SCHEDULE D — LAND

General

(D1) Contaminants that will or may cause environmental harm must not be directly or indirectly released to land except as permitted under this environmental authority.

Disturbance to Land – General

(D2) Prior to conducting petroleum activities that involve significant disturbance to land, an assessment must be undertaken of the condition, type and ecological value of any vegetation in such areas where the activity is proposed to take place.

(D3) The assessment required by Condition (D2) must be undertaken by a suitably qualified person and include the carrying out of field validation surveys, observations and mapping of any **Category A, B or C Environmentally Sensitive Areas (ESA's)** and the presence of species classed as endangered, vulnerable, rare or near threatened under the *Nature Conservation Act 1992* and for petroleum activities that commenced after XX March 2013 (the date of grant of this environmental authority), areas containing State significant biodiversity values.

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(D4) If the assessment required by Conditions (D2) and (D3) indicates that a regional ecosystem (RE) mapped as 'Endangered' or 'Of Concern' by the Queensland Herbarium should be in a lower conservation value classification and the holder of this environmental authority wishes to undertake activities as if the ecosystem is of the lower conservation value they must notify the administering authority in writing before any significant disturbance to land takes place.

(D5) If, within the 20 business days following the lodgement of the notification under Condition (D4) the administering authority notifies the holder of this environmental authority, in writing, that the RE mapping requires further validation, then significant disturbance to land in the mapped regional ecosystem are prohibited until the administering authority provides written advice that significant disturbance to land may proceed.

(D6) The holder of this environmental authority, when carrying out petroleum activities must:

(a) avoid, minimise or mitigate (in order of preference) any impacts on areas of vegetation or other areas of ecological value;
(b) minimise disturbance to land that may otherwise result in land degradation;
(c) ensure that for land that is to be **significantly disturbed** by petroleum activities:
  (i). the top layer of the soil profile is removed;
  (ii). stockpiled in a manner that will preserve its biological and chemical properties; and
  (iii). used for **rehabilitation** purposes (in accordance with Condition (H4));
(d) avoid clearing mature trees; and
(e) prior to carrying out field based activities, make all relevant staff, contractors or agents carrying out those activities, aware of the location of any category A, B or C ESA's and the requirements of this environmental authority.

Note: This environmental authority does not authorise the taking of protected animals or the tampering with an animal breeding place as defined under the Nature Conservation Act 1992 *and Regulations*.

(D7) In accordance with Condition (D6), if significant disturbance to land is unavoidable, the holder of this environmental authority must not clear vegetation or place fill:

(a) in a way which significantly isolates, fragments or dissects tracts of vegetation resulting in a reduction in the current level of ecosystem functioning, ecological connectivity (i.e. stepping stone or contiguous bioregional/local corridor networks) and/or results in an increase in **threatening processes** (e.g. potential impacts associated with edge effects or introduced species);
(b) on slopes greater than 10% for activities other than pipelines and wells; or
(c) in **discharge areas**.

(D8) Clearing of remnant vegetation shall not exceed 10 metres in width for the purpose of establishing tracks and 20 metres in width for dual carriageway roads unless otherwise approved by the administering authority in writing.

(D9) Cleared vegetation must be stockpiled in a manner that facilitates respreading or salvaging and does not impede vehicle, stock or wildlife movements.

Disturbance to Land – Environmentally Sensitive Areas

(D10) The holder of this environmental authority must ensure that petroleum activities, except as otherwise authorised by condition (D18) of this environmental authority:

(a) are not conducted in any category A, B or C Environmentally Sensitive Areas (ESAs);
~~(a)~~(b) ~~or~~ are not conducted within 200 ~~metres~~m of any ~~listed~~ category A, B or C ESAs; and
~~(b)~~(c) do not involve activities other than limited petroleum activities within the protection zone of a ~~listed~~ category A ESA (i.e. from 200m to 1km of the category A ESA), or within the protection zone of a ~~listed~~ category B or C ESA (i.e. from 200m to 500m of the category B or C ESA).

Note: Indicative ESA mapping is available on the Department of Environment and Heritage Protection's website at http://www.ehp.qld.gov.au/licences-permits/maps_of_environmentally_sensitive_areas.php

(D11) Limited petroleum activities carried out in accordance with Condition (D10(c)) must be preferentially located in pre-existing areas of clearing or significant disturbance to the greatest practicable extent and avoid the clearing of mature trees.

(D12) Despite Condition (D10), limited petroleum activities may be undertaken within 200m of, or in the following specified Category B and C ESAs:

(a) 'Endangered' regional ecosystems;
(b) 'Of Concern' regional ecosystems;
(c) State Forests;
(d) Timber Reserves

provided that they do not overlap with any other Category A, B or C ESA or its associated protection zone.

(D13) Where limited petroleum activities are proposed to be undertaken within 200m of, or in the Category B and C ESAs specified in Condition (D12), the holder of this environmental authority must:

(a) be able to demonstrate that no reasonable or practicable alternative exists; and
(b) where the ESA is a State Forest or Timber Reserve:
  (i). obtain written approval from the authority responsible for the administration of the *Forestry Act 1959*;
  (ii). comply with all restrictions and conditions contained within the approval required under Condition (D13(b)(i));
  (iii). where the conditions of the approval required under Condition (D13(b)(i)) conflict with the conditions of this environmental authority, comply with the conditions of this environmental authority; and
  (iv). provide a copy of the written approval required under Condition (D13(b)(i)) to the administering authority upon request.

(D14) Where limited petroleum activities are undertaken within 200m of, or in the Category B or C ESAs specified in Condition (D12), disturbance to land must only be located and carried out in areas according to the following order of preference:

(a) pre-existing cleared areas or significantly disturbed areas less than 200m from a Category C ESA;

Commented [LV41]: As per advice received must state specific conditions that authorise this

Commented [LV42]: There is no such thing as a listed Cat C, and definition of Cat A and B already states that is an area listed in the EP Reg. No need for this word.

Commented [LV43]: I recommend exerting caution with this one because the definition of limited pet activities in this EA is different to the model conditions. This condition is allowing them to have flowlines within PZ of ESAs without defining flowlines, and as per sch's email Arrow's flowlines can have greater impact than pipelines. I would suggest going with the essential petroleum activities definition in the model conditions and as Gillian has suggested authorise the specific activities required within PZ of ESAs.

Commented [MK44]: As per recent communication between Keara McDonagh (EHP) and Chris Johnstone (Arrow) on EA conditions for PEN100901910 for ATP683, Arrow requested this condition wording be entered into this EA also.

(b) pre-existing cleared areas or significantly disturbed areas less than 200m from a Category B ESA;
(c) undisturbed areas less than 200m from a Category C ESA;
(d) undisturbed areas less than 200m from a Category B ESA;
(e) pre-existing areas of significant disturbance within a Category C ESA (e.g. areas where significant clearing or thinning has been undertaken within a RE, and/or areas containing high densities of weed or **pest** species which has inhibited re-colonisation of native regrowth);
(f) pre-existing areas of significant disturbance within a Category B ESA (e.g. areas where significant clearing or thinning has been undertaken within a RE, and/or areas containing high densities of weed or pest species which has inhibited re-colonisation of native regrowth);
(g) areas where clearing of a Category C ESA is unavoidable; and
(h) areas where clearing of a Category B ESA is unavoidable.

(D15) Notwithstanding Conditions (D12) to (D14), where limited petroleum activities are proposed to be undertaken within 200m of, or in a Category B or C ESAs specified in Condition (D12), any vegetation clearing must not exceed any of the following areas:

(a) if the disturbance relates to an Endangered or Of Concern RE, 10% of the **remnant unit** of Endangered or Of Concern RE as ground truthed and mapped before any activity commences as per Condition (D2) and (D3) of this environmental authority for the life of the project; and
(b) more than 30m^2 for the construction of a sump; or
(c) six (6) metres in width for tracks; or
(d) 12 metres in width for pipeline construction purposes.

(D16) For each well site within 200m of, or in a Category B or C ESA specified in Condition (D12), all reasonable and practical measures are taken to minimize the area cleared which must include but not be limited to, for each well site, ranked constraints mapping and a risk assessment which considers safety.

(D17) Details of any significant disturbance to land undertaken within 200m of, or in a Category B or C ESA, along with a record of the assessment required by Conditions (D2) and (D3) must be kept and submitted to the administering authority upon request.

(D18) Despite Condition (D10), the Daandine Brine Dam 2 and associated activities necessary for construction, operation, maintenance and monitoring of the dam, located within the area bound by the coordinates prescribed by *Schedule ~~C~~D, Table 1 – Coordinates Enclosing the Disturbance Area for Daandine Brine Dam 2*, are permitted within the protection zones ~~or buffer zones~~ of Category B and Category C Environmentally Sensitive Areas.

Commented [GN46]: New conditions as per request in amendment application

Commented [LV45]: Have Arrow identified the type of ESA it is? Is it both a Cat B AND C ESA?

Schedule ~~C~~D, Table 1 – Coordinates Enclosing the Disturbance Area for Daandine Brine Dam 2

Point	Latitude or Northing (GDA94, Zone 56)	Longitude or Easting (GDA94, Zone 56)
1	7001708	297524
2	7001153	297384
3	7001051	298345
4	7001418	298444
5	7001601	298406
6	7001620	298190

Environmental Offsets

(D19) If the holder of this environmental authority requires access to Endangered Regional ecosystems, 'Of Concern' Regional Ecosystems, State Forests or Timber Reserves, the environmental authority holder must enter in to an environmental offset agreement with the administering authority which is at least equivalent to the value of any disturbed 'Endangered'

or 'Of Concern' RE within six (6) months after submitting an Operational Plan in accordance with Conditions (A5) – (A8).

(D20) The environmental authority holder must implement any environmental offset agreement entered into in accordance with Condition (D19) as soon as practicable after finalisation.

Commented [LV47]: These offsets are not the same as the offsets required by the QBOP nor do they apply to the same EVs covered by the QBOP. If these conditions have been in place for some time now without Arrow having a problem with them I suggest you keep them. This is an offset agreement that is required after finalisation, QBOP requires offsets to be secured before the impact occurs.

Commented [GN48]: May have implications on wording due to the insertion of new QBOP related conditions. *To be considered by Arrow and EHP when finalising EA amendment.*

Soil Management

(D21) The holder of this environmental authority must develop and implement soils management procedures, which have been certified by a suitably qualified person, for areas to be disturbed by petroleum activities prior to commencement of these petroleum activities to prevent or minimise the impacts of soil disturbance.

(D22) Despite condition D21, for areas of disturbance at the time of issue of this environmental authority, the holder of this environmental authority must develop and implement soils management procedures, which have been certified by a suitably qualified person by 18 July 2011.

(D23) The Soil Management Procedures required by conditions D21 and D22 must include, but not necessarily be limited to:

(a) identify soil units within areas to be disturbed by petroleum activities at a scale of 1:50 000, in accordance with the "Guidelines for Surveying Soil and Land Resources, 2nd Edition" (McKenzie et al. 2008), "Australian Soil and Land Survey Handbook, 3rd Edition" (National Committee on Soil and Terrain 2009), "The Australian Soil Classification" (Isbell 2002) and "Guidelines for agricultural land evaluation in Queensland" (Queensland Department of Primary Industries Information Series QI90005 1990) or subsequent versions thereof;
(b) establish baseline soils information for the soil units to be disturbed including soil depth, pH, electrical conductivity (EC), chloride, cations (aluminium, calcium, magnesium, potassium and sodium), exchangeable sodium percentage (ESP), particle size and soil fertility (including nitrogen, phosphorous, potassium, sulphur and micronutrients);
(c) a soils monitoring program outlining parameters to be monitored, frequency of monitoring and maximum limits for each parameter for each soil unit;
(d) identify the types of soils and soil units requiring specific management practices (e.g. saline or sodic soils) relevant to assessment for agricultural suitability erodibility and rehabilitation
(e) detailed topsoil and topsoil stockpile management procedures for each soil unit in the event of any significant soil disturbance;
(f) detailed mitigation measures and procedures for each soil unit to manage the risk of adverse soil disturbance in the carrying out of the petroleum activity(ies);
(g) for pipelines, methods of keeping soil horizons separate on excavation, storage and backfilling; and
(h) for areas of good quality agricultural land, detailed methods to be undertaken to minimise potential impacts.

(D24) A copy of the Soils Management Procedures must be submitted to any potentially affected landholders upon request.

Acid Sulfate Soils

(D25) The holder of this environmental authority must determine the presence of **acid sulfate soils** prior to:

(a) any excavation or otherwise removing 100m^3 or more of soil or sediment; or
(b) filling of land involving 500m^3 or more of material with an average depth of 0.5 of a metre or greater.

(D26) The holder of this environmental authority must determine the presence of acid sulfate soils prior to any excavation or filling at, or in exceedance of, the thresholds in Condition (D25)(a) or (b) in any of the following areas:

(a) areas to be disturbed where there are lithologies with sulfide bearing minerals; or
(b) naturally saline areas (*.e.g.* salt pans, lakes *etc*); or
(c) wetland areas (*e.g.* mapped as Land zone three (3) on the regional ecosystem database preclear layer and/or areas mapped as wetlands under the QLD Wetlands program, WetlandInfo*);* or
(d) areas with elevation less than 2 metres AHD; or
(e) areas with soil and sediment of recent geological age (Holocene); or
(f) areas where marine or estuarine sediments and tidal lakes are present; or
(g) low-lying coastal wetlands or back swamp areas, waterlogged or scalded areas; or
(h) stranded beach ridges and adjacent swales, interdune swales or coastal sand dunes; or
(i) coastal alluvial valleys; or
(j) areas where the dominant vegetation is tolerant of salt, acid and/or waterlogging conditions (e.g. mangroves, saltcouch).

(D27) Subject to Conditions (D25) and (D26) and prior to any disturbance of acid sulfate soils, the holder of this environmental authority must prepare an acid sulfate soil environmental management plan in accordance with Appendix 4 of the State Planning Policy 2/02 Guideline Acid Sulfate Soils.

(D28) The acid sulfate soil environmental management plan must be prepared and implemented by a suitably qualified person.

(D29) The holder of this environmental authority must comply with the acid sulphate soil environmental management plan.

Fauna Management

(D30) Fauna management procedures must be developed and implemented to ensure that petroleum activities (including, but not limited to, pipeline construction, dam construction and operation) are carried out in a manner that minimises the risk of injury, harm, or entrapment to wildlife and stock.

(D31) **Well lease infrastructure** and dams must be securely fenced and / or screened as soon as practicable, but within one (1) month after construction is completed to:

(a) exclude and prevent the entrapment of livestock and wildlife; and
(b) limit habitats for the introduction or spread of noxious fauna pest species.

(D32) The fauna management procedures must include training and awareness of staff and contractors and ensure that any planned fauna handling is undertaken by a suitably qualified person.

Note: The procedures required by Conditions (D30) and (D32) should consider the "Australian Pipeline Industry Association Code of Environmental Practice – Onshore Pipelines" dated March 2009, or subsequent versions thereof.

Pest management

(D33) In carrying out the petroleum activity(ies) the holder of this environmental authority must develop and implement an effective pest management program by 18 October 2011 which has been certified by a suitably qualified person that includes but is not limited to the following:

(a) identification of pest species and infestation areas;
(b) prevention and/or minimisation of the introduction and/or spread of pests;
(c) control and management of pest outbreaks as a result of petroleum activities; and
(d) details of community consultation in developing the pest management program.

Note: The pest management program required by Condition (D33) should consider the "Petroleum Industry (including coal seam methane gas) Minimising Pest Spread Guidelines" dated June 2008, or subsequent versions thereof. This document is available for download from: http://www.dpi.qld.gov.au/documents/Biosecurity_EnvironmentalPests/IPA-Minimising-Pest-Spread-Advisory-Guidelines.pdf

(D34) A copy of the pest management procedures must be made available to any potentially affected landholders upon request.

Chemical and Fuel Storage

(D35) 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.

(D36) 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.

(D37) All containment systems must be designed to minimise rainfall collection within the system.

Pipelines

(D38) Pipelines must be preferentially located alongside existing linear infrastructure such as roads, tracks and powerlines.

(D39) Pipeline trenches must only be left open for the minimum time practicable.

(D40) The length of pipeline trench open at any one time must be minimised as far as practicable.

(D41) Completed pipeline construction areas must be:

(a) a stable landform with no subsidence or erosion gullies for at least five (5) years;
(b) be re-profiled to original contours and established drainage lines;
(c) be visually consistent with the surround land features; and
(d) be reinstated to the pre-disturbed land use and soil suitability class.

(D42) The holder of this environmental authority must monitor reinstated pipeline corridors for subsidence at least every 20 business days for the first 120 business days after reinstatement to ensure compliance with Condition (D41).

Impacts to State Significant Biodiversity Values

(~~D29~~D43) **Impacts to mapped State significant biodiversity values** may only occur once the following have occurred:
(a) ~~an **Offset Area Management**~~a **Site Based Offset Plan** for those impacts has been submitted and accepted in writing by the administering authority; and
(b) the Site Based Offset Plan ~~Offset Area Management Plan~~ is recorded within a signed **deed of agreement** between the holder of this environmental authority and the administering authority.

(~~D30~~D44) The deed of agreement must be implemented.

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(~~D31~~D45) Offsets must be provided for impacts to mapped State Significant Biodiversity Values in accordance with the Queensland Biodiversity Offset Policy, and the signed deed of agreement.

Commented [MK50]: QBOP requirement which only required for any new activities post grant of this EA.

Offset conditions agreed upon between Arrow and EHP 20/02/2013. Only required for any new activities post grant of this EA as per note within email.

SCHEDULE E – ENVIRONMENTAL NUISANCE

Odour, dust and other airborne contaminants

(E1) The release of odour, dust or any other airborne contaminant(s), or light from the petroleum activity(ies) must not cause an environmental nuisance at any **sensitive place**.

Noise

(E2) Prior to undertaking petroleum activities that will result in **short-term**, **medium-term** or **long term noise events** that are likely to impact on a sensitive receptor, the holder of this environmental authority must model or calculate any potential noise emissions from the relevant petroleum activity and determine if noise emissions are likely to exceed the noise levels specified in *Schedule E, Table 1 – Noise limits at Sensitive Receptors*.

(E3) If noise modelling or the calculations indicates that petroleum activities are likely to exceed the noise levels specified in *Schedule E, Table 1 – Noise limits at sensitive receptors*, the holder of this environmental authority must prepare a Noise Management Plan prior to undertaking petroleum activities, which demonstrates how the noise limits specified in *Schedule E, Table 1 – Noise limits at sensitive receptors* will be achieved in the event of a valid noise complaint.

(E4) Despite condition E3, for any petroleum activities existing at the time of issue of this environmental authority, if noise modelling or the calculations indicates that petroleum activities are likely to exceed the noise levels specified in *Schedule E, Table 1 – Noise limits at sensitive receptors*, the holder of this environmental authority must implement a Noise Management Plan, which demonstrates how the noise limits specified in *Schedule E, Table 1 – Noise limits at sensitive receptors* will be achieved in the event of a valid noise complaint.

Commented [MK51]: Removed date as date has passed.

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(E5) The Noise Management Plan must address, but not be limited to, the following matters:

(a) a location based noise assessment to determine compliance with the noise limits in *Schedule E, Table 1 – Noise limits at Sensitive Receptors*
(b) the measured and/or predicted noise level of these noise sources and activities at noise sensitive receptors, taking into account any tonal or impulsive noise impacts;
(c) the reasonable and practicable control or abatement measures (including relocating the activity, hours of operation, or having an **alternate arrangement** in place with any potentially affected person) that can be undertaken to reduce identified intrusive noise sources;
(d) the level of noise at noise sensitive receptors that would be achieved from implementing these measures;
(e) the handling of future noise complaints;
(f) community liaison and consultation including but not limited consultation processes for when night time activities (i.e. between 10:00 pm and 6:00 am) are likely to exceed 25dBA; and
(g) training of staff and contractors in best available noise management practices.

(E6) The emission of noise from the licensed place must not result in levels greater than those specified in *Schedule E, Table 1 – Noise limits at Sensitive Receptors* in the event of a valid complaint about noise being made to the administering authority.

Schedule E, Table 1 – Noise Limits at Sensitive Receptors

Time Period	Metric	Short Term Noise Event	Medium Term Noise Event	Long Term Noise Event
7:00am – 6:00pm	$L_{Aeq,adj,15\ min}$ Max $L_{pA,\ 15\ mins}$	45 dBA 55 dBA	43 dBA 51 dBA	40 dBA 45 dBA
6:00pm – 10:00pm	$L_{Aeq,adj,15\ min}$ Max $L_{pA,\ 15\ mins}$	40 dBA 50 dBA	38 dBA 46 dBA	35 dBA 40 dBA
10:00pm – 6:00am	$L_{Aeq,adj,15\ min}$ Max $L_{pA,\ 15\ mins}$	28 dBA 38 dBA	28 dBA 36 dBA	28 dBA 33 dBA
6:00am – 7:00am	$L_{Aeq,adj,15\ min}$ Max $L_{pA,\ 15\ mins}$	40 dBA 50 dBA	38 dBA 46 dBA	35 dBA 40 dBA

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L_{Aeq} and Max L_{pA} *are to be measured over any 15 minute period*
Deemed background noise levels (L_{ABG}) for Schedule E, Table 1 – Noise Limits at Sensitive Receptors are:
7:00 am - 6:00pm: 35 dBA
6:00 pm – 10:00 pm: 30 dBA
10:00 pm – 6:00 am: 25 dBA
6:00 am – 7:00 am: 30 dBA

(E7) If the noise subject to a complaint is tonal or impulsive, the adjustments detailed in *Schedule E, Table 2 – Adjustments to be Added to Noise Levels at Sensitive Receptors* are to be added to the measured noise level(s) to derive $L_{Aeq,\ adj,\ 15\ min}$.

Schedule E, Table 2 – Adjustments to be Added to Noise Levels at Sensitive Receptors

Noise Characteristic	Adjustment to Noise
Tonal characteristic is just audible	+ 2 dBA
Tonal characteristic is clearly audible	+ 5 dBA
Impulsive characteristic is just audible	+ 2 dBA
Impulsive characteristic is clearly audibly	+ 5 dBA

(E8) Where alternative arrangements are in place with any affected person as referred to by Condition (E5)(c), the noise limits in *Schedule E, Table 1 – Noise limits at Sensitive Receptors* do not apply at that location for the duration for which the alternative arrangements are in place.

Low Frequency Noise

(E9) Notwithstanding Condition (E2), emission of any noise below 315 Hz must not cause an environmental nuisance.

(E10) Low frequency noise from the petroleum activities is not considered to be an environmental nuisance under Condition (E9) if monitoring shows that noise emissions do not exceed the following limits:

(a) 50 dB(Z) measured inside the sensitive receptor; and
(b) the difference between the internal A-weighted and Z-weighted noise levels is no greater than 15 dB.

Vibration and Blasting Activities

(E11) The holder of this environmental authority must develop a blast management plan in accordance with Australian Standard 2187 for each planned blasting activity before it is undertaken.

(E12) The blast management plan required by Condition (E11) must include measures to minimise the likelihood of any adverse effects being caused by airblast overpressure and/or ground borne vibrations at any sensitive receptor and demonstrate current best practice environmental management.

(E13) All blasting must be carried out in a proper manner by a suitably qualified person.

(E14) All blasting must be carried out in accordance with the Blast Management Plan.

(E15) Noise from blasting operations must not exceed an airblast overpressure level, when measured at or extrapolated to any sensitive receptor, of 115 dB (linear peak) for nine (9) out of any ten (10) consecutive blasts initiated nor 120 dB (linear peak) at any time.

(E16) Ground-borne vibration peak particle velocity caused by blasting operations, when measured at or extrapolated to any sensitive receptor must not exceed more than 5 mm per second for nine (9) out of any ten (10) consecutive blasts initiated, or 10 mm per second at any time.

SCHEDULE F – AIR

Fuel Burning or Combustion Equipment

(F1) The only type of fuel to be burned in fuel burning or combustion equipment under normal operating conditions is coal seam gas.

(F2) Contaminants releases to air emitted from fuel burning and combustion equipment point sources that are capable of burning at least 500 kg in an hour must be directed vertically upwards without any impedance or hindrance.

(F3) The holder of this environmental authority must maintain a register of fuel burning and combustion equipment that is capable of burning at least 500 kg of fuel in an hour that must include, as a minimum, the following information for each piece of equipment:

(a) fuel burning or combustion equipment name and location;
(b) stack emission height (metres);
(c) minimum efflux velocity (m/s);
(d) mass emission rates (g/s); and
(e) contaminant concentrations (mg/Nm^3 @ x %O_2 dry gas at 0°Celsius and 1 atmosphere).

(F4) The holder of this environmental authority must ensure that the information contained in the register of fuel burning and combustion equipment is always current and complete.

(F5) All entries in the register of fuel burning and combustion equipment must be certified by the chief executive officer for the tenure holder, or their delegate, as being accurate and correct.

Fuel Burning or Combustion Equipment Located Outside Hubs or Populated Areas

(F6) Prior to the installation and operation of any new fuel burning or combustion equipment, that is capable of burning at least 500 kg of fuel in an hour, the holder of this environmental authority must conduct air dispersion modelling to calculate the ground level concentrations of emissions from all existing and proposed fuel burning or combustion equipment under maximum operating conditions (including other industry) within the ambient airshed and identify any potential impacts to air quality within the study area.

(F7) The holder of this environmental authority must ensure that the calculated ground level concentrations required under condition (F6) do not exceed the criteria for each air contaminant in *Schedule F, Table 1 – Maximum Ground Level Concentration Criteria*.

Schedule F, Table 1 – Maximum Ground Level Concentration Criteria

Contaminant	Concentration at 0°Celsius	Units	Averaging time
NOx as Nitrogen Dioxide	250	µg/m^3	1 hour
NOx as Nitrogen Dioxide	33	µg/m^3	1 year
Carbon Monoxide	11	mg/m^3	8 hour

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(F8) The holder of this environmental authority must undertake emissions testing within 3 months post commissioning of any fuel burning and combustion equipment capable of burning at least 500 kg of fuel in an hour to verify the estimates used in the air dispersion modelling.

(F9) Where the results of the emissions testing required under condition (F8) indicate that the emission estimates used in the air dispersion modelling required under condition (F6) are exceeded, the holder of this environmental authority must:

(a) provide details to the administering authority within 10 **business days**;

(b) re-undertake the modelling based on the new information; and
(c) determine and implement appropriate pollution control measures to bring the emissions into compliance with the limits specified in *Schedule F, Table 1 – Maximum Ground Level Concentration Criteria*.

Fuel Burning and Combustion Equipment in Hubs and / or Places within 5 km of Populated Areas

(F10) Fuel burning or combustion equipment that is capable of burning at least 500 kg of fuel in an hour must not be located in hubs or in places within 5km of a populated area unless it is specified in *Schedule F, Table 2 – Release of Contaminants to Air*.

(F11) Fuel burning or combustion equipment located in hubs or in places within 5km of a populated area, that is capable of burning at least 500 kg of fuel in an hour, must only release contaminants to the atmosphere at a height and a efflux velocity not less than the corresponding height and velocity stated for that release point (RP) as provided for in *Schedule F, Table 2 - Release of Contaminants to Air*.

(F12) Fuel burning or combustion equipment located in hubs or in places within 5km of a populated area, that is capable of burning at least 500 kg of fuel in an hour, must not release contaminants to the atmosphere from a release point at a mass emission rate or concentration in excess of that stated in *Schedule F, Table 2 - Release of Contaminants to Air*.

Schedule F, Table 2 - Releases of Contaminants to Air

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Resource Authority	Field	Facility	Release Point No. (EA)	Unit Description	Release Height (m)	Minimum Efflux Velocity (m/sec)	NOx		CO	
							Maximum Release limit	Release limit type	Maximum Release limit	Release limit type
PL 230	Daandine	DD CGPF	A1	K-0001 Compressor 1	8.1	30	6.8	g/sec	5.5	g/sec
PL 230	Daandine	DD CGPF	A2	K-0002 Compressor 2	8.1	30	6.8	g/sec	5.5	g/sec
PL 230	Daandine	DD CGPF	A3	K-0003 Compressor 3	8.1	30	6.8	g/sec	5.5	g/sec
PL 230	Daandine	DD CGPF	A4	K-0004 Compressor 4	8.1	30	6.8	g/sec	5.5	g/sec
PL 230	Daandine	DD CGPF	A5	K-0005 Compressor 5	8.1	30	6.8	g/sec	5.5	g/sec
PL 230	Daandine	DD CGPF	A6	K-0006 Compressor 6	8.1	30	6.8	g/sec	5.5	g/sec
PL 230	Daandine	DD CGPF	A7	K-0007 Compressor 7	8.1	30	6.8	g/sec	5.5	g/sec
PL 230	Daandine	DD CGPF	A8	TEG Reboiler	6.8	14	100	ppm	na	na
PL 230	Daandine	DD CGPF	A9	Diesel Backup Generator	1.3	29	na	na	na	na
PL230	Daandine	TBA	TBA	Power Generation for RO Plant	TBA	TBA	TBA	TBA	TBA	TBA

Resource Authority	Field	Facility	Release Point No. (EA)	Unit Description	Release Height (m)	Minimum Efflux Velocity (m/sec)	NOx		CO	
							Maximum Release limit	Release limit type	Maximum Release limit	Release limit type
PL 198	Tipton	TW CGPF	A10	K-0001 Compressor 1	7.6	30	6.8	g/sec	5.5	g/sec
PL 198	Tipton	TW CGPF	A11	K-0002 Compressor 2	7.6	30	6.8	g/sec	5.5	g/sec
PL 198	Tipton	TW CGPF	A12	K-0003 Compressor 3	7.6	30	6.8	g/sec	5.5	g/sec
PL 198	Tipton	TW CGPF	A13	K-0004 Compressor 4	7.6	30	6.8	g/sec	5.5	g/sec
PL 198	Tipton	TW CGPF	A14	K-0005 Compressor 5	7.6	30	6.8	g/sec	5.5	g/sec
PL 198	Tipton	TW CGPF	A15	K-0006 Compressor 6	7.6	30	6.8	g/sec	5.5	g/sec
PL 198	Tipton	TW CGPF	A16	TEG Reboiler	6.8	14	100	ppm	na	na
PL 198	Tipton	TW CGPF	A17	Diesel Backup Generator	1.3	29	na	na	na	na

Note 1: Minimum efflux velocity, maximum mass emission and maximum concentration are calculated at the Maximum Continuous Rating.

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(F13) The holder of this environmental authority must undertake emissions testing within 3 months of the issue of this environmental authority of all fuel burning and combustion equipment listed in *Schedule F, Table 2 - Release of Contaminants to Air*.

(F14) The holder of this environmental authority must undertake air dispersion modelling using the results of the emission testing required under condition (F13) to verify that emissions will not result in an exceedance of the maximum ground level concentration for each air contaminant listed in *Schedule F, Table 1 – Maximum Ground Level Concentration Criteria*.

(F15) A report on the results of air emission testing and modelling required by conditions (F13) and (F14) must be provided to the administering authority with the next annual return.

SCHEDULE G – WASTE

General

(G1) All general and regulated waste must be removed from the site and sent to a site that is lawfully able to accept the waste under the *Environmental Protection Act 1994* except as permitted under another condition of this environmental authority.

(G2) All regulated waste removed from the site must be undertaken by a person who holds a current authority to transport such waste under the provisions of the *Environmental Protection Act 1994*.

(G3) Waste must not be burned or allowed to be burned on the licensed site.

(G4) All waste fluids and muds resulting from drilling and exploration activities must be contained in a properly lined dam or containment structure for disposal, remediation or reuse where applicable.

Coal Seam Gas Water Management Plan

(G5) A Coal Seam Gas Water Management Plan that includes but is not necessarily limited to the matters outlined in (a) and (b) must be implemented:

(a) the matters required by sections 310D (5), 310D (6) and 662 of *the Environmental Protection Act 1994*; and
(b) a management strategy for all integrated coal seam gas water management operations.

(G6) Where any inconsistency exists between the conditions of this environmental authority and the Coal Seam Gas Water Management Plan, the conditions of this environmental authority prevail.

Coal Seam Gas Water Use

(G7) Coal seam gas water may be used for the following purposes within the areas of the relevant resource authority(ies), subject to conditions (G8), (G9), (G10) and (G11):

(a) for dust suppression on roads and at other **sites**; and
(b) for **construction**; and
(c) for **operational purposes**.

(G8) Written approval from the relevant Local Government must be obtained prior to the application of coal seam gas water on any local government controlled roads in accordance with condition (G7)(a).

(G9) Any coal seam gas water being used for the purposes listed in conditions (G7)(a) and (b) must meet the limits specified in *Schedule G, Table 1 – Water Contaminant Release Limits* for each of the water quality characteristics listed:

Schedule G, Table 1 – Water Contaminant Release Limits

Water Quality Characteristics	Unit	Limit	Limit Type
pH	pH units	6.0 to 9.0	Range
Sodium Adsorption Ratio	ratio	6	80th Percentile
		12	Maximum
Total Dissolved Solids	mg/L	1500	Maximum
Total Petroleum Hydrocarbons	mg/L	10	Maximum

(G10) The use of coal seam gas water for the uses listed in conditions (G7)(a) and (b) must be carried out in a manner that:

(a) vegetation is not damaged;
(b) soil quality is not adversely impacted;
(c) there is no surface ponding or runoff of the coal seam gas water from the application area;
(d) minimises deep drainage below the root zone of any vegetation;
(e) quality of shallow aquifers is not adversely affected; and
(f) there are no releases of coal seam gas waters to any surface waters.

(G11) Any coal seam gas water released to the environment in accordance with conditions (G7)(a) and (G7)(b) must not have any properties that could cause, nor contain any contaminants in concentrations that are capable of causing environmental harm.

Supply of Coal Seam Gas Water to a Third Party

(G12) Coal seam gas water may be transferred to a third party to be used for the following purposes subject to compliance with (G13) and (G14):

(a) dust suppression if the coal seam gas water quality complies with the limits specified in *Schedule G, Table 1 – Water Contaminant Release Limits*;
(b) construction and operational purposes if the coal seam gas water quality complies with the limits specified in *Schedule G, Table 1 – Water Contaminant Release Limits*;
(c) **irrigation** and **livestock watering purposes**;
(d) the following industrial purposes:
  (i) coal washing;
  (ii) power stations; and
  (iii) water treatment facilities.

(G13) Any coal seam gas water supplied to a third party for irrigation and/or livestock watering purposes in accordance with condition (G12)(c) must comply with the relevant trigger values contained in *ANZECC and ARMCANZ Water Quality Guidelines 2000*, or subsequent versions thereof.

(G14) If the responsibility of coal seam gas water is given or transferred to a third party in accordance with condition (G12), the holder of environmental authority must ensure that:

(a) the responsibility of the coal seam gas water is given or transferred in accordance with a written agreement (the third party agreement); and
(b) the third party is made aware of the General Environmental Duty under section 319 of the *Environmental Protection Act 1994*.

SCHEDULE H – REHABILITATION

(H1) The holder of this environmental authority must not abandon any dam but must decommission each dam so as to prevent and/or minimise any environmental harm.

(H2) As a minimum, decommissioning must be conducted such that each dam either:

(a) becomes a stable landform similar to that of the surrounding undisturbed areas, that no longer contains substances that will migrate into the environment; or
(b) the administering authority and the landholder agree that the dam will be used by the landholder following the cessation of the petroleum activities

(H3) 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.

(H4) As soon as practicable but no later than 12 months (or longer period agreed in writing by the administering authority) after the end of petroleum activities causing significant disturbance to land, the holder of the authority must:

(a) remediate contaminated land (e.g. dams containing salt);
(b) reshape all significantly disturbed land to a stable landform similar to that of surrounding undisturbed areas;
(c) on all significantly disturbed land:
  (i). re-establish surface drainage lines;
  (ii). reinstate the top layer of the soil profile; and
  (iii). promote establishment of vegetation.
(d) undertake rehabilitation in a manner such that any actual and potential acid sulfate soils in or on the site are either not disturbed, or submerged, or treated so as to not be likely to cause environmental harm; and
(e) decommission all inactive buried pipelines in accordance with the requirements of AS 2885 and ensuring that there will not be any subsequent subsidence of land along the pipeline route.

(H5) All significantly disturbed land caused by the carrying out of the petroleum activities must be rehabilitated to meet the following final acceptance criteria:

(a) all significantly disturbed land is reinstated to the pre-disturbed land use unless otherwise agreed to between the environmental authority holder, the landholder and the administering authority;
(b) all significantly disturbed land is reinstated to the pre-disturbed soil suitability class;
(c) the landform is safe for humans and fauna;
(d) the landform is stable with no subsidence or erosion gullies for at least five (5) years;
(e) the minimum percent foliage cover of immediate surrounding area is maintained in the rehabilitated land for at least three (3) years;
(f) a minimum of 80% of the flora species in the immediate surrounding area is maintained in the rehabilitated land for at least three (3) years;
(g) a minimum of 80% of the fauna species diversity in the immediate surrounding area is maintained in the rehabilitated land for at least three (3) years;
(h) erosion is minimised with appropriate sediment traps and erosion control measures installed as determined by a suitably qualified person;
(i) 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.
(j) there is no ongoing contamination to surface water;
(k) there is no ongoing contamination to groundwater from dams or monocells (demonstrated via groundwater monitoring and leak detection);
(l) the maintenance requirements for rehabilitated land is no greater than that required for the land prior to its disturbance by petroleum activities.

(H6) Regular maintenance and at least yearly monitoring of rehabilitated areas must take place to measure compliance with the requirements of Condition (H5).

SCHEDULE I – MONITORING PROGRAMS

General

(I1) The holder of this environmental authority must develop and implement a monitoring program, the result of which will demonstrate compliance with the conditions of this environmental authority.

(I2) All monitoring under this environmental authority must be conducted by a suitably qualified person.

(I3) All instruments, equipment and measuring devices used for measuring or monitoring in accordance with any condition of this environmental authority must be calibrated, and operated and maintained effectively.

(I4) All laboratory analyses and tests required to be conducted under this environmental 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.

(I5) The method of water sampling required by this environmental authority must comply with the version of the *Queensland Monitoring Water Quality Sampling Manual*[2] that is current at the time the sampling is undertaken.

Note: Condition (I5) requires the version of the Queensland Monitoring Water Quality Sampling Manual *that is current at the time the sampling is undertaken to be followed and where it is not followed because of exceptional circumstances this should be explained and reported with the results.*

(I6) Any management or monitoring plans, systems, programs or procedures required to be developed and implemented by a condition of this environmental authority must be reviewed for performance and amended if required on an annual basis in accordance with the requirements for the particular plans, systems, programs and procedures.

(I7) If monitoring conducted in accordance with this environmental authority indicates a condition or contaminant level that has caused, or has potential to cause, environmental harm, the environmental authority holder must:

(a) as soon as is practicable, take the necessary actions to rectify the condition or contaminant level so as to avoid or minimise environmental harm; and
(b) notify the administering authority of the condition or contaminant level and the actions taken to rectify it.

(I8) An annual monitoring report must be prepared each year and submitted to the administering authority upon request. This report shall include but not be limited to:

(a) a summary of the previous 12 months monitoring results obtained under any monitoring programs required under this environmental authority and, a comparison of the previous 12 months monitoring results to both the limits set in this environmental authority and to relevant prior results; the date on which the samples was taken;
(b) the time at which the samples was taken;
(c) the monitoring point at which the sample was taken;
(d) the release flow rate of any authorised discharges to waters from all release points;
(e) the results of all monitoring and details of any exceedences with the conditions of this environmental authority and the dates and times these exceedences were reported to the administering authority.
(f) a summary of all records of quantities of releases required to be kept under this environmental authority including the total volume of any authorised discharges to waters for the previous yearly period from all release points and the individual daily volume of any authorised discharges to waters from all release points;

[2] The ~~version that is current as at the~~ XX March 2013 ~~is~~ *Monitoring and Sampling Manual 2009 – Environmental Protection (Water) Policy 2009 Version 2 September 2010*.

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Commented [LV58]: Check for compliance, did they comply with the condition before you removed the date?

Commented [MK59]: Changed title and added footnote as per agreement on EA PEN100901910 for ATP683 – still the same document.

Commented [LV60]: footnote will not make a difference if sampling occurs at a date when that version is no longer current. Suggest just stating the title. Besides footnotes or notes are not enforceable.

Commented [MK61]: Changed title and added footnote as per agreement on EA PEN100901910 for ATP683 – still the same document.

(g) details of all maintenance or work carried out on any discharge meter(s) and the impact (if any) on the release volume readings;
(h) an evaluation/explanation of the data derived from any monitoring programs;
(i) data analyses and interpretation to assess the nature and extent of any contamination and, if so, the level of environmental harm caused as a result of the contamination and the environmentally relevant activity; and
(j) an outline of actions taken or proposed to minimise the risk of environmental harm from any condition or elevated contaminant level identified by the monitoring or recording programs.

(I9) The evaluation and explanation of data for the purposes of the annual monitoring report must be performed by a suitably qualified person.

(I10) The holder of this environmental authority must continue to conduct monitoring as per that prescribed in Conditions (I11) to (I17) for a minimum of five (5) years after the activities prescribed in Condition (A1) have ceased and submit the results annually in accordance with Condition (I8).

Groundwater Monitoring

(I11) The Groundwater Monitoring Program, which must be implemented, must be able to detect any significant risks and changes to groundwater quality and level as a result of activities authorised under this environmental authority and must:

(a) be developed, installed and maintained by a suitably qualified person in the fields of hydrogeology, groundwater sampling design and groundwater monitoring program design;
(b) include locations of monitoring points, parameters to be measured, frequency of monitoring, monitoring methodology used, and trigger values;
(c) include procedures to establish background groundwater quality;
(d) a sufficient number of monitoring sites to provide information on the following:
  (i) seepage to groundwater and surrounding soils from any regulated dam authorised under this environmental authority and its effect on groundwater and soils; and
  (ii) background monitoring sites (i.e. groundwater quality in representative bore(s) that have not been affected by the activities authorised under this environmental authority);
(e) conduct a geodetic survey of all groundwater monitoring bores to determine the relative water surface elevations, measured to the nearest millimetre in each bore and reported in metres relative to the AHD;
(f) determine the hydraulic conductivity, groundwater flow direction and groundwater flow rate; and
(g) include a rationale containing details on the program purpose, program conceptualisation and verification of assumptions.

(I12) All groundwater bores must be installed according to the standards outlined in the latest edition of the Department of Environment and Heritage Protection's *Minimum Construction Requirements for Water Bores in Australia or the Minimum Standards for the Construction and Reconditioning of Water Bores that Intersect the Sediments of Artesian Basins in Queensland*.

(I13) Groundwater monitoring bores must be constructed by, or under the supervision of a licensed Queensland water bore driller who has the correct endorsements on their licence for the type of activity being performed.

(I14) The Groundwater Monitoring Program must provide for monitoring of groundwater quality as often as necessary to detect impacts of the petroleum activities authorised under this environmental authority, but not for fewer parameters or less frequently than that specified in *Schedule I, Table 1 – Minimum Groundwater Monitoring Parameters and Monitoring Frequency* and in compliance with Condition (I15).

Commented [MK62]: EHP has removed the reference to 40 business days after date of grant of the EA, as date has passed since original EA with this condition was granted.

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(I15) Groundwater samples taken as part of the Groundwater Monitoring Program must be analysed for, but not be limited to, the water quality parameters at the minimum frequencies specified in *Schedule I, Table 1 – Minimum Groundwater Monitoring Parameters and Monitoring Frequency*.

