Department of Environment and Resource Management

Notice

Environmental Protection Act

Decision to grant an amendment application for an environmental authority (chapter 5A activities)

This notice is issued by the administering authority pursuant to section 310Y of the Environmental Protection Act 1994, *to advise you of a decision or action.*

Australia Pacific LNG Pty Limited
Ground Floor, North Tower
339 Coronation Drive
MILTON QLD 4064

Your reference : PEN10006787
Our reference : 316919 / BNE40467

Attention: Mr Graeme Bartrim

Re: Application for the amendment of a level 1 non-code compliant environmental authority (chapter 5A activities) by Australia Pacific LNG Pty Limited on ATP692, ATP702, PL215, PL216, PL225, and PL226.

The above mentioned application was received by this office on 14 August 2009. The administering authority has decided to grant the application pursuant to section 310Y of the *Environmental Protection Act 1994* as follows:

Principal Holder	Joint Holder(s)	Resource Authority	Environmental Authority number	Decision
Australia Pacific LNG Pty Limited	N/A	ATP692, ATP702, PL215, PL216, PL225, PL226	PEN100067807	Granted on 29 June 2010

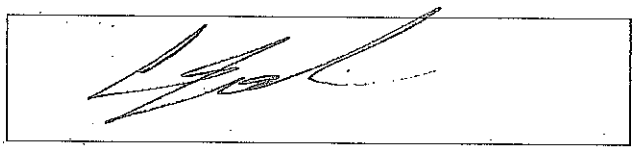
Should you have any queries in relation to this Notice, please contact Mark Hilton of the Department of Environment and Resource Management on telephone (07) 3330 5610.

Department of Environment and Resource Management
www.derm.qld.gov.au ABN 46 640 294 485

Queensland Government

Notice

Decision to grant an amendment application for an environmental authority (chapter 5A activities)



Signature

29 June 2010.

Date

Louise Jordan
Delegate of Administering Authority
Environmental Protection Act 1994

Enquiries:
Department of Environment and Resource Management
Petroleum and Gas Unit
Level 7, 400 George Street
BRISBANE QLD 4000
GPO Box 2454
BRISBANE QLD 4001
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ENVIRONMENTAL PROTECTION ACT 1994

Department of Environment
and Resource Management
Petroleum and Gas Unit
GPO Box 2454
BRISBANE QLD 4001

Environmental Authority (petroleum activities) Permit Number: PEN100067807

Section 310Y *Environmental Protection Act 1994*

This environmental authority is granted under the Environmental Protection Act 1994 *and includes conditions to minimise environmental harm caused, or likely to be caused, by the authorised petroleum activities. An environmental authority (petroleum activities) may be for petroleum activities authorised (under the Petroleum and Gas (Production and Safety) Act 2004, Petroleum Act 1923 or Petroleum (Submerged Lands) Act 1982) to occur under one or more of the following petroleum authorities: authority to prospect; petroleum lease, data acquisition authority, water monitoring authority, petroleum facility licence, survey licence, pipeline licence, licence, permit, primary licence, secondary licence or special prospecting authority. In general, a petroleum activity means an activity that is authorised under the relevant petroleum legislation. Rehabilitation and remediation activities that facilitate and support petroleum activities and any action taken to prevent environmental harm are included in the definition of petroleum activity.*

Under the provisions of the *Environmental Protection Act 1994* this environmental authority is issued to:

Australia Pacific LNG Pty Limited
339 Coronation Drive
MILTON QLD 4064

in respect of carrying out Level 2 Petroleum Activities under Section 23 of the Environmental Protection Regulation 2008 and the following level 1 petroleum activities under Schedule 5A of the Environmental Protection Regulation 2008:

Activity	Description	
Schedule 5, No. 6	A petroleum activity carried out on a site containing a high hazard dam or significant hazard dam.	
Schedule 5, No. 8	A petroleum activity, other than a petroleum activity mentioned in items 1 to 7, that includes a chapter 4 activity for which an aggregate environmental score is stated, including:	
	8(3A)	Chemical storage 10m^3 to 500m^3 of chemicals or dangerous goods Class 3 or Class C1 or C2 combustible liquids under AS1940.
	8(3B)	Chemical storage more than 500m^3 of dangerous goods Class 3 or Class C1 or C2 combustible liquids under AS1940
	10	Gas producing - manufacturing, processing or reforming hydrocarbon gas: 200t/yr or more.
	15	Fuel burning – fuel burning operation using equipment capable of burning at least 500kg/hr of fuel.
	60(1D)	Waste disposal facility (any combination of regulated waste, general waste and limited regulated waste – and <5t untreated clinical wastes if in a scheduled area) >200,000 t/yr.
	63(2B)	Sewage treatment 100 – 1500 EP.

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on or in relation to the relevant petroleum authorities identified below:

Relevant Petroleum Authority	Project Name	Project Location Description
ATP692, ATP702, PL215, PL216, PL225, PL226	Walloons	See Map 1 in Appendix 5

This environmental authority (petroleum activities) is subject to the conditions that the holder carry out the above environmentally relevant activities in accordance with the conditions listed in the attached schedules.

This environmental authority takes effect from **29 June 2010**.

This environmental authority remains in force unless it is cancelled, surrendered or suspended.

The anniversary date of this environmental authority is 14 March.

Signed

29 June 2010
Date

Louise Jordan
Delegate of Administering Authority
Environmental Protection Act 1994

Note: This environmental authority document is not proof of the current status of the environmental authority. The current status of the environmental authority may be ascertained by contacting the administering authority.

SCHEDULE OF CONDITIONS

This environmental authority incorporates the following schedules of conditions relevant to various issues:

Schedule A - General Conditions
Schedule B - Air Emissions
Schedule C - Water Management
Schedule D - Management of CSG Water
Schedule E - Noise Management
Schedule F - Waste Management
Schedule G - Land Management
Schedule H - Sewage Treatment and Effluent Management
Schedule I - Storage and Handling of Chemicals, Flammable and Combustible Substances
Schedule J - Drilling Operations
Schedule K - Environmentally Sensitive Areas
Schedule L - Declared Wild River Areas
Schedule M - Petroleum Infrastructure
Schedule N - Regulated Dams
Schedule O - Fuel Burning Facilities
Schedule P - Monitoring Programs
Schedule Q - Community Issues
Schedule R - Notification Procedures

APPENDIX 1 - Definitions
APPENDIX 2 - Draft standards and specifications for measuring /metering disposal of treated CSG water
APPENDIX 3 - Environmentally Sensitive Areas
APPENDIX 4 - Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions
APPENDIX 5 - Maps
APPENDIX 6 - Determining Hazard Categories for Regulated Dams

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SCHEDULE A GENERAL CONDITIONS

PREVENT AND/OR MINIMISE LIKELIHOOD OF ENVIRONMENTAL HARM

(A1) This authority does not authorise environmental harm unless a condition contained within this authority explicitly authorises that harm. Where there is no condition or the authority is silent on a matter, the lack of a condition or silence shall not be construed as authorising harm.

(A2) In carrying out petroleum activities the holder of this authority must prevent and / or minimise the likelihood of environmental harm being caused.

(A3) When CSG water is treated and released to waters (the Condamine River), if additional risks to public health are identified outside the existing approval conditions they must be managed by the holder of this authority.

(A4) If additional risks are identified under condition (A3), the holder of this authority must submit a plan to the Office of the Water Supply Regulator for approval on how the risks are to be managed.

(A5) The parameters referred to in Schedule C - Table 3 and Schedule D - Table 1 only refer to CSG water that has not been subject to fraccing (excluding cavitation).

(A6) If the holder of this authority wishes to include CSG water that has been subject to fraccing, approval must first be obtained from the Office of the Water Supply Regulator.

(A7) When conducting sampling for the water quality criteria in any condition of this authority and where a test result of "no result" or "laboratory error" are recorded, a supplementary sample must be conducted, where possible prior to the next regulatory scheduled test. The supplementary sample must be conducted and tested as soon as possible after notification of the original test result.

MAINTENANCE OF MEASURES, PLANT AND EQUIPMENT

(A8) The holder of this authority must:

a) install all measures, plant and equipment necessary to ensure compliance with the conditions of this authority; and
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.

(A9) All instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this authority must be calibrated, appropriately operated and maintained.

(A10) The holder of this authority must ensure that daily operation and maintenance of all plant and equipment relating to the authorised petroleum activities are carried out by suitability qualified, competent and experienced person(s).

(A11) No change, replacement or alteration of any plant or equipment is permitted if the change, replacement or alteration increases the risk of environmental harm from the petroleum activities.

(A12) All analyses and tests required to be conducted under this authority must be carried out by a laboratory that has NATA certification for such analyses and tests, except as otherwise authorised by the administering authority.

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FINANCIAL ASSURANCE

(A13) The holder of this authority must provide a financial assurance in the amount and form required by the administering authority for the authorised petroleum activities.

(A14) The financial assurance is to remain in force until the administering authority is satisfied that no claim is likely to be made on the assurance.

DEFINITIONS

(A15) Words and phrases used in this authority are defined in Appendix 1 – Definitions. Where a definition for a term used in this authority is not defined within this authority, the definitions in the *Environmental Protection Act 1994*, its Regulation and Environmental Protection Policies must be used.

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SCHEDULE B AIR EMISSIONS

DUST AND PARTCULATE MANAGEMENT

(B1) The release of any dust and particulate matter resulting from the petroleum activities must not cause an environmental nuisance at any sensitive or commercial place.

(B2) In relation to a complaint received in Condition (B1), dust and particulate matter must not exceed the following levels at any sensitive or commercial place:

a) Dust deposition of 120 milligrams per square metre per day, averaged over one month, when monitored in accordance with AS 3580.10.1 *Methods for sampling and analysis of ambient air - Determination of particulates - Deposited matter - Gravimetric method of 1991*; or

b) a concentration of particulate matter with an aerodynamic diameter of less than 10 micrometre (μm) (PM10) suspended in the atmosphere of 50 micrograms per cubic metre over a 24 hour averaging time, at a nuisance sensitive or commercial place downwind of the site, when monitored in accordance with AS3580.9.6 '*Ambient air – Particulate matter – Determination of suspended particulate PM10 high-volume sampler with size-selective inlet Gravimetric method*'; or

c) a concentration of particulate matter with an aerodynamic diameter of less than 2.5 micrometre (μm) (PM2.5) suspended in the atmosphere of 25 micrograms per cubic metre over a 24 hour averaging time, at a nuisance sensitive or commercial place downwind of the site, when monitored in accordance with AS/NZS3580.9.10.2006.

ODOUR MANAGEMENT

(B3) The release of noxious and / or offensive odour(s) or any other noxious or offensive airborne contaminant(s) resulting from the petroleum activity must not cause an environmental nuisance at any sensitive or commercial place.

ALTERNATIVE ARRANGEMENTS AVAILABLE WHEN AIR EMISSIONS MAY CAUSE NUISANCE

(B4) Where the holder of this authority has, at their cost, made alternative arrangements to the satisfaction of and with the written agreement of each person affected by nuisance air emissions at a sensitive or commercial place, then the requirements specified in conditions (B1)-(B3) will not apply at that sensitive or commercial place for the period of the alternative arrangements.

(B5) As a minimum each written agreement of an alternative arrangement must state:

a) the location of the sensitive or commercial place;
b) the names of the affected persons;
c) the nature of the alternative arrangement(s) (e.g. provision of alternative accommodation); and
d) the period of the alternative arrangement(s).

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SCHEDULE C WATER MANAGEMENT

RELEASE TO WATERS

(C1) The holder of this authority must ensure that the petroleum activities do not result in the release of contaminants to waters unless specifically authorised under this authority.

STORMWATER MANAGEMENT

(C2) Except as otherwise provided by the conditions of this authority, petroleum activities must be carried out by such reasonable and practicable means necessary to prevent the contact of incident rainfall and stormwater runoff with waste or other contaminants arising from petroleum activities.

(C3) All stormwater treatment devices must be maintained in proper and efficient working condition.

(C4) The maintenance and cleaning of vehicles and other equipment or plant must be carried out in purpose built facilities or areas where the resultant contaminants will not be released to any waters.

(C5) A stormwater management system must be designed, implemented and maintained so that:

a) in areas with the potential for significant erosion, erosion control measures are implemented and constructed to minimise the potential for overland flow to enter areas disturbed by petroleum activities;
b) erosion and sediment control structures are placed to minimise erosion of disturbed areas and prevent the contamination of any waters; and
c) contaminated stormwater runoff, incident rainfall and leachate is collected; and treated, reused, or released in accordance with the conditions of this authority.

GROUNDWATER MONITORING

(C6) The holder must prepare and submit a shallow groundwater monitoring program to the administering authority at least 60 days prior to production commencing. If the administering authority gives to the holder of this authority any comment on the monitoring program within 21 days of receiving the document, the holder of this approval must have due regard to those comments when implementing the monitoring program.

(C7) The groundwater monitoring program must be able to detect any significant changes to groundwater quality and level due to activities authorised under this authority. The program must:

(a) include a groundwater monitoring network designed and installed for the ponds containing saline water;
(b) include a sufficient number of monitoring sites to provide adequate information to:
  i. detect seepage from the ponds and understand effects on groundwater;
  ii. benchmark monitoring sites (i.e. background groundwater quality in hydraulically up-gradient or background bore(s) that have not been affected by any release of contaminants to groundwaters);
(c) include location of monitoring points, parameters to be measured, frequency of monitoring, monitoring methodology used, trigger values;
(d) develop procedures to establish background ground water quality; and
(e) be installed and maintained by a person possessing appropriate qualifications and experience in the fields of hydrogeology and groundwater monitoring program design to be able to competently make recommendations about these matters.

(C8) The release of contaminants to groundwaters is not considered to cause environmental harm if monitoring carried out as described in conditions (C6) and (C7) shows that the release does not result in statistically significant, mid to long term water level and contaminant concentration

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increases of more than 10% above those bores that are identified as benchmark groundwater quality bores.

(C9) The method of water sampling required by this authority must comply with that set out in the latest edition of the Department of Environment and Resource Management's Water Quality Sampling Manual.

(C10) The Groundwater Monitoring Program must provide for monitoring of groundwater quality as often as necessary to detect impacts of the petroleum activities, but not less frequently than biannually (every six months) for the first year of carrying out the petroleum activities and annually thereafter.

(C11) Groundwater samples taken as part of the Groundwater Monitoring Program must be analysed for at least the following water quality parameters:

(a) groundwater level (mAHD)
(b) pH (pH scale);
(c) Electrical conductivity (mS/cm);
(d) Sodium Adsorption Ratio.

(C12) All groundwater monitoring bores must be maintained in an operative condition and be reasonably accessible at all times to any authorised person.

(C13) All determinations of groundwater quality and the evaluation/explanation of data for the purposes of the annual monitoring report must be performed by a person or body possessing appropriate experience and qualifications to perform the required determinations and must include an assessment as to whether there is any groundwater contamination and, if so, the level of environmental harm caused as a result of such contamination.

GROUNDWATER MONITORING ANALYSIS REPORTING

(C14) The holder of this authority must ensure that the groundwater monitoring data gathered in accordance with this authority is analysed and interpreted to assess the nature and extent of any environmental impact of the environmentally relevant activity. The data, analysis and assessment must be submitted to the administering authority:

(a) on request; or
(b) with each Annual Return; and
(c) when any significant changes in aquifer connectivity, water level and/or deterioration in groundwater quality is detected within 14 days of receipt of analysis.

(C15) If groundwater monitoring indicates that changes as described in condition (C14) occur, then the information required must include any proposed actions to mitigate the changes in groundwater quality or quantity as well as means to prevent the event recurring.

DETERMINING WATER QUALITY CONTAMINANTS

(C16) All determinations of the quality of contaminants released to waters must be made in accordance with methods prescribed in the latest edition of the Department of Environment and Resource Management's Water Quality Sampling Manual, and carried out on samples that are representative.

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RELEASE TO WATERS OF TREATED CSG WATER

(C17) The release of treated CSG water must not take place until the holder of this authority has informed the administrative authority in writing, within 14 days prior to the discharge, when it intends to commence discharge under this environmental authority.

(C18) The release of treated CSG water is authorised for a maximum period of 18 months following the grant of this environmental authority.

(C19) The maximum volume of treated CSG water that may be released under this environmental authority must not exceed 20 ML per day.

(C20) The release of treated CSG water must only occur from the release point specified in Schedule C - Table 1 and depicted in Appendix 5 – Map 5 Location of Monitoring and Release Points attached to this environmental authority.

Schedule C – Table 1 CSG Water Release Point, Source and Receiving Waters

Release Point (U)	Latitude or northing (GDA94)	Longitude or easting (GDA94)	Contaminant Source and Location	Monitoring Points	Receiving waters description
U1 – Discharge Structure	7027447.36 N	236511.26 E	Treated CSG water from the Talinga RO plant located on PL226	End of pipe for temperature and dissolved oxygen For all parameters excluding temperature and dissolved oxygen; Point C – discharge tank MGA94 – Zone 56 N 7026968.1 E 236453.1 N 7026964.73 E 236461.53 N 7026978.46 E 236465.82 N 7026981.83 E 236457.39	Condamine River

(C21) The release of treated CSG water to waters must comply with the release limits stated in Schedule C - Table 2 when measured at the monitoring points specified in Schedule C - Table 1 for each quality characteristic.

(C22) The release of treated CSG water to waters from the release point must be monitored at the locations specified in Schedule C - Table 1 for each quality characteristics and at the frequency specified in Schedule C - Table 2.

(C23) All determinations of the quality of contaminants released must be carried out on samples that are representative of the discharge.

(C24) If the quality of treated CSG water required by condition (C21), does not meet the criteria specified in Schedule C - Table 2, the environmental authority holder must:

(a) notify the administering authority within five (5) business days; and
(b) complete an investigation in accordance with the ANZECC & ARMCANZ 2000 methodology, into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining:
  i. details of the investigations carried out; and
  ii. actions taken to prevent and/or minimise environmental harm.

(C25) All determinations of treated CSG water quality and the evaluation/explanation of data for the purposes of the annual monitoring report must be performed by a person or body possessing appropriate experience and qualifications to perform the required determinations.

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(C26) The environmental authority holder must monitor and record stream water quality at the Bedarra gauging station (GS422344A) on a quarterly basis for the parameters listed in Schedule C – Table 2 as well as filtered and unfiltered nutrients and the suite of analytes measured at DERM's surface water ambient monitoring sites in the Condamine-Balonne system.

Schedule C –Table 2 CSG Water Release Limits for Release Point U1

Physiochemical Parameters	*Release Limits	Limit Type	Monitoring frequency	
			First month following initial discharge	After first month of discharge.
Electrical conductivity (µS/cm)	200 – 500	Range	Daily during discharge	Daily during discharge
pH (pH Unit)	6.5 – 8.5	Range	Daily during discharge	Daily during discharge
Dissolved oxygen (mg/L)	2	minimum	Daily during discharge	Daily during discharge
Temperature (°C)	+/- 2*	Range	Daily during discharge	Daily during discharge
Suspended Solids (mg/L)	191	Maximum	Monthly	Monthly
Chloride (mg/L)	22 – 120	Range	Daily during discharge	Weekly during discharge
Sulphate (mg/L)	3 – 9	Range	Daily during discharge	Weekly during discharge
Calcium (mg/L)	>5	Range	Daily during discharge	Weekly during discharge
Magnesium (mg/L)	>1	Range	Daily during discharge	Weekly during discharge
Sodium (mg/L)	60	Winter Short term 80 percentile	Weekly during discharge	Weekly during discharge
	75	Summer short term 80 percentile		
	80	Maximum		
#Hardness (mg/L)	Monitor	Range	Daily during discharge	Weekly during discharge
Alkalinity (mg/L)	Monitor	Range	Daily during discharge	Weekly during discharge
SAR (mg/L)	Monitor	Range	Daily during discharge	Weekly during discharge

Notation: *background temperature as measured in the Condamine River in the first permanent pool up stream of the discharge location (7027447.36N, 236511.26E).
to be measured downstream at Bedarra Gauging Station 2km downstream of the discharge site (refer to Appendix 4, Map 5 – Location of monitoring and release points).

(C27) The volume released through the release point must be in accordance with the release limit as per condition (C19) at a flow rate consistent with the velocity of flow in the Condamine River.

(C28) The environmental authority holder must install and maintain a measuring device to measure/ meter the volume of treated CSG water released under this environmental authority.

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(C29) The measuring device/ meter must be installed prior to commencement of release of treated CSG water and its installation must comply with the '*Draft standards and specifications for measuring /metering disposal of treated CSG water*' (refer Appendix 2).

(C30) Upon practical completion of the meter installation, the environmental authority holder must provide a completed 'Meter Installation Form" (available from the administering authority upon request) signed by the installer and the environmental authority holder confirming that the installation complies with the manufacturer's specifications and/or national standards and/or DERM's metering standards (whichever is applicable).

(C31) The environmental authority holder must provide the administering authority with safe access to facilitate inspections, and must comply with any instructions issued by the administering authority relevant to the operation of the pump and meter installation.

(C32) The environmental authority holder must measure and record:
(a) the daily volume released;
(b) the release rate, and
(c) for any change in the release rate—
(i) the date and time of the change; and
(ii) the new release rate.

(C33) The 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.

