasions, or up until the stimulation well is mined through due to longwall activities and is no longer accessible.
K15	The results of the Stimulation Impact Monitoring Program must be made available to any potentially affected landholder upon request by that landholder.
K16	In addition to the requirements under Chapter 7, Part 1, Division 2 of the *Environmental Protection Act 1994,* the administering authority must be notified through the Pollution Hotline and in writing, as soon as possible, but within 48 hours of becoming aware of any of the following events: a) unauthorised releases of volumes of contaminants, in any mixture, to land greater than: i) 200 L of stimulation additives; or ii) 500 L of stimulation fluids. b) the use of restricted stimulation fluids; and c) groundwater monitoring results from a landholder's active groundwater bore monitored under the Stimulation Impact Monitoring Program which is a 10% or greater increase from a previous baseline value for that bore and which renders the water unfit for its intended use.

Definitions

Key terms and/or phrases used in this document are defined in this section. Where a term is not defined, the definition in the *Environmental Protection Act 1994*, its regulations or environmental protection policies must be used. If a word remains undefined it has its ordinary meaning.

"acceptance criteria" means the measures by which the actions implemented to rehabilitate the land are deemed to be complete. The acceptance criteria indicate the success of the rehabilitation outcome or remediation of areas which have been significantly disturbed by the mining activities. Acceptance criteria may include information regarding:

a) vegetation establishment, survival and succession;

b) vegetation productivity, sustained growth and structure development;

c) fauna colonisation and habitat development;

d) ecosystem processes such as soil development and nutrient cycling, and the re-colonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;

e) microbiological studies including re-colonisation by mycorrhizal fungi, microbial biomass and respiration;

f) effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;

g) resilience of vegetation to disease, insect attack, drought and fire; and

h) vegetation water use and effects on ground water levels and catchment yields.

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

"administering authority" means the administering authority of the *Environmental Protection Act 1994*.

"affected person" is someone whose drinking water can potentially be impacted as a result of discharges from a dam or their life can be put at risk due to dwellings or workplaces being in the path of a dam break flood.

"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).

"ANZECC" means the Australian and New Zealand Guidelines for Fresh Marine Water Quality 2000

"appropriately qualified person" means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relative to the subject matter using the relevant protocols, standards, methods or literature.

"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).

"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 environmental authority (mining activities) under the *Environmental Protection Act 1994*.

"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.

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

"certified or certification" in relation to any matter other than a design plan, 'as constructed' drawings or an annual report regarding dams means, a Statutory Declaration by a suitably qualified person or suitably qualified third party accompanying the written document stating:

a) the person's qualifications and experience relevant to the function;

b) that the person has not knowingly included false, misleading or incomplete information in the document;

c) that the person has not knowingly failed to reveal any relevant information or document to the administering authority;

d) that the document addresses the relevant matters for the function and is factually correct; and that the opinions expressed in the document are honestly and reasonably held**.**

"certifying, certify or certified" have a corresponding meaning as 'certification'.

"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

c) approved by the Australian Transport Council; or

d) a lead hazardous substance within the meaning of the Workplace Health and Safety Regulation 2008; or

e) 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

f) any substance used as, or intended for use as:

i) a pesticide, insecticide, fungicide, herbicide, rodenticide, nematicide, 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 –

vi) mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater; or

vii) 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.

"construction or constructed" in relation to a dam includes building a new dam and modifying or lifting an existing dam, but does not include investigations and testing necessary for the purpose of preparing a design plan.

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

"consequence category" means a category, either low, significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933).

"cover material" means any soil or rock suitable as a germination medium or landform armouring.

"dam" means a land-based structure or a void that is designed to contain, diverts or control flowable substances and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works.

"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).

"declared pest" and **"declared pest plant species"** has the meaning of a prohibited or restricted matter in the Biosecurity Act 2014 and is a live animal or plant declared to be a declared pest under section 29 (Declaring Pests by Regulation) or section 31 (Chief executive may make emergency prohibited matter declaration) of that Act and includes reproductive material of the animal or plant.

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

"design storage allowance or DSA" means an available volume, estimated in accordance with the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933) published by the administering authority, must be provided in a dam as at 1 November each year in order to prevent a discharge from that dam to an annual exceedance probability (AEP) specified in that Manual.

"designer" for the purposes of a regulated dam, means the certifier of the design plan for the regulated dam

"development approval" means a development approval under the *Integrated Planning Act 1997* or the *Sustainable Planning Act 2009* in relation to a matter that involves an environmentally relevant activity under the *Environmental Protection Act 1994*.

"EC" means electrical conductivity.

"effluent" treated wastewater discharged 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.

"end of pipe" means the location at which water is released to waters or land.