Schedule I, Table 1 – Minimum Groundwater Monitoring Parameters and Monitoring Frequency

Groundwater parameter	Monitoring frequency
Flow [m/hr]	Biannually
Water level to the nearest millimetre [m AHD]	Biannually
Groundwater Pressure in Geological Strata [kPa]	Biannually
pH	Biannually
Electrical conductivity [µS/m]	Biannually
Total Dissolved Solids [mg/L]	Biannually
Temperature [ºC]	Biannually
Dissolved Oxygen [mg/L]	Biannually
Alkalinity as $CaCO_3$ [mg/L]	Biannually
Residual Alkali [mg/L]	Biannually
Anions (bicarbonate, carbonate, hydroxide, chloride, fluoride, sulphate) [mg/L]	Biannually
Cations (aluminium, calcium, magnesium, potassium, sodium) [mg/L]	Biannually
Silica [mg/L]	Biannually
Total and dissolved Iron, manganese, zinc, aluminium, boron, copper, phosphorous [mg/L]	Biannually
Ammonia, nitrate, nitrite [m/L]	Biannually
Total Petroleum Hydrocarbons [mg/L]	Biannually
Polycyclic Aromatic Hydrocarbons [mg/L]	Biannually
Benzene, Toulene, Ethyl-benzene, Xylenes (BTEX) [mg/L]	Biannually

(I16) All groundwater monitoring bores must be maintained in an operative condition and be reasonably accessible at all times to any authorised person.

(I17) If groundwater monitoring indicates that any significant changes in groundwater quality caused by petroleum activities are detected, then information must be submitted to the administering authority within 10 business days of receipt of the analysis indicating these changes, including any proposed actions to mitigate the changes in groundwater quality.

Air Monitoring (Point Source)

(I18) The holder of this environmental authority must conduct a monitoring program of contaminants released to the atmosphere at each release point recorded in the register of fuel burning and combustion equipment for the contaminants and efflux velocities listed in *Schedule F, Table 1 – Maximum Ground Level Concentration Criteria* and at the frequencies specified in *Schedule I, Table 3 – Monitoring Frequency for Contaminants*.

Schedule I, Table 3 – Monitoring Frequency for Contaminants

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Contaminant	Monitoring frequency
NOx as Nitrogen Dioxide	Within three (3) months after commissioning of any fuel burning equipment; and annually thereafter.
Carbon monoxide	

(I19) The monitoring program must include, but not necessarily be limited to:

(a) monitoring provisions for the release points which complies with the most recent edition of **Australian Standard 4323**.
(b) tests for each sample taken at each release point specified in the register of fuel burning or combustion equipment (condition (F7)) including:

(i) gas velocity, volume and mass flow rate;
(ii) temperature; and
(iii) water vapour concentration (for non-continuous sampling);

(c) representative samples of the contaminants discharged when operating under maximum operating conditions;
(d) the collection of production rate and plant status during sampling periods; and
(e) monitoring of contaminant release carried out in accordance with the latest edition of the Department of Environment and Heritage Protection's "Air Quality Sampling Manual" 1997, as amended from time to time.

Monitoring of Contaminant Releases to the Atmosphere

(I20) 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 the following must be complied with:

(a) the holder of this environmental 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 I, Table 4 – Required Monitoring* which complies with the following:

(b) Monitoring provision for the release points listed in *Schedule I, Table 4 – Required Monitoring* must comply with the Australian Standard AS4323.1 – 1995 'Stationary source emissions Method 1: Selection of sampling provisions' or subsequent versions as they become available.

(c) The following tests must be performed for each required determination specified in *Schedule I, Table 4 – Required Monitoring* :
(i) gas velocity and volume flow rate;
(ii) temperature and oxygen content;
(iii) water vapour concentration (moisture content).

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

(e) During the sampling period the following additional information must be gathered:
(i) fuel used;
(ii) number of equipment and operating units; and
(iii) reference to actual test methods and accuracies.

Schedule I, Table 4 – Required Monitoring

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Determination Required	Release Point Numbers	Frequency[2]
Mass emission rate (g/s) and concentration (mg/Nm^3) of oxides of nitrogen (NOx) in the flue gas at the 5% oxygen reference level.	Stacks A1, A2, A3, A4, A5, A6, A7, A8 A9	Within three months upon the granting of the environmental authority and then annually thereafter

[2]*Note: Out of the seven (7) release points A1 to A7, at least three (3) stacks must be monitored each year on a rotational basis.*

Noise Monitoring

(I21) The holder of this environmental authority must undertake noise monitoring when requested by the administering authority to investigate a complaint of environmental nuisance at a sensitive receptor within the reasonable and practicable timeframe nominated by the administering authority, and report the results to the administering authority within three (3) business days of completion of the monitoring.

(I22) Noise monitoring and recording must include the following descriptor, characteristics and matters:
- (a) $L_{AN,T}$ (where N equals the statistical levels of 1, 10 and 90 and T=15);
- (b) $L_{Aeq\ adj,\ 15\ mins}$;
- (c) background noise level as $L_{A\ 90,\ T}$;
- (d) Max $L_{pA,\ 15\ mins}$
- (e) the level and frequency of occurrence of impulsive or tonal noise and any adjustment and penalties to statistical levels;
- (f) atmospheric conditions including temperature, relative humidity and wind speed and directions;
- (g) effects due to any extraneous factors such as traffic noise;
- (h) location, date and time of monitoring;
- (i) if the complaint concerns low frequency noise, Max $L_{pZ,\ 15\ min}$; and
- (j) If the complaint concerns low frequency noise, one third octave band measurements in dB(LIN) for centre frequencies in the 10 – 200 Hz range for both the noise source and the background noise in the absence of the noise source.

(I23) The method of measurement and reporting of noise levels and background sound pressure levels must comply with the latest edition of the administering authority's *Noise Measurement Manual* or the most recent version of Australian Standard 1055 Acoustics – description and measurement of environmental noise.

Nuisance Monitoring (other than Noise)

(I24) When the administering authority advises the holder of this environmental authority of a complaint alleging nuisance other than noise, the holder must investigate the complaint and advise the administering authority in writing of the action proposed or undertaken to resolve the complaint.

(I25) When requested by the administering authority, the holder of this environmental authority must undertake monitoring as specified by the administering authority, within a reasonable and practical timeframe nominated by the administering authority to investigate any complaint of environmental harm at any sensitive place.

(I26) 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 10 business days of completion of the investigation, or receipt of the monitoring results, whichever is the latter.

(I27) If monitoring in accordance with Condition (I25) and (I26), indicates that emissions exceed the limits set in this environmental authority or are causing environmental nuisance, then the holder of this environmental authority must:

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

Impact Assessment

(I28) Notwithstanding any other condition of the environmental authority, the environmental authority does not authorise any environmental harm arising from any release to the atmosphere of any of the contaminants mentioned in *Schedule I, Table 5 – Contaminants and Benchmarks for Evaluation*.

(I29) For the purpose of ensuring and demonstrating compliance with Condition (I28), the holder of the environmental authority must implement the findings of the evaluation, conducted by a suitably qualified and experienced person and provided to the administering authority, of the potential environmental impacts of the contaminants mentioned in *Schedule I, Table 5 – Contaminants and Benchmarks for Evaluation*. The evaluation addresses all matters relevant to the assessment of potential for environmental impacts to occur and includes, but not be limited to:

(a) Sampling, monitoring and analysis of the contaminants mentioned in *Schedule I, Table 5 – Contaminants and Benchmarks for Evaluation* for the range of plant operations likely to be encountered:
   i. entail sufficient levels of detection to adequately characterise the emissions; and
   ii. be representative; and complies with relevant Department of Environment and Heritage Protection's monitoring methods including the quality control requirements inherent in those methods;

(b) Using the air pollution dispersion models, an estimation of Ground Level Concentrations at the most sensitive nearest receptor(s) (using efflux velocity, temperature and flow rate) for emissions of the contaminants mentioned in *Schedule I, Table 5 – Contaminants and Benchmarks for Evaluation*;

(c) A comparison between the worst case measured emissions with the benchmarks maximum GLC mentioned in *Schedule I, Table 5 – Contaminants and Benchmarks for Evaluation*;

(d) The use of methods and guidelines for modelling and assessment of air pollutants approved by the New South Wales Department of Environment and Climate Change or by the Victoria Environmental Protection Agency.

Schedule I, Table 5 – Contaminants and Benchmarks for Evaluation

Contaminant	Averaging Periods	Maximum GLC concentration
Nitrogen dioxide	1 hour – health and wellbeing	250 µg/m^3 (at 0 ^{o}C)
	1 year – health and wellbeing	62 µg/m^3 (at 0 ^{o}C)
	1 year – health and biodiversity of ecosystems	33 µg/m^3 (at 0 ^{o}C)

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SCHEDULE J – COMMUNITY ISSUES

(J1) The holder of this environmental authority must maintain a record of complaints and incidents causing environmental harm, and actions taken in response to the complaint or incident; and

(J2) The holder of this environmental 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 as stated by the complainant;
(d) investigations undertaken in response to the complaint;
(e) conclusions formed;
(f) actions taken to resolve complaint;
(g) any abatement measures implemented to mitigate the cause of the complaint; and
(h) name and contact details of the person responsible for resolving the complaint.

SCHEDULE K NOTIFICATION PROCEDURES

(K1) The holder of this environmental authority must telephone the administering authority's Pollution Hotline (telephone: 1300 130 372) and any affected landholder, occupier or their nominated representative as soon as practicable, but within 24 hours after becoming aware of:

(a) any release of contaminants not in accordance with the conditions of this environmental authority; or
(b) any event where environmental harm has been caused or may be caused.

(K2) Notwithstanding Condition (K1), the holder of this environmental authority must telephone the administering authority's Pollution Hotline (telephone: 1300 130 372) as soon as practicable, but within 24 hours after becoming aware of any non-compliance with any condition of this environmental authority.

(K3) Subject to Condition (K1), the holder of this environmental authority is required to report in the case of spills of contaminants (including but not limited to hydrocarbons, CSG water or mixtures of both) of the following volumes or kind:

(a) releases of any volume of contaminants to water; and
(b) releases of volumes of contaminants greater than 200L of hydrocarbons, 1000 L of brine or 5 000 L of coal seam gas water to land; and
(c) releases of any volumes of contaminants where potential serious or material environmental harm has occurred or may occur.

(K4) The notification of emergencies or incidents as required by Conditions (K1) and (K3) must include but not be limited to the following information:

(a) the environmental authority number and name of the holder;
(b) the tenure type and number where the emergency or incident occurred;
(c) the name and telephone number of the designated contact person;
(d) the location of the emergency or incident;
(e) the date and time that the emergency or incident occurred;
(f) the date and time the holder of this environmental authority became aware of the emergency or incident;
(g) details of the nature of the event and the circumstances in which it occurred;
(h) the estimated quantity and type of any contaminants involved in the incident;
(i) the actual or potential suspected cause of the emergency or incident;
(j) a description of the land use at the site of the emergency or incident (*eg. g*razing, pasture, forest etc) and/or the name of any relevant surface waters and other environmentally sensitive features;
(k) a description of the possible impacts from the emergency or incident;
(l) a description of whether stock and/or wildlife were exposed to any contaminants released and measures taken to prevent access for the duration of the emergency or incident;
(m) any sampling conducted or proposed, relevant to the emergency or incident;
(n) landholder details and details of landholder consultation;
(o) immediate actions taken to control the impacts of the emergency or incident and how environmental harm was mitigated at the time of the emergency or incident; and
(p) whether further examination/root cause analysis is required and if so, the expected date by when this examination will be completed and reported to the administering authority.

(K5) Within 10 business days following the initial notification of an emergency or incident or receipt of monitoring results or completion of the examination/root cause analysis, whichever is the later, a written report must be provided to the administering authority, including the following (where relevant to the emergency or incident):

(a) the root cause of the emergency or incident the confirmed quantities and types of any contaminants involved in the incident;

(b) results and interpretation of any analysis of samples taken at the time of the emergency or incident;
(c) a final assessment of the impacts from the emergency or incident including any actual or potential environmental harm that has occurred or may occur in the longer term as a result of the release;
(d) the success or otherwise of actions taken at the time of the incident to prevent or minimise environmental harm;
(e) results and current status of landholder consultation, including commitment to resolve any outstanding issues/concerns; and
(f) actions and/or procedural changes to prevent a recurrence of the emergency or incident.

SCHEDULE L DEFINITIONS

Note: *Where a term is not defined in this environmental authority the definition in the* Environmental Protection Act 1994, *its regulations and Environmental Protection Policies or the* Petroleum and Gas (Production and Safety) Act 2004 *and its regulations must be used in that order.*

"acid sulfate soils" means soil or sediment containing highly acidic soil horizons or layers affected by the oxidation of iron sulfides (*actual acid sulfate soils*) and/or soil or sediment containing iron sulfides or other sulfidic material that has not been exposed to air and oxidised (*potential acid sulfate soils*). The term acid sulfate soil generally includes both actual and potential acid sulfate soils. Actual and potential acid sulfate soils are often found in the same soil profile, with actual acid sulfate soils generally overlying potential acid sulfate soil horizons.

"active" for the purposes of landholders' groundwater bores means bores that are able to continue to provide a reasonable yield of water in terms of quantity for the bores authorised purpose or use.

"aggregation dam" means a dam that is used to aggregate and contain CSG water prior to use, treatment or disposal of that water (by means other than evaporation). The primary purpose of the dam must not be to evaporate the water even though this will naturally occur.

"affected land" means land on which an event has caused or threatens serious or material environmental harm.

"AHD" means Australian Height Datum.

"alternative arrangement" means a written agreement between the holder of this environmental authority and an affected or potentially affected person at a sensitive receptor for a defined noise nuisance impact and may include an agreed period of time for which the arrangement is in place. An agreement for alternative arrangements may include, but not necessarily be limited to a range of noise abatement measures to be installed at a sensitive receptor and/or provision of alternative accommodation for the duration of the defined noise nuisance impact.

"analytes" means a chemical parameter determined by either physical measurement in the field or by laboratory analysis.

"appraisal well" means a petroleum well that is drilled to test the potential of 1 or more natural underground reservoirs for producing or storing petroleum.

"associated works" in relation to a dam, means:

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

"background noise level" means the sound pressure level, measured in the absence of the noise under investigation, as the L A90,T being the A-weighted sound pressure level exceeded for 90 percent of the measurement time period T of not less than 15 minutes, using Fast response.

"bed and banks" for a watercourse or wetland means land over which the water of the watercourse or wetland normally flows or that is normally covered by the water, whether permanently or intermittently; but does not include land adjoining or adjacent to the bed or banks that is from time to time covered by floodwater.

"black earth" also known as vertosols and is a soil order of the Australian Soil Classification. These are clay soils with shrink/swell properties that display strong cracks when dry and/or lenticular structural aggregates at depth. They have a high soil fertility and a large water holding capacity.

"bore" means a water observation bore or a water supply bore.

"brine" means either saline water with a total dissolved solid concentration greater than 40 000mg/l or CSG water after it has been concentrated through water treatment processes and/or evaporation.

"bund or bunded" in relation to spill containment systems for fabricated or manufactured tanks or containers designed to a recognised standard means an embankment or wall of brick, stone, concrete or other impervious material which may form part or all of the perimeter of a compound and provides a barrier to retain liquid. Since the bund is the main part of a spill containment system, the whole system (or bunded area) is sometimes colloquially referred to within industry as the bund. The bund is designed to contain spillages and leaks from liquids used, stored or processed above ground and to

facilitate clean-up operations. As well as being used to prevent pollution of the receiving environment, bunds are also used for fire protection, product recovery and process isolation.

"BTEX" means benzene, ethylbenzene, toluene, xylene.

"category A ESA" means any area listed in Section 25 of the *Environmental Protection Regulation 2008.*

"category B ESA" means any area listed in Section 26 of the *Environmental Protection Regulation 2008.*

"category C ESA" means any of the following areas:

- Nature Refuges as defined under the *Nature Conservation Act 1992*;
- Koala Habitat Areas as defined under the *Nature Conservation Act 1992*;
- State Forests or Timber Reserves as defined under the *Forestry Act 1959*;
- Declared catchment areas under the *Water Act 2000*;
- Resources reserves under the *Nature Conservation Act 1992*
- 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*;
- An area identified as "Essential Regrowth Habitat" under the *Vegetation Management Act 1999* for a species of wildlife listed as endangered, vulnerable, rare or near threatened under the *Nature Conservation Act 1992* for petroleum activities that commenced after XX March 2013 (the date of grant of this environmental authority); and
- "Of concern" regional ecosystems identified in the database maintained by the Department of Environment and Heritage Protection called 'Regional ecosystem description database' containing regional ecosystem numbers and descriptions.

Commented [MK67]: Section of definition amended so is the same as that agreed to for PEN100901910 for ATP683.

Commented [MK68]: Removed referrable wetlands as no longer included in suite of Cat C ESA types

"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:

- exactly what is being certified and the precise nature of that certification.
- the relevant legislative, regulatory and technical criteria on which the certification has been based;
- the relevant data and facts on which the certification has been based, the source of that material, and the efforts made to obtain all relevant data and facts; and
- the reasoning on which the certification has been based using the relevant data and facts, and the relevant criteria.

"certification" or "certified" in relation to any other matter in this environmental authority means a written statement from a suitably qualified person that the content of a document is accurate and true and meets the required intent of the document.

"clearing" means:

- in relation to grass, scrub or bush—the removal of vegetation by disturbing root systems and exposing underlying soil (including burning), but does not include—
  - the flattening or compaction of vegetation by vehicles if the vegetation remains living; or
  - the slashing or mowing of vegetation to facilitate access tracks; or
  - the clearing of noxious or introduced plant species; and
- in relation to trees—cutting down, ringbarking, pushing over, poisoning or destroying in any way.

"construction" in relation to a dam includes building a new dam and modifying or lifting an existing dam.

"construction and operational purposes" in relation to the use of coal seam gas water means the construction, use, modification, maintenance, replacement, operation and decommissioning of industrial sites.

"coal seam gas water" means underground water brought to the surface of the earth, or otherwise interfered with, in connection with exploring for or producing coal seam gas. Coal seam gas water is a waste, as defined under s13 of the *Environmental Protection Act 1994*.

"CSG water dams" include any type of dam (storage or evaporation) used to contain groundwater that is necessarily or unavoidably brought to the surface in the process of coal seam gas exploration or production.

"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.

"deed of agreement" means a legal agreement between the holder of the environmental authority and the administering authority. The deed of agreement governs the obligations of the holder of the environmental authority in relation to the *Queensland Biodiversity Offset Policy*. For clarity, the term deed of agreement in this environmental authority includes any subsequent version or amendment of the signed deed of agreement.

Commented [MK69]: QBOP requirement – only applied to activities post-grant of EA

"design plan" means 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 design and investigation reports, specifications and certifications, together with the planned decommissioning and rehabilitation works and outcomes. A design plan may include 'as constructed' drawings.

"development well" means a petroleum well that is drilled to produce or store petroleum.

"discharge area" means:
(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 Heritage Protection.

"ecosystem functioning" means the interactions between and within living and nonliving components of an ecosystem and generally correlates with the size, shape and location of an area of vegetation.

"end" means the stopping of the particular activity that has caused a significant disturbance in a particular area. It refers to, among other things, the end of a seismic survey or the end of a drilling operation. It does not refer to the end of all related activities such as rehabilitation. In other words, it does not refer to the 'completion' of the petroleum activity, the time at which the petroleum authority ends or the time that the land in question ceases to be part of an authority.

"equivalent person" or **"EP"** means an equivalent person under volume 1, section 2 of the *Guidelines for Planning and Design of Sewerage Schemes*, October 1991, published by the Water Resources Commission, Department of Primary Industries, Fisheries and Forestry.

"existing regulated dam" means a dam for which construction has substantially commenced on 17 December 2012.

"exploring for petroleum" means carrying out an activity for the purpose of finding petroleum or natural underground reservoirs as per section 14 of the *Petroleum and Gas (Production and Safety) Act 2004* for example including:
(a) conducting a geochemical, geological or geophysical survey
(b) drilling a well
(c) carrying out testing in relation to a well
(d) taking a sample for chemical or other analysis

"evaporation dam" means a land based structure designed to contain or impound CSG water, the purpose of which is to contain or impound the water, until the water content has been removed by evaporation.

"fill" means any kind of material in solid form (whether or not naturally occurring) capable of being deposited at a place but does not include material that forms a part of, or is associated with, a structure constructed in a watercourse, wetland or spring including a bridge, road, causeway, pipeline, rock revetment, drain outlet works, erosion prevention structure or fence.

"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' means 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 acceptably low probability of failure before that time.

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

"hazard category" means a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the Department of Environment and Heritage Protection's *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (Version 1.0, 2008)* or any updated version of the Manual that becomes available from time to time

"heritage place" means any place that may be of cultural heritage significance**,** or any place with potential to contain archaeological artefacts that are an important source of information about Queensland's history.

"high bank" means the defining terrace or bank or, if no bank is present, the point on the active floodplain, which confines the average annual peak flows in a watercourse.

"highly erodible soils" means very unstable soils that are generally described as Sodosols with hard –setting, fine sandy loam to silty clay loam surfaces (solodics, solodised solonetz and solonetz) or soils with a dispersible layer located less than 25cm deep or soils less than 25cm deep.

"hub" means more than one large compressor station and multiple items of fuel burning or combustion units located within three (3) km of each other and capable of burning fuel at a rate >500 kg/hr.

"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 *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams* published by EHP on its website.

"impacts to mapped State significant biodiversity values" means to have a negative effect on a State significant biodiversity value, as defined in this environmental authority, resulting from petroleum activities that commenced after XX March 2013 (the date of grant of this environmental authority). Examples may include, but are not necessarily limited to:

- clearing, removal or fragmentation of vegetation
- interference or disturbance of fauna habitat

"impacts to watercourse, wetland, lake or spring with state significant biodiversity values" means to have a negative effect on a watercourse, wetland, lake or spring with state significant biodiversity values as identified in Appendix 1 of the *Queensland Biodiversity Offsets Policy* (Department of Environment and Resource Management, 2011) resulting from petroleum activities that commenced after XX March 2013 (the date of grant of this environmental authority).

"impulsive sound" means sound characterised by brief excursions of sound pressure (acoustic impulses) that significantly exceed the background sound pressure. The duration of a single impulsive sound is usually less than one second.

"infrastructure" means water storage dams, roads and tracks, equipment, buildings and other structures built for the purpose and duration of the conduct of 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 (e.g. evaporation dams), pipelines and assets, that have been decommissioned, rehabilitated, and lawfully recognised as being subject to subsequent transfer with ownership of the land.

"irrigation" means the application of water to any agricultural or silvicultural crop or to a garden cultivated for domestic use.

Commented [MK70]: Removal of version of manual as it has been updated and will continue to be

Commented [MK71]: Changed to reflect new dept name

Commented [MK72]: On 27/02/2013, Arrow accepts this definition.

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Commented [GN73]: As per agreed definition within PEN100901910 for ATP683, this definition used to refer to watercourses with SSBVs as defined in Appendix 1 of the QBOP. However, a reworking of the definition now only relates to those SSBVS defined in the EA, i.e., only those watercourses with mapped SSBVs present.

Arrow to confirm its acceptance of this changed definition.

Commented [MK74]: QBOP requirement – modified to only include impacts post grant of the EA

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"$LA_{eq, adj, 15 mins}$" means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 15 minute period has the same square sound pressure as a sound level that varies with time.

"lake" means:
(a) a lagoon, swamp or other natural collection of water, whether permanent or intermittent; and
(b) the bed and banks and any other element confining or containing the water.

"landfill monocell" means a specialised, isolated landfill facility where a single specific waste type is exclusively disposed (i.e. salt).

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

"levee" means a dyke or bund that is designed only to provide for the containment and diversion of stormwater or flood flows from a contributing catchment, or containment and diversion of flowable materials resulting from unplanned releases from other works of infrastructure, during the progress of those stormwater or flood flows or those unplanned releases; and does not store any significant volume of water or flowable substances at any other times.

"limited petroleum activities" mean only activities including:
(a) geophysical surveys (including seismic activities);
(b) well sites;
(c) well pads;
(d) sumps;
(e) flare pits;
(f) flow lines; and
(g) supporting access tracks.
For clarity, limited petroleum activities do not include:
(a) the construction of infrastructure for processing or storing petroleum or by-products;
(b) dams;
(c) compressor stations;
(d) campsites/workforce accommodation;
(e) power supplies;
(f) waste disposal; or
(g) other supporting infrastructure for the project.

"livestock watering purposes" means the supply of water to any livestock.

"long term noise event" is a noise exposure, when perceived at a sensitive receptor, persists for a period of greater than five (5) days, even when there are respite periods when the noise is inaudible within those five (5) days.

"mapped State significant biodiversity values" means the regional ecosystems, essential habitat, wetlands, watercourses, legally secured offset areas and connectivity areas provided in Appendix 1 of the *Queensland Biodiversity Offset Policy* (Department of Environment and Resource Management, 2011) that are mapped in State mapping.

"**Max $L_{pZ, 15 min}$**" means the maximum value of the Z-weighted sound pressure level measured over 15 minutes.

"Max $L_{pA, 15 min}$" means the absolute maximum instantaneous A-weighted sound pressure level, measured over 15 minutes.

"mg/L" means milligrams per litre.

"medium term noise event" is a noise exposure, when perceived at a sensitive receptor, persists for an aggregate period not greater than five days and does not re-occur for a period of at least four weeks. Re-occurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a difference source or source location.

"meter" means a device for measuring, or giving an output signal proportional to, quantities of water passed and/or the rate of flow in a pipe."

Commented [GN75]: Added to definition for clarity that only those values that are mapped are covered.

Commented [MK76]: Included definition as per agreed definition within PEN100901910 for ATP683.

~~**"Offset Area Management Plan (OAMP)"** means a site-specific plan prepared to address the requirements of the *Queensland Biodiversity Offsets Policy* (Department of Environment and Resource Management, 2011) that includes, but is not necessarily limited to:~~

- ~~the applicant(s) name, postal address, contact details~~
- ~~lot/plan, stage (or area) to which the OAMP relates, GPS coordinates for the stage (or area)~~
- ~~a demonstration that the activity has avoided, then minimised impacts to State significant Biodiversity Values~~
- ~~a detailed description of the State Significant Biodiversity Values to be offset~~
- ~~a detailed description of the extent of impact on each of the State Significant Biodiversity Values~~
- ~~the offset delivery mechanism(s):~~
  - ~~direct land based offsets:~~
    - ~~values to be offset using a direct land based offset;~~
    - ~~an assessment of the offset area to demonstrate how it meets the requirements of the *Queensland Biodiversity Offsets Policy* (Department of Environment and Resource Management, 2011);~~
    - ~~an assessment of ecological equivalence carried out in accordance with the Ecological Equivalence Methodology.;~~
    - ~~legally binding mechanism; and~~
    - ~~offset area management plan.~~
  - ~~offset transfer:~~
    - ~~values to be offset using an offset transfer~~
    - ~~evidence that State significant biodiversity values to be impacted can be offset within the landscape;~~
    - ~~an assessment of ecological equivalence carried out in accordance with the Ecological Equivalence Methodology;~~
    - ~~Brokers Agreement or applicant letter; and~~
    - ~~identification of financial surety amount~~
  - ~~offset payment:~~
    - ~~the values to which the proposed offset payment relates; and~~
    - ~~offset payment amount and calculation method.~~

Commented [MK77]: QBOP requirement – only applied to activities post-grant of EA

"overland flow water" means water, including floodwater, flowing over land, otherwise than in a watercourse or lake:

- after having fallen as rain or in any other way; or
- after rising to the surface naturally from underground.

"permanent infrastructure" includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads, pipelines etc), which is to be left by agreement with the landowner.

"pest" means species:
(a) declared under the *Land Protection (Pest and Stock route Management) Act 2002*;
(b) declared under Local Government model local laws; and
(c) which may become invasive in the future.

"populated area" includes towns and cities which have a population of 500 or more people and with a minimum density of 40 people/km^2.

"prescribed storage gases" has the meaning provided in section 12 of the *Petroleum and Gas (Production and Safety) Act 2004.*

"regulated dam" means any dam in the significant or high hazard category as assessed using the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams (Version 1.0, 2008)* or any updated version of the Manual that becomes available from time to time

"rehabilitation" means 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

"remnant unit" means a continuous area of remnant vegetation representative of a single Regional Ecosystem type or a single heterogeneous unit (multiple Regional Ecosystem types that cannot be distinguished individually due to the scale of mapping).

"sensitive place" means:

- a dwelling (including residential allotment, mobile home or caravan park, residential marina or other residential premises, motel, hotel or hostel; or
- a library, childcare centre, kindergarten, school, university or other educational institution;
- a medical centre, surgery or hospital; or
- a protected area; or
- a public 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; or
- a work place used as an office or for business or commercial purposes, which is not part of the petroleum activities and does not include employees accommodation or public roads.

"sensitive receptor" means an area or place where noise (including low frequency, vibration and blasting) is measured investigate whether nuisance impacts are occurring and includes:

- a dwelling (including residential allotment, mobile home or caravan park, residential marina or other residential premises, motel, hotel or hostel; or
- a library, childcare centre, kindergarten, school, university or other educational institution;
- a medical centre, surgery or hospital; or
- a protected area; or
- a public 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; or
- a work place used as an office or for business or commercial purposes, which is not part of the petroleum activities and does not include employees accommodation or public roads.

"short term noise event" is a noise exposure, when perceived at a sensitive receptor, persists for an aggregate period not greater than eight hours and does not re-occur for a period of at least seven days. Re-occurrence is deemed to apply where a noise of comparable level is observed at the same receptor location for a period of one hour or more, even if it originates from a different source or source location.

"significantly disturbed land or significant disturbance to land" means disturbance to land as defined in section 28 of the *Environmental Protection Regulation 2008*.

"site" means the petroleum authority(ies) to which the environmental authority relates.

"Site Based Offset Plan (SBOP)" means a site-specific plan prepared to address the requirements of the *Queensland Biodiversity Offsets Policy* (Department of Environment and Resource Management, 2011) that includes, but is not necessarily limited to:

- the applicant(s) name, postal address, contact details
- lot/plan, stage (or area) to which the SBOP relates, GPS coordinates for the stage (or area)
- a demonstration that the activity has avoided, then minimised impacts to State significant Biodiversity Values
- a detailed description of the State Significant Biodiversity Values to be offset
- a detailed description of the extent of impact on each of the State Significant Biodiversity Values
- the offset delivery mechanism(s):
  - direct land based offsets:
    - values to be offset using a direct land based offset;
    - an assessment of the offset area to demonstrate how it meets the requirements of the *Queensland Biodiversity Offsets Policy* (Department of Environment and Resource Management, 2011);
    - an assessment of ecological equivalence carried out in accordance with the Ecological Equivalence Methodology.;
    - legally binding mechanism; and
    - offset area management plan.
  - offset transfer:
    - values to be offset using an offset transfer
    - evidence that State significant biodiversity values to be impacted can be offset within the landscape;
    - an assessment of ecological equivalence carried out in accordance with the Ecological Equivalence Methodology;
    - Brokers Agreement or applicant letter; and
    - identification of financial surety amount
  - offset payment:
    - the values to which the proposed offset payment relates; and

- offset payment amount and calculation method.

Commented [MK78]: QBOP requirement – only applied to activities post-grant of EA

"spring" means the land to which water rises naturally from below the ground and the land over which the water then flows.

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

"state heritage place" means a place entered in the Queensland heritage register under Part 4 of the *Queensland Heritage Act 1992*.

Commented [MK79]: Removed definition of "State significant biodiversity values" as have included definition for "mapped State significant biodiversity values".

"stimulation" means a technique used to increase the permeability of a natural underground reservoir, including for example, cavitation, hydraulic fracturing/hydrofraccing, fracture acidizing and the use of proppant treatments.

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

"suitably qualified and experienced person" in relation to a hazard assessment of a dam, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

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

"suitably qualified and experienced person" in relation to 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:

- knowledge of engineering principles related to the structures, geomechanics, hydrology, hydraulics, chemistry and environmental impact of dams; and
- a total of five (5) years of suitable experience and demonstrated expertise in the geomechanics of dams with particular emphasis on stability, geology and geochemistry, and
- a total of five (5) years of suitable experience and demonstrated expertise each, in three (3) 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.

"third party auditor" means a suitably qualified person who is either a certified third party auditor or an internal auditor employed by the holder of the environmental authority and the person is independent of the day to day management and operation of activities covered by this environmental authority

"threatening processes" means processes, features and actions that can have a detrimental effect upon the health and viability of an area of vegetation. For example altered hydrology, land use practices, invasion by pest and weed species, land degradation, edge effects and fragmentation.

"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 damage and limiting infiltration and percolation.

"topsoil" means the surface (top) layer of a soil profile, which is 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 the natural surface.

"transmissivity" means the rate of flow of water through a vertical strip of aquifer which is one unit wide and which extends the full saturated depth of the aquifer.

"unacceptable risk" is when the results of a hazard assessment indicates that there is both a high consequence and a high likelihood of an event occurring such that the risk is classified as "high", "very high" or "extreme".

"valid complaint" means a complaint the administering authority considers is not frivolous, nor vexatious, nor based on mistaken belief.

"void" means any man-made, open excavation in the ground (includes borrow pits, drill sumps, frac pits, flare pits, cavitation pits and trenches).

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

"watercourse" has the meaning provided in s 5 of the *Water Act 2000* and includes the bed and banks and any other element of a river, creek or stream confining or containing water.

"watercourse, **wetland, lake or spring with State significant biodiversity values"** are those described in Appendix 1 of the *Queensland Biodiversity Offsets Policy* (Department of Environment and Resource Management, 2011).

Commented [MK80]: QBOP requirement

"well lease infrastructure" means infrastructure required for the construction and completion of a well including but not limited to cellar pits, dams and drill sumps.

"wetland" means an area shown as a wetland on a 'Map of referable wetlands', a document approved by the chief executive (environment). A map of referable wetlands can be viewed at www.ehp.qld.gov.au .

"wild river declaration" means a statutory instrument under the *Wild Rivers Act 2005*. A declaration lists the relevant natural values to be preserved and delineates certain parts of the wild river area and the different constraints that may apply in these areas. With reference to environmental authorities for petroleum, each declaration also specifies conditions to be included in a new authority if the activity is to be located within the wild river area.

"20th percentile release limits" means that not more than four (4) of the measured values is to exceed the stated release limit for any five (5) consecutive samples where:
(1) the consecutive samples are taken over a five (5) month period; and
(2) the consecutive samples are taken at approximately equal periods.

"25th percentile release limits" means that not more than three (3) of the measured values is to exceed the stated release limit for any four (4) consecutive samples where:
(1) the consecutive samples are taken over a four (4) month period; and
(2) the consecutive samples are taken at approximately equal periods.

"75th percentile release limits" means that not more than one (1) of the measured values is to exceed the stated release limit for any four (4) consecutive samples where:
(1) the consecutive samples are taken over a four (4) month period; and
(2) the consecutive samples are taken at approximately equal periods.

"80th percentile release limits" means that not more than one (1) of the measured values is to exceed the stated release limit for any five (5) consecutive samples where:
(1) the consecutive samples are taken over a five (5) month period; and
(2) the consecutive samples are taken at approximately equal periods.

End of Conditions

Environmental Authority Amendment Application

Dalby Expansion Project
Environmental Authority PEN100449509

Daandine Brine Dam 2 - authorising activities in an ESA buffer zone

12 December 2012

1. Proposed Condition

Specific authorisation for construction, operation and maintenance of Daandine Brine Dam 2

(D10-1) Despite Condition (D10), Daandine Brine Dam 2 and associated activities necessary for construction, operation, maintenance and monitoring of the dam, located within the area bound by the coordinates shown in *Schedule C, Table 1 – Coordinates enclosing the disturbance area for Daandine Brine Dam 2*, are permitted within the buffer zones of Category B and Category C Environmentally Sensitive Areas.

Schedule C, Table 1 – Coordinates enclosing the disturbance area for Daandine Brine Dam 2

	Latitude or Northing (GDA94)	Longitude or Easting (GDA94)
1	7001708	297524
2	7001153	297384
3	7001051	298345
4	7001418	298444
5	7001601	298406
6	7001620	298190

Ecological Assessment

Daandine Brine Dam

December 2012

REV	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
0	10/12/2012	FINAL	SW	AE	

TABLE OF CONTENTS

1.0 INTRODUCTION

1.1 Background

This Ecological Assessment has been undertaken by Arrow Energy in accordance with Conditions D2 and D3 of the current Environmental Authority for PL230 (PEN100449509)(part of the Dalby Expansion Project [DXP]) which state:

'(D2) Prior to conducting petroleum activities that involve significant disturbance to land, an assessment must be undertaken of the condition, type and ecological value of any vegetation in such areas where the activity is proposed to take place

(D3) The assessment required by Condition D2 must be undertaken by a suitably qualified person and include the carrying out of field validation surveys, observations and mapping of any Category A, B or C Environmentally Sensitive Areas (ESA's) and the presence of species classes as endangered, vulnerable, rare or near threatened under the Nature Conservation Act 1992.'

The assessment involved the following:

- A desktop assessment of the proposed site, including State and Commonwealth database searches for threatened communities and species and a review of the current Regional Ecosystem, Regrowth Vegetation, Essential Habitat and Environmentally Sensitive Area (ESA) mapping. A review of internal GIS mapping for the location of watercourses, wetlands and springs was also undertaken.
- A comprehensive field assessment of the proposed site to assess the physical geography; land use and disturbance; vegetation cover , abundance, structure and condition; validation of Regional Ecosystem, Regrowth Vegetation, Essential Habitat and ESA mapping and targeted threatened species searches, including identification of breeding habitats.

1.2 Locality

Petroleum Lease PL230 is located in the Surat Basin about 20 kilometres North West of Dalby along the Dalby-Kogan Road as shown in Figure 1. Arrow selected four potential brine dam locations within PL230 in close proximity to the Daandine Water Treatment Facility (WTF). The WTF has reverse osmosis treatment plant that produces the brine as a by-product of the treatment of coal seam gas water.

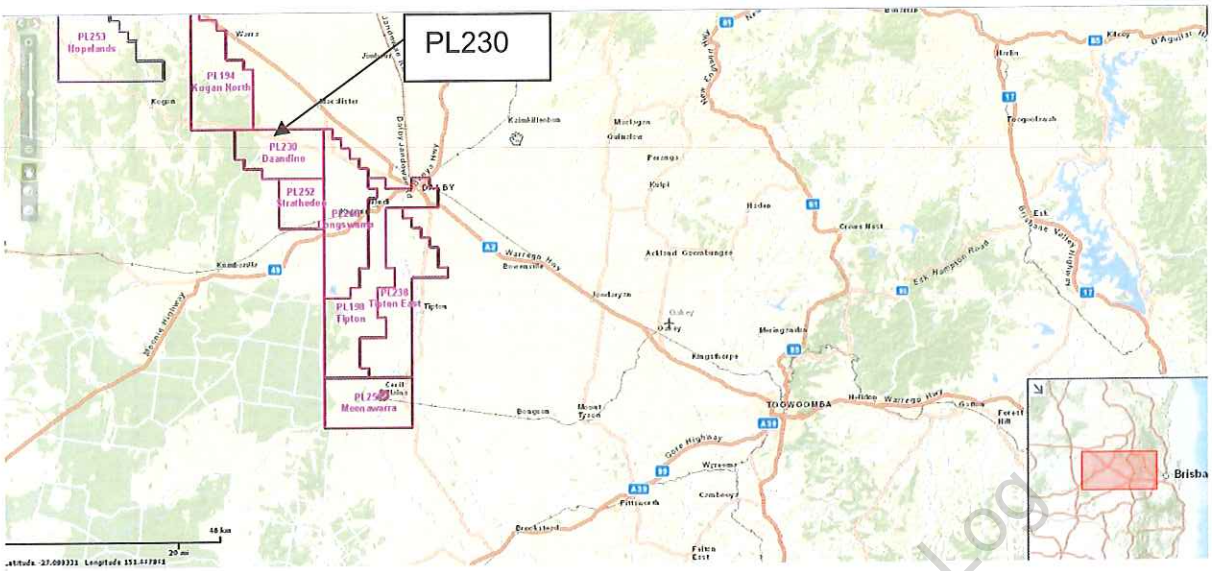

Figure 1 Location of Petroleum Lease 230

1.3 Site Selection

Arrow's preferred location of Daandine Brine Dam 2 is adjacent to existing water infrastructure near the Daandine Water Treatment Facility and a portion of the preferred location is within a buffer zone of a Category C Environmentally Sensitive Area. Four site options were assessed based on desktop studies, GIS information, geotechnical, ecological and cultural heritage risks to determine compliance with environmental authority conditions. Four potential brine dam locations within PL230 are shown in Figure 2

Arrow has also undertaken environmental assessments for Options 2, 3 and 4. These reports have not been included in this application. Information in the assessments includes the following:

- Ecological reports
- Maps depicting the distribution of values as per state mapping and on-ground surveys
- Photographs (aerial and on-ground photo information depicting above mentioned values over the site)

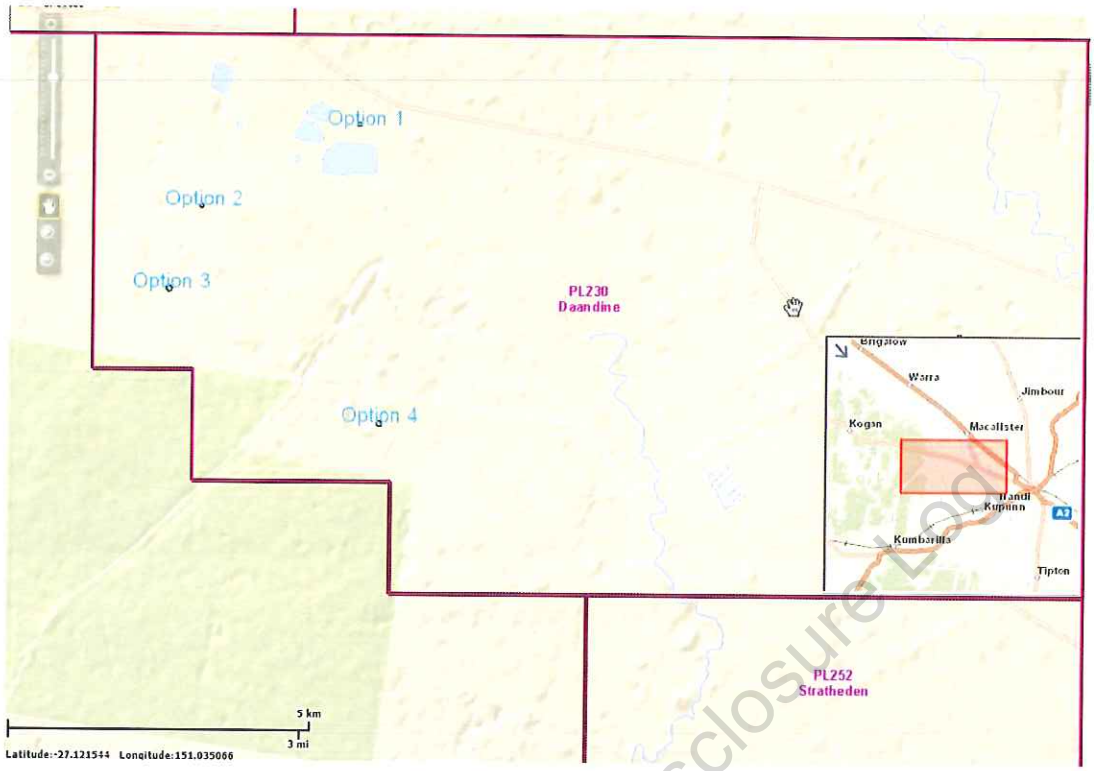

Figure 2 Potential brine dam locations: Option1, Option 2, Option 3 and Option 4

The majority of the area of Arrows preferred site, Option 1, is grassed and it is in close proximity to Daandine WTF infrastructure. Site Option 1 would achieve the least disturbance, ecological and approval risk when compared to the other 3 site options. Arrow's second preferred location for the brine dam is Option 4. Site Option 2 and Option 3 were considered non preferred options after desk top surveys as they both would require substantial vegetation clearing.

The proposed site is located on approximately 53ha at the intersection of Dalby-Kogan Road and Kumbarilla Lane within Lot 1 SP200461 at Daandine, 20 kilometres north-west of Dalby in southern Queensland (Figure 3).

The works are proposed to be undertaken within a predominantly cleared paddock containing a small stand of scattered regrowth Eucalypt (Eucalyptus populnea, E. crebra) around an abandoned cattle yard.