(C34) Prior to discharge to waters (the Condamine River), the holder of this authority must submit the sampling results collected in accordance with condition (D12), characterising the feed pond(s), wells and treated CSG water to the Office of the Water Supply Regulator for assessment to determine if there is a public health risk and to approval to discharge.

Monitoring of Final Water Quality for the Protection of Public Health

(C35) Notwithstanding condition (C21), the quality of the final water must meet the water quality parameters in Schedule C - Table 3.

Note: If the holder of this authority wishes to exclude any parameter listed in Schedule C - Table 3 from the ongoing final water quality monitoring, approval must be obtained from the Office of the Water Supply Regulator prior to the parameter being excluded.

(C36) Notwithstanding condition (C22), the final water quality must be monitored at the frequency indicated in Schedule C - Table 3 at the point of supply located at "Point C", as provided in Schedule C – Table 1.

(C37) Final water quality monitoring requirements must be based on contaminants found in the CSG water monitoring results from the wells or feed pond(s). If a contaminant previously not identified is found in the wells or feed pond(s), final water quality monitoring for the new parameter must commence in subsequent final water quality testing.

Schedule C - Table 3 Final Water Quality Release Limits

Chemical Compounds/ Parameters of concern		Release Limits (µg/L)	Monitoring Frequency
1, 1 Dichloroethene	(DI)	30	Weekly
1, 2 Dichlorobenzene	(DI)	1500	Weekly
1, 2 Dichloroethane	(DI)	3	Weekly
1, 2 Dichloroethene		60	Weekly
1, 4 Dichlorobenzene	(DI)	40	Weekly
2, 2 Dichloropropionic Acid (DPA)	(DI)	500	Weekly
2,4,5-Trichlorophenol		350	Weekly
2,4,6-Trichlorophenol		20	Weekly

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2,4-Dichlorophenol	(DI)	200	Weekly
2-Chlorophenol	(DI)	300	Weekly
4-Chlorophenol	(DI)	10	Weekly
4-Methylphenol		600	Weekly
4-Nitrophenol		30	Weekly
4-Nonylphenol		500	Weekly
Acenaphthene		20	Weekly
Acenaphthylene		0.014	Weekly
Acrylamide (2-propenamide)		0.2	Weekly
Aluminium		200	Weekly
Ammonia		500	Weekly
Anthracene		150	Weekly
Antimony		3	Weekly
Arsenic		7	Weekly
Barium		700	Weekly
Benzene		1	Weekly
Benzo(a)pyrene		0.01	Weekly
Bisphenol A		200	Weekly
Boron		4000	Weekly
Bromate		20	Weekly
Bromide		7000	Weekly
Bromine		7000	Weekly
Bromochloroacetic acid	(DI)	0.014	Weekly
Bromochloroacetonitrile	(DI)	0.7	Weekly
Bromochloromethane	(DI)	40	Weekly
Bromodichloromethane	(DI)	6	Weekly
Bromoform	(DI)	100	Weekly
Cadmium		2	Weekly
Chlorate		0.8mg/L	Weekly
Chlorine	(DI)	5 000	Weekly
Chlorine dioxide	(DI)	1 000	Weekly
Chlorite	(DI)	300	Weekly
Chloroacetic acid	(DI)	150	Weekly
Chlorobenzene	(DI)	300	Weekly
Chloroform (Trichloromethane)	(DI)	200	Weekly
Chromium (as Cr(VI))		50	Weekly
Copper		2000	Weekly
Cyanide		80	Weekly
Dibromoacetic acid	(DI)	0.014	Weekly
Dibromochloromethane	(DI)	100	Weekly
Dichloroacetic acid	(DI)	100	Weekly
Dichloroacetonitrile	(DI)	2	Weekly
Ethylbenzene		300	Weekly
Fluoride		1500	Weekly
Hydrazine		10 (ng/L)	Weekly
Iodide		100	Weekly
Iodine		60	Weekly
Iron		300	Weekly
Lead		10	Weekly
Manganese		500	Weekly
Mercury		1	Weekly
Molybdenum		50	Weekly
Monochloramine	(DI)	3000	Weekly
Nickel		20	Weekly
Nitrate		50000	Weekly
Nitrite		3000	Weekly
N-Nitrosodiethylamine (NDEA)	(DI)	0.01	Weekly
N-Nitrosodimethylamine (NDMA)	(DI)	0.01	Weekly

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Phenanthrene	150	Weekly
Phenol	150	Weekly
Pyrene	150	Weekly
Radiological Compounds	0.5 mSv/year for the total radionuclide exposure	Weekly
Selenium	10	Weekly
Silver	100	Weekly
Strontium (Stable)(Total)	4000	Weekly
Sulfate	500 000	Weekly
Thallium (Stable)(Total)	Detection limit	Weekly
Titanium (Total)	Detection limit	Weekly
Toluene	800	Weekly
Total Petroleum Hydrocarbons (reported as separate fractions)	(Total) 200	Weekly
Trichloroacetic acid (DI)	100	Weekly
Uranium	20	Weekly
Vanadium	50	Weekly
Xylene	600	Weekly
Zinc	3000	Weekly

Note: DI indicates the parameter is a disinfection by-product.

Commissioning Verification of Treatment Processes

(C38) Within 3 months of the date of issue of this authority, the holder of this authority must prepare and submit to the Office of the Water Supply Regulator a commissioning verification program that demonstrates how final water quality will be met on a continuous basis.

(C39) The commissioning verification program required by condition (C38) must include, but not be limited to:

(a) a description of any storages, treatment processes and equipment, cleaning processes and chemicals used, bypass systems and uses other than release to waters; and
(b) a process flow diagram that clearly indicates the locations and process flows between any storages, treatment processes and equipment, bypass systems and uses other than release to waters; and
(c) submission of a report covering the monitoring program for the parameters specified in Schedule C - Table 3, for the first 3 month from the commencement of release to waters.

Notification

(C40) If the release limits defined in Schedule C - Table 2 are exceeded, the holder of the environmental authority must notify the administering authority within 24 hours of receiving the results.

(C41) The environmental authority holder must, within 28 days of a release that exceeds the conditions of this environmental authority, provide a report to the administering authority detailing:

(a) the reason for the release; and
(b) the location of the release; and
(c) all water quality monitoring results; and
(d) any general observations; and
(e) all calculations; and
(f) corrective actions taken to rectify the cause of the exceedence; and
(g) measures taken to prevent a repeat of the exceedance taking place; and
(h) any other matters pertinent to the water release event.

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(C42) The holder of this authority must immediately notify the Office of the Water Supply Regulator on the Drinking Water Hot Line on (1300 596 709), of any non-compliance of a parameter of the final water quality as specified in Schedule C - Table 3.

(C43) Within 24 hours of the non-compliance being notified to the Office of the Water Supply Regulator, unless the holder of this authority has a reasonable excuse, an interim written report must be submitted to the Office of the Water Supply Regulator. The report must be in the approved form (Water Quality: Reporting an Exceedence of a Standard: Coal Seam Gas Water Release) and contain the circumstances that gave rise to the non-compliance and any corrective actions taken.

(C44) Upon resolution of the incident (i.e. completion of an investigation into the incident including a root cause analysis) the holder of this authority must submit to the Office of the Water Supply Regulator a report detailing:

(a) the reason for the exceedance; and
(b) all water quality monitoring results pertaining to the investigation; and
(c) any general observations; and
(d) all calculations; and
(e) corrective actions taken to rectify the cause of the exceedance; and
(f) measures taken to prevent a repeat of the exceedance taking place; and
(g) any other matters pertinent to the incident.

(C45) The holder of this authority must, upon becoming aware of any non-compliance of a parameter of the final water quality in Schedule C - Table 3, immediately notify the Drinking Water Service Provider responsible for the provision of water supply to Condamine Township.

(C46) If additional risk to public health is identified, the holder of this authority must immediately notify the Drinking Water Service Provider responsible for the provision of water supply to Condamine township and the Office of the Water Supply Regulator on the Drinking Water Hot Line on (1300 596 709).

(C47) If additional risk to public health is identified, this may include but is not limited to for example an increased occurrence of cyanobacterial blooms, the holder of this authority must immediately commence additional testing of the Condamine Township's source water for the parameter/s identified as posing the health risk.

(C48) Testing must be carried out at the weir prior to the effected drinking water off take point for the Condamine Township.

(C49) The holder of this authority must continue testing until such time as the identified risk is no longer evident.

(C50) As soon as practicable the holder of this authority must notify the Office of the Water Supply Regulator on the Drinking Water Hot Line on (1300 596 709) of any event or series of events that is likely to adversely affect the quality of drinking water for the Condamine Township (e.g. even when this is prior to confirmation with laboratory results).

Note: Examples of an event include, but are not limited to:
(a) Natural disasters, e.g. a flood flushing untreated water into the receiving environment;
(b) Process failures where normal operational or mitigation procedures are (or may be) unable to effectively manage the risk;
(c) Any issue that triggers a Drinking Water Service Provider incident or emergency management plan response and may affect public health.

(C51) Prior to discharge, the holder of this authority must develop and submit for approval to the Office of the Water Supply Regulator, an Incident and Emergency Response Plan incorporating communication protocols with the Drinking Water Service Provider downstream of the discharge point as stated in Schedule C – Table 1.

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Receiving Environment Monitoring Program (REMP)

(C52) A REMP must be implemented to monitor and record the effects of the release of contaminants on the receiving environment whilst contaminants are being discharged, with the aims of identifying and describing the extent of any adverse environmental impacts to local environmental values, and monitoring any changes in the receiving water.

Note: For the purposes of the REMP the receiving environment is defined as the waters of the Condamine River down to Cotswolds gauging station and including the Bedarra gauging station, 2km downstream of the release point U1 (refer to Appendix 5 Map 5 – Location of monitoring and release points).

(C53) The REMP must be maintained by a person possessing appropriate qualifications and experience in the field of hydrology and surface water monitoring program design.

(C54) The REMP must address, but not be limited to:

(a) A description of potentially affected receiving waters including key communities and background water quality characteristics based on accurate and reliable monitoring data that takes into consideration any temporal variation (e.g. seasonality);
(b) A description of applicable environmental values, including but not limited to:
    i. hydrology (flow, duration, periodicity, connectivity with groundwater systems;
    ii. physiochemical properties;
    iii. aquatic ecosystem parameters including flow and fauna habitat; and
    iv. geomorphological features;
(c) A description of water quality objectives to be achieved (i.e. as scheduled pursuant to the *Environmental Protection (Water) Policy 2009*);
(d) Any relevant reports prepared by other governmental or professional research organisations that relate to the receiving environment within which the REMP is proposed;
(e) Water quality targets within the receiving environment to be achieved, and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the REMP.
(f) Monitoring for any potential adverse environmental impacts caused by the release including impacts to bank stability and erosion;
(g) Monitoring of stream flow and hydrology;
(h) Measurement of the banks and beds of the receiving environment for SAR and an assessment of soil sodicity and erosion;
(i) An assessment of bank stability and an evaluation of water course bank slumping;
(j) Monitoring of contaminants should consider the limits specified in Schedule C - Table 2 to assess the extent of the compliance of concentrations with water quality objectives and/or the ANZECC & ARMCANZ 2000 guidelines for slightly to moderately disturbed ecosystems;
(k) Monitoring of physical chemical parameters as a minimum those specified in Schedule C - Table 2 (in addition to dissolved oxygen saturation);
(l) Monitoring biological indicators (for macroinvertebrates in accordance with the AusRivAS methodology and metals/metalloids in sediments (in accordance with ANZECC & ARMCANZ 2000, *A Guide To The Application Of The ANZECC & ARMCANZ Water Quality Guidelines In The Minerals Industry* (BATLEY et al) and/or the most recent version of AS5667*.1 Guidance on Sampling of Bottom Sediments*) for permanent, semi-permanent water holes and water storages;
(m) Monitoring of a selection of macro-invertebrate species (minimum three from the local receiving environment) to assess health (e.g. exoskeleton density) in respect to the availability of calcium of magnesium.
(n) The methods for analysis and interpretation all monitoring results;
(o) The locations of monitoring points (including the locations of proposed background and downstream impacted sites for each release point);
(p) The frequency or scheduling of sampling and analysis sufficient to determine water quality objectives and to derive site specific reference values within two (2) years (depending on wet season flows) in accordance with the *Queensland Water Quality Guidelines* 2009. For ephemeral streams, this should include periods of flow irrespective of mine or other discharges;

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(q) Specify sampling and analysis methods and quality assurance and control;
(r) Any historical data sets to be relied upon;
(s) Description of the statistical basis on which conclusions are drawn,
(t) Any control or reference sites; and
(u) Recording of planned and unplanned releases to watercourses, procedures for event monitoring, monitoring methodology used and procedure to establish background surface water quality.

(C55) The REMP must be prepared and submitted in writing to the administering authority four (4) months after this environmental authority has taken effect.

Discharge to Waters Release Strategy

(C56) The environmental authority holder must prepare and submit a treated CSG water "Discharge to Waters Release Strategy" to the administering authority within 12 months of grant of this environmental authority should a continuance of the discharge to the Condamine River be proposed by the environmental authority holder.

(C57) The strategy required by condition (C56) must, at a minimum:

(a) Be based on observed flows; and
(b) Include trigger thresholds for the commencement and cessation of the releases; and
(c) Include a monitoring and reporting scheduling (including provisions for the establishment of an upstream gauging station); and
(d) Take into account pre-development flow regimes; and
(e) Identify opportunities to restore flows to a pre-development state to as great an extent as is practicable.

Water Release Reduction Strategy

(C58) As part of the CSG Water Management Plan (CSG WMP) the holder of the environmental authority must develop and implement an on-going Release Reduction Strategy to maximise CSG water re-use and minimise any release to waters from the Reverse Osmosis Plant located on PL226 and the storage of CSG water in holding dams. The strategy must address the following matters:

(a) implementation of re-use schemes to achieve maximum use of the water;
(b) specific targets for achieving increased re-use of CSG water both treated and untreated;
(c) a market analysis at least every three (3) years to identify existing and future opportunities for water re-use;
(d) on-going review of emerging technologies and/or re-use options that could achieve significant reductions in mass loads of contaminants released to the environment;
(e) investigation of the feasibility of alternative options, practices and procedures to further minimise the volume and concentration of contaminants released to waters; and
(f) programs to implement feasible options to achieve increased water re-use and reduction in contaminant loads, including actions and timeframes for completion.

(C59) A progress report on the Release Reduction Strategy must be submitted to the administering authority with each annual return. The report(s) must address at least the following matters:

(a) details of the specific options, practices and procedures investigated;
(b) details of new practices, procedures and programs implemented since the last reporting period and targets met;
(c) where alternative options, practices and procedures are not considered feasible, the provision of justification to support that determination; and
(d) details of the option(s) yet to be implemented, including the timeframes for implementation, and justification for the chosen option(s).

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SCHEDULE D MANAGEMENT OF CSG WATER

CSG WATER MANAGEMENT PLAN

(D1) The holder of this authority must develop and submit, to the administering authority a CSG Water Management Plan (AWM Plan) for the proposed petroleum activities. The AWM Plan must adequately identify and quantify all waste generated and propose management options for disposing of or beneficially reusing CSG water. The AWM Plan must address the following matters:

(a) identification of environmental issues and potential impacts;
(b) control measures for routine operations to minimise likelihood of environmental harm;
(c) contingency plans and emergency procedures for non-routine situations;
(d) organisational structure and responsibility;
(e) effective communication;
(f) monitoring of contaminant releases;
(g) conducting environmental impact assessments;
(h) staff training;
(i) record keeping; and
(j) periodic review of environmental performance and continual improvement.

(D2) The AWM Plan must set specific performance goals, identify measures to achieve or maximise the beneficial reuse of CSG water and minimise the generation or emissions of potential contaminants to the receiving environment. The Plan should:

(a) State the objectives to be achieved and maintained under the Plan;
(b) State how the objectives are to be achieved and a timetable to achieve the objectives taking into account –
(c) Best practice environmental management;
(d) Current technology; and
(e) Risks of environmental harm being caused.
(f) State appropriate performance indicators at time intervals of not more than 12 months;
(g) Make provisions for monitoring and reporting compliance with this Plan; and
(h) State how the AWM Plan will comply with the requirements of the 'Queensland Coal Seam Gas Water Management Policy, released June 2010.

(D3) The holder of this authority must ensure that any ponds used as a primary means of disposal of CSG water are decommissioned and the area rehabilitated to final land use standard by 1 November 2011.

(D4) The holder of this authority must submit the AWM Plan for review to the administering authority within six (6) months after this authority is issued.

(D5) The holder of this authority must amend the AWM Plan to reflect any comments provided by the administering authority.

(D6) The holder of this authority must operate all CSG water management facilities in accordance with the AWM Plan.

(D7) The AWM Plan must not be implemented or amended in a way that contravenes any condition of this authority.

(D8) The holder of this authority must review the AWM Plan every three years. The review must consider current strategies, best practice alternatives, advances in new technology, standards and practices in relation to the management of CSG water, new beneficial use proposals and the management of respective waste streams.

(D9) Subject to Condition (D8), the holder will need to provide justification why existing management strategies and standards should be continued.

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(D10) The holder of this authority must provide a monitoring and compliance report in accordance with condition (D2) to the administering authority upon request and on submission of annual return. This report must provide information on the quantity of water produced, monitoring reports, contaminant loads and how waste streams are being managed in accordance with the AWM Plan

(D11) Notwithstanding conditions (D8 and D9), the holder of this authority may apply to the administering authority to amend the AWM Plan by written agreement with the administering authority.

CSG Water Monitoring Program

(D12) Prior to discharge and until such time as approval is gained from the Office of the Water Supply Regulator to discharge, the holder of this authority must undertake a water quality monitoring program (the program). The program must include:

(a) twice weekly monitoring of the feed pond(s) for the parameters stated in Schedule C - Table 3, at varying locations to ensure an indicative characterisation of the feed water (care should be taken to avoid sampling in close proximity to the permeate discharge location);

(b) twice weekly 10% rotational monitoring of all active wells for the parameters stated in Schedule C - Table 3 (excluding those parameters identified in Schedule C -Table 3 as disinfection by-products), expanding to include additional wells as they commence supply of CSG water to the feed ponds;

(c) Twice weekly monitoring of the final water quality for the parameters stated in Schedule C - Table 3 at the location indicated in condition (C36);

(d) In addition to Schedule C - Table 3, the following analysis must be undertaken on the samples collected under this condition:
   a) an ICP-MS screen of the whole periodic table;
   b) Screening for organics including:
      a. PAHs including methylated and heteroatom analogues
      b. Phenols, including chlorophenols and nitrophenols
      c. Petroleum hydrocarbons and heteroatom analogues
   c) Characterisation of radioisotopes
   d) Microbiological characterisation

e) submission of the initial monitoring data from a), b), c) and d) to the Office of the Water Supply Regulator to gain approval to discharge.

Note: The analysis required by condition (D12) should be undertaken by Queensland Health Forensic and Scientific Services (QHFSS)

(D13) Within 3 months provision of a report to the Office of the Water Supply Regulator for assessment and approval detailing the results of the CSG water monitoring for the water quality parameters in Schedule C - Table 3, including a statistical analysis of the CSG water quality data including but not limited to: maximum and minimum concentrations; mean, medium and the standard deviation over time;

(D14) Within 3 months of the date of issue of this authority, the holder of this authority must provide the Office of the Water Supply Regulator with a map or grid coordinates indicating the location of bores supplying CSG water to the feed pond(s) for treatment and any bores preparing to commence supply or which have commenced supply since the date this authority was issued.

(D15) Within 3 months of the date of issue of this authority, the holder of this authority must provide the Office of the Water Supply Regulator with the results from the monitoring undertaken in condition (D12).

Ongoing CSG Water Monitoring

(D16) Within 3 months of the date of issue of this authority, the holder of this authority must provide to the Office of the Water Supply Regulator for assessment and approval an ongoing monitoring program covering all parameters detected in the initial characterisation of the wells, feed pond(s)

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and final CSG waters for release. This program must be statistically sound and representative of the identified parameters and their presence within the source and final CSG waters.

(D17) Ongoing monitoring of the quality of the CSG water in the feed pond must be conducted for the water quality parameters outlined in Schedule C - Table 3 on a weekly basis.

(D18) The monitoring must be conducted as close as possible to the feed pond prior to chloramination, as indicated by grid coordinates E 238526 N 7024722.

Note: If the holder of this authority wishes to exclude any parameter listed in Schedule C - Table 3 from the ongoing monitoring, approval must be obtained from the Office of the Water Supply Regulator prior to the parameter being excluded.

AUTHORISED USES OF CSG WATER

(D19) The holder of this authority must ensure that CSG water is not released to land or waters, unless specifically authorised:

(a) under this authority for dust suppression and in civil construction works on the relevant petroleum authority, provided that the water meets the standards and requirements set out in Schedule D – Table 1 and Map 3 in Appendix 5 and Schedule D – Table 2; or
(b) under Section 186 of the *Petroleum and Gas (Production and Safety) Act 2004*; or
(c) under Section 86 of the *Petroleum Act 1923*; or
(d) under Section 74 of the *Water Act 2000*.