"environmental authority holder" means the holder of this environmental authority.

"environmentally relevant activity" means an environmentally relevant activity as defined under Section 18 of the *Environmental Protection Act 1994* and listed under Schedule 2 of the Environmental Protection Regulation 2008.

"existing authority" has the meaning in section 94 of the *Environmental Offsets Act 2014*.

"existing structure" means a structure that was in existence prior to 20 November 2015.

"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 (ESR/2016/1933)published by the administering authority

"flowable substance" means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids, fluids or solids either in solution or suspension.

"holder", for a mining tenement, means a holder of the tenement under the *Mineral Resources Act 1989*, and the holder of the associate environmental authority under the *Environmental Protection Act 1994*.

"hydraulic performance" means the capacity of a regulated dam to contain or safely pass flowable substances based on the design criteria specified for the relevant consequence category in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933).

"infrastructure" means water storage dams, roads and tracks, buildings and other structures built for the purpose of mining activities but does not include other facilities required for the long term management of mining impacts or the protection of potential resources. Such other facilities include dams, waste rock dumps, voids, or ore stockpiles and buildings as well as other structures whose ownership can be transferred and which have a residual beneficial use for the next owner of the operational land or the background landowner.

"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 capability" as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

"land suitability" as defined in the DME 1995 Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland.

"land use" term to describe the selected post mining use of the land, which is planned to occur after the cessation of mining operations.

"landholder's active groundwater bore" means bores that are able to continue to provide a reasonable yield of water in terms of quantity for the bores authorised purpose or use. This term does not include monitoring bores owned by the administering authority of the *Water Act 2000*.

"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).

"mandatory reporting level" or **"MRL"** means a warning and reporting level determined in accordance with the criteria in the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933)published by the administering authority.

"manual" means the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933) published by the administering authority, as amended from time to time.

"mg/L" means milligrams per litre.

"maximum extent of impact" means the total, cumulative extent and duration of impact to a prescribed environmental matter that will occur over a project's life after all reasonable avoidance and reasonable on-site mitigation measures have been, or will be, undertaken.

"mine affected water" means the following types of water:

a) pit water, tailings dam water, processing plant water; or

b) 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; or

c) 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 runoff containing sediment only, provided that this water has not been mixed with pit water, tailings dam water, processing plant water or workshop water; or

d) groundwater which has been in contact with any areas disturbed by mining activities which have not yet been rehabilitated; or

e) groundwater from the mine's dewatering activities; or

f) a mix of mine affected water (under any of paragraphs a)-e)) and other water; or

g) underground water brought to the surface of the earth, or moved underground in connection with exploring for, or producing coal seam gas; or

h) water used in stimulation activities including but not limited to stimulation flow back water.

"minimise" is to reduce to the smallest possible amount or degree.

"mining activity(ies)" means:

a) an activity that is an authorised activity for a mining tenement under the *Mineral Resources Act 1989*; or

b) another activity that is authorised under the *Mineral Resources Act 1989* that grants rights over land.

"modification or modifying" (see definition of 'construction').

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

"notice of election" has the meaning in section 18(2) of the Environmental Offsets Act 2014.

"noxious" means harmful or injurious to health or physical well-being.

"offensive" means causing reasonable offence or displeasure; is disagreeable to the sense; disgusting, nauseous or repulsive, other than trivial harm.

"operational plan" includes:

a) normal operating procedures and rules (including clear documentation and definition of process inputs in the DSA);

b) contingency and emergency action plans including operating procedures designed to avoid and/or minimise environmental impacts including threats to human life resulting from any overtopping or loss of structural integrity of the regulated structure.

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

"predominant (plant) species" has the meaning in the Methodology for Surveying and Mapping of Regional Ecosystems and Vegetation Communities in Queensland (Version 3.2 August 2012) and means a species that contributes most to the overall above-ground biomass of a particular stratum.

"prescribed environmental matters" has the meaning in section 10 of the *Environmental Offsets Act 2014*, limited to the matters of State environmental significance listed in Schedule 2 of the Environmental Offsets Regulation 2014.

"protected area" means:

a) a protected area under the *Nature Conservation Act 1992*;

b) a marine park under the *Marine Parks Act 2004*; or

c) a World Heritage Area.

"receiving environment" means all groundwater, surface water, land and sediments that are not disturbed areas authorised by this environmental authority.

"receiving waters" means all groundwater and surface water that are not disturbed areas authorised by this environmental authority.

"reference site" means an area of land which contains values and characteristics representative of an area to be rehabilitated prior to disturbance. Such values must encompass:

a) land use;

b) topographic aspects;

c) the chemical and physical characteristics of the soil;

d) vegetation community attributes including species types and diversity;

e) fire regime; and

f) other ecological characteristics.