An existing access track is present and will be utilised, therefore, no vegetation is required to be cleared in order to obtain access to the site.

Figure 3 Proposed location of the Daandine Brine Dam

1.4 Environmental Authority

The proposed works will be undertaken within an area that is located within the tenement for PL230, which is part of a collection of Petroleum Leases that form the Dalby Expansion Project (DXP). This tenement has been issued with an Environmental Authority (PEN 100449509) effective from 30 June 2011, which conditions the petroleum activities and the locations in which these activities may be undertaken. This Ecological Assessment specifically addresses the following conditions:

- Conditions B6 to B8 (Watercourse, Wetland and Springs)
- Conditions D2 to D9 (Disturbance to Land - General)
- Conditions D10 to D17 (Disturbance to Land - Environmentally Sensitive Areas)
- Conditions D29 to D31 (Fauna Management)

1.5 Proposed Development

It is Arrow's intent to construct, operated, maintain and monitor a regulated dam on petroleum lease 230 (PL230) under Arrow's current environmental authority PEN100449509 granted on 30 June 2011. The additional brine dam storage will form a crucial mitigation measure to ensure that system integrity is maintained and the risk of potential environmental harm is reduced.

This dam will be one of the seven authorised regulated dams greater than 401 megalitres on PL230 as shown in Schedule A, Table 1 – Authorised Petroleum Activities of the environmental authority.

The Daandine Brine Dam 2 project consists of the construction of a single dam, pipeline and monitoring bores at one site.

The proposed development will involve the construction of a brine dam and associated infrastructure including:

- clearing of an area approximately 53 hectares;
- construction of a high density polyethylene (HDPE) lined dam;
- placing of interconnecting pipe work and transfer lines from Daandine Water Treatment Facility to the brine dam;
- a spoil area which will be required during both the construction and operational phase of the brine dam;
- stock proof fencing around the perimeter of the brine dam upon completion of construction; and

- installation of up to 5 monitoring bores.

1.6 Land Use

The area of proposed works is currently used for grazing. The land adjacent to the proposed works contains existing water infrastructure associated with the Daandine Water Treatment Facility.

2.0 FLORA ASSESSMENT

2.1 Introduction

This following section outlines the methods used in the flora assessment and discusses the results.

2.2 Methods

2.2.1 Desktop Assessment

2.2.1.1 Database Searches

Searches of the Wildlife Online and EPBC Protected Matters databases were completed on 21 September 2012, to find records of both State and Commonwealth threatened communities and species located within 10km radius of the proposed site.

2.2.1.2 Review of Existing Mapping

Current certified Regional Ecosystem (RE) and Regrowth Vegetation maps (Version 6.1) produced by the Department of Environment and Heritage Protection (EHP), were reviewed on 21 September 2012 to determine the location of remnant regional ecosystems, high value regrowth vegetation and essential habitat within the locality of the proposed works. RE, regrowth vegetation and essential habitat mapping of the subject site are shown in Figure 4.

An Environmentally Sensitive Areas Map produced by EHP was reviewed on 21 September 2012 to determine the location of any Environmentally Sensitive Areas (ESAs) and their associated buffer zones within the locality of proposed works. ESA mapping of the site is shown in Figure 5.

Internal GIS Mapping was reviewed on 21 September 2012 to locate any watercourses, wetlands or springs within the locality and to note the distance provided between these features and the proposed site. Watercourse mapping of the locality is shown in Figure 4.

2.2.2 Field Assessment

A flora assessment was conducted on 6 November 2012 by an Arrow ecologist. The purpose of this field assessment was to assess the following:

- physical geography
- land use and disturbance
- vegetation cover, abundance, structure and condition
- validate Regional Ecosystem, Regrowth Vegetation, Essential Habitat and ESA mapping
- targeted threatened communities and species searches.

Flora species were identified in the field where possible, or collected for later identification.

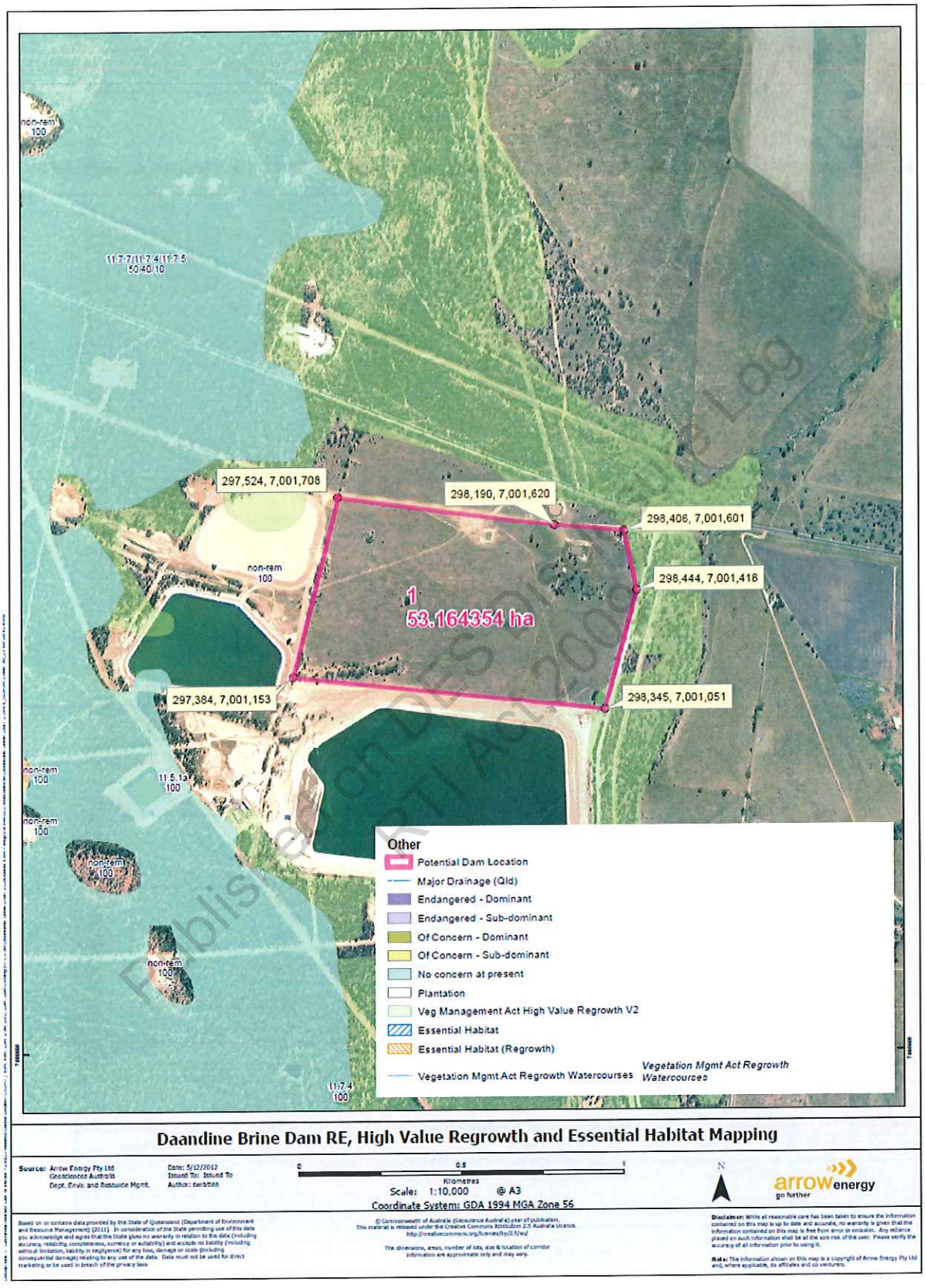

Figure 4 RE, High Value Regrowth and Essential Habitat mapping for Daandine Brine Dam

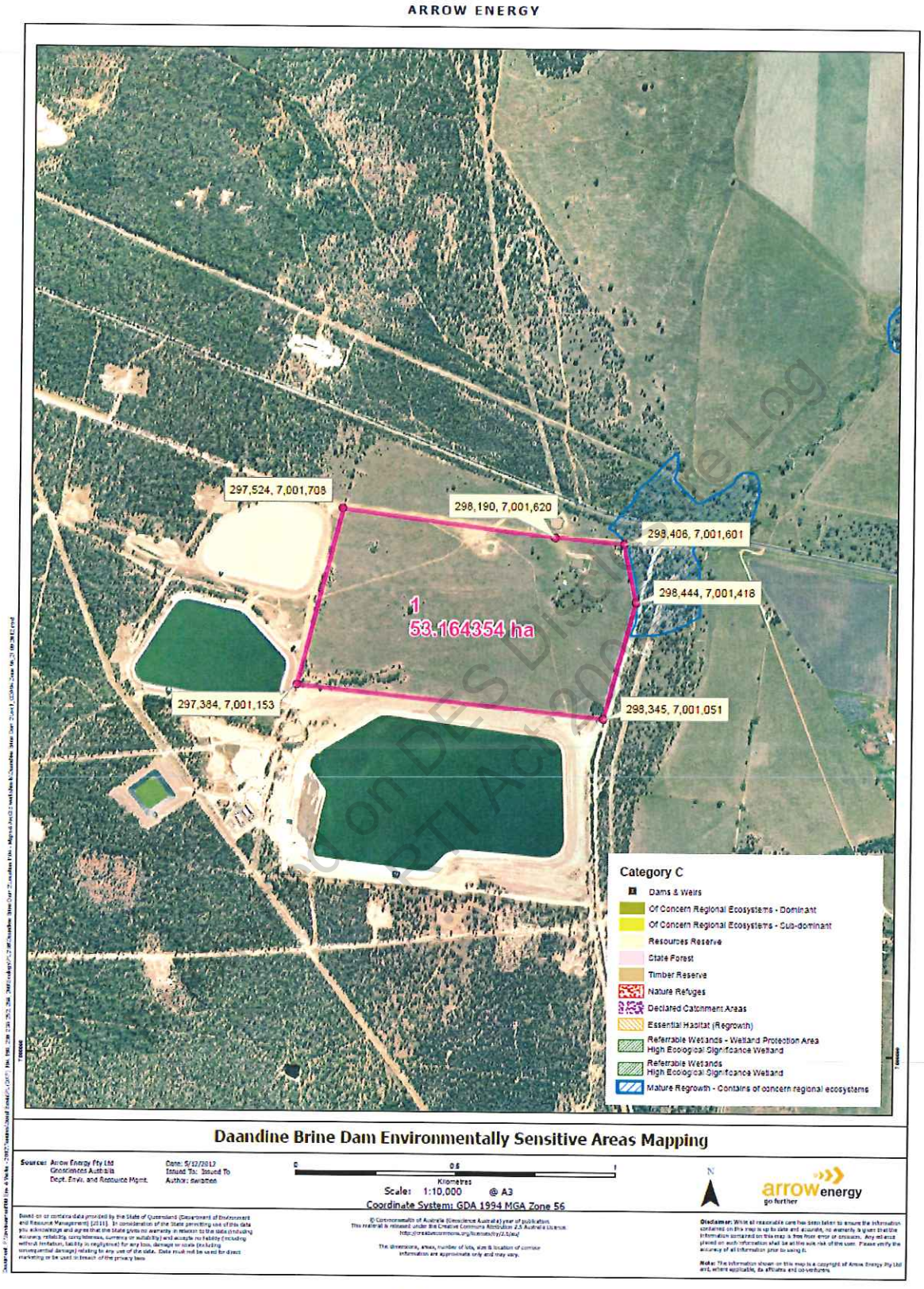

Figure 5 Environmentally Sensitive Area mapping for Daandine Brine Dam

2.2.3 Likelihood of Occurrence Assessment

A review of the preferred habitat for each threatened species identified in the database searches was undertaken and an assessment of the *likelihood of occurrence* within the locality was undertaken upon completion of the field assessment. A rating of 'Unlikely' is given where there are no records within the locality (10km buffer around the site) for the species and preferred habitat or essential microhabitat components do not occur on or adjacent to the site. A rating of 'Possible' is given when there are no records within the locality for the species, but preferred habitat occurs on or adjacent to the site and the site is within the species known range. A rating of 'Likely' is given when there are records within the locality for the species and preferred habitat occurs on and/or adjacent to the site. This assessment is shown in Section 2.3.3.

2.3 Results

2.3.1 Desktop Assessment

2.3.1.1 Database Searches

A search of the EPBC Protected Matters database identified five (5) threatened ecological communities listed under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act) within 10 km of the proposed works. These communities and their relative conservation status are listed in Table 1.

Table 1 Threatened Ecological Communities located within 1km of the proposed works

Community Name	Status	Presence
Natural grasslands on basalt and fine-textured alluvial plans of northern New South Wales and southern Queensland	Critically Endangered	May occur within the area
Brigalow (Acacia harpophylla dominant and co-dominant)	Endangered	Known to occur in the area
White Box -Yellow Box-Blakely's Red Gum Grassy Woodland and Derived Native Grassland	Critically Endangered	May occur within the area
Weeping Myall Woodlands	Endangered	Likely to occur within the area
Coolibah - Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions	Endangered	May occur within the area

A search of the EPBC Protected Matters and Wildlife Online databases identified one (1) endangered and five (5) vulnerable species listed under the EPBC Act and one (1) endangered, four (4) vulnerable and one (1) near threatened species listed under the *Nature Conservation Act 1992* (NC Act) within 10 km of the proposed works. The assessment for the likelihood of occurrence of these species within the locality is included in Section 2.3.3.

2.3.1.2 Review of Existing Mapping

A review of the current mapping identified that the area of proposed works is not located within a remnant regional ecosystem or area containing high value regrowth vegetation or essential habitat. An RE complex of 11.7.7/11.7.4/11.7.5 is mapped as occurring 160m west of the proposed site. A description for this RE can be found in Table 2, which also identifies the Regional Ecosystems located within 1km of the area of proposed works. Figure 4 shows the location of these vegetation communities in reference to the area of proposed works.

Table 2 Regional Ecosystems located within 1km of the proposed works

Regional Ecosystem	Distance and direction from proposed works	Biodiversity Status	Short Description
11.7.7/11.7.4/11.7.5 50/40/10	160m West	No Concern at Present	11.7.7: Eucalyptus fibrosa subsp. nubila +/- Corymbia spp. +/- Eucalyptus spp. on lateritic duricrust 11.7.4: Eucalyptus decorticans and/or Eucalyptus spp., Corymbia spp., Acacia spp., Lysicarpus angustifolius on lateritic duricrust 11.7.5: Shrubland on natural scalds on deeply weathered coarse-grained sedimentary rocks
11.5.1a	500m south west	No Concern at Present	Eucalyptus populnea woodland with Allocasuarina luehmannii low tree layer.

A desktop search for Environmentally Sensitive Areas located within one (1) kilometre of the proposed site was undertaken. Information on the type of ESA, distances and directions to the ESA and the buffer distance required under the current EA is included in Table 3. The proposed site is located directly adjacent to a patch of 'Of Concern 'High Value Regrowth. The current EA requires a 500m buffer to the Of Concern High Value Regrowth for any Petroleum Activities.

Table 3 Environmentally Sensitive Areas (ESA)

Identified ESA	Distance provided to ESA	Buffer Required under EA
Category C (Of Concern High Value Regrowth)	0m	500m

A review of the internal mapping identified a watercourse located 166m east of the site. There are no wetlands mapped within close proximity to the site.

2.3.2 Field Assessment

As part of the field assessment, an assessment of the landform and physiography within 300m of the proposed site was undertaken. The site was considered to be virtually flat, with a gentle slope to the north. The geology was sandy and sheet erosion was evident throughout the site. A summary of the site physiography is included in Table 4.

Table 4 Landform and Physiography

Features	Description
Landform	Unspecified, flat, gentle slopes, undulating terrain
Slope (%)	Very gently incline (>1-3%)
Aspect	South East
Geology	Fine Sedimentary
Dominant land use	Grazing
Site condition	Moderate

Twenty-seven (27) terrestrial flora species were identified within the area of proposed works. No Commonwealth or State listed flora species were recorded on site. A full list of species recorded during the assessment is included as Appendix 1.

The field assessment confirms that no EPBC threatened ecological communities, Regional Ecosystems, Regrowth Vegetation or Essential Habitat are present within the area of proposed works. The area of proposed works is a previously disturbed paddock with a patch of 'Of Concern' high value regrowth adjacent to the north-east corner (Figure 6 & Figure 7). It is not anticipated that the proposed works will impact on this area.

Figure 6 Survey area 1 - The site is predominantly a cleared paddock

Figure 7 Survey area 3 - Of Concern High Value regrowth adjacent to the north-east corner of the site.

The vegetation in the study area has been disturbed through prior clearing activity and is subject to on-going cattle and horse grazing. Grass species dominate the groundcover (*Bothriochloa decipiens, Cymbopogon refractus, Eragrostis parviflora*), with scattered exotic perennials including Mayne's Pest (*Verbena aristigera*). Poplar Box (*Eucalyptus populnea*) and Narrow-leaved Ironbark (*Eucalyptus crebra*) individuals are scattered through-out the north-eastern corner of the property. These individuals are relatively young and provide limited habitat for fauna. Table 5 to Table 7 include summaries of the data received from each vegetation assessment. The field assessment sheets are attached as Appendix 1.

Table 5 Vegetation Characteristics – Survey 1

Vegetation Characteristics	Description		
Remnant status (mapped)	Non-Remnant		
Remnant status (on site)	Non-Remnant		
RE type (on site - if applicable)	N/A	VM status: N/A	BD status: N/A
In accordance with mapping	Yes		
Ecologically dominant layer (EDL)	G		
Median height of EDL (m)	30cm		
Crown cover (T1) %	30-70%		
Median DBH of T1 (cm)	N/A		
Dominant species of T1 / T2 (list up to 3 species)	*N/A*		
Mid-storey (S1/S2) relative density	Sparse		
Dominant species of S1/S2	*N/A*		
Groundcover (G) dominant form	Grassland		
Dominant species of G (list up to 3 species)	*Verbena aristigera* *Cymbopogon refractus* *Bothriochloa decipiens*		
Type A Restricted plants	Nil		
NC Act threatened flora	Nil		
EPBC Act threatened flora	Nil		
EPBC Act Threatened Community	Nil		
Declared Weed Species	*Opuntia stricta*		

Table 6 Vegetation Characteristics – Survey 2

Vegetation Characteristics	Description		
Remnant status (mapped)	Non-Remnant		
Remnant status (on site)	Non-Remnant		
RE type (on site - if applicable)	N/A	VM status: N/A	BD status: N/A
In accordance with mapping	Yes		
Ecologically dominant layer (EDL)	G		
Median height of EDL (m)	15cm		
Crown cover (T1) %	10-30%		
Median DBH of T1 (cm)	N/A		
Dominant species of T1 / T2 (list up to 3 species)	*Eucalyptus populnea*		
Mid-storey (S1/S2) relative density	Sparse		
Dominant species of S1/S2	*N/A*		
Groundcover (G) dominant form	Forb		
Dominant species of G (list up to 3 species)	*Verbena aristigera* *Chrysocephalum apiculatum* *Bothriochloa decipiens*		
Type A Restricted plants	Nil		
NC Act threatened flora	Nil		
EPBC Act threatened flora	Nil		
EPBC Act Threatened Community	Nil		
Declared Weed Species	*Opuntia stricta*		

Table 7 Vegetation Characteristics – Survey 3

Vegetation Characteristics	Description		
Remnant status (mapped)	High Value Regrowth		
Remnant status (on site)	Of Concern		
RE type (on site - if applicable)	N/A	VM status: N/A	BD status: N/A
In accordance with mapping	Yes		
Ecologically dominant layer (EDL)	T1		
Median height of EDL (m)	30m		
Crown cover (T1) %	30-70%		
Median DBH of T1 (cm)	50cm		
Dominant species of T1 / T2 (list up to 3 species)	*Eucalyptus populnea* *Eucalyptus crebra* *Eucalyptus tessellaris*		
Mid-storey (S1/S2) relative density	Sparse		
Dominant species of S1/S2	*Geijera parviflora* *Pimelea neo-anglica*		
Groundcover (G) dominant form	Forb		
Dominant species of G (list up to 3 species)	*Eragrostis parviflora* *Bothriochloa decipiens* *Cymbopogon refractus*		
Type A Restricted plants	Nil		
NC Act threatened flora	Nil		
EPBC Act threatened flora	Nil		

Vegetation Characteristics	Description
EPBC Act Threatened Community	Nil
Declared Weed Species	*Opuntia stricta, Bryophyllum delagoense*

A small patch of 'Of Concern' high value regrowth vegetation was mapped adjacent to the north-eastern corner of the proposed site. An assessment of this vegetation confirmed its presence. It is not anticipated that the proposed works will impact on this vegetation.

The proposed works are designed to limit the potential for impacts on remnant vegetation and have been located in a disturbed, easily accessible, cleared area in order to avoid unnecessary clearing of vegetation for the construction of the dam or access track.

2.3.3 Likelihood of Occurrence Assessment

The field assessment did not identify suitable habitat for any Commonwealth or State listed flora species. Refer to Table 8 for the assessment of likelihood of occurrence on site.

Table 8 Threatened flora species that were detected in the desktop searches (within 10 km)

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
Cadellia pentastylis	Ooline	Vulnerable	Vulnerable	Tall eucalypt woodland on low undulating hills.	No	Unlikely	Low
Digitaria porrecta	Finger Panic Grass	Endangered	Near Threatened	Native grassland, woodlands or open forest with a grassy understory on richer soils. Found along roadsides and travelling stock routes where there is light grazing and occasional fire. Grass continues to persist in disturbed habitats. Flowers from mid Jan to late Feb.	No	Unlikely	Low
Homopholis belsonii	Belson's Panic	Vulnerable	Endangered	Homopholis belsonii occurs at elevations ranging from 200 m to 520 m above sea level. It is known to occur in dry woodland habitats on poor soils, such as those derived from basalt. It occurs on rocky hills supporting White Box (Eucalyptus albens) and in Wilga (Geijera parviflora) woodland; flat to gently undulating alluvial areas supporting Belah (Casuarina cristata) forest (Trémont & Whalley, 1993; DECC NSW, 2005a); and soils and plant communities of Poplar Box (Eucalyptus populnea) woodlands (Leigh et al., 1984; Menkins, 1998). It may also be associated with shadier areas of Brigalow (Acacia harpophylla), Myall (A. melvillei), and Weeping Myall (A. pendula) communities; in Mountain Coolibah (Eucalyptus orgadophila) communities; and on roadsides (Menkins, 1998). It is generally found among fallen timber at the base of trees or shrubs, among	No	Unlikely	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
				branches and leaves of trees hanging to ground level or along the bottom of netting fences (Trémont & Whalley, 1993)			
Philotheca sporadica	-	Vulnerable	Vulnerable	Philotheca sporadica is known from south-east Queensland, from just north of Tara, to approximately 12 km east of Kogan. Philotheca sporadica is found on residual hills which are remnants of laterised Cretaceous sandstones, where the soils are shallow, uniform sandy loams to clay loams of extremely low fertility and poor condition (Dawson, 1972). It occurs primarily in low open forest of Acacia burrowii, Eucalyptus exserta, E. crebra, E. fibrosa subsp. nubila and Callitris glaucophylla.	No	Unlikely	Low
Rhaponticum australe	Austral Cornflower, Native Thistle	Vulnerable	Vulnerable	On heavy clays derived from basalt. Austral Cornflower grows in eucalypt open forest with grassy understory on roadsides and on road reserves with Chloris gayana, Cirsium vulgare, Eucalyptus tereticornis and Angophora floribunda on black clay soil	No	Unlikely	Low
Thesium australe	Austral Toadflax	Vulnerable	Vulnerable	Occurs in grassland or grassy woodland. Often found in damp sites in association with Kangaroo Grass (Themeda australis). A root parasite that takes water and some nutrient from other plants, especially Kangaroo Grass.	No	Unlikely	Low

3.0 FAUNA ASSESSMENT

3.1 Introduction

This following section outlines the methods used in the fauna assessment and discusses the results.

3.2 Methods

3.2.1 Desktop Assessment

3.2.1.1 Database Searches

Searches of the Wildlife Online and EPBC Protected Matters databases were completed on 21 September 2012, to find records of State and Commonwealth threatened species located within 10km of the proposed site.

Arrow Energy has an internal Ecological Information System that contains records of threatened species and habitat features that are observed during field assessments. A search of this database was undertaken on 6 December 2012.

3.2.1.2 Review of Existing Mapping

Current certified Regional Ecosystem (RE) and Regrowth Vegetation maps (Version 6.1) produced by the Department of Environment and Heritage Protection (EHP), were reviewed on 21 September 2012 to determine the location of remnant regional ecosystems, high value regrowth vegetation and essential habitat within the locality of the proposed works. RE, Regrowth Vegetation and Essential Habitat mapping of the subject site are shown in Figure 4.

3.2.2 Field Assessment

A fauna assessment was conducted on 6 November 2012 by an Arrow ecologist. The purpose of this field assessment was to assess the following:

- fauna habitat features (type and abundance)
- the presence of fauna (incidental sightings/fauna signs)
- undertake targeted threatened species searches.

3.2.3 Likelihood of Occurrence on Site Assessment

A review of the preferred habitat for each threatened species identified in the database searches was undertaken and an assessment of the *likelihood of occurrence* within the locality was undertaken upon completion of the field assessment. A rating of 'Unlikely' is given where there are no records within the locality (10km buffer around the site) for the species and preferred habitat or essential microhabitat components do not occur on or adjacent to the site. A rating of 'Possible' is given when there are no records within the locality for the species, but preferred habitat occurs on or adjacent to the site and the site is within the species known range. A rating of 'Likely' is given when there are records within the locality for the species and preferred habitat occurs on and/or adjacent to the site. This assessment is shown in Table 7, Section 3.3.3.

3.3 Results

3.3.1 Desktop Assessment

3.3.1.1 Database Searches

The results from searches of the Wildlife Online and EPBC Protected Matters databases identified four (4) endangered and thirteen (13) vulnerable species listed under the *Environment Protection and Biodiversity Act 1999* and four (4) endangered, ten (1) vulnerable and three (3) near threatened species listed under the *Nature Conservation Act 1992* within 10km of the proposed works.

The assessment for the likelihood of occurrence of these species within the locality is included in Section 3.3.3.

A search of Arrow Energy's Ecological Information System for the general area within the tenement was undertaken on 6 December 2012 and returned no results for threatened species or habitat features.

3.3.1.2 Review of Existing Mapping

A review of the current mapping identified that the area of proposed works is not located within a remnant regional ecosystem or area containing high value regrowth vegetation or essential habitat.

3.3.2 Field Assessment

The study area has been cleared of mature vegetation for grazing purposes, thus providing limited habitat value for fauna. Table 7 includes the fauna characteristics identified within the area of proposed works.

Table 7: Fauna Characteristics

Habitat characteristics	Description
Dominant habitat type	Grassland
Primary habitat features	Small rocks; Leaf litter; Dense Shrub/ Grass shelter; Koala Feed Trees
Fauna signs	Scats/pellets/food remains; Bones/feathers
Fauna of note (sighted)	Nil
Declared Pest Species	Nil

3.3.3 Likelihood of Occurrence Assessment

The field assessment identified suitable habitat for five (5) Commonwealth and State listed vulnerable fauna species; Squatter Pigeon (*Geophaps scripta scripta)*, Five-clawed Worm-skink (*Anomalopus mackayi*), Collared Delma (*Delma torquata*), Koala (*Phascolarctos cinereus*) and Brigalow Scaly-foot (*Paradelma orientalis)*, with these species having a possibility of occurring within the area of proposed works. The field assessment also determined that while there was potential habitat on site for two (2)) marine and migratory species, the Cattle Egret (*Ardea ibis)* and Rainbow bee-eater (*Merops ornatus*), they are unlikely to have essential requirements on the site but may fly over the general area. Refer to Table 8 for the assessment of likelihood of occurrence on site.

Table 8: Threatened flora species that were detected in the desktop searches (within 10 km)

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
Threatened Species									
Geophaps scripta scripta	Squatter Pigeon	Vulnerable	Vulnerable	-	-	Inhabits open grassy woodlands on sandy soils with gravelly ridges. Open grassy woodlands; prefer sandy soils interspersed with low gravelly ridges. These poorer soils have more open, shorter grass cover that allows easier, faster movement than in the densely matted grass of rich black soil country. Birds are never far from water.	Yes	Possible	Low
Lathamus discolor	Swift Parrot	Endangered	Endangered	-	Y	Swift Parrots follow flowering eucalypts. They have been observed leaf gleaning in Eucalyptus melliodora and E. tereticornis, often seen in box/ironbark woodlands, especially high fertility soils and riparian areas where large trees have high nectar production. The Swift Parrot inhabits dry sclerophyll eucalypt forests and woodlands. It occasionally occurs in wet sclerophyll forests (Higgins 1999; Swift Parrot Recovery Team 2001). Saunders and Heinsohn (2008) observed that the Swift Parrot predominantly forages within habitats that have been so significantly cleared that they are classified as endangered ecological communities.	No	Unlikely	Low
Lophoictinia	Square-tailed	-	Near	-	-	Inhabits a range of	Yes	Possible	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
isura	Kite		Threatened			diverse habitats including woodland dominated by eucalypts, pandanus, gallery forest, heath. Found in a variety of timbered habitats including dry woodlands and open forests. Shows a particular preference for timbered watercourses.			
Neochmia ruficauda ruficauda	Star Finch	Endangered	Endangered	-	-	The Star Finch (eastern) occurs within the Desert Channels, Burdekin and Fitzroy (Queensland) Natural Resource Management Regions. It has been recorded from damp grasslands, sedgelands or grassy woodlands near permanent water or areas of regular inundation. Occasionally, individuals have been reported in disturbed habitat and suburban areas.The Star Finch (eastern) occurs within the Desert Channels, Burdekin and Fitzroy	No	Unlikely	Low
Rostratula australis	Australian Painted Snipe	Vulnerable	Vulnerable	Y	Y	Shallow inland wetlands, brackish or freshwater that are permanently or temporarily inundated. Generally in habits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Also waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Nests in and near swamps, canegrass swamps, flooded areas and grasslands.	No	Unlikely	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
						CAMBA listed.			
Maccullochella peelii peelii	Murray Cod	Vulnerable	-	-	-	Warm water habitats including clear, rocky streams, slow flowing turbid rivers and billabongs	No	Unlikely	Low
Chalinolobus dwyeri	Large-eared Pied Bat	Vulnerable	Vulnerable	-	-	Dry forests and woodlands, moist eucalypt forests, caves and mines. Little is known about the habitat and roosting requirements of the Large-eared Pied Bat, but natural roosts may depend heavily on sandstone outcrops. It has been found roosting in disused mine shafts, caves, overhangs and disused Fairy Martin (Hirundo ariel) nests for shelter and to raise young. It also possibly roosts in the hollows of trees.	No	Unlikely	Low
Chalinolobus picatus	Little Pied Bat	-	Near Threatened	-	-	This microbat is sparsely distributed in dry sclerophyll forest, woodland and scrub in the semi-arid zone of Queensland, NSW and SA. It is known to often forage along watercourses, and infrequently inhabits caves. Occurs in dry open forest, open woodland, mulga woodlands, chenopod shrublands, cypress-pine forest, mallee, Bimbil box. Roosts in caves, rock outcrops, mine shafts, tunnels, tree hollows and buildings. Requires access to nearby water.	No	Unlikely	Low
Dasyurus hallucatus	Northern Quoll	Endangered	-	-	-	Most abundant in rocky eucalypt woodlands but occurs in a variety of habitats. The most successful breeding occurs near creeklines, and dens	No	Unlikely	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
						are usually in hollow tree trunks. The Northern Quoll has declined significantly across most of its range in recent times.			
Nyctophilus corbeni	South-eastern Long-eared Bat	Vulnerable	-	-	-	The South-eastern Long-eared Bat occurs in a range of inland woodland vegetation types, including box, ironbark and cypress pine woodlands. The species also occurs in Buloke woodland, Brigalow woodland, Belah woodland, Smooth-barked Apple, Angophora leiocarpa, woodland; River Red Gum, Eucalyptus camaldulensis, forests lining watercourses and lakes, Black Box, Eucalyptus largiflorens, woodland, dry sclerophyll forest. Throughout inland Queensland, the species habitat is dominated by various eucalypt and bloodwood species, and various types of tree mallee with it being most abundant in vegetation with a distinct canopy and a dense cluttered shrub layer.	No	Unlikely	Low
Petrogale penicillata	Brush-tailed Rock-wallaby	Vulnerable	Vulnerable	-	-	This species prefers rocky habitats, including loose boulder-piles, rocky outcrops, steep rocky slopes, cliffs, gorges and isolated rock stacks. It also utilises tree limbs. While it appears that most Brush-tailed Rock-wallaby colonies are on north-facing slopes and cliff lines, colonies have been found on south-facing cliffs in	No	Unlikely	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
						Kangaroo Valley, in the Macleay River Gorge, in the Warrumbungles and at Mt Kaputar, although usually in lower densities.			
Phascolarctos cinereus	Koala	Vulnerable (QLD, NSW & ACT)	Vulnerable (SEQ)	-	-	Inhabits eucalypt woodlands and forests. Feeds on the foliage of more than 70 eucalypt species and 30 non-eucalypt species, but in any one area will select preferred browse species.	Yes	Unlikely	Low
Anomalopus mackayi	Five-clawed Worm-skink	Vulnerable	Endangered	-	-	It is restricted to the Darling Downs and the interior of NE NSW, in open woodland and open tussock grassland.	Yes	Unlikely	Low
Delma torquata	Collared Delma	Vulnerable	Vulnerable	-	-	On the mainland, the species is found in tall open forests, open forests and open woodlands	Yes	Possible	Low
Egernia rugosa	Yakka Skink	Vulnerable	Vulnerable	-	-	Endemic to dry open forests, woodland, rocky areas of the Brigalow Belt region, northern southeastern QLD, Einasleigh Uplands and southern Cape York Peninsula. Lives in communal burrow complexes, often under heaped dead timber, and in deep rock crevices. Often utilises abandoned rabbit warrens. Also recorded under shearing sheds and other rural buildings. Seldom ventures far from cover, often betraying its presence by communal defecation site.	No	Unlikely	Low
Furina dunmalli	Dunmall's Snake	Vulnerable	Vulnerable	-	-	Inhabits woodlands and dry sclerophyll forest particularly areas with Brigalow. Brigalow forest and woodland growing on cracking black clay and clay loam	No	Unlikely	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
						soils.			
Paradelma orientalis	Brigalow Scaly-foot	Vulnerable	Vulnerable	-	-	Shelter under sandstone slabs, surface debris or in grass hummocks. Still persist in cultivated/cleared areas. Found in open forests and woodlands of Brigalow, Narrow-leaved Ironbark, Bimble Box, Cypress Pine, Belah, Buloke, Spotted Gum, Gidgee, Lancewood and Hickory Wattle. Also found in vine thickets. Topgraphy varies from sandstone ridges to flats and gently undulating plains with clay, loam or sand.	Yes	Possible	Low
Strophurus taenicauda	Golden-tailed Gecko	-	Near Threatened	-	-	This species is common in Cypress and Brigalow. The gecko is a woodland-dependent species with a patchy distribution, but can be locally common in suitable habitat.	No	Unlikely	Low
Tympanocryptis pinguicolla	Grassland Earless Dragon	Endangered	Endangered	-	-	Confined to scattered remnants of treeless native grasslands. Shelters in invertebrate holes and soil cracks. Tympanocryptis cf. Tetraporophora-Darling Downs earless dragon	No	Unlikely	Low
Marine and Migratory Species									
Apus pacificus	Fork-tailed Swift	-	-	Y	Y	Almost exclusively aerial, flying from less then 1 m to at least 300 m above ground and probably much higher. They mostly occur over dry or open habitats, including riparian woodland and tea-tree swamps, low scrub, heathland or saltmarsh. They are also found at treeless grassland and	No	Unlikely	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
						sandplains covered with spinifex, open farmland and inland and coastal sand-dunes. Usually arrives in Australia around October and leaves the Darwin area by the end of April. The birds also depart via north-east Queensland, with sightings common from February–March and most birds having departed by May. CAMBA, JAMBA, ROKAMBA listed			
Ardea alba	Great Egret	-	-	Y	Y	Wetlands, flooded pastures, dams, estuarine mudflats, mangroves and reefs. CAMBA, JAMBA listed	No	Unlikely	Low
Ardea ibis	Cattle Egret	-	-	Y	Y	Occurs in tropical and temperate grasslands, wooded lands and terrestrial wetlands. It is commonly associated with the habitats of farm animals, particularly cattle, but also pigs, sheep, horses and deer. CAMBA, JAMBA listed	Yes	Possible	Low
Haliaeetus leucogaster	White-bellied Sea-Eagle	-	-	Y	Y	Found in coastal habitats (especially those close to the sea-shore) and around terrestrial wetlands in tropical and temperate regions. The habitats occupied by the sea-eagle are characterised by the presence of large areas of open water (larger rivers, swamps, lakes, the sea). CAMBA listed.	No	Unlikely	Low
Hirundapus caudacutus	White-throated Needletail	-	-	Y	Y	Almost exclusively aerial, from heights of less than 1 m up to more than 1000 m above the ground. Although they occur over most types of	No	Unlikely	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
						habitat, they are probably recorded most often above wooded areas, including open forest and rainforest, and may also fly between trees or in clearings, below the canopy, but they are less commonly recorded flying above woodland. Arrives into Australia from September to November and may stay until April. Some individuals occasionally remain in Australia for the breeding season. CAMBA, JAMBA, ROCKAMBA listed.			
Merops ornatus	Rainbow Bee-eater	-	-	Y	Y	Occurs mainly in open forests and woodlands, shrublands, and in various cleared or semi-cleared habitats, including farmland and areas of human habitation. It usually occurs in open, cleared or lightly-timbered areas that are often, but not always, located in close proximity to permanent water. JAMBA listed.	Yes	Possible	Low
Gallinago hardwickii	Latham's Snipe, Japanese Snipe	-	-	Y	Y	Occurs in permanent and ephemeral wetlands up to 2000 m above sea-level. They usually inhabit open, freshwater wetlands with low, dense vegetation (e.g. swamps, flooded grasslands or heathlands, around bogs and other water bodies). However, they can also occur in habitats with saline or brackish water, in modified or artificial habitats, and in habitats located close to humans or human activity.	No	Unlikely	Low

Scientific Name	Common Name	EPBC Act Status	NC Act Status	Migratory	Marine	Preferred Habitat	Suitable Habitat within site? (Yes / No)	Likelihood of species to occur? (Unlikely, Possible, Likely)	Sensitivity of species to project? (High, Medium, Low)
						BONN, CAMBA, JAMBA, ROCKAMBA listed.			
Rostratula australis	Australian Painted Snipe	Vulnerable	Vulnerable	Y	Y	Shallow inland wetlands, brackish or freshwater that are permanently or temporarily inundated. Generally in habits shallow terrestrial freshwater (occasionally brackish) wetlands, including temporary and permanent lakes, swamps and claypans. Also waterlogged grassland or saltmarsh, dams, rice crops, sewage farms and bore drains. Nests in and near swamps, canegrass swamps, flooded areas and grasslands. CAMBA listed.	No	Unlikely	Low
Anseranas semipalmata	Magpie Goose	-	-	-	Y	Mainly found in shallow wetlands (less than 1 m deep) with dense growth of rushes or sedges. Equally at home in aquatic or terrestrial habitats; often seen walking and grazing on land; feeds on grasses, bulbs and rhizomes. Often seen in trios or flocks on shallow wetlands, dry ephemeral swamps, wet grasslands and floodplains; roosts in tall vegetation.	No	Unlikely	Low

4.0 SITE VALUES AND IMPACTS

The proposed site was selected to avoid clearing of remnant and high value regrowth vegetation and mitigate the residual impacts of clearing such as erosion and increased salinity. The proposed area has been previously cleared and can be accessed via an existing access track that will require minor upgrading.

The proposed works will result in approximately 53 hectares of non-remnant vegetation being cleared (predominantly consisting of derived grassland and regrowth vegetation). The project site provides limited foraging and refuge opportunities for macropods, small reptiles and some ground birds. Similar historically cleared land is widespread throughout the locality and therefore the proposed project activities are unlikely to significantly impact habitat on which these species rely.

The site has been selected to avoid significant habitat areas. Wildlife corridors or good quality habitat will not be fragmented, and major fauna habitats (e.g. woody vegetation and aquatic habitat) mapped in the vicinity of the study area (Figure 4) will similarly not be impacted.

The increased level of noise, dust and vibration as a result of the proposed work may disturb fauna that use the vegetation to the east of Kumbarilla Lane. These effects would be temporary and unlikely to cause significant long term impacts.

The movement of vehicles and machinery on and off the site has the potential to spread weed seed. Furthermore, the disturbance to soil could increase the potential for weed establishment.

5.0 MITIGATION

Management measures that will be implemented to avoid or minimise potential impacts to flora and fauna values include the following:

- Vegetation clearing will be minimised to the greatest extent practicable.
- Fallen vegetation shall be retained where possible to provide habitat.
- Trees not identified for removal will be protected from damage. Construction activities will limit the scraping of standing tree trunks and breaking of limbs by equipment as far as practicable.
- Trees will be felled away from existing stands where practicable. Where trees unavoidably fall into a stand, the tree will be left in situ to emulate natural tree fall and provide habitat for ground-dwelling species, where practicable.
- Where ever possible, vegetation shall be removed at ground level by cutting / slashing (rather than removing root stock) and then stored for reuse as mulch during site rehabilitation, or sediment and erosion control.
- Construction equipment will be equipped with appropriate noise abatement devices, where practicable.
- Vehicles, equipment and machinery will be certified as weed free prior to crossing state borders, and if requested by the landholder, prior to entry on the property.
- Weeds (including vegetation, fruit and seed) removed during vegetation clearing will be destroyed or disposed of by suitable means to prevent its spread.
- Stockpiled soils and disturbed areas will be monitored to ensure weeds do not establish.
- The dam will be constructed with fauna exclusion and/or escape measures to prevent entrapment.
- On completion of activities, the site will be rehabilitated in a manner that promotes the re-establishment of pre-existing flora and fauna values.

- A complaints register will be maintained and any corrective actions will be implemented and documented.
- Corrective actions will be closed out by senior management.

6.0 LEGISLATIVE CONSIDERATIONS

The Daandine Brine Dam is proposed to be located directly adjacent to a patch of 'Of Concern' high value regrowth vegetation which is identified as a Category C Environmentally Sensitive Area under the Environmental Authority for PL230 (PEN100449509). Under this EA, no petroleum activities are to be undertaken within 500m of a Category C ESA.

7.0 CONCLUSIONS

The works for the proposed Daandine Brine Dam well have been located to avoid significant environmental impacts. The site has already been previously cleared of mature remnant vegetation and is currently used for cattle and horse grazing. The impacts from construction within this area are considered to be minimal.