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Schedule D – Table 1 – Water use for dust suppression and construction

Infrastructure Type	Location/ code	Water type	Total period water will be required	Means of application
Road	Yellow (construction of flow lines)	CSG water	1-2 weeks	3-4 times per day
Road	Yellow (drilling of wells)	CSG water	1-2 weeks	Once per day (morning) for dust suppression
Road	Orange - Minor roads within site	bore/rainwater	12 months	1 pass per day twice a week for dust suppression
Road	Pink major roads within site	rainwater	12 months	Twice per day for dust suppression
Pond B	Red (Major infrastructure construction)	CSG water	6 months total with 2 months per cell	Water is mixed with soil then soil put into cell wall - regularly through day
Gas Plant - main gas plant footprint	Red (Major infrastructure construction)	freshwater	3 months	Applied regularly throughout the day for concreting works
Gas Plant - infrastructure area (i.e. periphery to main site)	Red (Major infrastructure construction)	CSG water	2 months	Water is mixed with soil to achieve optimum water content for compaction
WTF- Feed pond	Red (Major infrastructure construction)	CSG water	6 weeks total with 3 weeks per cell	Water is mixed with soil then soil put into cell wall - regularly through day
WTF - Main facility site	Red (Major infrastructure construction)	CSG water	6 weeks	Water is mixed with soil to achieve optimum water content for compaction
Water Treatment Facility Feed Pond	Red (Major infrastructure construction)	CSG water	12 weeks	Water is mixed with soil then soil put into cell wall - regularly through day
Pond D (Cell1)	Red (Major infrastructure construction)	CSG water	6 months from start of construction	Water is mixed with soil then soil put into cell wall - regularly through day

The colour given in the Location/code column in Table 1 refers to colour-coded areas on Map 3 – in Appendix 5, which shows the frequency of use of the roads. Yellow indicates light use; orange intermittent, pink regular and red represents major construction.

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Schedule D – Table 2 CSG water quality – release limits.

PARAMETER	UNITS	MINIMUM	MAXIMUM
pH	pH Units	6.0	9.0
Electrical Conductivity	µS/cm	Not specified	6,000
Sodium Adsorption Ratio	-	Not specified	57.0
Volume	ML/day	Not specified	3.0

(D20) Despite Condition (D19), the holder of this authority must ensure that the CSG water to be used for domestic or stock purposes meets the ANZECC 2000 Water Quality Guidelines, or subsequent versions thereof, for stock and domestic purposes.

(D21) CSG water released in accordance with condition (D19) must not have any properties nor contain any contaminants in concentrations that are capable of causing environmental harm.

(D22) CSG water released in accordance with condition (D19) must be carried out in a manner that ensures:

(a) vegetation is not damaged;
(b) soil erosion and soil structure damage is avoided;
(c) the quality of groundwater is not adversely affected;
(d) there is no water runoff from the nominated discharge areas other than in accordance with this authority;
(e) there are no releases to any surface waters other than in accordance with this authority; and
(f) there is no surface ponding of CSG water.

(D23) To ensure compliance with conditions D19 and D20, the following monitoring must be carried out:
(a) weekly field based inspections of techniques and equipment;
(b) monthly testing of source water; and
(c) regular visual monitoring of dust levels and associated impacts.

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SCHEDULE E NOISE MANAGEMENT

(E1) Noise from the carrying out of petroleum activities must not cause an environmental nuisance at any sensitive or commercial place.

(E2) Prior to undertaking any petroleum activities, the holder of this authority must investigate the potential noise impacts from the proposed activities on surrounding sensitive and commercial places.

(E3) If the investigation of noise emissions under condition E2 indicates that noise emissions from the proposed petroleum activities are likely to cause environmental nuisance at surrounding sensitive or commercial places, then the holder of this authority must take appropriate measures to either relocate the petroleum activities or incorporate noise abatement and / or attenuation measures to mitigate those impacts as far as is practicable.

(E4) For the purposes of investigating a complaint of unlawful environmental nuisance and determining compliance with condition (E1), noise emissions from the petroleum activities will not constitute unlawful environmental nuisance where the limits specified in Schedule E – Table 1 – Noise Limits are complied with.

Schedule E – Table 1 – Noise Limits

Sensitive place						
Noise level dB(A) measured as:	**Monday to Saturday**			**Sundays and public holidays**		
	7am to 6pm	**6pm to 10pm**	**10pm to 7am**	**9am to 6pm**	**6pm to 10pm**	**10pm to 9am**
$L_{A90, adj, 15 mins}$	lesser of bg+3 or 48	lesser of bg+0 or 40	lesser of bg+0 or 40	lesser of bg+0 or 40	lesser of bg+0 or 40	lesser of bg+0 or 40
$L_{A10, adj, 15 mins}$	lesser of bg+5 or 50	lesser of bg+5 or 45	lesser of bg+0 or 40	lesser of bg+5 or 45	lesser of bg+5 or 40	lesser of bg+0 or 35
$L_{A1, adj, 15 mins}$	lesser of bg+10 or 55	lesser of bg+10 or 50	lesser of bg+5 or 45	lesser of bg+10 or 50	lesser of bg+10 or 45	lesser of bg+5 or 40
Commercial place						
Noise level dB(A) measured as:	**Monday to Saturday**			**Sundays and public holidays**		
	7am to 6pm	**6pm to 10pm**	**10pm to 7am**	**9am to 6pm**	**6pm to 10pm**	**10pm to 9am**
$L_{A90, adj, 15 mins}$	lesser of bg+5 or 50	lesser of bg+0 or 45	lesser of bg+0 or 40	lesser of bg+3 or 43	lesser of bg+0 or 40	lesser of bg+0 or 40
$L_{A10, adj, 15 mins}$	lesser of bg+10 or 55	lesser of bg+10 or 50	lesser of bg+5 or 45	lesser of bg+10 or 50	lesser of bg+10 or 45	lesser of bg+5 or 40
$L_{A1, adj, 15 mins}$	lesser of bg+15 or 60	lesser of bg+15 or 55	lesser of bg+10 or 50	lesser of bg+15 or 55	lesser of bg+15 or 50	lesser of bg+10 or 45

- bg = **background noise level**
- In the event that measured background is less than 25 dB(A), then 25 dB(A) can be substituted for the measured level.

E5) Noise monitoring must be undertaken as directed by the administering authority to investigate any complaint of noise nuisance being caused by the petroleum and associated activities which the administering authority considers is neither frivolous, nor vexatious nor based on mistaken belief,

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and the results thereof notified to the administering authority within 14 days following the completion of noise monitoring.

(E6) Noise monitoring must be undertaken in accordance with the latest edition of the Department of Environment and Resource Management's Noise Measurement Manual or the most recent version of AS1055 *Acoustics – Description and measurement of environmental noise* and the EPA guideline, *Assessment of Low Frequency Noise and Planning for Noise Control* and include:

(a) $L_{Amax, adj, 15\ mins}$ ($L_{A10, adj, 15\ mins}$).
(b) relevant background sound pressure level ($L_{A90, 15\ mins}$);
(c) $L_{A1, adj, 15\ mins}$
(d) the level and frequency of occurrence of impulsive or tonal noise;
(e) atmospheric conditions including wind speed and direction, and
(f) location, date and time of measurements.

ALTERNATIVE ARRANGEMENTS AVAILABLE WHEN NOISE EMISSIONS MAY CAUSE ENVIRONMENTAL NUSIANCE

(E7) Where the holder of this authority has, at their cost, made alternative arrangements to the satisfaction of and with the written agreement of each person that may be affected by nuisance noise emissions at a sensitive or commercial place, then the requirements specified in Schedule E Table 1- Noise Limits will not apply at that sensitive or commercial place for the period of the alternative arrangements.

(E8) As a minimum each written agreement of an alternative arrangement must state:

(a) the location of the sensitive or commercial place;
(b) the names of the affected persons;
(c) the nature of the alternative arrangement(s) (e.g. provision of alternative accommodation); and
(d) the period of the alternative arrangement(s).

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SCHEDULE F WASTE MANAGEMENT

(F1) A Waste Management Program (WMP) in accordance with Part 5 of the *Environmental Protection (Waste Management) Policy 2000* must be developed, implemented within 3 months from the date of this approval, and maintained for the authorised petroleum activities.

(F2) The holder of this authority must ensure that petroleum activities do not result in the release or likely release of a hazardous contaminant to land or waters.

(F3) Any spillage of hazardous contaminants or other contaminants that may cause environmental harm must be effectively contained and/or cleaned up as quickly as practicable. Such spillage must not be cleaned up by hosing, or otherwise thereby releasing such waste or contaminants to any land or waters.

(F4) The holder of this authority must ensure that all general waste produced by the petroleum activities is removed from the relevant petroleum authority and disposed to a facility licensed to accept such waste.

(F5) All regulated waste removed from the site must be removed by a person who holds a current authority to transport such waste under the provisions of the *Environmental Protection Act 1994* and sent to a facility licensed to accept such waste.

(F6) When regulated waste is removed from within the boundary of the petroleum authority and transported by the holder of this authority, a record must be kept of the following:

(a) date of waste transport;
(b) quantity of waste removed and transported;
(c) type of waste removed and transported;
(d) route selected for transport of waste;
(e) quantity of waste delivered; and
(f) any incidents (e.g. spillage) that may have occurred en route.

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SCHEDULE G LAND MANAGEMENT

MINIMISING DISTURBANCE TO LAND AND SOIL MANAGEMENT

(G1) The holder of this environmental authority must:

(a) minimise disturbance to land in order to prevent land degradation; and
(b) ensure that for land that is to be significantly disturbed by petroleum activities, the top layer of the soil profile is removed; and
  i. stockpiled in a manner that will preserve its biological and chemical properties, and
  ii. used for rehabilitation purposes in accordance with Condition (G23).

(G2) The holder of this authority must:

(a) minimise the risk to wildlife and stock; and
(b) construct borrow pits in a manner that will enable effective restoration consistent with the surrounding landuse.

VEGETATION MANAGEMENT

(G3) The holder of this authority must:

(a) prevent or minimise disturbance to vegetation;
(b) manage the effects of clearing to prevent the loss of biodiversity, reduction of ecological processes and land degradation.

(G4) The holder of this authority must consider whether it is feasible to avoid clearing, and where viable alternatives exist, must not clear vegetation:
(a) in, or within a distance to the high bank of a watercourse specified in Schedule G – Table 1;
(b) in, or within100m of a wetland or spring;
(c) in a way that dissects large tracts of vegetation resulting in a reduction in the current level of ecosystem functioning, an increase in threatening processes, or a dissection of corridors of vegetation that provide connection between contiguous tracts of vegetation;
(d) in a way that damages adjacent live vegetation;
(e) on slopes greater than 6° (10%);
(f) on dispersible soils or highly erodible soils; and
(g) in discharge areas.

(G5) Cleared vegetation must be stockpiled in a manner that facilitates respreading or salvaging and does not impede vehicle, stock or wildlife movements.

(G6) Clearing must be limited to the extent that is necessary for the conduct of petroleum activities only.

(G7) Clearing of remnant vegetation for the purpose of establishing roads or tracks, shall not exceed 10 metres in width.

(G8) Where coal seam gas infrastructure is to be located within areas containing *endangered* and/or *of concern* regional ecosystems, an appropriate offset in accordance with the *Policy for Vegetation Management Offsets – 28 September 2007* will need to be proposed.

(G9) Clearing must not occur in a Regional Ecosystem listed in Table 5—of the *Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions* (see Appendix 4 — unless the clearing is less than - a) 10 metres wide; or b) 2 hectares. If clearing of a regional ecosystem listed in Table 5 will exceed these parameters, an appropriate offset in accordance

with the *Policy for Vegetation Management Offsets – 28 September 2007* will need to be proposed.

(G10) In order to prevent land degradation associated with soil erosion and maintain ecological processes, the effects of clearing native vegetation shall be managed by implementing a soil erosion and sediment control plan compiled in accordance with the *Soil Erosion and Sediment Control - Engineering Guidelines for Queensland Construction Sites*, The Institution of Engineers, Australia, Queensland Division (1996).

(G11) Clearing must not occur in an area shown as essential habitat on the essential habitat map. If clearing will occur within an area of essential habitat, an appropriate offset in accordance with the *Policy for Vegetation Management Offsets – 28 September 2007* will need to be proposed.

(G12) Saline ponds/dams must not be located ***within 50 metres*** of remnant *endangered* and *of concern* regional ecosystems.

Note: The *Regional Vegetation Management Codes* and associated information sheets can be obtained from the NRW website on:
http://www.nrw.qld.gov.au/vegetation/pdf/codes/brigalow_code_nov_2006.pdf

MANAGEMENT OF FAUNA

(G13) The holder of this authority must develop and implement a fauna management plan that details how the holder will ensure that petroleum activities are undertaken to minimise the potential risk of causing harm to fauna. The Plan must be developed prior to undertaking the authorised petroleum activities

(G14) The Plan must consider, but not be limited to:

(a) the "Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines" dated October 2005 or subsequent versions thereof;
(b) practices to prevent fauna entrapment and death in pipeline trenches;
(c) practices to prevent fauna entrapment within well heads, borrow pits, and water storage facilities;
(d) Fauna handling by a suitably qualified person; and
(e) Fauna awareness training.

PROTECTION OF RIVERINE AREAS

(G15) Clearing must not occur:

(a) in or within 100 metres from any natural wetland;
(b) in or within 200 metres from any natural significant wetland.

(G16) Clearing must not occur:

(a) in any watercourse; and
(b) within the relevant distance stipulated in Schedule G - Table 1 - Distance from the high banks of water courses in which clearing cannot occur.

Schedule G - Table 1: Distance from the high banks of watercourses in which clearing cannot occur

Stream Order	Subregion	Distance from Each High Bank
1 or 2	Non-coastal subregions of the Brigalow Belt Bioregion and all subregions of the New England Tableland Bioregion	50 metres
3 or 4	Non-coastal subregions of the Brigalow Belt Bioregion and all subregions of the New England Tableland Bioregion	100 metres
5 or greater	Non-coastal subregions of the Brigalow Belt Bioregion and all subregions of the New England Tableland Bioregion	200 metres

(G17) Notwithstanding conditions G16, activities resulting in significant disturbance to the bed or banks of a watercourse or wetland, or a spring must:

(a) only be undertaken where necessary for the construction and/or maintenance of roads, tracks and pipelines that are essential for carrying out the authorised petroleum activities and no reasonable alternative location is feasible; and
(b) be no greater than the minimum area necessary for the purpose of the significant disturbance; and
(c) be designed and undertaken by a suitably qualified and experienced person; and
(d) have rehabilitation commence immediately upon cessation of the authorised petroleum activities.

(G18) Unless otherwise approved under relevant legislation, the holder of this authority must not:

(a) excavate or place fill in a way that interferes with the flow of water in a watercourse, wetland, or spring, including; works that divert the course of flow of the water, or works that impound the water;
(b) undertake activities that take water from a watercourse, wetland or spring;
(c) undertake activities that take overland flow water using works that are mentioned as assessable development in a water resource plan under the *Water Act 2000*.

(G19) Sediment control measures must be implemented to minimise any increase in water turbidity due to carrying out petroleum activities in the bed or banks of a watercourse or wetland, or a spring.

(G20) Routine, regular and frequent visual monitoring must be undertaken while carrying out petroleum activities in a watercourse, wetland or spring. If, due to the petroleum activities, water turbidity increases in the watercourse, wetland or spring outside contained areas, works must cease and the sediment control measures must be rectified, to limit turbidity, before activities recommence.

REHABILITATION REQUIREMENTS

(G21) Progressive rehabilitation of disturbed areas must commence as soon as practicable following the completion of any construction or operational works associated with the petroleum activities on the relevant petroleum authority.

(G22) As soon as practicable and within 3 months of cessation of petroleum activities that cause any significant disturbance to land, the holder of this authority must:

(a) investigate contaminated land status in accordance with *Environmental Protection Act 1994* requirements and the National Environment Protection (Site Assessment) Measure 1999 (NEPM) where land has been subject to contamination caused by petroleum activities authorised under this authority; and,
(b) on all significantly disturbed land, take all reasonable and practicable measures to:
    i. re-establish surface drainage lines; and
    ii. reinstate the top layer of the soil profile; and

iii. promote the re-establishment of vegetation.

(G23) All land significantly disturbed by petroleum activities must be rehabilitated to:

(a) a stable landform and with a self-sustaining vegetation cover and species that are similar to adjoining undisturbed areas;
(b) ensure that all land is reinstated to the pre-disturbed land use and suitability class;
(c) ensure that the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance by petroleum activities; and
(d) ensure that the water quality of any residual void or water bodies constructed by petroleum activities meets criteria for subsequent uses and does not have potential to cause environmental harm.

(G24) Maintenance of rehabilitated areas must take place to ensure and demonstrate:

(a) stability of landforms;
(b) erosion control measures remain effective;
(c) stormwater runoff and seepage from rehabilitated areas does not negatively affect the environmental values of any waters;
(d) plants show healthy growth and recruitment is occurring; and
(e) rehabilitated areas are free of any declared pest plants.

(G25) Rehabilitation can be considered successful when the site can be managed for its designated land-use (either similar to that of surrounding undisturbed areas or as otherwise agreed in a written document with the landowner/holder and administering authority) without any greater management input than for other land in the area being used for a similar purpose and there is evidence that the rehabilitation has been successful for at least 3 years.

SCHEDULE H SEWAGE TREATMENT AND EFFLUENT MANAGEMENT

(H1) The holder of this authority must develop and submit to the administering authority a Sewage Effluent Management Plan for the proposed sewage treatment systems. The Sewage Effluent Management Plan must address the following matters:

(a) identification of environmental issues and potential impacts.
(b) control measures for routine operations to minimise likelihood of environmental harm.
(c) contingency plans and emergency procedures for non-routine situations.
(d) organisational structure and responsibility.
(e) effective communication.
(f) monitoring of contaminant releases.
(g) conducting environmental impact assessments,
(h) staff training.
(i) record keeping.
(j) periodic review of environmental performance and continual improvement.

(H2) The holder of this authority must submit the Sewage Effluent Management Plan for review to the administering authority at least four (4) weeks prior to commencing activities.

(H3) The holder of this authority must amend the Sewage Effluent Management Plan to reflect any comments provided by the administering authority.

(H4) The holder of this authority must operate all sewage treatment works in accordance with the Sewage Effluent Management Plan.

(H5) The Sewage Effluent Management Plan must not be implemented or amended in a way that contravenes any condition of this authority.

IRRIGATION OF TREATED SEWAGE EFFLUENT

(H6) Subject to Condition (H7), the holder of this authority may use Class C treated effluent for irrigation provided that:

(a) the systems are designed by a professional with experience in the design and deployment of treated sewage effluent irrigation systems;
(b) records of system performance are maintained; and
(c) no spray drift or overspray occurs at any sensitive or commercial place.

(H7) The treated effluent from the sewage treatment plant must only be released to land at designated irrigation areas as determined in the Sewage Effluent Management Plan in compliance with the limits stated in Schedule H – Table 1.

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Schedule H – Table 1 Contaminant release limits to land

Quality Characteristics	Units	Release Limit
Biological Oxygen Demand	mg/L	20 (maximum)
pH	scale	6.0 – 8.5 (range)
EC	µs/cm	<1600
Total Dissolved Solids	mg/L	<1000
Total Suspended Solids	mg/L	30 (maximum)
E. coli (coliform forming units/100ml)	Colony forming units/100mL	<1000 (maximum)
Total Nitrogen	mg/L	35 (Maximum)
Total Phosphorous	mg/L	10 (Maximum)
Dissolved Oxygen	mg/L	2 (Minimum)

(8) Notwithstanding the quality characteristics limits specified in Schedule H – Table 1 Contaminant release limits to land, releases of treated sewage effluent must not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm.

(H9) Monitoring must be undertaken at the frequency specified under the Sewage Effluent Management Plan and records kept of contaminant releases to land for the parameters specified in Schedule H – Table 1 Contaminant release limits to land. All determinations of the quality of contaminants released must be:

(a) made in accordance with methods prescribed in the latest edition of the Department of Environment and Resource Management Water Quality Sampling Manual; and
(b) carried out on samples that are representative of the discharge.

MANAGING SEWAGE EFFLUENT FROM MOBILE OR TEMPORARY FACILITIES

(H10) The holder of this authority must ensure that:

(a) plant and equipment used for sewage treatment or disposal is installed, maintained and operated in a proper and efficient manner;
(b) untreated sewage effluent is not released to waters;
(c) sewage effluent is not released to land or waters (including groundwater) other than in accordance with the requirements of the *Queensland Plumbing and Waste Water Code;*
(d) any on site septic tanks and associated infrastructure are to be constructed and maintained in accordance with AS1546; and
(e) all sewage sludge wastes are removed from the system, transported and disposed of off site by a registered and suitability qualified person.
(f) the handling, treatment and disposal of sewage effluent does not cause the contamination of any water used for drinking or domestic purposes or manufacturing purposes or for consumption by animals;
(g) where sewage sludge is buried on land the sludge is covered with at least 250mm of soil and where practicable located above known flood levels;
(h) surface ponding of effluent on land disposal area(s) is minimised and managed in a way that does not cause nuisance; and
(i) access to any sewage effluent land disposal area is denied during the release of contaminants to the land and until the irrigation/disposal area has dried.