Reference sites can be the pre-disturbed site of interest where significant surveying effort has been undertaken to establish benchmark parameters.

"Register of Regulated Structures" includes:

a) date of entry in the register;

b) name of the structure, its purpose and intended/actual contents;

c) The consequence category of the dam as assessed using the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933);

d) dates, names, and reference for the design plan plus dates, names, and reference numbers of all document(s) lodged as part of a design plan for the dam;

e) name and qualifications of the suitably qualified and experienced person who certified the design plan 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 structure" means any structure in the significant or high consequence category as assessed using the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (ESR/2016/1933) published by the administering authority. A regulated structure does not include:

a) a fabricated or manufactured tank or container, designed and constructed to an Australian Standard that deals with the strength and structural integrity of that tank or container; or

b) a sump or earthen pit used to store residual drilling material and drilling fluid only for the duration of frilling and well completion activities; or

c) a flare pit.

"rehabilitation" the process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.

"release event" means a surface water discharge from mine affected water storages or contaminated areas on the licenced place.

"reporting limit" means the lowest concentration that can be reliably measured within specified limits of precision and accuracy during routine laboratory operating conditions. For many analytes, the reporting limit is selected as the lowest non-zero standard in the calibration curve. Results that fall below the reporting limit will be reported as "less than" the value of the reporting limit. The reporting limit is also referred to as the practical quantitation limit or the limit of quantitation. For polycyclic aromatic hydrocarbons, the reporting limit must be based on super-ultratrace methods and, depending on the specific polycyclic aromatic hydrocarbon, will range between 0.005 ug/L–0.02 ug/L.

"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.

"restricted stimulation fluids" has the meaning in section 206 of the Environmental Protection Act 1994 and means fluids used for the purpose of stimulation, including fracturing, that contain the following chemicals in more than the maximum amount prescribed under a regulation—

a) petroleum hydrocarbons containing benzene, ethylbenzene, toluene or xylene;

b) chemicals that produce, or are likely to produce, benzene, ethylbenzene, toluene or xylene as the chemical breaks down in the environment.

"riparian areas/corridor" is defined as:

any land which adjoins, directly influences, or is influenced by a body of water. This includes:

a) the land immediately alongside small creeks and river, including the riverbank itself;

b) gullies and dips which sometimes run with surface water;

c) areas surrounding lakes; and

d) wetlands on river flood plains which interact with the river in times of flood.

"riverine" includes the creek/riverbed and its associated adjoining riparian zone.

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

"saline drainage" the movement of waters, contaminated with salt(s), as a result of the mining activity.

"self-sustaining" means an area of land which has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.

"sensitive place" means:

a) a dwelling, residential allotment, mobile home or caravan park, residential marina or other residential premises; or

b) a motel, hotel or hostel; or

c) an educational institution; or

d) a medical centre or hospital; or

e) a protected area under the Nature Conservation Act 1992, the Marine Parks Act 2004 or a World Heritage Area; or

f) a public park or gardens.

Note: The definition of 'sensitive place' and 'commercial place' is based on Schedule 1 of the Environmental Protection (Noise) Policy 2008. That is, a sensitive place is inside or outside of a dwelling, library and education institution, childcare or kindergarten, school or playground, hospital, surgery or other medical institution, commercial and retain activity, protected area or an area identified under a conservation plan under the Nature Conservation Act 1992 as a critical habitat or an area of major interest, marine park under the 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.

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

For example, 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.

"significant residual impact" has the meaning in section 8 of the *Environmental Offsets Act 2014*.

"spillway" means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges from the dam, normally under flood conditions or in anticipation of flood conditions.

"stable" in relation to land, means landform dimensions are or will be stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.

"stimulation" means a technique used to increase the permeability of natural underground reservoir that is undertaken above the formation pressure and involves the addition of chemicals. It includes hydraulic fracturing/ hydrofracking, fracture acidizing and the use of proppant treatments.

Explanatory note: This definition is restricted from that in the Petroleum and Gas (Production and Safety) Act 2004 in order to only capture the types of stimulation activities that pose a risk to environmental values of water quality in aquifers.

"stimulation fluid" means the fluid injected underground to increase permeability. For clarity, the term stimulation fluid only applies to fluid injected down well post-perforation.

"stimulation impact zone" means a 100m maximum radial distance from the stimulation target location within a gas producing formation.

"**stimulation initiation point**" means the geographical location of stimulation within the stimulation bore hole.

"structure" means dam or levee.

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

a) for regulated dams, an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design; or

b) for regulated levees, an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments.

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

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

"µg/L" means micrograms per litre

"µS/cm" means microsiemens per centimetre

"void" means any constructed, open excavation in the ground.

"Watercourse" has the same meaning given in the *Water Act 2000*.