Appendix 1 Field Survey Sheets

arrow energy go further

Ecology Site Assessment Proforma

Draft

Environment Department

ENVIRONMENTAL FIELDWORK SHEET (EFS)

Site Identification			
Site Name:	Daandine Brine Dam 2	**Date:**	6 November 2012
Site / Waypoint Number:	Option 1 Survey 1	**Assessor/s:**	sch4p4(6) Pe

Development Type and Location					
Development type				**Location description**	
Production Well Site	☐	**Gas Processing Facility**	☐	**Easting**	297728
Pilot Well + Dam	☐	**Dam**	☒	**Northing**	7001511
Core/Chip Hole	☐	**Pipeline**	☐	**Datum + zone**	GDA94 Z56
Frac well	☐	**Seismic Line**	☐	**Other description**	
SIS well	☐	**Roads**	☐		
Well pad	☐	**Other**	☐		

Photo numbers and notes			
Camera used: sch4p4(6) P			
A	Transect	**E**	
B		**F**	
C		**G**	
D		**H**	

Landform within 300m					
Plains	Downs – open, rolling, ashy, pebbly	Alluvial plain or flat, flood plain	Inland clay pan, salt flat, salt pan	Coastal tidal flat or salt flat	**Unspecified, flat, gentle, slopes, undulating terrain**
Hill, Mountain, Tableland	Slope or hill not specified	Cliff, steep rock, rocky ledge, rocky outcrop, scarp, crevice	Coastal rocky headland	Top, crest of mountain or ridge	Jump-up, mesa, tableland, plateau
Dunes	Fossil coastal dune, high dune	Coastal dune – unspecified, beach dune, recent dune, low dune, coastal sand hill		Inland dune, inland sand hill	
Streams	Permanent lake, river, stream, watercourse, levees and/or their banks	Seasonal or intermittent creek, gully, drainage line, ravine, gorge, outwash		Inland channel country, stream distributary system, intermittently flooded	
Water	Freshwater lake, lagoon, spring	Freshwater swamp, marsh, soak, seepage area	Gilgai, melon hole, sinkhole	Saltwater, sea, swamp	

Physiography (ESU)									
Slope	Level (<1%)		Very gently inclined (>1-3%)		Gently inclined (>3-10%)			Mod. Inclined (>10-32%)	
	Steep (32-55%)		Very steep (56-100%)		Precipitous (100-299%)			Cliffed (>300%)	
Aspect	N	S	E	W	NE	NW	SE	SW	Nil

Geology	Alluvial	Clay	Sand	Coarse sedimentary	Fine sedimentary
	Igneous (coarse)	Volcanic (fine)	Metamorphic	Limestone	Laterite
Soil Colour	White	Yellow	Orange	Brown	Red
	Black	Grey	Pale	Dark	Mottled
Texture	Clay	Silt	Loam	Sand	Gravel	Saline mud
Erosion	Absent	Scattered	Frequent
Erosion Type	Tunnelling	Sheet	Rill	Gully	Mass failure	Stream-bank
Soil / Erosion notes						

Disturbance (ESU)							
Land use	Grazing	Forestry	Cropping	Conservation	Mining	Other:	
Evidence	Clearing	Cultivation	Regrowth	Logging	Thinning	Comment:	
Weeds	Absent	Scattered	Frequent	Dominant			
Declared Weeds	*Opuntia stricta*						
Dieback	0%	1-25%	26-75%	>76%			
Site condition	Very good	Good	Moderate	Poor	Degraded		
Fire scars	Absent	Scattered	Frequent	**Time since**	Recent	Old	**Average Height (m)**
Disturbance notes							

Vegetation structure and context (ESU)							
Dominant growth form	Closed forest	Open forest	Woodland	Shrubland	Grassland	Forbland	Wetland
Growth stage	Senescent	Uneven age	Mature	Advanced regeneration	Early regeneration		
Ecologically dominant layer (EDL)	T1	T2	S1	S2	G		
Median height (m) of EDL	30cm	**Median DBH (cm) of canopy species**	N/A				
% Crown cover	>70%	30-70%	10-30%	<10%			
Mid-storey density	Absent	Sparse	Dense	Very dense			
Remnant status	Remnant	High value regrowth	Non-remnant	Other			
Landscape state	Intact	Variegated	Fragmented	Relictual			
Condition notes							

Tertiary Flora Assessment (ESU)				
	RE Code	**EPBC Status**	**VMA Status**	**Biodiversity Status**
RE as mapped	Non-Remnant			
Survey result	Non-Remnant			
Agree w/ mapped RE?	Yes			
If no, provide reasons				

Type A Restricted Plants (timed search across ESU)								
Restricted plants	Species	No.	Coordinates					
			Easting	Northing	Easting	Northing	Easting	Northing
Orchidaceae sp. (orchids)	Nil							
Xanthorrhoea sp. (Grass trees)	Nil							
Myrmecodia sp. (Ant plants)	Nil							
Hydnophytum sp. (Ant plants)	Nil							
Cycadaceae sp. (Cycads)	Nil							
Zamiaceae sp. (Cycads)	Nil							
Huperzia sp. (lace plants)	Nil							
Platycerium sp. (Staghorns)	Nil							
Brachychiton sp. (Bottle trees)	Nil							
Livistona sp. (Cabbage palms)	Nil							

Threatened Flora (timed search across ESU)								
Threatened Flora Species		No.	Coordinates					
			Easting	Northing	Easting	Northing	Easting	Northing
Nil								
Nil								
Nil								
Nil								

Other points of interest (eg. track/infrastructure locations, additional flora sp.) (across ESU)			
Description / notes	Coordinates		Photo number
	Easting	Northing	
Nil			
Nil			
Nil			
Nil			
Nil			

Vegetation floristics (record all woody spp. and top 10 spp. cover in groundstorey within 20m x 20m quadrat)						
Sub-stratum	Growth form	Field name	Species name	Cover	Abundance	Field No.
			Hypochaeris microcephala	1%	100	
			Cymbopogon refractus	20%	500	
			Verbena aristigera	1%	500	
			Wahlenbergia gracilis	1%	100	
			Chrysocephalum apiculatum	1%	500	
			Enteropogon acicularis	5%	50	
			Bothriochloa decipiens	20%	500	
			Gomphrena celosioides	<1%	50	
			Brachyschome sp.	<1%	50	
			Veronica plebeia	<1%	20	
			Centipeda cunninghamii	<1%	20	
			Pseudoraphis spinescens	5%	50	
			Eragrostis parviflora	1%	10	
			Euchiton involucratis	1%	50	

Growth form	T=tree; M=mallee tree; S=shrub; Z=heath shrub; C=chenopod shrub; G=tussock grass; H=hummock grass; D=sod grass; V=vine; R=rush; E=fern; F=forb; A=cycad; P=palm; X=xanthorrhoea; U=samphire shrub, O=other
Cover	Crown cover measured in the following categories <1%; 1%; 2%; 3%; 4%; 5%; 10%; 15%; 20%; 25%; 30%; 35%; 40% etc
Abundance	Number of individuals measured in the following categories 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 20; 50; 100; 500; 1000; >1000

Rehabilitation				
*Baseline rehabilitation state	1. Annual groundcover or cultivation	2. Perennial exotic groundcover	3. Perennial native groundcover	4. Native vegetation remnant
Progress	Not yet undertaken	Satisfactory	Unsatisfactory	
Notes on rehabilitation concerns with regard to soil erosion, vegetation cover establishment, landform contouring, contamination.				

* record the original site condition as the goal for future rehabilitation works.

Groundcover monitoring (100m transect)							
Location	Daandine Brine Dam		Survey name	Plot number	Recorders		
Date	6/11/12		1		sch4p4(6) P		
Grid Reference	Zone	Datum	Transect Start (0m)		Transect end (100m)		
	54 55 56	GDA94	E 297728 N 7001511		E 297795 N 7001441		
Transect length	100m	Orientation	380° SE	Marked	Yes No	Photo # / orientation	5/ 300° SE

Ground cover	Tally first point of contact (<1m), every 1m along 100m transect (=100 points)	Total
Litter		
Bare ground	IIII IIII IIII I	16
Cryptogam		
Woody debris		
Rock		
Exotic – Annual		
Exotic – Perennial	IIII I	6
Shrub (crown height <1m)		
Grass – Hummock*		
Grass – Other*	IIII IIII IIII IIII IIII IIII IIII IIII IIII IIII IIII IIII III	68
Forb*	IIII IIII	10
Sedge / Rush*		
Fern*		
Other*		

* Native species

Belt transect for woody species (100m x 5m belt transect)						
Woody flora species observed	Form	Relative Dominance	Tally			
			T1 layer	T2 layer	S1 layer	Seedlings
Nil						
Nil						
Nil						
Nil						
Nil						

Species annotations	S=specimens collected; *=Exotic species; **=Declared species; +=Outside but adjoining plot
Form	T=Tree; S=Shrub; Seed=Seedling; Sap=Sapling
Relative dominance	D=Dominant; A=Abundant; F=Frequent; O=Occasional; R=Rare
Abbreviations	N/A=Not Applicable; N/R=Not Recorded; N/O=None Observed

Fauna Habitat Assessment (within ESU)							
No. of trees/ha with hollows (>10cm)	Nil	No. of hollow logs/ha	Nil	Total length of logs/ha (>10cm)	Nil	No. of logs/ha (>10cm)	Nil
Habitat feature	Status						
Cliffs / outcrops	Absent	Scattered	Common	Abundant			
Large rocks (>30cm)	Absent	Scattered	Common	Abundant			
Small rocks (10-30cm)	Absent	Scattered	Common	Abundant			
Rock piles	Absent	Scattered	Common	Abundant			
Leaf litter	Absent	Scattered	Common	Abundant			
Dense shrub/grass shelter	Absent	Scattered	Common	Abundant			
Termite mounds (>50cm)	Absent	Scattered	Common	Abundant			
Trees with shedding bark	Absent	Scattered	Common	Abundant			
Seeding grass cover	Absent	Scattered	Common	Abundant			
Fleshy fruiting plants	Absent	Scattered	Common	Abundant			
Nectar / pollen	Absent	Scattered	Common	Abundant			
Soil cracks	Absent	Scattered	Common	Abundant			
Waterway	Absent	Scattered	Common	Abundant			
Wetland / Swamp / Waterbody	Absent	Scattered	Common	Abundant			
Koala feed trees	Absent	Scattered	Common	Abundant			
Mistletoe/Epiphytes	Absent	Scattered	Common	Abundant			

Fauna signs (within ESU)				
Scats/pellets/ food remains	Absent	Scattered	Common	Abundant
Animal tracks / trails	Absent	Scattered	Common	Abundant
Bones, feathers	Absent	Scattered	Common	Abundant
Diggings / burrows	Absent	Scattered	Common	Abundant
Shelters / nests	Absent	Scattered	Common	Abundant
Tree scratches / feed scars	Absent	Scattered	Common	Abundant

Incidental Fauna Sightings and Breeding Places (within ESU)					
Species Name	Conservation Status	Breeding Place (eg. nests, hollows, logs, peeling bark)	Coordinates		Other Information (eg. Growth stage, number of individuals)
			Eastings	Northings	
Nil					
Nil					
Nil					
Nil					

Conservation Status

		Special Least Concern Species	Colonial Breeding Species
E	Endangered	Koala, Echidna, Platypus, Migratory Species	"a group of animals of the same kind co-existing in close association for breeding purposes"
V	Vulnerable		
NT	Near Threatened		Eg. Frogs, Microbats, Babblers, Apostlebirds, etc.
SLC	Special Least Concern		
CBS	Colonial Breeding Species		
LC	Least Concern		

ENVIRONMENTAL FIELDWORK SHEET (EFS)

Site Identification			
Site Name:	Daandine Brine Dam 2	**Date:**	6 November 2012
Site / Waypoint Number:	Option 1 Survey 2	**Assessor/s:**	sch4p4(6) F

Development Type and Location					
Development type				**Location description**	
Production Well Site	☐	**Gas Processing Facility**	☐	**Easting**	
Pilot Well + Dam	☐	**Dam**	☒	**Northing**	
Core/Chip Hole	☐	**Pipeline**	☐	**Datum + zone**	GDA94 Z56
Frac well	☐	**Seismic Line**	☐	**Other description**	
SIS well	☐	**Roads**	☐		
Well pad	☐	**Other**	☐		

Photo numbers and notes			
Camera used: sch4p4(6) P			
A	North (photo 2)	**E**	
B	East (photo 3)	**F**	
C	South (photo 4)	**G**	
D	West (photo 5)	**H**	

Landform within 300m					
Plains	Downs – open, rolling, ashy, pebbly	Alluvial plain or flat, flood plain	Inland clay pan, salt flat, salt pan	Coastal tidal flat or salt flat	**Unspecified, flat, gentle, slopes, undulating terrain**
Hill, Mountain, Tableland	Slope or hill not specified	Cliff, steep rock, rocky ledge, rocky outcrop, scarp, crevice	Coastal rocky headland	Top, crest of mountain or ridge	Jump-up, mesa, tableland, plateau
Dunes	Fossil coastal dune, high dune	Coastal dune – unspecified, beach dune, recent dune, low dune, coastal sand hill		Inland dune, inland sand hill	
Streams	Permanent lake, river, stream, watercourse, levees and/or their banks	Seasonal or intermittent creek, gully, drainage line, ravine, gorge, outwash		Inland channel country, stream distributary system, intermittently flooded	
Water	Freshwater lake, lagoon, spring	Freshwater swamp, marsh, soak, seepage area	Gilgai, melon hole, sinkhole	Saltwater, sea, swamp	

Physiography (ESU)									
Slope	Level (<1%)	Very gently inclined (>1-3%)	Gently inclined (>3-10%)	Mod. Inclined (>10-32%)					
	Steep (32-55%)	Very steep (56-100%)	Precipitous (100-299%)	Cliffed (>300%)					
Aspect	N	S	E	W	NE	NW	SE	SW	Nil
Geology	Alluvial	Clay	Sand	Coarse sedimentary	Fine sedimentary				
	Igneous (coarse)	Volcanic (fine)	Metamorphic	Limestone	Laterite				
Soil Colour	White	Yellow	Orange	Brown	Red				
	Black	Grey	Pale	Dark	Mottled				
Texture	Clay	Silt	Loam	Sand	Gravel	Saline mud			
Erosion	Absent	Scattered	Frequent						
Erosion Type	Tunnelling	Sheet	Rill	Gully	Mass failure	Stream-bank			
Soil / Erosion notes									

Disturbance (ESU)								
Land use	Grazing	Forestry	Cropping	Conservation	Mining	Other:		
Evidence	Clearing	Cultivation	Regrowth	Logging	Thinning	Comment:		
Weeds	Absent	Scattered	Frequent	Dominant				
Declared Weeds	*Opuntia stricta*							
Dieback	0%	1-25%	26-75%	>76%				
Site condition	Very good	Good	Moderate	Poor	Degraded			
Fire scars	Absent	Scattered	Frequent	**Time since**	Recent	Old	**Average Height (m)**	
Disturbance notes								

Vegetation structure and context (ESU)							
Dominant growth form	Closed forest	Open forest	Woodland	Shrubland	Grassland	Forbland	Wetland
Growth stage	Senescent	Uneven age	Mature	Advanced regeneration	Early regeneration		
Ecologically dominant layer (EDL)	T1	T2	S1	S2	G		
Median height (m) of EDL	15cm	**Median DBH (cm) of canopy species**	N/A				
% Crown cover	>70%	30-70%	10-30%	<10%			
Mid-storey density	Absent	Sparse	Dense	Very dense			
Remnant status	Remnant	High value regrowth	Non-remnant	Other			
Landscape state	Intact	Variegated	Fragmented	Relictual			
Condition notes							

Tertiary Flora Assessment (ESU)				
	RE Code	**EPBC Status**	**VMA Status**	**Biodiversity Status**
RE as mapped	Non-Remnant			
Survey result	Non-Remnant			
Agree w/ mapped RE?	Yes			
If no, provide reasons				

Vegetation floristics (record all woody spp. and top 10 spp. cover in groundstorey within 20m x 20m quadrat)						
Sub-stratum	Growth form	Field name	Species name	Cover	Abundance	Field No.
			Sclerolaena birchii	<1%	5	
			Verbena aristigera	1%	500	
			Opuntia stricta	5%	50	
			Maireana microphylla	5%	20	
			Gomphrena celosoides	1%	50	
			Hypochaeris microcephala	<1%	20	
			Eucalyptus populnea	15%	2	
			Wahlenbergia sp.	<1%	50	
			Aristida caput-medusae	<1%	10	
			Portulaca pilosa	1%	100	
			Cynodon dactylon	10%	100	
			Chrysocephalum apiculatum	2%	1000	
			Bothriochloa decipiens	10%	500	

Growth form	T=tree; M=mallee tree; S=shrub; Z=heath shrub; C=chenopod shrub; G=tussock grass; H=hummock grass; D=sod grass; V=vine; R=rush; E=fern; F=forb; A=cycad; P=palm; X=xanthorrhoea; U=samphire shrub, O=other
Cover	Crown cover measured in the following categories <1%; 1%; 2%; 3%; 4%; 5%; 10%; 15%; 20%; 25%; 30%; 35%; 40% etc
Abundance	Number of individuals measured in the following categories 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 20; 50; 100; 500; 1000; >1000

Rehabilitation				
*Baseline rehabilitation state	1. Annual groundcover or cultivation	2. Perennial exotic groundcover	3. Perennial native groundcover	4. Native vegetation remnant
Progress	Not yet undertaken	Satisfactory	Unsatisfactory	
Notes on rehabilitation concerns with regard to soil erosion, vegetation cover establishment, landform contouring, contamination.				

* record the original site condition as the goal for future rehabilitation works.

Type A Restricted Plants (timed search across ESU)									
Restricted plants	Species	No.	Coordinates						
			Easting	Northing	Easting	Northing	Easting	Northing
Orchidaceae sp. (orchids)	Nil								
Xanthorrhoea sp. (Grass trees)	Nil								
Myrmecodia sp. (Ant plants)	Nil								
Hydnophytum sp. (Ant plants)	Nil								
Cycadaceae sp. (Cycads)	Nil								
Zamiaceae sp. (Cycads)	Nil								
Huperzia sp. (lace plants)	Nil								
Platycerium sp. (Staghorns)	Nil								
Brachychiton sp. (Bottle trees)	Nil								
Livistona sp. (Cabbage palms)	Nil								

Threatened Flora (timed search across ESU)									
Threatened Flora Species		No.	Coordinates						
			Easting	Northing	Easting	Northing	Easting	Northing
Nil									
Nil									
Nil									
Nil									

Other points of interest (eg. track/infrastructure locations, additional flora sp.) (across ESU)			
Description / notes	Coordinates		Photo number
	Easting	Northing	
Nil			
Nil			
Nil			
Nil			
Nil			

ENVIRONMENTAL FIELDWORK SHEET (EFS)

Site Identification			
Site Name:	Daandine Brine Dam 2	Date:	6 November 2012
Site / Waypoint Number:	Option 1 Survey 3	Assessor/s:	sch4p4(6) Pe

Development Type and Location					
Development type				Location description	
Production Well Site	☐	Gas Processing Facility	☐	Easting	
Pilot Well + Dam	☐	Dam	☒	Northing	
Core/Chip Hole	☐	Pipeline	☐	Datum + zone	GDA94 Z56
Frac well	☐	Seismic Line	☐	Other description	
SIS well	☐	Roads	☐		
Well pad	☐	Other	☐		

Photo numbers and notes			
Camera used: sch4p4(6) P			
A		E	
B		F	
C		G	
D		H	

Landform within 300m					
Plains	Downs – open, rolling, ashy, pebbly	Alluvial plain or flat, flood plain	Inland clay pan, salt flat, salt pan	Coastal tidal flat or salt flat	Unspecified, flat, gentle, slopes, undulating terrain
Hill, Mountain, Tableland	Slope or hill not specified	Cliff, steep rock, rocky ledge, rocky outcrop, scarp, crevice	Coastal rocky headland	Top, crest of mountain or ridge	Jump-up, mesa, tableland, plateau
Dunes	Fossil coastal dune, high dune	Coastal dune – unspecified, beach dune, recent dune, low dune, coastal sand hill		Inland dune, inland sand hill	
Streams	Permanent lake, river, stream, watercourse, levees and/or their banks	Seasonal or intermittent creek, gully, drainage line, ravine, gorge, outwash		Inland channel country, stream distributary system, intermittently flooded	
Water	Freshwater lake, lagoon, spring	Freshwater swamp, marsh, soak, seepage area	Gilgai, melon hole, sinkhole	Saltwater, sea, swamp	

Physiography (ESU)									
Slope	Level (<1%)		Very gently inclined (>1-3%)		Gently inclined (>3-10%)		Mod. Inclined (>10-32%)		
	Steep (32-55%)		Very steep (56-100%)		Precipitous (100-299%)		Cliffed (>300%)		
Aspect	N	S	E	W	NE	NW	SE	SW	Nil
Geology	Alluvial		Clay	Sand	Coarse sedimentary		Fine sedimentary		
	Igneous (coarse)		Volcanic (fine)	Metamorphic	Limestone		Laterite		
Soil Colour	White		Yellow	Orange	Brown		Red		
	Black		Grey	Pale	Dark		Mottled		
Texture	Clay	Silt	Loam	Sand	Gravel		Saline mud		
Erosion	Absent		Scattered		Frequent				
Erosion Type	Tunnelling	Sheet	Rill	Gully	Mass failure		Stream-bank		
Soil / Erosion notes									

Disturbance (ESU)								
Land use	Grazing	Forestry	Cropping	Conservation	Mining	Other:		
Evidence	Clearing	Cultivation	Regrowth	Logging	Thinning	Comment:		
Weeds	Absent	Scattered	Frequent	Dominant				
Declared Weeds	*Opuntia stricta, Bryophyllum delagense*							
Dieback	0%	1-25%	26-75%	>76%				
Site condition	Very good	Good	Moderate	Poor	Degraded			
Fire scars	Absent	Scattered	Frequent	**Time since**	Recent	Old	**Average Height (m)**	
Disturbance notes								

Vegetation structure and context (ESU)							
Dominant growth form	Closed forest	Open forest	Woodland	Shrubland	Grassland	Forbland	Wetland
Growth stage	Senescent	Uneven age	Mature	Advanced regeneration	Early regeneration		
Ecologically dominant layer (EDL)	T1	T2	S1	S2	G		
Median height (m) of EDL	30m	**Median DBH (cm) of canopy species**		50cm			
% Crown cover	>70%	30-70%	10-30%	<10%			
Mid-storey density	Absent	Sparse	Dense	Very dense			
Remnant status	Remnant	High value regrowth	Non-remnant	Other			
Landscape state	Intact	Variegated	Fragmented	Relictual			
Condition notes							

Tertiary Flora Assessment (ESU)				
	RE Code	**EPBC Status**	**VMA Status**	**Biodiversity Status**
RE as mapped	High Value Regrowth			
Survey result	Of Concern			
Agree w/ mapped RE?	Yes			
If no, provide reasons				

Groundcover monitoring (100m transect)							
Location	Daandine Brine Dam		Survey name	Plot number	Recorders		
Date	6/11/12		2		sch4p4(6) Per		
Grid Reference	Zone	Datum	Transect Start (0m)		Transect end (100m)		
	54 55 56	GDA94	E 298270 N 7001617		E 298177 N 7001604		
Transect length	50m	Orientation	240° SW	Marked	Yes No	Photo # / orientation	21/ 245° SW

Ground cover	Tally first point of contact (<1m), every 1m along 100m transect (=100 points)	Total
Litter	IIIII IIII	9
Bare ground	IIIII IIII	9
Cryptogam		
Woody debris		
Rock		
Exotic – Annual		
Exotic – Perennial	IIIII	5
Shrub (crown height <1m)		
Grass – Hummock*		
Grass – Other*	IIIII IIIII IIIII I	16
Forb*	IIIII IIIII I	11
Sedge / Rush*		
Fern*		
Other*		

* Native species

Belt transect for woody species (100m x 5m belt transect)						
Woody flora species observed	Form	Relative Dominance	Tally			
			T1 layer	T2 layer	S1 layer	Seedlings
Nil						
Nil						

Species annotations	S=specimens collected; *=Exotic species; **=Declared species; +=Outside but adjoining plot
Form	T=Tree; S=Shrub; Seed=Seedling; Sap=Sapling
Relative dominance	D=Dominant; A=Abundant; F=Frequent; O=Occasional; R=Rare
Abbreviations	N/A=Not Applicable; N/R=Not Recorded; N/O=None Observed

Fauna Habitat Assessment (within ESU)							
No. of trees/ha with hollows (>10cm)	Nil	No. of hollow logs/ha	Nil	Total length of logs/ha (>10cm)	Nil	No. of logs/ha (>10cm)	Nil
Habitat feature		Status					
Cliffs / outcrops		Absent		Scattered		Common	Abundant
Large rocks (>30cm)		Absent		Scattered		Common	Abundant
Small rocks (10-30cm)		Absent		Scattered		Common	Abundant
Rock piles		Absent		Scattered		Common	Abundant
Leaf litter		Absent		Scattered		Common	Abundant
Dense shrub/grass shelter		Absent		Scattered		Common	Abundant
Termite mounds (>50cm)		Absent		Scattered		Common	Abundant
Trees with shedding bark		Absent		Scattered		Common	Abundant
Seeding grass cover		Absent		Scattered		Common	Abundant
Fleshy fruiting plants		Absent		Scattered		Common	Abundant
Nectar / pollen		Absent		Scattered		Common	Abundant
Soil cracks		Absent		Scattered		Common	Abundant
Waterway		Absent		Scattered		Common	Abundant
Wetland / Swamp / Waterbody		Absent		Scattered		Common	Abundant
Koala feed trees		Absent		Scattered		Common	Abundant
Mistletoe/Epiphytes		Absent		Scattered		Common	Abundant

Fauna signs (within ESU)					
Scats/pellets/ food remains	Absent		Scattered	Common	Abundant
Animal tracks / trails	Absent		Scattered	Common	Abundant
Bones, feathers	Absent		Scattered	Common	Abundant
Diggings / burrows	Absent		Scattered	Common	Abundant
Shelters / nests	Absent		Scattered	Common	Abundant
Tree scratches / feed scars	Absent		Scattered	Common	Abundant

Incidental Fauna Sightings and Breeding Places (within ESU)					
Species Name	Conservation Status	Breeding Place (eg. nests, hollows, logs, peeling bark)	Coordinates		Other Information (eg. Growth stage, number of individuals)
			Eastings	Northings	
Nil					
Nil					

Conservation Status

E	Endangered	Special Least Concern Species	Colonial Breeding Species
V	Vulnerable	Koala, Echidna, Platypus, Migratory Species	"a group of animals of the same kind co-existing in close association for breeding purposes"
NT	Near Threatened		
SLC	Special Least Concern		Eg. Frogs, Microbats, Babblers, Apostlebirds, etc.
CBS	Colonial Breeding Species		
LC	Least Concern		

Vegetation floristics (record all woody spp. and top 10 spp. cover in groundstorey within 20m x 20m quadrat)						
Sub-stratum	Growth form	Field name	Species name	Cover	Abundance	Field No.
			Wahlenbergia gracilis	<1%	100	
			Opuntia stricta	<1%	10	
			Eucalyptus populnea	20%	10	
			Cymbopogon refractus	10%	100	
			Chrysocephalum apiculatum	<1%	100	
			Eragrostis parviflora	20%	500	
			Bothriochloa decipiens	15%	500	
			Verbena aristigera	<1%	1	
			Pimelea neo-anglica	<1%	100	
			Geijera parviflora	<1%	1	
			Dianella longifolia	<1%	1	
			Dianella revoluta	<1%	2	

Growth form	T=tree; M=mallee tree; S=shrub; Z=heath shrub; C=chenopod shrub; G=tussock grass; H=hummock grass; D=sod grass; V=vine; R=rush; E=fern; F=forb; A=cycad; P=palm; X=xanthorrhoea; U=samphire shrub, O=other
Cover	Crown cover measured in the following categories <1%; 1%; 2%; 3%; 4%; 5%; 10%; 15%; 20%; 25%; 30%; 35%; 40% etc
Abundance	Number of individuals measured in the following categories 1; 2; 3; 4; 5; 6; 7; 8; 9; 10; 20; 50; 100; 500; 1000; >1000

Rehabilitation				
*Baseline rehabilitation state	1. Annual groundcover or cultivation	2. Perennial exotic groundcover	3. Perennial native groundcover	4. Native vegetation remnant
Progress	Not yet undertaken	Satisfactory	Unsatisfactory	
Notes on rehabilitation concerns with regard to soil erosion, vegetation cover establishment, landform contouring, contamination.				

* record the original site condition as the goal for future rehabilitation works.

Type A Restricted Plants (timed search across ESU)									
Restricted plants	Species	No.	Coordinates						
			Easting	Northing	Easting	Northing	Easting	Northing
Orchidaceae sp. (orchids)	Nil								
Xanthorrhoea sp. (Grass trees)	Nil								
Myrmecodia sp. (Ant plants)	Nil								
Hydnophytum sp. (Ant plants)	Nil								
Cycadaceae sp. (Cycads)	Nil								
Zamiaceae sp. (Cycads)	Nil								
Huperzia sp. (lace plants)	Nil								
Platycerium sp. (Staghorns)	Nil								
Brachychiton sp. (Bottle trees)	Nil								
Livistona sp. (Cabbage palms)	Nil								

Threatened Flora (timed search across ESU)									
Threatened Flora Species		No.	Coordinates						
			Easting	Northing	Easting	Northing	Easting	Northing
Nil									
Nil									
Nil									
Nil									

Other points of interest (eg. track/infrastructure locations, additional flora sp.) (across ESU)			
Description / notes	Coordinates		Photo number
	Easting	Northing	
Nil			
Nil			
Nil			
Nil			
Nil			

Groundcover monitoring (100m transect)							
Location	Daandine Brine Dam		Survey name	Plot number	Recorders		
Date	6/11/12		3		sch4p4(6) P		
Grid Reference	Zone	Datum	Transect Start (0m)		Transect end (100m)		
	54 55 56	GDA94	E 298483 N 7001578		E 298386 N 7001586		
Transect length	100m	Orientation	260° W	Marked	Yes No	Photo # / orientation	32/ 260° W

Ground cover	Tally first point of contact (<1m), every 1m along 100m transect (=100 points)	Total
Litter	IIII IIII IIII IIII IIII IIII IIII IIII IIII IIII	55
Bare ground	IIII IIII	9
Cryptogam		
Woody debris	III	3
Rock	II	2
Exotic – Annual		
Exotic – Perennial		
Shrub (crown height <1m)		
Grass – Hummock*		
Grass – Other*	IIII IIII IIII IIII IIII III	28
Forb*	III	3
Sedge / Rush*		
Fern*		
Other*		

* Native species

Belt transect for woody species (100m x 5m belt transect)						
Woody flora species observed	Form	Relative Dominance	Tally			
			T1 layer	T2 layer	S1 layer	Seedlings
Eucalyptus populnea			I	IIII IIII II	IIII IIII II	IIII IIII II
Eucalyptus crebra			I		I	
Eucalyptus tessellaris				I		

Species annotations	S=specimens collected; *=Exotic species; **=Declared species; +=Outside but adjoining plot
Form	T=Tree; S=Shrub; Seed=Seedling; Sap=Sapling
Relative dominance	D=Dominant; A=Abundant; F=Frequent; O=Occasional; R=Rare
Abbreviations	N/A=Not Applicable; N/R=Not Recorded; N/O=None Observed

Fauna Habitat Assessment (within ESU)							
No. of trees/ha with hollows (>10cm)	0	No. of hollow logs/ha	Nil	Total length of logs/ha (>10cm)	5m	No. of logs/ha (>10cm)	2

Habitat feature	Status			
Cliffs / outcrops	Absent	Scattered	Common	Abundant
Large rocks (>30cm)	Absent	Scattered	Common	Abundant
Small rocks (10-30cm)	Absent	Scattered	Common	Abundant
Rock piles	Absent	Scattered	Common	Abundant
Leaf litter	Absent	Scattered	Common	Abundant
Dense shrub/grass shelter	Absent	Scattered	Common	Abundant
Termite mounds (>50cm)	Absent	Scattered	Common	Abundant
Trees with shedding bark	Absent	Scattered	Common	Abundant
Seeding grass cover	Absent	Scattered	Common	Abundant
Fleshy fruiting plants	Absent	Scattered	Common	Abundant
Nectar / pollen	Absent	Scattered	Common	Abundant
Soil cracks	Absent	Scattered	Common	Abundant
Waterway	Absent	Scattered	Common	Abundant
Wetland / Swamp / Waterbody	Absent	Scattered	Common	Abundant
Koala feed trees	Absent	Scattered	Common	Abundant
Mistletoe/Epiphytes	Absent	Scattered	Common	Abundant

Fauna signs (within ESU)				
Scats/pellets/ food remains	Absent	Scattered	Common	Abundant
Animal tracks / trails	Absent	Scattered	Common	Abundant
Bones, feathers	Absent	Scattered	Common	Abundant
Diggings / burrows	Absent	Scattered	Common	Abundant
Shelters / nests	Absent	Scattered	Common	Abundant
Tree scratches / feed scars	Absent	Scattered	Common	Abundant

Incidental Fauna Sightings and Breeding Places (within ESU)					
Species Name	Conservation Status	Breeding Place (eg. nests, hollows, logs, peeling bark)	Coordinates		Other Information (eg. Growth stage, number of individuals)
			Eastings	Northings	
Nil					
Nil					

Conservation Status

E	Endangered	Special Least Concern Species	Colonial Breeding Species
V	Vulnerable	Koala, Echidna, Platypus, Migratory Species	"a group of animals of the same kind co-existing in close association for breeding purposes"
NT	Near Threatened		
SLC	Special Least Concern		Eg. Frogs, Microbats, Babblers, Apostlebirds, etc.
CBS	Colonial Breeding Species		
LC	Least Concern		

Form

Chapter 5A activities

Application for amendment of an environmental authority (chapter 5A activities)

OFFICIAL USE ONLY

DATE RECEIVED:

FILE REF:

DNRM DISTRICT: EHP REGION:

PROJECT REF:

FORM: COMPLETE FEE:

ENTERED BY [SIGNATURE]:

DATE:

ACCOUNT CODE:

EDZYNAAY02/43212

Guide for applicants

Information about the environmental regulation of chapter 5A activities can be found on the Department of Environment and Heritage Protection (EHP) website www.ehp.qld.gov.au.

If you have any queries about how to complete this form correctly please contact Permit and Licence Management (contact details are provided at the end of this form).

This is the approved form for making an application for amendment of an environmental authority (chapter 5A activities) under s. 310S of the *Environmental Protection Act 1994.*

A holder of an environmental authority (chapter 5A activities) may wish to make an amendment application to:

- add a new resource authority to a chapter 5A activity project
- add an additional chapter 5A activity proposed to be carried out as part of a chapter 5A activity project
- change a relevant chapter 5A activity for the environmental authority from a level 1 chapter 5A activity to a level 2 chapter 5A activity
- amend conditions of an environmental authority (chapter 5A activities). If a condition of a code compliant authority is amended, a non-code compliant authority must be issued
- complement an application under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act), chapter 4, part 6 to amend a relevant pipeline licence; and/or
- if a relevant resource authority is an authority to prospect under the P&G Act and the holder has, under chapter 2, part 2, division 2 of that Act, made an ATP-related application for a petroleum lease.

To correct a clerical or formal error, an amendment application is not needed. Simply advise or discuss the issue with the administering authority and the correction may be made as long as the proposed amendment does not adversely affect the interests of the environmental authority (EA) holder, or anyone else.

The administering authority or Minister may decide whether an environmental impact statement (EIS) is required for an amendment application. An EIS must not be required for the application if the relevant resource authority for the application is, or is included in, a significant project.

For an amendment application for an environmental authority (chapter 5A activities) for a level 1 chapter 5A activity, a public notice requirement may be made if the administering authority is satisfied there is likely to be a substantial increase in the risk of environmental harm under the amended environmental authority (chapter 5A activities) because of a substantial change in either: (a) the quantity or quality of contaminant authorised to be released into the environment; or (b) the results of the release of a quantity or quality of contaminant authorised to be released into the environment.

An increase of 10 per cent or more in the quantity of a contaminant to be released into the environment is taken to be a substantial change. An amendment application for an environmental authority (chapter 5A activities) for a chapter 5A activity project where the application is to add a level 1 chapter 5A activity to the authority is also taken to be a substantial change.

The amendment process is outlined in the Guideline: Assessment and approval process for environmental authorities for chapter 5A activities (EM438).

Refer to Appendix C for a glossary of terms used in this application form.

Please submit the completed form, together with the required fee, to Permit and Licence Management—postal details are provided at the end of the form.

Application for amendment of an environmental authority (chapter 5A activities)

Question 1

The applicant must be the holder of the environmental authority (EA), unless the applicant is the proposed transferee for the EA and a transfer application has been lodged.

The holders of the EA may, by a signed notice from all of them to the administering authority appoint one of the joint holders as the principal holder of the EA. The principal holder may, for all holders of the EA, give the administering authority a notice or other document relating to the EA. Also, the administering authority can make its dealings with all applicants/holders by dealing with the principal applicant/holder.

Complete Appendix B where a principal holder has not been appointed and there are more than three joint applicants.

1. Applicant details

Choose one of the following:

a) If you would like to newly appoint a principal applicant—complete the form in Appendix A: Appointment of principal applicant, and insert details of principal applicant only below.

b) Enter the details of an existing principal applicant/holder.

c) Enter the details of all joint applicants below.

☐ Where there are several applicants, joint applicants may appoint a principal holder by completing Appendix A: Appointment of principal holder. The administering authority can then make its dealings with all holders by dealing with the principal holder.

NAME & ABN:	REGISTERED BUSINESS ADDRESS (OR RESIDENCE) & POSTAL ADDRESS:
1. Arrow Energy Pty Ltd AM-60 Level 19 42-60 Albert Street BRISBANE QLD 4000 ABN: 73 078 521 936 PRINCIPAL HOLDER ☒	GPO Box 5262 Brisbane QLD 4001
NAME & ABN: **2.**	REGISTERED BUSINESS ADDRESS (OR RESIDENCE) & POSTAL ADDRESS:
NAME & ABN: **3.**	REGISTERED BUSINESS ADDRESS (OR RESIDENCE) & POSTAL ADDRESS:

Question 2
The contact person may be a consultant.

2. Contact person for the applicant

NAME, POSITION & COMPANY:		
sch4p4(6) Personal ir TEAM LEADER UPSTREAM APPROVALS ARROW ENERGY PTY LTD		
PHONE: 07 3012 4276	FAX: 3012 4001	EMAIL: sch4p4(6) Personal in@arrowenergy.com.au
ADDRESS: GPO Box 5262 Brisbane 4001		

Question 3

Note: The current environmental authority number is to be entered and a copy is to be attached to the application.

3. Current environmental authority

ENVIRONMENTAL AUTHORITY NUMBER:	RELEVANT RESOURCE AUTHORITIES (TYPE & NUMBER):
PEN100449509	Petroleum Lease (PL) PL 194, PL198, PL230, PL238, PL252, PL258 and PL260
ISSUE DATE (ATTACH COPY):	NAME OF PROJECT:
30 June 2011	Arrow Energy Dalby Expansion Project

If the amendment is for some other chapter 5A activity that is not listed, specify this activity in the commentary box.

☒ Please attach a copy of the current environmental authority

Please indicate which specific chapter 5A activities you would like the environmental authority to authorise.

- ☒ Coal seam gas (CSG) activities
- ☐ Conventional gas activities
- ☐ Conventional oil activities
- ☐ Greenhouse gas storage activities
- ☐ Geothermal activities
- ☐ Petroleum facility
- ☐ Pipeline activities (please specify the type of pipeline (i.e. gas, water or brine) in the box provided)
- ☐ Shale gas activities
- ☐ Shale oil activities
- ☐ Tight gas activities
- ☐ Other (please indicate the specific activity in the box below)

Note: If the amendment is for or includes a chapter 4 environmentally relevant activity associated with a chapter 5A activity, for example, a water treatment plant, indicate the specific activities in the commentary box provided.

Please specify:

Question 4

The administering authority may decide that an environmental impact statement (EIS) is required for the amendment application. Although the EIS decision is discretionary, in making this decision, the administering authority will consider the applicant's answers to this question and the trigger questions in question 8.

An EIS may also be required if the administering authority considers that there could be a significant environmental impact, if there is a high level of uncertainty about the possible impacts or there is a high level of public interest in the proposal.

(c) Category A and B environmentally sensitive areas are listed in rr. 25 and 26 of the Environmental Protection Regulation 2008. A free map service that details these areas is available at www.ehp.qld.gov.au (Note: use the search term 'Maps of environmentally sensitive areas').

EA holders of level 1 chapter 5A activities: The addition of a level 1 chapter 5A activity to the authority is considered to be a substantial amendment, and may be considered to cause an increase in the risk of environmental harm. The administering authority may, within five business days after the application date for the amendment application, make a public notice requirement.

EA holders of level 2 chapter 5A activities: The chapter 5A activity will be prescribed as a level 1 chapter 5A activity if the amendment includes any of the activities listed in this question.

4. Are you proposing to amend the environmental authority by carrying out any of the following activities?

	No	Yes
a. activities that, under the *Geothermal Energy Act 2010,* are authorised activities for a resource authority	☒	☐ Detail below
b. activities under a GHG injection and storage lease under the GHG Storage Act	☒	☐ Detail below
c. a petroleum activity authorised under the *Petroleum (Submerged Lands) Act 1982*	☒	☐ Detail below
d. a petroleum activity that is likely to have a significant impact on a category A or B environmentally sensitive area	☒	☐ Detail below
e. extending an existing pipeline by more than 150 km under a petroleum authority	☒	☐ Detail below
f. constructing a new pipeline of more than 150 km under a petroleum authority	☒	☐ Detail below
g. a petroleum activity carried out on a site containing a high hazard dam or a significant hazard dam	☒	☐ Detail below
h. a petroleum activity involving injection of a waste fluid into a natural underground reservoir or aquifer	☒	☐ Detail below
i. one or more chapter 4 activities for which an aggregate environmental score is stated	☒	☐ Detail below

Outline proposed amendment below or attach additional information

Question 5

An increase of 10 per cent or more in the quality of a contaminant to be released into the environment is considered to be a substantial amendment, and may be considered to cause an increase in the risk of environmental harm.

The administering authority may, within five business days after the application date for the amendment application, make a public notice requirement.

The application must be supported by enough information to allow the administering authority to decide the application.

[1] A change from a level 1 chapter 5A activity to a level 2 chapter 5A activity is possible if, for example, the threshold for an ERA being conducted changes from having an aggregate environment score to having no aggregate environmental score as prescribed under Schedule 2 of the Environmental Protection Regulation 2008.

5. Do you wish to make any of the following amendments to the environmental authority?

	No	Yes
a. add a new resource authority to a chapter 5A activity	☒	☐ Detail below
b. substantially change the quantity or quality of a contaminant to be released into the environment	☒	☐ Detail below
c. amend conditions of an environmental authority	☐	☒ Detail below
d. change a relevant chapter 5A activity from a level 1 chapter 5A activity to a level 2 chapter 5A activity[1]?	☒	☐ Detail below
e. make an amendment other than those above or listed in question 4?	☒	☐ Detail below

Outline the proposal or attach additional information.

Please refer to the attached additional information.

Question 6

Under s. 310U(2), amendment applications for coal seam gas (CSG) environmental authorities must submit a revised CSG environmental management plan (EM Plan). The purpose of the EM Plan is to propose environmental protection commitments to help decide the conditions of the environmental authority.

Note: For a CSG activity the EM Plan must include the matters outlined in s. 310D(5) of the *Environmental Protection Act 1994* relating to CSG water management.

Note: CSG is defined in s. 310D(7) of the *Environmental Protection Act 1994* as petroleum (in any state) occurring naturally in association with coal or oil shale, or in strata associated with coal or oil shale mining.

6. Does the application relate to a coal seam gas environmental authority?

☐ No

☒ Yes → A revised (CSG) EM Plan must accompany the application. The revised CSG EM Plan must include the information stated below. Please acknowledge the inclusion of this information by completing the checklist below.

Provide title and date below, and attach to application.

TITLE:	DATE:
Environmental Management Plan - Dalby Expansion Project. The EMP has been provided to EHP and is available www.arrowenergy.com.au /page/Sustainability/Environment/Current_Applications/www	August 2012

The amendment application is for a CSG EA and the revised EM Plan contains the following information:

☒ The quantity of CSG water the applicant reasonably expects will be generated in connection with the carrying out of each relevant CSG activity

☒ The flow rate at which the applicant reasonably expects the water will be generated

☒ The quality of the water, including changes in the water quality that the applicant reasonably expects will happen while each CSG activity is carried out

☒ The proposed management of the water including the use, treatment, storage or disposal of the water

☒ State the measurable criteria (management criteria) against which the applicant will monitor and assess the effectiveness of the management of CSG water including—

(i) the quantity and quality of the water used, treated, stored or disposed of

(ii) protection of the environmental values affected by each relevant CSG activity

(iii) the disposal of waste, including, salt generated from the management of the water

☒ The action that is proposed to be taken, if any of the management criteria are not satisfied, to ensure the criteria will be able to be satisfied in the future

☒ How the coal seam gas water management policy, including the preferred management options, has been considered by the applicant

☒ If a non-preferred management option is proposed to be used by the applicant instead of a preferred management option, the reason/s for not using a preferred management option/s.