SCHEDULE I STORAGE AND HANDLING OF CHEMICALS, FLAMMABLE AND COMBUSTIBLE SUBSTANCES

(I1) All explosives, hazardous chemicals, corrosive substances, toxic substances, gases, dangerous goods, flammable and combustible liquids (including petroleum products and associated piping and infrastructure) must be stored and handled in accordance with the relevant Australian Standard where such is available.

(I2) Notwithstanding the requirements of any Australian Standard, any liquids stored on site that have the potential to cause environmental harm must be stored in or serviced by an effective containment system that is impervious to the materials stored and managed to prevent the release of liquids to waters or land. Where no relevant Australian Standard is available, the following must be applied:

(a) storage tanks must be bunded so that the capacity and construction of the bund is sufficient to contain at least 110% of a single storage tank or 100% of the largest storage tank plus 10% of the second largest storage tank in multiple storage areas; and

(b) drum storages must be bunded so that the capacity and construction of the bund is sufficient to contain at least 25% of the maximum design storage volume within the bund.

(I3) All containment systems must be designed to minimise rainfall collection within the system.

SCHEDULE J DRILLING OPERATIONS

(J1) Prior to undertaking drilling activities, the holder of this authority must investigate the location of potential well sites and determine the well lease configuration that would minimise the area of disturbance.

(J2) Subject to Condition (J1), the holder of this authority must be able to demonstrate that the area disturbed by the construction of any well lease is as low as reasonably practicable, and the decision is based upon health and safety requirements and environmental considerations associated with the proposed drilling operations.

(J3) Subject to Condition (J2), well leases must not be more than:

(a) 10,000 m^2 in previously significantly disturbed areas (i.e. cleared agricultural lands); or
(b) 6400 m^2 in areas of remnant vegetation (i.e. areas of "Not of Concern" Regional Ecosystems); and
(c) 3600 m^2 in areas of remnant vegetation that has been identified as having a high conservation value by the Administering Authority (e.g. areas "Of Concern" and "Endangered" Regional Ecosystems).

(J4) Livestock must be excluded:

(a) around the well lease during drilling and rehabilitation operations ; and
(b) around all permanent well lease infrastructure.

(J5) Well lease infrastructure (e.g. cellar pits, turkeys nest dams or drill sumps) must be appropriately fenced and / or screened to prevent the entrapment of native fauna or provide habitats for the introduction or spread of noxious pest species.

(J6) All waste fluids and muds resulting from drilling and exploration activities must be contained in a dam or containment structure for disposal, remediation or reuse where applicable.

(J7) Prior to the use of oil and synthetic based drilling muds, the administering authority must be provided with written advice that demonstrates these materials will be used, stored, contained and disposed appropriately in a manner that will not result in environmental harm.

(J8) Production testing of coal seam gas wells must be restricted to determining the feasibility of gas reserves within a specific pilot program and be undertaken in accordance with the following conditions:

(a) Production test dams must be appropriately lined (using either a synthetic or clay liner) and be built in accordance with Schedule N - Dams.
(b) Production test dams must be restricted to the minimum size required to adequately determine gas reserves and:
(c) be no larger than 5 ha; and
(d) have a capacity of no greater then 200 ML.
(e) Production test dams must be decommissioned and rehabilitated within 12 months of cessation of production test activities, unless a longer period is agreed to in writing by the Administering Authority.
(f) After cessation of production test activities, produced water must be managed in accordance with the CSG Water Management Plan.

(J9) Notwithstanding condition J8(c), the holder can apply to the administering authority to enable the dams be used for further production testing activities for other pilot programs.

(J10) The holder of this authority must decommission all dams or sumps associated with the drilling operations by:

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(a) removing all remaining liquids in the dam;
(b) removing synthetic liners if used and disposing of them at a facility licensed to accept such waste material;
(c) removing all solids with TPH concentration >2200mg/kg and / or subsoils and:
  i. disposing of the contaminated solids at a facility licensed to accept such regulated waste; or
  ii. encapsulate in a purpose built storage facility that has been:
(d) designed by a suitably qualified and experienced person; and
(e) has been certified that that the design of the facility is fit for the purpose and is compliant in all respects with this authority.
(f) if required, remove the dam wall and rehabilitate the disturbed area in accordance with the rehabilitation conditions of this authority.

(J11) Drill sumps and flare pits are to be rehabilitated within 12 months after the cessation of drilling and completion activities.

(J12) After the cessation of drilling and well completion activities, the well lease area must be rehabilitated to a state where the site is stabilised and vegetation has been established while maintaining necessary exclusion zones for health and safety matters or future well maintenance activities.

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SCHEDULE K ENVIRONMENTALLY SENSITIVE AREAS

(K1) The holder of this authority must ensure that petroleum activities:

(a) are not conducted within a category A or B Environmentally Sensitive Area (ESA); and
(b) do not cause a significant disturbance within 1km of a category A ESA or within 500m of a category B ESA; and
(c) are not conducted in a category C ESA unless there is a written agreement to enter the area for those activities from the relevant administering authority.

(K2) Prior to carrying out field based activities, the holder of the environmental authority should make all relevant staff, contractors or agents carrying out those activities, aware of the location of any category A, B or C environmentally sensitive areas within area of the proposed activity.

(K3) Notwithstanding Condition (K1), where no reasonable alternative exists, petroleum activities may be undertaken within an endangered regional ecosystem or the 500m buffer zone of an endangered regional ecosystem, provided that those activities are located according to the following order of preference:

(a) pre-existing areas of significant disturbance within the buffer zone;
(b) undisturbed areas more than 100m from the ESA;
(c) undisturbed areas less than 100m from the ESA;
(d) pre-existing areas of significant disturbance within the ESA;
(e) areas within the ESA of lower environmental value (e.g. not of concern remnant vegetation or of concern remnant vegetation in a polygon mapped as containing endangered regional ecosystem and other ecosystems); and
(f) areas where clearing of an endangered regional ecosystem is unavoidable provided the clearing does not exceed 10 % of a polygon mapped as an endangered regional ecosystem and all reasonable effort is made to minimise the area cleared and to avoid clearing mature trees.

(K4) Condition (K3) does not authorise clearing that is:

(a) within *endangered* regional ecosystems or *of concern* regional ecosystems that are listed in Table 4—of the *Regional Vegetation Management Code for Brigalow Belt and New England Tablelands Bioregions* (refer Appendix 4);
(b) more than 10 % of a polygon mapped as an endangered regional ecosystem;
(c) more than 3600m^2 for the operational area for any drill site within an endangered regional ecosystem;
(d) Within an endangered regional ecosystem for construction of a sump larger than 30m^2;
(e) greater than 6 metres in width for tracks that are necessary within an endangered regional ecosystem for production and exploration purposes; and
(f) greater than 10 metres in width for pipeline or track construction purposes that is necessary within an endangered regional ecosystem.

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SCHEDULE L DECLARED WILD RIVER AREAS

(L1) The holder of this authority must ensure that any petroleum activities carried out within a wild river area comply with the conditions stated in the relevant **wild river declaration** for that area.

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SCHEDULE M PETROLEUM INFRASTRUCTURE

GENERAL CONDITIONS

(M1) Petroleum infrastructure must be located within the area defined by the relevant petroleum authority as shown in Map 1, Appendix 5.

(M2) All petroleum infrastructure (including buildings, structures, petroleum equipment and plant erected and/or used for the petroleum activities) must be removed from the relevant petroleum authorities prior to surrender of this authority, accept where agreed in writing by the administering authority and the current landowner.

(M3) Prior to the commencement of decommissioning or abandonment activities, the scope of work for decommissioning or abandonment of project infrastructure shall be developed and agreed to with the administering authority.

PIPELINES

GENERAL CONDITIONS

(M4) The holder of this authority must decommission each petroleum and gas pipeline to a situation where ongoing, or potential environmental harm is prevented or minimised. As a minimum, pipelines must be decommissioned such that:

(a) they no longer contain hazardous contaminants;
(b) they are left is stable condition;
(c) all the above ground infrastructure is removed, and
(d) all areas disturbed by above ground infrastructure are rehabilitated in accordance with the requirements of this authority.

(M5) Prior to the commencement of decommissioning or abandonment activities, the scope of work for decommissioning or abandonment shall be developed and agreed to with the administering authority.

HYDROTESTING PETROLEUM PIPELINES

(M6) The holder of this authority must ensure that:

(a) hydrotest waters containing chemical additives are not released to land or waters without the prior written approval of the administering authority; and
(b) water used for the purpose of hydro-testing the relevant pipeline may only be released to land when water quality limits are in accordance with Schedule M – Table 1.
(c) subject to condition (M7(c)), discharge areas must be located more than 100 m from the nearest water course.

Schedule M - Table 1 - Limits for the Disposal of Hydrostatic Test Water to Land

Parameter	Value
pH	6.5-8.5 (Range)
Arsenic (mg/L)	2.0 (Maximum)
Cadmium (mg/L)	0.05 (Maximum)
Chromium (mg/L)	1 (Maximum)
Copper (mg/L)	5 (Maximum)
Iron (mg/L)	10 (Maximum)
Lead (mg/L)	5 (Maximum)
Manganese (mg/L)	10 (Maximum)
Zinc (mg/L)	5 (Maximum)
Nitrogen (mg/L)	25 (Maximum)
Phosphorus (mg/L)	0.08 (Maximum)
Electrical Conductivity (uS/cm)	2000 (Maximum)

(M7) The holder of this authority must ensure that the release of hydrotest and/ or trench water authorised by condition (M6(c)) is carried out in a manner that ensures that:

(a) vegetation is not damaged;
(b) soil erosion and soil structure damage is avoided;
(c) the quality of groundwater is not adversely affected;
(d) discharge of hydrotest water is controlled to prevent water runoff from the nominated discharge areas;
(e) there are no releases of trench water or hydrotest waters to any surface waters; and
(f) there is no surface ponding of hydrotest water or trench water.

(M9) Subject to condition (M7(c)), the holder of this authority must develop and submit to the administering authority a Discharge Management Plan for disposing of hydrotest water that demonstrates the method of disposal will meet the objectives of condition (M7). The Discharge Management Plan must be submitted 4 weeks prior to any discharge event.

(M10) Not withstanding any other condition of this authority, the holder of this authority must ensure that pipeline trench water or hydrotest water, to be released to land for disposal, does not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing environmental harm. If the water quality is not suitable for release, then it must be collected and disposed of at appropriate facility.

MANAGEMENT OF WATER EXTRACTED FROM LOW POINT DRAINS

(M11) Water extracted from low point drains may be released to land providing that the water quality does not exceed the water quality limits set in Schedule M - Table 1 and that the release is carried out in a manner that ensures that:

(a) vegetation is not damaged;
(b) soil erosion and soil structure damage is avoided;
(c) the quality of groundwater is not adversely affected;
(d) discharge of low point drain water will be controlled so that there is no water runoff from the nominated discharge areas; and
(e) there are no releases of low point drain water to any surface waters.

(M12) Not withstanding any other condition of this authority, the holder of this authority must ensure that water from low point drains to be released to land for disposal, does not have any properties nor contain any organisms or other contaminants in concentrations that are capable of causing

environmental harm. If the water quality is not suitable for release, then it must be collected and disposed of at appropriate facility.

OPERATION OF PIPELINES TO PREVENT ENVIRONMENTAL HARM

(M13) The holder of this authority must provide the administering authority a copy an operational plan for each authorized pipeline that details how the holder will ensure that pipeline activities are undertaken to minimize the potential risk of causing environmental harm.

(M14) The holder of this authority must ensure that, where the current operational plan covers decommissioning and rehabilitation of the pipeline, those operations are consistent with the conditions of this authority.

EMERGENCY RESPONSE PLANS FOR DEALING WITH PIPELINE INCIDENCES THAT MAY RESULT IN ENVIRONMENTAL HARM

(M15) For each authorized pipeline the holder of this authority must provide the administering authority, within 3 months from the date of this approval, with a copy of the original or subsequently amended the Emergency Response Plan for operating the pipelines and associated facilities to aid in the effective response to an emergency situation that may result in environmental harm. The plan shall include:

(a) means by which an emergency response is initiated;
(b) defined key roles and responsibilities required to respond to an emergency;
(c) facilities required to coordinate the emergency response;
(d) key contact list;
(e) criteria for escalation of an emergency;
(f) likely emergency scenarios and guidelines for responding to such scenarios;
(g) communication and documentation requirements; and
(h) evacuation protocols and muster points.

The Emergency Response Plans must be reviewed annually to validate the adequacy of the scope of emergency scenarios and adequacy of the content.

(M16) In accordance with condition (M15), the holder of this authority must ensure that relevant personnel must be trained and competent to effectively fulfill their roles required as detailed in the relevant Emergency Response Plans to deal with pipeline incidents that could potentially result in environmental harm. Training records are to be kept for five years.

(M17) Subject to condition (M16), the holder of this authority must undertake emergency exercises to:

(a) Test the effectiveness of emergency response plan;
(b) Validate the competency of key emergency response personnel;
(c) Assess capability of to respond to an emergency;
(d) Reinforce prior training; and
(e) Identify opportunities for improvement.

Note: Emergency response exercises may be in the form of simulated emergencies, practical drills, desktop exercises, resources and equipment checks, or other exercises designed to systematically include all personnel likely to be involved.

(M18) Subject to condition (M17)), the holder of this authority must notify the administering authority in writing at least ten (10) business days prior to conducting emergency response exercise. The holder of this authority must also telephone the DERM's Pollution Hotline (1300 130 372) or local office the day during the emergency response exercise.

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SCHEDULE N DAMS

ALL DAMS

(N1) The hazard category of each dam must be determined by a suitably qualified and experienced person, prior to its construction and at least once in each two year period thereafter.

(N2) The holder of this authority must not commence construction of any dam determined to be in the significant or high hazard category, unless the location, basic details, and hydraulic performance of that dam are specifically referenced in this authority.

(N3) The holder of this authority must not abandon any dam but must decommission each dam so as to avoid any environmental harm.

(N4) As a minimum, decommissioning must be conducted such that each dam is either:

(a) becomes a stable landform, that no longer contains flowable substances, or
(b) is approved or authorised under relevant legislation for a beneficial use, or
(c) is a void authorised by the administering authority to remain after decommissioning; and
(d) is compliant with the rehabilitation requirements of this authority.

Regulated Dams - Location

(N5) The following regulated dams must be located within the control points defined in Schedule N - Table 1, below.

Schedule N — Table 1 Location of Regulated dams

Name of Regulated Dam	Latitude 94)	Longitude (GDA 94)
Pond B	26.899894S	150.368989E
	26.901292S	150.376829E
	26.907904S	150.374948E
	26.906446S	150.367332E
Condabri Pond	26.780831S	150.225836E
	26.782071S	150.227987E
	26.785280S	150.225534E
	26.784000S	150.223406E
Water Treatment Facility Feed Pond	26.8707S	150.3460E
	26.8707S	150.3521E
	26.8748S	150.3521E
	26.8748S	150.3406E

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Name of Regulated Dam	Latitude 94)	Longitude (GDA 94)
Water Treatment Facility Effluent Pond	26.8749S	150.3455E
	26.8749S	150.3474E
	26.8767S	150.3474E
	26.8767S	150.3455E
Pond D (Cell 1)	26.8730S	150.3381E
	26.8730S	150.3447E
	26.8782S	150.3447E
	26.8782S	150.3381E

(N6) The following regulated dams must conform to the basic details in Schedule N - Table 2, below.

Schedule N — Table 2 Basic Details of Regulated Dams

Name of Regulated dam	Hazard Category	Maximum surface area of dam (ha)	Maximum volume of dam (m^3)	Maximum depth of dam (m)	Use of dam
Pond B	High	40.37	1637.3	4.2	Storage of brine
Condabri Pond	Significant	8.0966	240	3.5	Storage and evaporation of CSG water
Water Treatment Facility Feed Pond	Significant	15.38	475.4	3.91	Storage and evaporation of CSG water
Water Treatment Facility Effluent Pond	Significant	0.87	10	2.0	Storage of brine
Pond D (Cell 1)	Significant	12.87	481	4.23	Storage of brine

(N7) The following regulated dams must meet the hydraulic performance criteria specified in Schedule N - Table 3, below.

Schedule N — Table 3 Hydraulic Performance of Regulated Dams

Name of Regulated dam	Spillway Capacity or Diversion Capacity (Levees) AEP	Design Storage Allowance (Dams other than levees) AEP	Mandatory Reporting Level (Dams other than levees) AEP
Pond B	1 in 50,000	1 in 100 (336 m^3)	1 in 100
Condabri Pond	1 in 10,000	1 in 50 (54250 m^3)	1 in 50 AEP 72hr
Water Treatment Facility Feed Pond	1 in 5000	1 in 10	1 in 100
Water Treatment Facility Effluent Pond	1 in 5000	1 in 100	1 in 100
Pond D (Cell 1)	1 in 5000	1 in 100	1 in 100

NOTE: For each entry in the table for Design Storage Allowances, the method of calculation (either 'full hydrological analysis' or 'method of monthly deciles') must be specified in conjunction with the AEP level applicable to the hazard category and method of calculation - as indicated in the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams, published by the Department of Environment and Resource Management (refer Appendix 6).

REGULATED DAMS – CERTIFICATION AND OPERATION

(N8) The holder of this authority must not commence construction of a regulated dam unless:

(a) the holder has submitted to the administering authority two copies of a design plan, together with the certification of a suitably qualified and experienced person that the design of the regulated dam will deliver the performance stated in the design plan and that it will be compliant in all other respects with this authority, and

(b) at least 20 business days has passed since the receipt of those documents, or the administering authority notifies the holder that a design plan and certification, has been received.

(N9) When construction of any regulated dam is complete, the holder of this authority must submit to the administering authority two copies of a set of 'as constructed' drawings, together with the certification of a suitably qualified and experienced person that the dam 'as constructed' will deliver the performance stated in the design plan and it is compliant in all respects with this authority.

(N10) An operational plan must be kept current for each regulated dam.

(N11) Where an operational plan covers decommissioning and rehabilitation, those operations are to be consistent with the design plan for the dam and the rehabilitation requirements of this authority.

(N12) The holder of this authority must notify the administering authority immediately the level in any regulated dam reaches the mandatory reporting level (MRL), and immediately act to prevent or minimize any actual or potential environmental harm.

REGULATED DAMS – ANNUAL INSPECTION AND REPORT

(N13) Each regulated dam must be inspected annually by a suitably qualified and experienced person.

(N14) At each annual inspection, the condition and adequacy of each regulated dam must be assessed for dam safety and against the necessary structural, geotechnical and hydraulic performance criteria.

(N15) At each annual inspection, if a mandatory reporting level is required, it must be determined and marked on each regulated dam.

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(N16) A final assessment of adequacy of available storage in each regulated dam must be based on a dam level observed within the month of October and result in an estimate of the level in that dam as at 1 November.

(N17) For each annual inspection, two copies of a report on the condition and adequacy of each regulated dam, certified by the suitably qualified and experienced person and including any recommended actions to be taken to ensure the integrity of each regulated dam; must be provided to the administering authority by 1 December.

(N18) The holder of this authority must, upon receipt of the annual inspection report, consider the report and its recommendations, and take action to ensure that each regulated dam safely performs its intended functions.

SCHEDULE O FUEL BURNING FACILITIES

(O1) The holder of this authority must provide the following fuel burning facility details, to the administrating authority, within 3 months of grant of this authority, for assessment by the administering authority, to ensure emissions resulting from fuel burning do not cause nuisance/ harm to the receiving environment:

- release source (stack, compressor or generator etc);
- stack height (m);
- efflux velocity[1] (m/sec);
- contaminants release;
- Mass emission rate and concentration of oxides of nitrogen (NOx) in the flue gas at the specified oxygen reference level;
- Release point location (GPS coordinates); and
- Proposed monitoring frequency.

(O2) The release of contaminants to the atmosphere from a point source must only occur from the release points identified in Schedule O – Table 1 and must be directed vertically upwards without any impedance or hindrance.

(O3) Contaminants must be released to the atmosphere from a release point at a height and flow rate not less than the corresponding height and velocity stated for the release point stated in Schedule O – Table 1.

(O4) Contaminants must not be released to the atmosphere from a release point at a mass emission rate / concentration, as measured at a monitoring point, in excess of the levels stated in Schedule O – Table 1 and monitored not less frequently than Schedule O – Table 2.

Schedule O – Table 1- Fuel Burning Facility Release Points and Contaminant Limits

Release Source	Minimum release height (metres)	Minimum velocity (m/sec)	Contaminant release	Maximum release limit [1]
Talinga Gas Plant				
Screw Compressors	6.5	29	NOx	6.6
Reciprocating Compressors	10.5	26	NOx	0.39
Generators	3.5	24	NOx	2.2
TEG Reboiler Burner	6.5	10	NOx	0.7
Rockwood Compressor Station				
Screw Compressors	6.5	26	NOx	0.13
Talinga Water Treatment Facility				
Power Station	5.5	13	NOx	0.11
Talinga Field				
Well Head Pump Microprocessors	1.5	10	NOx	0.0033

Note 1: The above NOx limits are applicable at all times except start-up, shut down and calibration of emission monitoring devices. The maximum start-up allowed is 30 mins.

(O5) The only type of fuel to be burnt under normal operating conditions is methane.

(O6) The holder of this authority must ensure that exhaust gases are released (or vented) without impedance from all release points, in a vertical direction not less than 5 metres high (above grade), or 1 metre above the roof of the relevant facilities, whichever is the higher.