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

"water year" means the 12-month period from 1 July to 30 June.

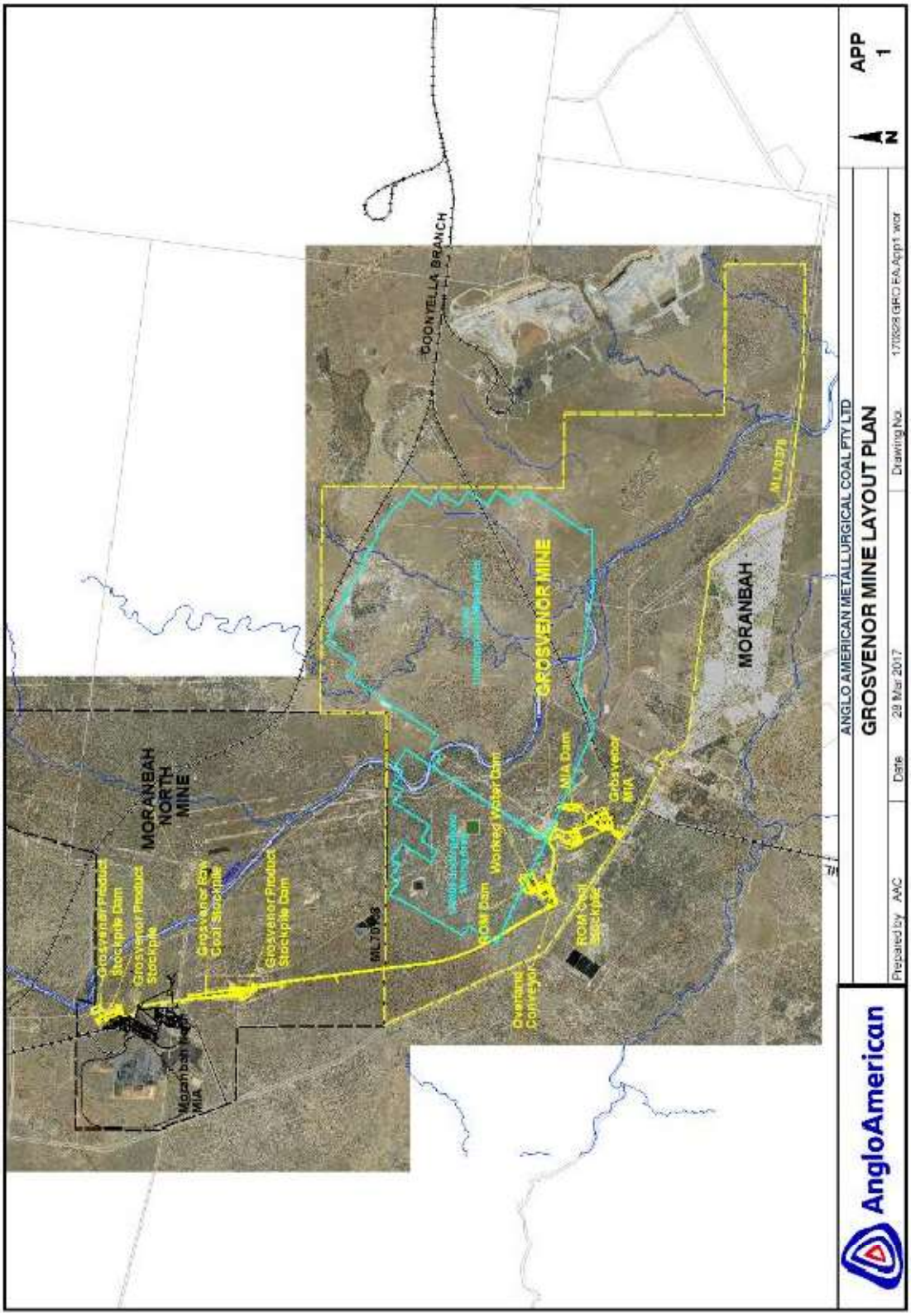
"waters" includes all or any part of a river, stream, lake, lagoon, pond, swamp, wetland, unconfined surface water, unconfined water in natural or artificial watercourses, bed and banks of a watercourse, dams, non-tidal or tidal waters (including the sea), stormwater channel, stormwater drain, roadside gutter, stormwater run-off, and groundwater and any part thereof.

"well integrity" the ability of a well to contain the substances flowing through it.