7. Is the <u>current</u> environmental authority for a level 1 chapter 5A activity?

☐ No

☒ Yes → Attach an amended environmental management plan.

Question 8

Question 8 will be used to help decide whether an EIS is required for the activity.

If any of the criteria for EIS requirement have been marked, you must attach supporting information about the impact.

The astronomical tide is the highest level of the tides that can be predicted to occur under average meteorological conditions. Further information can be located on www.ehp.qld.gov.au (Note: use the search term 'Storm tide monitoring').

8. Determination of whether the proposed chapter 5A activities will require an EIS

Will the proposed chapter 5A activities—

☐ Involve activities in a marine area?

☐ Involve activities less than 500 m from highest astronomical tide?

☐ Include an environmentally relevant activity with an aggregate environmental score of greater than 165?

Question 9

Land that has been or is being used for a notifiable activity (e.g. landfill, petroleum product or oil storage, chemical storage and waste storage) must be recorded on the environmental management register (EMR).

Information, guidelines (including the Draft Guidelines for the Assessment and Management of Contaminated Land in Queensland), forms and a factsheet can be found on www.ehp.qld.gov.au (Note: use the search term 'Contaminated land').

9. Notifiable activities

Are you intending to carry out a notifiable activity as part of this chapter 5A activity?

☐ Yes → You will need to lodge the form Notification of Land once a notifiable activity is commenced.

☒ No

Question 10

Chapter 5A activities likely to trigger a matter of national environmental significance may require approval under the *Environmental Protection and Biodiversity Conservation Act 1999* (EPBC Act). Applicants should refer to the EPBC Act and the information provided at www.environment.gov.au (Note: use the search term 'EPBC Act') to assess whether they must refer their project to the Australian Government Environment Minister or the Minister's delegate.

10. Matters of national environmental significance

Is the activity likely to trigger a matter of national environmental significance?

☐ Yes → Please select one of the following:

☐ The proposed new chapter 5A activities **have** been referred to the Australian Government Environment Minister or the Minister's delegate.

☐ The proposed new chapter 5A activities **have not** been referred to the Australian Government Environment Minister or the Minister's delegate.

☒ No

Question 11

The application must be supported by enough information to allow the application to be decided. This requires as a minimum the work program or development plan but will likely also require further, relevant information about the likely risks to the environment.

In order for the application to be valid, attach a copy of a letter provided by the Queensland Department of Natural Resources and Mines (DNRM) verifying that the application has been received and providing a list of resource authorities applied for (if this letter has been issued at the time of submitting this application).

11. Supporting information required

You are required to attach:

☒ A copy of the work program or development plan that was submitted with your application for a resource authority.

☒ A copy of the acknowledgment letter issued by the Department of Natural Resources and Mines (DNRM).

☐ An offset strategy in accordance with the Queensland Biodiversity Offset Policy if the application is for a level 2 environmental authority for a pipeline.

Question 12

The first step towards payment is to calculate the fees payable. Information on these fees can be located in the information sheets Fees for permits for environmentally relevant activities (ERAs) (EM33) and Summary of annual fees for environmentally relevant activities (ERAs) (EM389), available at www.ehp.qld.gov.au or through Permit and Licence Management (contact details are provided at the end of this form) for the current fee.

To pay by credit card you will need to provide contact details so you can be contacted for your credit card payment to be made over the phone.

Note:

An incomplete application (including applications that do not include the fee or a contactable phone number where fees are to be paid over the phone by credit card) may be invalid. Invalid applications will be returned without processing and will only be processed if resubmitted with all invalidating issues addressed.

12. Payment

The applicable fee is:	$276
Annual fee is:	$
Total fee is:	$276

You may pay your application fee via cheque, money order or credit card.

Select the payment method below:

☐ Payment by cheque or money order made payable to the Department of Environment and Heritage Protection (attached)

☒ Please contact me (the applicant) for credit card payment:

Phone number:

Application for amendment of an environmental authority (chapter 5A activities)

Question 13 & Certification

[1] This statement applies to anyone who is involved in the management of the applicant company, and relates to their current position and any other management positions they may have held in other companies. Suitability inquiries may be made.

[2] Corresponding law means under a law that provides for the same or similar matters as the *Environmental Protection Act 1994*.

[3] It is a requirement under s. 310(U)(b) that an amendment application be supported by enough information to allow the application to be decided. Applicants should consider whether an example of supporting information is submission of an environmental management plan (EM Plan). If the amendment application relates to a CSG environmental authority, the application must be accompanied by an environmental management plan (a revised CSG EM Plan) that includes the matters in s. 310D(5)(a) to (f) and complies with s. 310D(6).

[4] It is an offence, under the *Environmental Protection Act 1994*, to give the administering authority information that is false, misleading or incomplete in any material particular. The maximum penalty for such action is 1665 penalty units for an individual, or 8325 penalty units where the applicant is a corporation (s. 181B(3) of the *Penalties and Sentences Act 1992* (PS Act)), or two years imprisonment. Refer to the PS Act for value of a penalty unit.

13. I/we (the applicant/s) certify that (select each to certify):

- ☒ I/we am/are: the holder/s of the environmental authority identified in question 3 or applicants for amendment of the environmental authority identified in question 3
- ☒ I/we am/are suitable applicant/s[1] for the environmental authority, and have not been convicted (pleaded or found guilty) of an offence against, nor held an environmental authority that has been cancelled or suspended under, the *Environmental Protection Act 1994* or a corresponding law[2] in Queensland or another jurisdiction

To the best of my knowledge.

- ☒ A copy of the current environmental authority is attached
- ☒ Details of responses required in questions 4, 5 and 8 are included or attached
- ☒ The fees are enclosed or a phone number provided for payment by credit card
- ☒ I understand that it is a requirement to support the amendment application with enough information to allow the administering authority to decide the application[3]
- ☒ I do solemnly and sincerely declare that the information provided is true and correct to the best of my knowledge. I understand that it is an offence under s. 480 of the EP Act to give to the administering authority, or an authorised person, a document containing information that I know is false, misleading or incomplete in a material particular[4]
- ☒ I understand that an incomplete application (including applications that do not include the fee, or a contactable phone number where fees are to be paid over the phone by credit card) may be invalid. Invalid applications will be returned without processing and will only be processed if resubmitted with all invalidating issues addressed.

Certification

APPLICANT NAME / COMPANY: Arrow Energy Pty Ltd	
SIGNATORY NAME & POSITION: sch4p4(6) Personal inforr Operations Manager Chief Operations Officer	SIGNATURE: sch4p4(6) Personal information DATE: 13/12/12

APPLICANT NAME / COMPANY:

Application for amendment of an environmental authority (chapter 5A activities)

Privacy statement

The Department of Environment and Heritage Protection (EHP) is committed to protecting the privacy, accuracy and security of your personal information in accordance with the *Information Privacy Act 2009*. EHP is collecting your personal information in accordance with Chapter 5A Part 3 of the *Environmental Protection Act 1994* in order to process this amendment application. The information will only be accessed by authorised employees within the department. Some of this information may be given to the Department of Natural Resources and Mines (DNRM) for administrative purposes associated with the relevant resource authority(ies). Your information will not be given to any other person or agency unless you have given us permission or we are authorised or required by law. All information supplied on this form may be disclosed publicly in accordance with the *Right to Information Act 2009* and *Evidence Act 1977*. For queries about privacy matters email adminreview@ehp.qld.gov.au or telephone (07) 3896 3705.

If you have any queries about how to complete this form correctly please contact Permit and Licence Management, Department of Environment and Heritage Protection (contact details provided below).

SIGNATORY NAME & POSITION:	SIGNATURE:
sch4p4(6) Personal information OPERATIONS MANAGER	sch4p4(6) Personal informati DATE: 13/12/12.

APPLICANT NAME / COMPANY:	
SIGNATORY NAME & POSITION:	SIGNATURE: DATE:

APPLICANT NAME / COMPANY:	
SIGNATORY NAME & POSITION:	SIGNATURE: DATE:

Applicant checklist

- ☐ Question 1 – Appendix A: Appointment of principal holder (if applicable)
- ☐ Question 1 – Appendix B: Joint Applicant details (if applicable)
- ☒ Question 3 – Copy of current environmental authority
- ☐ Question 4 – Additional information (attached)
- ☒ Question 5 – Additional information (attached)
- ☒ Question 6 – Amended environmental management plan (attached)
- ☒ Question 7 – Amended environmental management plan (attached)
- ☐ Question 8 – Assessment against EIS triggers (attached)
- ☒ Question 11 – Fees enclosed or phone number provided for payment by credit card
- ☒ Supporting information attached (if applicable).

Application for amendment of an environmental authority (chapter 5A activities)

Please return your completed application to:

Regular or registered post:

Permit and Licence Management
Implementation and Support Unit
Department of Environment and Heritage Protection
GPO Box 2454
Brisbane QLD 4001

Courier or hand delivery:

Permit and Licence Management
Implementation and Support Unit
Department of Environment and Heritage Protection
Level 3, 400 George Street
Brisbane QLD 4000
(Hours 8:30am – 4:30pm business days)

Enquiries:

Permit and Licence Management
Phone: 13 QGOV (13 74 68)
Fax: (07) 3896 3342
Email: palm@ehp.qld.gov.au

Further information

The latest version of this publication can be found at www.ehp.qld.gov.au using the publication number EM2786 as a search term.

Appendix A – Appointment of principal applicant

We, being joint applicants for the amendment of the environmental authority (chapter 5A activities) identified in question 3, hereby appoint ______________________________
(print name of principal holder)
as the principal applicant for the environmental authority (chapter 5A activities) following the approval of this amendment application.

APPLICANT NAME / COMPANY:		ABN/ACN:
REGISTERED BUSINESS ADDRESS (OR RESIDENCE) :		POSTAL ADDRESS:
SIGNATORY NAME & POSITION:	SIGNATURE:	DATE:

APPLICANT NAME / COMPANY:		ABN/ACN:
REGISTERED BUSINESS ADDRESS (OR RESIDENCE):		POSTAL ADDRESS:
SIGNATORY NAME & POSITION:	SIGNATURE:	DATE:

APPLICANT NAME / COMPANY:		ABN/ACN:
REGISTERED BUSINESS ADDRESS (OR RESIDENCE):		POSTAL ADDRESS:
SIGNATORY NAME & POSITION:	SIGNATURE:	DATE:

APPLICANT NAME / COMPANY:		ABN/ACN:
REGISTERED BUSINESS ADDRESS (OR RESIDENCE):		POSTAL ADDRESS:
SIGNATORY NAME & POSITION:	SIGNATURE:	DATE:

The administering authority may accept an application for an EA made for all the joint applicants by a person who is a joint applicant if it is satisfied the person is authorised to make the application for each of the joint applicants.

The joint applicants may, by signed notice to the administering authority, cancel the appointment.

To add more joint applicants, attach additional information.

Appendix B – Joint applicant details

List all other joint applicants

NAME:		ABN:	
REGISTERED BUSINESS ADDRESS (OR RESIDENCE):		POSTAL ADDRESS:	
SUBURB:	POSTCODE:	SUBURB:	POSTCODE:

NAME:		ABN:	
REGISTERED BUSINESS ADDRESS (OR RESIDENCE):		POSTAL ADDRESS:	
SUBURB:	POSTCODE:	SUBURB:	POSTCODE:

NAME:		ABN:	
REGISTERED BUSINESS ADDRESS (OR RESIDENCE):		POSTAL ADDRESS:	
SUBURB:	POSTCODE:	SUBURB:	POSTCODE:

NAME:		ABN:	
REGISTERED BUSINESS ADDRESS (OR RESIDENCE):		POSTAL ADDRESS:	
SUBURB:	POSTCODE:	SUBURB:	POSTCODE:

To add more joint applicants, attach additional information.

Appendix C – Glossary

TERM	MEANING
Aggregate environmental score	Aggregate environmental score is the relative impact related to an average operation or activity on a single site, wherever located. It is expressed in terms of a calculation derived from the average emissions of contaminants from a particular environmentally relevant activity and the risks associated with other attributes of the site where the activity is undertaken. The aggregate environmental score for a level 1 chapter 5A activity stated in Schedule 5, column 1 of the Environmental Protection Regulation 2008 is the aggregate environmental score stated opposite the activity in column 2 of the Schedule.
Chapter 5A activity	A chapter 5A activity includes the following environmentally relevant activities— a) geothermal activities b) greenhouse gas storage activities; and c) petroleum activities.
Chapter 5A activity project	A chapter 5A activity project is all chapter 5A activities of the same type under the same resource legislation carried out, or proposed to be carried out, under one or more relevant resource authority for that type of chapter 5A activity, in any combination, as a single integrated operation.
Geothermal activities	Geothermal activities means— (a) activities that, under the *Geothermal Energy Act 2010*, are authorised activities for a resource authority; or (b) rehabilitating or remediating environmental harm because of an activity mentioned in paragraph (a); or (c) action taken to prevent environmental harm because of an activity mentioned in paragraph (a) or (b); or (d) activities required under a condition of an environmental authority for activities mentioned in paragraph (a), (b) or (c); or (e) activities required under a condition of an environmental authority for activities mentioned in paragraph (a), (b) or (c) that has ended or ceased to have effect, if the condition— (i) continues to apply after the authority has ended or ceased to have effect; and (ii) has not been complied with.
GHG	GHG means greenhouse gas.
GHG Storage Act	GHG Storage Act means the *Greenhouse Gas Storage Act 2009.*
Greenhouse gas storage activities	Greenhouse gas storage activities means— (a) activities that, under the GHG Storage Act, are authorised activities for a resource authority; or (b) rehabilitating or remediating environmental harm because of an activity mentioned in paragraph (a); or (c) action taken to prevent environmental harm because of an activity mentioned in paragraph (a) or (b); or (d) activities required under a condition of an environmental authority for activities mentioned

TERM	MEANING
	in paragraph (a), (b) or (c); or (e) activities required under a condition of an environmental authority for activities mentioned in paragraph (a), (b) or (c) that has ended or ceased to have effect, if the condition— (i) continues to apply after the authority has ended or ceased to have effect; and (ii) has not been complied with.
Level 1 chapter 5A activity	A chapter 5A activity stated in Schedule 5, column 1 of the Environmental Protection Regulation 2008 is a level 1 chapter 5A activity.
Level 2 chapter 5A activity	A level 2 chapter 5A activity is a chapter 5A activity other than a level 1 chapter 5A activity.
Petroleum activities	Petroleum activities means: (a) activities that, under the *Petroleum Act 1923,* are authorised activities for a 1923 Act petroleum tenure under that Act; or (b) activities that, under the *Petroleum and Gas (Production and Safety) Act 2004,* are authorised activities for a petroleum authority under that Act; or (c) exploring for, exploiting or conveying petroleum resources under a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982*; or (d) rehabilitating or remediating environmental harm because of an activity mentioned in paragraphs (a) to (c) (e) actions taken to prevent environmental harm because of activities mentioned in paragraphs (a) to (d) (f) activities required under a condition of an environmental authority for activities mentioned in paragraphs (a) to (e); or (g) activities required under a condition of an environmental authority mentioned in paragraphs (a) to (e) that has ended or ceased to have effect, if the condition— (i) continues to apply after the authority has ended or ceased to have effect, and (ii) has not been complied with.
Petroleum authority	A petroleum authority granted under the *Petroleum and Gas (Production and Safety) Act 2004* includes the following types of authorities: (a) an authority to prospect (b) a petroleum lease (c) a data acquisition authority (d) a water monitoring authority (e) a survey licence (f) a pipeline licence (g) a petroleum facility licence.
Resource authority	Resource authority means— (a) a geothermal exploration or production tenure granted under the *Geothermal Energy Act 2010*; or (b) any of the following under the GHG Storage Act— (i) a GHG exploration permit (also called a GHG permit) (ii) a GHG injection and storage lease (also called a GHG lease)

TERM	MEANING
	(iii) a GHG injection and storage data acquisition authority (also called a GHG data acquisition authority); or (c) a 1923 Act petroleum tenure granted under the *Petroleum Act 1923*; or (d) a petroleum authority granted under the *Petroleum and Gas (Production and Safety) Act 2004*; or (e) a licence, permit, pipeline licence, primary licence, secondary licence or special prospecting authority granted under the *Petroleum (Submerged Lands) Act 1982.*

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.*

Arrow Energy Pty Ltd
'AM-60', Level 19
42-60 Albert St
BRISBANE QLD 4000

ACN: 078 521 936

Your reference : ENV12-318
Our reference : 343728 / PEN100449509 / BNE43018

Attention: Ms sch4p4(6) Personal i

Re: Application for the amendment of a level 1 environmental authority (chapter 5A activities) number PEN100449509 by Arrow Energy Pty Ltd on Petroleum Leases (PL) 194, 198, 230, 238, 252, 258 and 260.

The above mentioned application was received by this office on 13 December 2012. 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
Arrow Energy Pty Ltd	Arrow CSG (Australia) Pty Ltd Australian CBM Pty Ltd Arrow (Tipton) Pty Ltd Arrow (Tipton Two) Pty Ltd Arrow (Daandine) Pty Ltd Stanwell Corporation Limited	PL 194, 198, 230, 238, 252, 258 and 260	PEN100449509	Granted on 8 March 2013

The administering authority gives notice relating to this application to all the applicants by giving it to the principal applicant.

The amended environmental authority is attached to this Notice.

Department of Environment and Heritage Protection
www.ehp.qld.gov.au ABN 46 640 294 485

QUEENSLAND GOVERNMENT

Should you have any queries in relation to this Notice, please contact Keara McDonagh of the Department of Environment and Heritage Protection on telephone (07) 3330 5618.

sch4p4(6) Personal information

Signature

8 March 2013

Date

John Frankish
Manager, Energy Assessments
Delegate of the Administering Authority
Environmental Protection Act 1994

Enquiries:
Energy Assessments Unit (Level 7, 400 George Street)
Department of Environment and Heritage Protection

Regular Post:
GPO Box 2454, Brisbane QLD 4001

Courier or Registered Post:
Level 3, 400 George Street, Brisbane QLD 4000

Phone: (07) 3330 5618
Fax: (07) 3330 5634

Joanne Kerr

From: Losada Vanessa
Sent: Thursday, 7 March 2013 10:04 AM
To: Keara Mcdonagh
Subject: RE: Offset Plans

Follow Up Flag: Follow up
Flag Status: Flagged

That may be dealt with through a correction for an error on our part.

From: Keara Mcdonagh
Sent: Thursday, 7 March 2013 9:45 AM
To: Losada Vanessa
Subject: RE: Offset Plans

Thanks Vanessa.

I'll discuss with Gill when she gets in and work out what to do about ATP683 that was granted and issued on Friday last week :s

Cheers,

K.

From: Losada Vanessa
Sent: Thursday, 7 March 2013 9:39 AM
To: Naylor Gillian
Cc: Keara Mcdonagh
Subject: FW: Offset Plans

FYI
Regarding Offset Area Management Plans (OAMP) and Site Based Offset Plans (SBOP)

From: Krikowa Damien
Sent: Thursday, 7 March 2013 9:26 AM
To: Losada Vanessa
Subject: FW: Offset Plans

From: Krikowa Damien
Sent: Wednesday, 6 March 2013 3:45 PM
To: 'Vlosada'
Subject: Offset Plans

Hi Vanessa,

Re: Offset Plans,

When meeting with Gillian and Arrow, I was confused as to what Plans the offset condition was linked too.

Gillian mentioned that the QBOP doesn't refer to a Site based offset Plan, only an offset area management plan. In my confusion I said it must have been a mistake on our end in regards to terminology.

As I remembered when discussing this with you a site based offset plan was defined in the EA definitions not the QBOP because the QBOP was written in a way that could not be implemented properly.

The SBOP is a plan that identifies what the exact values are that are being impacted and what the projected offset value needs to be ie 10 ha disturbance run through the QBOP calculator comes out as 20 ha offset. The SBOP then needs to identify if 20 ha is available to offset ie. the surrounding area might have 100 ha of the required value so 20 ha can be achieved.

The offset area management plan is a plan they must submit once they have legally secured their offset and identifies how they will manage that area to ensure it reaches remnant status ie weeding, fencing etc.

The condition need to be changed back to referencing the SBOP not the OAMP. This will rectify Arrows concerns as they will not have to have an offset secured straight away. They will have to have an SBOP and a signed deed of agreement prior to conducting activities but once this is completed (and they submit FA) the deed allows them 12 months to legally secure the offset and prepare an OAMP.

Can you pass this on to Gillian with my apologies, it had been many months since my head was in QBOP space.

Let me know if what I wrote doesn't make sense.

Cheers,

Damien Krikowa

Senior Environmental Officer
Energy Resources
Environmental Services and Regulation Division
Department of Environment and Heritage Protection
Telephone: 07 3330 6103 **Facsimile:** 07 3330 5634
Floor 7, 400 George Street, Brisbane, Q 4000
GPO Box 2454, Brisbane Q 4001

Joanne Kerr

From: Keara Mcdonagh
Sent: Thursday, 31 January 2013 4:37 PM
To: sch4p4(6) Personal inf
Cc: Naylor Gillian; Frankish John (John.Frankish@ehp.qld.gov.au)
Subject: Notice of Additional Information Request for DXP PL230 amendment application to allow for a brine dam within a cat C ESA buffer
Attachments: Notice_Additonal Information Request_DXP Brine Dam in ESA C buffer Amendment App_31012013.pdf; is-bi-review-and-appeal-court-em1866.pdf

Good afternoon sch4p4

I email regarding Arrow Energy's amendment application for a brine dam within a category C ESA buffer on PL230 under Arrow's Dalby Expansion Project (PEN100449509).

Please find attached a Notice of Additional Information Request for the above mentioned application.

The decision due date is currently 7 February 2013. Please give a date as to when Arrow will provide the additional information requested.

If you have any questions, please do not hesitate to contact me by email or on (07) 3330 5618.

Kind regards,

Keara McDonagh
Environmental Officer
Energy Assessments Unit
Department of Environment and Heritage Protection (EHP)
Level 7, 400 George Street, Brisbane QLD 4000 | GPO Box 2454, BRISBANE QLD 4001
T: 07 3330 5618
F: 07 3330 5634
E: keara.mcdonagh@ehp.qld.gov.au
W: http://www.ehp.qld.gov.au

Please consider the environment before printing this email.

Information sheet

Environmental Protection Act 1994

Internal review and appeal to Planning and Environment Court

This information sheet forms part of an information notice under the Environmental Protection Act 1994. *It gives a summary of the process for review and appeal to the Planning and Environment Court under the Environmental Protection Act and subordinate legislation. Refer to ss. 519 - 539 and schedule 2 of the Environmental Protection Act for complete information about the process for internal review and appeal to the Planning and Environment Court.*

Introduction

The *Environmental Protection Act 1994* (EP Act) provides for a right of internal review and appeal against certain decisions made under the EP Act. Decisions that can be reviewed or appealed are listed in schedule 2 of the EP Act and within certain sections of the regulations and subordinate legislation[1] made under the EP Act. The EP Act also provides that a dissatisfied person for a review decision, other than those listed in part 1 of schedule 2 of the EP Act[2], may appeal the decision to the Planning and Environment Court (the Court).

Summary of the process for internal review and appeal to the Court

Chapter 11, Part 3 of the EP Act

Division 1 — Interpretation

Section 519 Original decisions

1) A decision mentioned in schedule 2 is an 'original decision'.
2) A decision under an environmental protection policy or regulation that the policy or regulation declares to be a decision to which this part applies is also an 'original decision'.

Section 520 Dissatisfied person

This section nominates the dissatisfied person for an original or review decision.

Division 2 — Internal review of decisions

Section 521 Procedure for review

1) A dissatisfied person may apply for a review of an original decision.
2) The application must—
   a) be made in the approved form to the administering authority within—
      i) 10 business days[3] after the day on which the person receives notice of the original decision or the administering authority is taken to have made the decision (the 'review date'); or
      ii) the longer period the authority in special circumstances allows ; and
   b) be supported by enough information to enable the authority to decide the application.
3) On or before making the application, the applicant must send the following documents to the other persons who were given notice of the original decision—

a) notice of the application (the 'review notice');

b) a copy of the application and supporting documents.

4) The review notice must inform the recipient that submission on the application may be made to the administering authority within five business days after the application is made to the authority.

5) If the administering authority is satisfied the applicant has complied with subsection (2) and (3), the authority must, within 10 business days after receiving the application—

a) review the original decision;

b) consider any submissions properly made by a recipient of the review notice; and

c) make a decision (the 'review decision') to—

i) confirm or revoke the original decision; or

ii) vary the original decision in a way the administering authority considers appropriate.

6) The application does not stay the original decision.

7) The application must not be dealt with by—

a) the person who made the original decision; or

b) a person in a less senior office than the person who made the original decision.

8) Within 10 business days after making the review decision, the administering authority must give written notice of the decision to the applicant and persons who were given notice of the original decision.

9) The notice must—

a) include the reasons for the review decision; and

b) inform the person of their right of appeal against the decision.

10) If the administering authority does not comply with subsections (5) or (8), the authority is taken to have made a decision confirming the original decision.

11) Subsection (7) applies despite the *Acts Interpretation Act 1954*, section 27A.

12) This section does not apply to an original decision made by—

a) for a matter, the administration and enforcement of which has been devolved to a local government, the local government itself or the chief executive officer of the local government personally; or

b) for another matter — the chief executive personally.

13) Also, this section does not apply to an original decision to issue a clean-up notice.

Section 522 Stay of operation of original decisions

1) If an application is made for review of an original decision, the applicant may immediately apply for a stay of the decision to—

a) for an original decision mentioned in schedule 2, part 1—the Land Court; or

b) for an original decision mentioned in schedule 2, part 2—the Court.

2) The Land Court or the Court may stay the decision to secure the effectiveness of the review and any later appeal to the Land Court or the Court.

3) A stay may be given on conditions the Land Court or the Court considers appropriate and has effect for the period stated by the Land Court or the Court.

4) The period of a stay must not extend past the time when the administering authority reviews the decision and any later period the Land Court or the Court allows the applicant to enable the applicant to appeal against the review decision.

Division 4 — Appeals to Court

Section 531 Who may appeal

1) A dissatisfied person who is dissatisfied with a review decision, other than a review decision to which subdivision 1[4] applies, may appeal against the decision to the Court.

2) The chief executive may appeal against another administering authority's decision (whether an original or review decision) to the Court.

3) A dissatisfied person who is dissatisfied with an original decision to which s. 521 does not apply may appeal against the decision to the Court.

Section 532 How to start appeal

1) An appeal is started by—

   a) filing written notice of appeal with the registrar of the Court; and

   b) complying with rules of court applicable to the appeal.

2) The notice of appeal must be filed—

   a) if the appellant is the chief executive—within 33 business days after the decision is made or taken to have been made; or

   b) if the appellant is not the chief executive—within 22 business days after the day the appellant receives notice of the decision or the decision is taken to have been made.

3) The Court may at any time extend the period for filing the notice of appeal.

4) The notice of appeal must state fully the grounds of the appeal and the facts relied on.

Section 533 Appellant to give notice of appeal to other parties

1) Within 8 business days after filing the notice of appeal, the appellant must serve notice of the appeal on—

   a) if the appellant is the chief executive—all persons who were given notice of the original decision; or

   b) if the appellant is not the chief executive—the other persons who were given notice of the original decision.

2) The notice must inform the persons that, within 10 business days after service of the notice of appeal, they may elect to become a respondent to the appeal by filing in the Court a notice of election under rules of court.

Section 534 Persons may elect to become respondents to appeal

A person who properly files in the Court a notice of election becomes a respondent to the appeal.

Section 535 Stay of operation of decisions

1) The Court may grant a stay of a decision appealed against to secure the effectiveness of the appeal.

2) A stay may be granted on conditions the Court considers appropriate and has effect for the period stated by the Court.

3) The period of a stay must not extend past the time when the Court decides the appeal.

4) An appeal against a decision does not affect the operation or carrying out of the decision unless the decision is stayed.

Section 535A Stay of decision to issue a clean-up notice

5) This section applies to an application under section 535 for a stay of a decision to issue a clean-up notice.

6) In deciding the application, the Court must have regard to—

   a) the quantity and quality of contamination of the environment that is likely to be caused if the stay is granted; and

   b) the proximity of the place at or from which the contamination incident is happening or happened to a place with environmental values that may be adversely affected by the contamination.

Section 536 Hearing procedures

1) The procedure for an appeal is to be in accordance with the rules of court applicable to the appeal or, if the rules make no provision or insufficient provision, in accordance with directions of the judge.

2) An appeal is by way of rehearing, unaffected by the administering authority's decision.

Section 537 Assessors

If the judge hearing an appeal is satisfied the appeal involves a question of special knowledge and skill, the judge may appoint one or more assessors to help the judge in deciding the appeal.

Section 538 Appeals may be heard with planning appeals

1) This section applies if—

   a) a person appeals against an administering authority's decision (whether an original or review decision) to refuse to grant a registration certificate or to accredit an environmental risk management plan (ERMP); and

   b) a person appeals against the assessment manager's decision under the *Sustainable Planning Act 2009* about a planning or development matter for the premises to which the certificate or the ERMP or the application for the certificate relates.

2) On the application of a party to either of the appeals, the Court may order—

   a) the appeals to be heard together or one immediately after the other; or

   b) one appeal to be stayed until the other has been decided.

3) The application may be made—

   a) by an appellant when starting an appeal or at any time before the appeals are decided; or

   b) by another party at any time before the appeals are decided.

4) This section applies even though the parties, or all of the parties, to the appeals are not the same.

Section 539 Powers of Court on appeal

1) In deciding an appeal, the Court may—

a) confirm the decision appealed against; or

b) vary the decision appealed against; or

c) set aside the decision appealed against and make a decision in substitution for the decision set aside.

2) If on appeal the Court acts under subsection (1)(b) or (c), the decision is taken, for this Act (other than this part), to be that of the administering authority.

Further information

The latest version of this publication can be found at <www.ehp.qld.gov.au>. Note: where available, the publication number (e.g. EM1866 for this document) can be used as a search term.

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[1] The original decisions under the subordinate legislation are subject to change. As at 11 May 2010 they are listed in:

- Regulation 110 of the Environmental Protection Regulation 2008; and
- Regulation 68C of the Environmental Protection (Waste Management) Regulation 2000.

[2] An appeal may be made to the Land Court for original decisions in part 1 of schedule 2.

[3] Under the *Environmental Protection Act 1994* "business days does not include a business day between 26 December and 1 January in the following year".

[4] Subdivision 1 is about appeals to the Land Court and information about this is contained in ss. 519 - 539.

Notice

Environmental Protection Act 1994

Additional information required

This statutory notice is issued by the administering authority pursuant to s. 556 of the Environmental Protection Act 1994*, to advise you of a decision to require additional information for your application.*

Your reference : ENV12-318
Our reference : PEN100449509 / BNE43018

Arrow Energy Pty Ltd
'AM-60', Level 19
42-60 Albert St
BRISBANE QLD 4000

Attention: Ms sch4p4(6) Personal info

Re: Application to amend a level 1 environmental authority (EA) (chapter 5A activities) number PEN100449509 by Arrow Energy Pty Ltd for Petroleum Leases (PL) 194, 198, 230, 238, 252, 258 and 260 received on 13 December 2012.

The administering authority has reviewed the application received on 13 December 2012 and has determined that the following additional information is required to decide the application:**Environmental Management Plan**

A revised Environmental Management (EM) Plan was not submitted at the time the amendment application was made. s. 310U(2) of the *Environmental Protection Act 1994* (the EP Act) requires the application be accompanied by an EM Plan if the application relates to a coal seam gas EA. Please submit an EM Plan, ensuring that the matters required by s. 310D are highlight whether any amendments are required to be made to the EM Plan with respect to the proposed brine dam.

2. Impacts, risks to environmental values and mitigation measures

The supporting material for the application contains limited descriptions of the environmental impacts expected to result from the proposed brine dam and associated activities. Whilst general descriptions of potential impacts and mitigation measures are detailed, only limited consideration has been included that are specific to the brine pond activitiy and the actual environmental values located in the adjoining area.

- Provide further descriptions of the expected impacts and potential risks to specific environmental values of the adjoining site resulting from the following circumstances:
  - a dam overtopping event; and
  - the potential widening of the existing access track/s within the Mature Regrowth containing an Of Concern Regional Ecosystems (11.3.2/11.3.25/11.3.27) (a Category C environmentally sensitive area); and
  - the potential widening of the existing access track/s with the Southern Strategic Cropping Land Protected Area.
- Details of the proposed avoidance/mitigation measures and management solutions to be employed for the circumstances described above.

3. Clarification of location

Confirm the Map Zone for the coordinates supplied for the disturbance area for Daandine Brine Dam 2 is Zone 56, as it is not stated.

4. Dam Volume

It is unclear how much disturbance is expected from the proposed brine storage dam. Provide an approximate volume (in ML) of the proposed brine dam.

5. Financial Assurance

As a regulated dam is a high risk petroleum activity and rehabilitation of such an activity is costly, please provide clarification whether a revised calculation of financial assurance is required.

Please forward the requested information by 14 February 2013 to the Department of Environment and Heritage Protection office listed in this notice.

You may apply to the administering authority for a review of the decision to request additional information within 10 business days after receiving this notice. You may also appeal against this decision to the Planning and Environment Court.

Information outlining the review and appeal processes under the *Environmental Protection Act 1994* is included with this notice. This information is intended as a guide only. You may have other legal rights and obligations.

Should you have any queries in relation to this notice, Keara McDonagh of the Department of Environment and Heritage Protection on phone number (07) 3330 5618 would be happy to assist you.

sch4p4(6) Personal information

Signature

31 January 2013

Date

John Frankish
A/Manager, Energy Assessments
Delegate of Administering Authority
Department of Environment and Heritage Protection

Enquiries:
Energy Assessments Unit (Level 7, 400 George Street)
Department of Environment and heritage Protection

Regular Post:
GPO Box 2454, Brisbane QLD 4001
Courier or Registered Post:
Level 3, 400 George Street, Brisbane QLD 4000

Phone: (07) 3330 5618
Fax: (07) 3330 5634

Coal Seam Gas Water Management Plan

Surat Basin

REV	DATE	DESCRIPTION	PREPARED	CHECKED	APPROVED
A	20/07/11	ISSUED FOR COMMENT	BW	SS	CC
B	27/7/11	ISSUED FOR REVIEW	BW/AP		
0	29/7/11	ISSUED TO DERM	AP/BW	CC	CC
02	30/9/11	ISSUED TO DERM	MD	PO	CC

Contents

1. INTRODUCTION

1.1. PURPOSE AND SCOPE

The purpose of this Coal Seam Gas (CSG) Water Management Plan (the Plan) is to define and communicate Arrow Energy Pty Ltd's (Arrow) strategy for the current and future management of CSG water in the Surat Basin. Surat Basin activities addressed by this plan include gas exploration, appraisal, and production interests for the domestic market.

This document has been prepared in accordance with relevant legislation, government guidelines and Policy (further discussed in Section 2, below).

Under the *Environmental protection Act 1994*, a revised (CSG) environmental management plan is required for environmental authorities (EA) in force prior to 5 July 2010. This revised (CSG) environmental management plan (the Plan) has been submitted to fulfil this requirement and addresses the following Level 1 EAs within the Surat Basin.

Table 1: Level 1 EA's addressed in the Plan

EA	Applicable Tenures
PEN100449509	PL194, PL198, PL230, PL238, Pl252, PL258, PL258, PL260
PEN100901910	ATP683
PEN100052007	ATP676
PEN101539110	ATP810

1.2. OBJECTIVES

In addition to fulfilling relevant legislative and policy requirements, the objectives of this Plan are to:

- Define the hierarchy of options for the disposal of CSG water from appraisal and production activities.

- Establish a management framework for each CSG water disposal option.
- Identify the environmental values potentially affected by activities addressed by the Plan as well as mechanisms for protection (e.g. established procedures);
- Ensure salt will be disposed of in accordance with the Plan.
- Ensure action is taken, if any of the measurement criteria are not satisfied.

This plan is to be utilised in conjunction with Arrow's CSG Water Management Strategy.

1.3. Report Structure

The main body of this report describes existing activities, water characteristics, and Arrow's water management strategies in a basin wide context. Specific information with respect to infrastructure, water characteristics and management on each producing Surat Basin tenement (and associated EA) is provided in the attached Appendices.

2. Legislative and Policy Requirements

This Plan has been developed in accordance with relevant provisions of the *Environmental Protection Act 1994* (EP Act) (including Section 310 D), as well as the Queensland Government's *Coal Seam Gas Water Management Policy 2010*[1]. The plan has also considered the Department of Environment and Resource Management (DERM) guideline *Preparing an environmental management plan for coal seam gas activities*[2] (The Guideline), as well as requirements specified in correspondence received by Arrow from DERM on 20 May 2011, with respect to associated obligations under the EP Act.

Table 2 provides a list of key information requirements (as specified in the Guideline and addressing Section 310D of the EP Act), with reference to where this information is addressed in the Plan.

Table 2: Key information requirements and corresponding sections of the Plan where addressed.

REQUIREMENT	SECTION

[1] http://www.derm.qld.gov.au/environmental_management/coal-seam-gas/pdf/water-management-policy.pdf
[2] http://www.derm.qld.gov.au/environmental_management/land/documents/csg-environmental-management-plan.pdf

Provide an estimate of the quantity of CSG water produced annually over the life of the project.	5 and Appendix 1
Provide an estimate of the flow rate at which the CSG water will be generated.	5 and Appendix 1
Describe the quality of CSG water, including changes in the water quality that may be reasonably expected to occur whilst conducting the activity.	5.4
Describe how and where the CSG water will be produced, aggregated, stored and kept separate from other waters until it is used, treated, distributed or disposed of.	7.3
Describe how the CSG water will be dealt with in accordance with the CSG water management hierarchy, including a description of the estimated amount of CSG water that will be dealt with under the preferred water management options in category 1 and the water management options that are not preferred in category 2.	7.1
Where CSG water is to be treated, describe: • The treatment process; • How and where the treated water will be stored and used; and • How and where the waste generated by the treatment process will be stored, used and/or disposed of.	7.3
If any CSG water is proposed for direct disposal as waste, provide information sufficient to demonstrate that legislative, environmental, technological, economic and social requirements have all been evaluated and taken into consideration in deciding that disposal as waste is the only feasible option.	Table 5
Describe the detail of any pilot programs or trials for CSG water solutions, including: • Objectives of project; • Quantity and quality of CSG water applied; • Location/area; and • Duration of activity.	4.2, 5.2, 6.2, 7.5
Describe the characteristics of any receiving environment.	7.6
Describe the control measures that will be implemented for each water management option (aggregation, storage, treatment, use, or disposal) to prevent or control the release of a contaminant or waste to the environment.	7.7, 7.8
Describe the measurable criteria against which the performance of the CSG water management practices will be assessed. Criteria must include: • The quantity and quality of water used, treated, stored or disposed of; • Protection of the environmental values affected by the relevant CSG activity; • The disposal of waste, including for example, salt, generated from the management of the water.	7.9

Describe a monitoring program sufficient for the prediction and early detection of any detrimental impacts on the receiving environment from CSG water management practices.	7.8
Describe the procedures that will be adopted to regularly review the monitoring program and to report to management and DERM should unforeseen or non-compliant monitoring results be recorded.	7.8
Describe the procedures that will be implemented to prevent unauthorised environmental harm from unforeseen or non-compliant monitoring results.	7.7
Describe procedures for dealing with accidents, spills, failure of containment structures, and other incidents that may arise in the course of the CSG water management practices and result in the unexpected release of contaminants or waste to the environment.	7.7, 7.9
Describe the procedures used to identify and implement strategies that minimise the quantity of CSG water generated at the surface of the land, promote efficiency in the use of CSG water as a resource through direct use and treatment, improve the water management practices employed where non preferred management options are being used, and minimise the total area of land disturbed by water aggregation and storage structures.	7.8 and 7.10

3. SURAT BASIN TENEMENTS

Arrow's gas exploration and production acreage in the Surat Basin is located approximately 250km west of Brisbane covering an area of just under 9,000 km2 and extending from the township of Wandoan in the north towards Goondiwindi in the south (Figure 1). Surat Basin tenements are shown in Table 3.

Table 3: Surat Basin Tenements

Current Tenements	
Authority to Prospect (ATP)	**Petroleum Lease (PL)**
676	194
683	198
689	230
746	238

747	252
810	258
687	260
791	

The development of tenements within the Surat Basin primarily involves drilling wells and constructing the required infrastructure to extract, compress and transport gas, and to transport, store and treat associated water. Production and Appraisal activities currently undertaken on the above tenures are further described below.

4. Surat Basin Activities

4.1. Production

Arrow currently has approximately 300-350 existing gas production wells at Tipton West, Daandine, Stratheden and Kogan North near Dalby, across the PLs shown in Table 1. These tenements collectively supply more than 20% of the Queensland domestic gas market.

Arrow currently supports this production with a 12ML/day water treatment facility at Daandine and a similar capacity at Tipton is currently under construction. This will facilitate the treatment and beneficial use of CSG water generated through production activities, in accordance with Arrow's corporate strategy.

Specific production infrastructure is further described in the Environmental Management Plan (EM Plan) associated with each tenure, while the production water characteristics for each PL (where known) are described in APPENDIX 2 Water Management Infrastructure.

4.2. Exploration and Appraisal

The exploration and appraisal program being undertaken by Arrow across the Surat Basin will reduce the uncertainty in subsurface parameters that underpin the modelled rate of gas and water volumes expected. Exploration wells are being drilled to increase certainty in coal depth, thickness and data quality across the basin.

The appraisal program comprises a number of pilot production tests, conducted across the basin, to give a better understanding of dynamic behaviour on a large scale. Each pilot test consists of four to six wells spaced approximately 200m apart in a diamond shaped layout. The pilot tests generally run for three to six months. The exploration and appraisal data will provide the basis for field development planning work.

Arrow's CSG water management activities covered by this plan will incorporate the current production and field development scheduled to meet domestic gas contracts. The Surat Basin Tenements are shown in Figure 1

Specific exploration and appraisal infrastructure is further described in the EM Plan associated with each tenure.