(O7) Diesel engined backup generators must only be used for site back-up power generation or during testing in accordance with the manufacturer's specification.

(O8) Diesel engined backup generators must operate for no more than 30 days per year and for no more than 72 consecutive hours in any 7 day period.

(O9) Notwithstanding condition (08), the Diesel Engine Backup Generator may operate continuously for a further 7 day period if required for maintenance purposes, following written notification to the administering authority.

(10) Any operation of the Diesel Engine Backup Generator that will exceed the time periods specified in conditions (O8) and (O9) must be approved by the administering authority prior to the extended operation.

(11) Catalytic oxidation gas purifiers must be fitted to all diesel engined backup generators.

MONITORING OF CONTAMINANT RELEASES TO THE ATMOSPHERE

(O12) The holder of this authority must conduct and keep records of a monitoring program of contaminant release to the atmosphere at the release points, frequency, and the parameters specified in Schedule O – Table 2 and which complies with the following:

(a) Monitoring provision for the release points listed in Schedule O – Table 2 must comply with the Australian Standard AS4323.1 – 1995 'Stationary source emissions Method 1: Selection of sampling provisions'.

(b) The following test must be performed for each required determination specified in Schedule O - Table 2:
   i. gas velocity and volume flow rate;
   ii. temperature and oxygen content;
   iii. water vapour concentration.

(c) Where practicable samples taken must be representative of the contaminants discharged when emissions are expected to be at maximum rates.

(d) During the sampling period the following additional information must be gathered:
   iv. number of operating units;
   v. reference to actual test methods and accuracies.

Schedule O – Table 2- Required Monitoring

Determination Required	Release Point Numbers	Frequency
Mass emission rate and concentration of oxides of nitrogen (NOx) in the flue gas at the specified oxygen reference level.	see Map 2 in Appendix 4	During commissioning of the plant, twice a year for the first two years of operation and then annually thereafter

(O13) When requested by the administering Authority, contaminant monitoring and recording must be undertaken to investigate any complaint, and the results notified with 14 days to the Administering Authority. When monitoring is requested condition (O12)a)-d) must be complied with.

(O14) All release points referred to in Schedule 0 - Table 2 – Required Monitoring, must be conspicuously marked with the corresponding release point number and be located in accordance with Maps and/ or Figures provided in Appendix 5.

(O15) All determinations of air contaminant releases to the atmosphere must be made in accordance with the methods prescribed in the most recent version of the Department of Environment and resource Management's Air Quality Sampling Manual. If monitoring requirements for specific contaminants are not described in the Environment and resource Management's Air Quality Sampling Manual, monitoring protocols must be in accordance with a method as approved by New South Wales EPA, Victorian EPA or United States EPA.

NOISE ASSESSMENT POST CONSTRUCTION

(16) The holder of this authority must assess noise emissions from the all fuel burning facilities to confirm compliance with condition (E2).

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SCHEDULE P MONITORING PROGRAMS

(P1) The holder of this authority must:

(a) develop and implement a monitoring program, within one (1) month from the date of this approval, that will demonstrate compliance with the conditions in this authority; and
(b) document the monitoring and inspections carried out under the program and any actions taken.

(P2) From the date of commencement of this authority, the holder of this authority must submit to the Office of the Water Supply Regulator quarterly monitoring reports consisting of:

(a) water quality monitoring results of the CSG water from any new well commencing supply to the feed pond in that quarter in accordance with condition (D12);
(b) the monitoring results of the testing of the CSG water in the feed pond in that quarter in accordance with condition (D13); and
(c) the monitoring results of the testing of final water quality, including any non-compliance of a parameter of the final water quality in that quarter in accordance with conditions (C35) and (C36).

(P3) The holder of this authority must ensure that a suitably qualified, experienced and competent person(s) conduct all monitoring required by this authority.

(P4) The holder of this authority must record, compile and keep for a minimum of five (5) years all monitoring results required by this authority and make available for inspection all or any of these records upon request by the administering authority. Monitoring results relating to rehabilitation should be kept until the relevant petroleum tenure is surrendered.

(P5) Any management or monitoring plans, systems or programs required to be developed and implemented by a condition of this authority must be reviewed for performance and amended if required on an annual basis.

(P6) An annual monitoring report must be prepared each year and presented to the administering authority when requested. This report shall include but not be limited to:

(a) a summary of the previous twelve (12) months monitoring results obtained under any monitoring programs required under this authority and, a comparison of the previous twelve (12) months monitoring results to both this authority limits and to relevant prior results; and
(b) an evaluation/explanation of the data from any monitoring programs; and
(c) a summary of any record of quantities of releases required to be kept under this authority; and
(d) a summary of the record of equipment failures or events recorded for any site under this approval; and
(e) an outline of actions taken or proposed to minimise the environmental risk from any deficiency identified by the monitoring or recording programs.

SCHEDULE Q COMMUNITY ISSUES

(Q1) When the administering authority advises the holder of a complaint alleging nuisance, the holder must investigate the complaint and advise the administering authority in writing of the action proposed or undertaken in relation to the complaint.

(Q2) When requested by the administering authority, the holder of this authority must undertake monitoring specified by the administering authority, within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint of environmental harm at any sensitive or commercial place.

(Q3) The results of the investigation (including an analysis and interpretation of the monitoring results) and abatement measures implemented must be provided to the administering authority within fourteen (14) days of completion of the investigation, or receipt of monitoring results, whichever is the latter.

(Q4) If monitoring in accordance with Condition (Q2), indicates that emissions exceed the limits set by this authority or are causing nuisance, then the holder of this authority must:

(a) address the complaint including the use of appropriate dispute resolution if required; and/or
(b) as soon as practicable implement abatement or attenuation measures so that noise, dust, particulate or odour emissions from the authorised activities do not result in further environmental nuisance.

(Q5) The holder of this authority must maintain a record of complaints and incidents causing environmental harm, and actions taken in response to the complaint or incident; and

(Q6) The holder of this authority must record the following details for all complaints received and provide this information to the administering authority on request:

(a) name, address and contact number for complainant;
(b) time and date of complaint;
(c) reasons for the complaint;
(d) investigations undertaken;
(e) conclusions formed;
(f) actions taken to resolve complaint;
(g) any abatement measures implemented; and
(h) person responsible for resolving the complaint.

(Q7) The holder of this authority must retain the record of complaints required by condition (Q6) for 5 years.

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SCHEDULE R NOTIFICATION PROCEDURES

(R1) The holder of this authority must telephone the DERM's Pollution Hotline (1300 130 372) or local office as soon as practicable after becoming aware of any release of contaminants not in accordance with the conditions of this authority or any event where environmental harm has been caused or may be threatened.

(R2) Subject to condition (R1), the holder of this authority is required to report in the case of uncontained spills (including hydrocarbon, CSG water or mixtures of both) of the following volumes or kind:

(a) releases of any volume to water; and
(b) releases of volume greater than 200L to land; and
(c) releases of any volumes where potential serious or material environmental harm is considered to exist.

(R3) The notification of emergencies or incidents as required by conditions number (R1 and R2) must include but not be limited to the following:

(a) the authority number and name of holder;
(b) the name and telephone number of the designated contact person;
(c) the location of the emergency or incident;
(d) the date and time of the release;
(e) the time the holder of the authority became aware of the emergency or incident;
(f) the estimated quantity and type of any substances involved in the incident;
(g) the actual or potential suspected cause of the release;
(h) a description of the effects of the incident including the environmental harm caused, threatened, or suspected to be caused by the release;
(i) any sampling conducted or proposed, relevant to the emergency or incident; and
(j) actions taken to prevent any further release and mitigate any environmental harm caused by the release.

(R4) Within fourteen (14) days following the initial notification of an emergency or incident or receipt of monitoring results, whichever is the later, 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 environmental harm; and
(c) proposed actions to prevent a recurrence of the emergency or incident.

(R5) As soon as practicable, but not more than six (6) weeks following the conduct of any environmental monitoring performed in relation to the 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 authority, written advice must be provided of the results of any such monitoring performed to the administering authority.

APPENDIX 1 DEFINITIONS

TERM	MEANING
Acceptance criteria	Means the measures by which actions implemented are deemed to be complete. The acceptance criteria indicate the success of the decommissioning and rehabilitation outcomes or remediation of areas which have been significantly disturbed by the environmentally relevant activities. Acceptance criteria may include information regarding: • stability of final land forms in terms of settlement, erosion, weathering, pondage and drainage; • control of geochemical and contaminant transport processes; • quality of runoff waters and potential impact on receiving environment; • vegetation establishment, survival and succession; • vegetation productivity, sustained growth and structure development; • fauna colonisation and habitat development; • ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes; • microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration; • effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development; • resilience of vegetation to disease, insect attack, drought and fire; • vegetation water use and effects on ground water levels and catchment yields.
Accepted engineering standards	In relation to dams, means those standards of design, construction, operation and maintenance that are broadly accepted within the profession of engineering as being good practice for the purpose and application being considered. In the case of dams, the most relevant documents would be publications of the Australian National Committee on Large Dams (ANCOLD), guidelines published by Queensland government departments, and relevant Australian and New Zealand Standards.
Administering authority	Administering authority means - (a) for a matter, the administration and enforcement of which has been devolved to a local government under section 514 of the *Environmental Protection Act 1994* – the local government; or (b) for all other matters – the Chief Executive of the Department of Environment and Resource Management; or (c) another State Government Department, Authority, Storage Operator, Board or Trust, whose role is to administer provisions under other enacted legislation.
AEP	Means the Annual Exceedance Probability, which is the probability that at least one event in excess of a particular magnitude will occur in any given year.
Annulus	The space between the production casing and the inner injection tubing. It is filled with an inert fluid such that loss of the fluid to a water resource aquifer will not result in environmental harm or damage to the aquifer.
Aquitard	A formation that demonstrates a high degree structural integrity, low porosity, low hydraulic conductivity and a low level of geological anomalies that may allow fluid flow.
Assessable	Means vegetation in which clearing is assessable development under Schedule

TERM	MEANING
vegetation	8, Part 1, Table 4, Items 1A-1G of the *Integrated Planning Act 1997*
Assessment, assessed or assess	By a suitably qualified and experienced person in relation to a hazard assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time: (a) exactly what has been assessed and the precise nature of that assessment; (b) the relevant legislative, regulatory and technical criteria on which the assessment has been based; (c) the relevant data and facts on which the assessment has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and (d) the reasoning on which the assessment has been based using the relevant data and facts, and the relevant criteria.
Associated works	In relation to a dam, means: (a) operations of any kind and all things constructed, erected or installed for that dam; and (b) any land used for those operations.
AS 2885	Australian Standard Pipelines – Gas and Liquid Petroleum (2007 or subsequent versions thereof)
Authority	Means an environmental authority granted in relation to an environmentally relevant activity under the *Environmental Protection Act 1994*.
Background noise level	Background noise level $L_{A90,15min}$ means the A-weighted sound pressure level of the residual noise exceeded for 90% of a representative time period of not less than 15 minutes, using time weighting, 'F'.
Beneficial use	in respect of dams means that the current or proposed owner of the land on which a dam stands, has found a use for that dam that is: (a) of benefit to that owner in that it adds real value to their business or to the general community, (b) in accordance with relevant provisions of the *Environmental Protection Act 1994*, (c) sustainable by virtue of written undertakings given by that owner to maintain that dam, and the transfer and use have been approved or authorised under any relevant legislation.
Casing inspection log	A log or combination of logs, fully interpreted on a joint-by-joint basis which determines the percent penetration of anomalies, distinguishes between internal and external corrosion and detects holes, pits, perforations, metal loss and metal thickness. The maximum burst resistance must be greater than 1.3 times the maximum allowable wellhead injection pressure.
Cavitation	Is the process of collapsing the coal to create a down-hole cavern and de-stressed area at the well bore to enhance production, usually using compressed air.
Cement integrity log	Is a log using sonic or ultrasonic cement evaluation tools, using as a minimum dual receivers and a single transmitter and must provide a variable density or full wave train display, travel time curve, amplitude or attenuation curve, and gamma ray curve.

TERM	MEANING
Certification or certified	By a suitably qualified and experienced person in relation to a design plan or an annual report regarding dams, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time: (a) exactly what is being certified and the precise nature of that certification. (b) the relevant legislative, regulatory and technical criteria on which the certification has been based; (c) the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and (d) the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.
Competent person	A person with the demonstrated skill and knowledge required to carry out the task to a standard necessary for the reliance upon collected data or protection of the environment.
Commercial place	A work place used as an office or for business or commercial purposes, which is not part of the petroleum activity and does not include employees' accommodation or public roads.
Commissioning verification	Documented evidence of testing the quality of the final water to verify the treatment plant and equipment is consistently producing the quality of final water set under this authority.
Construction	Means a dam includes building a new dam and modifying or lifting an existing dam, but does not include investigations and testing necessary for purposes of preparing a design plan.
Contaminant	The *Environmental Protection Act 1994* defines, under Section 11, a contaminant as: (a) a gas, liquid or solid; or (b) an odour; or (c) an organism (whether alive or dead), including a virus; or (d) energy, including noise, heat, radioactivity and electromagnetic radiation; or (e) a combination of contaminants.
CSG water	Underground water brought to the surface of the earth or moved underground in connection with exploring for, or producing, coal seam gas.
Dam	Means a land-based structure or a void that is designed to contain, divert or control flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works. A dam does not mean a fabricated or manufactured tank or container, designed and constructed to an Australian Standard that deals with strength and structural integrity of that tank or container.
Design plan	Is the documentation required to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, and the criteria to be used for operating the dam. The documents must include all investigation and design reports, plans and specifications sufficient to hand to a contractor, and planned decommissioning and rehabilitation outcomes; so as to address all hazard scenarios that would be identified by a properly conducted hazard assessment for the structure. Documentation must be such that a 'suitable qualified and experience person' could conduct an independent review without seeking further information from the designer.

TERM	MEANING
Design storage allowance or DSA	Means the minimum storage required in a dam at 1 November each year in order to meet the hydraulic performance requirements.
Discharge area	Discharge area is: (a) that part of the land surface where groundwater discharge produces a net movement of water out of the groundwater; and (b) identified by an assessment process consistent with the document: Salinity Management Handbook, Queensland Department of Natural Resources, 1997; or (c) identified by an approved salinity hazard map held by the Department of Environment and Resource Management.
Dispersible soils	Soils in which clay material disintegrates into particles less than 2 microns across. This can be observed within 24 hours when soil crumbs are submerged in distilled water.
Dissects corridors	Dissects corridors of vegetation means clearing vegetation that results in a break more than 50 metres wide across a corridor.
Environmental Management Plan	The environmental management plan is an environmental management document to be submitted during the application process for a level 1 environmental authority (petroleum activities).
Environmental nuisance	Environmental nuisance is unreasonable interference or likely interference with an environmental value caused by: (a) noise, dust, odour, light; or (b) an unhealthy, offensive or unsightly condition because of contamination; or (c) another way prescribed by regulation.
Environmentally sensitive area	Environmentally sensitive area (as determined from the DERM's GIS data base) means a location, however large or small, that has environmental values that contribute to maintaining biological diversity and integrity, have intrinsic or attributed scientific, historical or cultural heritage value, or are important in providing amenity, harmony or sense of community.
Feed pond	Storage that provides feed water to a plant or equipment for the treatment of CSG water.
Final water	CSG water that has been treated to a prescribed quality that requires no further treatment and is ready to be released to waters and or supplied for the uses approved under this authority.
Financial assurance	A security deposit, either cash or a bank guarantee, held by the administering authority to cover the potential costs of rehabilitating areas significantly disturbed by the petroleum activities.
Flowable substance	Means matter or a mixture of materials which can flow under any conditions potentially affecting that substance. Constituents of a flowable substance can include water, other liquids fluids or solids, or a mixture that includes water and any other liquids fluids or solids either in solution or suspension.
Foreseeable future	Is the period used for assessing the total probability of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a 150 year foreseeable future with an acceptable probability of failure before that time.

TERM	MEANING
Formation	A named body of rock or minerals resources identified as distinct from other rocks on a geological map. It generally consists of a dominant rock type or combination of rock types.
Formation fracture pressure	The interpreted pressure reflecting that pressure rise when the formation starts to loose structural integrity. It can be estimated through such techniques as step rate injectivity tests.
Fraccing	Is the process of fracturing and propping open the coal with hydraulic pressure and sand to enhance production and it excludes cavitation.
Groundwater	Groundwater means subsurface water, generally saturating the soil or rock in which it occurs.
Hazard	In relation to a dam as defined in this authority, means the potential for environmental harm resulting from the collapse, or failure of the dam to perform its primary purpose of containing, diverting or controlling flowable substances.
Hazardous contaminant	A contaminant that, if improperly treated, stored, disposed of or otherwise managed, is likely to cause serious or material environmental harm because of: (a) its quantity, concentration, acute or chronic toxic effects, carcinogenicity, teratogenicity, mutagenicity, corrosiveness, explosiveness, radioactivity or flammability; or (b) its physical, chemical or infectious characteristics.
Hazard category	Means a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (Version 1.0, 2008) published by the Department of Environment and Resource Management on its website.
Hydraulic performance	Means the capacity of a regulated dam to contain or safely pass flowable substances based on a probability (AEP) of performance failure specified for the relevant hazard category in the current version of the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams published by the Department of Environment and Resource Management
Inert fluid	The fluid contained in the annulus that is monitored to ascertain integrity of the injection string. If a loss of this fluid is detected indicating a loss of mechanical integrity, adjacent water resource aquifers are protected from harm due to the inert nature of this fluid.
Infrastructure	Means water storage dams, roads and tracks, buildings and other structures built for the purpose and duration of the conduct the petroleum activities, but does not include other facilities required for the long term management of the impact of those activities or the protection of potential resources. Such other facilities include dams other than water storage dams, waste dumps, voids, or stockpiles and assets, that have been decommissioned, rehabilitated, and lawfully recognised as being subject to subsequent transfer with ownership of the land.
Injection tubing	The inner casing that conveys the injection fluid and terminates at the injection zone. This tubing provides the primary containment of the injection fluid.
Injection zone	The zone of the injection formation where the injection tubing terminates.
Levee(dyke or bund)	Means a long embankment that is designed only to provide for the containment and diversion of stormwater or flood flows from a contributing catchment, or

TERM	MEANING
	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.
Licensed waste disposal facility	A facility approved under a development approval and operated by a holder of a registration certificate for environmentally relevant activity item number 75 under Schedule 1 of the *Environmental Protection Regulation 1998.*
$L_{A\ 90,\ adj\ 15}$	Is the background A-weighted sound pressure level obtained using time weighting 'F' exceeded for 90 percent of any 15 minute time period.
$L_{A\ max,\ adj,\ T}$	$L_{A\ max,\ adj,\ T}$ is the adjusted average maximum A-weighted sound pressure level measured over a time period T. The maxima must be measured on a sound level meter with a frequency-weighting that corresponds to perceived loudness ("A" weighting) and the meter must be set to the "fast" response time-weighting. The measured values are to be adjusted upwards by 2 dB(A) to 5 dB(A) if the noise source has tonal characteristics. The measuring period must be in excess of five minutes. The arithmetic average of the adjusted maxima, after eliminating any extraneous noise peaks, is the measure used to characterise the noise environment. (This measure will generally be similar to a percent exceedance of 10% or less. Refer to Australian Standard AS1055.)
Lake	A natural or artificial body of water, either permanent or intermittent.
Land degradation	Land degradation includes the following: (a) soil erosion; (b) rising water tables; (c) the expression of salinity; (d) mass movement by gravity of soil or rock; (e) stream bank instability; and (f) a process that results in declining water quality.
Land use	Term to describe the selected final use of the land, which is planned to occur after the cessation of petroleum operations.
Level 2 petroleum activity	A Level 2 petroleum activity is a petroleum activity that, under section 20(1) of the EP Act is prescribed as a level 2 environmentally relevant activity.
Level 1 petroleum activity	A Level 1 petroleum activity is a petroleum activity that, under section 20(1) of the EP Act is prescribed as a Level 1 environmentally relevant activity.
Mandatory reporting level or MRL	Means a warning and reporting level determined in accordance with the current version of the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams published by the Department of Environment and Resource Management.
Meter	A meter is defined as: "a device for measuring, or giving an output signal proportional to, quantities of water passed and/or the rate of flow in a pipe."
NATA	National Association of Testing Authorities.
Noise	Noise means a sound or vibration of any frequency, whether transmitted through air or any other physical medium.
Operational land	Means the land associated with the petroleum project for which this authority has been issued.