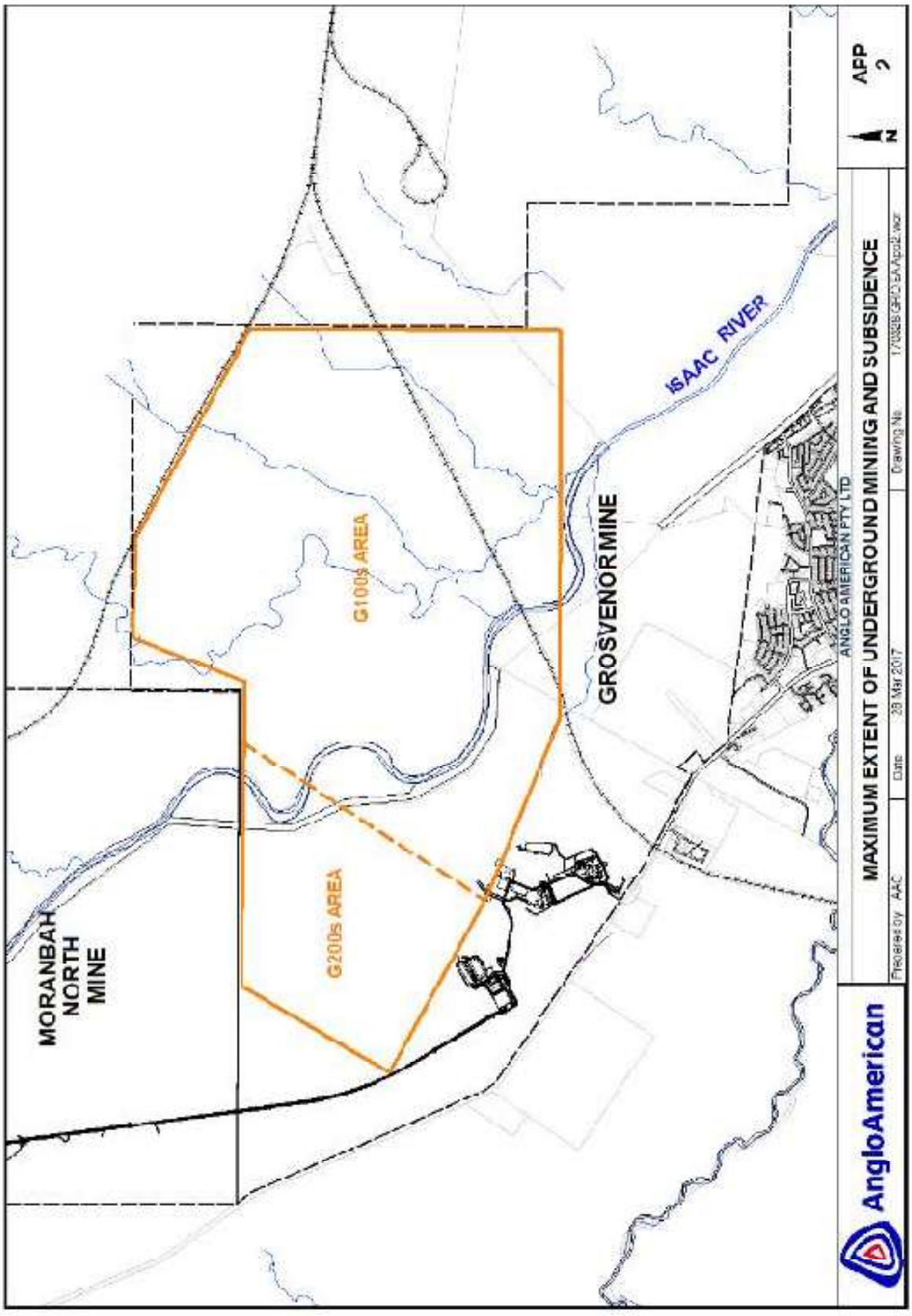
"wet season" means the time of year, covering one or more months, when most of the average annual rainfall in a region occurs. For the purposes of DSA determination this time of year is deemed to extend from 1 November in one year to 31 May in the following year inclusive.

Appendices

Appendix 1: Grosvenor Site Plan (Layout Plan)