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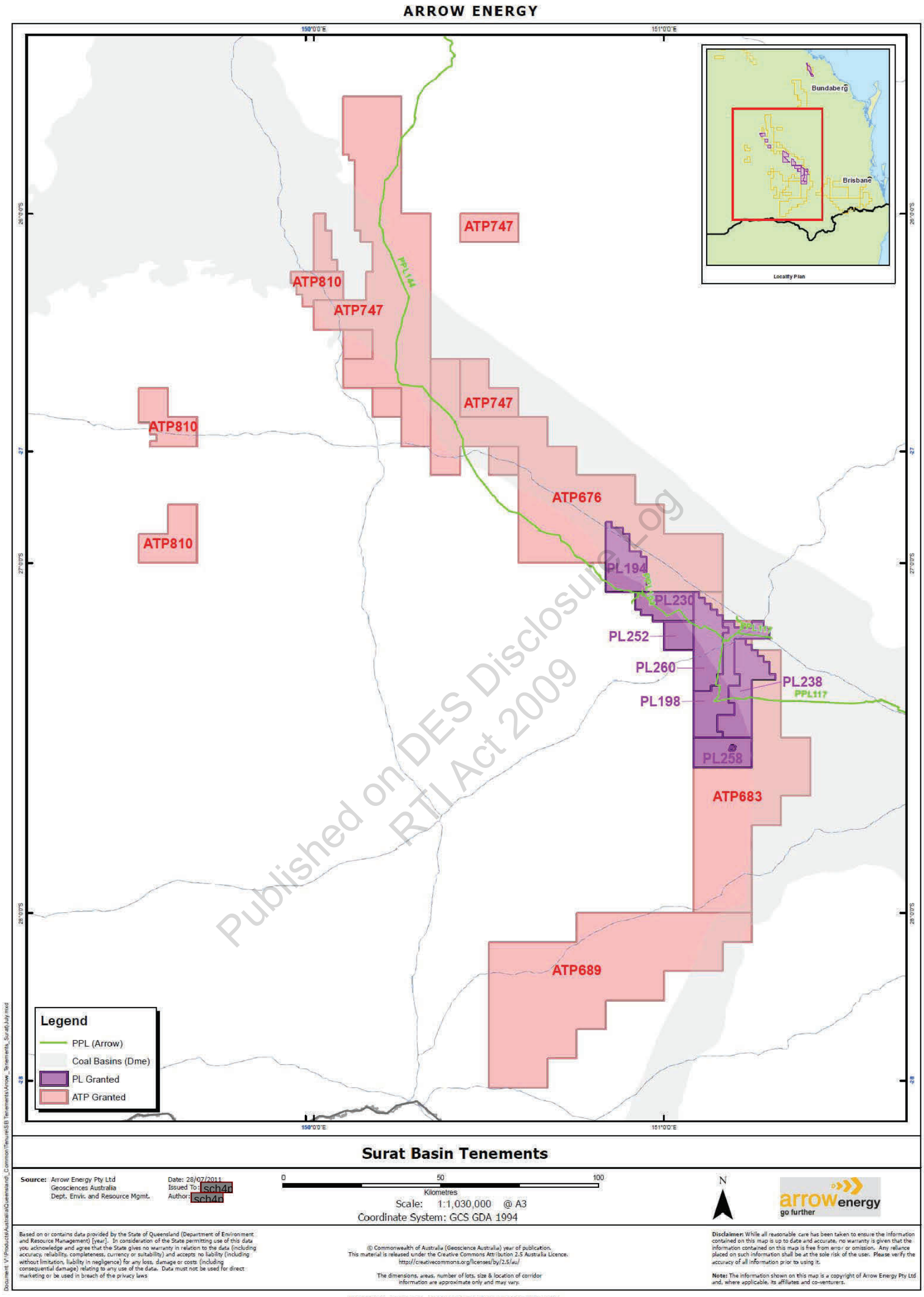


Figure 1: Surat Basin Tenements

5. Estimated Source Water Generation and Quality Characteristics

5.1. Production Water Volumes

Water volumes and quality may vary with location, well spacing and coal seam depth. Figure 2 shows the volume of expected CSG water generated each year (ML), for existing production and gas contracts. The data for the graph is contained in Table 1.1 in the Appendix 1.

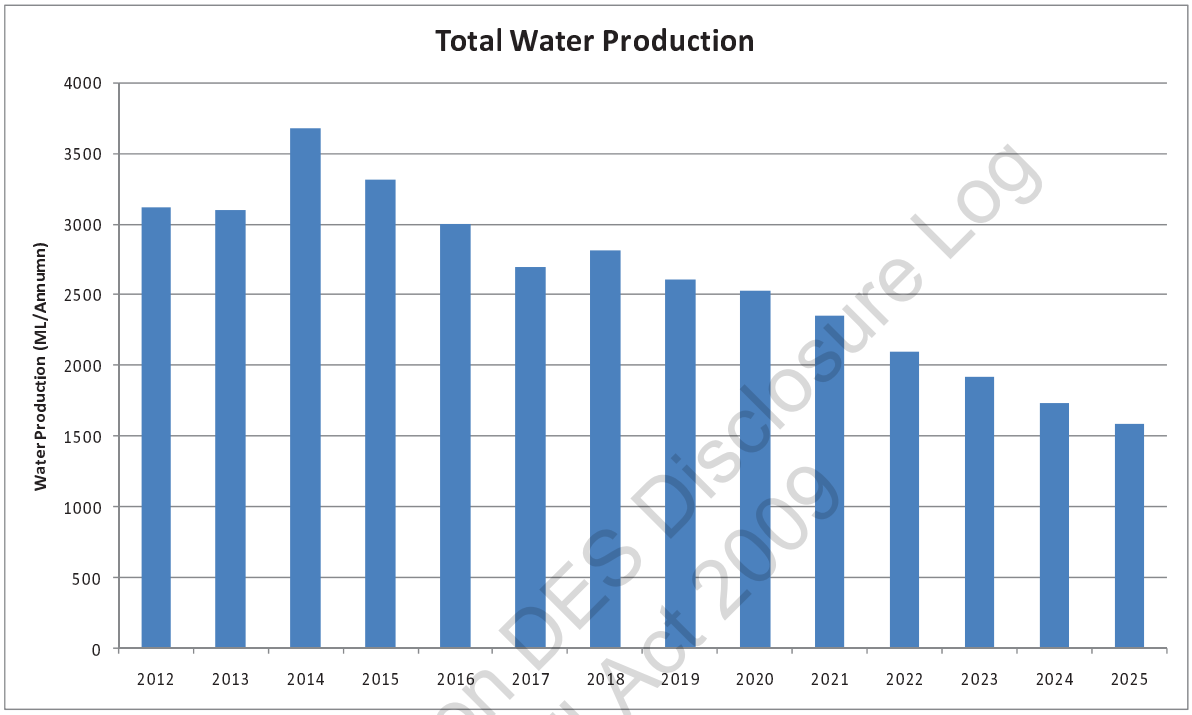


Figure 2: Surat Gas Basin Water Production

5.2. Annual Water Production by Tenure

Figure 3 shows the predicted annual water production for each year by tenure.

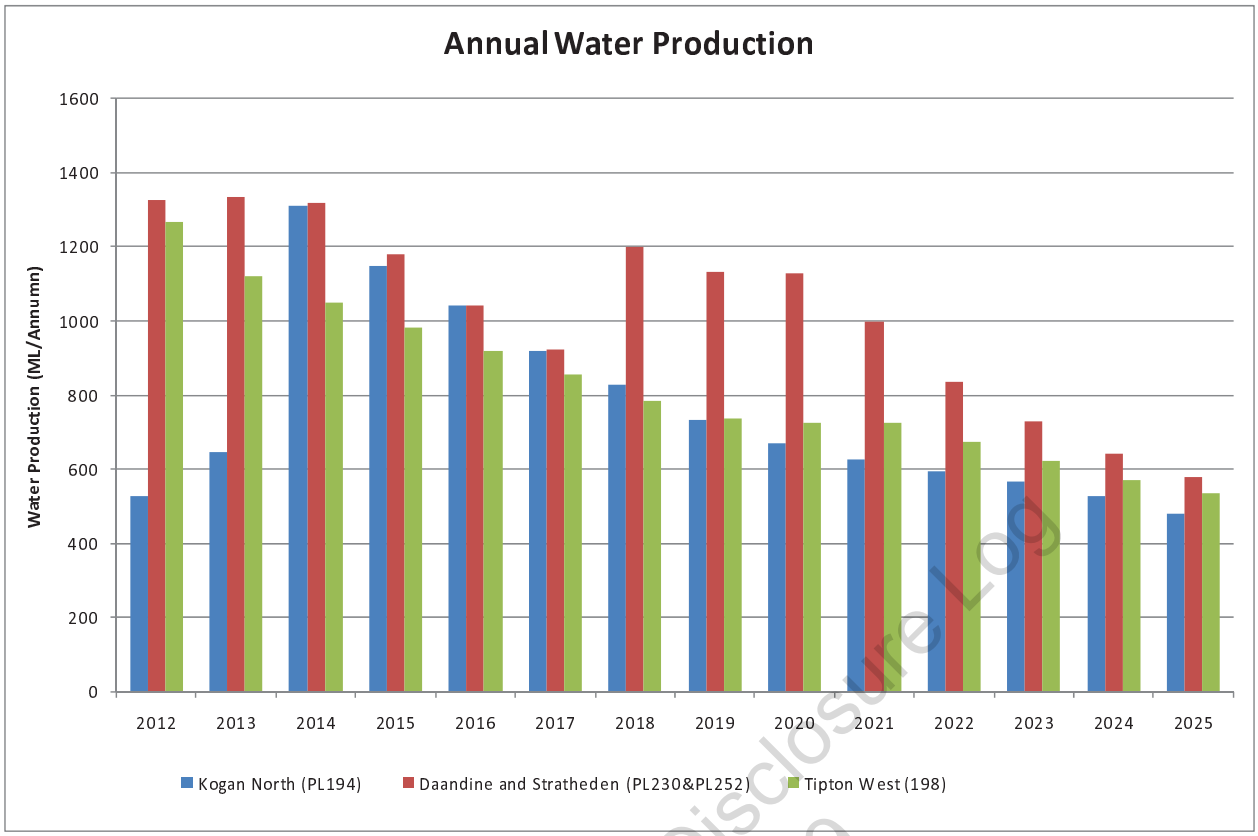


Figure 3 Annual water production by tenure

5.3. ESTIMATED PILOT VOLUMES

An Authority to Prospect (ATP) is granted under the *Petroleum and Gas (Production and Safety) Act 2004* or *Petroleum Act 1923* and authorises the holder to explore for petroleum (including coal seam gas) in Queensland. The purpose of exploration is to obtain information about the coal seam including the volume of water that may be produced.

Due to the nature of exploration, the water quantity and quality that will be generated is uncertain and to a large extent unpredictable. However, in some circumstances it is possible to estimate the quantity from previous experience and to extrapolate from exploration activities in close proximity. The CSG water generation curve over time for a typical pilot is illustrated in Figure 4.

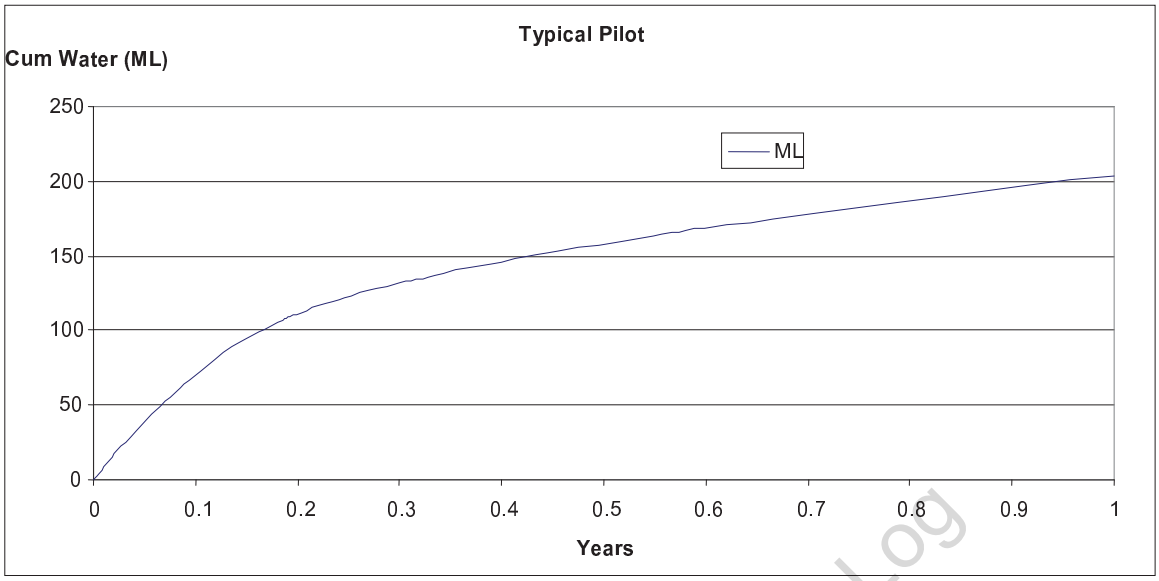


Figure 4 Predicted cumulative volume of CSG water produced over one year for a typical pilot well

At this stage in exploration Arrow has assumed that all production pilots in the Surat exploration acreage will produce a similar quantity of water as the coal characteristics are similar across the basin. This translates to an average production of approximately 0.55 ML/day per site with an anticipated peak production of 2.4 ML/day at each location in the early dewatering phase.

5.4. WATER QUALITY CHARACTERISTICS

CSG water extracted from most seams in Australia is saline with Total Dissolved Solids (TDS) typically falling in the range 2,500-8,500 mg/l. Previous exploration in the Surat Basin indicates that a range of 2500 – 7000 mg/l TDS (EC 4000-11000 µs/cm) is a reasonable expectation. The CSG water quality range across Arrow's Surat Basin tenements is shown in Table 4.

These water qualities have been developed by analysis of existing well water quality data and dam water quality data across the Surat basin, excluding samples that indicated poor sampling or outliers[3]. In total, water samples from 56 wells contributed to the analysis.

[3] Samples that were high in KCl indicate the sample was taken immediately after well drilling and therefore are not considered representative and excluded. Some other samples had inconsistencies in different parameters and were also excluded.

Arrow Energy is developing a process to provide greater detail of the water qualities that could be produced by wells in the Surat Basin. This process will include sampling of water produced during the piloting process and increasing the sampling of wells that are currently in production.

Table 4: Water quality values for Arrow Southern tenements

Surat Basin Wells						
Parameter	Units	Min	P10	Median	P90	Max
pH		6.8	7.8	8.2	8.6	9.5
TDS	mg/L	152	1399	4680	8614	11200
Conductivity	uS/cm	256	5714	8860	12760	18100
TSS	mg/L	9	11	99	381	466
Turbidity	NTU	19	26	55	83	90
Alkalinity (BiCarb)	mg/L	58	256.2	573	1292	1550
Alkalinity (Carb)	mg/L	0.5	0.5	29.5	72.3	80
Alkalinity (Hyd)	mg/L	0.5	0.5	0.5	5	6
Alkalinity (Total)	mg/L	50	185	568	1224	1520
SO4	mg/L	0.5	0.5	3	27	54
Cl	mg/L	28	571.3	1870	4488	5870
Ca	mg/L	1	4	8	63.8	132
Mg	mg/L	1	1	4	19.2	35
Na	mg/L	18	480.3	1465	2419	3070
K	mg/L	1	5	10	18	1150
Al	mg/L	<0.01	<0.01	<0.01	0.01	1.84
As	mg/L	<0.001	<0.001	<0.001	<0.001	0.001
Be	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Bo	mg/L	0.2	0.3	0.4	0.5	0.6
Cd	mg/L	<0.005	<0.005	<0.005	<0.005	<0.005
Cr	mg/L	<0.001	<0.001	0.001	0.0048	0.005
Co	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Cu	mg/L	<0.001	<0.001	0.001	0.002	0.002
Fe	mg/L	0.025	0.025	0.08	4.61	6.3
Pb	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Mn	mg/L	0.001	0.003	0.0105	0.0465	0.078
Mo	mg/L	N.D	N.D	N.D	N.D	N.D
Ni	mg/L	<0.001	<0.001	<0.001	<0.001	<0.001
Se	mg/L	N.D	N.D	N.D	N.D	N.D
V	mg/L	N.D	N.D	N.D	N.D	N.D
Zn	mg/L	0.003	0.003	0.008	0.065	0.089
U	mg/L	N.D	N.D	N.D	N.D	N.D
Hg	mg/L	N.D	N.D	N.D	N.D	N.D

Surat Basin Wells						
Parameter	Units	Min	P10	Median	P90	Max
F	mg/L	0.05	0.5	1.2	2.5	2.7
Ba	mg/L	0.6	0.7	1.1	1.9	2.4
Sr	mg/L	2.2	2.2	2.4	5.3	6.4
Si	mg/L	6.2	7.0	7.9	9.2	9.4
SiO2	mg/L	13	15	17	20	20
Nitrite as N	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Nitrate as N	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01
Nox as N	mg/L	<0.01	<0.01	<0.01	<0.01	<0.01

The results of a detailed water quality analysis that includes the full suite of metals, hydrocarbons (including BTEX) and radiological components are provided in APPENDIX 3. The samples used for this analysis were taken from an aggregation pond that provides the feed water for the Daandine RO facility.

Arrow is currently undertaking a detailed water analysis that examines water directly from the wells as well as the aggregation ponds. This exercise has a similar level of detail to the information provided in APPENDIX 3 and will aid in the development of the continual water quality sampling regime to improve the understanding of the water that will be produced in the Surat.

5.5. WATER QUALITY VARIATIONS

CSG water contained within the coal measures is typically considered to be in a state of equilibrium. When this is brought to the surface and stored in the aggregation ponds, a wide range of chemical and physical reactions may occur.

An important physical change that occurs during the removal of CSG water from the coal measure is a substantial reduction in pressure.

- Reduction in dissolved methane
- Reduction in dissolved carbon dioxide, resulting in an increase in pH
- Reduction of trace dissolved gases.

The impact of gases coming out of solution does not have significant impact on the water quality from a treatment perspective but it is an important concern for managing fugitive

emissions and the operation of the gathering systems. The reduction of carbon dioxide and associated pH increase has potential to result in formation of calcium carbonate scales, which can be a significant operational issue.

The most significant reactions that occur prior to the treatment processes are expected to occur when the water is exposed to the atmosphere.

- Oxidation and precipitation of iron (Fe2+ => Fe3+)
- Reduction and dissolution of iron (Fe3+ => Fe2+)
- Oxidation and precipitation of manganese (Mn2+ => Mn4+)
- Reduction and dissolution of manganese (Mn4+ => Mn2+)
- Increase in pH
- Shift of some alkalinity from bi-carbonate to carbonate form
- Evaporation and general increase of salinity
- Biological activity
- Introduction of windblown/environmental contaminants
- Settling and removal of solid material produced by the wells.

CSG water within the coal measures is expected to be anoxic with metals existed in a reduced form. Once exposed to the atmosphere, the dissolved oxygen is introduced and oxidation reactions occur. Oxidation of iron and manganese are the significant reactions, with both elements considered insoluble in the oxidised form. If the ponds are deep enough, anoxic/anaerobic zones can be expected at the bottom of the pond, which will result in an amount of reduction and dissolution of soluble iron and manganese.

Biological activity and the introduction of contaminants can result in the introduction of ammonia and nitrate, removal of organic carbon and an increase in the suspended solids and turbidity. Biological activity is in ponds is typically seasonal, with formation of algal blooms occurring during the warmer months.

5.6. Treated Water Qualities

The treated water uses that Arrow Energy has implemented or is investigating are outlined in this Water Management Plan. A summary of legislation and guideline water qualities for

each water use are noted in the following sub-sections. The DERM Beneficial Use Guidelines4 inform the water quality requirements for many uses.

No Additional Beneficial Use Approvals Required

Under the Petroleum Gas (Production and Safety) Act, Arrow Energy can:

Irrigate 2,500 m2 nearby the property (estimated at about 25 m3/day); or

Water free range stock (unknown quantity but expected to be small volumes per day).

Arrow Energy will still be obliged to 'not cause environmental harm' and therefore treatment will be required of the CSG water. Untreated CSG water is inherently unsuitable for irrigation due to high sodium concentrations. Guideline values are provided in the section below.

Approvals Required

As previously stated Arrow Energy will comply with Environmental Authorities (EA) or Beneficial Use (BU) approval. Approvals are required for any substantial use of water and can be contained in the EA or a dedicated BU approval. Arrow has EAs for all ATPs and PLs but BU approvals are granted on a case-by-case basis only.

5.7. Contaminants of Concern & Critical Control Points

Arrow Energy has undertaken a risk assessment on Daandine water treatment. Details of the infrastructure are contained in the Water Management Plan. A specific risk assessment is undertaken prior to a proposal for BU.

Each process step from aggregation through desalination and storage would form the critical control points as follows:

- Dam;
- Microfiltration;
- Reverse Osmosis;

[4] DERM, 2010, Approval of coal seam gas water for beneficial use.

- Post-Treatment (e.g. SAR adjustment); and
- Treated Water Storage.

The risk ratings show the following contaminants of concern in aggregated water:

- Microorganisms;
- Acidity / basicity;
- Metals including low and high toxicity;
- Major ions (Sodium and Chloride);
- TDS or EC25; and
- Algae.

Risk assessments show that desalination plants are very effective in managing these risks to lower risk ratings. For the main beneficial use of the water, irrigation, these risk ratings are expected to be low.

Arrow Energy's procedures for measurement and corrective measures which cover the contaminants of concern as well as other hazards are summarised in the Water Management Plan.

5.8. Capacity of the Water Management System

Arrow has developed a water balance model to determine water management system requirements. Arrow will make capital investments so that the capacity of the water management system can adequately respond to planned activities.

Future development will be the focus of concept studies to determine any additional water management capacity required and select the preferred facilities concept.

6. Process Flow of CSG Water Generation, Aggregation and Storage

CSG water[5] is water extracted from coal seams in order to release CSG from the coal.

[5] http://www.derm.qld.gov.au/factsheets/pdf/water/w195.pdf

Water produced from all wells is aggregated and stored in CSG (CS) water aggregation dams designed and constructed in accordance with the *DERM Guideline for Regulated Dams in Environmentally Relevant Activities*[6] and *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*.

The following subsections describe the process of water generation, aggregation and storage associated with production and appraisal wells.

6.1. PRODUCTION WELLS

CSG water produced from individual production wells within a field is transferred by gathering lines to water management facilities. Following aggregation in a dam, water undergoes a treatment process to allow the removal of any suspended solids and dissolved ions.

The current treatment process employed by Arrow incorporates micro filtration and reverse osmosis (RO). The RO process produces a high quality permeate (treated water) and a concentrated salt stream (brine). These two product streams, permeate and concentrate, are stored in fit for purpose water storage facilities in line with EA requirements.

The water collection and treatment process is an integral part of the water management and gas production strategy, shown below in Figure 5.

[6] NB: This guideline and has yet to be finalised or published.

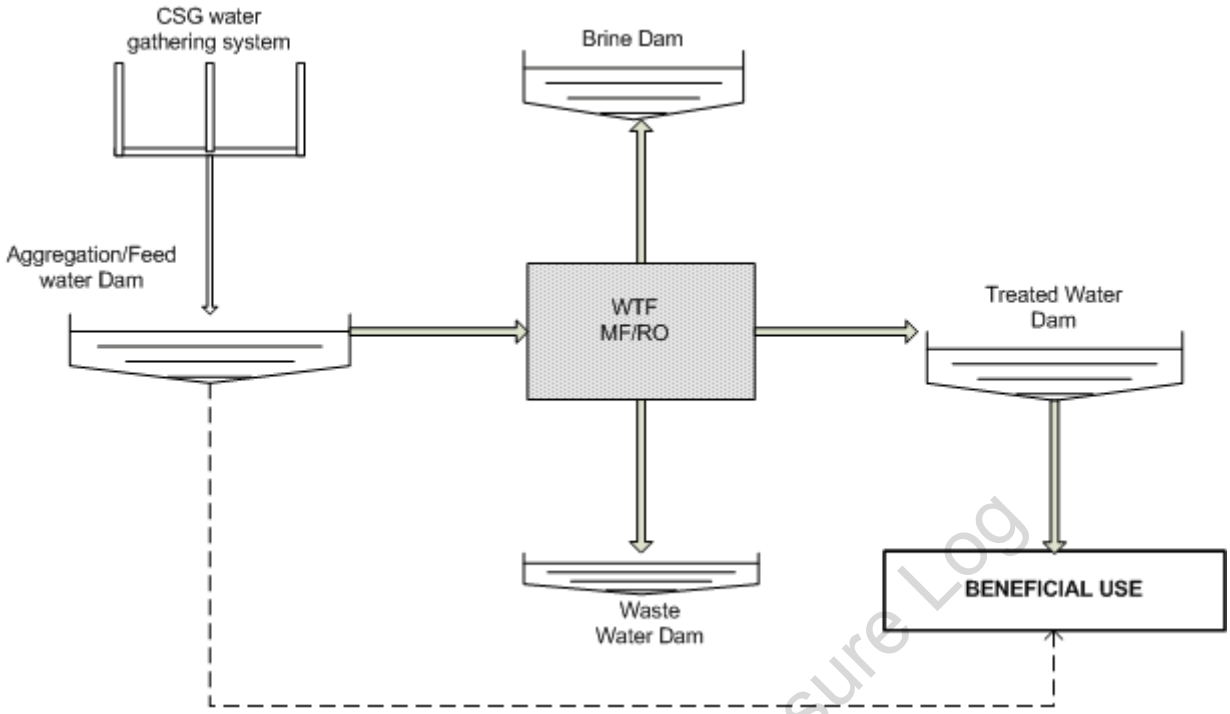


Figure 5: CSG water management scheme

A third stream is also created through the cleaning and backwash operations of the treatment plant. The volumes associated with this waste are minimal and are accumulated in a suitably designed utility dam and periodically transported to a regulated waste facility when required.

6.2. EXPLORATION/PILOT WELLS

Pilot wells assist in determining the viability of the coal seam gas resource. Until the appraisal project phase is complete it remains uncertain as to whether each area will be developed to production stage. Therefore, a key determinant of appropriate water management practices for pilot wells is proximity to existing water infrastructure.

Arrow considers that the construction of small aggregation dams is preferable to pre development investment in pipelines and the construction of larger centralised water storages, each of which would create a larger environmental footprint than is necessary. However, such dams will be connected to a water gathering network where possible during the exploration/appraisal phase of field development.

The conceptual strategy for the treatment of CSG water for exploration is as follows:-

Water produced from the pilot program will be aggregated in local associated water dams;

If pilots are successful and the project moves into the production phase (following an EIS process), dams will be connected to the Arrow Southern Water Infrastructure. This will involve:

- Construction of pipelines connecting dams to Reverse Osmosis (RO) Facilities (e.g. the Tipton facility to be situated on PL198);
- Transport of water to where it will be treated to a quality enabling beneficial reuse for industrial, agricultural and urban purposes (refer to Section 7.4 for Arrow BU processes currently approved or under investigation). The decision tree in Figure 7 will be applied when determining the most appropriate beneficial use or disposal option for the CSG water;
- Relevant land access and approval processes (including route assessments, ecological surveys, compensation agreements, development approvals and Beneficial use applications) as required, prior to undertaking the above; and
- The associated water dams may become part of the long term Arrow Southern Water Infrastructure.

In the event that any of the pilots deem an area not viable (and a production phase is not pursued), Arrow will decommission and rehabilitate dams as per Arrow's decommissioning and rehabilitation plan (which will accompany the specific dam operating plan). Arrow considers that the rehabilitation of individual dam sites will have a less significant environmental and social impact than rehabilitation of a network of pipelines over large distances.

It is anticipated that development of water processing and transport infrastructure will progress to the point of allowing connection of the majority of dams to facilitate beneficial use of the CSG water. At the time of connection to other water management infrastructure, the dams would be incorporated into the management scheme (Figure 5) as an integral part of the collection and treatment process.

7. CSG WATER MANAGEMENT

7.1. CSG WATER MANAGEMENT HIERARCHY

The EP Act provides for the *Environmental Protection (Waste Management) Policy 2000*[7] (EPP Waste) to deal specifically with environmental values relating to waste management. It does this by establishing a preferred waste management hierarchy and various principles as the basis for waste management. The environmental values to be enhanced or protected under this policy includes human health and safety, more effective use of resources and avoiding remediation costs.

In accordance with the EPP (Waste), waste management (including CSG water from exploration) will be based on the following hierarchy:

- Waste avoidance- Preventing the generation of waste or reducing the amount of waste generated- Re-using waste, without first substantially changing its form, then
- Waste re-use- Treating waste that is no longer useable in its present form and using it to produce new products, then
- Waste recycling
- Energy recovery- Recovering and using energy generated from waste, then
- Waste disposal- Disposing of waste, or treating and disposing of waste, in a way that causes the least harm to the environment.

DERM have adopted two categories of preferred options for management of CSG water. With regard to DERM's CSG water management hierarchy and preferred options, Arrow's approach is shown in Table 5.

[7] http://www.legislation.qld.gov.au/LEGISLTN/CURRENT/E/EnvProtWaMP00.pdf

Table 5: Water Management options

DERM CSG Water Management Categories			Arrow's Approach[8]
Category	**Option**	**Description**	**Option implemented / investigated**
1	Injection where detrimental impact is unlikely	Involves injecting either treated CSG water, untreated CSG water or brine into a natural underground reservoir, or aquifer, where the injection is unlikely to have a detrimental impact on the identified environmental values and water quality objectives of the waters in the target formation or surrounding environment	To determine the feasibility of CSG injection, Arrow's commitments, actions and milestones include the following: ***Commitments***: • To further investigate the potential for CSG injection as part of a risk managed portfolio of CSG water options for the Surat Basin • To work in close collaboration with other CSG operators and in conjunction with Regulatory agencies to assess injection options. ***Actions***: • Establishment of a targeted water injection specialist role within Arrow (position filled May 2011) • Currently investigating opportunities for targeted site based injection trials in the Surat Basin • Ongoing discussions with local irrigators and government with respect to a substitution allocation or BU schemes ***Milestones***: • Clarification of approval requirements with DERM to facilitate injection (**Nov. 2011**) • Relevant approvals secured to undertake trials (**June 2012)** • Completion of approved aquifer injection trials **(June 2013)** • Development of an internal water injection strategy on satisfactory completion of investigations and trials **(Nov. 2013)** (refer to section 7.5 for further details regarding scoping study)

[8] Refer to section 2.2 for period of implementation of management scheme.

DERM CSG Water Management Categories			Arrow's Approach[8]
Category	**Option**	**Description**	**Option implemented / investigated**
1	Untreated Use	Involves using the CSG water without first substantially changing its composition. Under a Specific Beneficial Use[9] or General Beneficial Use[10] approval issued by DERM the following uses are considered as an option for untreated CSG water: • - Irrigation and general use • - Livestock drinking water • - Dust suppression • - Landscaping and revegetation • - Power station cooling • - Coal washing • - Feedlots • - Urban use	Arrow currently has a range of projects utilising untreated water through beneficial -use approvals (as described in section 7.4) Arrow will identify further beneficial reuse opportunities through continued community and surrounding stakeholder engagement Arrow will actively develop practicable agreements with the relevant entity/s.
1	Treatment and Use	Includes treatment of CSG water through a process to remove or reduce contaminants to make the water suitable for a desired end use. Under a Specific Beneficial Use[11] or General Beneficial Use[12] approval issued by DERM the following uses are considered as an option for treated CSG water management under this plan: • aquaculture and human consumption of aquatic foods • coal washing • dust suppression • industrial use • irrigation	Arrow currently has a range of projects utilising treated water (as described in section 7.4) Containerised RO treatment facilities have been investigated for the purpose of treating the CSG water produced by pilot wells. Currently, this option has been deemed to possess an increased environmental impact compared to the current strategy of aggregating water for future linkage to the treatment system. This is associated with the generation of brine and additional footprint related to the infrastructure requirements of the RO facility and brine and treated water dams. Similarly, pumping CSG water to the nearest treatment facility by the installation of

[9] http://www.derm.qld.gov.au/environmental_management/land/documents/csg-water-beneficial-use-approval.pdf
[10] http://www.derm.qld.gov.au/register/p02281aa.pdf
[11] http://www.derm.qld.gov.au/environmental_management/land/documents/csg-water-beneficial-use-approval.pdf
[12] http://www.derm.qld.gov.au/register/p02281aa.pdf

DERM CSG Water Management Categories			Arrow's Approach[8]
Category	**Option**	**Description**	**Option implemented / investigated**
		• livestock watering	pipeline, involves substantial environmental (~15m easement for construction) and financial implications, and is best undertaken in production stage.
1	Direct supply via pipeline to a water supply dam managed by a water service provider[13]	This option involves the supply of water of a suitable quality via a pipeline to a water supply dam managed by a water service provider	This option has not been considered under this plan, as Arrow's preference is for the CSG water to remain within the area it is produced. Further, no service providers operate practicable infrastructure within the tenement area and Arrow does not hold approvals to construct pipelines off lease. Issues associated with the transport of regulated waste off tenement (including approval requirements and potential environmental impacts) are an additional impediment to this approach.
2	Disposal via evaporation dams	Evaporation dams are no longer to be used as the primary method for disposal of CSG water. In some circumstances, where a company can demonstrate that there is no feasible alternative for using, treating, storing or disposing of CSG water, evaporation dams may be authorised on application to DERM.	Arrow may propose to use evaporation dams for the exploration phase, where there is no feasible alternative for managing CSG water. An approval will be sought from DERM for specific instances.
2	Disposal via injection where a detrimental impact is likely	This option involves injection of CSG water.	This has not been considered as an option for CSG water management under this plan. Arrow's injection studies will initially focus on outcomes which will not result in detrimental impact.
2	Disposal to surface waters	The disposal of any CSG water (treated or untreated) directly to surface waters.	Continuous or long term discharge has not been considered as an option for CSG water management under this plan. Arrow will actively pursue opportunities for beneficial use, but will seek to retain approvals for

[13] http://www.derm.qld.gov.au/water/regulation/service_provider_list.html

DERM CSG Water Management Categories			Arrow's Approach[8]
Category	Option	Description	Option implemented / investigated
			emergency wet weather discharge when the water may not be able to be used. This approval will be sought through the relevant EA.
2	Disposal to land	The disposal of any CSG water (treated or untreated) directly to land.	This has not been considered as an option for CSG water management under this plan.

7.2. Water Treatment

7.2.1. Treatment process

Arrow currently treats CSG water through a process of micro filtration (MF) and reverse osmosis (RO). MF is a microporous membrane separation process with selectivity on the basis of size. Most MF membranes are screen filters with the feed inlet pressure serving as the driving force for filtration. The membranes allow the removal of turbidity, bacteria, cysts and particulates from the water to sizes of 0.1 to 3 µm. Following MF, water is treated using RO to remove dissolved salts. RO is significantly more complex than MF and involves the separation of salts from solution through a semi permeable microporous membrane under elevated hydrostatic pressure.

7.2.2. Treatment infrastructure

Arrow initially installed RO plants at Daandine (12ML/day) and a trial plant at Glenelg for aquifer injection trials. Both plants are currently not operational, and are awaiting modifications and the establishment of required water transport infrastructure and finalised BU agreements. Additionally, the Tipton West MF/RO plant (12ML/day) is due for commissioning early 2012. Refer to the Appendix for additional information regarding Arrow's treatment infrastructure particular to each tenure.

Through the design and operation of these plants (and associated 'lessons learnt'), Arrow has significantly bolstered its experience and capabilities in water treatment and waste reduction technologies. Arrow will continue its investigations into long-term industry-wide solutions and alternative technologies for efficient water treatment and waste management.

7.2.3. TREATED WATER QUALITY

Table 6 shows predicted parameters for the Daandine Water Treatment Facility, as an indicator of likely water qualities achieved through the RO Process. Due to the significant presence of sodium and low levels of calcium and magnesium in the treated water, ionic amendment will be required to lower the sodium absorption ratio (SAR) to make beneficial use possible. Amendment facilities are required for both Daandine and Tipton water treatment facilities and will be designed and constructed in accordance with the beneficial use quality requirements for each use.

Table 6: RO stream water qualities[14]

RO Pass Streams (mg/L)			
Name	Feed	Concentrate	Permeate
H4	0	0	0
K	0	0	0
Na	1660.09	9828.99	20.8
Mg	12	71.48	0.06
Ca	5	29.78	0.03
Sr	0	0	0
Ba	1.56	9.29	0.01
CO3	37.63	342.13	0
HCO3	1091.99	6224.77	14.71
NO3	0.1	0.54	0.01
Cl	1921	11375.14	23.79
F	1.52	8.99	0.02
SO4	2.06	12.29	0.01
SiO2	16.1	95.4	0.19
Boron	0.4	1.5	0.18
CO2	5.3	51.89	12.83
TDS	4751.37	28007.37	60.65
pH	8.3	7.86	6.24

Treated water quality (permeate) will be continuously monitored for the available in situ parameters (pH, EC), and the remaining parameters sampled frequently to ensure compliance with the relevant approval conditions, supply agreements and process stability.

[14] Projected parameters taken from ROSA (*Dow Water and Process Solutions*) modelling for Daandine WTF

7.3. STORAGE, USE AND / OR DISPOSAL OF TREATED CSG WATER AND BRINE

As described previously, prior to usage and /or disposal, treated CSG water and brine will be segregated and stored in purpose built dams, designed and constructed in accordance with the *Manual for Assessing Hazard Categories and Hydraulic Performance of Dam,* and relevant EA conditions. Proposed Surat Basin dams are summarised in Table 10 with further specific details provided in APPENDIX 2 WATER MANAGEMENT INFRASTRUCTURE.

Treated CSG water will be used according to the management hierarchy described in Section 7.1, of which BU approvals (as per examples in Table 8) are a current focus, pending the realisation of injection opportunities.

With respect to brine and residual solid salts through the water treatment and evaporation process, the following hierarchy will be used to determine appropriate management strategies:

1. Waste reuse/recycling through chemically processing/treating brine or salt residues to create useable/saleable products such as soda ash, then
2. Waste disposal through:
    - disposal of brine to an ocean/estuarine environment, then
    - disposal of salt into an existing licensed regulated waste disposal facility, then
    - disposal of salt into a purpose built regulated waste disposal facility (landfill mono cell) on freehold land owned by the tenure holder.
3. Injection of brine if the target formation is:
    - a single geological unit that is not regionally consistent and extensive;
    - isolated above and below by an aquitard or aquicludes within the hydraulic impact zone; or
    - not an aquifer that does or could supply water for potable, agricultural, industrial and commercial purposes.

Currently, the brine disposal strategy relies on evaporation and concentration until technologies for crystallisation have been fully investigated and trialled over the next two years. The proposed solution will potentially create marketable salts such as soda ash and sodium chloride. Arrow is currently collaborating with other CSG proponents to take advantage of economies of scale and reduce infrastructure requirements and footprints for brine management. Alternatively, as a last report, salt will be concentrated, dried and transported to a licensed and regulated landfill (Figure 6).

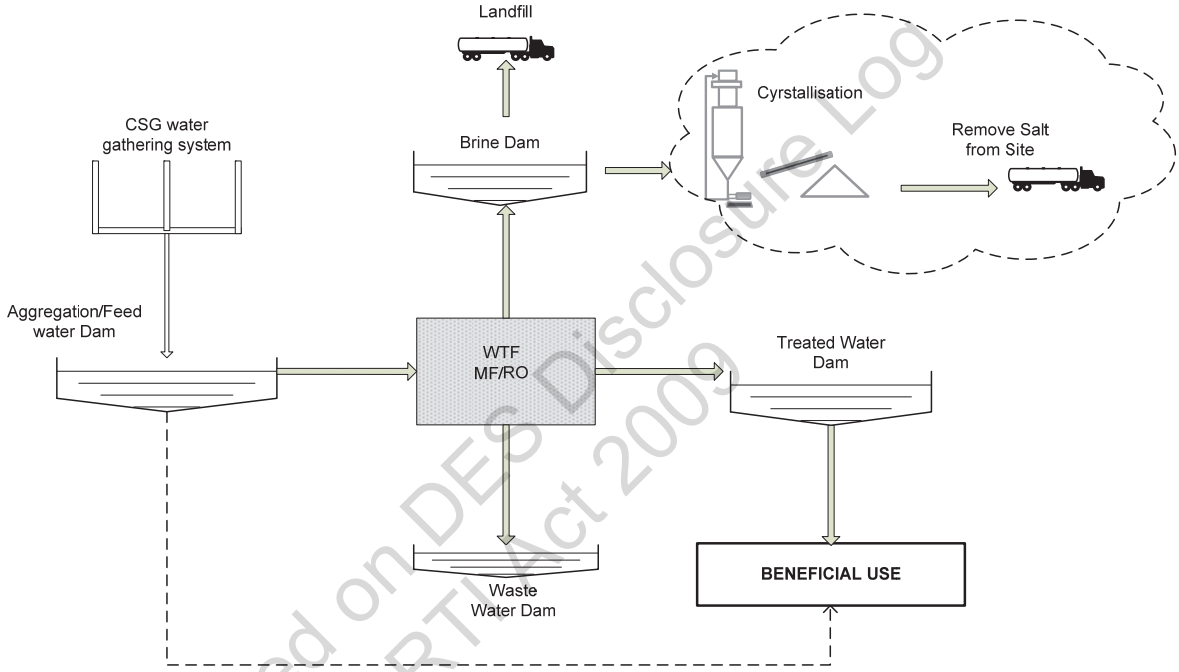


Figure 6: Surat Water and Salt Management Strategy

7.4. CURRENT AND PROPOSED BENEFICIAL USE

Arrow is currently investigating a range of additional beneficial use options, in accordance with the following prescribed activities specified in DERM's guideline for beneficial use:[15]

- irrigation
- dust suppression
- aquaculture and human consumption of aquatic foods
- industrial use
- livestock watering
- coal washing

[15] http://www.derm.qld.gov.au/environmental_management/land/documents/csg-water-beneficial-use-approval.pdf

The decision tree in Figure 7 shows the process for determining the most appropriate beneficial use or disposal option for the CSG water

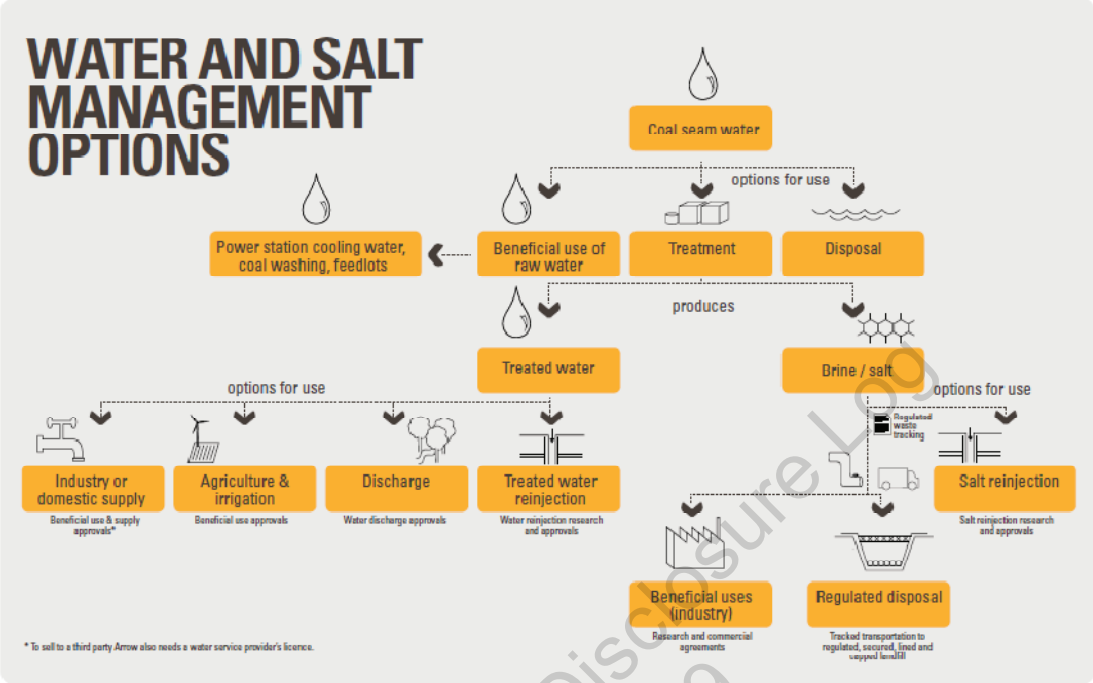


Figure 7: Decision tree for determining beneficial use or disposal options[16].

Arrow currently supplies water beneficial use and these are shown in Table 7:

Table 7: Water Supply Licences

Off-take	Water Supply Licence				
	Required	Status	Volume	Purpose	Expiry Date
Braemar 2 Power Station	Yes	Granted	548	Industrial	2/07/2014
Braemar 1 Power Station	Yes	Granted	400	Industrial	31/03/2014
Dalby	Yes	Granted	1825	Urban	31/03/2014
Grassdale Feedlot Lot 26 SP216719	Yes	Granted	1095	Stock Intensive	28/02/2012
Lot 122, SP204689	Yes	Granted	10	Stock/Stock Intensive	9/07/2011
Lot 3, RP99604	Yes	Granted	36	Stock/Stock Intensive	9/07/2011

Additionally, a beneficial use licence (ENBU01696710/350670) has recently been granted for Arrow's Theten property (Table 8). It will receive treated water (SAR

[16] http://www.arrowenergy.com.au/icms_docs/73090_Water_and_salt_management_brochure.pdf

amended) from the Daandine water treatment facility at an average of 10ML/day. This is scheduled to commence in the latter stages of 2011. Further investigations are currently underway for future beneficial use approvals in the Tipton West area, coinciding with the Tipton water treatment facility becoming available.