TERM	MEANING
Operational Plan	Means a document that amongst other things sets out procedures and criteria to be used for operating a dam during a particular time period. The operational plan as defined herein may form part of a plan of operations or plan otherwise required in legislation.
Oxygen activation log	A log which employs pulsed neutron techniques to activate oxygen nuclei, creating a radio-active nitrogen isotope of a very short half life.
Packer	A device designed to prevent fluid flow between two elevations in a well.
Packer isolation test	A pressure test of the tubing/casing annulus designed to evaluate the integrity of the casing, tubing and packer. The pressure in the annulus should be the greater of 7,000 kPa or 1.3 times the wellhead injection pressure. The packer isolation test is considered successful when the required pressure is applied and maintained for 15 minutes with variations not exceeding 3 percent of the applied pressure.
Petroleum activities	Petroleum activities means activities authorised to take place on land subject to a petroleum authority, including rehabilitation and decommissioning activities.
Petroleum authority	A petroleum authority is— (a) a 1923 Act petroleum tenure granted under the *Petroleum Act 1923*; or (b) a petroleum authority granted under the *Petroleum and Gas (Production and Safety) Act 2004*; or (c) a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982*.
Petroleum project	A petroleum project is all activities carried out, or proposed to be carred out, under 1 or more of the following, in any combination, as a single integrated operation— (a) a 1923 Act petroleum tenure granted under the *Petroleum Act 1923*; (b) a petroleum authority granted under the *Petroleum and Gas (Production and Safety) Act 2004*; (c) a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982*
Petroleum works site	A separate location on the area subject to a petroleum authority where petroleum activities are undertaken (e.g. a well site, seismic survey line, camp site, compressor site, evaporation pond etc).
Point of supply	A point or location where the final water quality is monitored prior to release to water.
Potential discharge area	Low lying parts of the landscape (relative to adjacent terrain) where groundwater movements are within 2-5m of the land surface and the landscape may be subject to upward movement of groundwater in the future.
Production casing	The outer casing which extends into the injection zone. Within it is an inert fluid between the production casing and the inner tubing conveying the injection fluid. It provides the secondary containment protection of the injection fluid.
Protected area	A protected area under the *Nature Conservation Act 1992*; or • a marine park under the *Marine Parks Act 1992*; or • a World Heritage Area.

TERM	MEANING
Progressive rehabilitation	Rehabilitation (defined below) undertaken progressively or as a staged approach to rehabilitation as petroleum operations are ongoing.
Public health risk	As defined in the *Public Health Act 2005*
Radioactive tracer survey	A logging survey which injects radioactive material with a down-hole injector at or near the maximum allowable injection pressure.
Regulated dam	Means any dam in the significant or high hazard category as assessed using the current version of the Manual for Assessing Hazard Categories and Hydraulic Performance of Dams published by the Department of Environment and Resource Management.
Regulated waste	A non-domestic waste mentioned in Schedule 7 of the *Environmental Protection Regulation 1998* (whether or not it has been treated or immobilised), and includes — (a) for an element—any chemical compound containing the element; and (b) anything that has contained the waste.
Rehabilitation	The process of reshaping and revegetating land to restore it to a stable landform and in accordance with the acceptance criteria set out in this environmental authority and, where relevant, includes remediation of contaminated land.
Representative	A sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the petroleum activities.
Riverine area	Refers to the land confined to the flood flow channel of a watercourse.
Salinisation	Means the process of salts accumulating in soils or waters.
Sedimentation pond	A bunded or excavated structure used to contain and settle waterborne sediment running off disturbed areas.
Self sustaining	An area of land that has been rehabilitated and has maintained the required acceptance criteria without human intervention for a period nominated by the administering authority.
Sensitive place	Sensitive place means any of the following places – (a) a dwelling; (b) a library, childcare centre, kindergarten, school, college, university or other educational institution; (c) a hospital, surgery or other medical institution; (d) a protected area or an area identified under a conservation plan as a critical habitat or an area of major interest, under the *Nature Conservation Act 1992*; (e) a marine park under the *Marine Parks Act 1982*; and (f) a park or garden that is open to the public (whether or not on payment of money) for use other than for sport or organised entertainment).
Sewage	Sewage is the effluent discharged from a sanitary appliance (i.e. sewage treatment works).
Short term 80 percentile	means not more than one (1) of the measured values of the quality characteristic is to exceed the stated release limit for any five (5) consecutive samples for a sampling point at any time during the environmental activity(ies) works.
Significantly disturbed land	Significantly disturbed land and significant disturbance means land if: (a) it is contaminated land; or

TERM	MEANING
	(b) it has been disturbed and human intervention is needed to rehabilitate it: i. to a state required under the relevant environmental authority; or ii. if the environmental authority does not require the land to be rehabilitated to a particular state – to its state immediately before the disturbance. Examples of a disturbance to land: (a) areas where soil has been compacted, removed, covered, exposed or stockpiled; (b) areas where vegetation has been removed or destroyed to an extent where the land has been made susceptible to erosion; (c) areas where land use suitability or capability has been diminished; (d) areas within a watercourse, waterway, wetland or lake where petroleum activities occur and human intervention is necessary to restore or stabilise the disturbed area; (e) areas submerged by hazardous waste storage and dam walls in all cases; (f) areas under temporary infrastructure. Temporary infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after petroleum activities have ceased; or (g) areas where land has become contaminated land and a suitability statement has not been issued. However, the following areas are not significantly disturbed: (a) areas off the petroleum authority (e.g. roads or tracks which provide access to the petroleum authority); (b) areas previously significantly disturbed which have been rehabilitated to the administering authority's satisfaction; (c) areas under permanent infrastructure; (d) areas that were significantly disturbed prior to the grant of the environmental authority, unless those areas are re-disturbed by the holder of the environmental authority during the term of the authority; (e) minor disturbances such as drill sumps and minor respreading of soil on GPS located seismic lines.
Significant wetland	Means the area of land that supports plants or is associated with plants that are adapted to and dependent on living in wet conditions for at least part of their life cycle and that is— a) a regional ecosystem listed in Table 14 and the area on the ground represented as a swamp, lake, marsh, waterhole, wetland, billabong, pool, spring or like, on the most recent 1:250 000 Geoscience Australia topographic map of the area; or b) a Ramsar wetland.
Spillway	Means a weir, channel, conduit, tunnel, gate or other structure designed to permit discharges form the dam, normally under flood conditions or in anticipation of flood conditions.
Stable	Means land form dimensions are or will be stable within tolerable limits now and in the foreseeable future. Stability includes consideration of geotechnical stability, settlement and consolidation allowances, bearing capacity (trafficability), erosion resistance and geochemical stability with respect to seepage, leachate and related contaminant generation.
Step rate injectivity test	The well is closed and a stabilized pressure is measured. Pressure is then increased at set intervals while pumping fluid into the formation. A linear (straight

TERM	MEANING
	line) increase of flow with pressure is expected if the formation holds integrity. If the flow rate increases substantially for minimal change in pressure, this is inferred as the formation fracture point.
Substantiated commentary	Interpretation of experimental evidence derived from samples obtained from the site to be used for injection. It is not inferred interpretation based on similar situations and the literature.
Suitably qualified and experienced person for dams	Means one who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the Professional Engineers Act 1988, OR registered as a National Professional Engineer (NPER) with the Institution of Engineers Australia, OR holds equivalent professional qualifications to the satisfaction of the administering authority for the Act; AND the administering authority for the Act is satisfied that person has knowledge, suitable experience and demonstrated expertise in relevant fields, as set out below: (a) knowledge of engineering principles related to the structures, geomechanics, hydrology, hydraulics, chemistry and environmental impact of dams; and (b) a total of five years of suitable experience and demonstrated expertise in the geomechanics of dams with particular emphasis on stability, geology and geochemistry, and (c) a total of five years of suitable experience and demonstrated expertise each, in three of the following categories: • investigation and design of dams. • Construction, operation and maintenance of dams. • hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology. • hydraulics with particular reference to sediment transport and deposition, erosion control, beach processes. • hydrogeology with particular reference to seepage, groundwater. • solute transport processes and monitoring thereof. • dam safety.
Summer	October to March.
Surface casing	The surface casing is the outer-most casing string designed to provide the tertiary protection for the production casing and injection tube.
Tolerable limits	Means a range of parameters regarded as being sufficient to meet the objective of protecting relevant environmental values. For example, a range of settlement for a tailings capping, rather than a single value, could still meet the objective of draining the cap quickly, preventing pondage and limiting infiltration and percolation.
Top layer	The surface layer of a soil profile, which is usually more fertile, darker in colour, better structured and supports greater biological activity than underlying layers. The surface layer may vary in depth depending on soil forming factors, including parent material, location and slope, but generally is not greater than about 300mm in depth from natural surface.
TPH	Total petroleum hydrocarbons
Validate	To carry out testing of the plant or equipment used for the treatment of CSG water to show the quality of the final water consistently meets the water quality parameters under this authority.
Void	Means any man-made, open excavation in the ground.

TERM	MEANING
Watercourse	Mean the area of land between the high banks of a natural channel—whether artificially improved or not—in which water flows permanently or intermittently, and that is represented as— (a) a creek, stream, river or watercourse on the most recent 1:100 000 Geoscience Australia topographic map; or (b) a creek, stream, river or watercourse on the most recent 1:250 000 Geoscience Australia topographic map in areas where there is no 1:100 000 Geoscience Australia topographic map available.
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.
Waterway	A naturally occurring feature where surface water runoff normally collects, such as a clearly defined swale or gully, but only flows in response to a local rainfall event.
Wetland	Means the area of land that supports plants or is associated with plants that are adapted to and dependent on living in wet conditions for at least part of their life cycle, and that is— (a) a regional ecosystem listed in Table 14; or (b) the area on the ground represented as a swamp, lake, marsh, waterhole, wetland, billabong, pool, spring or like, on the most recent — 1:100 000 Geoscience Australia topographic map of the area; or 1:250 000 Geoscience Australia topographic map, in areas where there is no 1:100 000 Geoscience Australia topographic map available; or (c) listed as an 'active' spring in the Queensland Springs Database, which can be accessed at the following internet address: http://www.epa.qld.gov.au/nature_conservation/habitats/wetlands/springs/
Wild river areas	Wild river areas are defined in the *Wild Rivers Act 2005* and may include the following– (a) high preservation areas; (b) preservation areas; (c) floodplain management areas; (d) subartesian management areas.
Winter	April to September.

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APPENDIX 2 DRAFT STANDARDS AND SPECIFICATIONS FOR MEASURING AND METERING DISPOSAL OF TREATED CSG WATER

1. The measuring device to measure/ meter the volume of treated CSG water released under the environmental authority must be a non-mechanical type of meter and must include a data logger that will provide a continuous flow record.

2. The meter and any of its supporting equipment (e.g. data logger) should be required to perform the following functions:
   - measure cumulative flow volume;
   - memorise and continuously display cumulative flow volume;
   - measure instantaneous flow rate (ML/day);
   - continuously display instantaneous flow rate;
   - memorise history (time of day, date, month, year) of instantaneous flow rate;

3. The meter must be installed and maintained by a person trained in the correct installation and maintenance of the particular meter (i.e. manufacturer or nationally certified).

4. The meter installation must comply with the following specifications:
   - The meter must be installed in a straight length of pipe 10 times the inside pipe diameter upstream of the meter and 5 times the inside pipe diameter downstream of the meter unless pattern approval (that complies with the national standards) allows for lesser pipe lengths.
   - No offtakes are to be installed within the pipeline on which the meter is installed (upstream or downstream). That is, the meter must be installed so that it measures all water released.
   - The meter must be able to operate in the above specified length of pipe to an accuracy of ± 2% under laboratory conditions, with the expectation that a field accuracy of ± 5% will be achieved.
   - The meter must have an electronic (pulse and/or analogue) output suitable for transmitting metered data to a data logger or other device if required.
   - The installation must be such that the meter operates under full pipe flow conditions at all times.

5. The completed 'meter installation form' must include installer name and certification, meter make, meter size, meter type, serial number (meter and data logger) and the initial meter reading. In addition, detail as to power source, pump type, pump output (L/s), pipe size and type – including outer diameter and inside diameter. A photo of the pump installation and meter installation is also required.

6. The EA holder must develop and maintain a maintenance schedule for the meter and data logger in line with manufacture's specifications. Maintenance is to be undertaken by manufacturer or nationally certified person.

APPENDIX 3 ENVIRONMENTALLY SENSITIVE AREAS

Category A and B environmentally Sensitive Areas

Category A and B environmentally sensitive areas are listed in Section 25 and 26 respectively of the *Environmental Protection Regulation 2008*.

Category C – Environmentally Sensitive Areas

LAND AREA CLASSIFICATION	ADMINISTERING LEGISLATION	ADMINISTERING AUTHORITY
• Nature Refuges and Resource Reserves	*Nature Conservation Act 1992*	DERM
• Declared Catchment Areas; • Declared Irrigation and Irrigation Undertaking Areas; • Water Reservoirs and Drainage Areas.	*Water Act 2000 and various Water Board Acts*	DEEDI and/ or Relevant Storage Operator or Board
• River Improvement Areas	*River Improvement Trust Act 1940*	DEEDI and the Relevant River Trust
• The Designated Landscape Area - Stanbroke Pastoral Holding	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	DERM
Areas under Part 5 Division 2 of the Aboriginal Cultural Heritage Act 2003 and Torres Strait Islander Cultural Heritage Act 2003	*Aboriginal Cultural Heritage Act 2003* *Torres Strait Islander Cultural Heritage Act 2003*	DEEDI
• State Forest or Timber Reserves	*Forestry Act 1959*	DERM
• DPI Research Sites	*Nil*	DEEDI
• Areas of land occupied by the Bureau of Sugar Experiment Stations.	*Sugar Industry Act 1999*	DEEDI
• Critical Areas and Public Purpose Reserves	*Land Act 1994*	DEEDI
• An area subject to a State Planning Policy that the policy declares is in need of environmental protection.	*Integrated Planning Act 1997*	DERM
• Erosion Prone Areas under Coastal Management Plans and Coastal Management Control Districts	*Coastal Protection and Management Act 1995*	DERM
• "Declared Areas"	*Vegetation Management Act 1999*	DEEDI
• An area identified as "Essential Habitat" for a species of wildlife listed as endangered, vulnerable, rare, or near threatened under the *Nature Conservation Act 1992*	*Nature Conservation Act 1992*	DERM
• State Wildlife corridor	*Vegetation Management Act 1999*	DEEDI

Important Note: Regional ecosystem classification is determined according to the Queensland Herbarium **Biodiversity Status** Classification. Information on ERE's is maintained by the EPA on the Regional Ecosystem Description Database.

APPENDIX 4 Regional Vegetation Management Code tables

Table 4: Dense regional ecosystems and mid-dense wet sclerophyll, melaleuca, mangrove and wetland regional ecosystems

8.3.8 *Syncarpia glomulifera, Eucalyptus portuensis, Corymbia intermedia* open forest on sandy creek flats and granite outwash
8.12.29 *Lophostemon confertus* ± *Acacia leptostachya* ± Acacia aulacocarpa ± *Corymbia dallachiana* ± *Eucalyptus* spp. ± *Melaleuca viridiflora* ± *Allocasuarina littoralis* shrubland to open forest on exposed hillslopes of islands with abundant rock at the surface
11.2.3 Microphyll vine forest on sandy beach ridges and dune swales
11.3.11 Semi-evergreen vine thicket on alluvial plains
11.4.1 Semi-evergreen vine thicket ± *Casuarina cristata* on Cainozoic clay plains
11.4.6 *Acacia cambagei* woodland on Cainozoic clay plains
11.5.11 *Acacia leptostachya* shrubland on Cainozoic sand plains/remnant surfaces
11.5.18 *Micromyrtus capricornia* shrubland on Cainozoic sand plains/remnant surfaces
11.8.7 Shrubland (heath) on Cainozoic igneous rocks.
11.8.13 Semi-evergreen vine thicket and microphyll vine forest on Cainozoic igneous rocks.
11.9.4 Semi-evergreen vine thicket or *Acacia harpophylla* with a semi-evergreen vine thicket understorey on fine grained sedimentary rocks
11.10.8 Semi-evergreen vine thicket in sheltered habitats on medium to coarse-grained sedimentary rocks
11.11.18 Semi-evergreen vine thicket on old sedimentary rocks with varying degrees of metamorphism and folding.
11.11.21 Semi-evergreen vine thicket on serpentinite
11.12.18 Montane shrubland on igneous rocks.
11.12.21 *Acacia harpophylla* open forest on igneous rocks. Colluvial lower slopes
12.3.1 Gallery rainforest (notophyll vine forest) on alluvial plains
12.5.6 *Eucalyptus siderophloia, E. propinqua, E. microcorys* and/or *E. pilularis* open forest on remnant Tertiary surfaces. Usually deep red soils
12.8.8 *Eucalyptus saligna* or *E. grandis* tall open forest on Cainozoic igneous rocks
12.8.12 *Eucalyptus obliqua* tall open forest on Cainozoic igneous rocks
12.8.13 Araucarian complex microphyll vine forest on Cainozoic igneous rocks
12.11.4 Semi-evergreen vine thicket on metamorphics ± interbedded volcanics
12.11.12 Araucarian complex microphyll vine forest on metamorphics ± interbedded volcanics; northern half of bioregion
12.12.10 Shrubland on rocky peaks on Mesozoic to Proterozoic igneous rocks
13.11.2 *Eucalyptus laevopinea* open forest on metamorphics
13.11.7 Low microphyll vine forest on metamorphics
13.12.6 Shrubland on igneous rocks

Table 5: Regional ecosystems that are at risk of the remnant extent falling below 30% of its pre-clearing extent, or having a remnant extent of less than 10 000 hectares

6.3.8 *Eucalyptus largiflorens* ± *Acacia cambagei* woodland on alluvium
6.5.1 *Acacia aneura, Eucalyptus populnea, E. melanophloia* open forest on undulating lowlands
6.5.2 *Eucalyptus populnea, Acacia aneura* and/or *E. melanophloia* woodland on Quaternary sediments
6.5.3 *Eucalyptus populnea, Acacia aneura* ± *Eremophila mitchellii* woodland within *A. aneura* communities
6.5.9 *Acacia aneura, Eucalyptus populnea* ± *E. melanophloia* shrubby low woodland on Quaternary sediments
6.7.2 *Acacia microsperma* open forest on upper and foot slopes
8.1.2 Samphire open forbland to isolated clumps of forbs on saltpans and plains adjacent to mangroves
8.2.4 Wet heath complex on coastal sand plains and depressions derived from coastal dunes
8.2.8 Variable eucalypt woodland often with heathy elements on parabolic dunes and beach ridges
9.11.8 Semi-deciduous vine thicket on limestone rock outcrops
10.3.11 *Corymbia citriodora* or *C. leichhardtii* woodland to tall woodland on alluvium in valleys
11.3.5 *Acacia cambagei* woodland on alluvial plains
11.3.16 *Eucalyptus largiflorens* +/- *Acacia cambagei* +/- *A. harpophylla* woodland to low open woodland on alluvial plains
11.3.29 *Eucalyptus crebra, E. exserta, Melaleuca* spp. woodland on alluvial plains
11.4.11 *Dichanthium sericeum, Astrebla* spp. and patchy *Acacia harpophylla, Eucalyptus coolabah* on Cainozoic clay plains
11.5.5 *Eucalyptus melanophloia, Callitris glaucophylla* woodland on Cainozoic sand plainsremnant surfaces. Deep red sands
11.5.15 Semi-evergreen vine thicket on Cainozoic sand plains-remnant
11.8.3 Semi-evergreen vine thicket on Cainozoic igneous rocks. Steep hillsides
11.9.8 *Macropteranthes leichhardtii* thicket on Cainozoic fine-grained sedimentary rocks.
11.11.20 *Eucalyptus platyphylla* woodland on old sedimentary rocks with varying degrees of metamorphism and folding. Lowlands
11.12.5 *Corymbia* spp., *Lysicarpus angustifolius, Eucalyptus crebra, E. cloeziana* woodland on igneous rocks (granite)
12.3.5 *Melaleuca quinquenervia* open forest on coastal alluvial plains
12.8.1 *Eucalyptus campanulata* tall open forest on Cainozoic igneous rocks
12.8.9 *Lophostemon confertus* open forest on Cainozoic igneous rocks
12.12.7 *Eucalyptus crebra* woodland on Mesozoic to Proterozoic igneous rocks
12.12.24 *Angophora leiocarpa, Eucalyptus crebra* woodland on Mesozoic to Proterozoic igneous rocks
13.11.1 *Eucalyptus youmanii, E. dealbata, E. caleyi, Callitris endlicheri* woodland on metamorphics
13.12.1 *Eucalyptus campanulata* open forest on igneous rocks