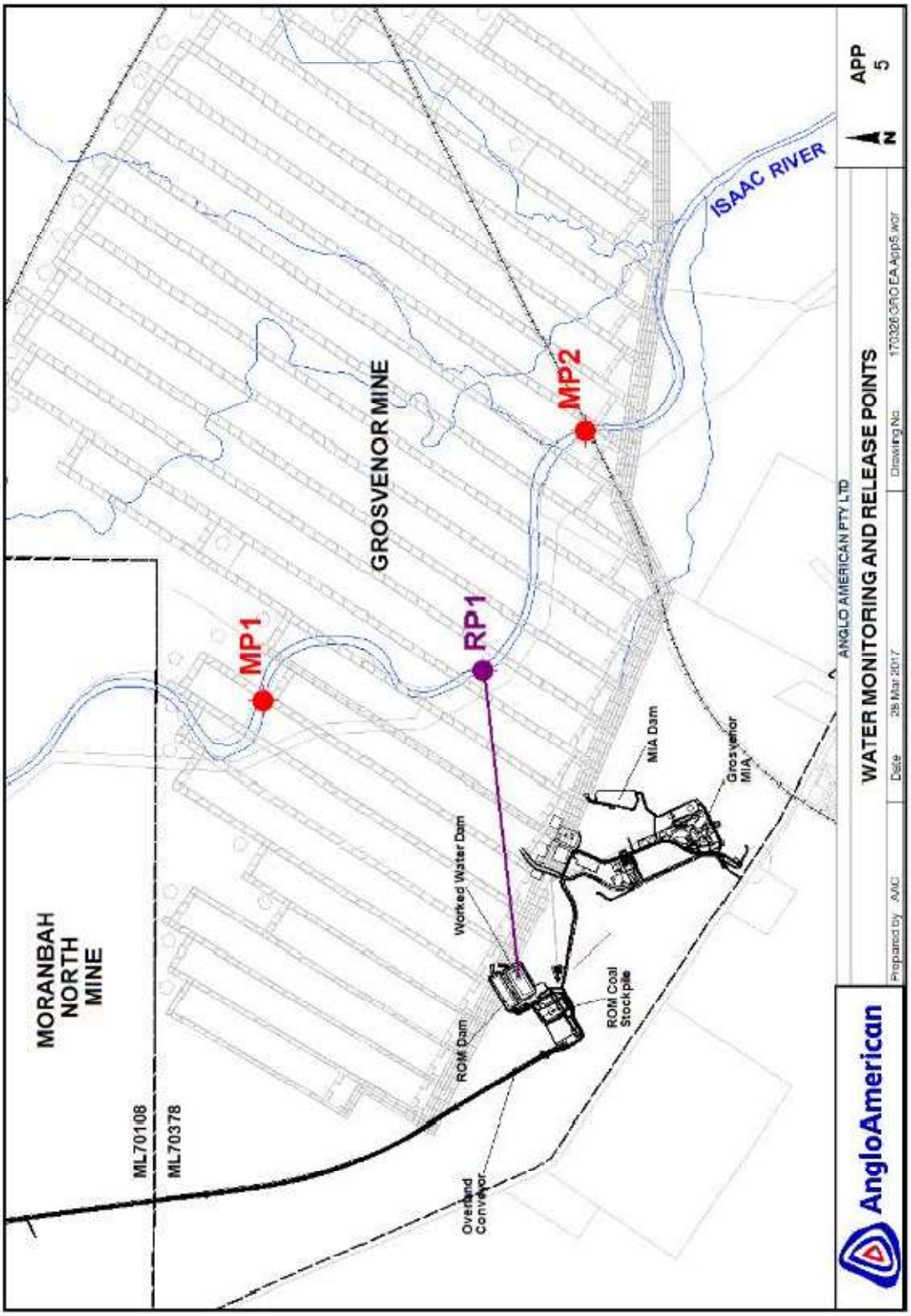
Appendix 2: Maximum Extent of Underground Mining and Subsidence



Appendix 3: Grosvenor Site Plan (Surface Facilities Conceptual Layout)