Table 8: BU Approvals/Applications

Supplying	Licence required	From	Status	Capacity (ML/yr)	Details
Theten	Yes	Daandine WTF	Approved – not yet operational	3656	Scheduled to be operational Sept 2011
Glenelg	Yes	Tipton WTF	Proposed – under investigation	TBA	To be competed Q4 2011
Broadwater	Yes	Tipton WTF	Proposed – under investigation	TBA	To be competed Q1 2012

Figure 8 shows the current Surat Basin Assets water disposal profile in comparison to the proposed off-takes that are being developed for the beneficial use scheme. It clearly reveals the diminishing reliance on evaporation to maintain the site's water balance[17].

[17] The proposed water disposal profile has assumed full utilisation of all CSG water produced.

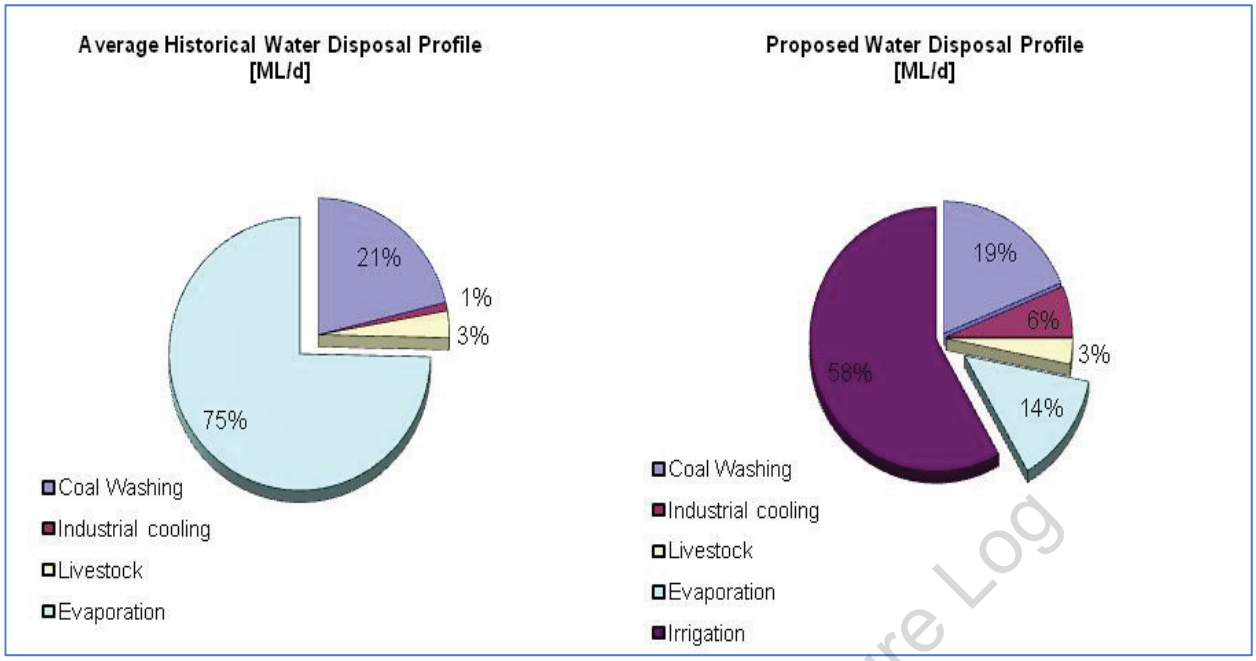


Figure 8 Surat Basin Water Disposal Profile

7.5. INVESTIGATIONS INTO CSG WATER MANAGEMENT

Arrow is currently undertaking the following investigations to further develop options for management of CSG water:

7.5.1. Injection feasibility study

The Aquifer Injection Feasibility Study will investigate injection potential for specific areas and will not focus on other possible water management options including substitution (virtual injection), beneficial uses etc for these areas. However Arrow is considering the feasibility of all water management options.

Arrow Energy is currently undertaking an aquifer injection feasibility study as part of a risk managed portfolio of CSG water options for the Bowen Basin.

The study will involve:

- A review of technical water characteristics and basin properties (both geophysical and chemical);
- Identification of target aquifers and estimation of injectibility and containment;

- Quantification of predicted water generation volumes and water quality;
- Data gap analysis (including literature review);
- Generation of an initial static model (identifying all geological formations);
- Environmental risk assessment activities with respect to identified water quality and geological formation characteristics;
- Assessment of non technical risks and issues (including approvals implications, stakeholder management, land access and cost implications)

Currently, a specifically designed well has been drilled at Glenelg for the injection of treated water from the Glenelg RO plant. It has been completed to target data collection in the Precipice Sandstone and future completion as an injection well, subject to application and grant of the appropriate approvals.

Further to the scoping study and depending on the outcomes, Arrow will undertake a data acquisition program to increase certainty around the feasibility of the aquifer injection which may include drilling (core, log), well testing, seismic and possibly injection/production tests.

The aquifer injection investigation will be undertaken in conjunction with Arrow's groundwater monitoring and modelling program. Arrow is also committed to work in close relationship with the other CSG proponents and in conjunction with interested government agencies.

A targeted water injection specialist role has been created and filled within Arrow to manage the injection investigation and implementation process.

7.5.2. Theten irrigation project (irrigation with treated CSG Water)

The primary objective is to establish the feasibility of utilising treated CSG water for irrigation purposes.

- The trail will be located in an area approximately 21 km west of Dalby covering an area of approximately 1334 Hectares.

- Beneficial Use licence approved with a capacity of 10ML/day, sourced from the Daandine waste treatment facility.
- Infrastructure (such as irrigation equipment and a treated water amendment plant), is currently being constructed with expected completion and commencement in late 2011.
- The trial is expected to run for five years.

7.5.3. Glenelg irrigation project (irrigation with treated CSG water)

- The primary objective is to establish the feasibility of utilising treated CSG water for irrigation purposes.
- The trail will be located in an area approximately 30 km south west of Dalby covering an area of approximately 840 Hectares.
- Source water is from Tipton RO plant.
- Investigations currently underway for soil, cropping and infrastructure requirements.
- Beneficial use application submission expected by late 2011 with a five year project duration.

7.5.4. Brine Treatment Studies

Arrow is planning on undertaking salt crystallisation trials early 2012 and is now is undertaking desktop feasibility studies. These feasibility studies include:

- Salt production feasibility study;
- Salt market analysis;
- Brine pipeline feasibility study;
- Desktop assessment of brine injection; and
- Brine evaporation trials (complete).

The salt production feasibility study will inform which technologies will be trailed. Worley Parsons has been engaged to undertake this feasibility study.

Key project details are:

Objective:	Options assessment of engineered salt treatment systems
Deliverables:	Feasibility study report
Timeline:	Practical completion by Christmas 2011
Water Quantity / Quality:	Nominally 10% of water production. Water to potentially be recovered for industrial (power generation) purposes.
Location / area:	Due to the need of waste heat potential sites are at power stations.

The initial findings from this work suggest:

- A brine pipeline is unlikely to be financially competitive compared to other options; and
- Evaporation may provide for some beneficial salt recovery but control will be challenging.

Nonetheless, these two studies will be incorporated into a multi-criteria analysis (MCA) done by Worley Parsons to select a preferred solution. The MCA criteria will be based on a triple bottom line assessment and include weighted factors for financial, social (community) and environment.

It is expected that salt treatment will be considered further to pilot trials and initial key project details include:

Objective:	Assess shortlisted salt treatment systems
Deliverables:	Various reports and sample data
Timeline:	January 2012 to August 2012
Water Quantity / Quality:	Nominally 10% of water production
Location / area:	At supplier's laboratories. Suppliers are overseas including US, Japan and Europe.
Duration:	Approximately 6 months
Authorisation requirements:	Handling and transport of a regulated waste (brine); importation to receiving countries.

The brine injection feasibility study will be undertaken at desktop only. Initial investigations suggest that suitable aquifers are not necessarily in close proximity to Arrow's operations.

The salt management options were chosen to align with DERM's CSG water management policy, 2010, except that the brine injection is lower in priority. The nominal application of brine management options to development / activity, along with key considerations are:

Development / activity	Brine management option
Exploration	As noted in the water management plan, exploration will result in the production of CSG water which will be transferred to major dams. Salt would therefore be managed through operations.
Operations	There is scope to store large quantities of salt at Arrow's operations. As noted in the water management plan, the strategy is to concentrate and store salt. If a salt processing facility is deemed practical, Arrow aims to recover this salt through the facility. Arrow aims to minimise salt waste until the salt management strategy is clear.

The brine quality is a key determinate for the type of salts that can be recovered. For salts to precipitate, the TDS must be elevated to above 200,000 mg/L. The type of salt recovered is dictated by the concentrations of constituent ions. The split between sodium chloride and sodium carbonate in CSG water is therefore important for determining which salt dominates the recovered salt. Sodium carbonate is around 4 – 6 times more valuable than sodium chloride. The investigation into the quantity and types of salts recovered is part of the feasibility study currently underway.

7.6. RECEIVING ENVIRONMENT

The receiving environment, relevant to each CSG water management activity in the Surat Basin, will be documented in the associated approval applications and management plans that are generated under specific conditions of the respective approvals (e.g. EAs, discharges approved under the EA, BUs and recycled water management plans).

7.7. CONTROL MEASURES AND PROCEDURES

Arrow has clearly defined environmental management responsibilities as required under relevant approvals (including EAs and BU approvals) that govern the undertaking of petroleum activities on Arrow tenures.

As part of these environmental management responsibilities, Arrow implements a range of control measures and procedures, which include (but are not limited to) the following:

7.7.1. CONTROL MEASURES

Aggregation and Storage

Key control measures include:

- All wells have the ability to be 'shut in' to cease water flow if required;
- All aggregation gathering systems are designed, constructed and tested to industry standard as a minimum;
- Gathering systems are frequently monitored and automated process control allows for prompt identification of any imminent issue;
- Storage dams will be engineered and constructed to a standard that meets all legislative and EA requirements. All dams will be inclusive of leak detection systems and monitoring programs (as described in each specific dam operating plans) to enable early detection of seepage and promptly action.

Treatment

Any water treatment facility constructed and operated by Arrow will incorporate best practice design and process controls. This will include:

- civil structures that will not allow any spill or contaminant to be released from the water treatment bunded areas;
- process controls that will trigger level shutdown and/or diversions for out of specification water quality; and
- sufficient number of process monitoring points to enable additional sampling and analysis by third party laboratories This will allow tighter process control, advanced operational analysis/optimisation and troubleshooting;
- development of standard operating procedures (SOP) to ensure safe and robust procedures are standardised to reduce risk of operating error; and

- regular monitoring to assess functionality and performance.

Use/Disposal

Arrow will comply with all requirements specified in BU and EA approval conditions as a minimum. All delivery networks and/or equipment will be designed and constructed to industry standards in conjunction with Arrow emergency procedures for any operational incident response and recovery.

7.7.2. PROCEDURES

A range of procedures have been developed by Arrow to prevent or to control the release of a contaminant or waste to the environment. These include:

- 99-H-PR-0010 (5) Incident Reporting Recording and Investigation Procedure;
- 99-H-PR-0016 (1) Chemical Management Procedure;
- 99-V-PR-0018 (1) Waste Management Procedure; and
- 99-V-PR-0019 (1) Water Management Procedure.

In addition, targeted environmental management and control measures, specific to relevant water infrastructure, are described in a range of documents including:

- Dam Operating Plans;
- Standard Operating Procedures for water treatment facilities; and
- Sampling and monitoring plans.

Furthermore, all wells have the ability to be shut in if water flow prevention was required. The dams are also operated and designed to have the capability to contain any contaminant of concern and redirected to supplementary treatment or disposal.

7.8. MONITORING PROGRAMS

7.8.1. GROUNDWATER

Monitoring sufficient for the prediction and early detection of any detrimental impacts on the receiving environment from CSG water management practices includes a Groundwater Monitoring Program and Annual Water Monitoring Report, as per the requirements of the relevant EA.

The groundwater monitoring network will detect any detrimental impacts on the receiving environment resulting from activities regulated by an Environmental Authority or BU through:

- regular monitoring of groundwater quality in the immediate vicinity of regulated dams,
- monitoring of background sites,
- monitoring of dam water quality;
- establishment of site-specific environmental values for the shallow groundwater system;
- development of site-specific trigger values;
- ongoing monitoring of groundwater to identify environmental impacts, and
- implementation of management actions in the event of environmental impact.

The Groundwater Monitoring Program required under the EA includes monitoring bores installed in close proximity to the dam. The exact location of these bores is guided by geotechnical investigations to identify the direction in which in groundwater impact is likely to travel. Background sites are also installed at distances of 500m to 1,500m (where access allows) both up and down gradient of the dams.

Samples are collected to establish background conditions (i.e. un-impacted by regulated activities) prior to commissioning of the dam, and over a 12 month period (from background bores). This data is used to establish what the environmental values (including current and maximum beneficial use) of the shallow groundwater resource area.

Site-specific trigger levels are developed by considering the background groundwater quality, established trigger levels (such as ANZECC water quality criteria), and the potential

impacts of seepage from regulated dams. Ongoing monitoring is then used to identify whether, and to what extent, environmental impacts, with reference to the aforementioned criteria, are occurring. Where unacceptable impacts have occurred, management actions are initiated to remedy these.

7.8.2. SURFACE WATER AND TREATMENT

The surface water monitoring program will detect any detrimental impacts on the receiving environment resulting from water discharge activities regulated by EAs through:

- regular monitoring of dam water quality;
- regular monitoring of treatment performance and process parameters,
- monitoring of any potential receiving waters;
- development of specific trigger values; and
- implementation of management actions in the event of environmental impact.

Arrow is currently undertaking a Surat Basin water characterisation study to establish CSG water quality and to understand any geographical variations associated with the well distribution across the basin. This will facilitate the prediction and any additional management preferences necessary for treatment requirements/optimisation and/or preventative operation to allow for varying water quality. On site monitoring programs are also being developed to monitor chemical parameters and document any seasonal, operational variations.

Baseline data will then be established to create site-specific trigger levels by considering the water quality, treatment parameters and reporting requirements. Ongoing monitoring will then be utilised to identify whether, and to what extent, any environmental or treatment impacts may occur.

7.8.3. REPORTING

If any contaminant levels are identified as having caused, or have the potential to cause environmental harm, this will be reported to DERM as per the EP Act and EA requirements. An annual monitoring report will be developed and made available to the administering authority upon request. Subsequent to the annual submission of the monitoring report, a

review of the procedures, assets and sampling frequencies will be undertaken to ensure all relevant requirements are being met.

7.9. MEASURABLE CRITERIA FOR KEY CSG WATER MANAGEMENT ACTIVITIES

The following table describes measurable criteria for the management of key CSG water infrastructure and processes in the Surat Basin. Criteria described in this table are not exhaustive but provide an indication of the currently anticipated measurable management techniques to be employed by Arrow. These will be further refined and documented through an iterative process as Arrow's development planning progresses and water management requirements are further defined.

Table 9: Measurable Criteria for Key CSG Water Activities

Objectives	Environmental value to be protected	Task / Action	Key Performance Indicators
Transmission of CSG water via pipelines			
• Effective containment of water throughout transmission activities (i.e. from source to point of storage, treatment, usage or disposal)	• Surface and groundwater quality to sustain surrounding agricultural and domestic use, and ecological processes • Soil quality (including structure and chemical properties) of surrounding areas able to support pre existing land use and ecological processes	• Maintain shut in capability of wells • Regular monitoring in accordance with relevant procedures and programs (including groundwater monitoring program, field infrastructure inspections and audits) • Regular maintenance in accordance with set programs and schedules • Effective planning and clearance activities to site flowlines in areas of low impact and in accordance with EA conditions	• Recommendations for any repairs or remediation are closed out appropriately • Any complaints from landholders received with respect to flowline leakage are resolved • No evidence of soil erosion from flowline construction activities • No evidence of weed proliferation from flowline maintenance activities
Storage of untreated and treated **CSG water** in dams			
• Effective storage and containment of CSG water in	• Surface and groundwater quality to sustain	• Regular dam integrity inspections (annually)	• Records indicate regular inspections and maintenance as per

Objectives	Environmental value to be protected	Task / Action	Key Performance Indicators
relevant dams • The quality and quantities of stored water are maintained within relevant approval thresholds	surrounding land for agricultural and domestic uses, and ecological processes • Soil quality of surrounding areas able to support pre existing land use and ecological processes	• Regular monitoring in accordance with relevant procedures and programs (including groundwater monitoring programs) • Maintenance of infrastructure and facilities necessary to effectively contain water and monitor leakage	planned schedules • Where dam levels reach mandatory reporting levels, appropriate actions are implemented within required timeframes (as per relevant EA conditions and dam operating plans) • Recommendations for any repairs or remediation are closed out appropriately
Beneficial use			
• Maximise use of CSG water (generated and treated through petroleum activities) for beneficial use • Undertake BU activities that aim to return water to the source catchment or basin • Water quality and quantities, as specified under relevant BU Approvals, are maintained	• Surface and groundwater quality to sustain surrounding agricultural and domestic uses, and ecological processes • Soil quality of surrounding areas able to support pre existing land use and ecological processes	• Regular monitoring of water quality and quantities in accordance with BU and EA conditions of approval • Regular inspections of BU infrastructure to ensure optimum operability	• Inspection reports indicate compliance with relevant EA and BU approval conditions (including water quality) • Records indicate that all required maintenance has been actioned in a timely manner • Any complaints with respect to BU stakeholders are appropriately actioned
Management and disposal of any wastes (including brine and salt)			
• Waste materials are managed in accordance with relevant hierarchies, legislation and policies • The community is not adversely affected by Arrow's waste generation and management	• Human health and safety • Land use capability, having regard to economic considerations • Surface and ground water quality to sustain surrounding land for agricultural and domestic uses, and ecological processes • Soil quality of	• Relevant control measures to detect leakages of brine from containment dams are regularly inspected and maintained • Storage of Hazardous wastes in is undertaken in accordance with relevant legislation and standards (including AS 1940). • Regular inspections of waste storage and transport infrastructure	• Any complaints with respect to waste management are appropriately actioned • Records indicate that all required maintenance has been actioned in a timely manner • No changes to baseline water quality remains unchanged

Objectives	Environmental value to be protected	Task / Action	Key Performance Indicators
	surrounding areas able to support pre existing land use	are undertaken to ensure optimum operability	

Should any of the above criteria not be met, actions to enable the criteria to be satisfied in future include:

- evaluation (including route cause analysis) of the underlying cause of the criteria not being met;
- implementation of corrective actions to address underlying cause (including engineering solutions and amendments to plans and procedures as required);
- review of relevant procedures, protocols and management plans to determine actions necessary to prevent further non conformance; and
- implementation of training and awareness programs to prevent further non conformance.

7.10. Release Reduction Strategy

Arrow is currently developing a Release Reduction Strategy which will be a continual initiative to realise and execute opportunities to minimise CSG water generated at the surface, maximise reuse and minimise ground disturbance through the establishment of CSG infrastructure. Specific activities that will be addressed by the Strategy include:

- A market analysis study to identify existing and future water management technologies;
- A feasibility assessment of BU opportunities for CSG water;
- On-going review of drilling technologies to minimise water generation; and
- optimisation of existing transport and treatment processes.

8. Dams

All of Arrow's dams (treated, untreated and brine) associated with the management of CSG water will be designed, constructed, operated and authorised in accordance with legislative requirements[18]. This includes completing a hazard assessment for all dams that hold CSG

[18] http://203.210.126.185/dsdweb/v4/apps/web/secure/docs/4382.pdf

water to determine if they are a Low, Significant or High hazard dam in accordance with DERMs *Manual for Assessing Hazard Categories and Hydraulic Performance of Dams*.

Dams that are assessed as being in the low hazard category will be designed and operated in accordance with accepted engineering standards and for dams that are assessed as being in the significant or high hazard category, Arrow will lodge a third party certified *Dam Design Report* to DERM for review prior to construction. Details of significant or high hazard dams will be maintained in Arrow's *Regulated Dam Register*.

Arrow's existing and planned regulated dams are shown in Table 10. Further details regarding these dams are provided in APPENDIX 2 WATER MANAGEMENT INFRASTRUCTURE.

Table 10 Surat Basin Dam Summary

PL	Description	Status	Service
198	Tipton West Evaporation Dam 1	Existing	TW CSG water
198	Tipton West Evaporation Dam 2	Existing	TW CSG water
198	Tipton West Pilot Dam	Existing	TW CSG water
198	Tipton West CGPF Dam 1	Existing	TW CGPF* oily water discharge
198	Tipton West CGPF Dam 2	Existing	TW CGPF oily water discharge
198	Tipton West Brine Dam	Planned	TW RO concentrate
198	Tipton West Feed Water Dam	Planned	TW CSG water
198	Tipton West Treated Water Dam	Planned	TW RO treated water
198	Tipton West Utility Dam	Planned	TW RO cleaning wastewater
230	Kogan North Evaporation Dam	Existing	KN CSG water
230	Daandine Feedwater Dam	Existing	DD CSG water
230	Daandine Brine Storage Dam	Existing	DD RO CS concentrate
230	Daandine Treated Water Dam	Existing	DD RO treated water
230	Daandine CGPF Dam	Existing	DD CGPF oily water discharge
230	Daandine Utility Dam	Existing	DD RO backwash and CIP
252	Stratheden Transfer Dam	Existing	SE CSG water

*Centralised gas processing facility

Arrow has implemented a dam upgrade project (currently being undertaken by specialist consultants) to identify any upgrade requirements for existing regulated dams to comply with current EA conditions and DERM water management guidelines. This will be completed by the 1 October 2011, and will include detailed design plans and recommendations to address any upgrade requirements. In conjunction with ongoing monitoring (Section 7.8), this will ensure all dams on tenure are compliant (within legislated

timeframes), structurally sound and will minimise any potential adverse environmental impacts.

9. APPENDIX 1 PRODUCTION WATER VOLUMES

Table 11 Production Water Volumes

Year	Kogan North (PL194)	Daandine and Stratheden (PL230&PL252)	Tipton West (198)	Total Water Production	Average daily
	(ML)	(ML)	(ML)	(ML)	ML/day
2012	527	1327	1266	3120	8.55
2013	644	1335	1122	3101	8.50
2014	1311	1319	1048	3678	10.08
2015	1148	1181	981	3310	9.07
2016	1043	1040	920	3002	8.23
2017	917	922	854	2693	7.38
2018	828	1201	785	2814	7.71
2019	732	1134	738	2604	7.13
2020	670	1130	726	2526	6.92
2021	628	996	724	2348	6.43
2022	593	837	672	2102	5.76
2023	565	728	623	1916	5.25
2024	526	640	572	1738	4.76
2025	478	577	533	1588	4.35

10. APPENDIX 2 WATER MANAGEMENT INFRASTRUCTURE

Water management infrastructure of relevant Surat Basin tenures

<table>
<tr><th>Tenure</th><th>Water Management Strategy and Infrastructure Characteristics</th></tr>
<tr><td>PL230</td><td>Beneficial use of CSG water will be realised through the treatment of all produced water and use for farm irrigation, industrial use and stock watering. Piping and pumping station infrastructure will be installed to allow for compliance upgrades and/or the decommissioning and rehabilitation of existing evaporation dams.

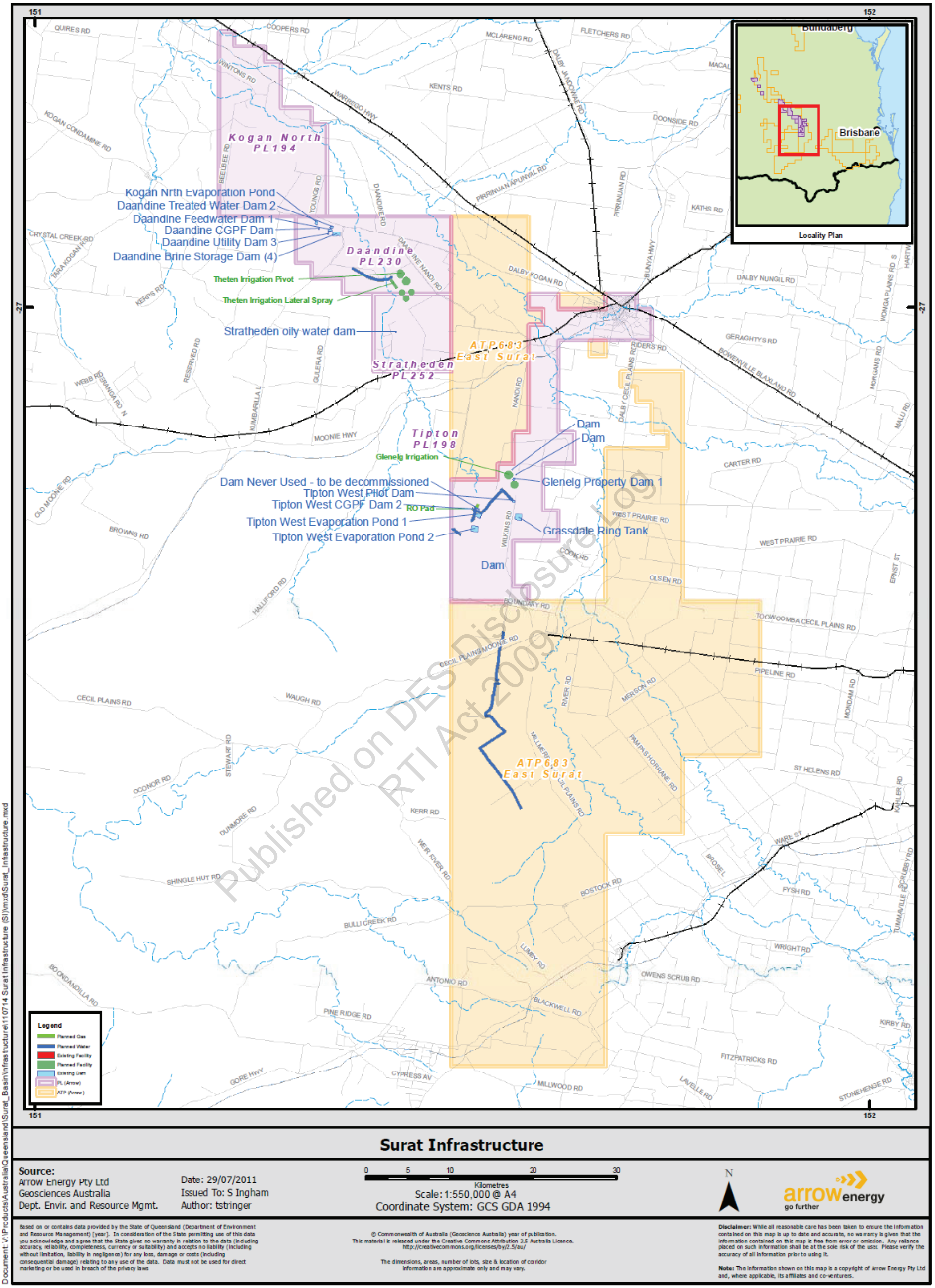
All CSG gas water gathered from PL230, PL252 and PL194 (Kogan North) will be treated at the Daandine water treatment facility and be made available for beneficial reuse.
<table>
<tr><th>Activity</th><th>Size/Capacity</th><th>Status</th><th>Purpose</th><th>Description</th></tr>
<tr><td>Water Treatment Facility</td><td>12ML/day</td><td>Constructed</td><td>Water Treatment</td><td>MF/RO</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Active</td><td>Aggregation</td><td>Kogan North Evaporation Dam</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Active</td><td>Aggregation</td><td>Daandine Feed Water Dam</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Active</td><td>WTF Brine Storage</td><td>Daandine Brine Dam</td></tr>
<tr><td>Regulated Dam</td><td><400ML</td><td>Active</td><td>WTF Product Storage</td><td>Daandine Treated Water Dam</td></tr>
<tr><td>Regulated Dam</td><td>400ML</td><td>Active</td><td>WTF Waste Storage</td><td>Daandine Utility Dam</td></tr>
<tr><td>Regulated Dam</td><td>400ML</td><td>Active</td><td>Condensate Storage</td><td>Daandine CGPF Oily Water Dam</td></tr>
<tr><td>Beneficial Use</td><td>3653ML/yr</td><td>Granted</td><td>Irrigation</td><td>Theten</td></tr>
<tr><td>Water Licences</td><td>548ML/yr</td><td>Granted</td><td>Industrial</td><td>Braemar 2 Power Station</td></tr>
<tr><td>Water Licences</td><td>400ML/yr</td><td>Granted</td><td>Industrial</td><td>Braemar 1 Power Station</td></tr>
<tr><td>Water Licences</td><td>not specified</td><td>Granted</td><td>Stock/Stock intensive</td><td>Wambo Cattle</td></tr>
</table></td></tr>
<tr><td>PL 252</td><td>All CSG water from PL 252 will be gathered and transported to Daandine WTF for treatment and beneficial reuse.
<table>
<tr><th>Activity</th><th>Size/Capacity</th><th>Status</th><th>Purpose</th><th>Description</th></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Granted</td><td>Aggregation</td><td>Stratheden Transfer Dam</td></tr>
<tr><td>Water Licences</td><td>10ML/yr</td><td>Granted</td><td>Stock/Stock Intensive</td><td>Lot 122, SP204689</td></tr>
<tr><td>Water Licences</td><td>36ML/yr</td><td>Granted</td><td>Stock/Stock Intensive</td><td>Lot 3, RP99604</td></tr>
</table></td></tr>
<tr><td>PL 194</td><td>All CSG water from PL 194 is transported to either Peabody Wilkie Creek Mine or Daandine WTF for treatment and beneficial reuse.
<table>
<tr><th>Activity</th><th>Size/Capacity</th><th>Status</th><th>Purpose</th><th>Description</th></tr>
<tr><td>Water Licences</td><td>1500 ML/yr</td><td>Granted</td><td>Industrial</td><td>Peabody Wilkie Creek Mine</td></tr>
</table></td></tr>
</table>

<table>
<tr><th>Tenure</th><th colspan="5">Water Management Strategy and Infrastructure Characteristics</th></tr>
<tr><td>PL198</td><td colspan="5">Beneficial use of CSG water will be realised through the treatment of all produced water and use for farm irrigation and stock watering. An MF/RO facility is currently under construction and will facilitate the treatment and amendment necessary to allow for further use.

Piping and pumping station infrastructure will also be installed to allow for any compliance upgrades and/or decommissioning and rehabilitation of existing evaporation dams. All CSG water gathered from Tipton West PL 198 and Meenawarra PL 258 will be treated at the Tipton water treatment facility and be made available for various beneficial uses.
<table>
<tr><th>Activity</th><th>Size/Capacity</th><th>Status</th><th>Purpose</th><th>Description</th></tr>
<tr><td>Water Treatment Facility</td><td>12ML/day</td><td>Under construction</td><td>Water Treatment</td><td>MF/RO</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Active</td><td>Evaporation</td><td>Tipton West Evaporation Dam 1</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Active</td><td>Evaporation</td><td>Tipton West Evaporation Dam 2</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Under construction</td><td>Aggregation</td><td>Tipton West Feedwater Dam</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Planned</td><td>WTF Product Storage</td><td>Tipton West Treated Water Dam</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Planned</td><td>WTF Brine Storage</td><td>Tipton West Brine Dam</td></tr>
<tr><td>Regulated Dam</td><td><400ML</td><td>Active</td><td>Aggregation</td><td>Tipton West Pilot Dam</td></tr>
<tr><td>Regulated Dam</td><td>400ML</td><td>Active</td><td>Condensate Storage</td><td>Tipton West CGPF Dam</td></tr>
<tr><td>Regulated Dam</td><td>400ML</td><td>Active</td><td>WTF Waste Storage</td><td>Tipton Utility Dam</td></tr>
<tr><td>Water Licences</td><td>1095ML/yr</td><td>Granted</td><td>Stock/Stock intensive</td><td>Mort & Co</td></tr>
</table></td></tr>
<tr><td>ATP 683</td><td colspan="5">Water produced from each pilot well will be aggregated and stored in a CSG water aggregation dam designed and constructed in accordance with the relevant legislation and guidelines. The dams will not be connected to any other water management infrastructure during the exploration/appraisal phase of field development.

If the pilots are deemed viable, Arrow will integrate the aggregation dams into the Tipton West treatment facilities. Alternatively, if in the event that any of the pilots are deemed not viable, Arrow will decommission and rehabilitate the dam area as per Arrow's decommissioning and rehabilitation plan which will accompany the specific dam operating plan.
<table>
<tr><td>Activity</td><td>Size/Capacity</td><td>Status</td><td>Purpose</td><td>Description</td></tr>
<tr><td>Regulated Dam</td><td>>400ML</td><td>Active</td><td>Aggregation</td><td>Hillview Pilot Dam</td></tr>
</table></td></tr>
</table>

ARROW ENERGY



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Surat Infrastructure

Source:
Arrow Energy Pty Ltd
Geosciences Australia
Dept. Envir. and Resource Mgmt.

Date: 29/07/2011
Issued To: S Ingham
Author: tstringer

0 5 10 20 30
Kilometres
Scale: 1:550,000 @ A4
Coordinate System: GCS GDA 1994

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arrow energy
go further

NOT FOR CONSTRUCTION

Figure 8: Surat Basin CSG Water Infrastructure

11. APPENDIX 3 WATER QUALITY FEED WATER

Sample Information		Units	LOR	Average Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed
	Sampling Date				11/04/2011	13/04/2011	11/04/2011	11/04/2011	13/04/2011	15/04/2011	15/04/2011
Water Chemistry	Temperature	°C	0.1	24.8				23.2	23.4		27.7
	Turbidity	NTU	0.1	244				-	-		243.7
	Dissolved oxygen	ppm	0.1	6.3				3.41	7.22		8.29
	Electrical conductivity	µS	0.01	12270				12250	12270		12290
	pH - Field	pH	-	9.7				9.67	9.78		9.66
Metals	Aluminium-Total	µg/L	10	300	380	-	-	440	330	-	130
	Antimony-Total	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Arsenic-Total	µg/L	1	15	17	-	-	17	20	-	9
	Barium-Total	µg/L	1	1233	1200	-	-	1200	1200	-	1300
	Beryllium-Total	µg/L	0.5	<0.5	<0.5	-	-	<0.5	<0.5	-	<0.5
	Bismuth-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Boron-Total	µg/L	5	550	530	-	-	540	550	-	560
	Bromine-Total*	µg/L	10	10567	15000	-	-	15000	15000	-	1700
	Cadmium-Total	µg/L	0.1	<0.1	<0.1	-	-	<0.1	<0.1	-	<0.1
	Cerium-Total*	µg/L	1	1.6	1.5	-	-	1.6	1.5	-	<1
	Caesium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Chromium-Total	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Cobalt-Total	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Copper-Total	µg/L	1	48	64	-	-	41	54	-	<1
	Dysprosium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Erbium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Europium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Gadolinium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Gallium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Germanium-Total*	µg/L	0.05	2.7	<0.05	-	-	<0.05	<0.05	-	2.7
	Gold*-Total	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Hafnium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Holmium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Indium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Iodine-Total*	µg/L	10	573	520	-	-	530	530	-	660
	Iridium-Total*	µg/L	10	<10	<10	-	-	<10	<10	-	<1
	Iron-Total	µg/L	10	173	230	-	-	240	190	-	89
	Lanthanum-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Lead-Total	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Lithium-Total	µg/L	1	113	100	-	-	100	100	-	140

Sample Information		Units	LOR	Average Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed
	Lutetium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Manganese-Total	µg/L	5	<5	<5	-	-	<5	<5	-	<5
	Mercury-Total	µg/L	0.1	0.3	0.4	-	-	0.4	0.2	-	<0.1
	Molybdenum-Total	µg/L	1	2.0	2	-	-	2	2	-	<1
	Neodymium-Total*	µg/L	1	1.3	1.3	-	-	1.3	1.2	-	<1
	Nickel-Total	µg/L	1	3	3	-	-	3	2	-	<1
	Osmium-Total*	µg/L	0.5	1.6	1	-	-	1	1	-	2.8
	Niobium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Palladium-Total*	µg/L	1	7.7	7.2	-	-	7.5	6.5	-	9
	Platinum-Total*	µg/L	5	<5	<5	-	-	<5	<5	-	<1
	Praseodymium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Rhenium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Rhodium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Rubidium-Total*	µg/L	1	11	11	-	-	12	11	-	11
	Ruthenium-Total*	µg/L	1	6	7	-	-	6	6	-	<1
	Samarium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Scandium-Total*	µg/L	1	6	7	-	-	6	6	-	<1
	Selenium-Total	µg/L	1	40	38	-	-	42	38	-	<1
	Silver-Total	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Strontium-Total*	µg/L	1	3533	3500	-	-	3500	3500	-	3600
	Tantalum-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Tellurium-Total*	µg/L	0.5	0.6	<0.5	-	-	0.6	0.5	-	<0.5
	Terbium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Thallium-Total	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Thorium-Total*	µg/L	0.5	<0.5	<0.5	-	-	<0.5	<0.5	-	<0.5
	Thulium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Tin-Total	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Titanium-Total*	µg/L	1	14	16	-	-	14	13	-	<1
	Tungsten-Total*	µg/L	1	1.1	<1	-	-	1.1	<1	-	<1
	Uranium-Total	µg/L	0.5	1	1	-	-	1	1	-	<0.5
	Vanadium-Total	µg/L	1	5.5	5	-	-	5	6	-	<1
	Ytterbium-Total*	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Yttrium-Total*	µg/L	1	1.7	1.6	-	-	1.7	1.6	-	<1
	Zinc-Total	µg/L	1	4.0	<1	-	-	<1	4	-	<1
	Zirconium-Total*	µg/L	1	1.9	1.6	-	-	1.8	1.5	-	2.4
Ion Balance	Calcium - Dissolved	mg/L	0.5	6.5	-	[NT]	-	6.7	6.4	[NT]	6.4
	Potassium - Dissolved	mg/L	0.5	13	-	[NT]	-	12	16	[NT]	9.7
	Sodium - Dissolved	mg/L	0.5	3433	-	[NT]	-	3500	3500	[NT]	3300
	Magnesium - Dissolved	mg/L	0.5	10	-	[NT]	-	11	10	[NT]	10
	Hydroxide Alkalinity (OH-) as CaCO3	mg/L	1	<1	-	<1	-	<1	<1	<1	<1
	Bicarbonate Alkalinity as CaCO3	mg/L	1	988	-	990	-	1000	1000	980	970

Sample Information		Units	LOR	Average Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed
	Carbonate Alkalinity as CaCO3	mg/L	1	916	-	910	-	910	920	920	920
	Total Alkalinity as CaCO3	mg/L	1	1900	-	1900	-	1900	1900	1900	1900
Ion Balance	Sulphate, SO4	mg/L	1	1.5	-	[NT]	-	<1	1	[NT]	2
	Chloride, Cl	mg/L	1	4567	-	[NT]	-	3300	3300	[NT]	7100
	Ionic Balance	%		-2.8	-	-	-	8	7.6	-	-24
Misc. Inorganics	Fluoride, F	mg/L	0.1	2.9	-	3.1	2.7	2.7	3.2	-	2.9
	Nitrate as N in water	mg/L	0.005	0.007	-	[NT]	0.007	0.007	<0.005	-	0.007
	Total Cyanide	mg/L	0.004	<1	-	-	-	-	-	-	<0.004
PAH	Naphthalene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Acenaphthylene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Acenaphthene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Fluorene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Phenanthrene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Anthracene	µg/L	1	<1	-	-	-	<1	<1	-	<1
PAH	Fluoranthene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Pyrene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Benz(a)anthracene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Chrysene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Benzo(b+k)fluoranthene	µg/L	2	<2	-	-	-	<2	<2	-	<2
	Benzo(a)pyrene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Indeno(1.2.3.cd)pyrene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Dibenz(a.h)anthracene	µg/L	1	<1	-	-	-	<1	<1	-	<1
	Benzo(g.h.i)perylene	µg/L	1	<1	-	-	-	<1	<1	-	<1
BTEX	Benzene	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Toluene	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	Ethylbenzene	µg/L	1	<1	<1	-	-	<1	<1	-	<1
	meta- & para-Xylene	µg/L	2	<2	<2	-	-	<2	<2	-	<2
	ortho-Xylene	µg/L	1	<1	<1	-	-	<1	<1	-	<1
TRH	C6 - C9 Fraction	µg/L	10	<10	<10	-	-	<10	<10	-	<10
	C10 - C14 Fraction	µg/L	50	70	-	-	-	<50	57	-	82
	C15 - C28 Fraction	µg/L	100	170	-	-	-	<100	<100	-	170
	C29 - C36 Fraction	µg/L	100	<100	-	-	-	<100	<100	-	<100
Phenols	Phenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	2-Chlorophenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	2-Methylphenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	3/4-Methylphenol	µg/L	20	<20	-	-	-	<20	<20	-	<20
	2-Nitrophenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	2,4-Dimethylphenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	2,4-Dichlorophenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	2,6-Dichlorophenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	2,4,5-Trichlorophenol	µg/L	10	<10	-	-	-	<10	<10	-	<10

Sample Information		Units	LOR	Average Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed	Daandine Untreated RO Feed
	2,4,6-Trichlorophenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	2,4-Dinitrophenol	µg/L	100	<100	-	-	-	<100	<100	-	<100
	4-Nitrophenol	µg/L	100	<100	-	-	-	<100	<100	-	<100
	2,3,4,6-Tetrachlorophenol	µg/L	10	<10	-	-	-	<10	<10	-	<10
	2-methyl-4,6-dinitrophenol	µg/L	100	<100	-	-	-	<100	<100	-	<100
	Pentachlorophenol	µg/L	100	<100	-	-	-	<100	<100	-	<100
	Bisphenol A*	µg/L	100	<100	-	-	-	<100	<100	-	<100
	Nonylphenol*	µg/L	100	<100	-	-	-	<100	<100	-	<100
Raidoactive Analysis	Radium-226	mBq/L	5	19	-	-	-	-	-	-	-
	Radium-228	mBq/L	10	87	-	-	-	-	-	-	-

Radiological

ADWG is based on total radiological at < 0.5 Bq/L

Radium contributes the bulk of radiological measures.