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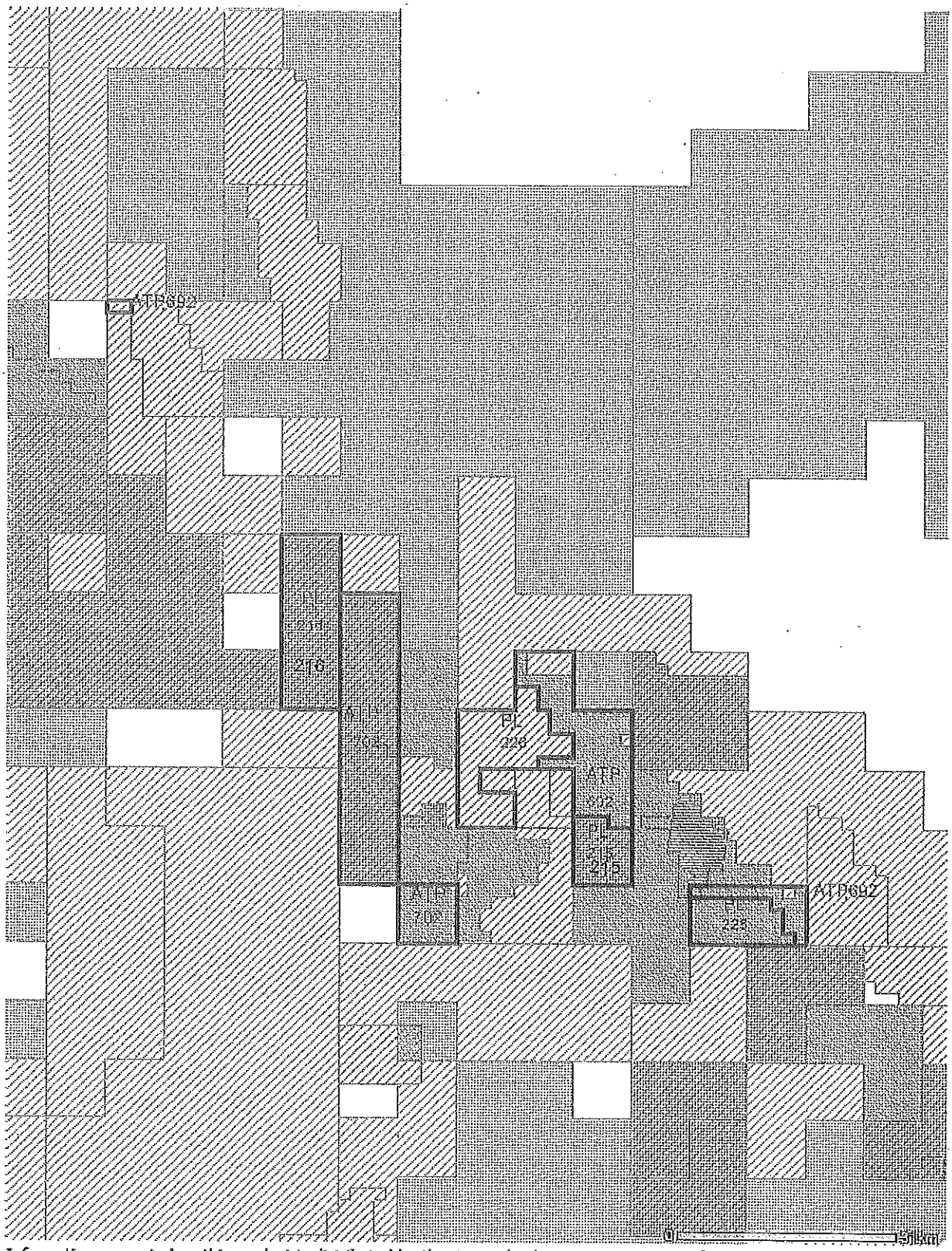
APPENDIX 5 MAPS, FIGURES AND APPROVED PLANS



Map 1 – Location of the Walloons Tenures

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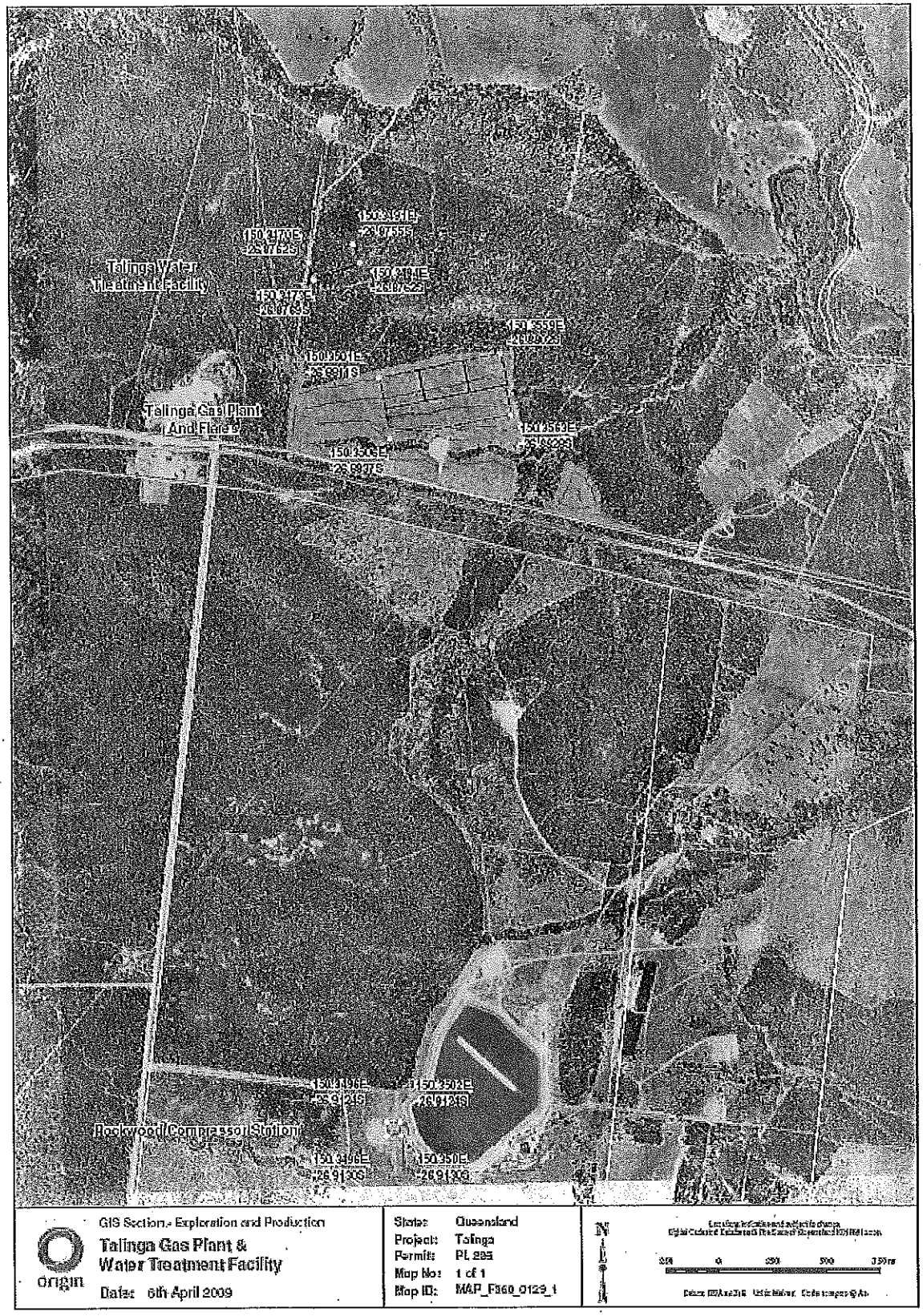
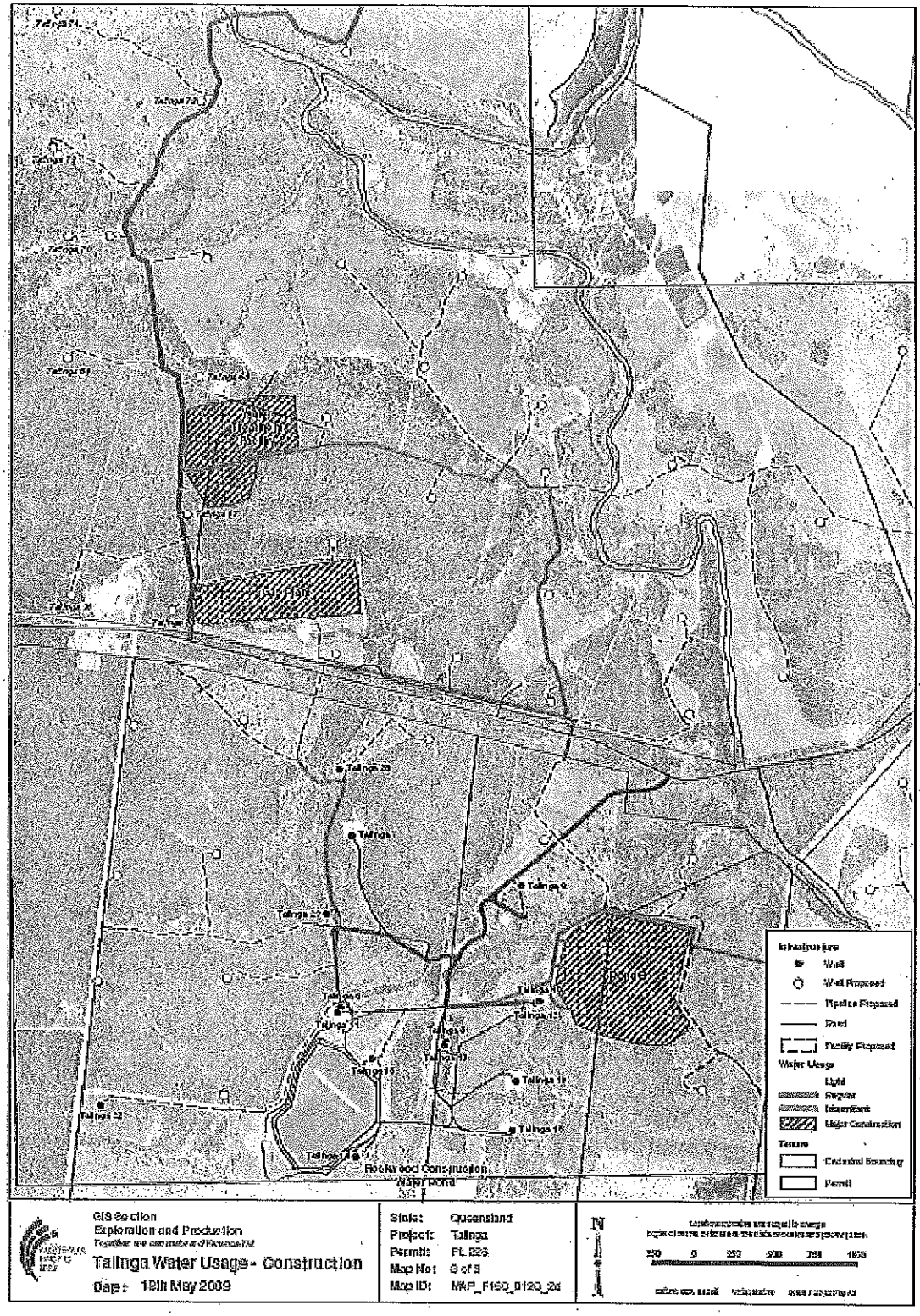
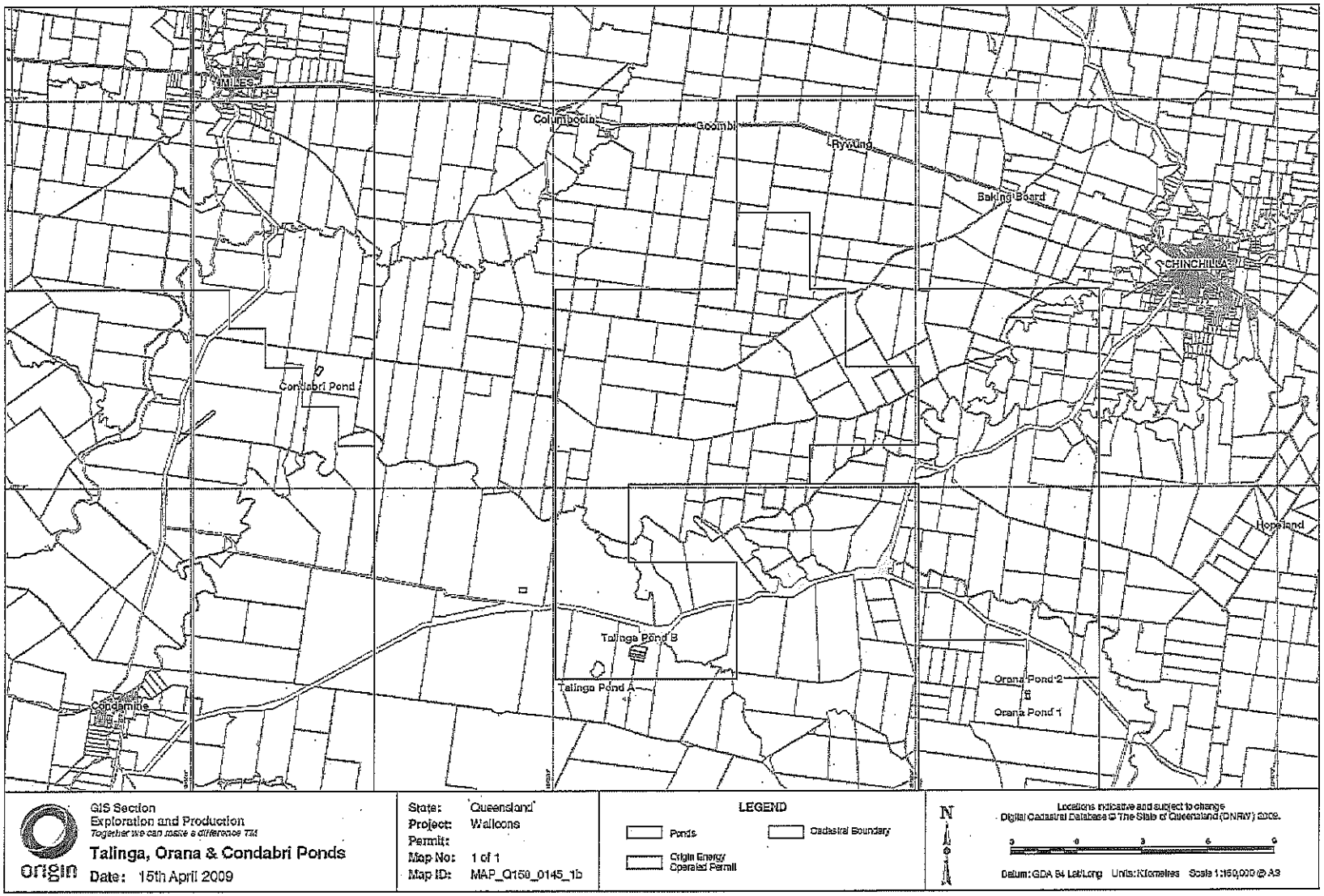


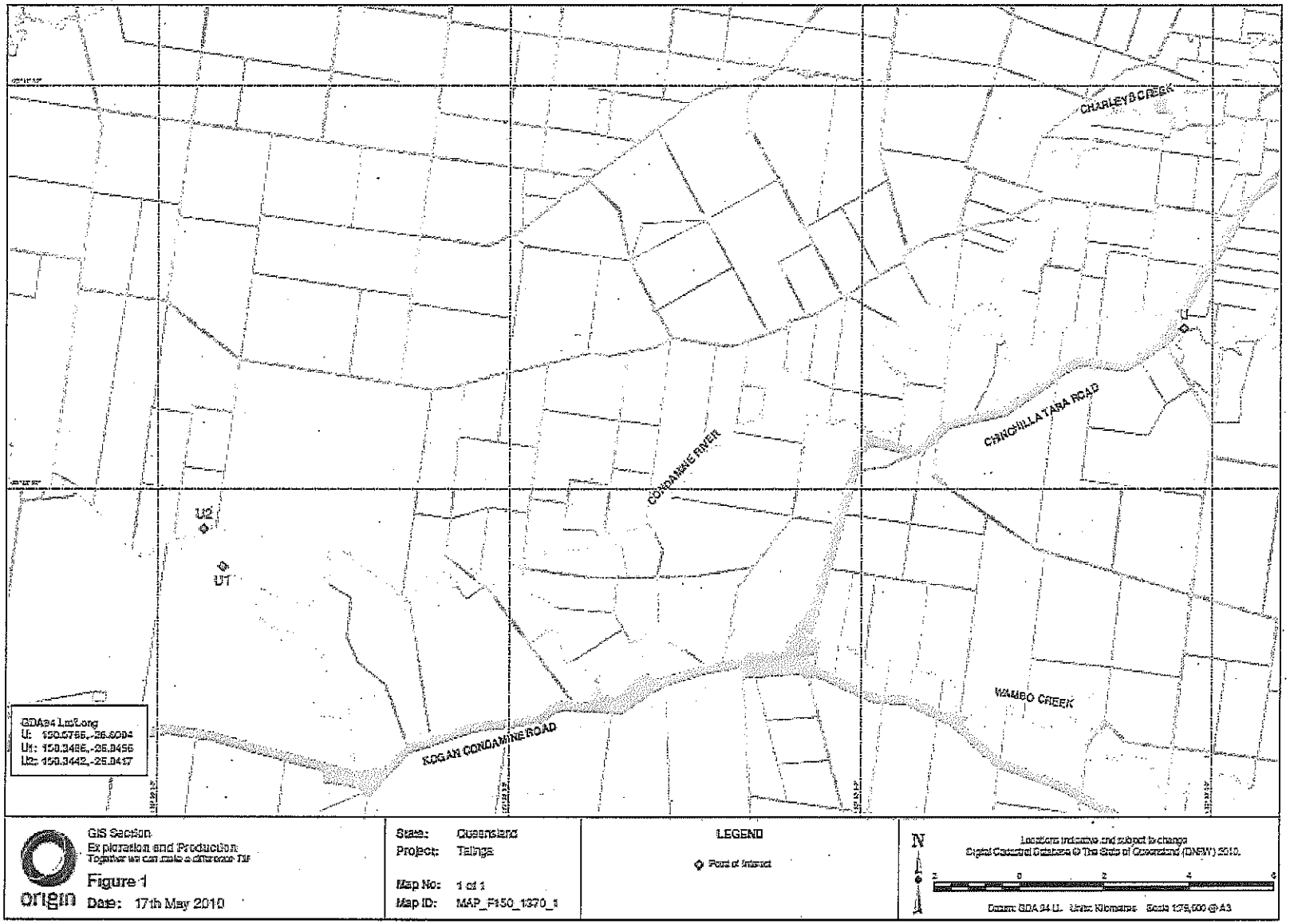
Map 2 – Location of Talinga Gas Plant and Water Treatment Facilities



Map 3 – Talinga Water Usage – Construction



Map 4 – Location of the Walloons Ponds



Map 5 - Location of monitoring and release points

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APPENDIX 6 Manual for Assessing Hazard Categories and Hydraulic Performance of Dams

Scope of Manual

The Chief Executive of the Department of Environment and Resource Management, under the *Environmental Protection Act 1994* (the Act) regulates dams associated with environmentally relevant activities to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends.

This manual is designed to ensure that the standards used for the design, construction, operation, modification and decommissioning of dams are appropriate for the hazards associated with each dam. This is consistent with the requirement under the Act to take all reasonable and practicable steps to protect the environmental values present, and to minimise environmental harm.

Background to Manual

Good practice requires that all dams must be assessed for "dam break" and "failure to contain" hazard potential. Those dams that could have significant or high impacts need to be carefully designed and operated. Hazards are situations where:

- Something exists that could cause environmental harm, and
- An environmental value is present which could be harmed.

The early identification of the hazard potential of a dam is important as this determines the standard of reliability required for construction and operation of the dam. In this manual, the hazard assessment will determine those dams that require documentation of basic design performance and monitoring. Detailed design of a dam may not need to be done prior to the issue of an authority or approval.

Purpose of Manual

This manual is a regulatory document designed to be called up by model conditions for environmental authorities and development approvals and any other relevant regulatory provisions. Together these provisions will regulate dams associated with environmentally relevant activities.

The purpose of this manual is to guide the assessment of the hazard category of all dams, and thereby determine those dams that require documentation of basic design performance and monitoring. This manual does *not* utilise risk (level) or risk (cost) assessment. Dams include levees, bunds and voids, but *not* any bunds designed for spill containment to an Australian Standard, for example AS1940.

Dams may be assessed using this manual into one of three hazard categories: low, significant or high. A suitably qualified and experienced person should review all available information on a dam, including a site inspection if necessary; and determine the appropriate hazard category for each dam. Lodgement of documentation of hazard assessments with the DERM is *only* required as set out in paragraphs below. Site inspection of a dam is at the discretion of the suitably qualified and experienced person conducting the hazard assessment, provided that all relevant aspects have been researched and documented.

While all dams subject to this manual must be assessed by a suitably qualified and experienced person for "dam break" and "failure to contain" hazard potential, dams with man-made embankments over a specified height or minimum volume and contaminant concentrations, cannot be assessed as low hazard.

For dams that are assessed as being in the low hazard category, basic conditions only are provided in model conditions, requiring dam owners to ensure that all their dams are designed and operated in accordance with accepted engineering standards and have an annual hazard assessment.

Dams that are assessed as being in the significant or high hazard category are referred to as 'regulated dams' because certification of design to performance standards by suitably qualified and experienced persons is normally required to be lodged, and certified annual inspections and reports must be provided.

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Background to Hazard Assessment based on Failure Event Scenarios

Failure to Contain Hazard

"Failure to contain" hazards are those potential dam failures that are non-flood producing, but the release of contaminants would endanger environmental values including human life. Examples of events include:

- Release of contaminated waters from a spillway during stormwater inflow events,
- Punctured membrane discharging contaminated process water or tailings,
- Releases due to pipe bursts in tailings or process water circuits associated with the dam,
- Piping (localised failure) of containment banks or bunds,
- Excessive foundation seepage,
- Overtopping of tailings dams by superelevation of tailings beaches or blockage of drainage,
- Erosion of containment structures around mining waste (decommissioned tailings dams, waste heaps etc.), and
- Dust and gas emissions.

Evaluation of the hazard potential on release requires information on the probable chemical nature of the stored material, including rates, volume and concentrations at the time of a possible release. Acidity and metal ions in solutions due to prolonged contact with ore bodies or stored material must also be considered.

Contaminant concentrations in an unplanned release must be estimated based on the contaminant concentration in the dam, basic design parameters such as storage volume, and resulting dilution in the stormwater. A range of less frequent rainfall events of short duration on contributing catchments must be checked. The hazard assessment must consider the interaction of any failure of a dam with all other dams, on project sites having multiple dams.

Dam Break Flood Hazard

The prerequisites for a dam break hazard are the existence, either permanently or temporarily, of a large body of water or other flowable substances (slimes, tailings etc); and environmental values, including stock, human life or property, that are susceptible to harm should a dam break occur.

A flood generally attenuates over time and ceases to be considered a flood once it is totally contained between the bed and banks of a stream. A high hazard for stock or animals on a flood plain or elsewhere is associated with water depths occurring in excess of 300 millimetres (0.3 metre). The estimated extent of the flood at a particular probability level is called the 'flood footprint'.

If the flood footprint is contaminated by the dam break flood, the environmental harm and potential for consequent harm from contaminants including access by stock or humans to the contaminants, must be fully considered. While environmental values include the ecology, if no significant environmental values exist within the flood footprint, then a conclusion of minimal consequent harm may be justified.

Where tailings or contaminated waters are associated with a dam break flood, environmental harm can also arise from the residual effects of the material deposited. The consequences of a clean up in the general environment can involve substantial costs that would fall within the meaning of 'environmental harm' in the Act.

Basic Hazard Evaluation Data

Applications that involve the construction and operation of any containment structure, must include relevant information on which an initial hazard assessment by the applicant has been undertaken.

Dam owners are likely to have much of the information already available. The minimum information is:

- specification by map/s of the location of the proposed project in relation to surrounding land use and watercourses – including the general topography and contours at a suitable scale,
- details of environmentally sensitive areas, rare and endangered species and human habitation and infrastructure developments in the near vicinity or general area and particularly downstream,
- details of watercourses and groundwater aquifers that are or might be used as water resources,

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- engineering sketch drawings, in accordance with good professional practice and sufficient to fully define the layout, structure, volume and proposed means of construction of all aspects of operations associated with the proposal,
- details of quantities and concentrations of all raw materials, products, by-products and waste products produced in operations associated with the proposal, and
- details of all studies conducted to assess requirements for storage and strength of all structures associated with the project – such as hydrological and geotechnical data.

Inspection of Site or Desktop Analysis

Whether or not a site inspection is required for a particular dam as part of a hazard assessment is a matter for consideration by the suitably qualified and experienced person concerned. Relevant factors to consider might be previous assessments, known changes, dams that are located remote from the main project site, and the likely outcomes. However, that person must be satisfied that all relevant aspects have been otherwise researched and documented to enable a reliable hazard assessment in each case.

Any assessment must include areas in the potential failure path or downstream of the dam that could be impacted by collapse or failure of the dam. Relevant matters to be observed include (but are not limited to):

- environmentally significant sites and species located in potential impact areas
- infrastructure including human habitation, worker accommodation and site offices, road crossings
- recreation facilities (bush camping etc.) along watercourses
- raw (fresh water) storages on the same watercourse
- presence of stock, irrigation and domestic water supply pumps, and water holes
- downstream storage containments – such as tailings dams and process water dams
- mine audits (entrances to underground mining) and/or open cuts (voids) – current or proposed
- catchment modification works (diversion drains, bunds etc) – current or proposed

In the case of tailings dams and other waste disposal facilities, a site inspection should also note points of impact above the level of the dam. Typical impacts from such facilities include:

- dusting potential (e.g. heavy metals, arsenic)
- gas emissions (e.g. cyanide, hydrogen fluoride, hydrogen sulphide, sulphur dioxide)
- spray mist (acid evaporation ponds etc)
- offensive odours
- smoke and heat (including spontaneous combustion of stored material)
- visual amenity

Collation and Assessment of Data

A hazard category based on 'dam break' or 'failure to contain' scenarios, must be determined based on the most adverse environmental harm that can arise from the range of all possible scenarios. The hazard category is based on the consequences of failure, not on the perceived probability of the failure occurring.

The following aspects of possible adverse scenarios should be carefully considered:

- Depending on its severity and duration, a rainfall event may give rise to a spill from a dam that does not result in collapse of the dam structure but nevertheless causes some harm.
- Rainfall events may be of sufficient intensity and duration to lead to a collapse of the dam structure with consequent increase in harm.
- Where potential harm is by release of a contaminant, account should be taken of the potential dilution by clean runoff entering the dam prior to release and potential dilution in receiving waters.
- A suitable range of rainfall events will need to be considered in order to cover all potential harm scenarios and the range of performance contained in Tables 4 and 5.
- For an earth dam or bund wall, a 'sunny day' failure can also occur due to loss of structural integrity of the wall, such as piping failure or weakness in zones of the wall due to various causes. The probability of such failure mechanisms occurring are reduced by good design and construction practices, and regular inspections by informed operators and qualified professionals.

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Hazard Category Assessment Criteria for this Manual

All dams as defined must have their hazard category assessed based on the potential harm resulting from failure event scenarios as set out in Tables 1 and 2 as guided by this text. For dams with a volume in excess of 250 megalitres, specific guidance is provided on the following page for assessing the dam break hazard.

However, as set out in the subsequent sections 'Hazard Category based on Height' or 'Hazard Category based on Contaminant Concentration and Minimum Volume', dams that meet the criteria in those sections must be assessed as regulated dams – either in the significant or high hazard category.

Hazard Category - Based on Assessment of Hazard Potential (Failure Event Scenarios)
The two basic possible "failure" sets of scenarios to be applied in any assessment are:

1. **"Failure to contain"** – spills or unplanned releases from the dam due to any cause, and
2. **"Dam break"** - collapses of the dam structure due to any possible cause.

In assessing the hazard category of a dam based on possible failure event scenarios, it is to be assumed that a failure event of each type specified has occurred i.e. 'failure to contain' and 'dam break', and then the potential environmental harm (i.e. the consequences) resulting from each such assumed failure event is to be assessed using Table 1. The hazard category for the dam overall, will be the highest hazard category produced in any category of harm, generated by any failure event scenario.

Failure to contain must consider potential adverse effects due to release to any groundwater systems.

Table 1 Failure to Contain Scenarios

ENVIRONMENTAL HARM	FAILURE TO CONTAIN HAZARD CATEGORY		
	High	Significant	Low
Categories of Harm			
General environmental	Location such that harm to a significant environmental value is likely, or serious environmental harm is possible. Such a value might include the presence of protected or endangered flora or fauna.	The environmental value is of lesser significance and harm is possible but not likely, or material environmental harm is possible.	No environmental values of significance, or only trivial environmental harm is possible.
Loss or harm to humans	Consumption of contaminated waters by humans with consequent loss or harm is likely.	Consumption of contaminated waters by humans with consequent loss or harm is possible.	No contamination of waters used for human consumption expected.
Loss of stock	Consumption of contaminated waters by stock with consequent loss or harm is likely.	Consumption of contaminated waters by stock with consequent loss or harm is possible.	Contaminated water not available to stock or no harm expected from consumption.
General economic loss.	Serious harm to communities, industrial, commercial or agricultural facilities, important utilities, the dam itself or other water resources in the failure path.	Material harm to industry, secondary roads, minor railways, public utilities, the dam itself or other water resources in the failure path.	Trivial harm to environmental values such as environmental nuisance arising from minor spills.

The hazard category of a dam can be changed by redesigning the proposal to isolate the dam from the environmental value. However, a hazard category cannot be changed by reliance on another structure,

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man-made or otherwise (e.g. bunds) to control the risk of a failure of the dam, where the bund/s could also be subject to failure under a possible scenario.

In relation to a dam break scenario, consideration must always be given to downstream consequences including failure of other storages that may be affected by the flood wave. The consequences of such sequential failure of other storages must be considered as part of the harm caused.

Where the contained volume of a dam at imminent failure is greater than 250 megalitres, the hazard assessment must fully address the hazard associated with consequent failure of other dams, containments or on-site infrastructure downstream of the dam being considered in the assessment.

Table 2 Dam Break Scenarios

ENVIRONMENTAL HARM	DAM BREAK HAZARD CATEGORY		
	High	Significant	Low
Categories of Harm			
General environmental	Location such that harm to a significant environmental value is likely, or serious environmental harm is possible. Such a value might include the presence of protected or endangered flora or fauna.	The environmental value is of lesser significance and harm is possible but not likely, or material environmental harm is possible.	No environmental values of significance, or only trivial environmental harm is possible.
Loss or harm to humans	Location such that people are routinely present in the failure path and if present loss or harm is likely. Consumption of contaminated waters by humans with consequent loss or harm is likely.	Location such that people are routinely present in the failure path and if present loss or harm is possible. Consumption of contaminated waters by humans with consequent loss or harm is possible.	Location such that people are not routinely present in the failure path. No contamination of waters used for human consumption expected.
Loss of stock	Location of stock such that loss of stock likely. Consumption of contaminated waters by stock with consequent loss or harm is likely.	Location of stock such that loss of stock possible. Consumption of contaminated waters by stock with consequent loss or harm is possible.	Stock not in path of dam break flood. Contaminated water not available to stock or no harm expected from consumption.
General economic loss	Serious harm to communities, industrial, commercial or agricultural facilities, important utilities, the dam itself or other water resources in the failure path.	Material harm to industry, secondary roads, minor railways, public utilities, the dam itself or other water resources in the failure path.	Trivial harm to environmental values such as environmental nuisance arising from minor spills.

For the purposes of assessing the aspect of potential environmental harm in Tables 1 or 2, the cost of potential environmental harm within the meaning of the *Environmental Protection Act 1994* may be taken to be the cost of rehabilitation or restoration of the environmental value harmed.

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Hazard Category Based on Height of a Man-made Embankment
While all dams as defined are subject to assessment using Tables 1 and 2 of this document, a dam is a regulated dam if it incorporates a man-made embankment and the height of that embankment is greater than 8 metres as measured between the crest and the lowest point of the toe of that embankment.

That is, such a dam must be assessed as in the significant or high hazard category and not in the low hazard category, even though it could be argued that the dam is low hazard by merely applying Tables 1 and 2.

Minimum Hazard Category Based on Contaminant Concentrations and Minimum Volume
While the hazard category of all dams is subject to assessment using Tables 1 and 2, a dam is an automatic minimum categorisation as a significant hazard if the dam:

(a) is likely to contain contaminants at a greater concentration than or outside the range of pH, indicated in Table 3, at any time when the volume contained within the dam is greater than 50% of the dam crest volume, AND
(b) has a dam crest volume that is greater than that indicated in Table 3.

Table 3 - Contaminant Concentrations and Minimum Volumes

Contaminant [1]	Liquor [2]	Total Solids [3]	Dam Volume
Arsenic	1.0 mg/L	500 mg/kg	2.5 ML
Boron	5.0 mg/L	15,000 mg/kg	2.5 ML
Cadmium	10 µg/L	100 mg/kg	2.5 ML
Cobalt	1.0 mg/L	500 mg/kg	2.5 ML
Copper	1.0 mg/L	5,000 mg/kg	2.5 ML
Lead	0.5 mg/L	1,500 mg/kg	2.5 ML
Mercury	2 µg/L	75 mg/kg	2.5 ML
Nickel	1.0 mg/L	3,000 mg/kg	2.5 ML
Selenium	50 µg/L	150 mg/kg	2.5 ML
Zinc	20 mg/L	35,000 mg/kg	2.5 ML
Cyanide	10 mg/L	2,500 mg/kg	2.5 ML
pH	5 to 9 inclusive	Net acid generation pH < 4.5	2.5 ML
Chloride	2,500 mg/L	-	10 ML
Fluoride	2.0 mg/L	-	10 ML

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Contaminant [1]	Liquor [2]	Total Solids [3]	Dam Volume
Sulphate	1,000 mg/L	-	10 ML
Salinity (conductivity)	4,000 µs/cm	-	10 ML

1 Metals should be analysed in accordance with recognised test methods by a NATA certified laboratory.
2 These concentrations apply to contaminants in solution, and therefore all samples should be filtered using the techniques described in the Water Quality Sampling Manual (EPA 1994).
3 Applies to the solids in a dam. Total solids include suspended and colloidal solids.

Hydraulic Performance Criteria for Regulated Dams
Hydraulic performance criteria mean the capacity of a regulated dam (as defined) to divert, contain or safely pass flowable substances. The performance criteria addressed below are:

For regulated dams that are NOT 'levees' as defined
- Spillway capacities.
- Design Storage Allowance (DSA).
- Mandatory Reporting Level (MRL).

For regulated dams that are 'levees' as defined
- Design protection (or conveyance) rating.

Application of Performance Criteria
Estimates of quantities based on the performance criteria set out in Tables 4 and 5 of this manual for regulated dams, must be applied as set out below, and documented accordingly.

1. Except as specified below in the section 'Full Hydrologic Analysis for DSA or MRL', a runoff coefficient of 1.0 must be used for all watershed translation of rainfall into runoff and no deductions must be allowed for losses due to evaporation from the ponded area of a dam.
2. For each regulated dam that is not a levee, a spillway must be designed and maintained to pass the peak flow from a design storm of critical duration for the relevant contributing catchment, at the annual exceedance probability (AEP) specified in Table 4. In determining the spillway capacity, the assumption must be made that the dam commences full at the spillway crest level.
3. For each regulated dam that is not a levee, and at any time could contain contaminants whose release would cause material or serious environmental harm, a DSA and MRL must be estimated.
4. The DSA must be provided in the dam or in the flow path below the dam, and must be demonstrated or estimated from either:
   (a) a 'full hydrologic analysis' as specified below and in table 5, OR
   (b) the 'method of monthly deciles' as specified below using the AEP value in Table 5.
   If a full hydrologic analysis cannot be conducted, then the 'method of monthly deciles' must be used.
5. For each regulated dam that is not a levee and requires an MRL, an MRL must be estimated as the lowest level (below spillway crest) that will allow either of the following to be retained within the dam:
   (a) the runoff from a 72 hour duration storm at the AEP specified in the Table 5; OR
   (b) a wave allowance at that AEP as estimated using a recognised engineering method.
6. Each levee must be designed and maintained to contain or divert the peak flow from either:
   (a) a design storm of critical duration for the contributing catchment relevant to the zone to be protected by the levee, at an AEP specified in Table 4, OR
   (b) the estimated volume and flow rate of a release of flowable materials resulting from a failure of relevant other works or infrastructure; AND such that
   (c) in at least one place in the levee crest, there is a restricted length of low crest, due to limiting the freeboard at that point or otherwise, such that the flood just exceeding the

imminent failure flood of the levee will be directed to a planned area or areas within the zone to be protected.

Important NOTE
Whatever hydrologic techniques are used for estimating required design parameters for a dam, the hazard assessor and dam designer must take into account the effect on hazard category that arises from changes in design of the dam. In particular, the impact on estimated concentrations of contaminants in releases resulting from unexpected and infrequent rainfall events contributing to dams or systems of dams, must be fully considered by the person assessing or designing the dam.

Full Hydrologic Analysis for DSA, MRL or Levees
A 'full hydrologic analysis' for DSA or MRL must use a model with a maximum daily timestep, and a calibrated watershed component based on soil moisture balance accounting, as set out below. All modelling must be conducted such that it obeys the law of conservation of matter (mass balanced).

The calibration of the watershed component of the model must be conducted using local rainfall data and consequent flows recorded at intervals the same as, or less than, the intervals to be used in analysis. The calibration must be conducted such that all of the following criteria are satisfied:

- at least five events must be used in the calibration, with each event resulting in 100% of the contributing catchment producing runoff at some time during the rainfall event;
- at least one event is estimated to be less frequent than ARI 5 when the real rainfall event is compared against design rainfall events of the same duration from AR&R or CRCFORGE;
- the simulated peak flow must agree with the recorded peak flow to within 30%, and the simulated total volume must agree with the recorded flow volume to within 10%; AND
- calibrations must be reviewed annually based on any additional qualifying events that have been recorded during the interim.

All hydrologic analyses with the calibrated model must use historical rainfall sequences representative of the site and sourced from either the Bureau of Meteorology daily rainfall stations or the Silo Data Drill.

Evaporative losses may be allowed in respect of lake evaporation based on accepted methods - such as Morton's method for shallow lakes. Daily data for Morton's method is available on the Silo Data Drill. No evaporative losses must be allowed for model time steps when rainfall is being applied.

A regulated dam shall be deemed to have sufficient design storage allowance (AEP 0.01) if the system of which it forms a part, does not spill during the continuous water balance simulation. For this condition to be met, a continuous simulation using at least 100 years of data is required (eg. Silo Data Drill). A spill may be acceptable within the simulation only if an outlier event is justified as indicated below.

Where the contributing catchment is less than or equal to 100 square kilometres, the AEP of an event in a 'full hydrologic analysis' and suspected of being an outlier, shall be estimated by matching the total depth of that 'real' rainfall event suspected of being an outlier, with an equivalent total depth for a design rainfall event (of the same duration and catchment area) from AR&R or CRCFORGE.

Where the contributing catchment is greater than 100 square kilometres, the AEP of an event in a 'full hydrologic analysis' and suspected of being an outlier, shall be estimated using frequency analyses of surface water flows from the application of real rainfall to the calibrated model, together with rainfall analyses of contributing catchments (and sub-catchments as relevant) as indicated above.

These methods of AEP estimation for real rainfall events may also be used when estimating volumes for MRL using a full hydrological analysis, as opposed to the default volume estimate method set out below.

Estimating Volume for MRL (Default Method)
The default method for estimating the volume allowance for MRL is to apply a design rainfall event to the contributing catchment of the particular dam or sequence of dams, making conservative operational assumptions: eg. pumps are not operable during the event.

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Method of Monthly Deciles for DSA (Default Method)

The 'method of monthly deciles' is the use of a rainfall record of sufficient length, recorded at a location in close proximity to the site physically and in terms of relevant rainfall characteristics, to be acceptable for conservative estimation of rainfall input to a dam.

A critical wet period is determined from Figure 1 based on the physical location of the site relative to catchments in Queensland. The maximum rainfall for the critical wet period each year is then determined and a probability distribution fitted to the data points.

Rainfall depths for relevant AEPs are interpolated or extrapolated as necessary, and 100% runoff is assumed from the relevant contributing catchments to generate run-off volumes for combination with estimated other inputs to the dam over the critical wet period.

Table 4 Spillway and Levee Rating – Annual Exceedence Probability (AEP)

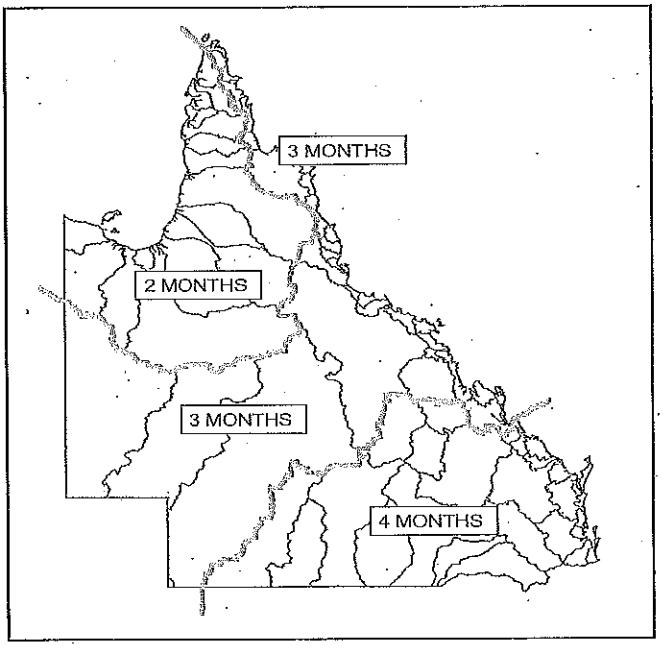
Life of Project involving Dam	Design Event Probability AEP by Hazard Category and Lifetime	
	High (See Note 1: below)	Significant
Less than 10 years	0.0001 (1 in 10,000)	0.001 (1 in 1,000)
11 to 20 years	0.00005 (1 in 20,000)	0.0005 (1 in 2,000)
21 to 50 years	0.00002 (1 in 50,000)	0.0002 (1 in 5,000)
51 to 100 years	0.00001 (1 in 100,000)	0.0001 (1 in 10,000)

Note 1: Where the hazard associated with a dam involves a population at risk (PAR), within the meaning of the Guidelines on Acceptable Flood Capacity for Dams February 2007 or its successor pursuant to the *Water Supply (Safety and Reliability) Act 2008*, and that PAR exceeds 15; a smaller AEP than that indicated in Table 4 may apply to that dam.

Table 5 Performance Criteria - AEP – Design Storage Allowance and Mandatory Reporting Levels

Hazard Category	Design Event Probability AEP		
	DSA Full Hydrologic Analysis	DSA Deciles Analysis	MRL 72 hour event
High	0.01	0.01	0.01
Significant	0.01	0.05	0.01

Figure 1 – Critical Wet Periods for 'Method of Monthly Deciles'



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