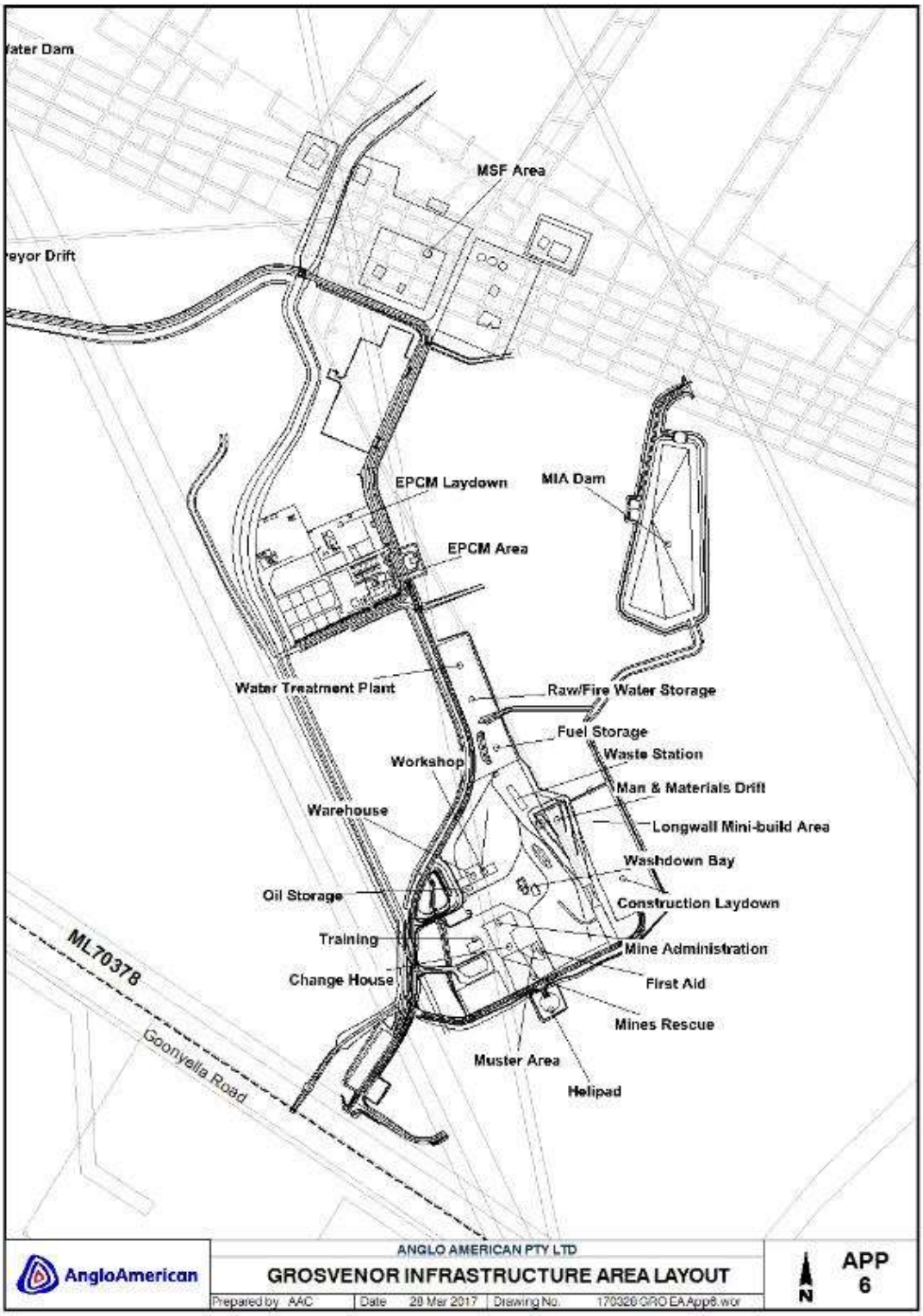


Appendix 4: Grosvenor Site Plan (Petroleum Facility Licence)

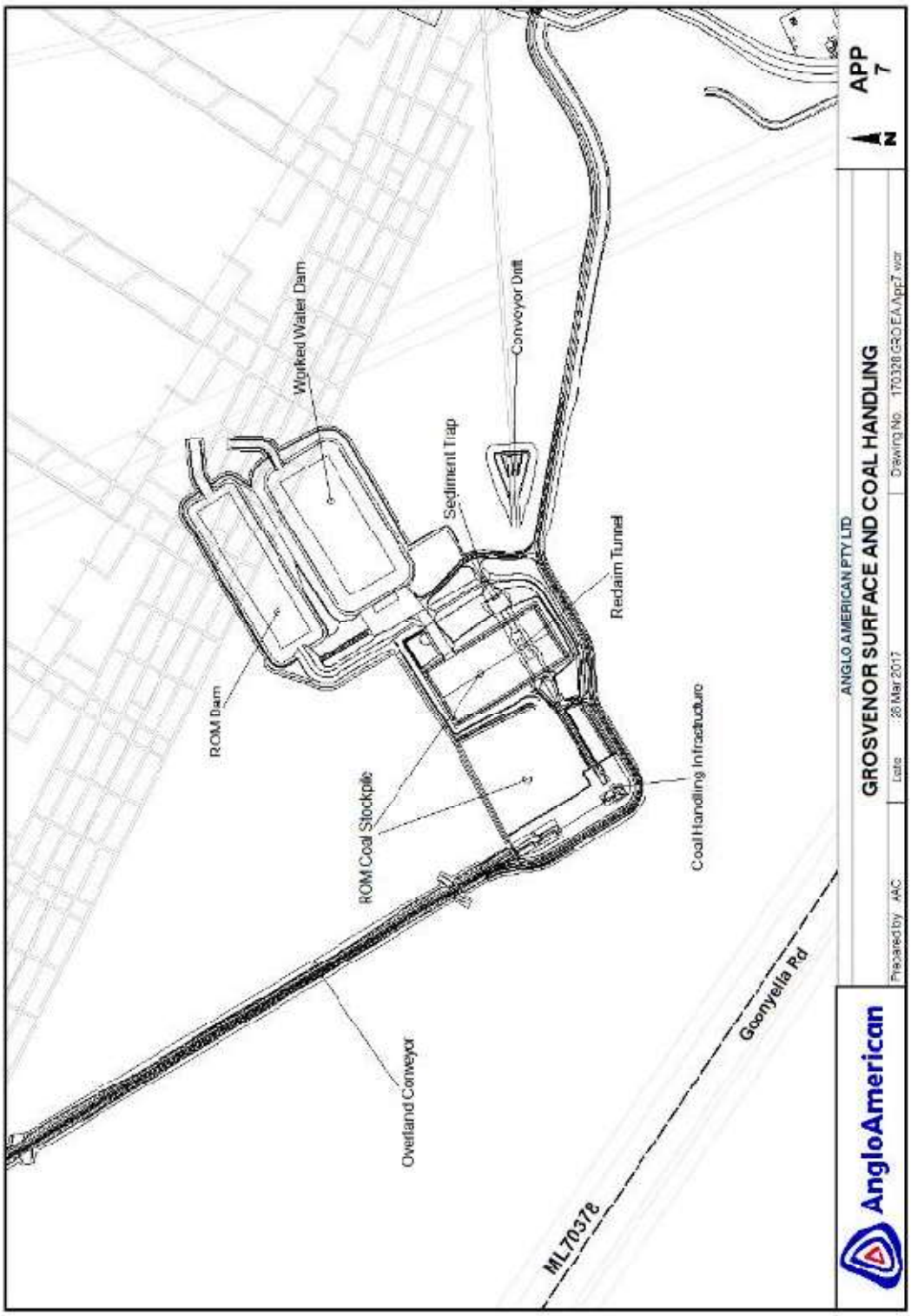


Appendix 5 - Water Release Points and Monitoring Points

Appendix 6: Surface Facilities – Workshops and Administration



Appendix 7: Surface Facilities – Surface and Coal Handling



Appendix 8: Watercourse Subsidence

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 proponent.

Governing legislation

Historically, subsidence on mining leases has been managed under two separate Government Departments; the Environmental Protection Agency (EPA) and Natural Resources and Water (NRW). Under the former EPA, subsidence within mining leases was conditional to the proponent's EA, however the impact on watercourses was not specifically addressed.

Now Departments are as one, regulation can be coordinated such as watercourse subsidence is authorised under specific conditions included in an EA issued under the *Environmental Protection Act 1994*. Works undertaken within the bed and banks of a watercourse aimed at mitigating or remediating any physical impacts pre or post-subsidence are also authorised under the conditions of the EA. This guideline has been developed to assist the Department and proponents in undertaking a single collaborative process in the assessment and authorisation of proposals regarding subsidence of watercourses.

Environmental impact associated with mining activities is regulated under the *Environmental Protection Act 1994*. While this legislation does not identify longwall mining as a specific mining activity, it provides a definition of a 'mining activity' and 'environmental harm'. The process of longwall mining and resultant subsidence is governed by the legislation and authorised under a proponent's EA.

The holder or holders of a mining tenement issued under the *Mineral Resources Act 1989* must hold an EA for the mining activities to be carried out on the tenement. When applying for an EA, a number of environmental management documents must be in place describing the proposed project and the management of any environmental impacts.

An Environmental Management Plan (EM Plan) is a strategic document which provides information to support the application for an EA and proposes environmental protection commitments. It describes the project and surrounding environment, identifies relevant environmental values likely to be affected by the mining activities, outlines the potential adverse and beneficial impacts on environmental values and provides details on how the proposal will protect and enhance these values. Once an EA has been granted, a Plan of Operations is required.

A Plan of Operations describes the actions and programs required to achieve compliance with the conditions of an EA. It also describes the actions and programs required to achieve or implement the commitments contained

in the relevant EM Plan. All activities carried out on a mining lease must be carried out in accordance with the submitted Plan of Operations. A Plan of Operations describes an action program for complying with the conditions of the associated EA and EM Plan, contains a plan showing where all activities are to be carried out on the land, and includes a rehabilitation program for land disturbed or proposed to be disturbed.

Whilst management of subsidence will be included in both the EM Plan and the Plan of Operations, the Subsidence Management Plan is a stand-alone document authorised under the conditions of the EA.

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 economical 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*

    i) A general description of the area pre subsidence including photographic record should be provided.

    ii) 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 a 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 riverbed 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 an y 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*

   i) *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.

   ii) *Cumulative Impacts on Watercourses*

      With an increasing number of mines being established in close proximity to watercourses, a proponent 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

<u>Monitoring</u>

- 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
    - 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 proponent 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 a suitably 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 proponent 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 proponent 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 proponent'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

END OF ENVIRONMENTAL AUTHORITY