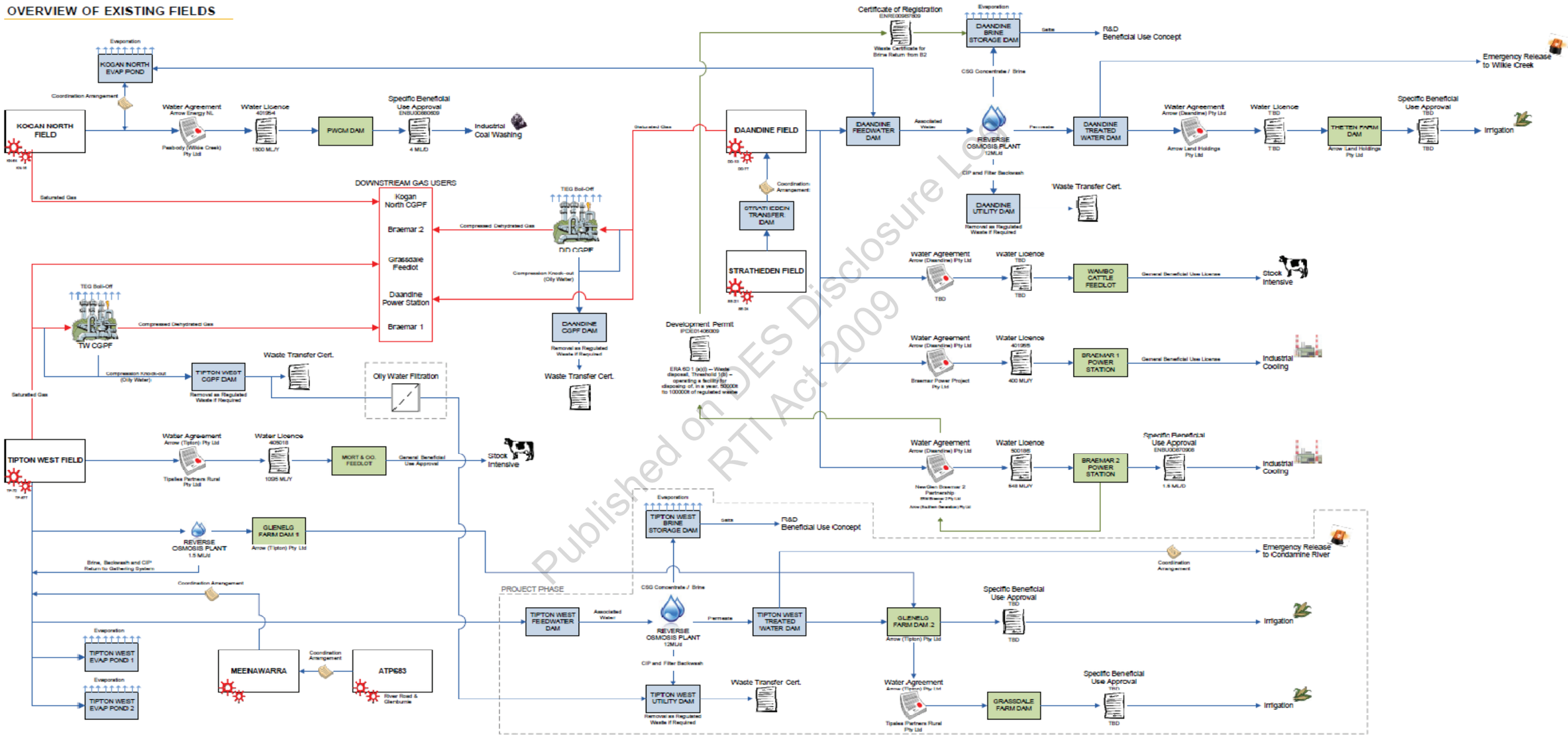
OWSR dictates a mass exposure - calc as per ADWG.

APPENDIX 4 ASSET SOUTH WATER OPERATIONS SUMMARY

ASSET SOUTH WATER OPERATIONS SUMMARY

arrow energy go further

OVERVIEW OF EXISTING FIELDS



Joanne Kerr

From: Naylor Gillian
Sent: Wednesday, 9 January 2013 4:55 PM
To: sch4p4(6) Personal in sch4p4(6) arrowenergy.com.au> (sch4p4(@arrowenergy.com.au)
Cc: Young Jenny
Subject: FW: Amendment application for PEN100449509 (DXP) - Proposed brine dam on PL230
Attachments: PN and EIS Notices - DXP Amendment_090113.pdf; is-bi-internal-rev-appeal-land-court-em1157.pdf

Sorry – here are the attachments

Gillian Naylor
Principal Environmental Officer, Energy Assessments
Environmental Services and Regulation Division

Department of Environment and Heritage Protection

Phone 07 3330 5620 | **Fax** 07 3330 5634
Email gillian.naylor@ehp.qld.gov.au | **Website** http://www.ehp.qld.gov.au

Please consider the environment before printing this email.

From: Naylor Gillian
Sent: Wednesday, 9 January 2013 4:54 PM
To: sch4p4(6) Personal in sch4p4(@arrowenergy.com.au> sch4p4(6) arrowenergy.com.au)
Cc: Young Jenny
Subject: Amendment application for PEN100449509 (DXP) - Proposed brine dam on PL230

Hi sch4p

With respect to the above application, please find attached:

- Scan of the decision notice stating that no EIS is required for the application;
- Scan of the decision notice stating that no public notification is required for the application; and
- Information regarding your right to seek the internal review and/or appeal of these decisions.

The original notices will be sent in the mail in the near future.

Please note that the decision date for the application is 7 February 2013.

Kind regards,

Gillian Naylor
Principal Environmental Officer, Energy Assessments
Environmental Services and Regulation Division

Department of Environment and Heritage Protection

Phone 07 3330 5620 | **Fax** 07 3330 5634
Email gillian.naylor@ehp.qld.gov.au | **Website** http://www.ehp.qld.gov.au

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Information sheet

Environmental Protection Act 1994

Internal review and appeal to Land Court

This information sheet forms part of an information notice under the Environmental Protection Act 1994. *It gives a summary of the process for review and appeal under the Environmental Protection Act and subordinate legislation. Refer to ss. 519 to 530 and Part 1 of Schedule 2 of the Environmental Protection Act for complete information about the process for internal review and appeal to the Land Court.*

Introduction

The *Environmental Protection Act 1994* (EP Act) provides for a right of internal review of certain decisions made under the EP Act. Decisions that can be reviewed are listed in Schedule 2 of the EP Act. The EP Act also provides that a dissatisfied person for a review decision listed in Part 1 of Schedule 2 of the EP Act may appeal against the original decision or the review decision to the Land Court.

Summary of the process for internal review and appeal to the Land Court

Chapter 11, Part 3 of the EP Act

Division 1—Interpretation

Section 519 Original decisions

1) A decision mentioned in schedule 2 is an 'original decision'.
2) A decision under an environmental protection policy or regulation that the policy or regulation declares to be a decision to which this part applies is also an original decision.

Section 520 Dissatisfied person

This section nominates the dissatisfied person for an original or review decision.

Division 2—Internal review of decisions

Section 521 Procedure for review

1) A dissatisfied person may apply for a review of an original decision.
2) The application must—
   a) be made in the approved form to the administering authority within—
      i) 10 business days[1] after the day on which the person receives notice of the original decision or the administering authority is taken to have made the decision (the 'review date'); or
      ii) the longer period the authority in special circumstances allows; and
   b) be supported by enough information to enable the authority to decide the application.
3) On or before making the application, the applicant must send the following documents to the other persons who were given notice of the original decision—
   a) notice of the application (the 'review notice');

b) a copy of the application and supporting documents.

4) The review notice must inform the recipient that submission on the application may be made to the administering authority within 5 business days after the application is made to the authority.

5) If the administering authority is satisfied the applicant has complied with subsections (2) and (3), the authority must, within 10 business days after receiving the application—

a) review the original decision;

b) consider any submissions properly made by a recipient of the review notice; and

c) make a decision (the 'review decision') to—

i) confirm or revoke the original decision; or

ii) vary the original decision in a way the administering authority considers appropriate.

6) The application does not stay (i.e. suspend or stop) the original decision.

7) The application must not be dealt with by—

a) the person who made the original decision; or

b) a person in a less senior office than the person who made the original decision.

8) Within 10 business days after making the review decision, the administering authority must give written notice of the decision to the applicant and persons who were given notice of the original decision.

9) The notice must—

a) include the reasons for the review decision; and

b) inform the person of their right of appeal against the decision.

10) If the administering authority does not comply with subsection (5) or (8), the authority is taken to have made a decision confirming the original decision.

11) Subsection (7) applies despite the *Acts Interpretation Act 1954*, s. 27A.

12) This section does not apply to an original decision made by—

a) for a matter, the administration and enforcement of which has been devolved to a local government—the local government itself or the chief executive officer of the local government personally; or

b) for another matter—the chief executive personally.

13) Also, this section does not apply to an original decision to issue a clean-up notice.

Section 522 Stay of operation of particular original decisions

1) If an application is made for review of an original decision mentioned in schedule 2, part 1 or 2, the applicant may immediately apply for a stay of the decision to—

a) for an original decision mentioned in schedule 2, part 1—the Land Court; or

b) for an original decision mentioned in schedule 2, part 2—the Court.

2) The Land Court or the Court may stay the decision to secure the effectiveness of the review and any later appeal to the Land Court or the Court.

3) A stay may be given on conditions the Land Court or the Court considers appropriate and has effect for the period stated by the Land Court or the Court.

4) The period of a stay must not extend past the time when the administering authority reviews the decision and any later period the Land Court or the Court allows the applicant to enable the applicant to appeal against the review decision.

Division 3—Appeals

Subdivision 1—Appeals to Land Court

Section 523 Review decisions subject to Land Court appeal

This subdivision applies to original decisions mentioned in Schedule 2, Part 1 of the EP Act.

Section 524 Right of appeal

A dissatisfied person who is dissatisfied with the decision may appeal against the decision to the Land Court.

Section 525 Appeal period

1) The appeal must be started within 22 business days after the appellant receives notice of the decision.

2) However, the Land Court may at any time extend the time for starting the appeal.

Section 526 Land Court mediation

1) Any party to the appeal may, at any time before the appeal is decided, ask the Land Court to conduct or provide mediation for the appeal.

2) The mediation must be conducted by the Land Court or a mediator chosen by the Land Court[2].

Section 527 Nature of appeal

The appeal is by way of rehearing, unaffected by the review decision.

Section 528 Land Court's powers for appeal

In deciding the appeal, the Land Court has the same powers as the administering authority.

Section 529 Decision for appeals against refusals under s. 207

1) This section applies if the decision appealed against is a decision under s. 207 to refuse to allow an application for environmental authority (mining lease) to proceed.

2) In deciding the appeal the Land Court must confirm the decision or allow the appeal.

3) If the appeal is allowed—

   a) the relevant period for the administering authority to make the decision is taken to have been extended to when the decision on the appeal is made; and

   b) the authority is taken, at the end of the period, not to have made the decision.

Section 530 Decision for other appeals

1) This section applies if the decision appealed against is not a decision mentioned in s. 529(1).

2) In deciding the appeal, the Land Court may—

   a) confirm the decision;

   b) set aside the decision and substitute another decision; or

c) set aside the decision and return the matter to the administering authority who made the decision, with directions the Land Court considers appropriate.

3) In setting aside or substituting the decision, the Land Court has the same powers as the authority.

4) However, this part does not apply to a power exercised under subsection (3).

5) If the Land Court substitutes another decision, the substituted decision is taken for this Act, other than this subdivision, to be the authority's decision.

---

[1] Under the *Environmental Protection Act 1994* business days—'generally, does not include a day between 26 December and 1 January in the following year'.

[2] For information on how to start the appeal, see the *Land and Court Rules 2000*. For information on the conduct of the mediation, see the *Land Court Act 2000*. Information is also available on the Land Court website at <www.landcourt.qld.gov.au>.

Notice

Environmental Protection Act

EIS requirement for an application for amendment of environmental authority (Chapter 5A activities)

This notice is issued by the administering authority pursuant to section 310V(4) of the Environmental Protection Act 1994, *to advise you of a decision made in relation to the EIS requirement for an application for the amendment of an environmental authority (Chapter 5A activities).*

Arrow Energy Pty Ltd
'AM-60' Level 19
42-60 Albert Street
BRISBANE QLD 4000
GPO Box 5262
BRISBANE QLD 4001

Your reference : PEN100449509 / PL194, PL198, PL230, PL238, PL252, PL258, PL260
Our reference : BNE 43018 / 343728

Attention: sch4p4(6) Personal infor

Re: Application to amend a level 1 environmental authority (chapter 5A activities) number PEN100449509 by Arrow Energy Pty Ltd for Petroleum Leases (PL) 194, 198, 230, 238, 252, 258 and 260 received on 13 December 2012.

This notice is in relation to the amendment application for "Daandine Brine Dam" received by the Department of Environment and Heritage Protection (EHP) on 13 December 2012.

Please be advised that, pursuant to section 310V(1) of the *Environmental Protection Act 1994* (EP Act), EHP has decided that an Environmental Impact Statement (EIS) is not required regarding the above mentioned application.

The administering authority gives notice relating to this application to all the applicants by giving it to the principal applicant.

If you have any questions in relation to this notice please contact Gillian Naylor on telephone (07) 3330 5620.

Department of Environment and Heritage Protection
www.ehp.qld.gov.au ABN 46 640 294 485

EIS requirement for an application for amendment of environmental authority (chapter 5A activities)

sch4p4(6) Personal informatio

Signature

9/1/2013

Date

John Frankish
Delegate of Administering Authority
Environmental Protection Act 1994
Department of Environment and Heritage Protection

Enquiries:
Energy Assessments Unit
Department of Environment and Heritage Protection
Floor 7, 400 George Street
BRISBANE QLD 4000
GPO Box 2454
BRISBANE QLD 4001
Phone: (07) 3330 5620
Fax: (07) 3330 5634

Notice

Environmental Protection Act

Public notice requirement for an application for amendment of environmental authority (Chapter 5A activities)

This notice is issued by the administering authority in relation to section 310W(2) of the Environmental Protection Act 1994, *to advise you of a decision made in relation to the Public Notice requirement for an application for the amendment of an environmental authority (Chapter 5A activities).*

Arrow Energy Pty Ltd
'AM-60' Level 19
42-60 Albert Street
BRISBANE QLD 4000
GPO Box 5262
BRISBANE QLD 4001

Your reference : PEN100449509 / PL194, PL198, PL230, PL238, PL252, PL258, PL260
Our reference : BNE 43018 / 343728

Attention: sch4p4(6) Personal infor

Re: Application to amend a level 1 environmental authority (chapter 5A activities) number PEN100449509 by Arrow Energy Pty Ltd for Petroleum Leases (PL) 194, 198, 230, 238, 252, 258 and 260 received on 13 December 2012.

This notice is in relation to the amendment application for "Daandine Brine Dam" received by the Department of Environment and Heritage Protection (EHP) on 13 December 2012.

Please be advised that, in relation to section 310W(2) of the *Environmental Protection Act 1994* (EP Act), EHP has decided that a Public Notice is not required regarding the above mentioned application.

The reason for this decision is that the administering authority is satisfied that there is not likely to be a substantial increase in the risk of environmental harm under the amended environmental authority because of substantial change in:

- the quantity or quality of contaminant authorised to be released into the environment; or
- the results of the release of a quantity or quality of contaminant authorised to be released into the environment.

Public notice requirement for an application for amendment of environmental authority (chapter 5A activities)

If you have any questions in relation to this notice please contact Gillian Naylor on telephone (07) 3330 5620.

sch4p4(6) Personal informatio

Signature

9/1/13

Date

John Frankish
Delegate of Administering Authority
Environmental Protection Act 1994
Department of Environment and Heritage Protection

Enquiries:
Energy Assessments Unit
Department of Environment and Heritage Protection
Floor 7, 400 George Street
BRISBANE QLD 4000
GPO Box 2454
BRISBANE QLD 4001
Phone: (07) 3330 5620
Fax: (07) 3330 5634

Request for Statutory Approval
RSA No.

EIS REQUIREMENT FOR AN AMENDMENT APPLICATION FOR A LEVEL 1 ENVIRONMENTAL AUTHORITY (CHAPTER 5A ACTIVITIES) – SECTION 310V OF THE *ENVIRONMENTAL PROTECTION ACT 1994*

PRINCIPAL HOLDER:	**Arrow Energy Pty Ltd**
REGISTERED BUSINESS ADDRESS:	'AM-60', Level 19, 42-60 Albert Street Brisbane QLD 4000
POSTAL ADDRESSS:	GPO Box 5262 Brisbane QLD 4001
JOINT HOLDERS:	Arrow CSG (Australia) Pty Ltd Australian CBM Pty Ltd Arrow (Tipton) Pty Ltd Arrow (Tipton Two) Pty Ltd Arrow (Daandine) Pty Ltd Stanwell Corporation Limited
PROJECT:	Arrow Energy Dalby Expansion Project (DXP)
TENEMENT/S:	Petroleum Leases (PL) 194, 198, 230, 238, 252, 258 and 260
ENVIRONMENTAL AUTHORITY NO.:	PEN100449509
FILE NO.:	BNE43018 v17
PROJECT NO:	343728
APPLICATION RECEIVED:	13 December 2012* (*NB: The application was not validated until 18 December 2012. As such, the validation date has been used as the application received date for the purposes of determining the EIS requirement for the application)
APPLICATION DATE:	9 January 2013
EIS DECISION DATE:	9 January 2013

1.0 BACKGROUND

Arrow Energy Pty Ltd ('Arrow') is the principal holder of environmental authority (chapter 5A activities) number PEN100449509 ('the EA') held for the Dalby Expansion Project ('the DXP'), a coal seam gas development project in the Surat Basin.

On 13 December 2012, Arrow lodged an application for the amendment of the EA with the Department of Environment and Heritage Protection ('the department') on behalf of the joint holders of the EA listed above.

The amendment application requests authorisation to construct and operate the 'Daandine Brine Dam' and its associated infrastructure within the primary protection zone of a Category C

environmentally sensitive area (ESA) – a mapped area of a regional ecosystem with an 'of concern' biodiversity status. The construction and operation of infrastructure of this nature in the primary protection zone of a Category C ESA is prohibited in the current EA.

The proposed dam is required to store the brine by-product resulting from the treatment of coal seam gas water in the existing Daandine Water Treatment Facility (WTF). As such, the dam is required to be in close proximity to the Daandine WTF. The supporting material to the application describes 4 sites that were considered by Arrow and provides reasoning for the nomination of the preferred site. The preferred location for the brine dam is within Lot 1 of SP200461 at the intersection of Dalby-Kogan Road and Kumbarilla Lane which the supporting material to the application describes as being a predominantly cleared paddock containing a small stand of scattered regrowth vegetation of *Eucalyptus populnea* and *E. crebra* which is currently used for grazing.

The supporting material to the application describes the proposed activities relating to the construction of the brine dam as follows:

- clearing of an area of approximately 53 ha;
- construction of a high density polyethylene (HDPE) lined dam;
- placing of interconnecting pipe work and transfer lines from the Daandine WTF to the brine dam;
- a spoil area required during both the construction and operational phase of the brine dam;
- stock proof fencing around the perimeter of the brine dam upon completion of construction; and
- installation of up to 5 monitoring bores.

The supporting information also states that no vegetation clearing is required to obtain access to the proposed site as an existing access track is to be utilised.

The supporting material for the application includes the results of desktop assessments and field assessments undertaken for flora and fauna at the preferred location.

Chapter 5A of the *Environmental Protection Act 1994* ('the EP Act') requires the administering authority to make a decision as to whether an environmental impact statement (EIS) is required when assessing an amendment application for a level 1 EA. The following section outlines how the relevant sections of the EP Act have been considered in making the EIS decision.

2.0 STATUTORY REQUIREMENTS

2.1 *Environmental Protection Act 1994*

SECTION 310V – EIS MAY BE REQUIRED

(1) The administering authority may, within the later of the following periods to end, decide whether an EIS is required for the application—

(a) 10 business days after it receives the application;
Noted – see comment below.

(b) if the administering authority, within the 10 business days, gives the applicant written notice that it has fixed a longer period—the longer period.
The application was given an application date of 9 January 2013 as the application was not validated until 18 December 2012 despite being received on 13 December 2012.

(2) However, despite any decision by the administering authority, the Minister may, at any time before the application is decided, decide—

(a) whether there is to be an EIS requirement for the application; and
(b) at what stage, or step within a stage, under this division, the processing of the application must start or resume.

Noted – to date, no advice has been received from the Minister regarding an EIS requirement decision for this application.

(3) The administering authority and the Minister must, in making a decision under this section, consider the standard criteria.
The administering authority has considered the standard criteria as set out in Schedule 4 of the EP Act in making its decision to not require an EIS for this application.

(4) The administering authority must, within 10 business days after a decision is made under this section, give the applicant written notice of the decision.
A written notice of the decision to not require an EIS has been prepared and is attached to this RSA.

(5) Despite subsections (1) and (2), an EIS must not be required for the application if a relevant resource authority for the application is, or is included in, a significant project.
To date, no relevant resource authorities for the application form part of any significant project declared by the Coordinator-General under the *State Development and Public Works Organisation Act 1971*. Arrow's Surat Gas Project, which includes all of the tenements subject to this application, is currently undergoing an EIS process under the EP Act.

(6) Also, a decision under subsection (1) or (2) ceases to have effect if a relevant resource authority for the application is, or is included in, a significant project.
Noted. See comment above.

SCHEDULE 4 – STANDARD CRITERIA

Under Schedule 4 (Definitions) of the EP Act, the standard criteria mean:

(a) the principles of ecologically sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development'; and
The guiding principles of the National Strategy for Ecologically Sustainable Development are:

1. decision making processes should effectively integrate both long and short-term economic, environmental, social and equity considerations;
2. where there are threats of serious or irreversible environmental damage, lack of full scientific certainty should not be used as a reason for postponing measures to prevent environmental degradation;
3. the global dimension of environmental impacts of actions and policies should be recognised and considered;
4. the need to develop a strong, growing and diversified economy which can enhance the capacity for environmental protection should be recognised;
5. the need to maintain and enhance international competitiveness in an environmentally sound manner should be recognised;
6. cost effective and flexible policy instruments should be adopted, such as improved valuation, pricing and incentive mechanisms; and
7. decisions and actions should provide for broad community involvement on issues which affect them.

The National Strategy for EDS states that these principles are to be considered as a package, with no one principle predominating over the others.
The recommendation for the amendment application to not require an EIS has been made in consideration of Queensland's already comprehensive regulatory framework in place to manage the potential and actual impacts (i.e., economic, environmental, social and equity impacts) of the coal seam gas industry. The regulatory framework considers the long-term impacts to environmental values, for example, by requiring impacts to state significant biodiversity values to be offset, and by requiring losses of groundwater water resources to be 'made good' to other groundwater uses, among other requirements. In addition, the *Coal Seam Gas Water Management Policy, June 2010* prescribes recommended CSG water management options (e.g. injection, beneficial uses) over non-recommended options (e.g. evaporation, surface water

disposal) and is required to be considered when making any environmental management decisions relating to coal seam gas EAs.

The extensive baseline and impact monitoring required through typical level 1 EA conditions, including the conditions in the current EA that relate to the construction and operation of any regulated dam, ensure that there is sufficient scientific advice available to help inform the adaptive management framework. When making the final recommendation for the amendment application, the assessing officer will more fully consider the guiding principles of the National Strategy for ESD.

(b) any applicable environmental protection policy; and
There are no relevant environmental protection policies (EPP) to this amendment application.

(c) any applicable Commonwealth, State or local government plans, standards, agreements or requirements; and
The assessing officer will consider all applicable Commonwealth, State or local government plans, standards, agreements or requirements when making its decision on the amendment application.

(d) any applicable environmental impact study, assessment or report; and
The application material includes 3 completed environmental fieldwork sheets for the field surveys undertaken at the preferred location as part of the 'Supporting Information – Ecological Assessment – Daandine Brine Dam, December 2012'. The assessing officer will consider this report when making its recommendation for the amendment application.

(e) the character, resilience and values of the receiving environment; and
The 'Supporting Information – Ecological Assessment – Daandine Brine Dam, December 2012' provides descriptions of the character, resilience and values of the receiving environment. This report has been considered by the assessing officer.

(f) all submissions made by the applicant and submitters; and
To date, no submissions have been received as the application has not been required to undergo a public notification period.

(g) the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows—
(i) an environmental authority;
(ii) a transitional environmental program;
(iii) an environmental protection order;
(iv) a disposal permit;
(v) a development approval; and
If the amendment to the EA for the proposed brine dam is granted, compliance with the conditions in the EA would ensure best practice environmental management for the proposed activities. Additionally, Arrow's environmental policy describes its commitment to best practice environmental management as follows:

- Conduct operations in compliance with all relevant environmental legislation, regulations, licences, permits, standards, approvals and authorities.
- Clearly allocate responsibilities for environmental performance at all levels within Arrow and its business associates and build environmental competency through provision of structured environmental training to its employees, contractors and other service providers.
- Seek continuous improvement in environmental performance through setting objectives and targets for environmental performance, provide sufficient financial and human resources to meet these objectives and targets, apply research and development and cleaner production principles and, where applicable, use environmentally sustainable products and resources.
- Apply best industry practice in the management, supply and delivery of coal seam gas.
- Communicate with the community and customers about commitments to this vision, its application and their view of Arrow's performance.

(h) the financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument; and

The assessing officer will consider the financial implications of conditions eventually included on the EA when making its recommendation for the grant or refusal of the amendment application. The cost implications of the conditions eventually included on the EA are not likely to result in a competitive disadvantage compared to other operators in the CSG industry because 'model conditions' are used as a starting point for all level 1 EAs granted and issued for petroleum activities with a similar level of environmental risk.

(i) the public interest; and

It is in the public interest to have strong environmental regulation of the coal seam gas industry. Whilst a public notification requirement has not been made for the application, the assessing officer will consider the public interest when making its recommendation on the application.

(j) any applicable site management plan; and

A revised EM Plan was not submitted with the amendment application – however the EM Plan submitted with an earlier amendment application was not required to be amended as a result of the proposed changes. The current EM Plan contains a chapter which describes Arrow's Environmental Policy and includes Arrow's various procedures that form part of its overall Environmental Management Procedures in Appendix D:

- Erosion and Topsoil Management Procedure
- Operating Procedure for Sampling Associated Water
- Environment Document Control Procedure
- Aboveground Storage Tanks Procedure
- Competence - Environmental Aspects Procedure
- Development of Environmental Documents Procedure
- Environmental Alert Procedure
- Environmental Corrective Actions Procedure
- Environmental Document Deviation Procedure
- Environmental Regulatory Compliance Procedure
- Office Environmental Aspects Procedure
- Environmental Noise and Vibration Management Procedure
- Land Clearing and Ground Disturbance Procedure
- Rehabilitation Procedure
- Traffic and Transport - Environmental Aspects Procedure
- Visual and Landscape Procedure
- Waste Management Procedure
- Water Management Procedure
- Weed and Pathogen Management Procedure
- Air Emissions Procedure
- Environmental Audit and Inspection Procedure
- Procedure for reporting Methane Gas Releases
- Ecological impact assessment procedure- upstream activities
- Wildlife and Stock Management Procedure
- Fauna Spotter/Catcher Procedure
- Chemical Management Procedure
- Fire Prevention Procedure
- Relocating Wildlife Procedure
- Incident Reporting Recording and Investigation Procedure
- Soil Management Procedure

The EM Plan also provides chapters which detail the existing environment and environmental values, the potential impacts to those environmental values, and the management of potential impacts including control strategies for the following environmental issues:

- Air
- Dams
- Geology, Land and Soils
- Terrestrial Flora and Fauna
- Aquatic Ecology
- Noise
- Waste
- Water
- Social Amenity

The EM Plan also includes a chapter on rehabilitation. The revised EM Plan will be considered by the assessing officer when making its recommendation for the amendment application.

(k) any relevant integrated environmental management system or proposed integrated environmental management system; and

The EM Plan states that Arrow maintains an integrated HSEMS that is based on the principles of ISO14001, Environmental Management Systems – Requirements with Guidance for Use (Standards Australia, 2004) and AS/NZS 4801:2001, Occupational Health and Safety Management Systems – Specifications with Guidance for Use (Standards Australia, 2001). The HSEMS will be considered by the assessing officer when making its recommendations for the amendment application.

(l) any other matter prescribed under a regulation.

The relevant sections of the *Environmental Protection Regulation 2008* were considered when making the EIS decisions as described in a later section of this report.

2.2 ***Environmental Protection Regulation 2008***

Chapter 4 of the Environmental Protection Regulation 2008 ("the EP Reg") provides the mandatory regulatory requirements required to be considered by the administering authority when make an environmental management decision as well as additional regulatory requirements for particular environmental management decisions.

SECTION 51 – MATTERS TO BE CONSIDERED FOR ENVIRONMENTAL MANAGEMENT DECISIONS

(1) The administering authority must, for making an environmental management decision relating to an activity, consider the following matters—

(a) each of the following under any relevant environmental protection policies—
- **(i) the management hierarchy;**
- **(ii) environmental values;**
- **(iii) quality objectives;**
- **(iv) the management intent;**

The management hierarchy, environmental values, quality objectives and management intent of the relevant environmental protection policies will be considered by the assessing officer when making its decision on the amendment application.

(aa) environmental values declared under this regulation;

The amendment application does not relate to any environmental values declared under the EP Reg (i.e., wetlands).

(b) the characteristics of the contaminants or materials released from carrying out the activity;

The amendment application does not propose to release any contaminants or materials to the receiving environment.

(c) the nature and management of, including the use and availability of technology relating to, the processes being, or to be, used in carrying out the activity;

The current conditions in the EA provide details on how regulated dams are to be constructed, managed and monitored.

(d) the impact of the release of contaminants or materials from carrying out the activity on the receiving environment, including the cumulative impact of the release with other known releases of contaminants, materials or wastes;

The amendment application does not propose to release any contaminants or materials to the receiving environment.

(e) the characteristics of the receiving environment and the potential impact on it from carrying out the activity;
The 'Supporting Information – Ecological Assessment – Daandine Brine Dam, December 2012' provides descriptions of the character, resilience and values of the receiving environment. This report has been considered by the assessing officer.

(f) for each affected person for the activity—the order of occupancy or use between the person carrying out the activity and the affected person;
There is unlikely to be any additional affected person for the proposed brine dam that are not already described as 'sensitive receptors' in the current EA.

(g) the remaining capacity of the receiving environment to accept contaminants or wastes released from future activities while protecting environmental values;
N/A – The amendment application does not propose to release any contaminants or materials to the receiving environment.

(h) the quantity and type of greenhouse gases released, and the measures proposed to demonstrate the release is minimised using best practice methods that include strategies for continuous improvement.
There is unlikely to be any additional greenhouse gases released on a permanent basis from the proposed activities other than from the equipment used in the construction and maintenance of the brine dam.

PART 3 – ADDITIONAL REGULATORY REQUIREMENTS FOR PARTICULAR ENVIRONMENTAL MANAGEMENT DECISIONS

Application of pt 3 – If an environmental management decision relates to an activity mentioned in a provision in this part, the administering authority making the decision must comply with the provision in addition to part 2.

The sections in this part have been considered by the administering authority, however it was found that the relevant sections in making a decision whether or not to require an EIS for this application would be sections 55, 56, 63, 64 and 64D of the EP Reg.

SECTION 55 – RELEASE OF WATER OR WASTE TO LAND

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, the release of water or waste to land (*the relevant land*).

Not applicable

SECTION 56 – RELEASE OF WATER, OTHER THAN STORMWATER, TO SURFACE WATER

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, the release of water, other than stormwater, to surface water.

Not applicable.

SECTION 57 – RELEASE OF STORMWATER

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, the release of stormwater to the receiving environment.
The EA already contains conditions designed to manage stormwater release through the requirement of an Erosion and Sediment Control Plan. The current amendment application does

not seek to change any of the conditions relating to the release of stormwater to land. As such, the assessing officer deems that although there may be additional activities likely to increase the area of disturbance subject to rainfalls, the conditions already in the EA are sufficient to not have to consider requirements.

SECTION 58 – RELEASE OF WATER OR WASTE TO WETLANDS FOR TREATMENT

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, the release of water or waste to a wetland for treatment.

Not applicable.

SECTION 59 ACTIVITY INVOLVING BERTHING, DOCKING OR MOORING A BOAT

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, berthing, docking or mooring a boat.

Not applicable.

SECTION 60 – ACTIVITY INVOLVING STORING OR MOVING BULK MATERIAL

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, storing or moving bulk material.
***Examples of bulk material*—alumina, cement, coal, grain, metaliferous ores, quarried materials, woodchips**

Not applicable.

SECTION 61 – ACTIVITY INVOLVING ACID SULFATE SOIL

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, disturbance of acid sulfate soil.

Not applicable.

SECTION 62 – ACTIVITY INVOLVING ACID-PRODUCING ROCK

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, disturbance of acid-producing rock.
***Example of an activity involving disturbance of acid-producing rock*—tailings from processing acid-producing rock in a mining operation**

Not applicable.

SECTION 63 – ACTIVITY INVOLVING DIRECT RELEASE OF WASTE TO GROUNDWATER

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, the release of waste directly to groundwater (the *receiving groundwater*).
***Example of direct release of waste to groundwater*— an activity involving the release of contaminated water to groundwater through a well, deep-well injection or a bore**

Not applicable.

SECTION 64 – ACTIVITY INVOLVING INDIRECT RELEASE OF CONTAMINANTS TO GROUNDWATER

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, the release of contaminants indirectly to groundwater (the *receiving groundwater*).
***Example of indirect release of waste to groundwater*— storage of contaminated water in a pond allowing infiltration of contaminated water to groundwater**

The current EA includes conditions relating to the construction and management of water storages. Where relevant, the assessing officer will consider whether changes to the relevant schedule of conditions in the EA are required when undertaking its assessment of the amendment application.

SECTION 64A – GENERATING WASTE

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, generating waste.

The current EA includes conditions relating to the generation and management of wastes. Where relevant, the assessing officer will consider whether changes to the relevant schedule of conditions in the EA are required when undertaking its assessment of the amendment application.

SECTION 64B – TRANSPORTING WASTE

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, transporting waste.

The current EA includes conditions relating to the management (including transport) of wastes. Where relevant, the assessing officer will consider whether changes to the relevant schedule of conditions in the EA are required when undertaking its assessment of the amendment application.

SECTION 64C – RECEIVING WASTE

(1) This section applies to the administering authority for making an environmental management decision relating to an activity that involves, or may involve, receiving waste.

Not applicable.

SECTION 64D – ACTIVITY INVOLVING THE USE OR DISPOSAL OF COAL SEAM GAS WATER

(1) This section applies to the administering authority for making an environmental management decision on an application for an activity that involves, or may involve, the use or disposal of coal seam gas water.
The amendment application relates to activities involving the use or disposal of coal seam gas water.

(2) The administering authority must consider the coal seam gas water management policy.
The assessing officer will consider the Coal Seam Gas Water Management Policy 2012 when making its assessment and recommendations for the amendment application.

2.3 *Environmental Protection (Water) Policy 2009* (EPP Water)

The EPP water was considered by Arrow in their development of management measures as found in section 10.2 of the EM Plan.

The management hierarchy, environmental values and quality objectives have also been addressed by Arrow in sections 10.2, 10.3 and 10.4 of the EM Plan. As such, EHP is satisfied that if in future the EA is granted, then compliance with the conditions likely to be imposed in the EA will protect the environmental values of waters.

2.4 *Environmental Protection (Air) Policy 2008* (EPP Air)

The EPP Air was considered by Arrow in their development of management measures as found in section 4 of the EM Plan.

The management hierarchy, environmental values and quality objectives have also been addressed by Arrow in sections 4.2, 4.2.1, and 4.4 of the EM Plan. As such, EHP is satisfied that if in future the EA is granted, then compliance with the conditions likely to be imposed in the EA will protect the environmental values for air.

2.5 *Environnemental Protection (Noise) Policy 2008* (EPP Noise)

The EPP Noise was considered by Arrow in their development of management measures as found in section 8 of the EM Plan.

The management hierarchy, environmental values and quality objectives have also been addressed by Arrow in sections 8.1, 8.1.1 and 8.3 of the EM Plan. As such, EHP is satisfied that if in future the EA is granted, then compliance with the conditions likely to be imposed in the EA will protect the identified environmental values.

2.6 *Environmental Protection (Waste Management) Regulation 2000* (EPP Waste)

The EPP Waste was considered by Arrow in their development of management measures as found in section 9 of the EM Plan.

The management hierarchy, environmental values and quality objectives have also been addressed by Arrow in sections 9.2, 9.3 and 9.4 of the EM Plan. As such, EHP is satisfied that if in future the EA is granted, then compliance with the conditions likely to be imposed in the EA will protect the identified environmental values.

3.0 OTHER DOCUMENTS CONSIDERED

3.1 *Guideline – Assessment and approval process for environmental authorities for chapter 5A activities*

Appendix B to this Guideline includes a number of factors that may trigger an requirement for an application. Assessment against each of these triggers is as follows:

(a) Have a significant impact on Category A or B environmentally sensitive areas?
No – the activities proposed in the amendment application do not appear to be located in any areas of Category A or B environmentally sensitive areas.

(b) Involve activities in a marine area?
No – The DXP Area is not location in a marine area.

(c) Involve activities less than 500m from highest astronomical tide?
No – the DXP is not located near any tidal areas.

(d) Involve the construction of a new pipeline of more than 150km under a petroleum authority?
No – no new pipelines are proposed in the amendment application.

(e) Include an environmentally relevant activity with an aggregate environmental score of greater than 165?
No – no additional ERAs are proposed that are not already authorised in the current EA.

(f) Involve activities under a GHG injection and storage lease under the *Greenhouse Gas Storage Act 2009*?
No – the activities proposed in the amendment application do not involve the injection or storage of any greenhouse gases.

(g) Involve the construction of a petroleum refining or processing facility?
No – the amendment application does not involve the construction of a petroleum facility or processing facility.

4.0 CONSULTATIONS

No consultations have occurred with regard to the amendment application.

5.0 RECOMMENDATIONS

It is recommended that:

1. The application for environmental authority permit number PEN100449509 not require an EIS for the reasons provided above; and

2. The attached notice advising of this decision is signed and issued to the principal holder accompanied with the attached information sheet to inform the applicant of its right to seek the internal review and/or appeal of this decision.

Signed –
Date –

Gillian Naylor
Principal Environmental Officer, Energy Assessments
Ph: (07) 3330 5620

Reviewed & Endorsed By

John Frankish
Manager, Energy Assessments
Phone: (07) 3330 5683

Signed –
Date –

Request for Statutory Approval
RSA No.

PUBLIC NOTIFICATION REQUIREMENT FOR AN AMENDMENT APPLICATION MADE FOR A LEVEL 1 ENVIRONMENTAL AUTHORITY (CHAPTER 5A ACTIVITIES) – SECTION 310W(2) OF THE *ENVIRONMENTAL PROTECTION ACT 1994*

PRINCIPAL HOLDER:	**Arrow Energy Pty Ltd**
REGISTERED BUSINESS ADDRESS:	'AM-60', Level 19 42-60 Albert Street Brisbane QLD 4000
POSTAL ADDRESSS:	GPO Box 5262 Brisbane QLD 4001
JOINT HOLDERS :	Arrow CSG (Australia) Pty Ltd Australian CBM Pty Ltd Arrow (Tipton) Pty Ltd Arrow (Tipton Two) Pty Ltd Arrow (Daandine) Pty Ltd Stanwell Corporation Limited
PROJECT:	Dalby Expansion Project (DXP)
ENVIRONMENTAL AUTHORITY NO.:	PEN100449509
TENEMENT/S:	Petroleum Leases (PL) 194, 198, 230, 238, 252, 258 and 260
FILE NO.:	BNE43018 v19
PROJECT NO:	343728
APPLICATION DATE:	9 January 2013
PN DECISION DATE:	16 January 2013

1.0 BACKGROUND

Arrow Energy Pty Ltd ('Arrow') is the principal holder of environmental authority (chapter 5A activities) number PEN100449509 ('the EA') held for the Dalby Expansion Project ('the DXP'), a coal seam gas development project in the Surat Basin.

On 13 December 2012, Arrow lodged an application for the amendment of the EA with the Department of Environment and Heritage Protection ('the department') on behalf of the joint holders of the EA listed above.

The amendment application requests authorisation to construct and operate the 'Daandine Brine Dam' and its associated infrastructure within the primary protection zone of a Category C environmentally sensitive area (ESA) – a mapped area of a regional ecosystem with an 'of concern' biodiversity status. The construction and operation of infrastructure of this nature in the primary protection zone of a Category C ESA is prohibited in the current EA.

The proposed dam is required to store the brine by-product resulting from the treatment of coal seam gas water in the existing Daandine Water Treatment Facility (WTF). As such, the dam is required to be in close proximity to the Daandine WTF. The supporting material to the application describes 4

sites that were considered by Arrow, and provide reasoning for the nomination of the preferred site. The preferred location for the brine dam is within Lot 1 of SP200461 at the intersection of Dalby-Kogan Road and Kumbarilla Land which the supporting material to the application describes as being a predominantly cleared paddock containing a small stand of scattered regrowth vegetation of *Eucalyptus populnea* and *E. crebra* which is currently used for grazing.

The supporting material to the application describes the proposed activities relating to the construction of the brine dam as follows:

- clearing of an area of approximately 53 ha;
- construction of a high density polyethylene (HDPE) lined dam;
- placing of interconnecting pipe work and transfer lines from the Daandine WTF to the brine dam;
- a spoil area required during both the construction and operational phase of the brine dam;
- stock proof fencing around the perimeter of the brine dam upon completion of construction; and
- installation of up to 5 monitoring bores.

The supporting information also states that no vegetation clearing is required to obtain access to the proposed site as an existing access track is to be utilised.

The supporting material for the application includes the results of desktop assessments and field assessments undertaken for flora and fauna at the preferred location.

Chapter 5A of the *Environmental Protection Act 1994* ('the EP Act') requires the administering authority to make a decision as to whether public notification is required when assessing an amendment application for a level 1 EA. The following section outlines how the relevant sections of the EP Act have been considered in making the public notification decision.

2.0 STATUTORY REQUIREMENTS

2.1 *Environmental Protection Act 1994*

SECTION 310W – PUBLIC NOTICE MAY BE REQUIRED IF APPLICATION IS FOR LEVEL 1 ACTIVITY

(1) This section applies for an amendment application only if it is for an environmental authority (chapter 5A activities) for a level 1 chapter 5A activity.

This section is applicable – the amendment application made was for a level 1 environmental authority (chapter 5A activities).

(2) The administering authority may, within 5 business days after the application date for the application, by written notice to the applicant, decide that sections 310F to 310L apply for the application (a *public notice requirement*).

The application date for the application is 9 January 2013. The department as the administering authority is required to decide on the public notification requirement by 16 January 2013, being 5 business days from the application date.

(3) However, a public notice requirement must not be made unless the administering authority is satisfied there is likely to be a substantial increase in the risk of environmental harm under the amended environmental authority (chapter 5A activities) because of a substantial change in—

(a) the quantity or quality of contaminant authorised to be released into the environment; or

(b) the results of the release of a quantity or quality of contaminant authorised to be released into the environment.

See comments below.

(4) Without limiting subsection (3)(a), each of the following is taken to be a substantial change—

(a) an increase of 10% or more in the quantity of a contaminant to be released into the environment;

(b) if the amendment application is for an environmental authority (chapter 5A activities) for a chapter 5A activity project and the amendment is to add a level 1 chapter 5A activity to the authority.

Section 11 of the EP Act defines a contaminant as:
(a) a gas, liquid or solid; or
(c) an odour; or
(d) an organism (whether alive or dead), including a virus; or
(e) energy, including noise, heat, radioactivity and electromagnetic radiation; or
(f) a combination of contaminants.

Whilst the dam is proposed to store a liquid contaminant (brine), the application does not seek to release brine or any other contaminants to the environment, though the application does acknowledge that the construction of the brine dam will result in noise, dust and vibration emissions to the environment on a temporary basis. The supporting material to the application states that the brine dam will be HDPE lined and a series of groundwater monitoring bores will be installed to monitor any potential release of contaminants to the environment from the brine dam.

On this basis, the assessing officer does not believe that a public notification period is required for this amendment application.

(5) The notice must be accompanied by, or include, an information notice about the decision.

A *Public Notification Notice* is attached to this RSA for endorsement by the delegate.

2.2 Environmental Protection Regulation 2008

The Environmental Protection Regulation 2008 ('the EP Reg') describes additional matters that must be considered if a decision being made by the administering authority is an environmental management decision.

SECTION 48 – MEANING OF *ENVIRONMENTAL MANAGEMENT DECISION*

(1) An *environmental management decision* **is a decision under the Act for which the administering authority making the decision is required to comply with regulatory requirements.**

(2) However, an *environmental management decision* **does not include a decision under the Act about the surrender of a registration certificate or an environmental authority.**

The assessing officer does not believe that a decision to require a public notification for an amendment application falls within the realm of what is an environmental management decision as described in section 48 above. This ruling has been made on the basis that the matters prescribed in s310W (a) to (5) do not include the consideration of regulatory requirements.

3.0 CONSULTATIONS

No consultations have occurred regarding this application to date.

4.0 RECOMMENDATIONS

It is recommended that:

1. The amendment application for environmental authority number PEN100449509 not be required to undergo a public notification period for the application; and

2. The attached notice advising of this decision is signed and issued to the principal holder with the relevant information sheet – internal review and appeals.

Signed:
Dated:

Gillian Naylor
Principal Environmental Officer, Energy Assessments
Ph: (07) 3330 5620

Reviewed & Endorsed By
John Frankish Manager, Energy Assessments Phone: (07) 3330 5683 Signed: Date: