Queensland Floods Commission of Inquiry

Statement of Andrew Stuart Brier

(Callide Power Station)

September 2011

Vol 1

QFCI

Date: 8/11/11 JM

Exhibit Number: 935

QUEENSLAND FLOODS
COMMISSION OF INQUIRY

STATEMENT OF ANDREW STUART BRIER

WITH RESPECT TO THE CALLIDE POWER STATION

I, **ANDREW STUART BRIER** of c/- 400 George Street Brisbane in the State of Queensland, General Manager Strategic Implementation, Coal & CSG Operations, Regional Service Delivery, Operations and Environmental Regulator, Department of Environment and Resource Management (DERM), solemnly and sincerely affirm and declare:

Requirement from Queensland Floods Commission of Inquiry

1. I have seen a copy of a letter dated 13 September 2011, which is attachment **ASB-01**, from the Commissioner, Queensland Floods Commission of Inquiry to me requiring a written statement under oath or affirmation, and which details the topics my statement should cover.

Role

2. I am currently the General Manager Strategic Implementation, Coal and Coal Seam Gas Operations within the Regional Service Delivery Division in the Department of Environment and Resource Management. I have held this position since 21 February 2011 although I was involved in the management of flood related issues surrounding coal mines from the 10 January 2011 onwards.

3. Between 2010 and 2011 my roles were as follows:
   - 25/12/2009 to 05/08/2010 - Regional Manager GABSI & Major Projects
   - 06/08/2010 to 02/01/2011 - Regional Manager CSG Activities
   - 03/01/2011 to 20/02/2011 - Director LNG Enforcement Unit
   - 21/02/2011 onwards - General Manager Coal & CSG Operations

Item 1: Department of Environment and Resource Management's activities in respect of each mine's flood preparedness in advance of the 2010/2011 wet season, including whether any particular activities were undertaken as a response to the forecast of an above-average rainfall wet season.

4. As a regulator DERM's compliance activities are designed to strategically review the performance of individual regulated entities on the basis of perceived risk.

5. DERM undertook pre wet season compliance programs to evaluate water management preparedness ahead of the 2010/2011 wet season. This primarily involved evaluating past wet season performance and preparedness ahead of the

next wet season in terms of having available dam storage capacity to meet the minimum design storage allowance required on the 1 November of any year.

6. Environmental authorities include requirements for companies to prepare Water Management Plans that outline the overall mine water management strategy for their site. The environmental authorities require an annual review of these plans to ensure learnings from past wet season performance are incorporated into forward plans and preparations for future wet seasons.

7. Environmental authorities for mine sites also include dam structural design, construction and operation requirements that are commensurate with flood risks given a mines location, including:
    a. certified hazard assessment required for all dams;
    b. must be designed to prevent floodwaters from entering the dam, wall failure and overtopping up to and including a specified flood event based on AEP;
    c. certified design plans, high risk dams reviewed by DERM technical experts;
    d. having a marked "mandatory reporting level" above which DERM must be notified immediately, and actions put in place to prevent or minimise environmental harm;
    e. ensuring that dams are inspected by a suitably qualified and experienced person;
    f. undertaking reviews annually about the effectiveness of the dam during the preceding wet season and modifying the water management system accordingly;
    g. monitoring of water quality within the dam prior to the wet season;
    h. maintaining a register of dams and relevant information.

8. CS Energy is a government owned corporation that operates Callide Power Station, located approximately 10 kilometres east of the Biloela township in Central Queensland.

9. Power generation is an Environmentally Relevant Activity (ERA) under the Environmental Protection Act 1994 for which a development permit is required. Waste ash and waste water produced as a result of power generation comprise of a range of contaminants that have the potential to cause environmental harm if not properly contained. CS Energy holds a Development Approval (CG0039 - **ASB-CPS02-01**), issued by DERM to authorise the ongoing operation of the power station and associated infrastructure. This approval also authorises the storage of contaminants on site in the Waste Containment Facility which includes Ash Dam B and associated seepage collection trenches and ponds, ash dam 1, 3 and 4 and evaporation areas. The Waste Containment Facility is located to the west of the power station.

10. CS Energy was issued with a notice to conduct au Environmental Evaluation (EE) (**ASB-CPS01-01**) in regards to the operation of Ash Dam B on 30 June 2010. This EE was a result of groundwater monitoring indicating elevated sulphate levels (above stock watering guideline limits) and increasing concentrations of trace elements such as Boron and Fluoride downstream of Ash Dam B. The

elevated levels are an indicator of possible ground water contamination as a result of seepage from Ash Dam B. The EE also included an assessment of dam integrity and water management. The information that had been gathered for this EE provided a basis for addressing the potential for discharge during the 2010/2011 wet season.

11. In response to the forecast of an above average rainfall, DERM prepared a Central West Region Summer Season Preparedness and Response Plan (**ASB-CPS01-02**).This document was designed to assist the Central West Region in identifying regulated water storage facilities which pose a risk of potential spillages during a summer season. Secondly, this document aims to identify what type of response is needed should an unauthorised discharge occur in order to best protect any surrounding water courses, population centres and land from pollution. The response involved writing to all holders of all environmental authorities that involved regulated storages prior to the wet season.

12. CS Energy was not included in the list of operators who were written to at the time as DERM was engaged with CS Energy through the statutory EE process where hazardous dam storage management was being actively evaluated. DERM formed the view that it did not need to reiterate management requirements through a formal letter.

Item 2: the water management sections of the environmental authority applicable at the mine during the 2010/2011 wet season, including:

a) **Any concerns held by him or the Department of Environment and Resource Management (DERM) regarding its terms and the ability of the mine operator to comply with it**
b) **Any terms that the mine operator has indicated it is unable to comply with, or breached**
c) **Any terms that had to be amended from the Fitzroy model conditions because the model terms were unsuitable for this mine site**
d) **Any terms that he or DERM consider do not adequately promote environmental protection and dam safety**

13. Environmental Authorities relate to Mining, Gas and Petroleum activities and are administered under Chapter 5 and 5A of the *Environmental Protection Act 1994* (EP Act). Chapter 4 of the EP Act relates to activities defined as assessable development under the *Sustainable Planning Act 2009* (SP Act) to which a Development Permit (also referred to as Development Approval) is issued. Environmentally relevant activities (ERAs) as defined in the *Environmental Protection Regulation 2008* are classified as assessable development under the SP Act. Development approval CG0039 (**ASB-CPS02-01**) is the permit for the Environmentally Relevant Activities associated with the operation of Callide Power Station does not authorise water to be discharged from Ash Dam B. The development approval includes conditions that establish a mandatory reporting level (MRL) for water level in Ash Dam B. If the MRL is exceeded, CS Energy is required to implement a Contingency Plan which is developed from the Corrective Action Plan (**ASB-CPS02-05**).

a) Any concerns held by him or the Department of Environment and Resource Management (DERM) regarding its terms and the ability of the mine operator to comply with it

14. Ash Dam B was designed and the power station is operated to ensure that water is not discharged from the dam. The height of the spillway was raised in 2003 to minimise the risk of a discharge occurring.

15. The EE was issued on the basis of possible groundwater contamination from Ash Dam B. Whilst storage levels can influence discharge to groundwater it was not the basis for issuing the EE. In terms of storage levels on the 1 November 2010, DERM believed CS Energy was compliant with its Development Approval as Ash Dam B was within the Design Storage Allowance and below the MRL.

b) Any terms that the mine operator has indicated it is unable to comply with, or breached

16. On 20 December 2010 [redacted] (Site Manager – Callide, CS Energy) provided written notification stating that the MRL had been reached (**ASB-CPS02-02**). The notification included a contingency plan for managing the water level in Ash Dam. On 22 December 2010 CS Energy advised DERM that the risk of a discharge from the dam was low and would require a further 500-550mm of cumulative rainfall for this event to occur (**ASB-CPS02-03**). On 5 January 2011 Environmental Services Officers, CS Energy and SunWater representatives met to discuss management strategies and the possibility of a discharge occurring (**ASB-CPS02-04**).

c) Any terms that had to be amended from the Fitzroy model conditions because the model terms were unsuitable for this mine site

17. The Fitzroy model conditions do not apply to the Callide Power Station. The Fitzroy Model conditions apply only to coal mines operating within the Fitzroy Basin

d) Any terms that he or DERM consider do not adequately promote environmental protection and dam safety

18. To the best of my knowledge, I do not consider that the relevant conditions of the development approval contain terms that do not adequately promote environmental protection and dam safety

Item 3: any transitional environmental program (TEP) issued or refused or any emergency direction (ED) given or considered regarding either mine during the period 1 October 2010 to 30 July 2011 related to water management, and for each, the following:

a) **Information received from the mine operator**

b) **Any relevant dam safety issues**
c) **Relevant correspondence with the mine operator and other stakeholders**
d) **Whether and, if so, how DERM consulted with stakeholders**
e) **What considerations DERM took into account in making the decision**
f) **Whether, and if so, how DERM balanced environmental considerations and economic consequences of mines being non-operational**
g) **Whether, and if so how, DERM took account of downstream effects, including cumulative effects**
h) **The terms of the TEP issued or ED given**
i) **What actions were taken by DERM to advise emergency management personnel, including local and regional disaster management groups and local residents downstream of the dam about the TEP and any discharges or effects**
j) **Reasons for the decision given to the mine operator**
k) **Any breaches of the TEP or ED by the mine operator and DERM's response**

19. CS Energy submitted a voluntary TEP on 7 January 2011(**ASB-CPS03-01**). Environmental Services staff liaised with CS Energy and other stakeholders (e.g. internal experts, Water Services, Office of the Water Supply Regulator). A revised and final voluntary TEP was submitted on 11 January (**ASB-CPS03-02**).

20. The voluntary TEP was assessed in accordance with section 337 and 338 of *the Environmental Protection Act 1994* (**ASB-CPS03-03**). DERM approved a TEP that authorised the release of water for Ash Dam B on 11 January 2011 (**ASB-CPS03-04**). The main concern was the possible impact of Ash Dam B water on the groundwater aquifer and drinking water supplies. The TEP authorised the controlled release of water from Ash Dam B simultaneously with releases of water from the adjacent Callide Dam to minimise the risk of contaminants entering the groundwater aquifer and drinking water. The TEP also placed conditions on the discharge such as location of the release, discharge flow rate relative to the release from Callide Dam, notification and receiving environment monitoring to minimise the impact on the environment and ensure it could be assimilated into surface waters and the groundwater aquifer without the causing environmental harm.

a) Information received from the mine operator

21. The following attachments relate to the information received from CS Energy:
    a. Letter from CS Energy on 30 December 2010 re: Update of water level in Ash Dam B (**ASB-CPS03-05**)
    b. Letter from CS Energy on 7 January 2011 re: Update of water level in Ash Dam B (**ASB-CPS03-06**)
    c. Telephone conversation between [redacted] (DERM), [redacted] (DERM) and [redacted] (CS Energy) 7 January 2011 (**ASB-CPS03-07**)
    d. Program Notice from CS Energy 7 January 2011 (**ASB-CPS03-08**)
    e. CS Energy voluntary TEP dated 7 January 2011 (**ASB-CPS03-01**)
    f. Ash Dam B raw water results (**ASB-CPS03-09**)
    g. Email traffic regarding water level in Ash Dam B and Callide Dam release 8 January 2011 (**ASB-CPS03-10**)
    h. CS Energy Water Release Calculator 10 January 2011 (**ASB-CPS03-11**)

i. Email from [redacted] 10 January 2011 (**ASB-CPS03-12**)
j. CS Energy Final voluntary TEP dated 11 January 2011 (**ASB-CPS03-02**)

b) Any relevant dam safety issues

22. No dam safety issues were identified. From 24 December 2010 routine dam safety inspections by CS Energy staff were increased to daily. On 26 December 2010 arrangements were initiated with SunWater for an Emergency Inspection by a suitably qualified engineer. The inspection occurred on 29 December 2010 and no obvious dam safety issues were identified. An additional dam safety inspection was scheduled once the water level reached 214.53m and no issues were identified.. The inspections were conducted on 5 and 13 January 2011 and no integrity issues were identified.

c) Relevant correspondence with the mine operator and other stakeholders

23. DERM environmental services staff continually consulted and liaised with CS Energy and other relevant areas of DERM such as dam safety, water services and the office of the water supply regulator. This communication is reflected in the attachments listed below.
    a. Email from [redacted] to [redacted] (DERM Dam Safety) 20 December 2010 re: High water levels is Ash Dam B (**ASB-CPS03-13**)
    b. Email from [redacted] (Water Services) 7 January 2011 re: Comments on Ash Dam B discharging (**ASB-CPS03-14**)
    c. Email from [redacted] to [redacted] (Environment and Resource Sciences) 8 January 2011 re: voluntary TEP for comment (**ASB-CPS03-15**)
    d. Email from [redacted] to [redacted] (Office of the Water Supply Regulator) 8 January 2011 re: voluntary TEP for comment (**ASB-CPS03-16**)
    e. Email from [redacted] to [redacted] on 10 January 2011 re: voluntary TEP comments (**ASB-CPS03-17**)
    f. Email from [redacted] 10 January 2011 re: voluntary TEP comments (**ASB-CPS03-18**)
    g. CS Energy proposed monitoring plan 10 Jan 2011 (**ASB-CPS03-19**)
    h. Email from [redacted] (Water Services) re:Monitoring of release 10 January 2011 (**ASB-CPS03-20**)
    i. Email from [redacted] to [redacted] (CS Energy) re: voluntary TEP comments 11 January 2011 (**ASB-CPS03-21**)
    j. Email from [redacted] (QLD Health) 12 January 2011 re: voluntary TEP comments (**ASB-CPS03-22**)

d) Whether and, if so, how DERM consulted with stakeholders

24. DERM staff consulted with internal DERM experts as well as Queensland Health, SunWater (the operators of the adjacent Callide Dam), the Office of the Water Supply Regulator and Banana Shire Council when considering the application, approval and conditions of the TEP. DERM Officers also attended a Callide Irrigators Advisory Committee Meeting.

e) What considerations DERM took into account in making the decision

25. Transitional environmental programs (TEPs) are specific programs that, when complied with, achieve compliance with the *Environmental Protection Act 1994* (EP Act) for an activity by reducing environmental harm, detailing the transition of the activity to an environmental standard or detailing the transition of the activity to comply with a condition of a development approval, an environmental authority or code of environmental compliance. The requirements for TEPs and the process for assessing and approving them is set out in chapter 7, part 3 of the EP Act (**ASB-CPS03-29**).

26. Draft TEPs may be submitted voluntarily by a mine operator, or DERM may require an operator to submit a draft TEP if it is satisfied that an activity or proposed activity is or may cause unlawful environmental harm. In either case, the draft TEP is prepared by the operator. DERM's role is to assess the draft TEP against the requirements of the EP Act and either approve the TEP, approve the TEP with conditions, or refuse to approve the TEP.

27. Section 338 of the EP Act (**ASB-CPS03-30**) provides the framework for considerations that the administering authority must make in deciding whether to approve or refuse a draft TEP or the conditions (if any) of the approval. In making its decision it:
    - must comply with any relevant regulatory requirement and
    - subject to the above, must also consider the following:
        - the standard criteria
        - additional information given in relation to the draft TEP and
        - the views expressed at a conference held in relation to the draft TEP.

28. DERM has produced guidance material to support regional officers and delegated decision makers in assessing draft TEPs. A two part procedural guide; Part 1- Notice requiring a draft TEP (**ASB-CPS03-23**) and Part 2-Considering and making a decision about a draft TEP (**ASB-CPS03-24**) is attached. Supplementing the guidelines are two correlating assessment report templates Part 1 Assessment Report (**ASB-CPS03-25**) to assist officers to record the information considered by DERM when deciding to issue a notice requiring a TEP and Part 2 – Assessment Report (**ASB-CPS03-26**) to assist users to evaluate the content of a draft TEP and make a decision to either approve (with or without conditions) or refuse a draft TEP. Prior to the procedural guides and assessment reports coming into effect, a draft Administrative Practice Note (**ASB-CPS03-31**) and a Request for Statutory Approval template (**ASB-CPS03-32**) was utilised by regional officers to assist with the TEP assessment process.

29. The voluntary TEP was assessed in accordance with section 337 and 338 of *the Environmental Protection Act 1994* (**ASB-CPS03-03** – Request for Statutory Approval). Section 338 requires consideration of the Standard Criteria, compliance with any relevant regulatory requirement, additional information give in relation to the TEP and views expressed at a conference held in relation to the TEP. The principal concern was in regards to the potential for impacts on water quality in the downstream Callide Creek aquifer system. This aquifer provides the

town water supply for Biloela as well as stock and domestic water and irrigation water for a variety of agricultural operations in the region. Consideration was also given to the potential for damage and disruption to downstream infrastructure including roads and bridges.

f) Whether, and if so, how DERM balanced environmental considerations and economic consequences of mines being non-operational

30. The EP Act and subordinate legislation governs the responsibilities of DERM in the environmental regulation of mining activities in Queensland. The objective of the EP Act is to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. This is referred to as ecologically sustainable development (ESD). Accordingly, DERM is required to balance environmental, economic, social and equity considerations when making decisions.

31. When making any decision under the EP Act, including whether to approve a draft TEP, DERM must consider the "Standard Criteria" (**ASB-CPS03-27**) as specified in Schedule 4 of the EP Act. The standard criteria specifically require environmental and economic considerations to be balanced and considered. Part 2- Considering and making a decision about a draft TEP procedural guide (refer to **ASB-CPS03-24**) provides further guidance on some of the principles on evaluating ESD. In addition further direction is provided on other considerations of the standard criteria, relevantly the financial implications for an applicant in complying with a TEP (and any conditions that may have been imposed) and the character, resilience and values of the receiving environment.

32. Furthermore, part 2 and 3 of the *Environmental Protection Regulation 2008* (EP Reg) (**ASB-CPS03-28**) stipulate requirements for all environmental management decisions and additional regulatory considerations with respect to imposing conditions relating to a wide ambit of environmental and economic considerations including but not limited to monitoring, and releases to waters or land. Decisions must also consider any relevant Environmental Protection Policies (EPP) such as the *Environmental Protection (Water) Policy 2009* which sets out to achieve the objective of the EP Act with respect to Queensland waters. It does this by identifying environmental values and management goals and providing a framework for making consistent, equitable and informed decisions about Queensland waters.

33. The option of requiring the power station to cease operation was not considered as this would have been unlikely to make a significant impact on the water level in the ash dam.

g) Whether, and if so how, DERM took account of downstream effects, including cumulative effects

34. The purpose of the TEP was to reduce the risk of negative impacts on the quality of downstream water supplies that may have occurred in the event of an uncontrolled discharge from the ash dam. The TEP authorised the controlled

release of water from Ash Dam B simultaneously with releases of water from the adjacent Callide Dam to minimise the risk of contaminants entering the groundwater aquifer. [redacted] (Water Services), [redacted] (Chief Scientist, Aquatic Ecosystem Risk and Decision Support) and [redacted] (Principal Scientist, Aquatic Ecosystem Risk and Decision Support) were contacted by phone and email to provide advice on the TEP and to ensure discharge rates were at levels that would provide for appropriate assimilation of the discharge without impact on the receiving environment.

h) The terms of the TEP issued or ED given

35. Refer to attachment **ASB-CPS03-04** – Transitional Environmental Program Certificate of Approval. The Certificate of Approval included conditions relating to the location of the release, dilution ratio, notification and receiving environment monitoring requirements.

i) What actions were taken by DERM to advise emergency management personnel, including local and regional disaster management groups and local residents downstream of the dam about the TEP and any discharges or effects

36. CS Energy liaised with potentially affected landholders and issued a media release to the Central Telegraph about the discharge of Ash Dam B water. DERM staff also attended a meeting of the Callide Irrigators Advisory Committee to discuss the TEP and to explain the conditions placed on CS Energy to ensure a low level of risk noting the environmental values within the receiving environment.

j) Reasons for the decision given to the mine operator

37. It was communicated verbally to [redacted] that the conditions placed on the TEP was to protect the values of the downstream environment and aquifer.

k) Any breaches of the TEP or ED by the mine operator and DERM's response

38. CS Energy failed to submit a report 28 days after the cessation of the release. DERM contacted CS Energy and this was promptly provided.

Item 4: the effects on the environment, drinking water quality and public health downstream of each of the mine sites (as far as the Great Barrier Reef Marine Park) as a result of discharges of water under a TEP or ED.

39. The potential effects of releases of water from mine sites are assessed prior to the grant of environmental authorities or transitional environmental programs. In applying to receive approval to discharge to a surface water, applicants must prepare information to support the application which identifies the environmental values, water quality objectives and management intent (that is, the goals to be achieved in terms of meeting water quality objectives and protecting environmental values) of the surface water. This framework is provided in the *Environmental Protection (Water) Policy 2009* (EPP Water) **(ASB-CPS04-01)**.

Applications must be able to demonstrate that the management intent for the receiving water will be met despite the discharge occurring.

40. All applications for environmental authorities and TEPs submitted for the approval of discharge to surface waters must be assessed by DERM against the requirements of the EP Act which includes the EPP Water, including an impact assessment to ensure that environmental values of any surface water will be protected. In conducting these regulatory assessments, DERM has developed a number of decision support tools including the guideline "Protecting Environmental Values from CSG Water Discharged to Surface Waters" (2010, **ASB-CPS04-02**) Conditions for Coal Mines in the Fitzroy Basin – Approach to Discharge Licensing (June 2010) and the Operational Policy "Waste water discharge to Queensland Waters" (2007, **ASB-CPS04-03**) and associated procedural information (**ASB-CPS04-04** and **ASB-CPS04-05**). DERM has also prepared an "*Interim Decision Support Matrix Release of water produced in association with Coal Seam Gas activities to surface waterways*" (2010, **ASB-CPS04-06**) which informs assessments and resultant authority conditions

41. The approach used by DERM throughout the 2010-2011 wet season aimed to be consistent with state/national water quality guidelines e.g. The Queensland Water Quality Guidelines (2006), ANZECC/ARMCANZ Guidelines for Fresh and Marine Water Quality 2000, the Australian Drinking Water Quality Guidelines and the October 2010 released Draft for Consultation – Establishing Environmental Values, Water Quality Guidelines and Water Quality Objectives for Fitzroy Basin Waters. .

42. Controls and limitations are placed on authorities as conditions such as limits upon the volumes discharged, timing of discharge and required dilution and mixing zones for discharges. Conditions also include comprehensive contaminant monitoring programs for discharge quality which is supplemented by detailed receiving environment monitoring programs.

43. Releases of water from a dam at a mine site can be authorised by the conditions of an environmental authority or via specific permission under a transitional environmental program. Regardless of the statutory instrument, for releases of water from a dam at a mine site to be authorised, the assessment procedure described above would apply.

44. The EP Act and the subordinate EPP Water provides for drinking water values for Queensland waters. Accordingly, the protection of these values must be demonstrated prior to any authority being granted authorising a contaminant release to surface waters. Conditions of the environmental authority or TEP will provide quality limits and environmental monitoring to ensure that discharge quality is sufficient to protect drinking water values.

45. During the 10/11 wet season, DERM staff liaised with Queensland Health on a regular basis to ensure that any authorised or un-authorised discharges from mine sites were managed to ensure the protection of drinking water quality.

46. TEPs issued during or as a result of the 10/11 wet season also considered the effects of any mine site release on drinking water and were conditioned to ensure that the discharge was managed in such a way as to ensure the protection of drinking water supplies.

47. Surface water quality was monitored by DERM during the January release and CS Energy during all releases from Ash Dam B. CS Energy has also undertaken an expanded groundwater monitoring program.

48. Based on the monitoring data (**ASB-CPS04-07** for the TEP report and **ASB-CPS04-08** for DERM monitoring results report) the discharge of water from Ash Dam B has not impacted the environment, drinking water quality or public health downstream. Some parameters such as electrical conductivity increased during discharge but was maintained below the trigger values (e.g. Electrical conductivity 1000 µS/cm, pH 6.5-8.5, Dissolved Oxygen >2.0 mg/L) and returned to background once discharge ceased.

Item 5: details of how the new Fitzroy Model Conditions negotiated during 2011, or any other discussions with DERM, will resolve any issue raised above 1, 2, 3, or 4

49. The Fitzroy model conditions do not apply to the Callide Power Station.

Item 6: an explanation as to whether the new Fitzroy Model Conditions negotiated during 2011 are advantageous or disadvantageous to the mine operator in the management of water at the mine, the downstream environment and safety issues.

50. The Fitzroy model conditions do not apply to the Callide Power Station.

Item 7: any briefing (written or oral) given to any Minister or Director-General regarding a TEP or ED related to water management or non-compliance with an environmental authority at the mine and the reason for that briefing

51. A briefing note was written for the both the then Minister for Natural Resources, Mines and Energy and Minister for Trade and the Minister for Climate Change and Sustainability advising of a Water Release from Callide Power Station Ash Dam (**ASB-CPS07-01**).

52. There were a significant number of oral briefings provided to the Minister for Climate Change and Sustainability and the Director General of DERM in relation to TEPs during the wet season period of which there are no written records. In general, these were primarily in relation to the mining/CSG industry as a whole and the number of TEPs issued or currently being assessed. Individual mines were discussed at several of these briefings but I am unable to provide an accurate transcript or meeting notes from these briefings.

Item 8: DERM's opinion as to whether the mine operator should be managing water at the Mine other than by storing it in dams or ponds, including by using desalination plants, purification procedures or any other means

53. DERM is of the opinion that CS Energy is required to comply with the waste management hierarchy as defined in the *Environmental Protection (Waste Management) Policy 2000.* The intention of this policy was reflected in the requirements of the EE and was a consideration in determining the on-going activities that are being implemented as a result of the EE. As a result of the EE, CS Energy was required to submit a TEP that addressed waste water management, seepage interception and control and receiving environment monitoring (**ASB-CPS08-01**).

Item 9: an explanation of that which is involved in managing water at the Mine other than by storing it in dams or ponds, including by using desalination plants, purification procedures or any other means

54. CS Energy has implemented a Waste Management Improvement Program which identifies a number of measures to manage water. These include:
    - Reverse Osmosis Plant (installed and operating)
    - Evaporative sprays (installed and operating)
    - Minimisation of raw water usage(ongoing due for completion 10 August 2014)
    - Changes to the ash disposal system. (ongoing due for completion 10 August 2014)

Item 10: to the knowledge of DERM, the effects on the environment, drinking water quality and public health downstream of each of the Power Station sites (as far as the Great Barrier Reef Marine Park) as a result of discharges from Ash Dam B between 1 October 2010 and 30 July 2011

55. Surface water quality was monitored by DERM during the January release and CS Energy during all releases from Ash Dam B. CS Energy has also undertaken an expanded groundwater monitoring program.

56. Based on the monitoring data (**ASB-CPS10-01** – TEP report; and **ASB-CPS10-02** DERM monitoring results report) the discharge of water from Ash Dam B has not impacted the environment, drinking water quality or public health downstream. Some parameters such as electrical conductivity increased during discharge but was maintained below the trigger values (e.g. Electrical conductivity 1000 µS/cm, pH 6.5-8.5, Dissolved Oxygen >2.0 mg/L) and returned to background once discharge ceased.

57. To the best of my knowledge, neither DERM nor CS Energy has received any complaints in relation to the discharge of Ash Dam B water.

Item 11: a description of the concerns surrounding Ash Dam B during the period 1 October 2010 to 30 July 2011, including:

a. water level
b. dam safety
c. uncontrolled discharge
d. contaminants and hazardous waste in the contents of the dam

a) water level

58. Increasing water level in Ash Dam B during the wet season lead to two major concerns:
    1. Dam integrity and safety
    2. The potential for a discharge from Ash Dam B to negatively impact the quality of water in the Callide Creek aquifer and downstream water supplies.

59. Post wet season, DERM is liaising with CS Energy to track the current water level in Ash Dam B. DERM seeks CS Energy to reach the MRL and comply with the Design Storage Allowance prior to 1 November to ensure a safety factor is established heading into the wet season and comply with their development approval.

b) dam safety

60. As identified, dam safety and integrity was of concern during the wet season; however, dam safety inspections were undertaken and CS Energy conducted daily inspections of the dam. No integrity issues were identified.

c) uncontrolled discharge

61. There were a number of concerns with the potential for an uncontrolled discharge that factored into the granting of the TEP:
    - Impact on the Callide Creek aquifer and drinking water that is sourced downstream.
    - Unknown quantity of contaminants released into the receiving environment
    - Unknown volume of Ash Dam B water released into the receiving environment
    - Possible dam integrity issues with an uncontrolled discharge
    - Erosion of the landscape.

d) contaminants and hazardous waste in the contents of the dam

62. Ash Dam B contains a range of contaminants. The following elements were considered of greatest concern:
    - Electrical conductivity
    - Sulfates
    - Chlorides
    - Boron
    - Molybdenum.

63. These contaminants have the ability to negatively affect the groundwater aquifer. A controlled release from Ash Dam B is preferred to ensure it can be assimilated into the receiving environment with low risk of environmental harm. The volume of water released from Ash Dam B was capped at maximum 5% of the receiving water flow rate of Callide Creek with no release from Ash Dam B during low flows of less than 300 megalitres per day. The dilution rate was designed to ensure compliance with Australian Drinking Water guidelines and ANZECC/ARMCANZ (2000). An uncontrolled release of water from Ash Dam B would not guarantee a low dilution ratio and could potentially impact the environmental values within the receiving environment ie groundwater aquifer and drinking water supplies.

I make this solemn declaration conscientiously believing the same to be true, and by virtue of the provisions of the *Oaths Act 1867*.

Signed .[redacted].......
Andrew Stuart Brier

Taken and declared before me, at Brisbane this 27th day of September 2011

.[redacted]...........
Solicitor/~~Barrister/Justice of the Peace/Commissioner for Declarations~~

Our ref: Doc 1712484

13 September 2011

Mr Andrew Brier
General Manager, Strategic Implementation, Coal & CSG Operations,
Regional Service Delivery, Operations and Environmental Regulator
Department of Environment and Resource Management
Level 13, 400 George Street
BRISBANE QLD 4001

REQUIREMENT TO PROVIDE STATEMENT TO COMMISSION OF INQUIRY

I, Justice Catherine E Holmes, Commissioner of Inquiry, pursuant to section 5(1)(d) of the *Commissions of Inquiry Act 1950* (Qld), require Mr Andrew Brier of the Department of Environment and Resource Management to provide a written statement, under oath or affirmation, to the Queensland Floods Commission of Inquiry, in which the said Mr Brier gives an account of the following topics.

With respect to the Hail Creek Mine, Dawson Mine, Callide Power Station, Rolleston Coal Mine and Moranbah CSG Project:

1. Department of Environment and Resource Management (DERM) activities in respect of each mine's flood preparedness in advance of the 2010/2011 wet season, including whether any particular activities were undertaken as a response to the forecast of an above-average rainfall wet season

2. the water management sections of the environmental authority applicable at the mines during the 2010/2011 wet season, including:
   a. any concerns held by him or DERM regarding its terms and the ability of the mine operator to comply with it
   b. any terms that the mine operator has indicated it is unable to comply with, or breached
   c. any terms that had to be amended from the Fitzroy model conditions because the model terms were unsuitable for this mine site
   d. any terms that he or DERM consider do not adequately promote environmental protection and dam safety

3. any transitional environmental program (TEP) issued or refused or any emergency direction (ED) given or considered regarding any of the mines during the period 1 October 2010 to 30 July 2011 related to water management, and for each, the following:
   a. information received from the mine operator

400 George Street Brisbane
GPO Box 1738 Brisbane
Queensland 4001 Australia
Telephone 1300 309 634
Facsimile +61 7 3405 9750
www.floodcommission.qld.gov.au
ABN 82 696 762 534

b. any relevant dam safety issues
c. relevant correspondence with the mine operator and other stakeholders
d. whether and, if so how, DERM consulted with stakeholders
e. what considerations DERM took into account in making the decision
f. whether, and if so how, DERM balanced environmental considerations and economic consequences of mines being non-operational
g. whether, and if so how, DERM took account of downstream effects, including cumulative effects
h. the terms of the TEP issued or ED given
i. what actions were taken by DERM to advise emergency management personnel, including local and regional disaster management groups and local residents downstream of the dam about the TEP and any discharges or effects
j. reasons for the decision given to the mine operator
k. any breaches of the TEP or ED by the mine operator and DERM's response

4. the effects on the environment, drinking water quality and public health downstream of each of the mine sites (as far as the Great Barrier Reef Marine Park) as a result of discharges of water under a TEP or ED

5. details of how the new Fitzroy Model Conditions negotiated during 2011, or any other discussions with DERM, will resolve any issue raised above in 1, 2, 3, or 4

6. an explanation as to whether the new Fitzroy Model Conditions negotiated during 2011 are advantageous or disadvantageous to the mine operator in the management of water at the mines, the downstream environment and safety issues

7. any briefing (written or oral) given to any Minister or Director-General regarding a TEP or ED related to water management or non-compliance with an environmental authority at the mine and the reason for that briefing

8. DERM's opinion as to whether the mine operator should be managing water at the Mine other than by storing it in dams or ponds, including by using desalination plants, purification procedures or any other means

9. an explanation of that which is involved in managing water at the Mine other than by storing it in dams or ponds, including by using desalination plants, purification procedures or any other means

With respect to the Callide Power Station only:

10. to the knowledge of DERM, the effects on the environment, drinking water quality and public health downstream of each of the Power Station sites (as far as the Great Barrier Reef Marine Park) as a result of discharges from Ash Dam B between 1 October 2010 and 30 July 2011

11. a description of the concerns surrounding Ash Dam B during the period 1 October 2010 to 30 July 2011, including:
    a. water level

b. dam safety
c. uncontrolled discharge
d. contaminants and hazardous waste in the contents of the dam

With respect to the Moranbah CSG Project only:

12. a description of any concerns regarding the potential for pond overtopping at the site between 1 October 2010 and 30 July 2011

13. an explanation of how the risks to the environment, drinking water quality and public health posed by the discharge of water from coal seam gas operations are different to those risks posed by the discharge of water from coal, gold or copper mining

14. an explanation of how the process of DERM assessing and deciding whether to grant a TEP is different for coal seam gas projects as compared to mines

15. an explanation of how consideration taken into account by DERM in assessing and deciding whether to grant TEP or ED is different for coal seam gas projects as compared to mines

Mr Brier should attach to his statement:

- the water management sections of the environmental authority in force during the 2010/2011 wet season for the mines
- all relevant TEP or ED documentation, including internal working documents, assessment report, policy documents used, expert reports, notes of any conference, meeting or teleconference, reasons given to mine operators, notice of decision, correspondence with the mine operator and other stakeholders
- any new environmental authority issued in response to the 2011 amendments to the Fitzroy Model Conditions
- any internal reports regarding the Ensham Coal Mine de-watering between 2008 and 2011

In addressing these matters, Mr Brier is to:

- provide all information in his possession and identify the source or sources of that information;
- make commentary and provide opinions he is qualified to give as to the appropriateness of particular actions or decisions and the basis of that commentary or opinion.

Mr Brier may also address other topics relevant to the Terms of Reference of the Commission in the statement, if he wishes.

The statement is to be provided to the Queensland Floods Commission of Inquiry by 5 pm, Monday 26 September 2011.

The statement can be provided by post, email or by arranging delivery to the Commission by emailing info@floodcommission.qld.gov.au.

C. Holmes

Commissioner
Justice C E Holmes

eco access

Notice

Environmental Operations

Conduct or commission an environmental evaluation[1]

This statutory notice is issued by the administering authority pursuant to sections 323 and 324 of the Environmental Protection Act 1994, *to advise you of a decision to require an environmental investigation to be conducted or commissioned.*

[redacted]
Corporate Secretary
CS Energy
c/o PO Box 392
BILOELA QLD 4715

Our reference: GLT868

Attention: [redacted]

Re: Environmental investigation required for CS Energy's Waste Containment Facility (Ash Dam B) on land described as Lot 1 on Plan RP615528.

Under section 323 of the *Environmental Protection Act 1994* (the Act) this notice requires you to conduct an environmental investigation. The administering authority is satisfied on reasonable grounds that CS Energy Ltd is carrying out an activity that is causing or is likely to cause environmental harm.

The administering authority has made this decision based on the following grounds, taking into account the facts and circumstances outlined below.

Grounds, Facts and Circumstances

1. CS Energy Ltd is the holder of Environmental Authority CG0039.
2. Under the *Environmental Protection Act 1994*, Environmental Authority CG0039 authorises CS Energy Ltd to operate facilities for management and containment of waste associated with power generation. One such facility is known as Ash Dam B and is located on Lot 1/RP615528
3. Environmental Authority CG0039 authorises CS Energy Ltd to release ash and effluent to Ash Dam B through condition 2(E2)
4. Condition 2 (E4) of Environmental Authority CG0039 requires CS Energy Ltd to develop and implement an Ash Dam Management Plan, which, amongst other matters, provides for the operation and maintenance of Ash Dam B.
5. Condition 2 (G3) and 2 (G8) of Environmental Authority CG0039 requires CS Energy Ltd to maintain a groundwater monitoring network and submit a groundwater monitoring plan to measure contaminants in accordance with schedule 2G, Table 6.

[1] An environmental evaluation may be either an environmental audit under section 322 or an environmental investigation under section 323.

6. Schedule 2G, Table 6 of Environmental Authority CG0039 identifies those quality characteristics CS Energy must monitor in accordance with the submitted groundwater monitoring program and the frequency of monitoring.
7. On 20 April 2010 the department received notification from CS Energy Ltd in accordance with the provisions of section 320 of the *Environmental Protection Act 1994* advising that, data obtained during sampling of groundwater monitoring bores in accordance with the approved Ash Dam Management Plan and Groundwater Monitoring Plan indicated the presence of elevated sulphate levels (above stock watering guideline limits) along with increasing concentrations of trace elements such as Boron and Fluoride downstream of Ash Dam B.
8. CS Energy Ltd confirmed in the notice that elevated sulphate and trace element levels are an indication of possible groundwater contamination as a result of seepage from Ash Dam B and stated that: "available evidence suggests that seepage from Ash Dam B is contributing to the observed levels in groundwater in Callide Creek".
9. At the time of the notice, trace element concentrations were below guideline limits in groundwater monitoring bores located off site, however, according to monitoring data obtained during routine surface water monitoring, elevated levels of Boron and other trace elements have been observed in surface water points off site in Callide Creek.
10. CS Energy Ltd have met with the department on three occasions in April and May 2010 to discuss the content of the section 320 notice and have indicated they are investigating the Ash Dam seepage issue in an effort to identify the source and possible mitigation measures available.
11. At the meeting conducted with the department on 28 May 2010 it was recognised that the groundwater behaviour in Callide Creek was probably influenced by the recharge sources on both sides of the creek, namely seepage from the Ash Dams at Callide Power Station and seepage from Callide Dam and associated works. Any modelling should include consideration of groundwater influenced by Callide Dam. This data should be collected by and be available from Sun Water.
12. At the meeting conducted with the department on 28 May 2010 it was also recognised that the groundwater is affected by seepage coming:
    a. through the built embankment (shallow seepage) and associated cut off measures and seepage collection system, and
    b. through the floor of the ash impoundment (deep seepage).

The investigation must address the following matters:

1. Undertake a detailed assessment in the form of a Dam Safety Review[2] of Ash Dam B. The assessment must cover all feasible operating scenarios in relation to the deposition of ash and other wastes associated with power generation. The assessment must specifically:
    a) Review the design of Ash Dam B and provide as built plans that detail structural measures put in place during construction of Ash Dam B to control seepage from the storage
    b) Review current operational policies, procedures and management practices associated with the disposal of ash and other waste to Ash Dam B and any water treatment processes associated with the disposal;
    c) Identify and document best practice environmental management for the operation of ash disposal dams associated with power generation facilities, including water quality management, as a benchmark for assessing the performance of Ash Dam B; and
    d) Assess items identified in b) above against c) above and provide recommendations in relation to strategies for the future operation and management of Ash Dam B to reduce the level of risk of offsite contamination due to seepage from Ash Dam B.

[2] The State of Queensland *2002 Queensland Dam Safety Management Guideline* ISBN 0 7345 2633 4

2. Undertake a detailed assessment of the current shallow and deep seepage control systems in place at Ash Dam B and detail any proposed modifications to the current systems to reduce the risk of contamination of ground waters entering the aquifers of Callide Creek. This assessment must specifically:
   a) Review the current design and operation of shallow and deep seepage control measures in place to determine operational efficiency and areas of the Ash Dam where preferential seepage pathways exist.
   b) Identify priority actions to be undertaken to enhance current seepage control measures to manage seepage from those areas identified in a); and
   c) Review the available monitoring data to determine if there is a need for additional monitoring of shallow and deep seepage downstream and in the region of Ash Dam B.
3. Undertake a detailed investigation of groundwater resources downstream of Ash Dam B in Callide Creek focussing on:
   a) Assumed groundwater flow paths associated with the shallow alluvial aquifer and potential for shallow seepage from Ash Dam B to infiltrate this aquifer,
   b) Assumed groundwater flow paths associated with the deeper fractured rock aquifer and potential for deep seepage from Ash Dam B to infiltrate the alluvial aquifer of Callide Creek.
4. Prepare a detailed groundwater monitoring plan and numerical model to predict the impacts of seepage from Ash Dam B on the alluvial aquifer in Callide Creek and the deeper fractured rock aquifer. The monitoring plan must provide for the following:
   a) A detailed monitoring network design based upon the results of the investigation undertaken in 3 above. The design must provide for:
      i. Installation of adequate monitoring bores; and
      ii. Justification of the proposed monitoring locations.

   The model must provide for the following:
   b) Numerical simulation of groundwater observations and contaminant plumes associated with seepage from Ash Dam B and measured variations over time,
   c) Numerical prediction of the effectiveness of any mitigation measures proposed above; and
   d) Prediction of any ongoing impacts on groundwater downstream of Ash Dam B post closure of the CS Energy Ltd - Callide Power Station

   Note: Any model developed to predict the impacts of seepage from Ash Dam B on groundwater resources downstream must be able to be recalibrated using the most up to date monitoring data available and any other relevant data available about the groundwater resource.
5. Prepare a detailed report that lists the actions CS Energy Ltd has identified and those actions that CS Energy will implement to provide reasonable and practicable measures to minimise offsite seepage from Ash Dam B.

A report on the investigation must be submitted by 4 March 2011 to the Department of Environment and Resource Management at:

Lvl 3, 136 Goondoon St

GLADSTONE QLD 4680; or

PO Box 5065

GLADSTONE QLD 4680

Both you and the person who conducted the Investigation must complete the enclosed statutory declarations.

You are responsible for the costs of meeting the requirements of this Notice.

You may apply to DERM for a review of this decision within 10 business days of 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, Christopher Loveday of DERM on telephone [redacted] would be happy to assist you.

Signature	Date

[redacted]
Manager
Delegate of Administering Authority
Environmental Protection Act 1994

Enquiries:
Christopher Loveday
Department of Environment and Resource Management
Ph. [redacted]
Fax [redacted]

Central West Region

Environmental Services

Summer Season Preparedness and Response Plan 2010/11



Department of Environment and Resource Management

Version Control

Date	Version	Author	Notes
16.11.2010	1.0	Regional Administration Officer (RAO) Water	Draft
24.11.2010	2.0	RAO Water	Draft
30.11.2010	3.0	RAO Water	Draft
06.12.2010	4.0	RAO Water and Project Officer RSD	Final – Forwarded to ADG on 06.12.10
16.12.2010	4.1	Senior Administration Officer (SAO) ES	▪ Amended on-call roster for the 27th December from [redacted] to [redacted] ▪ Amended appendix 1 – site risk assessment for Callide Coal Mine/Anglo in details of any existing response plan column.

Contents

Purpose and Scope

This document is designed to assist the Central West Region identify regulated water storage facilities which pose a risk of potential spillages during a summer season. Secondly, the document aims to identify what type of response is needed should an unauthorised discharge occur in order to best protect any surrounding water courses, population centres and land from pollution.

Background

Mackay averages 942mm, Rockhampton 395mm and Emerald 270mm during the traditional summer wet season (based on data from the BoM website).

The highest recorded rainfall over the last 100 years in January alone has been 2027mm for Mackay, Rockhampton received 807mm and there was 605mm in Emerald (based on data from the BoM website).

Rainfall in the Fitzroy region results in stream flow in several large catchments, including the Comet, Nogoa, MacKenzie, Connors, Isaac and Dawson.

In the Mackay region, catchments include the Pioneer, Whitsunday and Burdekin. The Mackay and Whitsunday region produces higher rainfall figures during this season, and is also prone to flooding events. Unexpected major rainfall events can push storage facility capabilities to their limits, whether they involve industry, population centres or agriculture.

Hence it is necessary to have a two tiered approach to unplanned discharges from storage facilities, to organise some preparatory work which take place before the summer season occurs (called the Preparedness Plan) and then what the department is required to do should there indeed be an unauthorised discharge due to the increased water level during the summer season (called the Response Plan).

Preparedness Plan

Prior to each summer season a priority list of sites is identified that would be of concern to the department should a discharge occur. This includes specific details that would assist the department in determining what pre-emptive action is needed to ensure the site managers are aware of their responsibilities.

The risk posed by waste storage facilities is assess by consideration of a ranger of factors including but not limited to:

- The size of the storage and current levels
- The proximity to areas of environmental value such as water courses
- The preparedness plan of the organisation operating the facility
- The potential magnitude of the disaster should there be a discharge
- The ability of the local environment to absorb such discharges

Each site is assessed using a desktop model and categorised, in order of priority. Depending on the outcome, regional staff can then plan inspections deemed necessary to establish the operators' contingency plans in preparation for the summer season. Details of the sites identified are shown in Appendix 1.

Due to the impact of the flooding events of 2008, the department regards mining facilities are at a greater risk of unauthorised discharges, therefore a proactive system of communications is put in place. The owners of the identified sites are sent a letter (Appendix 6) to bring to their attention that their site will be visited by the department in order to assess their preparedness for the summer season. The departmental representatives then coordinate the following to ensure that the site is fully aware of its responsibilities:

Pre-inspection

Review Environmental Authority (EA), Water Management Plan and the Receiving Environment Management Plan to gain a basic understanding of the water management arrangements on site.

Inspection Focus: Water management

Environmental Services Mining Staff:

- Water storage monitoring locations – water storages associated with release points, as defined in the Environmental Authority, Table W5
- All release points on sites – water levels in associated dams (Regulated dams MRL's), discuss water quality and review available data,
- All water monitoring locations – accessible in summer weather, requirement for stream flow gauges, telemetry systems, automatic samplers
- All receiving waters (upstream and downstream) as defined in the Environmental Authority

Assistance Staff:

- Identify water storages that may have the potential for uncontrolled discharges through the failure to contain water and embankment failure.
- Identify spillway capacity for water storages and determine appropriateness of capacity.

Post Inspection

Environmental Services Mining Staff:

- Develop brief inspection report
- Correspondence to Mines identify areas of concern/outcomes of inspection

Assistance Staff:

- Provision of technical information to facilitate the drafting of a brief inspection report.

Inspection Schedule:

This is determined following the desktop risk assessment, an example of which is shown in Appendix 7.

Response Plan
The aim of the Response Plan if to enable the department to respond with minimum delay and put in place a plan of action to respond to any unplanned discharge from a waste water storage facility within our region

This includes:

- Contact details of site
- Location
- Identification of possible hazards
- Contact details of rostered Environmental Services team members (Appendix 3)

Roles and Responsibilities during the summer season
The roles and responsibilities will depend on the incidents which are scaled up/down depending upon the type of incident. In virtually all cases the relevant Manager is the primary contact; however it may be co-ordinated by the State Incident Response Network member for a major environmental incident.
Central West Region Environmental Services operates a 24 hour, seven day a week on-call system that allows the department to respond to any environmental incident that may occur. The on-call system and responsibilities of the on-call officer are detailed in Appendix 5.

Communications Plan in the event of an incident

The responsibility of communicating any unauthorised discharge lies with a number of stakeholders as detailed below:

Mining Companies

- Responsible to ensure compliance with conditions of the environmental authority relating to notification of release events.

Notification of Release Event

The authority holder must notify the administering authority as soon as practicable (no later than 6 hours of having commenced releasing mine affected water to the receiving environment). Notification must include the submission of written verification to the administering authority of the following information:

a) release commencement date/time;
b) expected release cessation date/time;
c) release point/s;
d) release volume (estimated);
e) receiving water/s including the natural flow rate; and
f) any details (including available data) regarding likely impacts on the receiving water(s).

Note: Notification to the administering authority must be addressed to the Manager and Project Manager of the local Administering Authority via email or facsimile.

The authority holder must notify the administering authority as soon as practicable, (nominally within twenty-four (24) hours after cessation of a release) of the cessation of a release notified under Condition W12 and within 28 days provide the following information in writing:

a) release cessation date/time;
b) natural flow volume in receiving water;
c) volume of water released;

d) details regarding the compliance of the release with the conditions of Department Interest: Water of this environmental authority (i.e. contamination limits, natural flow, discharge volume);
e) all in-situ water quality monitoring results; and
f) any other matters pertinent to the water release event.

Notification of Release Event Exceedance

If the release limits defined in Table W2 are exceeded, the holder of the environmental authority must notify the administering authority within twenty-four (24) hours of receiving the results.

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

a) the reason for the release;
b) the location of the release;
c) all water quality monitoring results;
d) any general observations;
e) all calculations; and
f) any other matters pertinent to the water release event.

DERM

- The department has developed an interim template for notification of discharges to ensure that information received is consistent.
- The ES Mining team has developed a database to collate the submitted information.
- Regional Manager- Mining is responsible for informing the Fitzroy Water Quality Advisory Group (FWQAG).

Appendix 1 - Site Risk Assessment

Central West ES Mining Waste Water Storage Risk Assessment

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Blackwater Coal Mine / BMA	Various mine water storages	Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total)	High	Moderate	Medium	[redacted]	A Transitional Environmental Program is in place for the site.	Compliance inspection completed 16.11.2010
Goonyella Riverside and Broadmeadow Mine / BMA	Various mine water storages	Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead	High	Moderate	Medium	[redacted]	A Transitional Environmental Program is in place for the site.	Compliance inspection completed on 5.11.2010

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total)						
Callide Coal Mine / Anglo	Various mine water storages	Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total)	High	Moderate	Medium	[redacted]	**Short term** Actions by Callide Mine to minimise the risk of discharge for 2010-2011 wet season include:- - Discontinuation of Trap Gully pit dewatering inflows into Goldings Dam. - Current de-silting program for Dunn Creek Dam and Magazine Dam to increase storage capacity. - Discontinuation of pit dewatering inflows into Lake Gasteen. - Discontinuation of pit dewatering inflows into Oaky Creek Diversion Lake. - Discontinuation of pit dewatering inflows into Dunn Creek Dam. - Current pumping of Dunn Creek Dam into D West Pit via Magazine Dam to maximise residual storage capacity. - Reduce flows into Dunn Creek Dam from Magazine	Compliance inspection completed on 10.11.2010

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
							Dam by pumping from Magazine Dam into D West Pit. - 25mm rainfall triggers water discharge site check by ALS. Protocol includes SMS update to Callide Mine. **Long term** - Anglo American water management planning for all Anglo mines.	
Blair Athol Coal Mine / Rio Tinto	Stockpile Dam, (Spillway) Main Release Point	Mine contaminated water	High	Minor	Medium	[redacted]	Monitoring and reporting program in accordance with Environmental Authority MIN100930009 Planned releases for 2010/2011 wet season Contingency Plans Monitoring methodology Monitoring frequency Sampling methodology for water reuse Sampling parameters Sampling frequency Other release points – intentional or unintentional Exceedences of EA parameters Telemetry used Telemetry maintenance schedule Contingency plan on failure of telemetry	BAC plan to release water which complies with the EA parameters when the storage levels are close to the maximum dam levels and rain events are imminent. BAC's contingency plan is to use as much water as possibe for mine operations and to return water to Clermont where practical Electronic telemetry systems are in place and maintained by external contractors. The telemetry is backed up by physical monitoring. Monitoring frequency is daily via electronic telemetry and weekly by physical monitoring. Where water releases are in operation, BAC monitor electronically hourly. BAC use dip sampling at release points and monitor with electronic water quality meter Sampling parameters are electrical conductivity, pH, suspended solids and sulphate
	Environmental Dam, (Spillway)	Mine contaminated water	High	Minor	Low		Same as above for all water holding facilities listed	
	Ramp 1 Transfer Dam, (Pump Station) Not a release point, but can be point of exceedence	Mine contaminated water	High	Minor	Medium			
	Hazardous Waste Storage Not an authorised release point (RP), but could become RP in	Highly Contaminated Water	Low	High	High			

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	1:100 ARI							Sampling frequency is weekly for water reuse and prior to controlled releases and during releases No other release points – intentional or unintentional No exceedences of EA parameters recorded None recorded Telemetry used is electronic monitoring system Telemetry maintenance is quarterly unless otherwise required with manual monitoring and maintenance 4 hour turnaround on report of failure
Clermont Coal Mine / Rio Tinto	Mine Water Dam, (Outlet Pipe) Main Release Point to Wolfgang Creek	Mine contaminated water	High	Minor	Medium	[redacted]	Monitoring and reporting program in accordance with Environmental Authority MIN100340805 Planned releases for 2010/2011 wet season Contingency Plans Monitoring methodology Monitoring frequency Sampling methodology for water reuse Sampling parameters Sampling frequency Other release points – intentional or unintentional Exceedences of EA parameters Telemetry used Telemetry maintenance schedule Contingency plan on failure of telemetry	Clermont plans to release settled water during the season to remove the probability of uncontrolled releases Clermont's plan is to use as much water as possibe for mine operations and to pipe water to BAC where practical Electronic telemetry systems are in place and maintained by external contractors. Daily via electronic telemetry. Where water releases are in operation, Clermont monitor electronically hourly. Clermont uses dip sampling at release points and monitor with electronic water quality meter
	Northern Mine Water Pit	Mine contaminated water	High	Minor	Low		Same as above for all water holding facilities listed	
	Transfer pipeline, (Pump Station)	Mine contaminated water	High	Minor	Medium			

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Not a release point, but can be point of exceedence							Electrical conductivity, pH, suspended solids and sulphate Weekly for water reuse and prior to controlled releases and during releases No other release points – intentional or unintentional No exceedences of EA parameters Electronic monitoring system Quarterly maintenance unless otherwise required Maintenance 4 hour turnaround on report of failure
	Hazardous Waste Storage Not an authorised release point (RP), but could become RP in 1:100 ARI	Highly Contaminated Water	Low	High	High			
Kestrel Coal Mine / Rio Tinto	Environmental Dam- discharge point SW1	Mine contaminated water	High	Minor	Low	[redacted]	Monitoring and reporting program in accordance with Environmental Authority MIN100924009 Planned releases for 2010/2011 wet season Contingency Plans Monitoring methodology Monitoring frequency Sampling methodology for water reuse Sampling parameters Sampling frequency Other release points – intentional or unintentional Exceedence of EA parameters Telemetry used Telemetry maintenance schedule Contingency plan on failure of telemetry	Kestrel plan to release settled water during the season to remove the probability of uncontrolled releases Kestrel plans to use as much water as possibe for mine operations. Electronic telemetry systems are in place and maintained by external contractors. Daily monitoring via electronic telemetry. Where water releases are in operation, Kestrel monitor electronically hourly. Kestrel uses dip sampling at release points and monitor with electronic water quality meter Sampling parameters are electrical conductivity, pH, suspended solids
	Holding Dam- discharge point SW4	Mine contaminated water	High	Minor	Medium		Same as above for all water holding facilities listed	
	Rejects return Water Dam SW5	Mine contaminated water	High	Minor	Medium			

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Hazardous Waste Storage Not an authorised release point (RP), but could become RP in 1:100 ARI	Highly Contaminated Water	Low	High	High			and sulphate Weekly sampling for water reuse and prior to controlled releases and during releases No other release points – intentional or unintentional No exceedence of EA parameters recorded Electronic monitoring system Telemetry maintenance is quarterly unless otherwise required Maintenance 3 hour turnaround on report of failure
Minerva Coal Mine / Felix Resources	Dam, (Spillway) Release Point 1 to Sandhurst Creek	Mine contaminated water	High	Minor	Medium	[redacted]	Monitoring and reporting program in accordance with Environmental Authority MIN100552307 Planned releases for 2010/2011 wet season Contingency Plans Monitoring methodology Monitoring frequency Sampling methodology for water reuse Sampling parameters Sampling frequency Other release points – intentional or unintentional Exceedence of EA parameters Telemetry used Telemetry maintenance schedule Contingency plan on failure of telemetry	Minerva does not plan to release settled water during the season as sufficient storages exist on the lease. Minerva plans to use as much water as possibe for mine operations and to pipe water to residual voids where practical. Monitoring is by electronic telemetry systems are in place and maintained by external contractors. Monitoring is daily via electronic telemetry. Minerva uses dip sampling at storages and monitor with electronic water quality meter Sampling parameters are electrical conductivity, pH, suspended solids and sulphate Sampling is done weekly for water reuse No other release points –
	Dam, (Spillway) Release Point 2 to Sandhurst Creek	Mine contaminated water	High	Minor	Low		Same as above for all water holding facilities listed	
	Dam, (Spillway) Release Point 3 to Sandhurst Creek	Mine contaminated water	High	Minor	Medium			

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Hazardous Waste Storage Not an authorised release point (RP), but could become RP in 1:100 ARI	Highly Contaminated Water	High	High	High			intentional or unintentional Exceedence of EA parameters have not been recorded to date Electronic monitoring system Telemetry maintenance is quarterly unless otherwise required Maintenance 2 hour turnaround where required
Cook Coal Mine / Xstrata	Siltation Pond 3 (Colliery) to Magpie Creek	Mine contaminated water	High	Minor	Medium	[redacted]	Monitoring and reporting program in accordance with Environmental Authority MIN100783108 Planned releases for 2010/2011 wet season Contingency Plans Monitoring methodology Monitoring frequency Sampling methodology for water reuse Sampling parameters Sampling frequency Other release points – intentional or unintentional Exceedences of EA parameters Telemetry used Telemetry maintenance schedule Contingency plan on failure of telemetry	Cook has no storages for mine affected water on site. Cook is in negotiation with land holders adjacent to the mine to construct storages Monitoring is physical sampling and visual at gauging station Monitoring frequency is weekly unless rain events prompt a more frequent response Water is not reused Sampling parameters are electrical conductivity, pH, suspended solids and sulphate Sampling is performed when monitoring is done There are no other release points on the site Exceedences of EA parameters occur due to the nature of the site and the lack of storages No electronic telemetry is used
	V-Notch Weir (Washery) to Taurus Creek	Mine contaminated water	High	Minor	Low		Same as all water holding facilities Cook Coal Mine listed	This weir does not have the capacity to prevent or control releases and can become a release hazard

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
								where the flow rate of water is high enough to disturb settlings at the base of the weir.
	Hazardous Waste Storage Not an authorised release point (RP), but could become RP in 1:100 ARI	Highly Contaminated Water	High	High	High			
Rolleston Coal Mine / Xstrata Coal Queensland Pty Ltd	Bootes Creek Discharge Point 1 RP 1 to Bootes Creek	Mine contaminated water	High	Minor	Medium	[redacted]	- Monitoring and reporting program in accordance with Environmental Authority MIM800090802. - Releases for the 2010/2011 wet season will be oportunisitic in accordance with EA. - Rolleston has a current TEP (MAN11099) which permits release of up to 4 GL water from Spring Creek Dam. - Rolleston has several storage areas on-site which have available capacity which could be used as contingency. Water qualiity at these storages is within curretn EA discharge limits. - Monitoring methodology = in-situ monitoring and automated gauging station - Monitoring frequency = *Daily during release (the first sample must be taken within 2 hours of commencement of release)* For end of pipe contaminant limits & *Within 2 hours of commencement of release and there after weekly during release* for 'metals' Other qater stoirages quaterly in accordance with EA.	Rolleston Coal Mine/ Xstrata Coal Queensland Pty Ltd

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
							- Any water reuse(stock, irrigation) would be in accorandacne with EA & is monitored in storages as above; non being undertaken at this stage. - Water Management Plan has been submitted in acoracne with EA condition W32. REMP has also been submitted in accordance with condition W20. - All release points identified in EA; no other unintentional release points to date. - Rolleston has notified of one release in 2010/2011 wet season to date; this was in opportunistic & in compliance with EA. TEP has also been in compliance to date. - Some Telemetry used. - Telemetry maintenance schedule = Monthly; ALS. - Contingency plan on failure of telemetry = In-situ monitoring can be be undertaken.	
	Meteor Creek Discharge Point 1 RP 2 to Meteor Creek	Mine contaminated water	High	Minor	Low		Same as above for all water holding facilities listed	
	Environment Dam RP 3 to Bootes Creek	Mine contaminated water	High	Minor	Low			
	Bootes Creek Discharge Point 2 RP 4 to Bootes Creek	Mine contaminated water	High	Minor	Low			

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Meteor Creek Discharge Point 2 RP 5 to Meteor Creek	Mine contaminated water	High	Minor	Low			
	Hazardous Waste Storage Not an authorised release point (RP), but could become RP in 1:100 ARI	Highly Contaminated Water	High	High	High			
Carborough Downs Coal Mine / Vale Australia (CQ) Pty Ltd	Mine Waste Water Evaporation Dam (Reg Dam) & (RP1) -only authorised release point under EA MIN100329305. Spillway is release point.	Contaminant monitoring: Electrical Conductivity, pH Suspended Solids, Sulphate (SO_4^{2-}), Aluminium, Arsenic Cadmium, Chromium, Copper Iron, Lead, Mercury, Nickel, Zinc, Boron, Cobalt, Manganese, Molybdenum, Selenium, Silver, Uranium, Vanadium, Ammonia, Nitrate Petroleum hydrocarbons (C6-C9), Petroleum hydrocarbons (C10-C36), Fluoride (total), Boron.	Medium	Minor	Low	[redacted]	Regulated under EA; including Water Management Plan.	Water from RP1 is being transferred to Broadlea (see below) as a short term management strategy to minimise risk of release. If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
Broadlea Coal Mine / Vale Australia (CQ) Pty Ltd	(RP1) Quarry Dam - Sediment Dam 2 - only authorised release point under EA MIN100726908.	Contaminant monitoring: Electrical Conductivity, pH Suspended Solids, Sulphate (SO_4^{2-}), Aluminium, Arsenic Cadmium, Chromium, Copper Iron, Lead, Mercury, Nickel, Zinc, Boron, Cobalt, Manganese, Molybdenum, Selenium, Silver, Uranium, Vanadium, Ammonia, Nitrate Petroleum hydrocarbons (C6-C9), Petroleum	Medium	Minor	Low	[redacted]	Regulated under EA; including Water Management Plan.	Mine under care & maintenance, no active mining currently being undertaken. If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		hydrocarbons (C10-C36), Fluoride (total), Boron.						client is required to undertake an investigation into the potential for environmental harm.
Ensham Coal Mine / Bligh Coal Limited	(RP1) (Nogoa River) Ramp 24 Fill Point Dam & Ramp 4 Dam. (RP2) (Boggy Creek) Ramp 8 Pit (Yongala)	Contaminant monitoring: Electrical Conductivity, pH, Turbidity, Suspended Solids, Sulphate (SO_4^{2-}), Aluminium, Arsenic, Cadmium, Chromium, Copper, Iron, Lead, Mercury, Nickel, Zinc, Boron, Cobalt, Manganese, Molybdenum, Selenium, Silver, Uranium, Vanadium, Ammonia, Nitrate, Petroleum hydrocarbons (C6-C9), Petroleum hydrocarbons (C10-C36), Fluoride (total), Boron.	Medium Medium	Minor Minor	Low Low	[redacted]	Regulated under EA; including Water Management Plan.	Ensham still has large volumes of mine affected water stored on-site, however this water has been consolidated & stored in-pit to negate the potential for release. If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
Isaac Plains Coal Mine / Vale Australia (IP) P/L	RP1 (Release Dam 1) - release to Smokey Creek RP2 (Release Dam 2) - Release to Billy's Gully	Contaminant monitoring: Electrical Conductivity, pH Suspended Solids, Sulphate (SO_4^{2-}), Aluminium, Arsenic Cadmium, Chromium, Copper Iron, Lead, Mercury, Nickel, Zinc, Boron, Cobalt, Manganese, Molybdenum, Selenium, Silver, Uranium, Vanadium, Ammonia, Nitrate Petroleum hydrocarbons (C6-C9), Petroleum hydrocarbons (C10-C36), Fluoride (total), Boron	Medium	Minor	Low	[redacted]	Regulated under EA; including Water Management Plan.	TSF only authorised reg. dam is not yet constructed. If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
Lake Vermont Coal Project / Bowen Basin Coal P/L	(RP1) Sediment Dam 1 (RP2) Sediment Dam 2 (RP3) Sediment Dam 3	Contaminant monitoring: Electrical Conductivity, pH Suspended Solids, Sulphate (SO_4^{2-}), Aluminium, Arsenic	Medium	Minor	Low	[redacted]	Regulated under EA; including Water Management Plan.	Lake Vermont has a Co-disposal Dam & Environmental Dam as Reg structures - these

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	All RP's report to Garfax Gully before reaching Isaac River.	Cadmium, Chromium, Copper Iron, Lead, Mercury, Nickel, Zinc, Boron, Cobalt, Manganese, Molybdenum, Selenium, Silver, Uranium, Vanadium, Ammonia, Nitrate Petroleum hydrocarbons (C6-C9), Petroleum hydrocarbons (C10-C36), Fluoride (total), Boron.						are not release points. If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm
North Goonyella Coal Mine (NGCM) / Peabody (Bowen) Pty Ltd	Eastern Sediment Dam (authorised release point, releases to Goonyella Ck)	Storm water runoff and mine process water	High	Minor (assuming water quality is within authorised limits)	Low	[redacted]	Water management plan in place Trigger Action Response Plan being developed (as at August 2010) EA conditions	NGCM conducted a release under EA MIN100590107 from the Eastern Sediment Dam in March 2010. The mine was unable to demonstrate compliance with minimum flow requirements of conditions W8 and W9 of the EA. Water quality was within authorised limits.
	Co-disposal dam (regulated dam)	Tailings (coarse and fine rejects), mine affected water	Low	Severe	High		Water management plan in place Trigger Action Response Plan being developed (as at August 2010) Operational plan for the dam EA conditions	An expansion of NGCM's co-disposal facilities is currently under construction.
South Walker Creek Coal Mine (SWCM) / BHP Mitsui Coal Pty Ltd	Ramp F dam (authorised release point, releases to Walker Ck)	Pit water	High	Minor (assuming water quality is within authorised limits)	High	[redacted]	EA conditions	
	Ramp C dam (authorised release point, releases to Walker Ck)	Pit water	High	Minor (assuming water quality is within	High		EA conditions	

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
				authorised limits)				
	Eastern Sediment Dam (authorised release point, releases to Sandy Ck)	Mine affected water	High	Minor (assuming water quality is within authorised limits)	High		EA conditions	
	Clean Side Bidgerly's Tailings Dam (authorised release point, releases to Sandy Ck, regulated dam)	Mine affected water	High	Minor (assuming water quality is within authorised limits)	High		EA conditions	
	Down Dip Dam (authorised release point, releases to Sandy Ck)	Raw water	High	Minor (assuming water quality is within authorised limits)	Low		EA conditions	Sandy Creek rarely flows, and since inclusion of the model water conditions, has not reached minimum flow to allow a compliant release from this release point.
	Bidgerly's Tailings Dam (regulated dam)	Tailings	Low	Severe	Medium		EA conditions	Annual Audit conducted in 2009 advised that the dam is in good condition. Raise of Bidgerly's Tailings Dam Cell 1 is currently being actioned, as storage space remaining in Cell 1 will run out in early 2011. Should a flood event cause a release, it may impact on the Hail Creek Railway.
	Old Tailings Dam (regulated dam)	Tailings - no longer receiving fresh tailings, capped with coarse rejects	Low	Severe	Low		EA conditions	The Old Tailings Dam was decommissioned in 2002. Tailings are continuously consolidating and the tailings crust is hard and dry. The tailings have been capped with coarse rejects.
	Return Water Dam (regulated dam)	Supernatant water from Clean Side Bidgerly's Tailings Dam and runoff from	Low	Severe	Low		EA conditions	The SWCM rail loop and main road into the site are downstream of the

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Old Tailings Dam						dam, however they would not be impacted by an uncontrolled discharge from the dam.
Millennium Coal Mine / Millennium Coal Pty Ltd	Sediment Pond 2 (release point)	Mine affected water	High	Minor (assuming water quality is within authorised limits)	Low	[redacted]	EA conditions	
	Western Dam (release point and regulated dam)	Mine affected water	High	Minor (assuming water quality is within authorised limits)	Low		EA conditions	
	Windmill Dam (release point)	Mine affected water	High	Minor (assuming water quality is within authorised limits)	Low		EA conditions	
Red Mountain Infrastructure Joint Venture / Millennium Coal Pty Ltd	Process Dam (release point and regulated dam)	Mine affected water	High	Minor (assuming water quality is within authorised limits)	Low	[redacted]	EA conditions	
	Environment Dam (release point and regulated dam)	Mine affected water	High	Minor (assuming water quality is within authorised limits)	Low		EA conditions	
	Tailings Cells (regulated dam)	Tailings	Low	Severe	High		EA conditions	
	Emergency Tailings Storage Facility (regulated dam)	Ex-tailings	Low	Minor	Low		EA conditions	The emergency tailings storage facility is currently being rehabilitated in line with EA conditions. A recent inspection confirmed that the cells no longer contain tailings, and are being filled in with benign material and levelled.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Poitrel Coal Mine BHP Mitsui Coal Pty Ltd	Sediment Dam 3 (release point)	Mine affected water	High	Minor (assuming water quality is within authorised limits)	Low	[redacted]	EA conditions	
Gregory Crinum / BMA	11 Storages (14 release points) Balmoral Dam	Storm waters (With coal dust)	Medium	Minor	Low	[redacted]	Regulated under EA; including Water Management Plan.	Monitored quarterly
	Dam C	Mine affected water	Medium	Severe	Low			
	Dam D	Mine affected water	Medium	Severe	Low			
	F Block spillway	Mine affected water	Medium	Severe	Low			
	Ramp 4	Mine affected water	Low	Severe	Low			
	Crinum East Trench	Mine affected water	Medium	Severe	Low			
	I Block Spillway	Mine affected water	Medium	Severe	Low			
	TSF Western Cell Spillway	Mine affected water	Medium	Severe	Low			
	J Block South	Mine affected water	Medium	Severe	Low			
	Dam B Spillway	Mine affected water	Low	Severe	Low			
	Gregory Stormwater Dam Spillway	environmental water	High	Minor	Low			
Curragh Coal Mine / Wesfarmers Curragh Pty Ltd	Retention Dam RD1	Mine affected water	Medium	Severe	Low	[redacted]	Regulated under EA; including Water Management Plan.	No issues have been identified with mine water management. Site inspection to be undertaken in the early 2011.
	Retention Dam CN3	Mine affected water	Medium	Severe	Low			
	Retention Dam CN5	Mine affected water	Medium	Severe	Low			
Norwich Park Coal Mine / BMA	Horseshoe Dam	Environmental water	Medium	Minor	Low	[redacted]	Regulated under EA; including Water Management Plan.	Monitored quarterly. Inspection undertaken 4 November 2010. No issues identified on site at that time.
	Browns Dam	Mine affected water	Medium	Minor	Low			
	Leichhardt Pit HW (R20)Dam	Mine affected water	Medium	Severe	Low			
	Price Pit (R50) Dam	Mine affected water	Low	Severe	Low			
	Ramp 6 HW Dam	Mine affected water	Medium	Severe	Low			
	Ramp 6 Fill Pt Dam	Mine affected water	High	Severe	Low			

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Ramp 8 Dam	Mine affected water	Medium	Severe	Low			
	Suttles Bend Dam (Old)	Mine affected water	High	Minor	Low			
	Suttles Bend Dam (New)	Mine affected water	Low	Minor	Low			
Dawson South Mine /Anglo Coal	WA-DS01T Industrial Dam South – mine affected water storage with release point (**RP-DS01T**)	- Potential contaminants in water storage as per Tables 2 and 3 of the water conditions. - Characterisation studies of potential contaminants at Dawson South Mine with tendency to bioaccumulate have identified selenium and mercury. - Water quality data supplied by Dawson South Mine on 9/11/10 identified **exceedences of contaminant limits for metals and EC** in Tables 2, 3 & 6. EC currently **3790ųs/cm**. - Further rainfall may provide the dilution required to meet discharge water quality limits. - In the event of discharge, Industrial Dam South may exceed water quality limits and affect downstream water quality in the Dawson River.	Low	Medium	Medium	[redacted]	**Short term** Actions by Dawson South Mine to minimise the risk of discharge for 2010-2011 wet season include:- - Discontinuation of pit water inflows into Industrial Dam South to maximise residual storage capacity. - Planned construction of contour banks to divert normal catchment flow from adjacent grazing land away from Industrial Dam South. **-** Monitoring of residual storage capacity via telemetry system. **Long term** Anglo Coal (Dawson Management) Pty Ltd has commenced long term water management planning including:- - Water Management Strategy (10 year water management and associated infrastructure plan) including all Dawson mine sites (Dawson South, Central and North Mines) by Worley Parsons. Draft plan due at end of December 2010. To be finalised March 2011. - Anglo American water management planning for all Anglo mines.	Sections of public roads subject to flash flooding. During these events access to monitoring sites is restricted.
Dawson Central and North Mine / Anglo Coal	WA-DC02T 14 Dam - mine affected water storage with release point (RP-DC02T)	- Potential contaminants in water storage as per Tables 2 and 3 of the water conditions.	High	Medium	Medium	[redacted]	**Short term** Actions by Dawson Central and North Mine to minimise the risk of discharge for	Water levels depicted on graph at site office appeared inconsistent with water level observed

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		- Characterisation studies of potential contaminants at Dawson Central and North Mine with tendency to bioaccumulate have identified selenium and mercury. - Water quality data supplied by Dawson Central and North Mine on 9/11/10 identified **exceedences of contaminant limits for metals and EC** in Tables 2, 3 & 6. EC currently **3536ųs/cm**. - Further rainfall may provide the dilution required to meet discharge water quality limits. - In the event of discharge, 14 Dam may exceed water quality limits and affect downstream water quality in the Dawson R.					2010-2011 wet season include:- - 14 Dam is currently at capacity level. Drains normally directing catchment flow into 14 Dam have been recently blocked to reduce inflows. **-** Monitoring of residual storage capacity via telemetry system. **Long term** Anglo Coal (Dawson Management) Pty Ltd has commenced long term water management planning including:- - Water Management Strategy (10 year water management and associated infrastructure plan) including all Dawson mine sites (Dawson South, Central and North Mines) by Worley Parsons. Draft plan due at end of December 2010. To be finalised March 2011. - Anglo American water management planning for all Anglo mines.	in 14 Dam by approximately 2 metres. Dawson Central and North Mine to investigate.
	Hillview Dam WA-DC01T - mine affected water storage with release point (RP-DC01T)	- Potential contaminants in water storage as per Tables 2 and 3 of the water conditions. - Characterisation studies of potential contaminants at Dawson Central and North Mine with tendency to bioaccumulate have identified selenium and mercury. - Water quality data supplied by Dawson Central and North Mine on 9/11/10 identified **exceedences of contaminant limits for**	High	Medium	Medium		**Short term** Actions by Dawson Central and North Mine to minimise the risk of discharge for 2010-2011 wet season include:- **-** Two pumps currently transferring water from Hillview Dam to Pit 2C North to increase residual storage capacity. - New pipeline recently installed (not yet operational) dedicated to dewatering of Hillview Dam into Pit 2C North.	The shallow nature of Hillview Dam was evident by the current pumping activities. Extensive dam area was exposed compared with relatively small reduction in water level (700mm).

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		metals and EC in Tables 3 & 6. EC currently **1396ųs/cm**. - Further rainfall may provide the dilution required to meet discharge water quality limits. - In the event of discharge, Hillview Dam may exceed water quality limits and affect downstream water quality in the Dawson River.					**-** Monitoring of residual storage capacity via telemetry system. **Long term** Anglo Coal (Dawson Management) Pty Ltd has commenced long term water management planning including:- - Water Management Strategy (10 year water management and associated infrastructure plan) including all Dawson mine sites (Dawson South, Central and North Mines) by Worley Parsons. Draft plan due at end of December 2010. To be finalised March 2011. - Anglo American water management planning for all Anglo mines.	
	WA-DN01T Industrial Dam 1 North - mine affected water storage with release point (RP-DN01T)	- Potential contaminants in water storage as per Tables 2 and 3 of the water conditions. - Characterisation studies of potential contaminants at Dawson Central and North Mine with tendency to bioaccumulate have identified selenium and mercury. - Water quality data supplied by Dawson Central and North Mine on 9/11/10 identified **exceedences of contaminant limits for metals and EC** in Tables 2, 3 & 6. EC currently **1990ųs/cm**. - Further rainfall may provide the dilution required to meet discharge water quality limits.. - In the event of discharge,	Low	Medium	Medium		**Short term** Actions by Dawson Central and North Mine to minimise the risk of discharge for 2010-2011 wet season include:- **-** Monitor residual storage capacity via telemetry system. **Long term** Anglo Coal (Dawson Management) Pty Ltd has commenced long term water management planning including:- - Water Management Strategy (10 year water management and associated infrastructure plan) including all Dawson mine sites (Dawson South, Central and North Mines) by Worley Parsons. Draft plan due at end of	Nil.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Industrial Dam North may exceed water quality limits and affect downstream water quality in the Dawson River.					December 2010. To be finalised March 2011. - Anglo American water management planning for all Anglo mines.	
	DN-Cell 1 - Tailings from coal washing facility.	- Potential contaminants as per Tables 2 and 3 of the water conditions. - Flocculents (chemical content unknown).	No risk of discharge	N/A	N/A		Tailings from coal washing is deposited into an in pit storage dam. Design of dam includes a section of dam wall constructed of unstabilised spoil to promote seepage of tailings water to report to main section of void maintaining tailings as a thickened paste.	Nil.
Callide Mine / Anglo Coal	Lake Gasteen - mine affected water storage with release point.	- Potential contaminants in water storage as per Tables 2 and 3 of the water conditions. - Water quality data supplied by Callide Mine on 10/11/10 identified EC **2400 ųs/cm** on 4/08/10 and **1420 ųs/cm** on 8/10/10. No additional exceedences were recorded on these dates. - Further rainfall may provide the dilution required to meet discharge water quality limits.. - In the event of discharge Lake Gasteen may exceed water quality limits and affect downstream water quality in the Don River.	Low	Medium	Medium	[redacted]	**Short term** Actions by Callide Mine to minimise the risk of discharge for 2010-2011 wet season include:- - Discontinuation of pit dewatering inflows into Lake Gasteen. - Increased tank capacity at adjacent water fill point to maximise water output to haul road dust suppression operation. **-** ALS monitoring of residual storage capacity with gauge boards and telemetry system. - 25mm rainfall triggers water discharge site check by ALS. Protocol includes SMS update to Callide Mine. **Long term** - Investigation into alternative in pit water storage. - Anglo American water management planning for all Anglo mines.	Callide Mine is currently actively recruiting additional environmental staff. Callide Mine advised that stream flow gauging station installation completed by 31/10/10.
	Goldings Dam - mine affected water storage	- Potential contaminants in water storage as per Tables	High	Medium	Medium		**Short term** Actions by Callide Mine to	At the time of the inspection, Goldings

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	with release point.	2 and 3 of the water conditions. - Water quality data supplied by Callide Mine on 10/11/10 identified EC **1310 ųs/cm** on 20/07/10 and **1820 ųs/cm** on 8/10/10. No additional exceedences were recorded on these dates. - Further rainfall may provide the dilution required to meet discharge water quality limits.. - In the event of discharge Goldings Dam may exceed water quality limits and affect downstream water quality in the Don River.					minimise the risk of discharge for 2010-2011 wet season include:- - Discontinuation of Trap Gully pit dewatering inflows into Goldings Dam. - Current de-silting program to increase storage capacity. - 25mm rainfall triggers water discharge site check by ALS. Protocol includes SMS update to Callide Mine. **Long term** **-** Investigation into groundwater bores to intercept groundwater flow into Trap Gully mining area. - Investigation into alternative in pit water storage. - Anglo American water management planning for all Anglo mines.	Dam was being desilted. Some water seepage was still being discharged off site. Goldings Dam's capacity was severely reduced by silt levels. Goldings Dam has extremely limited storage capacity. It is considered that that Goldings Dam was not originally constructed as water storage but as a sediment dam for overflows from Ghost Ryders Dam. Callide Mine advised that stream flow gauging station installation completed by 31/10/10.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Oaky Creek Diversion Lake - mine affected water storage with release point.	- Potential contaminants in water storage as per Tables 2 and 3 of the water conditions. - Water quality data was unavailable for Oaky Creek Diversion Lake on 10/11/10 - Further rainfall may provide the dilution required to meet discharge water quality limits.. - In the event of discharge Oaky Creek Diversion Lake may exceed water quality limits and affect downstream water quality in the Don River.	Medium	Medium	Medium		**Short term** Actions by Callide Mine to minimise the risk of discharge for 2010-2011 wet season include:- - Discontinuation of pit dewatering inflows into Oaky Creek Diversion Lake. **-** ALS monitoring of residual storage capacity with gauge boards and telemetry system. - 25mm rainfall triggers water discharge site check by ALS. Protocol includes SMS update to Callide Mine. **Long term** - Investigation into filling in the Oaky Creek Diversion Lake to prevent current seepage from the water storage into adjacent mining pit. - Investigation into alternative in pit water storage. - Anglo American water management planning for all Anglo mines.	Access to monitoring sites restricted during excessive rainfall. Callide Mine advised that stream flow gauging station installation completed by 31/10/10.
	Dunn Creek Dam - mine affected water storage with release point.	- Potential contaminants in water storage as per Tables 2 and 3 of the water conditions. - Water quality data supplied by Callide Mine on 10/11/10 identified EC **1720 ųs/cm** on 8/10/10. No further exceedences were recorded on this date. - Further rainfall may provide the dilution required to meet discharge water quality limits.. - In the event of discharge	High	Medium	Medium		**Short term** Actions by Callide Mine to minimise the risk of discharge for 2010-2011 wet season include:- - Discontinuation of pit dewatering inflows into Dunn Creek Dam. - Current pumping of Dunn Creek Dam into D West Pit via Magazine Dam to maximise residual storage capacity. - Reduce flows into Dunn Creek Dam from Magazine	Callide Mine advised that stream flow gauging station installation completed by 31/10/10.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Dunn Creek Dam may exceed water quality limits and affect downstream water quality in the Don River.					Dam by pumping from Magazine Dam into D West Pit. - Desilt Magazine Dam to increase storage capacity. - Recently installed pump back system to collect and return from Dunn Creek Dam. - ALS monitoring of residual storage capacity with gauge boards and telemetry system. - 25mm rainfall triggers water discharge site check by ALS. Protocol includes SMS update to Callide Mine. **Long term** - Investigation into alternative in pit water storage. - Anglo American water management planning for all Anglo mines.	
Cracow Gold Mine / Newcrest Operations Pty Ltd	Historical waste dump collection dam ML3228 - mine affected water storage with release point SW11	Cyanide, sulphates, molybdenum, cadmium, aluminium, EC.	Low	High	Low	[redacted]	**Short term** Water recycled through ore treatment plant. **Long term** Planned construction of enhanced water storage infrastructure.	Newcrest Operations Limited advised the department in 2010 that nil discharges have occurred from Cracow Gold Mine since operations commenced in 2004 (following exploration period in 1990 - 2004).
	Ore treatment plant collection dam - mine affected water storage with release point SW12	Cyanide, sulphates, molybdenum, cadmium, aluminium, EC.	Low	Medium	Low		**Short term** Water recycled through ore treatment plant. **Long term** Planned construction of enhanced water storage infrastructure	Same as historical waste dump collection dam ML3228 Cracow Gold Mine
	Tailings storage facility - cyanide tailings with release point SW13	Cyanide, sulphates, molybdenum, cadmium, aluminium, EC.	Low	High	Low		**Long term** All water from thickened tailings collected and recycled through ore treatment plant.	Same as historical waste dump collection dam ML3228 Cracow Gold Mine

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Decline/workshop/ admin area collection dam - mine affected water storage with release point SW14	Cyanide, sulphates, molybdenum, cadmium, aluminium, EC.	Low	Medium	Low		**Short term** Water recycled through ore treatment plant. **Long term** Planned construction of enhanced water storage infrastructure.	Same as historical waste dump collection dam ML3228 Cracow Gold Mine
	TSF seepage collection dam - tailings affected water storage with release point SW16	Cyanide, sulphates, molybdenum, cadmium, aluminium, EC.	Low	Medium	Low		**Long term** Water pumped back to tailings storage facility for recycling through ore treatment plant.	Same as historical waste dump collection dam ML3228 Cracow Gold Mine
	Tailings Dam 2 sediment dam - tailings affected sediment dam with release point SW20	Cyanide, sulphates, molybdenum, cadmium, aluminium, EC.	Low	Medium	Low		**Long term** Water pumped back to tailings storage facility for recycling through ore treatment plant.	Same as historical waste dump collection dam ML3228 Cracow Gold Mine
	Tailings Dam 4 seepage collection dam - tailings affected water storage with release point SW16	Cyanide, sulphates, molybdenum, cadmium, aluminium, EC.	Low	High	Low		**Long term** Water recycled through ore treatment plant.	Same as historical waste dump collection dam ML3228 Cracow Gold Mine
	Tailngs Dam 4 - cyanide tailings with release point SW33	Cyanide, sulphates, molybdenum, cadmium, aluminium, EC.	Low	High	Low		**Long term** Water recycled through ore treatment plant.	Same as historical waste dump collection dam ML3228 Cracow Gold Mine
Baralaba Coal Mine/Baralaba Coal Pty Ltd	Farm Dam - mine affected water storage with release point (RP1)	- Potential contaminants in water storage as per Tables 2 and 3 of the water conditions. - In the event of discharge, Farm Dam is not anticipated to exceed water quality limits or affect downstream water quality in the Dawson River.	Low	Minor	Low	[redacted]	Response plan in place to remove water from mine to Farm Dam via pump. Prior to pump, laboratory analysis of water to prevent exceedence of water quality limits.	Mine has not discharged in over 5 years. Mine is a net user of water, recent above average rainfall has not required discharge. Recent maintenance of dam (August 2010) to improve storage.
QER / Queensland Energy Resources (Assun) Pty Ltd	Boxcut - Boxcut water release location	- Potential contaminants include pH and suspended solids. - Discharge into estuarine environment. - Above average rainfall may require discharge. - Water analysis conducted prior to discharge.	Low	Minor	Low	[redacted]	**Short term** Actions by QER to minimise the risk of discharge for 2010-2011 wet season include:- - minimise stormwater from entering boxcut via stormwater separation - review of release requirements by water services. **Long term**	Water release being review as amendment to EA process, QER to implement new water conditions within EA

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
							QER to implement release requirements within amended EA - QER to identify water values within Em Plan.	
	Clean Water Holding Pond, (WP-1) - mine affected water storage with release point (WP-1)	- Potential contaminants in water storage as per Table 1. - Water analysis conducted prior to discharge. - Excessive rainfall may require uncontrolled discharge.	Medium	Minor	Low		**Short term** Actions by QER to minimise the risk of discharge for 2010-2011 wet season include:- **-** Pump back system and laboratory analysis to ensure discharge meets limits identified on Table 1. **Long term** Department to review conditions with EA amendments to ensure up to date water condition meet current standards	Water storage limited and water storage in pit requires treatment prior to discharge.
	Mine Water Management System, (WP-2) - mine affected water storage with release point (WP-2)	- Potential contaminants in water storage as per Table 1. - Water analysis conducted prior to discharge. - Excessive rainfall may require uncontrolled discharge.	Low	Minor	Low		**Short term** Actions by QER to minimise the risk of discharge for 2010-2011 wet season include:- **-** Pump back system to Clean Water Holding Pond and laboratory analysis to ensure discharge meets limits identified on Table 1. **Long term** Department to review conditions with EA amendments to ensure up to date water condition meet current standards	Water storage limited and water storage in pit requires treatment prior to discharge.
	Emergency Overflow, (WP-3) - mine affected water storage with release point (WP-3)	- Potential contaminants in water storage as per Table 1. - Water analysis conducted prior to discharge. - Excessive rainfall may require uncontrolled discharge.	Low	Minor	Low		**Short term** Actions by QER to minimise the risk of discharge for 2010-2011 wet season include:- **-** Pump back system to Clean Water Holding Pond and laboratory analysis to ensure discharge meets limits identified on Table 1. **Long term**	Water storage limited and water storage in pit requires treatment prior to discharge.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
							Department to review conditions with EA amendments to ensure up to date water condition meet current standards	
	End of Pipe, (MP) - boxcut with release point (MP)	- Potential contaminants in water storage as per Table 2. - Water analysis conducted prior to discharge. - On-going dewatering for proposed backfill.	Low	Minor	Medium		**Short term** Actions by QER to minimise the risk of discharge for 2010-2011 wet season include:- - Dewater as part of backfill activity - Increase available capacity - Laboratory analysis to ensure discharge meets limits identified on Table 2. **Long term** Backfill activity to prevent discharge	Water storage decreasing by backfill activity anticipated completion December 201.
Omya / Omya Australia Pty Ltd	Unused Pit - mine affected and stormwater storage with uncontrolled release to drainage.	- Potential contaminants include pH, EC, and suspended solids. - Water quality data recorded during discharge. No exceedences recorded during 2009-2010.	Medium (limited capacity)	Minor	Low	[redacted]	**Short term** Omya current EA allows unrestricted discharge to maintain mining operations. - Omya to improve monitoring to minimise potential receiving water quality impacts.	Recent change to on site environmental personnel (new south wales based) On site water management not to current standards. Amended EA water conditions will be a challenge for Omya to comply with. Water quality does not appear to be an issue, more regarding volume of discharge, receiving waters, and monitoring.
	Mine Pit - mine affected and stormwater storage with pump release to drainage.	- Potential contaminants include pH, EC, and suspended solids. - Water quality data recorded during discharge. No exceedences recorded during 2009-2010.	Medium (limited capacity within mining pit)	Minor	Low		**Short term** Omya current EA allows unrestricted discharge to maintain mining operations. - Omya to improve monitoring to minimise potential receiving water quality impacts.	Recent change to on site environmental personnel (New South Wales based) On site water management not to current standards. Amended EA water conditions will be a

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
								challenge for Omya to comply with. Water quality does not appear to be an issue, more regarding volume of discharge, receiving waters, and monitoring.
QMAG / Queensland Magnesia Pty Ltd	Unused Pits - Mine affected water storage with controlled release to overland flow.	- Potential contaminants include pH, high EC, and suspended solids. - Water quality data recorded during discharge. No exceedences recorded during 2009-2010.	Medium (excess rainfall fills limited capacity)	Minor	Medium	[redacted]	**Short term** QMAG current EA allows unrestricted overland discharge to maintain mining operations. - QMAG current discharge limits includes high EC (6000 us/cm).	On site water management not to current department standards. Water conditions to the current standard will be a challenge for QMAG to comply with. Water services should review current conditions for advice regarding potential approach.
Cement Australia (East End Mine) / Cement Australian (Exploration) Pty Ltd	End of Pipe (A) - Mine affected fro m pit to sediment ponds discharge to Shultz's lagoon.	- Potential contaminants include pH, EC. - Water quality data recorded during discharge. One exceedence in 2009-2010 wet season investigated and received warning notice.	Medium (poor water management allows excess rainfall into pit)	Minor	Medium	[redacted]	**Short term** Cement Australia current EA allows discharge to maintain mining operations as long as complies with water quality guidelines. - Cement Australia current EA includes discharge volume based on limits includes high EC (4700 us/cm).	On site water management not to current department standards. Water conditions to the current standard will be a challenge for Cement Australia to comply with. EIS for amended EA should be received early 2011. Amended EA to include water conditions to current department standard.
	End of Pipe (E) - Spoil Dump affected water to storage pond to discharge to ephemeral creek, no monitoring of discharge volume.	- Potential contaminants include pH, EC. - Mine reports not meeting monitoring requirements during the last few years.	Medium (poor water management does not monitor as required)	Minor	Medium		**Short term** Cement Australia to improve monitoring of Point E and provided results to department.	On site water management not to current department standards. Water conditions to the current standard will be a challenge for Cement Australia to comply with. EIS for amended EA should be received early 2011. Amended EA to include water conditions to current department

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
								standard.
Affinis / Affinis Pty Ltd	End of Pipe - Former mine pit	- Potential contaminants include low pH and metals. - Mine affected water discharge offsite.	Medium (poor water management)	Medium	Medium	[redacted]	**Short term** Affinis pump back system to capture discharge prior to leaving mine site.	On site water management not to current department standards. Water conditions to the current standard will be a challenge for Affinis to comply with. Current owner delays compliance.
Moranbah North Coal Mine / Moranbah North Coal Management Pty Ltd	Dam 1 - discharge authorised under EA MIN100557107 – RP3	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium	High	Minor (if compliant)	Low	[redacted]	None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 2 - Discharge authorised under EA MIN100557107 – RP3	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 3 - Discharge authorised under EA MIN100557107 – RP1	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 4 - Discharge authorised under EA MIN100557107 – RP1 and 2	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Environmental Dam - Pond will spill way. Water spills into the Environmental Dam from the Production Dam spillway. Discharge is authorised under TEP MAN10140	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Production Dam - Water from the Production Dam spills via a spillway to the Environmental Dam. Water is released to the environment, authorised under EA MIN100557107 – RP1	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Various mine water storages	Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total)	High	Moderate	Medium		None – only conditons of EA	Compliance inspection completed 6.10.2010
German Creek Mine / Anglo Coal (German Creek) Pty Ltd	Oak Park Water Management System - Water is released to the environment, authorised under EA MIN100497707 – RP6	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	High	Minor (if compliant)	Low	[redacted]	None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Lake Lindsay Water Management System - Water is released to the environment, authorised under EA MIN100497707 – RP6	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Pit W - Water is released to the environment, authorised under EA MIN100497707 – RP8	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Central Storage - Water is released to the environment, authorised under EA MIN100497707 – RP8	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Old Tailings Dam - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Bruce's Billabong - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Lake Lisa - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm. .

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Potential for environmental harm.						
	Stacker Dam - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.
	White's Dam - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	High	Moderate	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Pit F - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Pit B2 - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES	Low	High	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Potential for environmental harm.						
	Pit P North - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.
	Pit P South - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Pit Q South - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Pit U1 - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		harm.						
	Pit U2 - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.
	Pit T - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Pit D North - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Pit D South - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		harm.						
	Pit C - Identified regulated structure under EA MIN100497707. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.	Low	Moderate	Low		None – only conditions of EA	OUTCOMES Potential for environmental harm.
Foxleigh Coal Mine / CAML Resources Pty Ltd	North West Open Cut Pit - Authorised discharge under EA MIN100734308. Discharge Point RP1	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low	[redacted]	None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	North East Open Cut Pit - Authorised discharge under EA MIN100734308. Discharge Point RP1	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	WC North Open Cut Pit - Authorised discharge under EA MIN100734308. Discharge Point RP2	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	WC South Open Cut Pit - Authorised discharge under EA MIN100734308. Discharge Point RP2	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	Far South Pit - Authorised discharge under EA MIN100734308. Discharge Point RP3	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	Carlo Creek Open Cut Pit - Authorised discharge under EA MIN100734308. Discharge Point RP4	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	One Tree Open Cut Pit - Authorised discharge under EA MIN100734308. Discharge Point RP4	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	Cockatoo Creek Sediment Dam 1 - Authorised discharge under EA MIN100734308. Discharge Point RP4	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	Cockatoo Creek Sediment Dam 2 - Authorised discharge under EA MIN100734308. Discharge Point RP4	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	Cockatoo Creek Sediment Dam 3 - Authorised discharge under EA MIN100734308. Discharge Point RP4	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	Tailings Dam 1 - Identified regulated structure under EA MIN100734308. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Tailings Dam 2 - Identified regulated structure under EA MIN100734308. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
Lake Lindsay Coal Mine/ Anglo Coal (German Creek)Pty Ltd	Central Storage - Authorised discharge under EA MIN800279904. Discharge Point RP2	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low	[redacted]	None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
Middlemount Coal Mine/ Ribfield Pty Ltd	Dam 1A - Authorised discharge under EA MIN100646307. Discharge Point 1A	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low	[redacted]	None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 1B - Authorised discharge under EA MIN100646307. Discharge Point 1B	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 1C - Authorised discharge under EA MIN100646307. Discharge Point 1C	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 2 - Authorised discharge under EA MIN100646307. Discharge Point 2	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 3 - Authorised discharge under EA MIN100646307. Discharge Point 3	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 4 - Authorised discharge under EA MIN100646307. Discharge Point 4	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 5 - Authorised discharge under EA MIN100646307. Discharge Point 5	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 6 - Authorised discharge under EA MIN100646307. Discharge Point 6	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 7 - Authorised discharge under EA MIN100646307. Discharge Point 7	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Dam 8 - Authorised discharge under EA MIN100646307. Discharge Point 8	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						
	Tailings Storage Facility - Identified regulated structure under EA MIN100646307. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Potential for environmental harm.						
	Open Pit - Identified regulated structure under EA MIN100646307. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.
Oaky Creek Coal Mine / Xstrata Coal Queensland Pty Ltd	G3 – coal handling and preparation area, industrial area and administration area - Authorised discharge under EA MIN100924209. Discharge Point RP1	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	High	Minor (if compliant)	Low	[redacted]	None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	OC1 – Oaky No 1 - Authorised discharge under EA MIN100924209. Discharge Point RP2	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	G9 open cut - Authorised discharge under EA MIN100924209. Discharge Point RP3	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	A4 open cut - Authorised discharge under EA MIN100924209. Discharge Point RP4	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
Peak Downs Mine/ BHP Coal Pty Ltd :	12 North Dam - Authorised discharge under EA MIN100496107. Discharge Point 1	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	High	Minor (if compliant)	Low	[redacted]	None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	7 North Dam - Authorised discharge under EA MIN100496107. Discharge Point 2	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	1 South Dam - Authorised discharge under EA MIN100496107. Discharge Point 3 and 5	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	1 North Dam - Authorised discharge under EA MIN100496107. Discharge Point 5	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Boomerange Dam - Authorised discharge under EA MIN100496107. Discharge Point 4 and 7	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						client is required to undertake an investigation into the potential for environmental harm.
	7N Harrow Creek - Authorised discharge under EA MIN100496107. Discharge Point 6	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	8/9 Dam - Authorised discharge under EA MIN100496107. Discharge Point 7	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						investigation into the potential for environmental harm.
	Ripstone RA Dam - Authorised discharge under EA MIN100496107. Discharge Point 12	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						potential for environmental harm.
	R6S Tailings Disposal - Identified regulated structure under EA MIN100496107. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	R7S Tailings Disposal - Identified regulated structure under EA MIN100496107. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	2N Tailings Dam - Identified regulated structure under EA MIN100496107. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.	Low	Severe	Medium		None – only conditions of EA	OUTCOMES Potential for environmental harm.
Saraji Coal Mine / BHP Coal Pty Ltd	Lake Lester - Authorised discharge under EA	CONTAMINANTS Electrical Conductivity	High	Minor (if compliant)	Low	[redacted]	None – only conditions of EA	If authorised release limits are exceeded or

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	MIN100845908. Discharge Point RP1	pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Dudley's Dam - Authorised discharge under EA	CONTAMINANTS Electrical Conductivity pH	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	MIN100845908. Discharge Point RP2	Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Evaporation Ponds - Authorised discharge under EA MIN100845908.	CONTAMINANTS Electrical Conductivity pH Suspended Solids	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement,

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Discharge Point RP3	Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Farmhouse-Ramp 15 High Wall Dams - Authorised discharge under EA MIN100845908.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-})	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
	Discharge Point RP4	Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Campbell's Dam - Authorised discharge under EA MIN100845908. Discharge Point RP5	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	HCD Back Access Road - Authorised discharge under EA MIN100845908. Discharge Point RP6	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur.

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	OMCD Back Access Road - Authorised discharge under EA MIN100845908. Discharge Point RP7	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Ramp Zero Evaporation Dam - Authorised discharge under EA MIN100845908. Discharge Point RP8	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						values are exceeded the client is required to undertake an investigation into the potential for environmental harm.
	Ramp 2 Fill Dam - Authorised discharge under EA MIN100845908. Discharge Point RP9	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron	High	Minor (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						undertake an investigation into the potential for environmental harm.
	Evaporation Pond - Identified regulated structure under EA MIN100845908. Release from structure not authorised under EA.	CONTAMINANTS Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead	Low	Medium (if compliant)	Low		None – only conditions of EA	If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES If authorised release limits are exceeded or the receiving water flow rate/dilution requirement, there is a potential for environmental harm to occur. If the trigger investigation values are exceeded the client is required to undertake an investigation into the potential for environmental harm.						investigation into the potential for environmental harm.
	Ramp 3 TSF - Identified regulated structure under EA MIN100845908. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead	Low	Severe	Medium		None – only conditions of EA	Potential for environmental harm

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
	Ramp 2 TSF - Identified regulated structure under EA MIN100845908. Release from structure not authorised under EA.	CONTAMINANTS Tailings Material Electrical Conductivity pH Suspended Solids Sulphate (SO_4^{2-}) Aluminium Arsenic Cadmium Chromium Copper Iron Lead Mercury Nickel Zinc Boron Cobalt Manganese Molybdenum Selenium Silver Uranium Vanadium Ammonia	Low	Severe	Medium		None – only conditions of EA	Potential for environmental harm

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
		Nitrate Petroleum hydrocarbons (C6-C9) Petroleum hydrocarbons (C10-C36) Fluoride (total) OUTCOMES Potential for environmental harm.						
Coppabella Coal Mine / Coppabella Coal Pty Ltd	Raw water dam	Elevated levels of EC	Medium	Minor	Low	[redacted]	None – only conditions of EA	The mine has implemented procedures to pump water back into an unused pit to maintain capacity in the dam for the upcoming wet season
	ABI dam	Slightly elevated levels of EC	Medium	Minor	Low		None – only conditions of EA	The mine has constructed diversions to reduce the size of the catchment reporting to the dam. A piping network has been constructed on site to pump water from ABI dam to Creek Pit as an emergency procedure.
	Orica dam	Slightly elevated levels of EC	Low	Minor	Low		None – only conditions of EA	The mine has dredged the dam to increase the capacity of the dam in preparation to the wet season
	Creek Pit	Elevated levels of EC and metals	Low	Medium	Low		None – only conditions of EA	Creek pit currently has an available storage capacity of 20,000 ML. Creek pit has a small catchment area and therefore the water level is unlikely to increase significantly during a heavy rainfall event. Creek pit does not have a release point.
Moorvale Mine / Coppabella Coal Pty Ltd	Sediment dam 1	Slightly elevated levels of EC and turbidity	Low – Medium	Minor	Low	[redacted]	None – only conditions of EA	The mine is planning to increase the height of the dam wall to increase capacity of the dam in preparation to the wet

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
								season.
	Raw water dam	Elevated levels of EC	Low - Medium	Minor	Low		None – only conditions of EA	The mine has implemented procedures to pump water back into the current pit to maintain capacity in the dam for the upcoming wet season
Hail Creek / Queensland Coal Pty Ltd	Polishing Pond	Water impounded in the Hail Creek mine water storage system. Including water used in processing, dewatering from pits and rainfall entering catchment	Low - Medium	Medium	Low - Medium	[redacted]	None – only conditions of EA	
Burton / Peabody (Burton Coal) Pty Ltd	Plumtree Northern Dam, Wallanbah Eastern Dam, Wallanbah Eastern, Dirty Water Dam, Wallanbah ROM Dam, Broadmeadow North, Western Dam, Western Lease Dam, Dam B2N, Dam B4N,	Mine affected water	Medium	Medium	Medium	[redacted]	None – only conditions of EA	
Newlands / Xstrata Coal Queensland Pty Ltd	West Drain Sediment Basin, Wollombi Farm Evaporation Dam, Banrock C, Dirty Water Dam, Banrock Evaporation Dam, Lenny's Lagoon, Mclaren Evaporation Dam, Ramp 17, East Drain Sediment Dam	Mine affected water	Medium	Medium	Medium	[redacted]	None – only conditions of EA	
Sonoma / QCoal Sonoma Pty Ltd	Decant water dam 1 (for Co-disposal Stage 1 – dam 1)	Mine impacted water	Low	Low	Low	[redacted]	None – only conditions of EA	No discharge point – very low risk for discharge
	Decant water dam 2 (for Co-disposal Stage 2 - dams 2 to 6)	Mine impacted water	Low	Medium	Low		None – only conditions of EA	No discharge point – very low risk for discharge
	Sediment Dam 3, Sediment Dam 4	Runoff from overburden stockpile	Low	Low	Low		None – only conditions of EA	
	Sediment Dam 5,	Runoff from ROM, wash plant and product stockpile	Low	Low	Low		None – only conditions of EA	

Facility/Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Collinsville Coal / Xstrata Coal Queensland Pty Ltd	Kerale Dam • Colinta Dam • Strathmore Seepage • Farm Dam • CHPP Primary Antipollution Pond • CHPP Secondary Antipollution Pond • Workshop Antipollution Pond • Workshop Evaporation Pond • Workshop Evaporation Pond #3 • Garrick East Pit • Tailings / reject disposal area • Hookies Highway Dam • Ramp 11 Pit	Mine impacted water – acid mine drainage	Low – Medium Not sure of discharges in previous years – would need to check file	Medium – High	Medium	[redacted]	None – only conditions of EA	Collinsville has a very old EA – Does not have model water conditions Acid mine drainage issues
Olive Downs, New Lenton / Copabella Coal Pty Ltd / New Lenton Coal Pty Ltd	Not Operational	Not Operational	Low	Low	Low	[redacted]	Not Operational	Not operational

Central West ES Gladstone Waste Water Storage Risk Assessment

Facility / Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Red Mud Dam / Queensland Alumina Limited	Two storage facilities holding waste bauxite residue.	Neutralised waste bauxite residue. If it were to discharge via the spillway would have high turbidity/suspended solid load may also have slightly elevated pH outside licence conditions and potential for heavy metal.	Medium	Moderate	Medium	[redacted]	Dam maintained in accordance with code of environmental compliance for high hazard dams containing hazardous waste. Annual inspection conducted each year to ensure integrity of dam is maintained	QAL are attempting to lower the decant pond in anticipation of a major inflow. Currently subject to an Environmental Evaluation
Ash Pond / Queensland Alumina Limited	One ash pond with decant pond into South Trees Inlet	Residues resulting from the burning of coal in boilers clinker and plant scale, tank bottom sludg and alumina hvdrate.	Low	Minor	Low	[redacted]	Dam management in accordance with Ash Disposal Management Plan	
Residue Management Area / RTAY	One facility with decant pond that discharge under licence to Fishermans Land Port Curtis	Neutralised waste bauxite residue. If it were to discharge via the spillway would have high turbidity/suspended solid load may also have slightly elevated pH and potential for heavy metals.	Low	Moderate	Low	[redacted]	Dam maintained in accordance with code of environmental compliance for high hazard dams containing hazardous waste. Annual inspection conducted each year to ensure integrity of dam is maintained	
Ash Pond / CS Energy	Ash pond with decant pond into Callide Creek	Residues resulting from the burning of coal in Callide Power Station. Waters high in salinity, sulphates and heavy metals.	Medium	Moderate	Medium	[redacted]	Dam maintained in accordance with code of environmental compliance for high hazard dams containing hazardous waste. Annual inspection conducted each year to ensure integrity of dam is maintained	Currently subject to an Environmental Evaluation
Evaporation Ponds / Queensland Nitrates Pty Ltd	Six evaporation ponds used for disposal of waste waters.	Pond waters high in nitrates, salts, slightly acidic, ammonia and sulphates	Medium	Moderate	Medium	[redacted]	Following compliance inspection Qld Nitrates have commence regular testing of the evaporation ponds, and implement a water management strategy including pond integrity and nutrient load	Inspection conducted on 2 Dec 10, QNP raising pond wall by 800mm to increase capacity and reduce risk. Concern about types of materials used to raise wall (ie road

							minimisation. QNP to provide DERM with fortnightly updates on water quality and storage levels. Ponds managed in accordance with IEMS which is currently being reviewed, proposed completion date January 2011. QNP also developing a wet season contingency plan which is being forwarded to DERM	base) and no controlled discharge system (ie spillway) installed. Investigations ongoing

Central West ES Mackay Waste Water Storage Risk Assessment

Facility / Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Bakers Creek STP / Mackay Regional Council	3 ponds (1 with spillway)	Treated effluent	High - ponds are currently at full capacity	Unsure as not sure of water quality	Medium	[redacted]	Contingency received from MRC. EPO for monitoring of current discharge	Access prevented when too wet to monitor, observe the dams/discharge point.
Mirani STP / Mackay Regional Council	1 Pond	Treated effluent	High - ponds are currently at full capacity	Unsure as not sure of water quality	Medium	[redacted]	Contingency plan received from MRC	
Borthwicks Meat Works / Thomas Borthwicks and Sons	1 pond	Discharge from meatworks	Medium – discharge has not occurred from ponds for sometime	Minor	Low	[redacted]	None – only conditions of EA	
Racecourse Sugar Mill / Mackay Sugar	Mill Ponds	Treated effluent and discharge from mill	High - the mill is currently taking water from Farleigh mill	Medium	Medium	[redacted]	None – only conditions of EA	
Proserpine Sugar Mill and Furfal plant / Proserpine Sugar Mill Cooperative	Mill Ponds	Treated effluent and discharge from mill	Medium – discharge has not occurred from ponds for sometime	Medium	Medium	[redacted]	None – only conditions of EA	
Sarina Sugar Mill / Sucrogen	Mill Ponds	Treated effluent and discharge from mill	Medium – discharge has not occurred from ponds for sometime	Medium	Medium	[redacted]	None – only conditions of EA	
Farleigh Sugar Mill / Mackay Sugar	Mill Ponds	Treated effluent and discharge from mill	High - ponds are currently at full capacity	Medium	Medium	[redacted]	None – only conditions of EA	
Marian Sugar Mill / Mackay Sugar	Mill Ponds	Treated effluent and discharge from mill	Medium – discharge has not occurred from ponds for sometime	Medium	Medium	[redacted]	None – only conditions of EA	

Facility / Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Woorabinda STP / Woorabinda Shire Council	ERA 63 2C	Treated and Untreated Effluent	Medium	Minor	Medium	[redacted]	DA Conditions.	STP Needs to be upgraded.
Farnborough STP / Iwaski Sangyo Co Pty Aust Pty Ltd	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Low	[redacted]	DA Conditions.	
Keppel Island STP / GKI Resort Pty Ltd	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Low	[redacted]	DA Conditions.	
Keppel Island STP / Team Keppel Pty Ltd	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Low	[redacted]	DA Condition.	
Mulambin Beach STP / Island View Caravan Park / Paul & Robyn Madigan	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Low	[redacted]	DA Conditions.	
STP / Cool Waters Holiday Village	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Low	[redacted]	DA Conditions.	
Bluff STP / Qld Rail (Bluff)	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Low	[redacted]	DA Conditions	
Etna Creek STP / Dept of Corrective Services	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions	

Facility / Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Stanwell Power Station / Stanwell Corporation Ltd	ERA 14 2B & 63 2B	Increased Salinity + Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	Yes.	
North Rockhampton STP / George Baxter	ERA 63 2a	Treated and Untreated Effluent	Low	Minor	Low	[redacted]	DA Conditions.	
Goodsall Street STP / Fitzroy River Water	ERA 63 2E	Treated and Untreated Effluent	Low	Moderate	Medium	[redacted]	DA Conditions.	
Harman Street STP / Fitzroy River Water	ERA 63 2E	Treated and Untreated Effluent	Low	Moderate	Medium	[redacted]	DA Conditions.	
Quay Street STP / Fitzroy River Water	ERA 63 2E	Treated and Untreated Effluent	Low	Moderate	Medium	[redacted]	DA Conditions.	
Yeppoon STP / Fitzroy River Water	ERA 63 2E	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Emu Park STP / Fitzroy River Water	ERA 63 2D	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Armstrong Street STP / Fitzroy River Water	ERA 63 2D	Treated and Untreated Effluent	Low	Moderate	Medium	[redacted]	DA Conditions.	
Mt Morgan STP / Fitzroy River Water	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions	

Facility / Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Lakes Creek Meatworks / Consolidated Meat Group Pty Ltd	ERA 25 2C	Treated and Untreated effluent	Medium	Minor	Medium	[redacted]	DA Conditions.	
Swift Australia Pty Ltd Nerimbera Meatworks	ERA 52 2C	Treated and Untreated effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Blackwater STP / Central Highlands Regional Council	ERA 63 2D	Treated and untreated effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Springsure STP / Central Highlands Regional Council	ERA 63 2B	Treated and untreated effluent	Low	Minor	Low	[redacted]	DA Conditions.	
Capella STP / Central Highlands Regional Council	ERA 63 2B	Treated and untreated effluent	Low	Minor	Low	[redacted]	DA Conditions.	
Tieri STP / Central Highlands Regional Council	ERA 63 2C	Treated and untreated effluent	Low	Minor	Low	[redacted]	DA Conditions.	
Emerald STP / Central Highlands Regional Council	ERA 63 2E	Treated and untreated effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Mt Morgan Mine Site	Abandoned Mines Project	Contamination of Fitzroy	Low	Extreme	High	[redacted]	Mt Morgan Mine Contingency Plan 2010.	

Facility / Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Lakes Creek Landfill / Rockhampton Regional Council	ERA 60	Leachate	Medium	Minor	High	[redacted]	DA Conditions & Incident Plans.	Q10 Flood prone area.
Blackall STP / Blackall Tambo Regional Council	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Tambo STP / Blackall Tambo Regional Council	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Muttaburra STP / Barcaldine Regional Council	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Aramac STP / Barcaldine Regional Council	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Barcaldine STP / Barcaldine Regional Council	ERA 63 2D	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
STP / Kestrel Coal Pty Ltd	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
STP / Winton Shire Council	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Caravan Park STP / Willows Gemfields / David and Valda Lee	ERA 63 2A	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	

Facility / Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
STP / Party Sapphire Pty Ltd	ERA 63 2A	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Comet STP / Ensham resources Pty Ltd	ERA 63 2A	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
STP / Comet Accommodation Park	ERA 63 2A	Treated and Untreated Effluent	Low	Minor	Medium	[redacted]	DA Conditions.	
Emerald STP / A & L Romeo Pty Ltd	ERA 63 2A	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
Carnarvon Gorge STP / Bluegums National Property Ltd	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	High	[redacted]	DA Conditions.	Overflow into creek that runs into pristine national park.
Carnarvon Gorge STP / Nature Australia Ltd	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	High	[redacted]	DA Conditions.	Overflow into creek that runs into pristine national park.
Comet STP/ Paul Kelly	ERA 63 2A	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
North Goonyella STP / Peabody (Bowen) P/L	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
Willows STP / Gem-Air Village Caravan Park	ERA 63 2A	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	

Facility / Organisation	Description of storage	Details of contaminants & possible outcome	Probability of Release L/M/H	Consequence of Release Minor - Severe	Overall Risk Low - High	DERM Main contact	Details of any existing response plan in place	Comments or observations
Emerald STP / Brian Robert Birch	ERA 63 2A	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
STP / Pacific Century Production P/L	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
STP / Rubyvale Caravan Park	ERA 63 2A	Treated and Untreated Effluent	Medium	Minor	Medium.	[redacted]	DA Conditions.	
STP / Australian Agricultural College Corporation	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
Ilfracombe STP / Longreach Regional Council	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
Isisford STP / Longreach Regional Council	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
Longreach STP / Longreach Regional Council	ERA 63 2D	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions.	
Birdsville STP / Diamantina Shire Council	ERA 63 2B	Treated and Untreated Effluent	Low	Minor	Medium.	[redacted]	DA Conditions	

Appendix 2 - Waste Water Storage Facilities Contacts List

Gladstone Mining Sites

Site	Site Contact		Corporate Contact	
	Name/Position/Phone/Email	Postal Address	Name/Position/Phone/Email	Postal Address
Affinis	[redacted]	992 Albany Highway EAST VICTORIA PARK WA 6101	[redacted]	992 Albany Highway EAST VICTORIA PARK WA 6101
Arc Marlborough	[redacted]	PO Box 4 NEWPORT BEACH NSW 2106	[redacted]	PO Box 4 NEWPORT BEACH NSW 2106
Baralaba	[redacted]	The Minserv Group Level 1 1 Swann Road TARINGA QLD 4068	[redacted]	Level 2 66 Hunter Street SYDNEY NSW 2000
Callide	[redacted]	Anglo Coal (Callide Management) Pty Ltd Anglo Coal Callide Mine BILOELA QLD 4715	[redacted]	Anglo Coal (Callide Management) Pty Ltd Level 11 201 Charlotte Street BRISBANE QLD 4000
Cheetham Salt	[redacted]	1017 Port Alma Road BAJOOL QLD 4699	[redacted]	Cheetham Salt Limited Level 4 565 Burke Street MELBOURNE VIC 3000
Cracow		Cracow Gold Mine Locked Bag 2 THEODORE QLD 4719	[redacted]	Newcrest Operations Limited Level 9 600 Street Kilda Road MELBOURNE VIC 3004

Dawson Central/North	[redacted]	[redacted]	[redacted]	Level 11 201 Charlotte Street BRISBANE QLD 4000
Dawson South	[redacted]	[redacted]	[redacted]	Level 11 201 Charlotte Street BRISBANE QLD 4000
East End Mine	[redacted]	[redacted]	[redacted]	
Genesis Resources			[redacted]	8/52 Marina Road Cullen Bay DARWIN NT 0820 2 Lacebark Ct BELLBOWRIE QLD 4070
Gladstone LNG				Ground Floor 5 Ord Street WEST PERTH WA 6872

Marlborough Nickel	[redacted]		[redacted]	[redacted]
Norton Goldfields	Currently no onsite office in QLD.	Currently no onsite office in QLD.	[redacted]	[redacted]
Omya	[redacted]	285 College Road BATHURST NSW 2795	[redacted]	285 College Road BATHURST NSW 2795
QER	[redacted]	[redacted]	[redacted]	[redacted]
QLD Magnesium	[redacted]	[redacted]		
Unimin			[redacted]	[redacted]

Site	Site Contact		Corporate Contact	
	[redacted]hone/Email	Postal Address	Name/Position/Phone/Email	Postal Address
Burton	[redacted]	[redacted]	[redacted]	Peabody Energy Australia Pty Ltd GPO Box 164 BRISBANE QLD 4001
Coppabella	[redacted]	[redacted]	[redacted]	Coppabella Coal Pty Ltd GPO Box 1025 BRISBANE QLD 4000
Hail Creek	[redacted]	[redacted]	[redacted]	Rio Tinto Coal Australia GPO Box 391 BRISBANE QLD 4001
Lenton	[redacted]	[redacted]	[redacted]	PO Box 47 IPSWICH QLD 4305
Moorvale	[redacted]	[redacted]	[redacted]	Coppabella Coal Pty Ltd GPO Box 1025 BRISBANE QLD 4000
Olive Downs	[redacted]	[redacted]	[redacted]	Coppabella Coal Pty Ltd GPO Box 1025 BRISBANE QLD 4000

Sonoma Coal Mine	[redacted]	Sonoma Mine Management Pty Ltd PO Box 10069 Adelaide Street BRISBANE QLD 4000
Newlands Coal Mine	[redacted]	Xstrata Coal Queensland GPO Box 2587 Riverside Centre BRISBANE QLD 4001
Collinsville	[redacted]	Xstrata Coal Queensland GPO Box 2587 Riverside Centre BRISBANE QLD 4001
QER	[redacted]	Same

Emerald Mining Sites

Site	Site Contact		Corporate Contact	
	Name/Position/Phone/Email	Postal Address	Name/Position/Phone/Email	Postal Address
Alpha Coal	[redacted]			Hancock Coal Pty Ltd GPO Box 963 BRISBANE QLD 4001
Blackwater				GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000
Blair Athol				Queensland Coal Pty Ltd GPO Box 391 BRISBANE QLD 4001

Broadlea	[redacted]			Vale Head office **Ph:** (07) 3136 0500 **Fax:** (07) 3136 0510 **Postal Address:** GPO Box 731, BRISBANE QLD 4001 **Site Address:** Level 11 100 Creek Street BRISBANE QLD 4001
Caval Ridge				PO Box 1389 BRISBANE QLD 4001

Carborough Downs	[redacted]			Vale Head office **Ph:** (07) 3136 0500 **Fax:** (07) 3136 0510 **Postal Address:** GPO Box 731 BRISBANE QLD 4001 **Site Address:** Level 11 100 Creek Street BRISBANE QLD 4001
Clermont Coal				Queensland Coal Pty Ltd GPO Box 391 BRISBANE QLD 4001

Cook	[redacted]	
Curragh		Wesfarmers Curragh Pty Ltd Private Mail Bag BLACKWATER QLD 4717
Daunia		GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000

Ensham	[redacted]	[redacted]	[redacted]	Ensham Resources Level 18 AMP Place 10 Eagle Street GPO Box 814 BRISBANE QLD 4001
Foxleigh	[redacted]	[redacted]	[redacted]	Anglo Coal Australia GPO Box 1410 BRISBANE QLD 4001
Galilee Coal Mine	[redacted]	[redacted]	[redacted]	Waratah Coal GPO Box 89 BRISBANE QLD 4001
German Creek	[redacted]	[redacted]	[redacted]	Anglo Coal Australia GPO Box 1410 BRISBANE QLD 4001

Goonyella Riverside	[redacted]			GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000
Gregory Crinum				GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000
Grosvenor				Anglo Coal Australia GPO Box 1410 BRISBANE QLD 4001
Isaac Plains				

Jellinbah	[redacted]	
Kestrel		Rio Tinto Level 3 – West Tower 410 Ann Street BRISBANE QLD 4000
Kevin's Corner		Hancock Galilee Pty Ltd GPO Box 963 BRISBANE QLD 4001
Lake Lindsay		Anglo Coal Australia GPO Box 1410 BRISBANE QLD 4001

Lake Vermont	[redacted]			Lake Vermont Coal Mine GPO Box 374 BRISBANE QLD 4001
Middlemount Mine	[redacted]			
Millennium	[redacted]			**Postal Address:** GPO Box 164 BRISBANE QLD 4001 **Physical Address:** BOQ Building Lvl 13 259 Queen Street BRISBANE QLD 4000
Minerva	[redacted]			Minerva Mining Pty Ltd PO Box 1845 EMERALD QLD 4720

Moranbah North	[redacted]	Anglo Coal Australia GPO Box 1410 BRISBANE QLD 4001
North Goonyella	[redacted]	**Postal Address:** GPO Box 164 BRISBANE QLD 4001 **Physical Address:** BOQ Building Lvl 13 259 Queen Street BRISBANE QLD 4000
Norwich Park	[redacted]	GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000
Oaky Creek	[redacted]	PO Box 2245 NORTH MACKAY QLD 4740

Peak Downs	[redacted]	GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000
Poitrel		GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000
Red Mountain		**Postal Address:** GPO Box 164 BRISBANE QLD 4001 **Physical Address:** BOQ Building Lvl 13 259 Queen Street BRISBANE QLD 4000

Rolleston	[redacted]	PO Box 2245 NORTH MACKAY QLD 4740
Saraji	[redacted]	GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000
South Walker Creek	[redacted]	GPO Box 1389 BRISBANE QLD 4001 OR Level 23 Riparian Plaza 71 Eagle Street BRISBANE QLD 4000
Yarrabee	[redacted]	Yarrabee Coal Company Pty Ltd PO Box 431 BLACKWATER QLD 4717

Gladstone Waste Water Sites

Site	Contact at facility	Name	Job title	Tel	Mobile	Email	Facility address	Registered Business address
Rio Tinto Alcan Yarwun	[redacted]							975 Hanson Road, Gladstone, QLD,4680
Queensland Alumina Ltd								Queensland Alumina Limited, Parsons Point, Gladstone, QLD 4680 Australia
Queensland Nitrates Pty Ltd								Three Chain Road, PO Box 322, Moura QLD 4719
CS Energy Ltd								Callide Power Station, PO Box 392, Biloela Qld 4716

Mackay Waste Water Sites

Site	Contact at facility	Name	Job title	Tel	Mobile	Email	Facility address	Registered Business address
Bakers Creek STP Mackay Regional Council	[redacted]							Civic Precinct Gordon Street Mackay 4740
Mirani STP Mackay Regional Council								Civic Precinct Gordon Street Mackay 4740
Thomas Borthwick & Sons meatworks								113a Main Street Bakers Creek Mackay 4740
Racecourse mill Mackay Sugar Co-op Assoc Ltd								Peak Downs Highway Mackay
Farleigh mill Mackay Sugar Co-op Assoc								Peak Downs Highway Mackay
Marian mill Mackay Sugar Co-op Assoc								Peak Downs Highway Mackay
Proserine Sugar Mill and Furfural Plant								Main Street Proserpine 4800
Sucrogen (CSR Sugar mill and distillery)								Mill Street Sarina 4737

Rockhampton Waste Water Sites

Site	Contact at facility	Name	Job title	Tel	Mobile	Email	Facility address	Registered Business address
Woorabinda Shire Aboriginal Council Woorabinda STP ERA 63 2C		[redacted]						Council Chambers Munns Drive Woorabinda
Iwaski Sangyo Co Pty Aust Pty Ltd STP ERA 63 2B		[redacted]						Farnborough Road, Yeppoon
GKI Resort Pty Ltd Keppel Island STP ERA 63 2B		[redacted]						"North Point" SE 3 L 30 100 Miller Street North Sydney NSW 2060
Team Keppel Pty Ltd Keppel Island STP ERA 63 2B		[redacted]						Great Keppel Island
Paul & Robyn Madigan (Island View Caravan Park) Mulambin Sands STP ERA 63 2B		[redacted]						946 Scenic Highway Kinka Beach 4703
Cool Waters Holiday Village STP ERA 63 2B		[redacted]						760 Scenic Highway Kinka Beach 4703
Qld Rail (Bluff) Bluff STP ERA 63 2B		[redacted]						Infrastructure Services Floor 12 RC1, 305 Edward Street Brisbane Qld 4000
Dept of Corrective Services Etna Creek STP ERA 63 2B		[redacted]						

Stanwell Corporation Ltd Stanwell Power Station ERA 14 2B & 63 2B		[redacted]	Level 12 Waterfront Place 1 Eagle Street Brisbane Qld 4000
George Baxter North Rockhampton STP ERA 63 2a			397 Alexandra Street North Rockhampton
Fitzroy River Water Goodsall Street ERA 63 2E			Belmont Road Rockhampton
Fitzroy River Water Harman Street ERA 63 2E			Belmont Road Rockhampton
Fitzroy River Water Quay Street ERA 63 2E			Belmont Road Rockhampton
Fitzroy River Water Yeppoon ERA 63 2E			Belmont Road Rockhampton
Fitzroy River Water Emu Park ERA 63 2D			Belmont Road Rockhampton
Fitzroy River Water Armstrong Street ERA 63 2D			Belmont Road Rockhampton
Fitzroy River Water Mt Morgan ERA 63 2B			Belmont Road Rockhampton
Consolidated Meat Group Pty Ltd ERA 25 2C			

Swift Australia Pty Ltd ERA 52 2C		[redacted]	30 Industry Park drive BROOKLYN VIC 3012
CHRC Blackwater STP ERA 63 2D			66 Egerton Street Emerald
CHRC Springsure STP ERA 63 2B			67 Egerton Street Emerald
CHRC Capella STP ERA 63 2B			68 Egerton Street Emerald
CHRC Tieri STP ERA 63 2C			69 Egerton Street Emerald
CHRC Emerald STP ERA 63 2E			70 Egerton Street Emerald
Mt Morgan Mine Site			
Rockhampton Regional Council Lakes Creek Landfill ERA 60			Town Hall, Bolsover Street, Rockhampton
Blackall Tambo Regional Council Blackall STP ERA 63 2B			6 Coronation Street Blackall
Blackall Tambo Regional Council Tambo STP ERA 63 2B			6 Coronation Street Blackall

Barcaldine Regional Council Muttaburra STP ERA 63 2B		[redacted]	71 Ash Street Barcaldine
Barcaldine Regional Council Aramac STP ERA 63 2B			72 Ash Street Barcaldine
Barcaldine Regional Council Barcaldine STP ERA 63 2D			73 Ash Street Barcaldine
Kestrel Coal Pty Ltd STP ERA 63 2B			Level 3 West Tower 410 Ann Street Brisbane
Winton Shire Council STP ERA 63 2B			Vindex Street Winton
David and Valda Lee Willows Gemfields C'van Park STP ERA 63 2A			Willows Gemfield Caravan Park 30 Willows Road Willows Gemfields
Party Sapphire Pty Ltd STP ERA 63 2A			925 Anakie Sapphire road Sapphire
Ensham resources Pty Ltd Comet STP ERA 63 2A			Level 18 AMP Place 10 Eagle Street Brisbane
Comet Accommodation Park STP ERA 63 2A			Ballard Street Comet
A & L Romeo Pty Ltd Emerald STP ERA 63 2A			Phlorides Gallo & Associates Level 1 113A High Street PRESTON VIC

Bluegums National Property Ltd Carnarvon Gorge STP ERA 63 2B		[redacted]	C/- Vertical Corporation Pty Ltd Suite 308, 434 St. Kilda Road MELBOURNE VIC
Nature Australia Ltd Carnarvon Gorge STP ERA 63 2B		[redacted]	Level 18 344 Queen Street Brisbane
Steve Horn Comet STP ERA 63 2A		[redacted]	SHOP 1 16 RUBY STREET Emerald
Peabody (Bowen) P/L North Goonyella STP ERA 63 2B		[redacted]	Level 4 300 Queen Street Brisbane
Gem-Air Village Caravan Park Willows STP ERA 63 2A		[redacted]	Little Gem Road Willows Gemfields
Brian Robert Birch Emerald STP ERA 63 2A		[redacted]	C/- McDonnell Hume Partners 50 Borilla Street Emerald
Pacific Century Production P/L STP ERA 63 2B		[redacted]	Lot 2 Gregory Highway Emerald
Rubyvale Caravan Park STP ERA 63 2A		[redacted]	Main Street Rubyvale
Australian Agricultural College Corporation STP ERA 63 2B		[redacted]	Capricorn Highway Emerald

Longreach Regional Council Ilfracombe STP ERA 63 2B		[redacted]						96A Eagle Street Longreach
Longreach Regional Council Isisford STP ERA 63 2B		[redacted]						96A Eagle Street Longreach
Longreach Regional Council Longreach STP ERA 63 2D		[redacted]						96A Eagle Street Longreach
Diamantina Shire Council Birdsville STP ERA 63 2B		[redacted]						Herbert Street Bedourie

Appendix 3 - Contact Details of ES Team Members

Central West Region

Name	Position	Telephone	Mobile
[redacted]	[redacted]	[redacted]	[redacted]

Environmental Services

Name	Position	Telephone	Mobile
Environmental Services			
Mackay			
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
Rockhampton			
[redacted]	[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Name	Position	Telephone	Mobile
[redacted]	[redacted]	[redacted]	[redacted]
Emerald			
[redacted]	[redacted]	[redacted]	[redacted]
Gladstone			
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

Environmental Services (Mining)

Name	Position	Telephone	Mobile
Environmental Services (Mining)			
Rockhampton			
[redacted]	[redacted]	[redacted]	[redacted]
Mackay			
[redacted]	[redacted]	[redacted]	[redacted]
Emerald			
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

			[redacted]
[redacted]	[redacted]	[redacted]	[redacted])
Gladstone			
[redacted]	[redacted]	[redacted]	[redacted]
[redacted]	[redacted] [redacted]	[redacted]	[redacted]
[redacted]	[redacted]	[redacted]	[redacted]

On Call Roster for Environmental Services

Date w/c	Rockhampton (R) and Gladstone (G)	Emerald (E) and Mackay(M) 1st Officer	Emerald (E) and Mackay (M) 2nd Officer
29 November 2010	[redacted]	[redacted]	[redacted]
6 December 2010	[redacted]	[redacted]	[redacted]
13 December 2010	[redacted]	[redacted]	[redacted]
20 December 2010	[redacted]	[redacted]	[redacted]
27 December 2010	[redacted]	[redacted]	[redacted]
3 January 2011	[redacted]	[redacted]	[redacted]
10 January 2011	[redacted]	[redacted]	[redacted]
17 January 2011	[redacted]	[redacted]	[redacted]
24 January 2011	[redacted]	[redacted]	[redacted]
31 January 2011	[redacted]	[redacted]	[redacted]
7 February 2011	[redacted]	[redacted]	[redacted]
14 February 2011	[redacted]	[redacted]	[redacted]
21 February 2011	[redacted]	[redacted]	[redacted]
28 February 2011	[redacted]	[redacted]	[redacted]
7 March 2011	[redacted]	[redacted]	[redacted]
14 March 2011	[redacted]	[redacted]	[redacted]
21 March 2011	[redacted]	[redacted]	[redacted]

Note: Please refer to Contacts List above for on-call contact details

Appendix 4 - Incident Action Recording Sheet

DERM officer name ____

Site attended ____

Initial response date and time ___/_____/______ ___:___

Details of actions taken

Date	Time	Action	Outcome

Appendix 5 - Environmental Services On-Call system

Central West Region

Environmental Services, Local Procedural Guide

After Hours On-Call system

Objective

1. To operate a system that:

   (a) ensures Environmental Services Central West Region has capacity after hours to manage or support pollution or hazardous incident response and initiate investigations in relation to, cause or threat of environmental harm; and

   (b) is efficient and safe for Environmental Services officers.

An After Hours On-Call system

2. The Central West Region, Environmental Services After Hours On-Call system responds to calls escalated on from the State Incident Response Network (SIRN).

Matters that may be escalated to after hours on-call officers from SIRN

3. The following matters are incidents that may be escalated by SIRN:

   (a) Oil or hazardous chemical spills, and large fires involving oil or hazardous chemicals.

   (b) Sewage from a municipal sewage system actually flowing into and polluting a waterway.

   (c) Fish kills in rivers or creeks where the fish kill involves 20 or more dead or affected fish, and is clearly recent and associated with a contamination incident.

   (d) Major air pollution fallout, but not nuisance dust, smoke and odour.

   (e) Requests by Maritime Safety Queensland (“MSQ”) about discharges from vessels.

   (f) Requests by Department of Emergency Services (“DES”).

   (g) Request by Department of Primary Industries (“DPI”), if the report is about animal disease, significant fish kill, or the death of large numbers of agricultural stock and carcass disposal or investigation.

   (h) Requests by Local Governments.

   (i) Reports by the Great Barrier Reef Marine Park Authority (GBRMPA).

The After Hours On-Call roster

4. An After Hours On-Call roster will be developed annually.
   (a) Participation in the After Hours On-Call roster will be voluntary.
   (b) The relevant Manager will determine in consultation with the officer whether the officer has the skills and experience to participate in on-call duties.
   (c) One officer will be rostered for on-call duty for the operational area (Rockhampton Regional, Gladstone Regional and Banana Shire municipalities).
   (d) The duty period will generally be 7 consecutive days (Monday pm to Monday am).
   (e) The duty period is generally the period outside of normal office hours 4:30pm to 8:30am, weekends and public holidays.
   (f) Where an on-call officer wishes to amend the rostered period it is the responsibility of the officer to organise the amendment and notified the relevant Manager in advance of the on-call duty.
   (g) The Managers or Regional Manager (Environmental Services) will generally be contactable after-hours, and are to be contacted to provide support to the rostered on-call officer in relation to the following matters.
      - Where an officer is to travel to the scene of an incident;
      - Where there may be serious environmental harm or additional resources are required;
      - Where Environmental Services may need to commit expenditure for clean-up;
      - Where the media may be involved;
      - Where an officer is uncertain about the action that should be taken.

5. An allowance that will be paid to on-call officers in accordance with the relevant *State Government Departments Certified Agreement*.

Recall to Duty

6. A Manager or Regional Manager or Regional Service Director may recall to duty any employee who is an employee under the *Public Service Act 1996* and/or an authorised person under the *Environmental Protection Act 1994* if the employee's assistance is required in relation to an incident.

The role of the After Hours on-call officer

7. The role of an on-call officer is to manage or support the management of an environmental or hazardous incident.

8. The on-call officer will:
   (a) Monitor the phone to receive and respond to calls.
   (b) Maintain a blood alcohol content below 0.05%.
   (c) Ensure the Departmental vehicle, PPE and other relevant equipment is available

for deployment at short notice.

(d) Ensure they are located within the operational area with the capacity to respond to an incident. It is generally expected that the office will be at the site of an incident within 2 hours of notification (particularly for high hazard areas) although for some locations within the operation area it is acknowledged that is not feasible.

9. If a matter is escalated to an on-call officer, the officer will:

(a) Liaise with the SIRN officer reporting the incident and obtain further details about the incident, including the contact details for the incident controller.

(b) Discuss with the SIRN officer:

(i) the management of the incident without attendance at the scene, or

(ii) attendance at the scene of the incident, and/or

(iii) recall to duty of other staff.

10. If the on-call and SIRN officer determines that attendance at the scene of the incident is warranted, the on-call officer must undertake the following.

(a) Contact the relevant Manager, or Regional Manager to advise of their attendance at the scene of an incident.

(j) The Manager will determine in consultation with the on-call officer whether the recall to duty of other staff may be required to assist in the management of the incident or to accompany the officer to the scene i.e. involves extended driving at night to remote locations.

(ii) Should the on-call officer be unable to contact the Manager they may attend the scene provided they log onto the relevant call-in reporting system.

(b) Determine in consultation with the SIRN Officer and Manager whether Situation Reports are required and how frequently they should be made.

11. The on-call officers will be supported by management in the decisions that they make in responding to after-hours calls. If an officer is in doubt about a decision, the officer should liaise with the SIRN Officer for guidance.

Safety of on-call officers

12. Existing Departmental safety policies apply to all after-hours work. The Department is committed to providing a safe and secure environment for its staff.

13. An on-call officer attending the scene of an incident after hours should only do so after making contact with the Manager, or where the officer considers that it is safe to do so (for example, an officer may decide that it is safe to conduct an initial inspection of an easily accessible site in an urban area, or on a main highway).

14. An on-call officer should ensure that they are suitably attired to respond to an incident before attending. That is, an officer should ensure that they wear the standard issues PPE to an after hours incident, that would normally be worn to an incident during business hours.

15. An on-call office shall ensure they have logged on to the relevant call-in reporting system.

Vehicles

16. An appropriately equipped 4WD Government vehicle will be available for the use of an on-call officer required to respond to an incident and may be home garaged for the period of the on-call duty.

    Use of the Government vehicle will be in accordance with the Departmental Vehicle Management Procedures and the exemption given by the Office of the Public Service Commissioner for the parking of vehicles behind the property line.

17. The Vehicle Management Procedure provides for the on-call officers normal route to and from work to be the authorised journey not withstanding that it may not be the most direct route to and from a place of residence. The Manager may authorise the carriage of a spouse, dependents, family members or friends in an official vehicle that is being home garaged as part of an officers on-call duties. Use of an official vehicle for the purpose of taking children to and from school, or minor purchasing of groceries will be permitted where that is part of an on-call officer's responsibility undertaken during their regular journey to work.

18. The Vehicle Management Procedures otherwise precludes private use of Government vehicles. The Agency does not expect its on-call officers to remain at their residence where the Government vehicle is garaged. An on-call officer is paid for the disruption that occurs while they are on–call and is expected to exercise reasonable judgement about how far and for what time they travel away from the residence at which the vehicle is garaged, whilst maintaining the ability to respond to any escalated matter.

19. The on-call vehicle will be equipped with an EPIRB and telephone communication.

20. The on-call vehicle will be equipped with sunscreen, mosquito repellent, latex gloves, chemical resistant gloves, hard hat, reflector vest, barrier overalls, torch, hand-wash liquid and paper towels and a first aid kit.

21. The on-call vehicle will carry appropriate testing, sampling and recording equipment to allow an officer attending the scene of an incident to take and preserve appropriate samples and other evidence for later reference. This equipment will include for example, distance measuring tapes and devices, water testing meters, cameras, sampling bottles and bags, evidence seals, and equipment such as extendable poles and cover lifters to provide access to inaccessible areas.

22. The on-call officer is responsible for arranging for the replacement of any items that are consumed, damaged or otherwise need to be replaced.

23. At the commencement of each rostered period, the on-call officer should complete a vehicle safety and equipment checklist and, if necessary, arrange for any unserviceable or missing items of safety and sampling equipment to be replaced.

Appendix 6 - Example of letter sent to Mining Facilities Pre-inspection

File/Ref

[Insert Date]

[Reply Name]
[Reply Address]
[Suburb State Postcode]

[CC: Name]

Dear [Miss/Mrs/Ms/Mr Surname] / Attention: [use attention if the letter is for someone other than who it is addressed to]

Compliance Inspection to be conducted for <INSERT activity> at <INSERT premises>

Officers of the Department of Environment and Resource Management (the department) are conducting compliance inspections as part of the compliance inspection program. The compliance inspection program is a pro-active system for measuring environmental compliance during the operational stage of an environmentally relevant activity.

Officers of the department will be visiting your site on <insert date > to conduct a compliance inspection in regards to your Environmental Authority (EA) issued under the *Environmental Protection Act 1994*. This inspection will specifically address the on-site water management systems for <insert mine name> and conditions relating to Department Interest - Water in EA MIN<number>.

Please arrange to have the appropriate company personnel on site for this inspection, and have all environmental records and documents available for inspection. Officers of the department will enter the premises at a reasonable time and complete the inspection as promptly as possible. Because of the scale of the activity the environmental inspection will take <insert timeframe>.

Should you have any further enquiries, please do not hesitate to contact [Miss/Mrs/Ms/Mr Firstname Surname, Position] of the department on telephone [number, i.e. [redacted]

Yours sincerely,

[Insert Signing Officer's name]
Manager (Environmental Services – Mining)
Central West Region

Appendix 7- ES Mining Pre-summer Season Planned Inspection Schedule

November 2010

Mon	Tue	Wed	Thu	Fri	Sat	Sun
1 Millennium/RMIJV (LP, GH)	2	3	4 Goonyella Riverside (CM, RB) O/N	5 Norwich Park (CM,RB)	6	7
8 Carborough / Moorvale (GW, TR) O/N	9 Coppabella (GW, TR) O/N Callide (FC, MJ) O/N	10 Dawson Central (TF, MJ)	11 Blair Athol/ Clermont (GH, RB)	12	13	14
15	16 Hail Creek (TR,GB) O/N Blackwater (CM/DL)	17 Ensham (GW/DL) LR O/N EMD	18 Cook/ Kestrel (GH/MJ) South Walker (LP, LR) O/N	19 Burton (TR,GB) Minerva (GH/MJ) North Goonyella (LP, LR) LR O/N EMD	20	21
22	23 Peak Downs (RB*) O/N	24 Saraji (RB*)	25	26	27	28
29	30					

ENVIRONMENTAL PROTECTION ACT 1994

Queensland Government
Environmental Protection Agency
Queensland **Parks and Wildlife Service**

Gladstone District Office
PO Box 5065 GLADSTONE QLD 4680
Phone: (07) 4971 6500 Fax: (07) 4972 1993
www.env.qld.gov.au ABN: 87221158786

Integrated Authority No. CG0039

Section 311 *Environmental Protection Act 1994*

This integrated authority, issued in accordance with section 311 of the Environmental Protection Act 1994 *(the EP Act), provides for the carrying out of different Environmentally Relevant Activities or Environmentally Relevant Activities at different places managed in an integrated way. This integrated authority comprises of one or more types of environmental authority(ies) in accordance with sections 86, 93, 95, 104, 113 and 311, of the EP Act, and this integrated authority details the conditions that are relevant to each stated type of environmental authority.*

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

CS Energy Limited ACN 078 848 745
Level 21 Central Plaza Two
66 Eagle Street
Brisbane QLD 4000

in respect of carrying out the Environmentally Relevant Activities (ERAs) at the same place and under the type of environmental authority described in Table 1.

This integrated authority is subject to the conditions set out in the attached schedules.

The anniversary date of this licence is 05 September.

This amended integrated authority takes effect from 14 August 2004.

....	30 July 2004
Signed	Date

[redacted]
District Manager
Delegate of Administering Authority
Environmental Protection Act 1994

Note: This integrated authority document is not proof of the current status of the integrated authority. The current status of the integrated authority may be ascertained by contacting the Environmental Protection Agency.

Table 1: This integrated authority consists of the following part(s):

Part 2: Licence/s (without development approval) (Section 93)

Applicable Part & Schedule(s)	ERA No.	ERA name	Lot	Plan	Location
Part 2 All Schedules	18(b) 15(b) 11(b) 75(b)(iv) 84(b)	Power Station Sewage treatment Fuel Storage Regulated Waste Disposal Regulated Waste Storage	Part of Lot 1,	RP615528,	Coal Rd Biloela QLD 4715
Part 2 All Schedules	18(b) 15(b) 11(b) 75(b)(iv) 84 (b)	Power Station Sewage treatment Fuel Storage Regulated Waste Disposal Regulated Waste Storage	Part of Lot 3	CP890133	Coal Rd Biloela QLD 4715
Part 2 All Schedules	18(b) 15(b) 11(b) 75(b)(iv) 84 (b)	Power Station Sewage treatment Fuel Storage Regulated Waste Disposal Regulated Waste Storage	Lot A	RP894446	Coal Rd Biloela QLD 4715

Part 4: Approval/s (without development approval)

Applicable Part & Schedule(s)	ERA No.	ERA name	Lot	Plan	Location
Part 4 All Schedules	7(a)	Chemical Storage	Part of Lot 1,	RP615528,	Coal Rd Biloela QLD 4715
Part 4 All Schedules	7(a)	Chemical Storage	Part of Lot 3	CP890133	Coal Rd Biloela QLD 4715
Part 4 All Schedules	7(a)	Chemical Storage	Lot A	RP894446	Coal Rd Biloela QLD 4715

The aforementioned description of the ERA(s) for which this authority is issued is simply a restatement of the ERA(s) as prescribed in the legislation at the time of issuing the authority. Where there is any conflict between the above description of the ERA(s) for which this authority is issued and the conditions as specified in this authority as to the scale, intensity or manner of carrying out of the ERA(s) then such conditions prevail to the extent of the inconsistency.

This integrated authority incorporates the following parts

Part 2 - Licence/s (without development approval)
Part 4 – Approval/s (without development approval)

Each part consists of conditions relevant to various issues.

PART 2 - LICENCE(S) (WITHOUT DEVELOPMENT APPROVAL) (Section 93)

This part is for the carrying out of a level 1 environmentally relevant activity without a development approval, under chapter 4, part 3, division 2, subdivision 1 of the Environmental Protection Act 1994.

SCHEDULE 2A - GENERAL CONDITIONS

Records

2(A1) Any record or document required to be kept by a condition of this environmental authority must be kept at the licensed place for a period of at least five (5) years and be available for examination by an authorised person. For daily and weekly records, the record retention requirements of this condition are satisfied if any daily and weekly records are kept for a period of three (3) years and these records are then kept in the form of annual summaries after that period. The records are to be kept either on paper or in electronic form.

2(A2) Except where otherwise specified in this environmental authority, copies of any record or document required to be kept as a condition of this environmental authority must be provided to any authorised person or the Administering Authority on request.

Alterations

2(A3) The holder of this environmental authority must submit details of any amendment to Management Plans or the Integrated Environmental Management System (IEMS) to the Administering Authority with the annual return which immediately follows the implementation of any such amendment.

Integrated Environmental Management System (IEMS)

2(A4) The Integrated Environmental Management System, as submitted to the administering authority must be implemented by the holder of this environmental authority.

Emergency Release of Air Emissions – Exceedance of Release Limits

2(A5) The holder of this environmental authority is authorised to release particulates from the Release Points CA1, CA2 and CB1 in excess of the limits specified in Schedule 2G Table 2, subject to the following conditions:

(a) a "lack of reserve" condition has been declared under the National Electricity Code as defined in the Electricity – National Scheme (Queensland) Act 1997 and a failure of any of the flue gas cleaning plant has occurred;

(b) the holder of this environmental authority must notify the administering authority of any such occurrence as soon as practicable, and advise:

(i) the likely period over which such operation is intended and possible exceedance; and
(ii) the likely maximum emission concentration (in milligrams per cubic metre) that will be emitted from the relevant point and the duration of the exceedance; and
(iii) when the relevant flue gas cleaning plant and equipment will be repaired.

2(A6) Notwithstanding this condition no environmental harm will be caused by any releases in excess of limits specified.

END OF CONDITIONS FOR SCHEDULE 2A

SCHEDULE 2B - AIR

Release of Contaminants to the Atmosphere

2(B1) Except as authorised by conditions 2(B4) and 2(B5), products of combustion must only be released to the atmosphere from those release points specified in Schedule 2G, Table 1.

2(B2) Products of combustion must be released to the atmosphere from a release point at a height not less than the corresponding height stated for that release point in Schedule 2G, Table 1.

2(B3) Products of combustion produced during Normal Unit Operating Conditions must not be released to the atmosphere from a release point at a concentration in excess of those stated in Schedule 2G, Table 2.

Fugitive Emissions

2(B4) Ducting and extraction systems that transfer contaminants from one location to another must be constructed, operated and maintained so as to minimise any leakage of contaminants to the atmosphere occurring from these sources.

2(B5) In the event of emissions of contaminants occurring from industrial plant or ducting and extraction systems that transfer contaminants from one location to another, the fault or omission that resulted in that emission must be corrected as soon as practicable.

Dust Control

2(B6) The holder of this environmental authority must take all reasonable and practicable measures to minimise the release of dust and particulate matter to the atmosphere beyond the licensed premises.

Fuel Burning

2(B7) The fuels which may be burned in the boiler are coal, natural gas, liquid petroleum gas, and distillate. Recycled fuel oils and fuel oil may be used at start up, shut down and for flame support. Co-firing fuels must be approved in writing by the administering authority prior to use, other than any fuels otherwise approved by the administering authority.

2(B8) The sulphur content of any coal blend burned in power generation on an as received basis is not to exceed 0.35 per cent by weight on a monthly average and any fuel oils burned must not exceed 0.5% sulphur on a monthly weighted average.

END OF CONDITIONS FOR SCHEDULE 2B

SCHEDULE 2C - WATER

Release of Contaminants to Waters

2 (C1) The holder of this environmental authority is authorised to release contaminants from the licensed place at the locations listed in condition 2(C2) in accordance with the requirements of this schedule.

Release Point Details

2 (C2) 'A' Station:

a) Release Point R1: Stormwater and seepage runoff from Ash Dam 1,

b) Release Point R2: Process water, stormwater and seepage runoff from Ash Dam 2 / Callide A Wetland,

2 (C3) Monitoring of release Points R1 and R2 will be undertaken when discharge occurs as per Schedule 2G, Table 4 to ensure compliance with the parameters noted in Schedule 2G, Table 5.

END OF CONDITIONS FOR SCHEDULE 2C

SCHEDULE 2D - STORMWATER MANAGEMENT

Stormwater Management Plan

2 (D1) The holder of this environmental authority must implement a Stormwater Management Plan. This management plan must be reviewed every five (5) years.

General Conditions

2 (D2) The maintenance and cleaning of equipment or plant at 'A' Station must be carried out in designated areas. Process waters released from R1 and R2 are not to cause environmental harm.

2 (D3) Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable.

2 (D4) All bunding must be constructed of materials that are impervious to the materials stored.

2 (D5) All permanent drum storage areas must be bunded and where practicable covered or roofed. Drums located in a temporary storage area or in use must be placed on portable bunds.

2 (D6) The holder of this environmental authority must ensure that any stormwater released from bunds does not contain levels of contaminants that would cause environmental harm.

2 (D7) Collected waste oil and sludge from the gravity separators must be removed and disposed of as required in a manner that does not cause environmental harm.

2 (D8) Oil separator(s) and oil separating equipment must be regularly inspected and effectively maintained.

END OF CONDITIONS FOR SCHEDULE 2D

SCHEDULE 2E - LAND APPLICATION

Ash Release Location

2 (E1) The Ash release area is described as the Waste Containment Facility as defined in Schedule 2I.

2 (E2) The holder of this environmental authority is authorised to release ash and effluent to the waste containment facility from A, B and C sites including effluent and ash from:

- the sedimentation dams,
- effluent from the chemical drains,
- demineralisation and treatment plant,
- Callide C blowdown water,
- cooling tower blowdown
- effluent from chemical cleans,
- washdown waters,
- quantities of oils and petroleum products that will not cause environmental harm,
- dirty drains,
- boiler blowdown,
- Blowdown water treatment plant,
- ash dam B seepage pond waters,
- coal plant wastes,
- cooling tower sludges,
- waste ion exchange resins,
- bag filters (and including the bag filters),
- laboratory drains and
- A and B station sewage effluent.

2 (E3) Biosolids from the sewage treatment plant may be disposed of in the designated area adjacent to the sewage treatment plant. Such disposal must be made in a manner not to cause environmental harm.

Ash Dam Management Plan

2(E4) By 1 December 2005:

(a) The holder of this environmental authority must develop and implement an Ash Dam Management Plan for Ash Dam B (consisting of Spill Management Plan, Corrective Action Plan, Emergency Action Plan, Ash Management Plan and Operations and Maintenance Manual) which provides for the following functions:

- Minimisation of waste, where practicable;
- Operation, maintenance, surveillance, and decommissioning of Ash Dam B and Ash Dam 4;
- Optimisation of ash storage facilities;
- Suppression of dust under extreme dry weather conditions;
- Inspection and reporting on the integrity of Ash Dam B and Ash Dam 4, monitoring the storage capacity of Ash Dam B and the development of alternative ash storage facilities; and
- Managing the risk of discharge from Ash Dam B.

(b) The Ash Dam Management Plan is to be prepared and certified by a suitably qualified and experienced person.

(c) The Ash Dam Management Plan must be submitted to the administering authority.

(d) Ash Dam B must be operated in accordance with the Ash Dam Management Plan.

2(E5) Upon construction of any modifications to either Ash Dam B or Ash Dam 4, the Ash Dam Management Plan must be amended to incorporate the modifications, which when amended is to be certified by a suitably qualified and experienced person.

2(E6) The Ash Dam Management Plan must be reviewed at least every three years. If the Ash Dam Management Plan is amended, the holder of this environmental authority must submit the revised Ash Dam Management Plan and certification to the administering authority within three months of any amendment.

Ash Dam Operational Criteria

2(E7) Ash Dam B must be designed so that the target for the annual risk of a discharge through the spillway is less than 0.01 AEP, measured at 1 November each year and calculated utilising the operational water balance model referred to in 2(E9).

2(E8) If the risk of a discharge through the spillway of Ash Dam B exceeds 0.01 AEP measured at 1 November each year, the holder of this environmental authority must implement a Contingency Plan (developed from the Corrective Action Plan) to reduce the risk of spill to below 0.01 AEP.

2(E9) The holder of this environmental authority must maintain an operational water balance model for Ash Dam B and its catchments and utilise it to determine the risk of a discharge through the Ash Dam B spillway. The operational water balance model must be prepared by a suitably qualified and experienced person, updated at least annually, and made available to the administering authority on request.

2(E10) On becoming aware that the risk of a discharge through the Ash Dam B spillway is greater than 0.01 AEP for a single 72 hour storm, or there is insufficient freeboard to meet the allowance for wave action generated by a 0.01 AEP wind, the holder of this environmental authority must:

(a) Notify the administering authority (in writing) within 24 hours; and

(b) Submit a Contingency Plan (developed from the Corrective Action Plan) to the administering authority and have due regard to its comments. The plan must detail the management measures, risk of discharge, the quantity of possible discharge and monitoring required to assess the level of environmental impact.

Preparing and Certifying the Design Plan

2(E11) Before constructing or modifying Ash Dam B or Ash Dam 4, a suitably qualified and experienced person must:

(a) Prepare a design plan in accordance with an appropriate engineering standard; and

(b) Certify that the design plan meets an appropriate engineering standard and is consistent with the conditions in the environmental authority.

Submitting the Certified Design Plan

2(E12) Before construction of modifications to Ash Dam B or Ash Dam 4, the holder of this environmental authority must submit the certified design plan to the administering authority.

2(E13) The design plan is deemed to be acceptable if the administrating authority has not rejected the design plan within 28 days of its submission.

Completion of Construction

2(E14) Construction or modification shall be done only in accordance with an accepted design plan.

2(E15) When construction of the modification to Ash Dam B or Ash Dam 4 is complete, the holder of this environmental authority must:

(a) Obtain certification from a suitably qualified and experienced person that the construction of the modification to Ash Dam B or Ash Dam 4 is in accordance with the certified design plan; and

(b) If the modification is in accordance with the certified design plan, submit the construction certification to the administering authority, or,

(c) If changes have occurred, submit a set of "as built" drawings and the construction certification to the administering authority.

Inspection of Ash Dam B and Ash Dam 4

2(E16) Ash Dam B must be inspected by a suitably qualified and experienced person on or about 1st October but no later than 1st November each year or at any time if alarming, unusual or otherwise unsatisfactory conditions are observed.

2(E17) Ash Dam 4 must be inspected by a suitably qualified and experienced person once every five (5) years from the date of issue (1979) of the original licence on or about 1st October but no later than 1st November or at any time if alarming, unusual or otherwise unsatisfactory conditions are observed.

2(E18) For each inspection, the suitably qualified and experienced person must assess the condition of the dam and its foundations, determine the hydraulic adequacy of the dam, and assess the adequacy of the works with respect to dam safety.

2(E19) For each inspection, two copies of the suitably qualified and experienced person's report and any recommendations as to measures to be taken to ensure the integrity of the dam must be provided to the administering authority within 28 days of the inspection.

Decommissioning of Ash Dam B and Ash Dam 4

2(E20) A Decommissioning Strategy for inclusion in the Ash Dam Management Plan must be documented and submitted to the administering authority at least 5 years prior to commencement of decommissioning.

2(E21) Ash Dam B and Ash Dam 4 must be decommissioned in accordance with the Decommissioning Strategy to a stable landform.

Rehabilitation Requirements

2(E22) The holder of this environmental authority must develop, implement and submit to the administering authority a Final Land Use and Rehabilitation Plan for that part of the Waste Containment Facility to be decommissioned at least two years prior to such decommissioning. The Plan must include, but is not limited to, the following:

(a) Disturbance type;

(b) Disturbance area;

(c) Proposed final surface level and contours, final drainage system and species of vegetation to be planted for the rehabilitation program;

(d) A description of rehabilitation management techniques incorporating works and monitoring programs and timetables;

(e) Indicators for success; and

(f) Keeping of appropriate records of rehabilitation measures implemented including taking of photographs demonstrative of rehabilitation achieved and the preparation of annual rehabilitation progress reports.

2(E23) Any amendments to the Rehabilitation Plan are to be submitted to the administering authority.

2(E24) A summary of the annual rehabilitation progress report must be submitted to the administering authority with each annual return, from when the Final Land Use and Rehabilitation Plan 2(E22) is implemented, until the environmental authority is surrendered or the administering authority advises that this reporting is no longer required, (whichever is the earlier).

2(E25) Subject to acceptance by the administering authority, uncontaminated stormwater runoff from any rehabilitated area may be released from the licensed place.

Water Quality Monitoring of Releases from the Ash Dam B Seepage Interception System

2(E26) The holder of this environmental authority is responsible for ensuring that the seepage pond pump-back system to Ash Dam B is managed to ensure a low water level in the seepage ponds.

2(E27) The holder of this authority is authorised to release stormwater overflows from the seepage ponds, and is to provide the administering authority with:

(a) An estimate of the quantity of stormwater discharged; and

(b) An assessment of the stormwater discharge quality. All determinations of the quality must be made in accordance with conditions 2(G5) and 2(G6). The samples obtained must be analysed for:

(i) pH;

(ii) specific electrical conductivity;

(iii) total dissolved salts (calculated); and

(iv) dissolved oxygen.

END OF CONDITIONS FOR SCHEDULE 2E

SCHEDULE 2F - WASTE MANAGEMENT

General

2(F1) The holder of this environmental authority is authorised to burn in the boilers;

(a) coal to which waste oils and sludges from separators have been added,
(b) waste ion exchange resin and absorbent materials that have been used to soak up oil spills,
(c) chemical clean waste generated on site and approved by the Administering Authority.

2(F2) Natural vegetation may be burned periodically to reduce fire risk on the site. This does not exempt the holder of this environmental authority from compliance with any other Acts, Bylaws, Regulations, Rules or Ordinances of any Local Authority or Government Department regarding vegetation management or vegetation burning.

2(F3) Where a no-cost recycling service is available, recyclable waste must not be deposited in the general waste stream.

Waste Storage and Handling Conditions

2(F4) Drum storage of waste or processed materials must be clearly labelled and sealed or covered to prevent loss of contents or exposure of contents to the atmosphere as well as bunded in accordance with conditions 2(D5) and 2(D6).

2(F5) All loading and unloading of bulk materials must take place only within designated vehicle loading and unloading areas.

Waste Management Plan

2 (F6) The holder of this environmental authority must maintain a current Waste Management Plan.

END OF CONDITIONS FOR SCHEDULE 2F

SCHEDULE 2G - SELF MONITORING AND REPORTING

Complaint Recording

2 (G1) All complaints of an environmental nature received by the holder of this environmental authority relating to operations at the licensed place must be recorded with the following details:

a) time and date of complaints;
b) type of communication (telephone, letter, personal etc.); name, contact address and contact number of complainant (NOTE: if the complainant does not wish to be identified, then 'Not identified' is to be recorded);
c) response and investigation undertaken as a result of the complaint;
d) name of person responsible for investigating complaint; and
e) action taken as a result of the complaint investigation and signature of the responsible person.

Monitoring of Contaminant Releases to the Atmosphere

2 (G2) The holder of this environmental authority must conduct a monitoring program of contaminant releases to the atmosphere at the release points specified in Schedule 2G, Table 1. The frequency of monitoring is specified in Schedule 2G Table 3 and must comply with the following:

a) Monitoring provisions for the release points listed in Schedule 2G Table 2 must comply with the Australian Standard AS 4323 1 - 1995 "Stationary source emissions Method 1: Selection of sampling provisions"; or the Department of Environment's Air Quality Sampling Manual 1997 and any subsequent versions.

b) The following tests must be performed for each required emission point specified in Schedule 2G Table 2:

- Particulates
- Nitrogen Oxides;

c) where practicable samples taken must be representative of the contaminants discharged under normal operating conditions.

Monitoring of Contaminant Releases to Waters

2 (G3) The submitted ground water monitoring program must be maintained. The ground water monitoring program must include measuring groundwater constituents listed in Schedule 2G, Table 6.

2 (G4) Water monitoring will be undertaken by the holder of this environmental authority as noted in Schedule 2G Table 4, Schedule 2G Table 5 and Schedule 2G Table 6.

2 (G5) All determinations of water quality must be done in accordance with the methods prescribed in the Environment Protection Agency Water Quality Sampling Manual, 2nd Edition, December 1999, or more recent additions or supplements to that document as they become available, or the latest edition of the CS Energy Corporate Sciences Standards Methods Manuals.

2 (G6) All determinations of the quality of contaminants released must be performed by a person or body with appropriate experience or training.

Report Submission

2 (G7) The holder of this environmental authority must ensure that the results of all monitoring performed during the 12 months preceding the last Annual Return in accordance with this environmental authority are summarised annually and made available to the administering authority upon request.

Underground Water Monitoring

2 (G8) The holder of this environmental authority must maintain bores for the purpose of sampling and analysing groundwater in accordance with condition 2(G3).

Schedule 2G Table 1

Source Description	Release Point Number	Minimum Release Height (Metres)
Callide Stack B1	CB1	210
Callide Stack A1	CA1	64
Callide Stack A2	CA2	64

Schedule 2G Table 2

Contaminant	Release Point Number	Release Limit	Release Limit Units
NO_X	CB1	1200 not to be exceeded	Parts Per Million
Particulates	CB1	4 hour moving average not to exceed 340.	mg/m^3
NOx	CA1, CA2	850 not to be exceeded	Parts Per Million
Particulates	CA1, CA2	4 hour moving average shall not exceed 100 over 80% of the time per calendar month	mg/m^3

SCHEDULE 2G, TABLE 2 NOTES:

1. The concentration of solid particles (expressed as a 4 hour moving average) referenced to dry gas, 0 degrees Celsius, 101.32 kPa and corrected to 12% by volume of CO_2.
2. The concentration of oxides of Nitrogen referenced to dry gas, 0 degrees Celsius, 101.32 kPa and corrected to 7% by volume of O_2.

Schedule 2G Table 3

Frequency	Release Point Number	Determination Required
Continuous	CA1, CA2, CB1	Particulates
Quarterly	CA1, CA2, CB1	Nitrogen Oxides

Schedule 2G, Table 4

Quality Characteristic Determination	Frequency	Release Point
Quantity of water released	Twice weekly during discharge	R1 and R2
pH	Weekly During Discharge	R1 and R2
Dissolved Oxygen	Weekly During Discharge	R1 and R2
Suspended Solids	Weekly During Discharge	R1 and R2
Total Dissolved Salts	Weekly During Discharge	R1 and R2
Chloride	Weekly During Discharge	R1 and R2

Schedule 2G, Table 5

Quality Characteristic Determination	Discharge limit	Limit Type
pH	6.5 – 9.0	Range
Dissolved Oxygen (mg/L)	2 mg/L	Minimum
Suspended Solids (mg/L)	100 mg/L	Maximum
Total Dissolved Salts (Calculated mg/L)	1450 mg/L	Maximum
Chloride (mg/L)	400 mg/L	Maximum

Schedule 2G, Table 6

Quality Characteristic Determination	Frequency	Location
pH	Annually	Groundwater Monitoring
Conductivity	Annually	Groundwater Monitoring
Total Arsenic	Annually	Groundwater Monitoring
Total Barium	Annually	Groundwater Monitoring
Total Calcium	Annually	Groundwater Monitoring
Chloride	Annually	Groundwater Monitoring
Total Chromium	Annually	Groundwater Monitoring
Total Copper	Annually	Groundwater Monitoring
Total Fluoride	Annually	Groundwater Monitoring
Total Magnesium	Annually	Groundwater Monitoring
Total Molybdenum	Annually	Groundwater Monitoring
Total Potassium	Annually	Groundwater Monitoring
Total Selenium	Annually	Groundwater Monitoring
Total Sodium	Annually	Groundwater Monitoring
Total Strontium	Annually	Groundwater Monitoring
Total Sulphate	Annually	Groundwater Monitoring
Total Vanadium	Annually	Groundwater Monitoring
Total Zinc	Annually	Groundwater Monitoring

END OF CONDITIONS FOR SCHEDULE 2G

SCHEDULE 2I - DEFINITIONS

2 (I1) For the purposes of this environmental authority any term not otherwise defined in the Act and any subordinate legislation made pursuant to the Act or in the Definitions Schedule of this Environmental Authority has the meaning conferred to that term in its common usage.

2 (I2) In the event of any inconsistency arising between the meaning of any term provided in the Definitions Schedule of this Environmental Authority and any common usage of that term, the meaning conferred in the Definitions Schedule of this environmental authority prevails.

For the purposes of this environmental authority the following definitions apply:

2 (I3) "Act" means the Environmental Protection Act 1994.

2 (I4) "Administering Authority" means the Environmental Protection Agency or its successor.

2 (I5) 'Land" means land excluding waters and the atmosphere.

2 (I6) "mg/L" means milligrams per litre..

2 (I7) Cubic Metre"("m3") means the volume of dry gaseous contaminant which occupies 1 cubic metre at a temperature of zero degrees Celsius and at an absolute pressure of 101.3 kilopascals.

2 (I8) "Waste Containment Facility" means the ash containment facilities including Ash Dam B and its associated seepage collection trenches and ponds, ash dam 1, ash dam 3 and ash dam 4, evaporation areas, the drains reclaim dam and the wetlands and sedimentation ponds associated with ash dam 2.

2 (I9) "Ash" means the residue after burning coal.

2 (I10) "Normal Unit Operating Conditions" is the normal operating state of a unit and means that the unit is operating on a stable coal flame with oil support no longer necessary.

2 (I11) "Products of Combustion" comprise all the solid and gaseous products from the combustion of fuel and include residual sulphur trioxide used to enhance precipitator performance.

2 (I12) "Process Water" means any water arising from the power station operating systems.

END OF CONDITIONS FOR SCHEDULE 2I

END OF PART 2

PART 4 - LEVEL 2 APPROVAL(S) (Section 104)

This environmental authority type remains in force until 30 May 2015.

This part is for the carrying out of a level 2 environmentally relevant activity, under chapter 4, part 3, division 3 of the Environmental Protection Act 1994.

SCHEDULE 4A - GENERAL CONDITIONS

Access to Copy of Environmental Authority

4(A1) A copy of this Environmental Authority must be kept in a location readily accessible to personnel carrying out the activity.

Records

4(A2) Any record or document required to be kept by a condition of this Environmental Authority must be kept at the licensed place for a period of at least five years and be available for examination by an authorised person. For daily and weekly records, the record retention requirements of this condition will be satisfied if any daily and weekly records are kept for a period of at least three (3) years and these records are then kept in the form of annual summaries after that period. The records are to be kept either electronically or on paper.

END OF CONDITIONS FOR SCHEDULE 4A

SCHEDULE 4B - AIR

Nil Conditions

END OF CONDITIONS FOR SCHEDULE 4B

SCHEDULE 4C - WATER

Nil conditions

END OF CONDITIONS FOR SCHEDULE 4C

SCHEDULE 4D - STORMWATER MANAGEMENT

4 (D1) Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable.

4 (D2) All bunding must be constructed of materials that are impervious to the materials stored.

4 (D3) All permanent drum storage areas must be bunded and where practicable covered or roofed. Drums located in a temporary storage area or in use must be placed on portable bunds.

4 (D4) The holder of this environmental authority must ensure that any stormwater released from bunds does not contain levels of contaminants that would cause environmental harm.

4 (D5) Collected waste oil and sludge from the gravity separators must be removed and disposed of as required in a manner that does not cause environmental harm.

4 (D6) Oil separator(s) and oil separating equipment must be regularly inspected and effectively maintained.

4(D7) Drum storage of waste or processed materials must be clearly labelled and sealed or covered to prevent loss of contents or exposure of contents to the atmosphere as well as bunded in accordance with conditions 4(D3) and 4(D4).

4(D8) All loading and unloading of bulk materials must take place only within designated vehicle loading and unloading areas.

END OF CONDITIONS FOR SCHEDULE 4D

SCHEDULE 4E - LAND APPLICATION

Nil conditions

END OF CONDITIONS FOR SCHEDULE 4E

SCHEDULE 4F - NOISE

Nil Conditions

END OF CONDITIONS FOR SCHEDULE 4F

SCHEDULE 4G - WASTE MANAGEMENT

Nil Conditions

END OF CONDITIONS FOR SCHEDULE 4G

SCHEDULE 4H - SELF MONITORING AND REPORTING

Nil Conditions

END OF CONDITIONS FOR SCHEDULE 4H

SCHEDULE 4I - DEFINITIONS

Nil Conditions

END OF CONDITIONS FOR SCHEDULE 4I

SCHEDULE 4J - SITE PLANS

Nil Conditions

END OF CONDITIONS FOR SCHEDULE 4J

END OF PART 4

END OF INTEGRATED AUTHORITY

[redacted]

From: [redacted]
Sent: Monday, 20 December 2010 2:34 PM
To: [redacted]
Subject: FW: DERM letter
Attachments: SKMBT_C45010122008430.pdf

[redacted]
Please find attached the formal letter discussed.
Regards
[redacted]
Callide Site Manager
CS Energy

P[redacted]M

PO Box 392
BILOELA QLD 4715

****
This email and any files transmitted with it are confidential and may be privileg
****

Callide Power Station
CS Energy Ltd ABN 54 078 848 745
PO Box 392 Biloela Qld 4715
T 07 4992 9329
F 07 4992 9328
W www.csenergy.com.au

20 December 2010

Ms [redacted]
Department of Environment and Resource Management
Gladstone QLD 4680

cs energy
generations ahead

VIA EMAIL: [redacted]

Dea[redacted]

RE: CALLIDE ASH DAM B

I am writing to notify you of the potential for the Callide Power Station site to exceed the 0.01 AEP 72 hour single storm event freeboard allowance in Callide Ash Dam B. This level has been calculated by Aurecon in the Annual Spill Risk Modelling as of November 1, 2010. As required by the site's Integrated Environmental Authority CG 0039 Section 2(E10) Ash Dam Operational Criteria, summarised below is our Contingency Plan developed from our Corrective Action Plan.

Reference dam levels:

- Current dam level (@ 20 Dec 2010) is 213.33 m.
- Dam level @ 1 Nov 2010 (date for storage allowance calculations) was 213.16 m
- Mandatory Reporting Level MRL (0.01 AEP 72 hour single storm event freeboard allowance @ 1 Nov 2010) is 213.33 m.
- Design Storage Allowance DSA (0.01 AEP annual storage allowance @ 1 Nov 2010) is 213.37 m.
- Spillway level is 214.95 m.

Contingency Plan

Management measures

Following unseasonal rainfall and a significant rise in the water level of Ash Dam B earlier this year, elements of Callide's Corrective Action Plan have been implemented including:

- Operation of the Blowdown Water Treatment Plant was re-established in September and is currently performing to target levels following several maintenance issues over preceding months.
- Process water inflows to Ash Dam B arising from General Purpose Raw Water use were reduced through plant changes and substitution with water from Ash Dam B.
- The existing evaporative sprays ("Chook Sprays") have been upgraded to enhance their effectiveness.
- An irrigation spray system utilising water from Ash Dam B has been installed covering 4.5 hectares of ash beach area, which evaporates water and controls dust.
- Ash mining from Ash Dam 4 has commenced to facilitate additional water storage volumes.
- Enhanced operability of Callide B dense phase pumping to reduce ADB Sub-aerial volume loss.

The following additional contingency actions are planned in response to exceeding the MRL:

- The operating cycles on the cooling towers will be revised by end December to reduce volumes of blowdown.
- The water quality in the site Drains Reclaim Dam is being assessed for suitability for use as cooling tower makeup. The capability of existing pumping systems to accommodate this water is being verified.
- An additional irrigation spray system covering 6.5 hectares of ash beach area is being procured with a target operational date of 31 January 2011.
- Engineering investigations into additional plant changes to substitute raw water usage with water from Ash Dam B are continuing.

The following monitoring activities will continue:

- Rainfall and dam level are recorded twice weekly and after each significant rain event.
- Raw water usage and process water inflows to Ash Dam B are closely monitored each day with variances investigated for corrective action.
- Key items of plant such as the Blowdown Water Treatment Plant receive high priority to resolve maintenance issues that may impede efficient operation.

Note that unit Callide B1 is currently offline until 10 January 2011 for maintenance, reducing pressure on the site water balance

Risk of discharge and quantity of possible discharge

In the absence of a substantial rainfall event, CS Energy does not consider Ash Dam B to be at imminent risk of discharge.

Monitoring required to assess the level of environmental impact

The monitoring required in the event of an imminent or current spill as outlined in our Spill Action Plan has been reviewed for currency. The existing Receiving Environment Monitoring Program is currently adequate to monitor environmental impacts in the absence of an imminent or current spill. As part of this program, CS Energy is currently undertaking a background groundwater sampling program in Callide Creek.

If you require additional information, please contact [redacted] Technical Services Superintendent, on [redacted] or [redacted]. [redacted] will be acting Site Manager over the Christmas break. I am also available on [redacted].

Yours sincerely

[redacted]

[redacted]

Site Manager - Callide

Department of Environment and Resource Management
FILE NOTE

TO: **File – GLT 1174**

SUBJECT: Teleconference re: Ash Dam B reaching MRL (Mandatory Reporting Level)

22 December 2010

Participants:
[redacted] EO, DERM Gladstone
[redacted] ting Manager, DERM Gladstone
[redacted] Co-ordinator, CS Energy, Brisbane
[redacted] (Waste Management Plans), CS Energy, Brisbane
[redacted] Site Manger – Callide, CS Energy, Biloela
[redacted] nical Services Superintendent – Callide, CS Energy, Biloela

22 December 2010

Discussed the following:
Water Quality Monitoring
- Last analysed in August
- Currently taking additional samples to have analysed in the New Year.
- Have the capacity to sample for conductivity, chloride and possibly sulphate – having access issues at the moment

Require 500 – 550mm of cumulative rainfall (conservation runoff) to take them from where they are now (MRL) to the spillway. Cyclone Benny in 2003 dropped ~300mm.

Consider situation as low risk as on Monday just touched the MRL. 2.85 ratio.

Callide dam is managed by Sunwater and is unlike to go over. Has the capacity to hold several hundred ML before it spills.

Environmental Investigation report due in March is the priority and will deal with this issue as they have to as it is considered low risk; however, staff is available over the Xmas period if issues arise.
- Gathered significant information on Ash Dam and environmental impacts
  - Conducted receiving environment monitoring since 1996/1998 and therefore have long term data on and off site
  - Updating what they have done and sharing information with the department.

[redacted] asked about structural implications – at this stage, they are not aware of any implications. The EI reviewed the structural integrity and the draft report has not flagged any issues.

The dam was raised by 1m in 2003 and the spillway by 1.4m. [redacted] is sure that the dam is constructed based on a 1:1000 year rain event.

Will keep department update if there is a change in the situation.

Author Name: [redacted] Position: Environmental Officer Tel No: [redacted] Date: 22/12/2010	

Department of Environment and Resource Management
FILE NOTE

TO: File – GLT 1174

SUBJECT: Meeting at CS Energy re: Ash Dam B water levels

5 January 2011

Participants:
[redacted] DERM Gladstone
[redacted] anager, DERM Gladstone
[redacted] Energy
[redacted] anger – Callide, CS Energy
[redacted] Services Superintendent – Callide, CS Energy,
[redacted] Environmental Coordinator, CS Energy
[redacted]
[redacted] er
[redacted] Sunwater

Background

- Ash Dam B has a 5 400ML capacity.
- Received 441mm of rain in Dec 10 (highest recorded).
- Level of Ash Dam B on 5 January is 214.69m.
  - 260mm below spillway; equivalent to ~85mm rain event
  - 3:1 rise for rainfall
  - Large heavy falls = more runoff
- Water balance
  - Net process flow input = + 16.84ML/wk
  - Net reuse = - 10.55ML/wk
  - Ex rain & evaporation = + 6.29MLwk to dam
  - Wet season evap 37ML/wk (dry x 2)
  - Need no rain for 35 weeks.
  - Greater than 65 to 70% median rainfall (250-500mm).
    - La Nina to April.
- Remove 1280ML to get to DSA.
- Dilute with Callide Dam release @ 10%.

Other options

- Expansion chook spray –operational March/April (4ML/mth).
- Portable RO Plant (cost of ~$4 million).
  - Expensive – trial and error to get functional; need power supply.
  - 45ML/mth gain 9ML/mth on dam.
- Forced fan blowers – issues with salt and power (looking at purchasing a trial unit).

- Callide dam currently at 94% capacity 129 000ML.
  - May release for 28 days (dry creek bed).

- Ash dam's ability to get rid of water is slow. Usually managing at 211-212RL.
- Release to bring back to 'historical levels'.

Author Name: [redacted] Position: Environmental Officer Tel No: [redacted] Date: 10/1/2011	

- 10:1 dilution to get to drinking.
- No release mechanism other than spillway
    - Pumps (11ML/day ~1cm/day on dam level)
    - Siphons

- Water quality of Callide dam – concentrated up in sulphate and chlorides.

SunWater
- Water is available for release to recharge the aquifer.
- No plan for recharge as there is a trickle.
- 6 000 ML to full capacity - >100+ capacity automatic discharge.

- CS Energy can release from the dam as part of their allocation ("purchased water").
    - 2500ML CSE 3200 CPM CSE ~2200 remaining for year

- Darryl – Aquifer will take an enormous amount of water (recharge above weir).
- Neville – Larger flows with Callide dam to go through system. More impacts with small controlled flow.
- Can open valve at weir to let water through system.
- Small flow 150ML/day; Medium flow 200+ML/day; Large 500+/ML/day.
- 350ML/day to keep under road to weir.
- Issue: Don't leave discharge to end of wet season.

CS Energy
- Working on a 10:1 dilution ratio 320ML +30 (ash) take a 30-40 day period. ~3cm/day =70mm/wk rain.
    - 40-45 days – don't have allocation 12 000ML (possibility of forward drawing on next years allocation).
- Worst case scenario is an ash dam spill without Callide dam spilling.
- Issue with pumping volume of water from ash dam.
- Consider rapid draw and dam integrity issues.

- Discussed CS Energy submitting a TEP for the discharge of water from Ash Dam B ASAP. Handed CS Energy a template that mining is using for their TEP applications.

- Discussed need for parameters and monitoring performance indicators.

- Discussed TEP to be finalised around April – in line with when the EI is due.

Author Name: [redacted] Position: Environmental Officer Tel No [redacted] Date: [redacted]	

Connell Wagner Pty Ltd
ABN 54 005 139 873
433 Boundary Street
Spring Hill
Queensland 4004 Australia

Telephone: [redacted]
Facsimile: [redacted]
Email: [redacted]
www.conwag.com

Callide Power Station
Ash Dam - Corrective Action Plan

27 February 2009
Reference 752939WD
Revision 8

Connell Wagner

Document Control

Connell Wagner

Document ID: DOCUMENT3

Rev No	Date	Revision Details	Typist	Author	Verifier	Approver
0	18-08-03	Initial Draft for Client Review	[redacted]			
1	28-08-03	Draft for Discussion	[redacted]			
2	29-08-03	Issue for EPA Review	[redacted]			
3	20-11-03	Review including Client Comment	[redacted]			
4	28-11-03	Final	[redacted]			
5	07-01-04	2003 Final	[redacted]			
6	31-05-05	2005 Revision Draft	[redacted]			
7	13-07-05	2005 Final	[redacted]			
8	27-02-09	2008 Revision Draft	[redacted]			

Contents

1. Introduction

1.1 When to Use this Document

The Corrective Action Plan ("CAP") has been prepared to assist with the evaluation of options to reduce the water level in Ash Dam B ("ADB") should it reach any of the identified trigger levels over the remaining operational life of the facility.

It is envisaged that this document will be referenced in the event that the 0.01 AEP annual storage allowance is not available as of 1 November each year, or if the 0.01 AEP 72 hour storm event allowance is encroached at any time. Note that with the large evaporation area relative to the ponded volume in ADB, and the existing waste water volumes, the 0.01AEP 72 hour storm event allowance is the larger of the two. In either event the goal of the CAP is to:

- Curb the rate of rise of the dam level
- Prevent the dam reaching either regulatory trigger levels
- Ensure the dam water level is below the annual 0.01 AEP storage allowance by November 1

The trigger levels are discussed in Section 3.

1.2 What is in the document

The document presents a hierarchy of options to reduce the water level in ADB. The relative effectiveness of the options can be evaluated under the present prevailing operational and seasonal conditions using the water balance model for the site.

1.3 What are the related documents

Operation and maintenance of the waste containment area is documented in the Operations and Maintenance ("O&M") Manual.

In the event that the water level exceeds any of the trigger levels the Corrective Action Plan (CAP) is implemented.

A Spill Management Plan ("SMP") has been prepared which documents the actions in the event that the water level continues to rise and threatens spillage.

An Emergency Action Plan ("EAP") exists to cover preparedness in relation to the occurrence of an emergency condition at ADB and provides information necessary for emergency agencies to manage a downstream evacuation in the case of a potential dam failure.

1.4 Definitions

The following abbreviations are used throughout this document.

AD3	Ash Dam 3
ADB	Ash Dam B
AD4	Ash Dam 4
AEP	Annual Exceedence Probability – the probability of exceedance of a given magnitude storm or flood within a one year period
BDWTP	Blowdown Water Treatment Plant
Cal B	Callide B Station
CAP	Corrective Action Plan
CPP	Callide Power Plant (also known as Callide C Power Station)

DRD	Drains Reclaim Dam
EAP	Emergency Action Plan
Environmental Licence	The Integrated Authority CG0039 as issued by the EPA
EPA	Queensland Environmental Protection Agency
O&M Manual	Operations and Maintenance Manual
SMP	Spill Management Plan

2. Background

2.1 Regulatory Freeboard Requirements

As of August 2008, the requisite freeboard volumes are summarised in the following table.

Table 1 Regulatory Freeboard Requirements at 1 November 2008

Description	Volume [ML]	Level [m AHD]
0.01 AEP annual storage allowance	1,552	213.54
0.01 AEP 72 hour storm event / 0.01 AEP wind generated wave	1,802	213.27

The water level to provide these freeboard volumes will change as ash deposition continues into ADB (ash deposition below the spillway level occupies freeboard volume).

Whilst the freeboard volume to accept a 0.01 AEP 72 hour single storm event is derived on the basis of potential rainfall inputs, the 0.01 AEP annual storage allowance is derived from a water balance over the station for the coming year. As a result, it is based on an assumed generating and operating scenario and would be affected for example, by any changes to this assumed scenario or the performance of water management systems within the site (e.g. BDWTP performance).

2.2 Waste Containment Area

It is noted that the regulatory focus is on the water held in ADB. However ADB is the largest of five water and/or ash storage facilities in the waste containment area for the station. Also located in the waste containment area are: the evaporation ponds, Ash Dam 3 (“AD3”), Ash Dam 4 (“AD4”) and the drains reclaim dam (“DRD”).

2.3 Overview of Inputs and Discharges from Waste Containment Area

The following table summarises the dominant inputs and discharges for the waste containment area. Process inflows contributing to ADB include general purpose raw water (GPRW), demin plant effluent, polisher regeneration, sewage treatment plant effluent and boiler blowdown, cooling water BDWTP wastes, BDWTP bypass and ash crusher flushing water. These processes contribute a total of 1747.2 ML/a to ADB.

DESCRIPTION	VALUE
INPUTS	
Process Inflows	1747.2 ML/a
Average Annual Rainfall	683.43 mm/a
Average Annual Run-off	122.56 mm/a
LOSSES	
Evaporation	1711.37 mm/a
AREAS	
Catchment Area	654.3 ha
Free Water Surface Area	68 ha

Of course, allowance for rainfall, and run-off from the relevant catchments, must also be considered in the operation of the waste containment area. The total catchment area that drains to ADB is 654.3 ha. Average rainfall, run-off and evaporation values were calculated from data provided for water balance modelling and spill risk assessment models. Consequently it is the large potential input to the waste containment area associated with rainfall and run-off that will dominate the risk of spillage from ADB.

The site is not licensed to allow discharge from the waste containment area under normal operational conditions.

2.4 Quantifying the Risk of Spillage

To quantify the risk of spillage it is necessary to use the Operational Water Balance Model of the ash water systems to simulate the effect of operational conditions, in conjunction with a range of possible meteorological conditions, on the estimated water level in the storage. The use of the model is the means by which the effectiveness of measures can be determined with respect to a reduction in the risk of spillage.

It is noted that the use of the model with the correct “start date” for the rainfall sequences will automatically correct the simulation for the “time of year” or the likelihood of significant rainfall.

The use of the model with the historical rainfall sequences incorporates assessment of the impact of the wettest wet season. Specific rainfall events can also be entered to allow assessment of performance in the immediate short-term.

Options available to reduce the water level in ADB include:

- Transfer of water from ADB to other on-site storages (largely limited to spare capacity that might exist within the evaporation ponds)
- Use of additional stop boards to increase storage volume in the evaporation ponds
- Operation of the cooling water systems at higher cycles of concentration to reduce the volume of blowdown
- Extraction and reclaim of water from ADB (via the ash water recovery system to the BDWTP)
- Extraction and reclaim of water from ADB (via the provision of additional dedicated treatment plant capacity)
- (Short term) Diversion of cooling tower blowdown directly to Callide Creek
- (Short-term) Discharge of ADB to Callide Creek

It is noted that on-going management of the waste containment area must also:

- Ensure operational efficiency of the blowdown water treatment plant is optimised
- Ensure water consumption and wastewater generation at the site is minimised
- Ensure that where water quality allows, all reclaim of water from the DRD is directed to cooling towers
- Ensure full evaporative capacity of evaporation ponds is maintained at all times by ensuring that no ponds dry out

2.5 Use of the Operational Water Balance Model

2.5.1 Annual Audit of Waste Containment Area

It is specified in the O&M Manual that a survey and audit of the waste containment area is to be conducted annually (nominally in August). This process will include validation of the performance of the water balance model over the previous 12 months (predicted vs observed Water Level behaviour). The model would then be used to predict performance for the coming 12 months under the anticipated operational scenario (eg generation profile, ash management performance etc). In this instance the use of the model is shown schematically in Chart 1.

2.5.2 Rising Water Level

In the event that the water level rises to one of the trigger levels, then the water balance model will be used to assess the risk of further water level rise and, as necessary, the impact of corrective actions on the predicted water level. In this instance the use of the model is illustrated schematically in Chart 2.

3. Trigger levels

3.1 Level 1 – Exceedence of 0.01 AEP 72 Hour Single Storm Event

This target level [as per Integrated Authority No CG0039 (licence) 2(E10)] must be calculated using a survey of the ash beach and decant pond in ADB conducted prior to November each year. In the event that the water level at any time rises above this level, then a Level 1 action is to be initiated.

3.2 Level 2 – Exceedence of 0.01 AEP Annual Storage Allowance at 1 November

The 0.01 AEP annual storage allowance level for 1 November [as detailed in the licence 2(E7) &2(E8)], must be calculated using a survey of the ash beach and decant pond in ADB conducted prior to November each year. In the event that the calculated water level is above the 0.01 AEP target, then a Level 2 action is to be initiated.

3.3 Level 3 – Exceedence of Spill Warning Level (214.45m)

This level is set at 0.5 m below the spillway. In the event that the water level at any time rises above this level, then a Level 3 action is to be initiated.

3.4 Level 4 – 200 mm Below Spillway and Expected to Continue to Rise

In the event that the water level at any time reaches a level of less than 200 mm below the spillway and is expected to continue to rise, a level 4 action is to be initiated.

4. Hierarchy of actions

4.1 Level 1 Actions

4.1.1 Reclaim of Ash Water – Utilising "Spare" BDWTP Capacity

An ash water reclaim system has been installed to allow transfer of ash water from ADB to the BDWTP. The system has capacity to transfer 50 L/s of water from ADB to the BDWTP. Conceptually the system can provide additional water of up to 2.2 ML/d to make up the throughput to the design capacity of 8.9 ML/d. While the system has been commissioned, further evaluation is required to determine the actual operating capacity with ADB reclaim water.

4.1.2 Evaporative Water Sprays (Chook Sprays)

These sprays have been installed and have a net evaporative capacity of approximately 20 to 30 L/s, depending on season/weather conditions and time of day. This equates to approximately 2 ML/day.

4.1.3 Increasing Cooling Tower Cycles of Concentration

The cooling towers are currently operated at approximately 8 to 9 cycles of concentration. The normal long term strategy is to run the cooling water chemistry at the maximum possible concentration as determined by the Station Chemist. Should Level 1 be reached, then the chemistry will be checked to ensure that maximum concentration is being applied. In particular the use of chemical additives to the cooling water circuits to assist with control of scaling at higher cycles of concentration should be explored.

4.2 Level 2 Actions

(Contact Health Department and Department of Natural Resources and Water for contacts to provide advice on possible health and irrigation/livestock impacts for actions 4.2.3 and 4.3.2).

4.2.1 Review of available spare storage capacity within the waste containment area

The evaporation ponds have a total surface area of 126 ha and a storage capacity at design operating level of 0.75 m providing a total storage volume of 950 ML.

In addition there may also be capacity in AD4 and DRD. The water balance model tracks the volume of water held in each of the storages separately. Consequently it is possible to run the model using the initial water level for each from the date of measurement through to 1 November to determine the predicted water level in ADB.

It is possible that spare storage capacity exists with these storages to off-set excess water held in ADB. There are some restrictions in the capacity of the infrastructure to move from ADB to these storages – the most significant of which is likely to be capacity to transfer water from ADB to the evaporation ponds.

4.2.2 Reclaim or Treatment and Disposal of Ash Water using Dedicated Treatment Plant

Containerised desalination equipment is available for lease or purchase. This equipment could be used to treat ash water from ADB to produce permeate suitable for return as make-up to the cooling towers. Reject brine would be returned to the waste containment area (ideally directly to the evaporation ponds).

4.2.3 Diversion of Cooling Tower Blowdown to Callide Creek

It may be possible to obtain regulatory approval for the short-term discharge of cooling tower blowdown to Callide Creek to reduce risk of spillage from ADB. The cooling tower blowdown does not contain problematic trace elements (e.g. Boron) that the ash water has picked up from contact with the ash, however it does contain elevated concentrations of salts that make its discharge to Callide Creek unsustainable over the longer-term. The impact of any such discharge could be moderated by concurrent releases from Callide Dam.

At present there is no infrastructure to allow discharge of this wastewater to Callide Creek. This might be most readily achieved by temporary discharge from the BDWTP to the eastern diversion drain.

Regulatory approval is required for this action and discussions with the regulatory authorities would have to be initiated well in advance of its possible implementation.

4.2.4 Evaporative Disposal via Callide A Cooling Water Circuits

Preliminary assessment indicates that evaporative disposal of up to 1.5 GL of water over 12 months could be achieved via supply of water from ADB as make up to Callide A power station. Such action would reduce the remaining operational life of this station. Investigation of the capacity of the installed infrastructure to allow this quantity of water to be transferred from ADB to Callide A would be required.

4.2.5 Provision of Emergency Storage Capacity for Wastes

An alternate strategy for consideration is the construction of an emergency storage for short-term storage of wastes. Such a storage would be constructed within the catchment of the waste containment area above the spillway level.

4.3 Level 3 Actions

4.3.1 Evaporation Pond Stop Boards

It is possible to raise the operating level of the ponds by the use of additional stop boards in the discharge structure for each of the ponds. This provides an extra storage capacity of approximately 125ML.

- AD4 is normally run at a lowered level to provide opportunities for reclaiming runoff. At this time, the dam will be run at full
- At maximum water level the DRD has capacity for storage of 120 ML

4.3.2 Release from ADB

It may be possible to obtain regulatory approval for the short term release of water from ADB during periods of heavy rainfall, if it can be demonstrated that this would reduce the risk of spillage of ADB during dry conditions when (presumably) the impact of such a release would be of greater detriment. The impact of any such release could be moderated by concurrent releases from Callide Dam.

At present there is no infrastructure to allow discharge of this wastewater to Callide Creek. This might be most readily achieved by the use of low head pumping equipment (rental, diesel driven) to initiate discharge over the ADB spillway.

4.3.3 Temporary Spillway Raise

It may be possible to obtain regulatory approval for a temporary raise to the ADB spillway using a fuse plug. This option is considered in the DME Technical Guidelines for the Environmental Management of Exploration & Mining in Queensland 1995.

4.4 Level 4 Action

4.4.1 Generation Management

In the event that the water level reaches within 200 mm of the spillway and is expected to continue to rise, the impact of reduced power generation on the predicted water level will be evaluated.

Issues to be considered include adjusting the BDWTP input mix, from cooling tower blowdown and ADB reclaim. The intention is to process ADB water to offset the volume of waste discharged from the BDWTP. There are two levels available for consideration:

- so that there is no nett increase in process wastes in the waste containment area
- so that there is actually a nett decrease in process wastes in the waste containment area

Appendix A

Decision Flow Charts
Chart 1 – Annual Audit
Chart 2 – Actual Water Level

Appendix A

Chart 1 - Model Based Decision Tree - Annual Ash Water System Audit

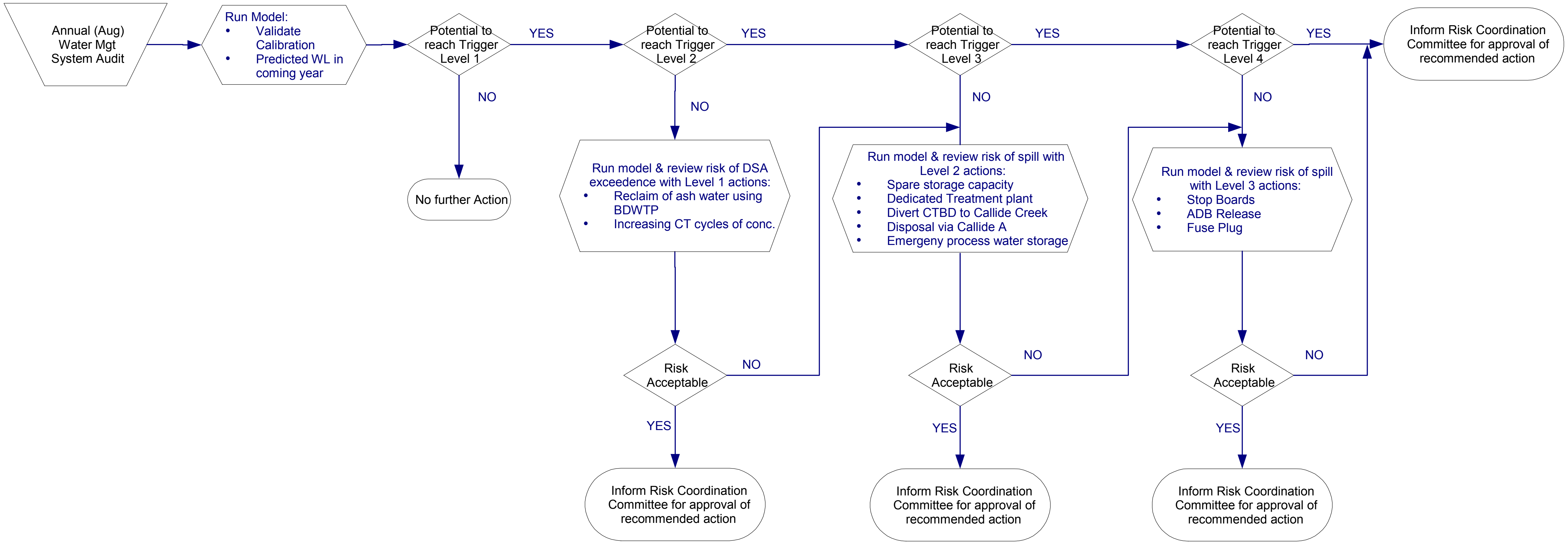
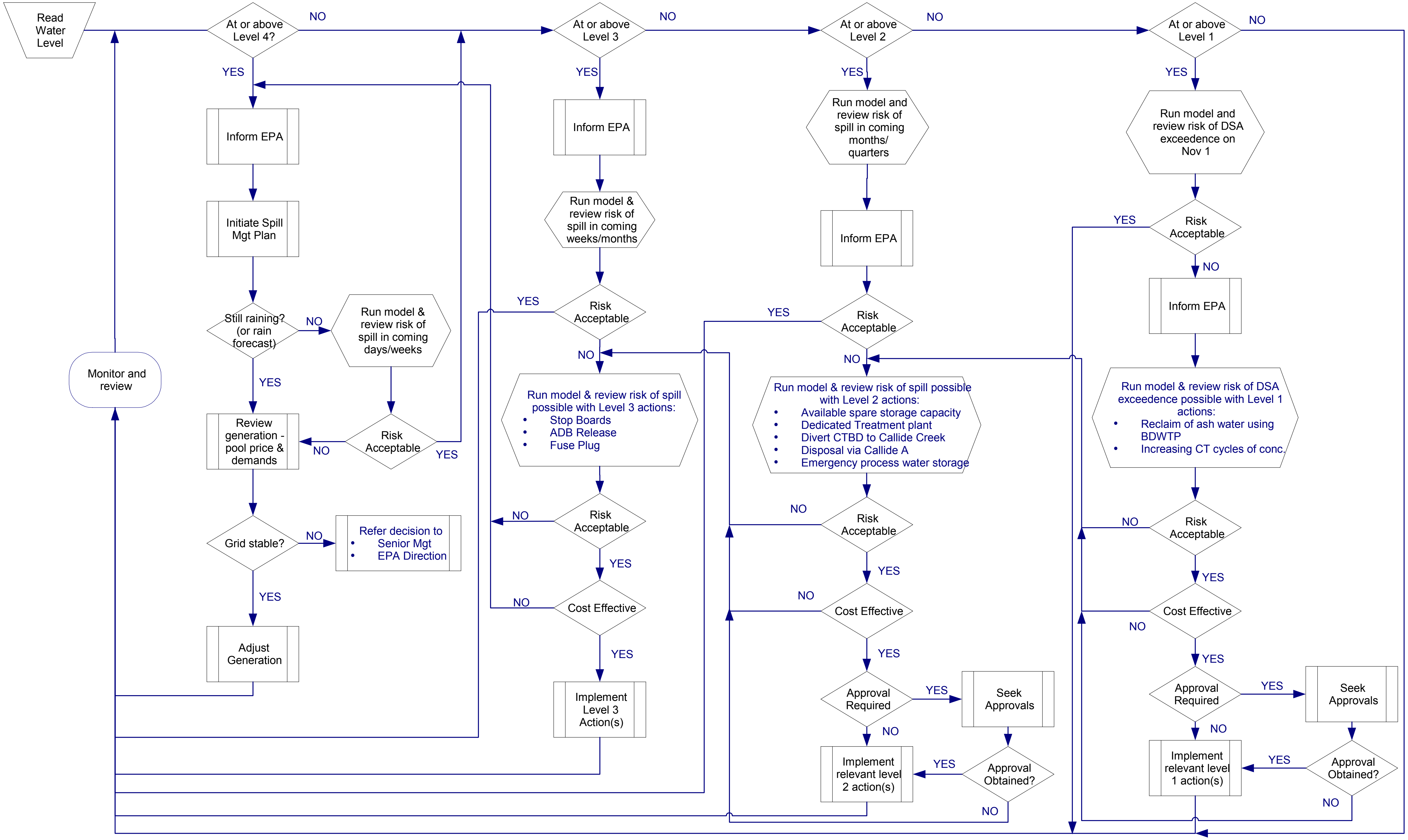


Chart 2 - Actual Water Level Based Decision Tree



[redacted]

From: [redacted]

Sent: Friday, 7 January 2011 5:43 PM

To: [redacted]

Cc: [redacted]

Subject: VTEP Attached

Attachments: 20110107_Covering Letter to DERM with TEP.DOC; 20110107_Final - Voluntary TEP for High Ash Dam Water Level.pdf

[redacted]

My apologies but it has taken a bit longer than planned to finalise

Regards

[redacted]

[redacted]
Callide Site Manager
CS Energy

Pl [redacted]

PO Box 392
BILOELA QLD 4715

Ref:

7 January 2011

[redacted]
Environmental Officer, Regional Services
Department of Environment and Resource Management
Level 3, 136 Goondoon Street
PO Box 5065
GLADSTONE 4680

By e-mail[redacted]

Dear [redacted]

VOLUNTARY TRANSITIONAL ENVIRONMENTAL PROGRAM
CALLIDE POWER STATION ASH DAM B – EXCESS WATER LEVEL MANAGEMENT

Further to our ongoing discussions and videoconference on 5 January 2011, enclosed please find a Voluntary Transitional Environmental Program (VTEP) covering proposed release scenarios to progressively reduce the water level in Callide Ash Dam B.

CS Energy seeks your approval of the enclosed VTEP which will facilitate releases from the ash dam whilst adequate flow is available in Callide Creek.

Thank you for your continuing assistance with this and other regulatory matters associated with the management of the Callide Ash Dam.

If you require any further information please do not hesitate to contac[redacted] directly.

Yours sincerely

[redacted]
SITE MANAGER CALLIDE POWER STATION

Enquiries: [redacted]
Environmental Coordinator
Telephone
Mobile

Encl

- Transitional Environmental Program

cs energy

CALLIDE POWER STATION VOLUNTARY TRANSITIONAL ENVIRONMENTAL PROGRAM (VTEP)

DATE: 7 January 2011

LOCATION: Callide A and B, and Callide C Power Stations
Coal and Callide Roads respectively
BILOELA QLD 4715

EXISTING DEVELOPMENT APPROVALS:
Integrated Authority CG0039 issued 30 July 2004
Integrated Authority CG0117 issued 17 June 2004.

REGISTRATION CERTIFICATE HOLDERS:
CS Energy Limited ACN 078 848 745 holds ENRE 00952209
Callide Power Management Pty Ltd ACN 082 468 700 holds ENRE 00849808

ACTIVITIES:

ENRE 00952209

- ERA 8 Chemical Storage Threshold 1
- ERA 8 Chemical Storage Threshold 3(b)
- ERA 14 Electricity Generation Threshold 2(b)
- ERA 56 Regulated Waste Storage Threshold 2
- ERA 60 Waste Disposal Threshold 1(d)
- ERA 63 Sewage Treatment Threshold 2(b)

ENRE 00849808

- ERA 14 Electricity Generation Threshold 2(b)
- ERA 56 Regulated Waste Storage Threshold 2

BACKGROUND

CS Energy owns and operates Callide A and B power stations located at Coal Road, Biloela, Queensland and holds Registration Certificate ENRE 00952209.

2010 has been an exceptionally wet year, with the Power Station site recording 1,134 mm of rain, compared with a 2010 total rainfall for Thangool of 1,097 mm. Long-term rainfall records show the 10-year average rainfall for the power station site of 584 mm, and a 79-year average rainfall for Thangool of 662 mm.

Notwithstanding, at the commencement of the nominal 4 month wet season on 1 November 2010, Ash Dam B was in compliance with the statutory 0.01 AEP (Annual Exceedance Probability) annual risk level (Design Storage Allowance) (DSA) of RL 213.37 m. The level of the dam on 1 November 2010 was RL 213.16 m.

On 20 December 2010, the dam level of 213.335 m exceeded the statutory 0.01 AEP for the 72 hour storm risk level (Mandatory Reporting Level - MRL) of 213.33 m and DERM were notified.

Significant rainfall events in the area in December 2010 have resulted in raised water levels in the ash dam. Total rainfall at Callide Power Station as at Friday 31 December 2010 was 441 mm, the highest recorded rainfall in the area for a December period. As a result of these rainfall events, water levels in the ash dam have risen by 1.27 m in December, with levels rising by 1.06 m between 22 December and 31 December. A further 131 mm of rain was recorded at the power station from 1 to 7 January 2011, increasing the water level of the ash dam by 350 mm. The water level in the ash dam is now approaching the dam's spillway level, and is likely to spill if a further 43 mm of rain is received at the Callide Power Station. in the very near future. Furthermore the current strong La Nina event continues with the Bureau of Meteorology forecasting wetter than normal conditions are likely to persist until autumn.

As at 6 January 2011, the water level in the dam was RL 214.77 m, just below the spillway level of RL 214.95 m.

Ash Dam B also receives effluent and ash from Callide C Power Station located at Callide Road, Biloela, Queensland. Callide Power Management Pty Ltd (CPM) is the holder of Registration Certificate ENRE 00849808 for Callide C Power Station. CS Energy through Callide Energy Pty Ltd is a part owner of Callide Power Management. CS Energy is also the contracted operator of Callide C Power Station.

The recent rainfall events in the region have also caused heavy sediment loads in water supplies from Callide Dam which has affected the performance of the C station cooling tower blowdown water treatment plant.

The original design basis for the dam set a risk level of 1% total (not annual) over the station life that the water level would reach the spillway level.[1] In 2003, the spillway level was raised from RL 213.55 m to RL 214.95 m. CS Energy has and continues to investigate, as part of its longer term strategy, outside the scope of this VTEP, future actions to address the spill risk from the next wet season nominally commencing in November 2011.

It is also noted that CS Energy is investigating the impact of seepage from Ash Dam B and measures to reduce it, to meet the scope of the Environmental Investigation Report to be submitted to DERM by 4 March 2011.

OBJECTIVE OF THE VTEP

The Objective of this Voluntary Transitional Environmental Program is to ensure compliance with the *Environmental Protection Act 1994* (EP Act) by implementing water management measures to avoid as far as practicable environmental harm being caused or threatened by an overflow of Ash Dam B, if the forecast cumulative rainfall events occur during the balance of the current wet season.

[1] Callide B Power Station Ash Dam - Design Report, prepared by Macdonald Wagner for QEC June 1985.

In particular, this VTEP proposes planned controlled low flow releases from Ash Dam B diluted by flow in Callide Creek, to reduce the water level in Ash Dam B to below the Spill Warning Level of RL 214.45 m, as specified in the Emergency Action Plan developed as part of the Ash Dam Management Plan documentation required by the Development Approval. The VTEP also seeks authorization for opportunistic controlled low and high flow releases from Ash Dam B diluted by flow in Callide Creek, to reduce the water level in Ash Dam B to below the Mandatory Reporting Level of RL 213.33 m.

THE PROGRAM IS REQUIRED BASED ON THE FOLLOWING GROUNDS:

This VTEP is required based on the following grounds:

- The water level in Callide Ash Dam B has risen some 3 metres from RL 211.74 m on 1 January 2010 to RL 214.77 m on 6 January 2011, as a consequence of the significantly higher than normal rainfall received during 2010 and 2011 to date due to the strong La Nina event affecting eastern Australia. The spillway overflow level is RL 214.95 m.

- Preventative measures such as a controlled release may be necessary to ensure that environmental harm is not caused or threatened, should the ash dam overflow if forecast cumulative rainfall is received. Controlled releases will aim to achieve a better environmental outcome for the receiving environment by managing water flow rates, discharge locations and quality, compared with rainfall-driven uncontrolled spills.

HOW OBJECTIVE WILL BE ACHIEVED

The Objective will be achieved by adopting the following strategy:

- Carrying out actions under the proposed scenarios and within the indicative timeframes proposed under this VTEP.

AUTHORISATION

The operation of Callide A and B stations is authorised by Integrated Authority CG0039 and Registration Certificate ENRE 00952209.

"Schedule 2 E – Land Application" of the Integrated Authority authorises the Registration Certificate Holder to release ash and effluent to the Waste Containment Facility from A, B and C stations.

"Schedule 2C - Water" of the Integrated Authority authorises the release of contaminants from the licensed place at Release Points R1 and R2 from Ash Dams 1 and 2 respectively.

The *"Waste Containment Facility"* is defined in the Integrated Authority and includes Ash Dam B.

The operation of Callide C station is authorised by Integrated Authority CG0117. *"Schedule 2E - Land Application"* authorises ash and effluent (coal material, boiler blowdown and chemical cleaning waters and treated sewage effluent) to be placed in the Waste Containment Facility.

Controlled release from the dam with concurrent flow in Callide Creek is also a listed response strategy for a Level 3 Action under the Corrective Action Plan developed as part of the Ash Dam Management Plan documentation required by the Development Approval.

Accordingly, CS Energy is authorised to continue to operate the Callide A, B and C Stations and to continue to direct ash and effluent to the Waste Containment Facility under the terms of this VTEP. Callide Power Management as the Callide C Registration Certificate holder is authorized to continue to direct ash and effluent to the Waste Containment Facility from Callide C Station under the terms of this VTEP.

PERFORMANCE INDICATORS

The following Actions will be carried out by CS Energy with the aim of achieving the targeted water level reductions.

CS Energy will use its best endeavours to achieve the desired water level reductions within the indicative timeframe given. However, the timeframe for achieving the targeted water level reduction will be heavily influenced by:

(a) The times and durations for which the water flows and quality of water in the receiving environment in Callide Creek facilitates controlled or opportunistic releases from the Ash Dam.
(b) Operational delays, including the sourcing, delivery, commissioning and operation of plant and equipment.
(c) Inability of personnel to safely access plant and equipment due to weather conditions.
(d) Further rainfall events.

At the time of submission of this VTEP, technical investigations into the sourcing and delivery of pumps, pipes and associated plant and equipment are continuing. It is anticipated that by 8 January 2011, the power station will be capable of the controlled release of around 30 ML/day of ash dam water, and by 12 January 2011, it is hoped to have another 15 ML/day of capacity commissioned.

CS Energy will keep DERM regularly informed as to the progress with proposed actions under this VTEP.

ACTION 1 - RELEASE SCENARIOS

It should be noted that the following Scenarios and related Actions may occur simultaneously in various combinations, with Ash dam releases from separate release points, depending on the state of Callide Dam, Callide Creek, Ash Dam B, and the operability of pumping equipment.

Two final release points to Callide Creek are available for ash dam releases:

- The western route has 2 x 2.4 m diameter culverts under the Biloela-Callide Rd. It would potentially receive releases from the Western Stormwater Diversion Channel or the Western Seepage Collection Trench. This route has a high capacity flow capability.

- The eastern route has 4 x 900 mm diameter culverts under the Biloela-Callide Rd. This flow path is however currently restricted by a single 900 mm culvert below the dam access road. Flows may need to be restricted to avoid cutting the access road, or the culvert modified. It would potentially receive releases from the area of the spillway, the Eastern Stormwater Diversion Channel or the Eastern Seepage Collection Trench. This route currently has a lower capacity flow capability than the western route.

Water will be released from Ash Dam B to meet the water quality objectives for Callide Creek combined flows as specified in Table A, based on meeting the drinking water standards for those parameters influenced by the ash dam water quality and for applicable stock and irrigation water quality requirements.

SCENARIO 1: Callide Dam Not Spilling and Callide Creek Flowing

RELATED ACTION 1: Opportunistic Controlled "Low Flow" Release

Objective: Ash Dam water will be released into natural Callide Creek run-off flow to below the Mandatory Reporting Level.

Characteristics of Release

- After a moderate rain event the upper reaches of the Callide Creek above the Linkes Road culvert will be running with surface water flow rates of 100 to 350 ML/d
- Controlled release of up to 10% of this volume of ash water
- Proposed start when flows are +150 ML/d and stop when flows pass back through that figure
- Monitor release volumes and quality and match to volumes and flows at Callide Dam Road and Linkes Road culverts
- Enables some discharge capability using rain events without drawing on water reserves in Callide Dam
- Discharge ash dam down to MRL if sequence of events allows
- Will occur in a series of events
- Total release volume estimated to be 1,750 ML plus rain events

SCENARIO 2: Callide Dam Not Spilling But Releasing and Callide Creek Flowing

RELATED ACTION 2: Planned Controlled "Low Flow" Release

Objective: Ash Dam water will be released into a Callide Dam Release to below the Spill Warning Level.

Characteristics of Release

- Arrangements made with Sunwater to release water reserves at a rate that provides a creek flow of 300 ML/d at Linkes Road culvert
- Discharge 30 ML/d of ash water
- Monitor volumes and adjust release rate to maintain a creek flow of 300 ML/d at Linkes Road
- Discharge down to below Spill Warning Level
- A number of such releases may be required if subsequent rain events increase level to above the Spill Warning Level.

SCENARIO 3: Callide Dam Spilling or Releasing and Callide Creek Flowing

RELATED ACTION 3: Opportunistic Controlled "High Flow" Release

Objective: Ash Dam water will be released into a Callide Dam flood overflow or release event to below the Mandatory Reporting Level.

Characteristics of Release

- Install high capacity 80+ML/d pump plus syphons ~45 ML/d
- Assumes Callide Dam overflow rate is greater than 1,250 ML/d
- Callide Creek will be in flood
- Potential to lower level to MRL in 10 days of operation
- Maximum discharge would be around 1,750 ML plus any subsequent rain events
- A number of such releases may be required if subsequent rain events increase level to above the Mandatory Reporting Level.

ACTION 2: Landholder Consultation

CS Energy has commenced consultation with downstream landholders potentially affected by the proposed releases from Ash Dam B in accordance with the Spill Management Plan.

ACTION 3: Receiving Environment Monitoring

Monitoring of Release Volumes and Callide Creek Flows

CS Energy will use its best endeavours to regularly measure, monitor and adjust release volumes to maintain an acceptable dilution ratio with the available flow in Callide Creek.

CS Energy will adjust discharge volumes to ensure downstream property and infrastructure are protected from Ash Dam releases.

CS Energy will have no control over downstream flood events and volumes, but will endeavour to estimate these.

CS Energy anticipates being able to access release and flow data from Sunwater.

Monitoring of Callide Creek Surface Water and Groundwater Quality

CS Energy will sample and analyse the Receiving Environment (surface water sites and groundwater monitoring bores) in accordance with the Spill Management Plan developed as part of the Ash Dam Management Plan documentation required by the Development Approval:

ACTION 4: REPORTING TO DERM

Weekly summary reports of progress with the VTEP actions will be provided to DERM.

More detailed Monthly reports on the releases from the Ash Dam, and water quality of the Receiving Environment will also be submitted to DERM until the completion of releases under this VTEP.

ACTION 5: REVIEW AND EVALUATION

Following completion of the actions identified in this VTEP, CS Energy will review whether the actions met the stated objective and will report its findings to DERM.

CLOSURE

This VTEP remains in force until such time as DERM are satisfied that the objective of the Program has been met, i.e. until the Mandatory Reporting Level of RL 213.33 m is achieved and reliably maintained beyond the current wet season.

This VTEP will target a closure date of 1 July, 4 months past the end of the nominal 4 month wet season to 1 March 2011. However, should factors such as rainfall, availability of suitable flow rates in Callide Creek and performance of pumping plant jeopardise the reliable achievement of this outcome, CS Energy will discuss with DERM the possible extension of the VTEP.

This VTEP will conclude 14 days after receipt by CS Energy of written acknowledgement by DERM that the Review Report has been received from CS Energy and the actions proposed under this VTEP have been satisfied.

RESPONSIBLE OFFICER

[redacted] Site Manager Callide Power Station
CS Energy Limited

TABLE A

WATER QUALITY PERFORMANCE INDICATORS

		Callide Creek Water Quality Objectives	Australian Drinking Water Guideline	STOCK WATER	IRRIGATION WATER
pH VALUE		6.5 - 8.5	6.5 - 8.5	4.5 - 9.0	6.5 - 8.5
CONDUCTIVITY @ 25 C	us/cm	1500			
TOTAL DISSOLVED SOLIDS (TDS)	mg/L	1000	500 - 1000 acceptable		
	mg/L				
CALCIUM	mg/L	200	200 Aesthetic	1000	
MAGNESIUM	mg/L				
SODIUM	mg/L	180	180 Aesthetic		
CHLORIDE PPM	mg/L	500	250 aesthetic		
SULPHATE	mg/L	500	500 - 250 Aesthetic	1000	
BORON	mg/L	4	4	5	0.5
BARIUM	mg/L	0.7	0.7		
CHROMIUM (as CR6)	mg/L	0.05	0.05		
COPPER	mg/L	1	2 - 1 Aesthetic		
LEAD	mg/L	0.01	0.01		
MOLYBDENUM	mg/L	0.05	0.05	0.15	0.05
SELENIUM	mg/L	0.01	0.01	0.02	0.05
VANADIUM	mg/L	0.01	0.01	0.1	0.5
ZINC	mg/L	3	3 Aesthetic		
MERCURY	mg/L	0.001	0.001		
FLUORIDE	mg/L	1.5	1.5	2	2
CADMIUM	mg/L	0.002	0.002		
NICKEL	mg/L	0.02	0.02		
NITRATE	mg/L	50	50		
SILVER	mg/L	0.1	0.1		
URANIUM	mg/L	0.02	0.02	0.2	0.01
ANTIMONY	mg/L	0.003	0.003		

Note; Trace element levels are measured as dissolved levels

From [redacted] **Date** Tuesday, 11 January 2011 2:35:38 PM
To
Cc
Subject Final Document vTEP

20110111 - Table B - Callide Ash Dam Water Level Management TEP.PDF (674 KB HTML) CALL

[redacted]

Attached are the final versions agreed between yourself and Roger for approval.
Regards

[redacted]

Callide Site Manager
CS Energy

Pl [redacted]

PO Box 392
BILOELA QLD 4715

Table B-TEP

Sampling locations and results as stipulated in the 'Callide Power Station Ash Dam B Spill Management Plan, 27th Feb, 2009 Revision 7'.

Pre -spill - Surface Water - Ash Dam B Spillway, Linkes Rd Crossing, Calvale/Coal Rd crossing, Gladstone Hwy crossing, Callide Dam. If discharge occurs via Western channel then Callide Creek adjacent to Nob's bore to be added to sampling monitoring

Frequency - One sample of each is require to be conducted prior to release

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency - Numbered bores to be sampled once prior to release.

During spill - Surface Water - Ash Dam B Spillway, Linkes Rd Crossing, Calvale/Coal Rd crossing, Gladstone Hwy crossing, Callide Dam. If discharge occurs via Western channel then Callide Creek adjacent to Nob's bore to be added to sampling monitoring

Frequency - All surface water to be sampled daily

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency - Numbered bores to be sampled initially at a fortnightly interval, reduced to monthly after two sampling events. Landholders bores to be sampled prior to any extraction and every 1ML that is irrigated.

NOTE - If plume is detected within the bores then sampling frequency is to be increased to weekly with sampling locations to be both d/stream and laterally from the creek.

Post spill - Surface Water - Ash Dam B Spillway, Linkes Rd Crossing, Calvale/Coal Rd crossing, Gladstone Hwy crossing, Callide Dam. If discharge occurs via Western channel then Callide Creek adjacent to Nob's bore to be added to sampling monitoring

Frequency - As above until it has been been determined that the spill plume is within acceptable levels.

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency - As above until it has been been determined that the spill plume is within acceptable levels.

** Note that if ash dam plume is detected then bore monitoring is required to be escalated to a weekly monitoring with sampling locations to be extended both downstream and laterally from the creek.*

Analytes	Sample container to be used	Sample size required	Preservation Methods	Maximum Storage Time
Field analytes - in field (using the YSI Field monitor	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C	72 hours
Conductivity, TDS, SS, Alkalinity, Fluoride, Sulfate, Chloride, Boron, Silica, Hardness	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C	24 hours
BOD	Plastic bottle - unpreserved	250 mL	Refrigerate at 4°C	24 hours
Aluminium, Arsenic, Barium, Beryllium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Sodium, Strontium, Tin, Thallium, Thorium, Uranium, Vanadium, Zinc	Plastic bottle - nitric acid supplied in bottle	250 mL	Filter on site to 0.45 µm Refrigerate at 4°C	28 days
Oil and Grease	Glass bottle - acid supplied within bottle	1000 mL	Refrigerate at 4°C	7 days

Sampling routine during and post - spill event (pre-spill sampling conducted by environment)

Sampler Enviro Chem Contractor

* Chemistry to cover environment sample during an unavailability

Daily Fortnightly Monthly

* Note that if ash dam plume is detected then bore monitoring is required to be escalated to a weekly monitoring with sampling locations to be extended both downstream and laterally from the creek.

Week 1

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Sampler								
Surface								
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores								
68807	Fortnightly	Contractor						
68267	Fortnightly	Contractor						
34330	Fortnightly	Contractor						
62420	Fortnightly	Contractor						
Nob's	Fortnightly	Contractor						
13030283	Fortnightly	Contractor						
13030284	Fortnightly	Contractor						
13030532	Fortnightly	Contractor						
13030128	Fortnightly	Contractor						

Week 2

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Sampler								
Surface								
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores								
68807	Not required							
68267	Not required							
34330	Not required							
62420	Not required							
Nob's	Not required							
13030283	Not required							
13030284	Not required							
13030532	Not required							
13030128	Not required							

Week 3

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Sampler								
Surface								
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores								
68807	Monthly	Contractor						
68267	Monthly	Contractor						
34330	Monthly	Contractor						
62420	Monthly	Contractor						
Nob's	Monthly	Contractor						
13030283	Monthly	Contractor						
13030284	Monthly	Contractor						
13030532	Monthly	Contractor						
13030128	Monthly	Contractor						

Week 4

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Sampler								
Surface								
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores								
68807	Not required							
68267	Not required							
34330	Not required							
62420	Not required							
Nob's	Not required							
13030283	Not required							
13030284	Not required							
13030532	Not required							
13030128	Not required							

Week 5

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Sampler								
Surface								
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores								
68807	Not required							
68267	Not required							
34330	Not required							
62420	Not required							
Nob's	Not required							
13030283	Not required							
13030284	Not required							
13030532	Not required							
13030128	Not required							

Week 6

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat	Sun
Sampler								
Surface								
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores								
68807	Not required							
68267	Not required							
34330	Not required							
62420	Not required							
Nob's	Not required							
13030283	Not required							
13030284	Not required							
13030532	Not required							
13030128	Not required							

cs energy

CALLIDE POWER STATION VOLUNTARY TRANSITIONAL ENVIRONMENTAL PROGRAM (VTEP)

DATE: 11 January 2011

LOCATION: Callide A and B, and Callide C Power Stations
Coal and Callide Roads respectively
BILOELA QLD 4715

EXISTING DEVELOPMENT APPROVALS:
Integrated Authority CG0039 issued 30 July 2004
Integrated Authority CG0117 issued 17 June 2004.

REGISTRATION CERTIFICATE HOLDERS:
CS Energy Limited ACN 078 848 745 holds ENRE 00952209
Callide Power Management Pty Ltd ACN 082 468 700 holds ENRE 00849808

ACTIVITIES:

ENRE 00952209

- ERA 8 Chemical Storage Threshold 1
- ERA 8 Chemical Storage Threshold 3(b)
- ERA 14 Electricity Generation Threshold 2(b)
- ERA 56 Regulated Waste Storage Threshold 2
- ERA 60 Waste Disposal Threshold 1(d)
- ERA 63 Sewage Treatment Threshold 2(b)

ENRE 00849808

- ERA 14 Electricity Generation Threshold 2(b)
- ERA 56 Regulated Waste Storage Threshold 2

BACKGROUND

CS Energy owns and operates Callide A and B power stations located at Coal Road, Biloela, Queensland and holds Registration Certificate ENRE 00952209.

2010 has been an exceptionally wet year, with the Power Station site recording 1,134 mm of rain, compared with a 2010 total rainfall for Thangool of 1,097 mm. Long-term rainfall records show the 10-year average rainfall for the power station site of 584 mm, and a 79-year average rainfall for Thangool of 662 mm.

Notwithstanding, at the commencement of the nominal 4 month wet season on 1 November 2010, Ash Dam B was in compliance with the statutory 0.01 AEP (Annual Exceedance Probability) annual risk level (Design Storage Allowance) (DSA) of RL 213.37 m. The level of the dam on 1 November 2010 was RL 213.16 m.

On 20 December 2010, the dam level of 213.335 m exceeded the statutory 0.01 AEP for the 72 hour storm risk level (Mandatory Reporting Level - MRL) of 213.33 m and DERM were notified.

Significant rainfall events in the area in December 2010 have resulted in raised water levels in the ash dam. Total rainfall at Callide Power Station as at Friday 31 December 2010 was 441 mm, the highest recorded rainfall in the area for a December period. As a result of these rainfall events, water levels in the ash dam have risen by 1.27 m in December, with levels rising by 1.06 m between 22 December and 31 December. A further 131 mm of rain was recorded at the power station from 1 to 7 January 2011, increasing the water level of the ash dam by 350 mm. The water level in the ash dam is now approaching the dam's spillway level, and is likely to spill if a further 43 mm of rain is received at the Callide Power Station. in the very near future. Furthermore the current strong La Nina event continues with the Bureau of Meteorology forecasting wetter than normal conditions are likely to persist until autumn.

As at 6 January 2011, the water level in the dam was RL 214.77 m, just below the spillway level of RL 214.95 m.

Ash Dam B also receives effluent and ash from Callide C Power Station located at Callide Road, Biloela, Queensland. Callide Power Management Pty Ltd (CPM) is the holder of Registration Certificate ENRE 00849808 for Callide C Power Station. CS Energy through Callide Energy Pty Ltd is a part owner of Callide Power Management. CS Energy is also the contracted operator of Callide C Power Station.

The recent rainfall events in the region have also caused heavy sediment loads in water supplies from Callide Dam which has affected the performance of the C station cooling tower blowdown water treatment plant.

The original design basis for the dam set a risk level of 1% total (not annual) over the station life that the water level would reach the spillway level.[1] In 2003, the spillway level was raised from RL 213.55 m to RL 214.95 m. CS Energy has and continues to investigate, as part of its longer term strategy, outside the scope of this VTEP, future actions to address the spill risk from the next wet season nominally commencing in November 2011.

It is also noted that CS Energy is investigating the impact of seepage from Ash Dam B and measures to reduce it, to meet the scope of the Environmental Investigation Report to be submitted to DERM by 4 March 2011.

OBJECTIVE OF THE VTEP

The Objective of this Voluntary Transitional Environmental Program is to ensure compliance with the *Environmental Protection Act 1994* (EP Act) by implementing water management measures to avoid as far as practicable environmental harm being caused or threatened by an overflow of Ash Dam B, if the forecast cumulative rainfall events occur during the balance of the current wet season.

[1] Callide B Power Station Ash Dam - Design Report, prepared by Macdonald Wagner for QEC June 1985.

In particular, this VTEP proposes planned controlled low flow releases from Ash Dam B diluted by flow in Callide Creek, to reduce the water level in Ash Dam B to below the Spill Warning Level of RL 214.45 m, as specified in the Emergency Action Plan developed as part of the Ash Dam Management Plan documentation required by the Development Approval. The VTEP also seeks authorization for opportunistic controlled low and high flow releases from Ash Dam B diluted by flow in Callide Creek, to reduce the water level in Ash Dam B to below the Mandatory Reporting Level of RL 213.33 m.

THE PROGRAM IS REQUIRED BASED ON THE FOLLOWING GROUNDS:

This VTEP is required based on the following grounds;

- The water level in Callide Ash Dam B has risen some 3 metres from RL 211.74 m on 1 January 2010 to RL 214.77 m on 6 January 2011, as a consequence of the significantly higher than normal rainfall received during 2010 and 2011 to date due to the strong La Nina event affecting eastern Australia. The spillway overflow level is RL 214.95 m.

- Preventative measures such as a controlled release may be necessary to ensure that environmental harm is not caused or threatened, should the ash dam overflow if forecast cumulative rainfall is received. Controlled releases will aim to achieve a better environmental outcome for the receiving environment by managing water flow rates, discharge locations and quality, compared with rainfall-driven uncontrolled spills.

HOW OBJECTIVE WILL BE ACHIEVED

The Objective will be achieved by adopting the following strategy:

- Carrying out actions under the proposed scenarios and within the indicative timeframes proposed under this VTEP.

AUTHORISATION

The operation of Callide A and B stations is authorised by Integrated Authority CG0039 and Registration Certificate ENRE 00952209.

"Schedule 2 E – Land Application" of the Integrated Authority authorises the Registration Certificate Holder to release ash and effluent to the Waste Containment Facility from A, B and C stations.

"Schedule 2C - Water" of the Integrated Authority authorises the release of contaminants from the licensed place at Release Points R1 and R2 from Ash Dams 1 and 2 respectively.

The *"Waste Containment Facility"* is defined in the Integrated Authority and includes Ash Dam B.

The operation of Callide C station is authorised by Integrated Authority CG0117. *"Schedule 2E - Land Application"* authorises ash and effluent (coal material, boiler blowdown and chemical cleaning waters and treated sewage effluent) to be placed in the Waste Containment Facility.

Controlled release from the dam with concurrent flow in Callide Creek is also a listed response strategy for a Level 3 Action under the Corrective Action Plan developed as part of the Ash Dam Management Plan documentation required by the Development Approval.

Accordingly, CS Energy is authorised to continue to operate the Callide A, B and C Stations and to continue to direct ash and effluent to the Waste Containment Facility under the terms of this VTEP. Callide Power Management as the Callide C Registration Certificate holder is authorized to continue to direct ash and effluent to the Waste Containment Facility from Callide C Station under the terms of this VTEP.

PERFORMANCE INDICATORS

The following Actions will be carried out by CS Energy with the aim of achieving the targeted water level reductions.

CS Energy will use its best endeavours to achieve the desired water level reductions within the indicative timeframe given. However, the timeframe for achieving the targeted water level reduction will be heavily influenced by:

(a) The times and durations for which the water flows and quality of water in the receiving environment in Callide Creek facilitates controlled or opportunistic releases from the Ash Dam.
(b) Operational delays, including the sourcing, delivery, commissioning and operation of plant and equipment.
(c) Inability of personnel to safely access plant and equipment due to weather conditions.
(d) Further rainfall events.

At the time of submission of this VTEP, technical investigations into the sourcing and delivery of pumps, pipes and associated plant and equipment are continuing. It is anticipated that by 8 January 2011, the power station will be capable of the controlled release of around 30 ML/day of ash dam water, and by 12 January 2011, it is hoped to have another 15 ML/day of capacity commissioned.

To meet the objective of implementing water management measures that avoid environmental harm being caused by a release from Ash Dam B, a key performance indicator will be meeting the water quality objectives shown in Appendix A for Callide Creek during any controlled release.

CS Energy will keep DERM regularly informed as to the progress with proposed actions under this VTEP, as per Action 4 of this TEP.

ACTION 1 - RELEASE SCENARIOS

It should be noted that the following Scenarios and related Actions may occur simultaneously in various combinations, with Ash dam releases from separate release points, depending on the state of Callide Dam, Callide Creek, Ash Dam B, and the operability of pumping equipment.

Two final release points to Callide Creek are available for ash dam releases:

- The western route has 2 x 2.4 m diameter culverts under the Biloela-Callide Rd. It would potentially receive releases from the Western Stormwater Diversion Channel or the Western Seepage Collection Trench. This route has a high capacity flow capability.

- The eastern route has 4 x 900 mm diameter culverts under the Biloela-Callide Rd. This flow path is however currently restricted by a single 900 mm culvert below the dam access road. Flows may need to be restricted to avoid cutting the access road, or the culvert modified. It would potentially receive releases from the area of the spillway, the Eastern Stormwater Diversion Channel or the Eastern Seepage Collection Trench. This route currently has a lower capacity flow capability than the western route.

Water will be released from Ash Dam B to meet the water quality objectives for Callide Creek combined flows as specified in Table A, based on meeting the drinking water standards for those parameters influenced by the ash dam water quality and for applicable stock and irrigation water quality requirements.

It is proposed that water be released from Ash Dam B initially as per Scenario 1. The dynamics of Scenario 1 will be reviewed from operating experience in implementing it in terms of flow rates, dilution ratios and achievement of water quality objectives, and CS Energy will seek an amendment of this TEP as required based on that operating experience.

For each of these Scenarios, triggers for ceasing release will be as follows:

- When the water quality in Callide Creek as measured at the surface water monitoring sites reaches any of the Callide Creek Water Quality Objectives listed in Column 1 of Table A "Water Quality Performance Indicators".
- The flow in the Creek at Linkes Road is expected to fall below 300 ML/day in the next 24 hours.
- When the water level in the Ash Dam is reduced to the MRL.

For each of the Scenarios, the trigger for adjusting the dilution flow to less than 5% will be the results of the monitoring of the ash dam water release quality being unsuitable to meet the performance indicators at the authorised dilution ratio of 5%.

SCENARIO 1: Callide Dam Not Spilling and Callide Creek Flowing

RELATED ACTION 1: Opportunistic Controlled "Low Flow" Release

Objective: Ash Dam water will be released into natural Callide Creek run-off flow to below the Mandatory Reporting Level.

Characteristics of Release

- After a moderate rain event the upper reaches of the Callide Creek above the Linkes Road culvert will be running with surface water flow rates of 100 to 350 ML/d.
- This TEP authorises controlled release from the Ash Dam when the flow in Callide Creek as measured at the Linkes Road monitoring site is above 300 ML/day.
- This TEP authorises the controlled release from the Ash Dam of up to 5% of the measured flow at Linkes Road. For example, at the minimum authorised Creek flow of 300 ML/day, a maximum of 15 ML/day is authorised for releases from Callide Dam.
- Proposed start when flows are at or above 300 ML/day and stop when flows pass back through that figure.
- Monitor release volumes and quality and match to volumes and flows at Callide Dam Road and Linkes Road culverts
- Enables some discharge capability using rain events without drawing on water reserves in Callide Dam

- Discharge ash dam down to MRL if sequence of events allows
- Will occur in a series of events
- Total release volume estimated to be 1,750 ML plus rain events

SCENARIO 2: Callide Dam Not Spilling But Releasing and Callide Creek Flowing

RELATED ACTION 2: Planned Controlled "Low Flow" Release

Objective: Ash Dam water will be released into a Callide Dam Release to below the Spill Warning Level.

Characteristics of Release

- Arrangements made with Sunwater to release water reserves at a rate that provides a creek flow of 300 ML/d at Linkes Road culvert
- Discharge 15 ML/d of ash water
- Monitor volumes and adjust release rate to maintain a creek flow of 300 ML/d at Linkes Road
- Discharge down to below Spill Warning Level
- A number of such releases may be required if subsequent rain events increase level to above the Spill Warning Level.

SCENARIO 3: Callide Dam Spilling or Releasing and Callide Creek Flowing

RELATED ACTION 3: Opportunistic Controlled "High Flow" Release

Objective: Ash Dam water will be released into a Callide Dam flood overflow or release event to below the Mandatory Reporting Level.

Characteristics of Release

- Install high capacity 80+ML/d pump plus syphons ~45 ML/d
- Assumes Callide Dam overflow rate is greater than 1,250 ML/d
- Callide Creek will be in flood
- Potential to lower level to MRL in 10 days of operation
- Maximum discharge would be around 1,750 ML plus any subsequent rain events
- A number of such releases may be required if subsequent rain events increase level to above the Mandatory Reporting Level.

ACTION 2: Landholder Consultation

CS Energy has commenced consultation with downstream landholders potentially affected by the proposed releases from Ash Dam B in accordance with the Spill Management Plan.

ACTION 3: Receiving Environment Monitoring

Monitoring of Ash Dam Water Quality

Initial monitoring by CS Energy has shown that the ash dam water quality is uniform down to a depth of 3 metres adjacent to the proposed discharge point. This will be checked periodically to ensure the quality of the water is not significantly stratified.

Notwithstanding, CS Energy will monitor the quality of the water being released from the ash dam at the release point (end of pipe) or at the inlet to the pipe / pump.

Monitoring of Release Volumes and Callide Creek Flows

CS Energy will use its best endeavours to regularly measure, monitor and adjust release volumes to maintain an acceptable dilution ratio with the available flow in Callide Creek.

CS Energy will adjust discharge volumes to ensure downstream property and infrastructure are protected from Ash Dam releases.

CS Energy will have no control over downstream flood events and volumes, but will endeavour to estimate these.

CS Energy anticipates being able to access release and flow data from Sunwater.

Monitoring of Callide Creek Surface Water and Groundwater Quality

CS Energy will sample and analyse the Receiving Environment (surface water sites and groundwater monitoring bores) in accordance with the Spill Management Plan developed as part of the Ash Dam Management Plan documentation required by the Development Approval.

A copy of the proposed monitoring program is attached as Table B.

ACTION 4: REPORTING TO DERM

Weekly summary reports of progress with the VTEP actions will be provided to DERM.

More detailed Monthly reports on the releases from the Ash Dam, and water quality of the Receiving Environment will also be submitted to DERM until the completion of releases under this VTEP.

During release, daily reports will be provided to DERM of EC, DO, Cl, pH, and TDS and temperature for water released from the Ash Dam and from the Callide Creek surface monitoring sites as well as flow in Callide Creek and volume discharged from the ash dam.

When bore samples are taken, daily reports will be provided to DERM of EC, DO, Cl, pH, and TDS.

Laboratory analysis reports will be provided to DERM within 1 week of receiving laboratory results.

ACTION 5: REVIEW AND EVALUATION

Following completion of the actions identified in this VTEP, CS Energy will review whether the actions met the stated objective and will report its findings to DERM.

CLOSURE

This VTEP remains in force until such time as the Mandatory Reporting Level of RL 213.33 m is achieved and reliably maintained, or until 20 April 2011, whichever comes first.

RESPONSIBLE OFFICER

[redacted]

[redacted] Site Manager Callide Power Station
CS Energy Limited

TABLE A

WATER QUALITY PERFORMANCE INDICATORS

		Callide Creek Water Quality Objectives	Australian Drinking Water Guideline	STOCK WATER	IRRIGATION WATER
pH VALUE		6.5 - 8.5	6.5 - 8.5	4.5 - 9.0	6.5 - 8.5
CONDUCTIVITY @ 25 C	us/cm	1000			
TOTAL DISSOLVED SOLIDS (TDS)	mg/L	1000	500 - 1000 acceptable		
	mg/L				
CALCIUM	mg/L	200	200 Aesthetic	1000	
MAGNESIUM	mg/L				
SODIUM	mg/L	180	180 Aesthetic		
CHLORIDE PPM	mg/L	500	250 aesthetic		
SULPHATE	mg/L	500	500 - 250 Aesthetic	1000	
BORON	mg/L	4	4	5	0.5
BARIUM	mg/L	0.7	0.7		
CHROMIUM (as CR6)	mg/L	0.05	0.05		
COPPER	mg/L	1	2 - 1 Aesthetic		
LEAD	mg/L	0.01	0.01		
MOLYBDENUM	mg/L	0.05	0.05	0.15	0.05
SELENIUM	mg/L	0.01	0.01	0.02	0.05
VANADIUM	mg/L	0.01	0.01	0.1	0.5
ZINC	mg/L	3	3 Aesthetic		
MERCURY	mg/L	0.001	0.001		
FLUORIDE	mg/L	1.5	1.5	2	2
CADMIUM	mg/L	0.002	0.002		
NICKEL	mg/L	0.02	0.02		
NITRATE	mg/L	50	50		
SILVER	mg/L	0.1	0.1		
URANIUM	mg/L	0.02	0.02	0.2	0.01
ANTIMONY	mg/L	0.003	0.003		

Note; Trace element levels are measured as dissolved levels

TABLE B

WATER QUALITY MONITORING PROGRAM

Refer attached A3 Document "Table B – TEP" for details.

GLT2011/371. GLT1174.

APPLICATION FOR A TRANSITIONAL ENVIRONMENTAL PROGRAM

Under Section 339 of the *Environmental Protection Act 1994*

Name of applicant:	CS Energy
Address:	PO Box 392 BILOELA QLD 4715
Telephone:	[redacted]
Contact:	[redacted] (Site Manager) [redacted] (Environmental Coordinator)

Background

CS Energy (CSE) is a Queensland Government owned corporation that operates the Callide Power Station, located approximately 10 kilometres east of the Biloela township.

Waste ash and waste water produced as a result of power generation is stored in Ash Dam B which has a 5 400ML capacity. The waste ash and waste water includes a range of contaminants that have the potential to cause environmental harm if not properly contained.

On the 20 December 2010, DERM was notified that the Level 1 trigger (MRL 213.33m) in the 'Callide Power Station Ash dam – Corrective Action Plan' had been reached. The height of the spillway is 214.95m.

Heavy rainfall occurred over the Ash dam between 22 December and 29 of December and as a result, DERM was notified on 30 December that the ash dam water level had risen to 214.35m.

A meeting with CSE, SunWater and DERM was held on the 5 of January 2011 to discuss options for reducing the ash dam water level. As there is a greater than 65 to 70% median rainfall (250-500mm) expected in the next 6-8 weeks, CSE has submitted a TEP as the risk of a spill is imminent.

Reasoning

The area of the Callide Creek, from just downstream of the Callide dam wall to the weir (near Biloela) is a recharge zone for the Callide Alluvium aquifer. Water is extracted for consumption and irrigation and stock purposes.

Current water quality in the Ash Dam is not suitable for drinking water or to be utilised for irrigation or stock purposes.

Therefore, to minimise risk of the impact on the water quality in the aquifer if the Ash Dam discharged water into the Callide Creek, the TEP proposes a series of scenarios that ensure a controlled discharge from Ash Dam B to the Callide Creek:

1. Callide Dam not spilling and Callide Creek flowing
2. Callide Dam not spilling but releasing and Callide Creek flowing

3. Callide Dam spilling or releasing and Callide Creek flowing.

CSE are required to release at least 1 750ML to reach an acceptable level in the dam for future predicated rainfall events.

Objective of the TEP

The objective of the TEP is to:

- Ensure compliance with the *Environmental Protection Act 1994* by implementing water management measures (what are these measures- for the delegate to sign he will need to know this) to avoid as far as practicable environmental harm being caused by overflow of Ash Dam B.
- Reduce the water level in Ash Dam B to below the Spill Warning Level of RL 214.45m.
- To reduce the water level in Ash Dam B to below the Mandatory Reporting Level of RL 213.33m.

Other

To counteract this risk to the aquifer, the following measures should be adhered to:

- flow rates of at least 300ML/d in the Callide Creek,
- controlled release of ash dam water of up to 5% of the measure flow at Linkes Road.
- non-contaminated tailing water to flow through the system.

A comprehensive monitoring plan of both surface and ground water will be undertaken. In-field analysis of surface water will be conducted daily during releases and if trigger values in Table A, 'Water Quality Performance Indicators' are exceeded the release will stop. Water samples will be collected and analysed for parameters not able to be tested in the field.

Groundwater bores with be sampled initially during release and then every fortnight. If contamination is noticed in the bores, the frequency of monitoring the bores will be increased.

Consultation
In considering this approval the following people were consulted;

[redacted] CS Energy
[redacted] Office of the Water Supply Regulator
[redacted] Water Quality and Aquatic Ecosystem Health, DERM
[redacted] Water Services, DERM
[redacted], SunWater

Criteria for Deciding the Approval
Section 338 of the *Environmental Protection Act 1994* requires the administering authority to consider the following matters;

The Standard Criteria	
The principles of ecologically sustainable development as set out in the National strategy for Ecologically Sustainable Development;	CSE are continuing to investigate ways to minimise the amount of water entering the ash dam such as: • Expansion of chook sprays (irrigation) • Purchasing RO unit • Cutting back/re-using water where possible.
Any applicable environmental protection policy;	The Environmental Protection (Water) Policy 2009 has been considered. CS Energy is continuing to investigate ways to minimise the amount of water entering the ash dam. To ensure that water quality objectives of the Callide Creek and aquifer are maintained, the Ash Dam water will be diluted. Due to unprecedented rainfall in the ash dam catchment area, the measures in place and future preventative measures will not have an immediate impact on the ash dam water level. Predicted future rainfall for the next 6-8weeks is 250-500mm of rain. The ash dam is unable to accommodate this amount of water. To minimise potential environmental harm from uncontrolled releases from the ash dam, CSE are proposing controlled releases into Callide Creek. Scenario 1 'Callide Dam not spilling and Callide Creek flowing' involves the release of ash dam water during opportunistic flows (100ML – 350ML/d). This scenario states that release will occur during flows of greater than 150ML. This scenario as it currently stands, is not supported as: • a flow rate of at least 300-350ML/d is required for water to reach the weir and the flow may not be maintained down the length of the creek; • adequate dilution ratio may not be maintained and potential issues with the mixing zone; and • the possibility of non-contaminated tailing flows through the system not occurring. Scenario 1 can only occur if the flow rate is at least 300ML/day at Linkes Road and there will be sufficient flow for the next 24hours to ensure that the contaminants are flushed out of the system. Scenarios 2 (Callide Dam not spilling but releasing and Callide Creek flowing) and Scenario 3 (Callide Dam spilling or releasing and Callide Creek flowing) are considered more suitable options as the risk of environmental harm is reduced due to: • higher flow rates in the Callide Creek; • potential for higher dilution rates thus ensuring water quality guidelines (drinking water, stock, irrigation and aquatic ecosystems) are reached; • allowance for non-contaminated tailing flows through the system.
Any applicable Commonwealth, State or	As the discharge from the ash dam enters the recharge area for the Callide Alluvium in which water for domestic, irrigation and stock

local government plans, standards, agreements or requirements;	purposes is utilised, the guidelines for drinking water (Australian guidelines), irrigation and stock water quality (ANZECC guidelines) are relevant. CSE will release up to 5% of the measured flow at Linkes Road. This will ensure an adequate dilution factor to ensure the water quality performance indicators are met.
Any applicable environmental impact study, assessment or report;	
The character, resilience and values of the receiving environment;	As mentioned previously, the area downstream of the ash dam discharge area to the weir is a recharge zone for the Callide Alluvium aquifer. The capacity of this aquifer is extremely large. The aquifer is utilised for drinking water, irrigation and stock and is thus, very sensitive to the release of contaminants that are present in the ash dam water. To counteract this risk, the following measures should be adhered to: • flow rates of at least 300ML/d in the Callide Creek, • controlled release of ash dam water of up to 5% of the measure flow at Linkes Road. • non-contaminated tailing water to flow through the system.
All submissions made by the applicant and submitters;	The submission was not available for public comment.
The best practice environmental management for the activity under the authority, program, order or permit;	The CSE site is a closed system. There are no provisions for the discharge of ash dam water to the environment. Given the current circumstances and the risk of the ash dam spilling in an uncontrolled manner, controlled releases are the best management option. Additionally, flow rates, minimum dilution ratio and a comprehensive monitoring program will be implemented.
The financial implications of the requirements of the authority, program, order or permit as they would relate to the type of activity or industry carried on under the authority, program or order;	Without this approval, the operators are not in compliance with their obligations under the *Environmental Protection Act 1994*. As a result, enforcement action could be taken and financial penalties may be imposed. Uncontrolled releases that results in contamination of the aquifer will result in substantial financial implications for CSE, landholders and Banana Shire Council.
The public interest;	There is considerable public interest in this issue as there is potential for environmental harm to the aquifer as a result of contaminated ash dam water. Conditions will be in place to ensure that the risk of environmental harm is minimised.
Any applicable site management plan and/or IEMS	CSE Spill Management Plan details the action plan and monitoring process for releases from the ash dam.
Any other matter prescribed under a regulation.	

Recommendation
It is recommended that the CS Energy TEP be approved in accordance with the attached conditions.

Recommendation	Approved
[redacted] Environmental Officer Environmental Services – Gladstone	[redacted] A/Manager Environmental Services - Gladstone

Department of Environment and Resource Management

Environmental Protection Act

Transitional environmental program certificate of approval number CA22011

This certificate of approval is issued by the administering authority pursuant to section 339 of the Environmental Protection Act 1994. *A transitional environmental program is a specific program that, when approved, achieves compliance with the* Environmental Protection Act 1994 *for the matters dealt with by the program by reducing environmental harm, or detailing the transition to an environmental standard.*

Under the provisions of the *Environmental Protection Act 1994*, this certificate of approval is hereby granted to:

[redacted]

CS Energy
PO Box 392
BILOELA QLD 4715

approving the draft transitional environmental program; titled Callide Power Station Voluntary Transitional Environmental Program for management of Ash Dam B water levels at Callide Power Station.

The draft transitional environmental program, dated 11 January 2011, was received by this office on 11 January 2011.

The draft transitional environmental program is approved subject to the following conditions:

Undertaking the release of water from Ash Dam B

1. Contaminants that will, or have the potential to cause environmental harm must not be released directly or indirectly to any waters except as permitted under this Transitional Environmental Approval – Certificate of Approval, unless otherwise authorised to under the *Environmental Protection Act 1994*.
2. The release of contaminants to waters must only occur from the release points specified in the Transitional Environmental Program (Western route or the Eastern route).
3. The release of contaminants to waters from the release points must be monitored at the locations specified in Water Quality Monitoring Program (Table B) for each quality characteristic and at the frequency specified in Table B of this Transitional Environmental Program.
4. Where the downstream results exceed the trigger values specified in Table A 'Water Quality Performance Indicators', for any quality characteristic, discharge from Ash Dam B must cease. The department must be notified within 24 hours of receiving the result.

Contaminant release events

5. Contaminant release flow rate must not exceed 5% of receiving water flow rate.
6. The daily quantity of contaminants released from each release point must be measured and recorded.

Erosion and sediment control

7. Release to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause material build up of sediment in such waters.

Notification of release events

8. The Transitional Environmental Program holder must notify the administering authority within 24 hours of having commenced releasing Ash Dam B water to the receiving environment. Notification must include the

submission of written verification to the administering authority of the following information:

a. release of contaminants

b. expected release cessation date/time

c. release point/s

d. release volume (estimated)

e. receiving water/s include the natural flow rate

f. any details (including available data) regarding the likely impacts on the receiving water(s).

9. The Transitional Environmental Program holder must provide daily written reports to the administering authority during the release which includes the following information:
   a. all in-situ monitoring data for that day
   b. the receiving water flow rate
   c. the release flow rate.

10. The Transitional Environmental Program holder must notify the administering authority as soon as practicable, (no later than within 24 hours after cessation of a release) of the cessation of a release notified under condition 8 and within 28 days provide the following information in writing:
    a. release cessation date/time
    b. natural flow volume in receiving water
    c. volume of water released
    d. details regarding the compliance of the release with the conditions of this Transitional Environmental Program (i.e. contamination limits, natural flow, discharge volume)
    e. all in-situ water quality monitoring results
    f. any other matters pertinent to the water release event.

Notification of release event exceedence

11. The Transitional Environmental Program holder must, within 28 days of a release that does not comply with the conditions of this Transitional Environmental Program, provide a report to the administering authority detailing:
    a. the reason for the release
    b. the location of the release
    c. all water quality monitoring results
    d. any general observations
    e. all calculations
    f. any other matters pertinent to the water release event.

Requirements to cease the release of Ash Dam B water

12. The release of Ash Dam B water must cease immediately if any water quality limit as specified in the Water Quality Performance Indicators (Table A) is exceeded.

13. The release of Ash Dam B water must cease immediately if identified that the release of mine affected waters is causing erosion of the bed and banks of the receiving waters, or is causing a material build up of sediment in such waters.

14. The release of Ash Dam B water must cease immediately if the holder of this Transitional Environmental Program is directed to do so by the administering authority.

Monitoring requirements

15. Where monitoring is a requirement of this Transitional Environmental Program, ensure that a competent person(s) conducts all monitoring.

16. All monitoring undertaken as a requirement of this Transitional Environmental Program must be undertaken in accordance with the administering authority's Monitoring and Sampling Manual 2009 Environmental Protection (Water) Policy, Version 2 September 2010.

Department of Environment and Resource Management

Notice

Transitional environmental program certificate of approval

Notification of emergencies or incidents

17. Within 24 hours of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this Transitional Environmental Program, the administering authority must be notified of the release by telephone, facsimile or email.

18. The notification of emergencies or incidents must include but not be limited to the following:
    a. the holder of the Transitional Environmental Program
    b. the location of the emergency or incident
    c. the number of the Transitional Environmental Program
    d. the name and telephone number of the designated contact person
    e. the time of the release
    f. the time the holder of the Transitional Environmental Program became aware of the release
    g. the suspected cause of the release
    h. the environmental harm caused, threatened, or suspected to be caused by the release, and
    i. actions taken to prevent any further release and mitigate any environmental harm caused by the release.

19. Not more than fourteen days following the initial notification of an emergency or incident, written advice must be provided of the information supplied to the administering authority in relation to:
    a. proposed actions to prevent a recurrence of the emergency or incident, and
    b. outcomes of actions taken at the time to prevent or minimise environmental harm.

The transitional environmental program remains in force until 30th April 2011 or when the Ash Dam B Mandatory Reporting Level of RL 213.33m is achieved, whichever comes first.

In any case where conditions are imposed upon a certificate of approval, you may apply to the administering authority for a review of the decision. You may also appeal against the decision to the Planning and Environment Court.

Information relating to a review of decisions or appeals 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.

Fees apply for the assessment of a draft transitional environmental program and any subsequent annual returns.. The fees are outlines in the attached operational policy *Transitional Environmental Program (TEP) fees.*

A fee of $1 055.10 is payable.

Should you have any queries in relation to this Notice, Lisa Thompson, of the Department of Environment and Resource Management on telephone 07 4671 6528 would be happy to assist you.

Signature

11/01/11

Date

[redacted]

A/Manager, Environmental Services, Gladstone
Department of Environment and Resource Management

Enquiries:
Department of Environment and Resource Management
Level 3, 136 Goondoon Street,
GLADSTONE QLD 4680
Ph. 07 4971 6500
Fax. 07 49721993

From [redacted] **Date** Thursday, 30 December 2010 3:11:24 PM
To
Cc CAMPBELL Gary
Subject 30 December Callide Ash Dam Update
20101230 - DERM Advice re Callide Ash Dam B - Emailed 30.12.2010.PDF (265 KB HTML)

[redacted]

Please find attached an update on the status of the CSE Callide Power Station Ash Dam B.

If you have any queries please don't hesitate to contact me.

Kind Regards,

[redacted]
Technical Services Superintendent

Callide Power Station
CS Energy Ltd
PO Box 392
Biloela
QLD 4715
Bhrs [redacted]
Fax
Mob

Be green..... read from the screen

Callide Power Station
CS Energy Ltd ABN 64 078 848 745
PO Box 392 Biloela Qld 4715
T 07 4992 9329
F 07 4992 9328
W www.csenergy.com.au

30th December 2010

[redacted]
Department of Environment and Resource Management
Gladstone QLD 4680
[redacted]

cs energy
generations ahead

Dea[redacted]

RE: CALLIDE ASH DAM B

I am writing to update you on the current status of the Callide Ash Dam B.

Our last correspondence to DERM was on 22 December 2010 when the Ash Dam water level was 213.36m. A total of 1701ML storage volume was available from the 213.36 level up to the spillway level, which equated to an estimated rainfall event of 540mm.

As of 7.00 am today (30th December 2010), the ash dam water level was 214.35m, a rise of 990mm. This followed 262.5mm of rain between the 22nd December and the 29th December – the most significant rain event was 127mm of rain overnight from the 27th to the 28th December.

At the ash dam water level of 214.35m, the freeboard volume to the spillway level of 214.95m is 690ML, which is equivalent to an estimated rainfall event of 215mm.

During the period 22nd December to 29th December the water level in the Callide Dam (operated by Sunwater) also rose from approximately 30% to 88% of full supply capacity.

It is noted that Callide Power Station rainfall for December 2010 (to the 29th December) was 441mm and resulted in an ash dam water level rise of 1.16m. The average December rainfall (Thangool 1929 – 2008 records) is 90.4mm, and the wettest December at Thangool (in 1973) was 344.4mm.

As requested in your email of 23rd December, a water sample was taken at the ash dam spillway on 28/12/10 and analysed – the results are below. The sample is also being kept for detailed analysis in Brisbane by a Consultant laboratory.

Measurement	Result
PH	8.21
Conductivity	7910 uS/cm
Turbidity	4.0 NTU
Sulphate	1700 mg/litre
Chloride	1784 mg/litre

.../2

Another Dam Safety Inspection of the ash dam was conducted yesterday by Sunwater, as a precaution following the significant water level rise over the Xmas period. No dam safety problems had been noted by the daily Site Inspections, and no Dam Safety problems were found during the Sunwater Inspection. A summary of the Dam Safety Inspection will be forwarded separately.

Local stakeholders Sunwater and The Banana Shire Council are being briefed regularly on the dam status.

Monitoring actions as previously noted are continuing.

If you require any additional information, please do not hesitate to contact me.

Yours sincerely,

[redacted]

[redacted]
Acting Site Manager – Callide

Phone: [redacted] (Direct)
Mobile: [redacted]

Callide Power Station
CS Energy Ltd ABN 54 078 848 745
PO Box 392 Biloela Qld 4715
T 07 4992 9329
F 07 4992 9328
W www.csenergy.com.au

cs energy
generations ahead

7 January, 2011

[redacted]
Department of Environment and Resource Management
Gladstone QLD 4680
Via Email: [redacted]

Dear [redacted]

RE: CALLIDE ASH DAM B

Background

I am writing to update you on the current status of the Callide Ash Dam B as of 6 January 2011.

In summary our previous correspondence covered:

- Correspondence to DERM on20 December notifying the exceedence of the Level 1 trigger in the "Callide Power Station Ash dam – Corrective Action Plan" – MRL 213.33m.
- Correspondence to DERM on 22 December 2010 providing additional requested information as well of the increase in Ash dam water level to 213.36 m. A total of 1701 ML storage volume was available from the 213.36 level up to the spillway level, which equated to an estimated rainfall event of 540mm.
- Correspondence to DERM on 30th December 2010 noting that the ash dam water level had risen to 214.35m, a rise of 990 mm. This followed 262.5 mm of rain between the 22nd December and the 29th December – the most significant rain event was 127 mm of rain overnight from the 27th to the 28th December. The freeboard level was 690 ML equivalent to a 215mm rain event. During the period 22nd December to 29th December the water level in the Callide Dam (operated by Sunwater) also rose from approximately 30% to 88% of full supply capacity.

Based on the trigger levels in the "Callide Power Station Callide Ash Dam B Emergency Action Plan", special Dam Safety Inspections were carried out by Sunwater on 29 December (historical highest water level) and again on 5 January (water level increased by more than 0.25 m in a week). No dam safety issues have been identified.

As per discussion and presentation at the Callide site meeting with DERM and Sunwater on 5 January, it was noted that the water level had risen to 214.66 m on 4 January due to a 46.5 mm rain event. This level exceeded the Spill Warning Level of 214.45 m and as such represented a Level 3 Exceedence as per the Corrective Action Plan. Applicable Level 3 actions were initiated at the Spill Warning Level including the meeting discussion regarding a controlled release from Ash Dam B in conjunction with a release of water from Callide Dam. CS Energy is currently preparing an urgent TEP for the controlled release proposal. Local stakeholders Sunwater, The Banana Regional Council and local landholders are being briefed on the Ash dam water level status and CS Energy planned actions.

As of 6 January, due to a 41.5 mm overnight rain event, the Ash dam water level has risen to 214.77 m – representing a remaining freeboard of 180 mm to the spillway level of 214.95 m and equivalent to freeboard volume of 210 ML and a rain event of some 60mm to result in spilling of the dam. Thus spilling of the Ash Dam is imminent – management actions would be as per the "Callide Power Station Ash Dam B Spill Management Plan" and the Corrective Action Plan, noting the urgent TEP also being prepared for DERM approval. The level of 214.77 m represents a Level 4 Exceedence under the Corrective Action Plan.

CS Energy has continued to monitor appropriate water samples – the Ash Dam B water analysis for 6 January is noted below:

Measurement	Result
pH	8.18
Conductivity	6440 µS/cm
Total Dissolved Solids	4122 mg/Litre
Sulphate	1425 mg/Litre
Chloride	1436 mg/Litre

If you require any additional information, please do not hesitate to contact me.

Yours faithfully,

[redacted]

Site Manager - Callide

7 January 2011

Telephone conversation – [redacted] (CS Energy)

- Rainfall - A few mm between 10-12 today
  - Looking at radar 1pm – large rainfall heading their way

- Have 133mm of freeboard which equates to approximately 44mm of rain

- Last heavy metals data was 18 August 2010
  - Have samples waiting for ALS to open on Monday
  - Gary has devised a calculation sheet based on flows to indicate what water quality they are dealing with (sending through)
  - In August, apart from molybdenum everything was within drinking water guidelines
    - Molydbenum 0.284 (drinking water guidelines 0.05)
- Working on a dilution ration of 10:1
  - Don indicated that this was probably not acceptable and we will be seeking the advice of Freshwater Services

- [redacted] has been speaking with Sunwater to get the values at the bottom of the dam wall open (flow rate of 3-6ML).
  - Sunwater's standard operating procedure for flood is to open the gates

- Department would like to ensure water is released well before discharge
  - Creek is running (200-300ML) and CS Energy is working on the assumption that the water is running off over the aquifer before it can be absorbed.

- Meeting at 1.30 today with Senior CS Exec's and Deputy Director Sue Ryan (DERM?)
  - Expedite approvals
  - Discussions with Senior Sunwater Exec's about release of water

- CS Energy have exhausted all possibilities for operations and re-use
  - All process units operational
  - Little evaporation occurring
  - Chook sprays in use
  - Ash return water
  - Net flow into the dam is now approximately 6ML/wk but this is immaterial to the amount of rain entering the ash dam catchment
  - Quotes etc for portable RO plant. 4 weeks to drop + 4 weeks to commission (45ML/mth)

From [redacted] **Date** Friday, 7 January 2011 5:00:40 PM
To
Cc
Subject Section 320 Notice

20110107_Updated_Section 320 Notice re Imminent Ash Dam Spill.doc (47 KB HTML)

[redacted]

Please find attached a Section 320 notice of imminent release from the Callide Ash dam.

Should an event occur over the weekend I will follow up with verbal advice.

Regards

[redacted]

Callide Site Manager
CS Energy

Pl[redacted]

PO Box 392
BILOELA QLD 4715

Ref:

7 January 2011

[redacted]
Environmental Officer, Regional Services
Department of Environment and Resource Management
Level 3, 136 Goondoon Street
PO Box 5065
GLADSTONE 4680

By e-mail: [redacted]

Dea[redacted]

CALLIDE POWER STATION ASH DAM B
NOTIFICATION OF IMMINENT RELEASE
ENVIRONMENTAL PROTECTION ACT 1994 – SECTION 320 NOTICE

CS Energy has been in regular contact with the Department of Environment and Resource Management (DERM) in relation to the risk of an uncontrolled release from Callide Power Station's Ash Dam B as a consequence of the extreme rainfall events in the area since December 2010.

On 1 November, at the start of the wet season, the water levels in the ash dam were below the design storage allowance and mandatory reporting level (MRL) and accordingly met the requirements of the Callide Ash Dam Management Plan under CS Energy's Integrated Environmental Authority No. CG0039. Significant rainfall events since the start of December 2010 have, however, resulted in raised water levels in the ash dam.

On 20 December 2010, CS Energy notified DERM that the ash dam water level had reached the MRL of 213.33 m. On 22 December 2010, CS Energy advised DERM that the ash dam water level was 213.36 m and therefore had exceeded the MRL. Further advice was provided to DERM on 30 December 2010 that the ash dam water level had risen to 214.35 m following 262 mm of rain recorded between 22 December and 29 December 2010.

Total rainfall at Callide Power Station for December 2010 was 441 mm, the highest recorded rainfall in the area for the December period since 1973. As a result, water levels in the ash dam rose by 1.27 m during December 2010.

A further 123 mm of rain was recorded at the power station in the period 1 January 2011 to 6 January 2011. The water level reading of the ash dam on 3 January 2011 showed that the Spill Warning Level of 214.45 m had been exceeded, with the level at 214.55 m, due to a storm the previous afternoon. Since 1 January 2011, the water level of the ash dam has increased by 350 mm. The ash dam water level is now 130 mm below the spillway. A further 43 mm rainfall is likely to result in the ash dam spilling.

../2

CS Energy is assessing a range of water level management options, including the controlled release of water from the Callide Ash Dam. A controlled release would reduce the likelihood of an uncontrolled spill in the event of further heavy rain. CS Energy is working with DERM and Sunwater to ensure that should a controlled release be necessary, it would meet drinking, stock and irrigation water quality requirements.

Following a site meeting conducted with DERM and SunWater on 5 January 2011 to discuss options for managing the high water level risk, a Voluntary Transitional Environmental Program to manage controlled releases is being developed.

In the meantime, however, it is considered that while the ash dam water level is presently below the spillway, ongoing rainfall events mean that the risk of an uncontrolled release before the Transitional Environmental Program is approved is considered very high.

CS Energy is monitoring water levels on a daily basis, and conducting a detailed analysis of the risk and potential impact of the ash dam reaching or exceeding the spillway level if further significant rainfall is received. Actions being undertaken by CS Energy include the collection of water samples and assessment of water levels and flows in the surrounding area, including Callide Creek.

As part of the Ash Dam Management Plan required by Condition 2(E4) of the relevant development approval (CG0039), the Spill Management Plan and Corrective Action Plan have been implemented. CS Energy is providing regular briefs to DERM, the Banana Shire Council and SunWater, regarding the dam status. As required under the Spill Management Plan, communications with neighbouring property owners within 6 kilometres downstream of the dam and 200 metres laterally from Callide Creek commenced yesterday regarding the water levels.

In the event of an uncontrolled release, CS Energy will:

- monitor water levels and flows of the ash dam and in the surrounding area;
- collect water samples from the ash dam and in the surrounding area;
- provide advice of the uncontrolled release to DERM, the Banana Shire Council, SunWater and landowners in the vicinity of the dam, and continue to keep those entities/individuals up-to-date with developments.

CS Energy has a strong commitment to the effective management of the ash dam water levels. A series of plant improvements have been undertaken that significantly reduce the process water inflows into the ash dam on an ongoing basis. Additional irrigation and evaporative sprays are also being installed to increase site water disposal capacity. Additional measures such as alternative evaporator technology and further in-plant modifications are under investigation for technical feasibility and risk assessment.

Consistent with maintaining open communication with DERM, we wish to advise DERM of the risk of an imminent uncontrolled release from the Callide Power Station Ash Dam B. Should an uncontrolled release occur, this event is not expected to cause environmental harm.

This letter is intended to constitute a notice under Section 320 of the Environmental Protection Act 1994 (Qld) and will be referred to in the relevant annual return.

Should you have any queries in relation to this matter, please do not hesitate to contact me directly or [redacted]

Yours sincerely

[redacted]
SITE MANAGER CALLIDE POWER STATION

Enquiries: [redacted]
Environmental Coordinator
Telephone
Mobile

[redacted]

From: [redacted]
Sent: Saturday, 8 January 2011 11:03 PM
To: [redacted]
Cc:
Subject: FW: Raw Water 16/11/2010

G'day [redacted]

See below fyi.

Cheers ... [redacted]

[redacted]

Incident Hotline - 1300 130 372

-----[redacted]
From: [redacted]
Sen[redacted] 8 January 2011 7:38 PM
To: [redacted]
Subject: FW: Raw Water 16/11/2010

[redacted]

Sorry for the delay. Below is the latest raw water sample results that I can get with some trace element results

Please let me know if you need more and I will see what I can chase up in the morning

Regards

[redacted]

Callide Site Manager
CS Energy

PI [redacted]

PO Box 392
BILOELA QLD 4715

-----Original Message-----
From: [redacted]
Sent: Saturday, 8 January 2011 7:02 PM
To: [redacted]
Cc:
Subject: Fw: Raw Water 16/11/2010

Hello [redacted]

Attached is the latest Callide Dam water quality info we had (nov 2010) - this is site analysis data obviously very diluted from this level now with current conductivity about 130.

[redacted] may be able t access any additional info.

Regards

[redacted]

------Original Message------
From: Gloria DROCHMANN

To: [redacted]
Subject: Raw Water 16/11/2010
Sent: Jan 6, 2011 11:50 AM

[redacted]

Raw Water	16/11/2010	1002456
pH VALUE	7.7	
CONDUCTIVITY @ 25 C	345	uS/cm
TOTAL DISSOLVED SOLIDS (TDS)	210	mg/L
CALCIUM	25	mg/L
MAGNESIUM	9	mg/L
SODIUM	23	mg/L
POTASSIUM	4	mg/L
ALKALINITY AS $CaCO_3$	104	mg/L
CHLORIDE	25	mg/L
SULPHATE	7	mg/L
SILICA	19.2	mg/L
IRON	<0.05	mg/L
ALUMINIUM	<0.01	mg/L
BARIUM	0.024	mg/L
MANGANESE	0.533	mg/L
STRONTIUM	0.164	mg/L
FLUORIDE	0.1	mg/L

Some Raw Water results from the 16th November. Limited trace metals as it was sent away with water treatment samples.
I will send th[redacted]ivity readings form yesterday and today as I tabulate them. [redacted] energy - Callide Power Station
Ph: [redacted]
Fax: [redacted]
e-mai[redacted]

[redacted]

From: [redacted]
Sent: Monday, 10 January 2011 8:58 AM
To: [redacted]
Cc:
Subject: RE: Callide Ash Dam

[redacted]

No discharge at this point in time. Getting close to the stage where any wave action from wind will be a concern. Look forward to hearing from you as soon as possible.
Thanks for all your help so far

[redacted]

[redacted]

Callide Site Manager
CS Energy

Pl [redacted]

PO Box 392
BILOELA QLD 4715

From: [redacted]
Sent: [redacted]8:55 AM
To: [redacted]
Cc:
Subject: RE: Callide Ash Dam

G'day [redacted]

Thanks, I assume this means CS Energy are not discharging at this point awaiting the TEP. Will hopefully get back to you today re dilution rates which I believe will be the key consideration.

Cheers ..... [redacted]

[redacted]

Incident Hotline - 1300 130 372

From: [redacted]
Sent: Monday, 10 January 2011 7:50 AM
To: [redacted]
Subject: [redacted]

[redacted]

Good morning
The ash dam level this morning is at 214.91mRL leaving us 40mm of free board
Rainfall on Sat and Sun has been minimal,
Sunwater commenced flood release from Callide Dam at approximately mid day Sat 8th. I was advised Sat that they expected to release at a rate of ~2,000ML/d. Do not yet have an update on actuals.
We have been sampling the Callide Dam release at some of causeways and will have some preliminary results later in the day.
Best regards

[redacted]

Callide Site Manager
CS Energy

Pl [redacted]

PO Box 392
BILOELA QLD 4715

****
This email and any files transmitted with it are confidential and may be privi
****

[redacted]

From: [redacted]
Sent: Monday, 10 January 2011 10:45 AM
To: [redacted]
Cc:
Subject: FW: Water Quality
Attachments: WATER RELEASE CALCULATOR Ash Dam B 2009 to2010 _Dec 2010.xls

G'day [redacted]

I think the attached table also holds some data on water quality in Callide Dam. You may need to forward this to [redacted] group.

Thanks ..... [redacted]

[redacted]

Incident Hotline - 1300 130 372

From: [redacted]
Sent: Friday, 7 January 2011 1:02 PM
To: [redacted]
Subject: Water Quality

[redacted]

As discussed please find attached our working sheet on quality estimates. Note the 1 in 10 ratio we have been working toward is aimed at bringing salinity below drinking water standards.

The latest trace element analysis that I have is from August as discussed

My concern with rain today and what is on the radar as we were talking is that we will be at risk of a spill later tonight.

Regards

[redacted]

Callide Site Manager
CS Energy

Pl [redacted]

PO Box 392
BILOELA QLD 4715

Ash Dam B Water Calculation Jan 2011

C:\Documents and Settings\thompsli\Local Settings\Temporary Internet Files\OLK3DB\[WATER RELEASE CALCULATOR Ash Dam B 2009 to2010 _Dec 2010.xls]Sheet1

		18/08/2010 - FULL ALS ANALYSIS	CALLIDE DAM WATER 31/12/2010	Historical CALLIDE DAM WATER 1995 - 1998	ASH DAM WATER QUALITY CALC SPILL FROM 18/8/2010 DATA	10 % DILUTION OF ASH DAM WATER WITH CALLIDE DAM WATER - ash dam contribution only	10 % DILUTION OF ASH DAM WATER WITH CALLIDE DAM WATER - combined contribution	DRINKING WATER PUBLIC HEALTH REGULATION 2005 SCH 3	Australian Drinking water Guideline	STOCK WATER	IRRIGATION WATER
					Dam Overflow						
RL	m	212.64			214.95						
Volume	ML	3,082	94%		5,394						
VOLUME DILUTION FACTOR					0.571						
ANALYSIS DILUTION FACTOR											
pH VALUE		8.07	7.36	7.3 - 8.49					6.5 - 8.5		
CONDUCTIVITY @ 25 C	us/cm	9120	131	400	5,211	521	639				
TOTAL DISSOLVED SOLIDS (TDS)	mg/L	7480	84	256	4,274	427	503		500 - 1000 acceptable		
SUSPENDED SOLIDS	mg/L	6	360			0					
CALCIUM	mg/L	592	9.2	27	338	34	42		200 Aesthetic		
MAGNESIUM	mg/L	442	1.2	13	253	25	26				
SODIUM	mg/L	1270		35	726	73			180 Aesthetic		
POTASSIUM	mg/L	31		3.7	17.7	1.8					
HYDROXIDE ALK CACO3		<1									
CARBONATE ALKALINITY		<1									
BICARBONATE ALKALINITY		82			46.9	4.7					
TOTAL ALKALINITY AS CaCO3	mg/L	82		125	46.9	4.7					
CHLORIDE PPM	mg/L	2590	13.6	48	1,480	148	160		250 aesthetic		
SULPHATE	mg/L	2430	21.5	16	1,389	139	158	500	500 - 250 Aesthetic	1000	
SILICA	mg/L	0.7		10	0.400	0.040					
BORON	mg/L	3.44			1.966	0.197		4	4	5	0.5
IRON	mg/L				0.000	0.000			0.3 Aesthetic		
ALUMINIUM	mg/L	0.14			0.080	0.008		0.2	0.2 Aesthetic		
ARSENIC	mg/L	0.004			0.002	0.000		0.007	0.007	0.5	2
BARIUM	mg/L	0.107			0.061	0.006		0.7	0.7		
COBALT	mg/L	<.001									
CHROMIUM	mg/L	0.001			0.001	0.000		0.05	0.05		
COPPER	mg/L	0.003			0.002	0.000		2	2 - 1 Aesthetic		
LITHIUM	mg/L	0.489			0.279	0.028					
LEAD	mg/L	<.001						0.01	0.01		
MOLYBDENUM	mg/L	0.284			0.162	0.016		0.05	0.05	0.15	0.05
SELENIUM	mg/L	0.01			0.006	0.001		0.01	0.01		
STRONTIUM	mg/L	7.62			4.354	0.435					
VANADIUM	mg/L	0.01			0.006	0.001		0.05	0.01	0.1	0.5
ZINC	mg/L	<.005						3	3 Aesthetic		
MERCURY	mg/L	<.00001			<.00001			0.001	0.001		
FLUORIDE	mg/L	2.3			1.314	0.131		1.5	1.5		
TOTAL PHOSPHORUS	mg/L	0.06			0.034	0.003					
MANGANESE	mg/L	0.018			0.010	0.001		0.5	0.5		
CADMIUM	mg/L				0.000	0.000		0.002	0.002		
NICKEL	mg/L				0.000	0.000		0.02	0.02		
NITRATE	mg/L				0.000	0.000			50		
NITRITE	mg/L				0.000	0.000		50			
SILVER	mg/L				0.000	0.000			0.1		
URANIUM					0.000	0.000		0.02	0.02		
ANTIMONY						0.000			0.003		
						0.000					

[redacted]

From: [redacted]
Sent: Monday, 10 January 2011 5:33 PM
To: [redacted]
Subject: FW: Callide Ash Dam vTEP
Attachments: Dam inspection 09012011 005.jpg; Current Callide Creek Flows

FYI , not sure I forwarded this your way although you may have seen my response ..... [redacted]

[redacted]

Incident Hotline - 1300 130 372

From: [redacted]
Sent: [redacted]
To: [redacted]
Subject: [redacted]e Ash Dam vTEP

[redacted]

Just thinking after our recent phone call.
At the moment there are very high flows in the Callide Creek with the current dam release. Equally with what I have available at the moment the most I can release from the ash dam is about 20 to 30ML/d. If Sunwater are releasing 1,000ML/d then this is a dilution of ~3%. Sunwater advise flows of around 1,200ML/d increasing to around 1,760ML/d based on rain in the upper catchment area yesterday. Latest email from Sunwater attached.
Very approximately this equates to 18 to 27mm of level in the ash dam. At 40mm freeboard I am keen to gain any space I can to prevent a spill.

Is there a partial approval we can start with at that these flows for a day or two while we work through finalising the vTEP.

My guys are completing our detailed sampling and monitoring program and I would be happy fo[redacted] to be in Gladstone first thing in the morning to take [redacted] through it.
If it is beneficial I can have [redacted] our Brisbane based Manager Chemistry & Environment meet your people in Brisbane to help answer any queries that they may be trying to resolve.

Let me know if there is anything else that I can do that will help.

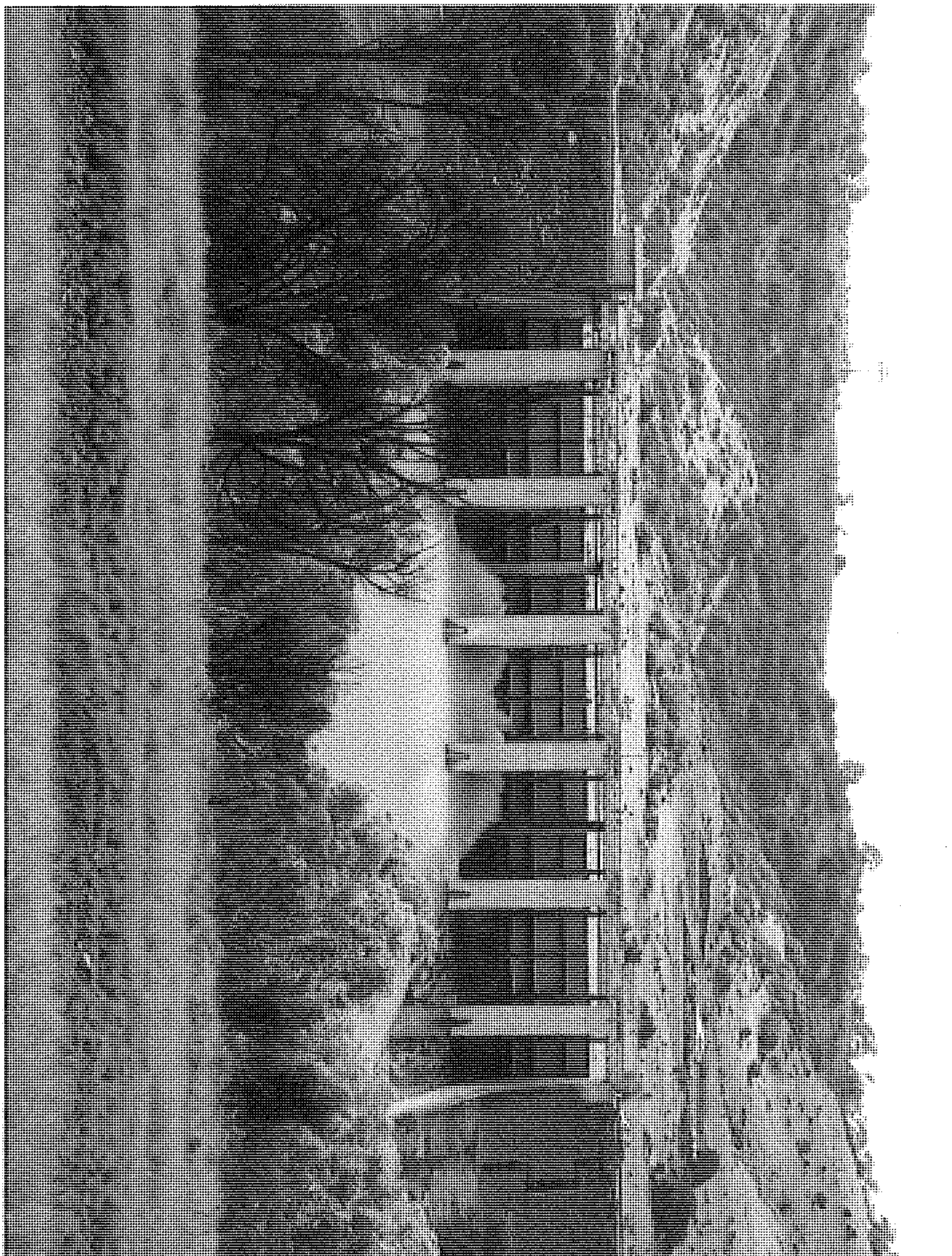
Best regards

[redacted]

Callide Site Manager
CS Energy

P[redacted]

PO Box 392
BILOELA QLD 4715



[redacted]

From: [redacted]
Sent: Monday, 10 January 2011 3:06 PM
To: [redacted]
Cc: [redacted]
Subject: Current Callide Creek Flows

[redacted]

Flow data for today, as at midday.

Inflow to Callide Dam was approx 2100 ML/day and slowly decreasing.

Spillway discharge as recorded at the downstream g/s was 1760 ML/day at the same time.

I would expect the inflow to hold at greater than 1000 ML/day for at least another day maybe two. Discharge will change accordingly as the gates balance the dam level.

When required discharge rate drops below 400 ML/day we will be able to release via the outlet works.

Regards

[redacted]
Service Manager
SunWater Ltd
Address: PO Box 251, Biloela 4715
Phone : [redacted]
Fax :
Mobile
Email :

[redacted]

From: [redacted]
Sent: Monday, 20 December 2010 5:16 PM
To: [redacted]
Cc:
Subject: FW: Callide Ash Dam B notification
Attachments: SKMBT_C45010122008430.pdf

G'day [redacted]

See attached a report from CS Energy re Callide Ash Dam B which is approaching a point where they may potentially reach the mandatory reporting level for freeboard allowance. You will note a number of con[redacted]ons planned in an attempt to reduce the level. At the moment I'm A/Regional Manager an[redacted]s the A/Manager in Gladstone, so any comment please forward t[redacted]

With regard to Qld Nitrates I've received some data on water quality etc and hope to forward your way in the next day or two. Might try and ring you before the weeks out to discuss.

I'll also attempt to send you some photos of QAL's RMD 2 inspection that was done over a month ago. Unfortunately they're in Gladstone and I'm in Mackay just at the moment but will have to you before the weeks out.

Cheers ..... [redacted]

[redacted]

Incident Hotline - 1300 130 372

From: [redacted]
Sent: Monday, 20 December 2010 2:55 PM
To: [redacted]
Subject: Callide Ash Dam B notification

FYI

Cheers

[redacted]

Environmental Officer, Regional Services
Telep[redacted]
Email[redacted]
www.derm.qld.gov.au

Department of Environment and Resource Management
136 Goondoon Street, Gladstone
PO Box 5065, Gladstone QLD 4680

*Nominations for the 2011 Premier's ClimateSmart Sustainability Awards, which recognise Queenslanders who are ClimateSmart champions achieving excellence in sustainability, are open until **Friday 4 March 2011**. For more information on how to enter visit www.derm.qld.gov.au/premiersawards*

From: [redacted]
Sen[redacted] PM
To: [redacted]
Sub[redacted]

[redacted]

Please find attached the formal letter discussed.
Regards

[redacted]

Callide Site Manager
CS Energy

Pl [redacted]

PO Box 392
BILOELA QLD 4715

****

****

****
This email and any files transmitted with it are confidential and may be privi
****

[redacted]

From: [redacted]
Sent: Friday, 7 January 2011 3:55 PM
To: [redacted]
Subject: FW: Callide Ash Dam
Importance: High
Attachments: SKMBT_C25211010709190.pdf; Attachment B CS Energy BN.ppt; CS Energy CTS08914-10 signed.pdf

G'day [redacted]

See [redacted] comments below based on my earlier comments.

Cheers [redacted]

[redacted]

Incident Hotline - 1300 130 372

From: [redacted]
Sent: [redacted]2 PM
To: [redacted]
Cc:
Subject: FW: Callide Ash Dam
Importance: High

Hi

I have spoken with SunWater re CS energy

They have offered to release water owned by CS energy , currently they have a credit balance in Callide Dam of approx 2500ML at end of December. The balance is done monthly. To use this water would need some changes to formulas determining how this volume is arrived at. However should not be a big issue. this is stored water form Awoonga pipeline normally carried over to cover pipe breakdowns etc. Volume pumped in December was approx 1100 ML.

At this stage any Awoonga dam credits do not disappear on a dam spill as happens in many other storages.

Sunwater have not offered to make any other releases. Given the IROL operating conditions would be difficult for them to do so.

Given where we went with Ensham not sure the Minister can direct Sunwater as the operator to release water committed to other users. May even be a doubt about powers.
He has recently directed SunWater to use some unallocated water they hold to be used for a specific purpose (in Burnett system as result of deflation of weir bags on all SunWater dams). In Callide case very little unallocated water.

Sunwater advise they expect that dam will overflow in next 24 to 48 hours very overcast at present.

Any releases will be designed to hold dam at 100% capacity so releases will depend on inflow.

The best recharge area is the area immediately downstream so any discharge from CS energy would enter the underground unless there was a large flow in Callide Creek.

Don't believe the 68% previous capacity is correct. Paper talk similar to the one that the dam had overflowed.

Water may be able to be released for groundwater recharge but normally in such volumes that any releases including ash dam discharge would end up in the underground system.

Unless there are substantial flows any ash dam discharge will not flow through the system

Not sure where the 200ml/d is flowing but would suggest it is downstream and may not benefit the ash dam discharge dilution

The prime purpose of the dam is groundwater recharge and landholders will react adversely if they were not receiving benefits in accordance with IROL while at the same time draft WRP is seeking to reduce individual allocations to much lower levels.

please contact [redacted] or myself if you require further clarification in relation to the operation of Callide dam.

[redacted]
A Regional Manager
Water Services
Central West Region
Department of Environment and Resource Management
Telephone [redacted]
Mobile [redacted]
Email [redacted]
www.nrw.qld.gov.au

From: [redacted]
Sent: [redacted]ary 2011 1:59 PM
To: [redacted]
Cc:
Subject: FW: Callide Ash Dam
Importance: High

G'day [redacted]

See attached a report from CS Energy updating on the status of their regulated Ash Dam B. Since this report I have spoken with the [redacted] Manager CS Energy who advised that the dam can take

approximately 44mm before it will run the spillway. The status report also provides some water quality data. In terms of water quality the issues relate to
Salinity moderate (6000EC)
Sodium moderate to high (7 x drinking water guidelines)
Boron moderate (7 x irrigation water guidelines)
Chloride high (10 x DWG)
Sulphates high (10 x DWG)
Arsenic moderate (2 x DWG)
Molybdenum moderate (5 x DWG)
Fluoride (1.5 x DWG)

- Were the discharge to be diluted with a flow from Callide Dam (subject to the level of flow) it is certainly possible to get adequate dilution to minimise the risk of environmental harm..
- CS Energy are in the process of submitting a TEP something I discussed with them b/w Xmas and New Year but yet to produce.
- Callide dam at current inflow is likely to discharge within 48 hrs via the spillway the first time in history, highest prior level was 68%.
- Sunwater manage Callide Dam, I assume Minister Robertson is a Shareholding Minister. The Minister is also a shareholding Minister in CS Energy. I assume he could direct Sunwater to discharge?
- CS Energy has had discussion with Sunwater and is hopeful that they will consider a possible release commencing today in the order of 300ML/day.
- The water in Callide dam supplies CS Energy, Biloela Township and recharges the Callide alluvium which also supplies Biloela with water and downstream landholders with irrigation and stock and domestic water.
- It would be advantages to management of the Callide alluvium if Sunwater commenced releasing water from the dam to assist in recharging the aquifer prior to any discharge from CS Energy.
- release
- Should CS Energy release prior to a release from Callide Dam there could be significant public criticism of groundwater contamination.
- Given the rain we are getting at the moment it is possible that Ash Dam B will discharge today or in the very near future.
- I am advised that Callide Ck is running approx 200 ML/day, if it did discharge there would be some existing dilution but possibly not adequate.

Also find attached a previous briefing note which gives an overview of seepage issues. And some associated info. I'm looking to get a briefing note developed today and will forward through shortly.

Cheers ..[redacted]

[redacted]
Incident Hotline - 1300 130 372

From: [redacted]
Sent: [redacted] 11:31 AM
To [redacted]
Subject: FW: Callide Ash Dam
Importance: High

Update on Ash Dam.

[redacted]

Environmental Officer, Regional Services
Teleph[redacted]
Email [redacted]
www.derm.qld.gov.au

Department of Environment and Resource Management
136 Goondoon Street, Gladstone
PO Box 5065, Gladstone QLD 4680

*Nominations for the 2011 Premier's ClimateSmart Sustainability Awards, which recognise Queenslanders who are ClimateSmart champions achieving excellence in sustainability, are open until **Friday 4 March 2011**. For more information on how to enter visit www.derm.qld.gov.au/premiersawards*

From: [redacted]
Sent: [redacted]ry 2011 9:25 AM
To: [redacted]
Subject: Callide Ash Dam

[redacted]
Please find attached a letter confirming our various updates and conversations earlier in the week.

Latest data is that Ash Dam level is now 214.82mRL leaving head room of 133mm or approximately the equivalent of 44mm of additional rain. January MTD the site has experienced a further 131mm of rain over the large December totals.

We are finalising the VTEP which I hope to have through to you efter lunch today.

My concern is that we will be into a spill situation before we have a chance for the TEP to be approved. I will have in place by late today two syphons capable we believe of 30ML/d discharge. Sunwater have advised that they expect Callide Dam to spill in the next 48hrs.

Is there any quick way that I can get approval to discharge into that spill should it occur over the weekend? I am assuming that it would need to take the form of an Emergency Direction.

Thank you for your assistance so far

[redacted]
Callide Site Manager
CS Energy

PI [redacted]

PO Box 392
BILOELA QLD 4715

****

****

Callide Power Station
CS Energy Ltd ABN 54 078 848 745
PO Box 392 Biloela Qld 4715
T 07 4992 9329
F 07 4992 9328
W www.csenergy.com.au

cs energy
generations ahead

7 January, 2011

[redacted]

Department of Environment and Resource Management
Gladstone QLD 4680
Via Email: [redacted]

Dea[redacted]

RE: CALLIDE ASH DAM B

Background

I am writing to update you on the current status of the Callide Ash Dam B as of 6 January 2011.

In summary our previous correspondence covered:

- Correspondence to DERM on20 December notifying the exceedence of the Level 1 trigger in the "Callide Power Station Ash dam – Corrective Action Plan" – MRL 213.33m.
- Correspondence to DERM on 22 December 2010 providing additional requested information as well of the increase in Ash dam water level to 213.36 m. A total of 1701 ML storage volume was available from the 213.36 level up to the spillway level, which equated to an estimated rainfall event of 540mm.
- Correspondence to DERM on 30th December 2010 noting that the ash dam water level had risen to 214.35m, a rise of 990 mm. This followed 262.5 mm of rain between the 22nd December and the 29th December – the most significant rain event was 127 mm of rain overnight from the 27th to the 28th December. The freeboard level was 690 ML equivalent to a 215mm rain event. During the period 22nd December to 29th December the water level in the Callida Dam (operated by Sunwater) also rose from approximately 30% to 88% of full supply capacity.

Based on the trigger levels in the "Callide Power Station Callide Ash Dam B Emergency Action Plan", special Dam Safety Inspections were carried out by Sunwater on 29 December (historical highest water level) and again on 5 January (water level increased by more than 0.25 m in a week). No dam safety issues have been identified.

As per discussion and presentation at the Callide site meeting with DERM and Sunwater on 5 January, it was noted that the water level had risen to 214.66 m on 4 January due to a 46.5 mm rain event. This level exceeded the Spill Warning Level of 214.45 m and as such represented a Level 3 Exceedence as per the Corrective Action Plan. Applicable Level 3 actions were initiated at the Spill Warning Level including the meeting discussion regarding a controlled release from Ash Dam B in conjunction with a release of water from Callide Dam. CS Energy is currently preparing an urgent TEP for the controlled release proposal. Local stakeholders Sunwater, The Banana Regional Council and local landholders are being briefed on the Ash dam water level status and CS Energy planned actions.

As of 6 January, due to a 41.5 mm overnight rain event, the Ash dam water level has risen to 214.77 m – representing a remaining freeboard of 180 mm to the spillway level of 214.95 m and equivalent to freeboard volume of 210 ML and a rain event of some 60mm to result in spilling of the dam. Thus spilling of the Ash Dam is imminent – management actions would be as per the "Callide Power Station Ash Dam B Spill Management Plan" and the Corrective Action Plan, noting the urgent TEP also being prepared for DERM approval. The level of 214.77 m represents a Level 4 Exceedence under the Corrective Action Plan.

CS Energy has continued to monitor appropriate water samples – the Ash Dam B water analysis for 6 January is noted below:

Measurement	Result
pH	8.18
Conductivity	6440 µS/cm
Total Dissolved Solids	4122 mg/Litre
Sulphate	1425 mg/Litre
Chloride	1436 mg/Litre

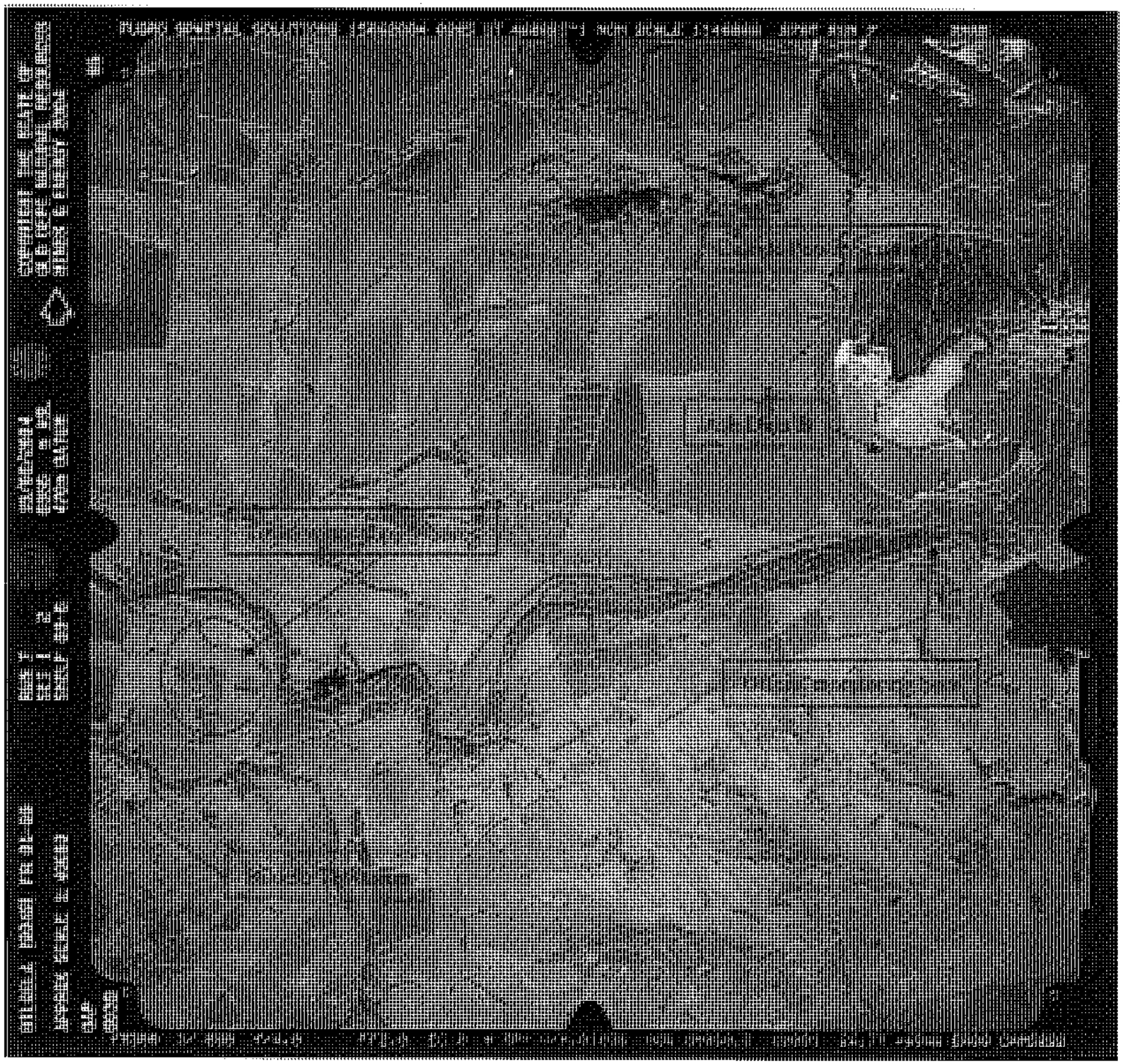
If you require any additional information, please do not hesitate to contact me.

Yours faithfully,

[redacted]

Site Manager - Callide

Attachment B: Aerial Photo of Callide Power Station and Ash Dam



CTS No. 08914/10

Department of Environment and Resource Management
JOINT MINISTERIAL BRIEFING NOTE

TO: **Minister for Natural Resources, Mines and Energy and Minister for Trade**
AND: **Minister for Climate Change and Sustainability**

RECEIVED
MINISTERIAL OFFICE
3 JUN 2010

☐ MINISTER
☐ POL ADV
☐ MEDIA ADV
☐ PARL SEC
☐ ADMIN
☐ ....

SUBJECT: **CS Energy - Callide Power Station, Ash Dam Groundwater Contamination**

TIMEFRAME
- Non–urgent.

RECOMMENDATION
- It is recommended that the Ministers **note** the action being taken by the Department of Environment and Resource Management (the department) to address probable groundwater contamination as a result of seepage from Ash Dam B at the Callide Power Station, east of Biloela operated by CS Energy Ltd (CS Energy).

BACKGROUND
- CS Energy is a Queensland Government owned corporation that operates the Callide Power Station, located approximately 10 kilometres east of the Biloela township in Central Queensland (see Attachment A).
- Power generation is an Environmentally Relevant Activity (ERA) under the *Environmental Protection Act 1994* (EP Act) for which a development permit is required. Waste ash and waste water produced as a result of power generation comprise a range of contaminants that have the potential to cause environmental harm if not properly contained.
- CS Energy holds a Development Approval (number CG0039), issued by the department to authorise the ongoing operation of the power station and associated infrastructure. This approval also authorises the storage of contaminants on site in a number of Waste Containment Facilities (dams), located to the west of the power station.
- As a condition of the original approval and ongoing management of the site, CS Energy was required to prepare, implement and periodically update an ash management plan to address seepage and other hydrogeological issues associated with contaminant storage in the dams.
- Monitoring of groundwater and surface water on site and surrounding the dams is required under its development approval and associated ash management plan.
- In 2005 and 2007, in response to increasing contaminant levels in both groundwater and surface waters, CS Energy in consultation with the department reviewed and amended its ash management plan and associated documents.
- The review outcome was to establish a retention and recovery system designed to intercept contaminated water and return it to the dams. The system was constructed between 2006 and 2008.
- There are a number of groundwater and surface water users downstream of the power station in Callide Creek and associated Callide Creek alluvium. The alluvium is an extensive groundwater aquifer and is continuous over the length of the creek and its associated tributaries.

Rec'd - ODG
25 MAY 2010

- The Biloela town water supply bore field is located in the Callide Creek alluvium approximately 15 kilometres to the west of the power station and supplies potable water to the town. At this stage, there is no data to indicate that it is being impacted or will be impacted by any contaminants associated with the power station.

CURRENT ISSUES
- In accordance with section 320 of the EP Act, CS Energy notified the department on 20 April 2010, that receiving environment monitoring bores located in Callide Creek alluvium and surface water

Author Name: [redacted] Position: Operations Manager Environmental Services Gladstone Tel No: [redacted] Date: 14/05/2010	Cleared by Name: [redacted] Position: Regional Services Director, Central West Region Ph: [redacted]	Cleared by Name: Damien Brown Position: Assistant Director-General, Regional Service Delivery PH: [redacted] Rec'd 20/05/10 21/5/10
	Name: Terry Wall Position: Associate Director General Ph: [redacted] 21.5.10	Name: John Bradley Position: Director General Ph: [redacted]

(Callide Creek) were detecting elevated contaminant levels presenting an increasing risk of environmental harm.

- A number of monitoring bores on site and surface water points, both on and off site, identified concentrations of ash waste water specific trace elements such as boron, molybdenum, lithium, fluoride and sulphate a known ash waste water specific anion.
- CS Energy has indicated in its correspondence to the department dated 15 April 2010 (see Attachment B) that elevated sulphate levels in groundwater may be due the severe drought being experienced in the area and subsequent concentration of contaminants as a result of declining water levels.
- The current development approval states a limit of 1000 milligrams per litre (mg/L) for sulphate, which is in line with the ANZECC Stock Water Quality Guidelines
- The Australian Drinking Water Guidelines lists a health and wellbeing limit for sulphate in drinking water of 500mg/L
- Monitoring data for January 2010 shows a sulphate concentration of 1210mg/L in one groundwater monitoring bore located in the Callide Creek Alluvium, downstream of the Ash Dam.
- Concentrations of trace elements remain below licence limits; however data trends show increasing concentrations, indicating contamination from ash waste water is happening beyond the retention and recovery system.
- The area downstream of the waste containment facility was periodically used for cattle grazing with cattle using surface water, in waterholes, for drinking. Cattle have been removed from this area.

RESOURCE/IMPLEMENTATION IMPLICATIONS

- There are no resource/implementation implications.

PROPOSED ACTION

- The department proposes to meet with CS Energy on 21 May 2010 where possible mitigation and remediation measures will be discussed.
- The department is considering issuing CS Energy with an Environmental Evaluation notice, under section 324 of the EP Act. This decision will be made after the meeting on 21 May 2010.

OTHER INFORMATION

- *Consultation:*
  - CS Energy briefed the department on 22 April 2010.
  - The Manager, Project Support, Technical Operations Branch (the department's hazardous dam technical advisor) has been consulted and will be present at the scheduled meeting on 21 May 2010.
  - CS Energy has been actively engaging with potentially affected stakeholders to keep them informed as to the situation.

ATTACHMENTS

- Attachment A: Aerial Photograph
- Attachment B: Correspondence from CS Energy Ltd dated 15 April 2010

Author Name: [redacted] Position: Operations Manager Environmental Services Gladstone Tel No: [redacted] Date: 14/05/2010	Cleared by Name [redacted] Position: Regional Services Director, Central West Region Ph: [redacted]	Cleared by Name: Damien Brown Position: Assistant Director-General, Regional Service Delivery PH [redacted] *Rec'd 20/05/10*
	Name: Terry Wall Position: Associate Director General Ph [redacted]	Name: John Bradley Po[redacted]tor General Ph [redacted]

[redacted]

[redacted] [redacted]

[redacted]

Comments:	
[redacted] / /	[redacted]... / /
Minister for Climate Change and Sustainability	**Principal Policy Advisor**

Min — Update plan for Minister on DG mtg.

Sent through in view of urgency — but we will get you an immediate update on outcome of discussions & enforcement action consideration with CSR.

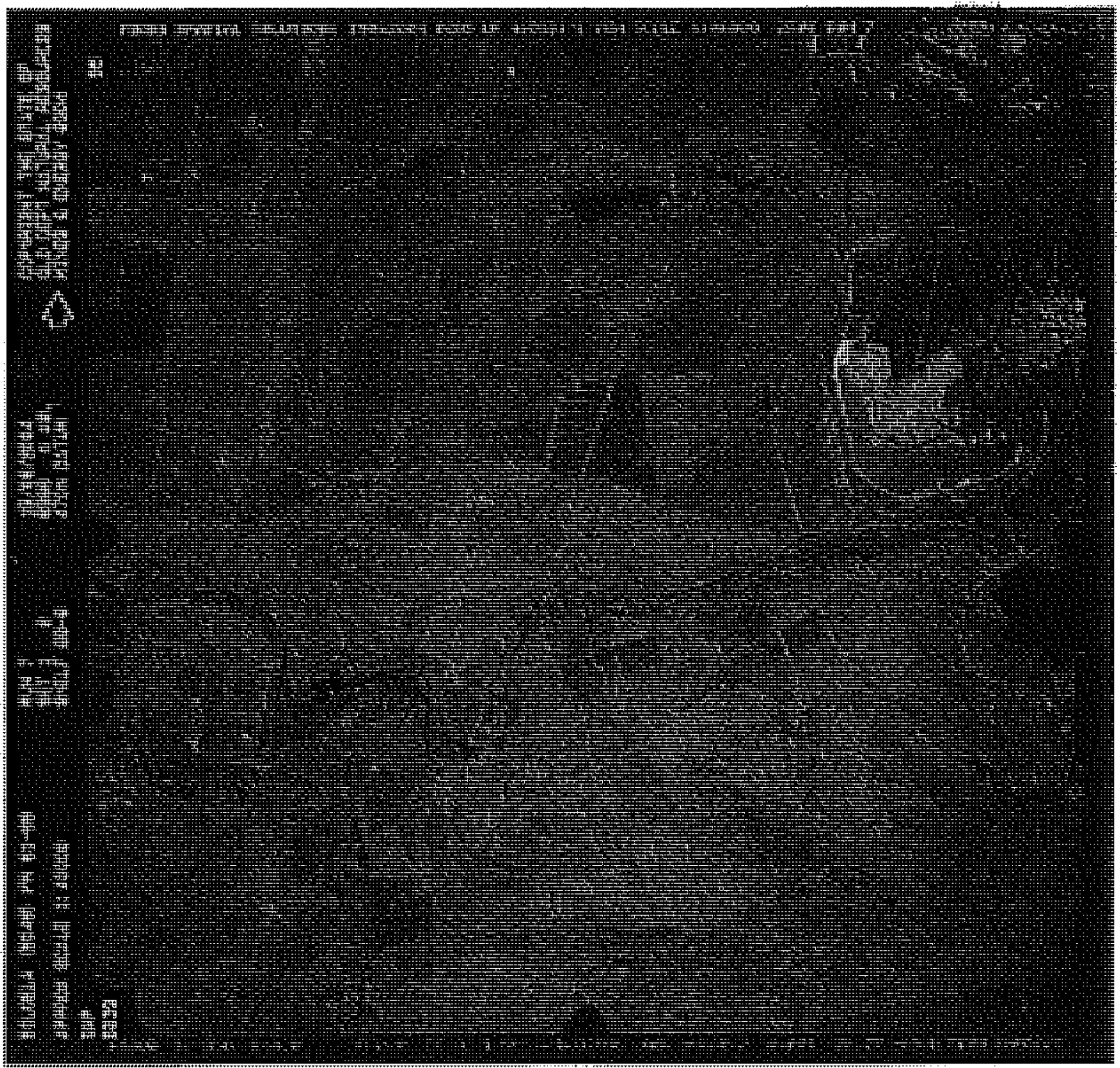
Please keep me informed of progress

[redacted]

Author	Cleared by	Cleared by
Name: Chris Loveday Position: Operations Manager Environmental Services Gladstone Tel No [redacted] Date: 14/05/2010	Name: [redacted] Position: Regional Services Director, Central West Region Ph: [redacted]	Name: Damien Brown Position: Assistant Director-General, Regional Service Delivery PH [redacted] *Rec'd 20/05/10*
	Name: Terry Wall Position: Associate Director General Ph: [redacted]	Name: John Bradley Position: Director General Ph [redacted]

File Ref:

Attachment A – Aerial Photo of Callide Power Station and Ash Dam



CS Energy Ltd ABN 54 078 848 745
Level 21 Central Plaza 2
66 Eagle St Brisbane Qld 4000
GPO Box 769 Brisbane Qld 4001
T 07 3222 9333
F 07 3222 9300
W www.csenergy.com.au

cs energy
generations ahead

Ref: 396/12/6

15 April 2010

Mr Christopher Loveday
A/Operations Manager, Environmental Services
Department of Environment and Resource Management
PO Box 5065
GLADSTONE QLD 4680

Dear Mr Loveday

CS ENERGY – CALLIDE POWER STATION ASH DAM B
GROUNDWATER MONITORING
ENVIRONMENTAL PROTECTION ACT – SECTION 320 NOTICE

CS Energy has been in regular contact with the EPA and now DERM in relation to the Ash Management Plan (AMP) (originally prepared and submitted to the EPA by 1 December 2005 in accordance with Integrated Authority Number CG0039 (30 July 2004) and revised and provided to the EPA on 27 February 2009).

Section 8.5 of the original AMP addressed seepage and hydrogeological issues, noting that seepage from the Waste Containment Facility (WCF) has been observed in the Eastern and Western Seepage Collection Ponds (ESCP, WSCP), the Western Diversion Channel, the toe drain of the Ash Dam B (ADB) western embankment and in the seepage collection channel and small gully downstream of the ADB southern embankment. The AMP noted that the significance of the seepage was being assessed. The revised AMP addresses seepage and hydrogeological issues at Section 10.4. It notes that the most recent assessment of the data from the monitoring program has indicated that some seepage from the WCF is migrating down gradient of the site.

Over this period of 2006-2008, CS Energy has installed a number of seepage retention and recovery systems, including: basal sumps and pump-out systems constructed in the ESCP and WSCP; groundwater recovery bores and a seepage collection system constructed between the ESCP and the Biloela-Callide Road; and a shallow seepage collection and pump-back scheme installed at a seepage area between the southern wall of ADB and the Biloela-Callide Road.

Ongoing monitoring of an extensive network of underground monitoring bores around the WCF has been undertaken in accordance with the site Receiving Environment Monitoring Program (REMP). The most recent REMP data were recently received and are attached as SigmaMsc Report No 10/010. Note that Section 6.4 of the report provides a basic assessment of trend analysis of the results without any consideration of sampling locations and site hydrogeology. To provide a more meaningful interpretation of the data, CS Energy commissioned Environmental Management Strategies to prepare the attached summary assessment of the SigmaMsc results. Both reports are enclosed and form part of this notice..

../2

The results of the most recent samples taken in January 2010 have shown sulphate levels exceeding the ANZECC stock watering guideline value (1000 mg/L) in the shallow bore (MW34S – 1210 mg/L, January 2010) installed by CS Energy in the Callide Creek alluvium, just upstream of the causeway on the Callide Creek road crossing to Callide Dam.

As sulphate is a very mobile anion associated with ADB water, it can be used as the first indicator of possible ash dam seepage when confirmed by the subsequent presence of ash dam trace elements (e.g. boron, molybdenum, fluoride) and other cation or anion species.

At this time, potential ash water presence in groundwaters in Callide Creek is primarily indicated by elevated sulphate. At this stage, the ash dam specific trace elements have not been detected in groundwater at elevated concentrations off-site (i.e. in bores MW34S and the deep bore MW34D).

However, along with sulphate, and other salts, elevated boron concentrations greater than 1 mg/L, which are above inferred background levels (<0.1 mg/L), have been observed at surface water sampling point SW12 in Callide Creek down gradient of the Eastern Seepage Collection Pond area. As well as elevated boron, some increases in molybdenum and fluoride have also been recorded at times at SW12 and in other ponded surface waters downstream of SW12, over the period the ponds have been sampled, but the extent to which this might represent increasing concentrations due to ash water migration or might simply result from evaporative concentration (initially) and subsequent re-dissolution of salts is not known.

The true extent of the potential influence on groundwater quality of ash dam seepage in groundwater downstream of the monitoring bores installed to monitor possible Ash Dam B impacts (MW34S/D) is also presently unknown.

There are a number of potential causes of increased Callide Creek groundwater salinity detected from the REMP sampling:

- drought conditions and lack of aquifer recharge (There have been no releases from Callide Dam since May 2004.);
- natural high salinity deep groundwater inflows;
- possible third party impacts such as discharges from other developments;
- seepage from Ash Dam B.

However available evidence suggests that seepage from Ash Dam B is contributing to the observed levels in groundwater in Callide Creek, no doubt exacerbated by the on-going drought in the Callide Dam catchment and lack of aquifer recharge.

Callide Creek is currently dry and it is understood cattle previously grazing in the area adjacent to Ash Dam B and using the Creek for drinking water have been removed. However, if cattle are re-introduced to the area of Callide Creek between the Callide Dam wall and downstream to the access road causeway, the impacts from cattle drinking potentially saline water will need to be risk assessed.

In Ash Dam B, salt levels have increased over time due to the storage of high salinity brine wastewater from the Blowdown Water Treatment Plant, overflow from the evaporation ponds which are becoming increasingly saline, and storage of seepage recovered from the dam.

The presence of ash dam water – related solutes has been observed at the following on-site monitoring locations within the site boundary:

- In the vicinity of the ESCP in groundwater recovery monitoring bores ESC1, ESC2, ESC3 and ESC4 and bores MW11, MW23, MW24. Sulphate levels in several bores exceeded 2500 mg/L (ESC1, 2, 3 and MW23) in January 2010. (Note background sulphate levels in this area would be less than 100 mg/L.);
- From the southern seep area (sulphate 1560 mg/L at bore MW9 in January 2010).
- Possibly from the WSCP. At downstream bore MW8, the December 2008 sulphate value was 2014 mg/L and boron 0.94 mg/L. (Note that MW8 was dry in January 2010.)
- Potentially, on the western side of Ash Dam B – principally chloride decrease and sulphate increase in some bores (Bore X, MW26).

As indicated in the AMP (both original and revised), and described above, seepage interception infrastructure has been installed at various locations, and seepage pump-back to ADB has been implemented.

The trends in seepage flows have also been factored into the AMP whereby the means and location of ash placement is targeting a reduction in seepage generation. However, it is now apparent that additional reduction in the seepage rate is required and further changes to the AMP are under investigation.

Seepage and in particular salt and salinity management at Callide Power Station are long-term issues. CS Energy recognises that actions are required to mitigate the potential for off-site environmental impacts and to manage salt generation on site.

Four key areas are under investigation:

- Improved management/reduction in salinity generation sources e.g. brine waste streams, high salinity evaporation pond discharges;
- Augmentation and improved management and operation of seepage recovery works;
- Upgrading existing containment facilities to minimise seepage generation; e.g geotechnical controls;
- Develop a better understanding of the potential environmental risks to off-site receptors and develop and implement remedial strategies for both short-term and long-term actions to promote improvements and maintenance of Callide Creek groundwater quality.

In terms of mitigating off-site environmental risks, CS Energy is proposing to give priority to further augmentation and improved management and operation of seepage recovery works, including installation of control measures on the western side of the dam.

CS Energy has been advised that Sunwater are proposing to release water from Callide Dam commencing on 19 April, which is expected to have a positive impact on the Creek water quality. CS Energy is proposing to assess the short and medium-term impacts of this release on groundwater quality.

[redacted]
COMPANY SECRETARY
CS ENERGY LTD

Enquiries: [redacted]
Site Manager Callide Power Station
Telephone [redacted]
Facsimile

Encl.

- "Results of the 2009 Receiving Environment Monitoring Program conducted around Callide Power Station in January 2010". Report 10/010. SigmaMsc. 1 March 2010.
- "Callide Power Station Preliminary REMP Water Quality Review". Environmental Management Strategies. 12 April 2010.

[redacted]

From: [redacted]
Sent: Saturday, 8 January 2011 11:00 AM
To: [redacted]
Cc: [redacted]
Subject: FW: VTEP Attached
Attachments: 20110107_Covering Letter to DERM with TEP.DOC; 20110107_Final - Voluntary TEP for High Ash Dam Water Level.pdf; SKMBT_C25211010709180.pdf; Attachment B CS Energy BN.PPT; Water Quality Parameters.doc

G'day [redacted]

I know your probably run off your feet with TEP assessments from CWR. See attached an application from CS Energy the operators of Callide Power Station at Biloela. Their Ash Dam B currently has 90mm of freeboard and is likely to discharge in the very near future. At present 1mm of rain reduces freeboard by 3mm so 30mm will see the dam running the spillway. The dam discharges into Callide Creek a creek that recharges the Callide Ck Alluvium an aquifer where Biloela takes part of it's drinking water supply (10 – 15km downstream) and a range of farmers extract for irrigation and stock and domestic use. Upstream of the power station is Callide Dam it is holding 99.9% at the moment and predicted to run the spillway gates in the next 6hrs ie by 6pm today. Initial discharge may be in the order of 4000ML/day and is likely to discharge at around 500ML/day for next 10 to 14 days. Should we get more rain it may be higher. CS Energy hold some 2,500ML above what they need for power supply purposes in Callide Dam. The bulk of the water is entitlement issued to the groundwater extractors down stream. As you can see this will likely be a political/media sensitive issue. Particularly when the power station is a government asset. Minister Robertson is a shareholding Minister.

Within the TEP CS Energy propose to discharge at a 10 parts Callide Dam to 1part Ash Dam mix. The principal contaminants of concern are:
Salinity moderate (6440EC)
Sodium moderate to high (7 x drinking water guidelines)
Boron moderate (7 x irrigation water guidelines)
Chloride high (10 x DWG)
Sulphates high (10 x DWG)
Arsenic moderate (2 x DWG)
Molybdenum moderate (5 x DWG)
Fluoride low (1.5 x DWG)

I have advised CS Energy that it is unlikely that we would make any decision on the TEP prior to Monday. I have also advised that that a 10:1 ratio is also on the margin and that it is more likely that 30:1 would be the range we would seek however at the end of the day I will be guided by our Marine & Freshwater Group.

I have also attached data from CS Energy and DERM assessment of water quality based results in ash dam as at Aug 2010, given the high rainfall I would expect that water quality would slightly better than this, certainly this is the case for salinity. They are in the process of getting further analysis done but his is not available at present.

I will attempt to give you a call this weekend to discuss.

Cheers ...... [redacted]

[redacted]

Incident Hotline - 1300 130 372

From: [redacted]
Sent: Friday, 7 January 2011 5:43 PM
To: [redacted]
Cc: [redacted]
Subject: VTEP Attached

[redacted]

My apologies but it has taken a bit longer than planned to finalise
Regards

[redacted]

Callide Site Manager
CS Energy

Pl [redacted]

PO Box 392
BILOELA QLD 4715

Water Quality Parameters based on Water Analysis 18 August 2010 for Ash Dam B

Note:
Health and aesthetic are in relation to the Australian Drinking Water Guidelines. (Prepared by DERM Staff Gladstone)

Crop sensitivity (extract from CS Energy Spill Management Plan)

Crop	Note	Key Parameter(s)	Sensitivity
Mung beans	Typically irrigated	Boron	Sensitive
Wheat (grain & forage)	Sometimes irrigated	Boron Salinity (Conductivity)	Sensitive Tolerant
Sorghum	Sometimes irrigated	Boron Chloride Salinity (Conductivity) Sodium	Tolerant Moderately Tolerant Tolerant Moderately Tolerant
Cotton	Typically irrigated	Chloride Salinity (Conductivity) Sodium	Tolerant Tolerant Tolerant
Lucerne	Typically irrigated	Chloride Salinity (Conductivity) Sodium	Moderately Tolerant Moderately Sensitive Moderately Tolerant

Agricultural irrigation water long-term trigger value (LTV), short-term trigger value (STV).

The *long-term trigger value* (LTV) is the maximum concentration (mg/L) of contaminant in the irrigation water which can be tolerated assuming 100 years of irrigation, based on the irrigation loading assumptions described in Volume 3, Section 9.2.5.

The *short-term trigger value* (STV) is the maximum concentration (mg/L) of contaminant in the irrigation water which can be tolerated for a shorter period of time (20 years) assuming the same maximum annual irrigation loading to soil as for LTV.

The LTV and STV values have been developed: (1) to minimise the build-up of contaminants in surface soils during the period of irrigation; and (2) to prevent the direct toxicity of contaminants in irrigation waters to standing crops. Where LTV and STV have been set at the same value, the primary concern is the direct toxicity of irrigation water to the standing crop (e.g. for lithium and citrus crops), rather than a risk of contaminant accumulation in soils and plant uptake.

The ANZECC 2000 guidelines for irrigation water quality are given here for biological parameters, salinity and sodicity, inorganic contaminants (i.e. specific ions, including heavy metals and nutrients), organic contaminants (i.e. pesticides) and radiological characteristics. The guidelines are trigger values below which there should be minimal risk of adverse effects. Further investigation is recommended if a trigger value is exceeded, to determine the level of risk.

Parameter	**Units**	**Callide Ash Dam B level**	**Australian Drinking Water Quality Guidelines**	**ANZECC Irrigation**	**ANZECC Stock**	**Draft sub-regional water quality guidelines for protection of aquatic ecosystems Callide Catchment**
pH		8.07		6-8.5		6.5-8.5
Conductivity *Moderate sensitive* *Moderate tolerant* *Tolerant* *Very Tolerant*	µS/cm	9120		 950-1900 1900-4500 4500-7700 7700-1220		1220
Total Dissolved Solids	mg/L	7480	500		Beef cattle/horses, pigs 0-4000 Dairy cattle 0-2500 Sheep 0-5000 Poultry 0-2000	
Suspended solids	mg/L	6				25
Phosphorous	mg/L	0.06		0.05 LTV 0.8-12 STV		0.05
Aluminium Health Aesthetic	mg/L	0.14	 0.2 (acid –soluble)	5 LTV 20 STV	 5	
Arsenic	mg/L	0.004	0.007	0.1 LTV	0.5	

				2.0 STV		
Barium	mg/L	0.107	0.7	-		
Beryllium				0.1 STV 0.5 LTV	ND	
Boron *Sensitive* *Moderate sensitive* *Moderate tolerant* *Tolerant* *Very Tolerant*	mg/L	3.44	4	0.5 LTV (Refer to table 9.2.18 Volume2) for STV	5	
Cadmium (I)	mg/L		0.002	0.01 LTV 0.05 STV	0.01	
Calcium	mg/L	592		-	Limit of 1000	
Chloride Health Aesthetic *Moderate sensitive* *Moderate tolerant* *Tolerant*	mg/L	2590	 250	 <175 175-350 350-700 >700		
Chromium (VI)	mg/L	0.001	0.05	.01 LTV 1 STV	1	
Cobalt	mg/L	<0.001		0.05 LTV 0.1 STV	1	
Copper (I) Health Aesthetic	mg/L	0.003	 2 1	0.2 LTV 5 STV	0.4 (sheep) 1 (cattle) 5 (pigs, poultry)	

Fluoride	mg/L	2.3	1.5	1 LTV 2 STV	2	
Lithium	mg/L	0.489		2.5 LTV 2.5 STV		
Iron Aesthetic	mg/L	0.32	 0.3	0.2 LTV 10 STV	Not sufficiently toxic	
Lead	mg/L	<0.001	0.01	2 LTV 5 STV	0.1	
Magnesium	mg/L	442		-	Limit 2000	
Manganese Health Aesthetic	mg/L	0.018	 0.5 (<0.05 desirable) 0.1	0.2 LTV 10 STV	Not sufficiently toxic	
Mercury	mg/L	<0.0001	0.001	0.002 LTV 0.002 STV	0.002	
Molybdenum	mg/L	0.284	0.05	0.01 LTV 0.05 STV	0.15	
Nickel (I)	mg/L		0.02	0.2 LTV 2 STV	1	
Potassium	mg/L	31		-		
Selenium	mg/L	0.01	0.01	0.02 LTV 0.05 STV	0.02	
Sodium Health Aesthetic *Sensitive* *Moderate sensitive*	mg/L	1270	 180	 <115 115-230		

Moderate tolerant *Tolerant*				230-460 >460		
Strontium	mg/L	7.62				
Sulfate Health Aesthetic	mg/L	2430	 500 250		 1000	20
Thallium						
Thorium						
Tin						
Uranium	mg/L		0.02	0.2 Bq/L	0.2	
Vanadium	mg/L			0.1 LTV 0.5 STV	ND	
Zinc (I) Aesthetic	mg/L	<0.005	 3	2 LTV 5 STV	20	

[redacted]

From: [redacted]
Sent: [redacted]:36 PM
To: [redacted]
Cc:
Subject: RE: CSE/Callide

Attachments: FW: VTEP Attached

FW: VTEP Attached

G'day [redacted]

Please see attached.

Cheers ..... [redacted]

[redacted]
A/Regional Manager, Environmental Services, Gladstone
Telephone: [redacted]
Email: [redacted]
www.derm.qld.gov.au

Department of Environment and Resource Management
3/136 Goondoon St, GLADSTONE, Qld 4680
PO Box 5065, GLADSTONE, Qld 4680
Incident Hotline - 1300 130 372

Nominations for the 2011 Premier's ClimateSmart Sustainability Awards, which recognise Queenslanders who are ClimateSmart champions achieving excellence in sustainability, are open until Friday 4 March 2011. For more information on how to enter visit www.derm.qld.gov.au/premiersawards

-----Original Message-----
From: [redacted]
Sent: Saturday, 8 January 2011 1:04 PM
To: [redacted]
Cc:
Subject: RE: CSE/Callide

Hi [redacted]
As discussed, please forward copy of TEP and other relevant information. I'll review the water quality information and discuss further with you later today.
Thanks
[redacted]

[redacted]

Director, Recycled and Drinking Water Quality,

Office of the Water Supply Regulator

Telephone: [redacted] Mobile: [redacted]

Facsimile: [redacted]

Email: [redacted]

www.derm.qld.gov.au

Department of Environment and Resource Management,

Level 3, Mineral House, 41 George St, Brisbane Q 4000

GPO Box 2454, Brisbane Q 4001

-----Original Message-----
From: Reilly Bob
Sent: Saturday, 8 January 2011 12:17 PM
To: [redacted]
Cc:
Subject: Fw: CSE/Callide

Hi [redacted]

Could you please contact [redacted]--contact details in email below, to discuss the proposed tep for the callide ash dams. You may wish to check with peter on the location of downstream towns' water sources.

Thanks

[redacted]

----- Original Message -----
From: Birchley Michael
To: Best Debbie
Cc: Brown Damien; [redacted]
Sent: Sat Jan 08 12:01:43 2011
Subject: RE: CSE/Callide

Debbie

In addition to my earlier advice and [redacted] added comments below, a further issue in this case is the fact that the water in Callide Dam not only supplies CS Energy's Power Station and Biloela Township, but also recharges the Callide alluvium which is a further source of supply for Biloela town and for downstream landholders with irrigation and stock and domestic water. This reinforces the need for appropriate management by CS Energy of any discharges from its ash dam into Callide Creek.

[redacted] has raised with CS Energy the need to notify relevant parties such as Banana Shire Council and downstream landholders if it anticipates discharging from its ash dam. Given the linkage to town water supplies I have included [redacted] in this email for consideration of any appropriate action from an OWSR perspective. I will also try to phone [redacted].

Mike

Mike Birchley
Acting Assistant Director-General
Regional Service Delivery
Dept of Environment and Resource Management
Telephone:
Mobile: 0
Email: [redacted]

From: [redacted]
Sent: Saturday, 8 January 2011 9:54 AM
To: Birchley Michael
Cc: Brown Damien; [redacted] Best Debbie
Subject: RE: CSE/Callide

G'day [redacted]

Note that CS Energy lodged a TEP application last night after I had left the office. I will look to commence assessment this weekend but would not expect to have it processed before Monday at the earliest.

t spoken to [redacted] (CS Energy Site Manager) this morning at 9:21am. [redacted] advised that Ash Dam freeboard has reduced overnight from 130mm yesterday to 90mm. Currently every 1mm of rain is reducing freeboard by 3mm. The following information is provided by [redacted]

At 9pm last night Sunwater were predicting that Callide dam would run the spillway gates in 12 to 18hrs time dependent on inflows, ie 9am to 6pm today. Current inflows are approximately 4000ML per day.

Dependant on inflows Sunwater anticipate that Callide dam will discharge at approx 500ML/day for 10 to 14 day when it runs the spillway gates.

CS Energy are setting up a system to discharge at approximately

Initially 20ML/day

By Tue 12 Jan 30ML/day

By Wed 13 Jan 45ML/day

Sourcing a large pump that would allow up to 125ML/day when flow in Callide Ck allows.

A 30Ml/day discharge from CS Energy Ash Dam will drop the dam by 3mm/day ie the equivalent of 1mm of rainfall so there is every likely hood that it will run the spillway at some stage unless we get a dry spell will high evaporation.

I believe CS Energy are requesting a discharge ration of 10 parts Callide Ck flow to 1 part Ash dam discharge ie 10:1. I suspect that would not be acceptable to DERM and we would likely seek a 30:1 ration however have not at this stage discusses with [redacted] or his group. Many of the contaminants in the dam are currently 10 times drinking water standards however these dilution factors are not always linear and we are likely to seek something greater.

Subject to rain as it stands at the moment it is looking like Callide Dam will discharge prior to CS Energy Ash Dam.

I'll give you a call to discuss.

Cheers ….. [redacted]

[redacted]

Incident Hotline - 1300 130 372

-----Original Message-----
From: Birchley Michael
Sent: Saturday, 8 January 2011 9:22 AM
To: Best Debbie
Cc: Brown Damien; [redacted]
Subject: RE: CSE/Callide

Debbie

Debbie

As at cob yesterday we were yet to receive a TEP application from CS Energy for discharge from its ash dam at Callide Power Station. We require this before we can authorise any discharge outside licence conditions.

At this stage it is up to CS Energy to determine how it will proceed in conjunction with SunWater to manage the discharge from its ash dam. We have received an EP Act section 320 notice advising that discharge through its ash dam spillway was imminent and of the potential for environmental harm consistent with its general environmental duty obligations.

[redacted] spoke at length with CSE staff yesterday and will attempt to contact them again now to provide whatever advice we can to manage the situation. CSE will then need to work with SunWater to manage the release of flows taking into account the advice we have already been able to provide, including timing and volume of releases from both Callide Dam and the ash dam to avoid environmental harm.

Mike Birchley

Acting Assistant Director-General

Regional Service Delivery

Dept of Environment and Resource Management

Telephone: [redacted]

Mobile:

Email: [redacted]

-----Original Message-----

From: Best Debbie

Sent: Saturday, 8 January 2011 8:36 AM

To: Birchley Michael

Subject: Fw: CSE/Callide

----- Original Message -----

From: [redacted]

To: Best Debbie

Sent: Sat Jan 08 08:34:08 2011

Subject: CSE/Callide

Debbie,

Latest advice to me is that at this point CSE do not have approval for any discharge. Can you advise status of discharge approvals process.

Fyi, Callide should spill before midday.

[redacted]

[redacted]

From: [redacted]
Sent: Monday, 10 January 2011 3:28 PM
To: [redacted]
Cc: [redacted]
Subject: RE: VTEP for Work request - CS Energy

Hi [redacted]

This email is just to advise you that [redacted] (at least, I think it was [redacted]) and I discussed this situation of the phone today and the following outcomes were reached:

- Data is out of date (5 months old) – all following comments are based on that inadequacy;
- Data shows results which would be mostly compliant with 1 in 10 dilutions, and compliant in all respects (for the parameters analysed) with 30-50 times dilution (50 times if considering over-conservative Al trigger value in ANZECC/ARMCANZ (2000));
- The water is likely to be denser than receiving water and likely to sink if not mixed thoroughly immediately upon release – this may impact groundwater recharge zone located about ~500m downstream, and
- High discharge rates may not allow sufficient time and space for mixing to occur to a level whereby ANZECC/ARMCANZ (2000) trigger values are met before recharge zone is reached by those discharged wastewaters.

Further from those immediate concerns:

- Water quality data should include depth sampling/profiling to better represent WQ at depth – water samples from surface alone can be misleading, particularly in large bodies of deep, still water;
- Water quality sampling for EC should occur downstream during release and upstream to provide a background measure – this can be used to identify whether or not the mixing zone is extending into the GW recharge area – note that denser water sinks and sampling at depth in high flows may prove logistically challenging.

Cheers.

Kind Regards,

[redacted]
Principal Scientist

Department of Environment & Resource Management
Environment and Resource Sciences
Water Quality & Aquatic Ecosystem Health
Aquatic Ecosystem Risk and Decision Support

Phone: [redacted]
Fax:
Mobile:
E-mail:

From: [redacted]
Sent [redacted]
To: [redacted]
Subject: FW: VTEP for Work request - CS Energy
Importance: High

From: [redacted]
Sent: Monday, January 10, 2011 8:47:25 AM
To: WorkRequests Water
Subject: VTEP for Work request - CS Energy
Importance: High
Auto forwarded by a Rule

Hi,

As per my email on Friday, attached is the TEP for CS Energy to release Ash Dam Water.

Kindest regards,

[redacted]

Environmen[redacted]
Teleph[redacted]
Emai[redacted]
www.derm.qld.gov.au

Department of Environment and Resource Management
136 Goondoon Street, Gladstone
PO Box 5065, Gladstone QLD 4680

From: [redacted]
Sent: Friday, 7 January 2011 5:43 PM
To: [redacted]
Cc: [redacted]
Subject: VTEP Attached

[redacted]

My apologies but it has taken a bit longer than planned to finalise
Regards

[redacted]

Callide Site Manager
CS Energy

Pl [redacted]

PO Box 392
BILOELA QLD 4715

[redacted]

From: [redacted]
Sent: Monday, 10 January 2011 3:48 PM
To: [redacted]
Subject: FW: Callide

FY consideration ...[redacted]

[redacted]

Incident Hotline - 1300 130 372

From: [redacted]
Sent: Monday, 10 January 2011 3:37 PM
To: [redacted]
Cc: [redacted]
Subject: FW: Callide

Hi [redacted]
As per my email on Saturday, my drinking water team has briefly reviewed the TEP application. Comments are provided below. Anne had a brief discussion with [redacted] (QH) regarding the TEP. [redacted] is very busy with other, more pressing public health matters at the moment and was not overly concerned about this matter.
Please don't hesitate to call if I can be of any further assistance.
[redacted]
Director, Recycled and Drinking Water Quality,
Office of the Water Supply Regulator
Telephone: [redacted] **Mobile:**
Facsimile: [redacted]
Email: [redacted]
www.derm.qld.gov.au

Department of Environment and Resource Management,
Level 3, Mineral House, 41 George St, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

From: [redacted]
Sent: Monday, 10 January 2011 1:48 PM
To: [redacted]
Subject: RE: Callide

Hi [redacted],

I have reviewed the information we have on the drinking water infrastructure at Biloela and calculated the dilution effects of the Ash Dam B with Callide Dam water on the monitored parameters prior to release. Given a worst case scenario of a 1 in 10 dilution and no treatment (as may be the case if water from the alluvium derived bores is delivered directly to consumers) then there is unlikely to be a concern with drinking water quality.

- Biloela WTP has a multistage treatment system (aeration, flocculation, lime and alum dosing, filtration as well as chlorination). Water from the Callide dam is normally blended with the water from 11 bores in Callide Creek and is supplied to the Biloela, Thangool and Callide region servicing over 6000 people.
- There are a number of parameters in the Ash Dam water that breach ADWG health guideline values however the dilution with Callide Dam water can manage these effectively to avoid any breach of ADWG health guideline values.
- A dilution of the Ash Dam B at a rate on one part in 10 parts with Callide Dam water means no parameters are likely to breach ADWG health guideline limits. However there are a number of parameters that breach aesthetic values or are close to levels of concern. The substances of concern are dissolved salts (specifically measured through chloride, sulfate, TDS and conductivity).
- Dilution of one in twenty would ensure that both the aesthetic values are under the guideline values. If the projected 1 in 30 dilution is achieved, there should be no issues with water quality.

Given the proximity of the town water offtake for Biloela water supply and the probability that the alluvium is recharged through Callide Creek, it is important that the dilution actually achieves the 1 in 10 dilution as a minimum and this dilution effectiveness is monitored. This can be achieved through continual monitoring of the conductivity to ensure the level does not exceed a set value. The Ash Dam B currently has a measured conductivity of 9120 micro semens and is being diluted with dam water of 345. A one in ten dilution should achieve a value of approximately 958, which is about double the ADWG aesthetic guideline of 500, but will achieve all health guideline values. If a monitoring benchmark is set closer to the ADWG aesthetic guideline that would be preferable and achievable with at least a 1 in 20 dilution. Note, the conductivity does not have a direct health impact but would be a good means of monitoring the dilution effectiveness.

Regard[redacted]

[redacted]
Principal Scientist
Office of the Water Supply Regulator
Telephone: [redacted]
fax [redacted]
Email: [redacted]

Department of Environment and Resource Management
Level 3, Mineral House,
41 George St,
GPO Box 2454,
Brisbane Qld 4001

From: [redacted]
Sent: Monday, 10 January 2011 9:24 AM
To: [redacted]
Subject:

[redacted]
Director, Recycled and Drinking Water Quality,
Office of the Water Supply Regulator
Telephone [redacted] **Mobile:**
Facsimile: [redacted]
Email: [redacted]

www.derm.qld.gov.au

Department of Environment and Resource Management,
Level 3, Mineral House, 41 George St, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

[redacted]

From: [redacted]
Sent: Monday, 10 January 2011 6:09 PM
To: [redacted]
Cc: [redacted]
Subject: Proposed Callide Creek Groundwater and Surface Water Monitoring For TEP
Attachments: ADB Spill-discharge monitoring.xlsx; ADB Spill-discharge monitoring.xls

[redacted]

Further to our [redacted] and I) discussion this afternoon, attached is the proposed monitoring schedule I offered to provide to you which will form part of the TEP. The following comments are relevant to this monitoring program.

Surface water monitoring

Since our discussion, and to address the concern you add that "Linkes Road Callide Creek" site was too far downstream for monitoring of Western Route releases [redacted] and I have reviewed the initial proposal we had developed and have added an additional surface water sampling site ("Callide Creek adjacent to Nob's Bore"). This location is on private land but we do not anticipate access issues. This site lies downstream of the "Callide Dam Access Road Causeway" and upstream of the "Linkes Road" site. It would be used as the near-release monitoring site at times when release is down the Western Route from the site. "Nob's Callide Creek" site lies about 1.5 km downstream of the Causeway site. The Causeway site would continue to be monitored to cover release from the Eastern Route.

Groundwater sampling

We have also increased the monitoring proposal for groundwater, over and above that specified in the Spill Management Plan. We have included Nob's Bore and CS Energy Bore 34S (adjacent to the Causeway) noting however that it will be impossible to sample 34S at most times when the Creek is flowing with any significant volume. We have also added 4 additional bores along the Creek down to the Biloela-Gladstone Road Bridge, that were sampled in December as part of the baseline monitoring undertaken in Callide Creek. This will give a total of 9 bores, plus MW34S when accessible.

Attached is the proposed Monitoring Plan. I have included the file saved as Office 2007 (developed in) and Office 2003. Note also that whereas the plan refers to Aurecon carrying out some monitoring, arrangements for this are still being finalised. We would probably prefer to leave the name of the consultant out of the final TEP version.

Finally, if you were able to forward a list of the changes you required to the TEP wording, I will amend the TEP accordingly and get it back to you ASAP for approval.

Regards

[redacted] from Callide Power Station

Mobile

Sampling locations and results as stipulated in the 'Callide Power Station Ash Dam B Spill Manag

Pre -spill - **Surface Water** - Ash Dam B Spillway, Linkes Rd Crossing, Calvale/Coal Rd crossir

Frequency - One sample of each is require to be conducted prior to release

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 1303053

Frequency - Numbered bores to be sampled once prior to release.

During spill - **Surface Water** - Ash Dam B Spillway, Linkes Rd Crossing, Calvale/Coal Rd crossir

Frequency - All surface water to be sampled daily

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 1303053

Frequency - Numbered bores to be sampled initially at a fortnightly interval

NOTE - If plume is detected within the bores then sampling frequency is to be in

Post spill - **Surface Water** - Ash Dam B Spillway, Linkes Rd Crossing, Calvale/Coal Rd crossir

Frequency - As above until it has been been determined that the spill plume

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 1303053

Frequency - As above until it has been been determined that the spill plume

<u> Note that if ash dam plume is detected then bore monitoring is required to be escalated to a weekly monit</u>*

ement Plan, 27th Feb, 2009 Revision 7'.

ıg, Gladstone Hwy crossing, Callide Dam. If discharge occurs via Western channel then Callide Cı

2, 13030128 and any extraction bores landholders are utilising.

ıg, Gladstone Hwy crossing, Callide Dam. If discharge occurs via Western channel then Callide Cı

2, 13030128 and any extraction bores landholders are utilising.
, reduced to monthly after two sampling events. Landholders bores to be sampled prior ro any ε
ıcreased to weekly with sampling locations to be both d/stream and laterally from the creek.

ıg, Gladstone Hwy crossing, Callide Dam. If discharge occurs via Western channel then Callide Cı
ɜ is within acceptable levels.
2, 13030128 and any extraction bores landholders are utilising.
ɜ is within acceptable levels.

oring with sampling locations to be extended both downstream and laterally from the creek.

reek adjacent to Nob's bore to be added to sampling monitoring

reek adjacent to Nob's bore to be added to sampling monitoring

extraction and every 1ML that is irrigated.

reek adjacent to Nob's bore to be added to sampling monitoring

Sampling routine during and post - spill event (pre-spill sampling (

Sampler	Enviro	Chem	Aurecon

* Chemistry to cover environment sample durin

Daily	Fortnightly	Monthly

* Note that if ash dam plume is detected then b

Week 1

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat
Sampler							
Surface							
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores							
68807	Fortnightly	Aurecon					
68267	Fortnightly	Aurecon					
34330	Fortnightly	Aurecon					
62420	Fortnightly	Aurecon					
Nob's	Fortnightly	Aurecon					
13030283	Fortnightly	Aurecon					
13030284	Fortnightly	Aurecon					
13030532	Fortnightly	Aurecon					
13030128	Fortnightly	Aurecon					

Week 3

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat
Sampler							
Surface							
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro

Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores							
68807	Monthly	Aurecon					
68267	Monthly	Aurecon					
34330	Monthly	Aurecon					
62420	Monthly	Aurecon					
Nob's	Monthly	Aurecon					
13030283	Monthly	Aurecon					
13030284	Monthly	Aurecon					
13030532	Monthly	Aurecon					
13030128	Monthly	Aurecon					

Week 5

	Frequency	Mon	Tue	Wed	Thu	Fri	Sat
Sampler							
Surface							
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro	Enviro
Bores							
68807	Not required						
68267	Not required						
34330	Not required						
62420	Not required						
Nob's	Not required						
13030283	Not required						
13030284	Not required						
13030532	Not required						
13030128	Not required						

:onducted by environment)

g an unavailability

ore monitoring is required to be escalated to a weekly monitoring with sampling locations to be extended t

Sun
Enviro
Enviro
Enviro
Enviro
Enviro
Enviro

Week 2

	Frequency	Mon	Tue	Wed	Thu	Fri
Sampler						
Surface						
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Callide dam	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Bores						
68807	Not required					
68267	Not required					
34330	Not required					
62420	Not required					
Nob's	Not required					
13030283	Not required					
13030284	Not required					
13030532	Not required					
13030128	Not required					

Sun
Enviro
Enviro
Enviro
Enviro
Enviro

Week 4

	Frequency	Mon	Tue	Wed	Thu	Fri
Sampler						
Surface						
ADB	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Calv/coal crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Nob's if required	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Linke's crossing	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Glad hwy	Daily	Enviro	Enviro	Enviro	Enviro	Enviro

Enviro	*Callide dam*	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
	Bores						
	68807	Not required					
	68267	Not required					
	34330	Not required					
	62420	Not required					
	Nob's	Not required					
	13030283	Not required					
	13030284	Not required					
	13030532	Not required					
	13030128	Not required					

Week 6

Sun		Frequency	Mon	Tue	Wed	Thu	Fri
	Sampler						
	Surface						
Enviro	*ADB*	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Enviro	*Calv/coal crossing*	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Enviro	*Nob's if required*	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Enviro	*Linke's crossing*	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Enviro	*Glad hwy*	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
Enviro	*Callide dam*	Daily	Enviro	Enviro	Enviro	Enviro	Enviro
	Bores						
	68807	Not required					
	68267	Not required					
	34330	Not required					
	62420	Not required					
	Nob's	Not required					
	13030283	Not required					
	13030284	Not required					
	13030532	Not required					
	13030128	Not required					

ɔoth downstream and laterally from the creek.

Sat	Sun
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro

Sat	Sun
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro

Enviro	Enviro

Sat	Sun
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro
Enviro	Enviro

Analytes	Sample container to be used	Sample size required	Preservation Methods
Field analytes - in field (using the YSI Field monitor	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C
Conductivity, TDS, SS, Alkalinity, Fluoride, Sulfate, Chloride, Boron, BOD, Silica, Hardness	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C
Aluminium, Arsenic, Barium, Beryliium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Sodium, Strontium, Tin, Thallium, Thorium, Uranium, Vanadium, Zinc	Plastic bottle - nitric acid supplied in bottle	250 mL	Filter on site to 0.45 µm Refrigerate at 4°C
Oil and Grease	Glass bottle - acid supplied within bottle	1000 mL	Refrigerate at 4°C

Maximum Storage Time
72 hours
24 hours
28 days
7 days

Pre-Spi

pill

Surface	ADB	ADB	ADB	ADB	ADB	ADB
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
CallideLab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Nob's if req	Nob's if req	Nob's if req	Nob's if req	Nob's if req	Nob's if req
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Bore	68807	68807	68807	68807	68807	68807
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Thorium						
Uranium						
Vanadium						
Zinc						

Bore	68267	68267	68267	68267	68267	68267
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Bore
Date
Time
Sampler
Field results
pH
DO
Cl
EC (µS/cm)
TDS
Temp
Lab results
Conduct
TDS
SS
Alkalinity
Fluoride
Sulfate
Chloride
Boron
BOD
Silica
Oil and Grease
Hardness
Aluminium
Arsenic
Barium
Beryllium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Sodium
Strontium
Tin
Thallium

Thorium						
Uranium						
Vanadium						
Zinc						

Thorium
Uranium
Vanadium
Zinc

34330	34330	34330	34330	34330	34330

Bore	62420
Date	
Time	
Sampler	
Field results	
pH	
DO	
Cl	
EC (µS/cm)	
TDS	
Temp	
Lab results	
Conduct	
TDS	
SS	
Alkalinity	
Fluoride	
Sulfate	
Chloride	
Boron	
BOD	
Silica	
Oil and Grease	
Hardness	
Aluminium	
Arsenic	
Barium	
Beryllium	
Calcium	
Chromium	
Cobalt	
Copper	
Iron	
Lead	
Lithium	
Magnesium	
Manganese	
Mercury	
Molybdenum	
Nickel	
Potassium	
Selenium	
Sodium	
Strontium	
Tin	
Thallium	

Thorium	
Uranium	
Vanadium	
Zinc	

62420	62420	62420	62420	62420

Nob's	Nob's	Nob's
Date		
Time		
Sampler		
Field results		
pH		
DO		
Cl		
EC (µS/cm)		
TDS		
Temp		
Lab results		
Conduct		
TDS		
SS		
Alkalinity		
Fluoride		
Sulfate		
Chloride		
Boron		
BOD		
Silica		
Oil and Grease		
Hardness		
Aluminium		
Arsenic		
Barium		
Beryllium		
Calcium		
Chromium		
Cobalt		
Copper		
Iron		
Lead		
Lithium		
Magnesium		
Manganese		
Mercury		
Molybdenum		
Nickel		
Potassium		
Selenium		
Sodium		
Strontium		
Tin		
Thallium		

Thorium		
Uranium		
Vanadium		
Zinc		

Nob's	Nob's	Nob's	Nob's

13030283	13030283	13030283	13030283
Date			
Time			
Sampler			
Field results			
pH			
DO			
Cl			
EC (μS/cm)			
TDS			
Temp			
Lab results			
Conduct			
TDS			
SS			
Alkalinity			
Fluoride			
Sulfate			
Chloride			
Boron			
BOD			
Silica			
Oil and Grease			
Hardness			
Aluminium			
Arsenic			
Barium			
Beryllium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Lithium			
Magnesium			
Manganese			
Mercury			
Molybdenum			
Nickel			
Potassium			
Selenium			
Sodium			
Strontium			
Tin			
Thallium			

Thorium			
Uranium			
Vanadium			
Zinc			

13030283	13030283	13030283

13030284	13030284	13030284	13030284	13030284
Date				
Time				
Sampler				
Field results				
pH				
DO				
Cl				
EC (µS/cm)				
TDS				
Temp				
Lab results				
Conduct				
TDS				
SS				
Alkalinity				
Fluoride				
Sulfate				
Chloride				
Boron				
BOD				
Silica				
Oil and Grease				
Hardness				
Aluminium				
Arsenic				
Barium				
Beryllium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron				
Lead				
Lithium				
Magnesium				
Manganese				
Mercury				
Molybdenum				
Nickel				
Potassium				
Selenium				
Sodium				
Strontium				
Tin				
Thallium				

Thorium				
Uranium				
Vanadium				
Zinc				

13030284	13030284

13030532	13030532	13030532	13030532	13030532	13030532
Date					
Time					
Sampler					
Field results					
pH					
DO					
Cl					
EC (µS/cm)					
TDS					
Temp					
Lab results					
Conduct					
TDS					
SS					
Alkalinity					
Fluoride					
Sulfate					
Chloride					
Boron					
BOD					
Silica					
Oil and Grease					
Hardness					
Aluminium					
Arsenic					
Barium					
Beryllium					
Calcium					
Chromium					
Cobalt					
Copper					
Iron					
Lead					
Lithium					
Magnesium					
Manganese					
Mercury					
Molybdenum					
Nickel					
Potassium					
Selenium					
Sodium					
Strontium					
Tin					
Thallium					

Thorium					
Uranium					
Vanadium					
Zinc					

13030532

13030128	13030128	13030128	13030128	13030128	13030128	13030128
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Thorium						
Uranium						
Vanadium						
Zinc						

During

Surface	ADB	ADB	ADB	ADB	ADB	ADB
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (μS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Surface	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
CallideLab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (μS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Nob's if req	Nob's if req	Nob's if req	Nob's if req	Nob's if req	Nob's if req
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Bore	68807	68807	68807	68807	68807	68807
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Thorium						
Uranium						
Vanadium						
Zinc						

Bore	68267	68267	68267	68267	68267	68267
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Bore
Date
Time
Sampler
Field results
pH
DO
Cl
EC (µS/cm)
TDS
Temp
Lab results
Conduct
TDS
SS
Alkalinity
Fluoride
Sulfate
Chloride
Boron
BOD
Silica
Oil and Grease
Hardness
Aluminium
Arsenic
Barium
Beryllium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Sodium
Strontium
Tin
Thallium

Thorium						
Uranium						
Vanadium						
Zinc						

Thorium
Uranium
Vanadium
Zinc

34330	34330	34330	34330	34330	34330

Bore	**62420**
Date	
Time	
Sampler	
Field results	
pH	
DO	
Cl	
EC (µS/cm)	
TDS	
Temp	
Lab results	
Conduct	
TDS	
SS	
Alkalinity	
Fluoride	
Sulfate	
Chloride	
Boron	
BOD	
Silica	
Oil and Grease	
Hardness	
Aluminium	
Arsenic	
Barium	
Beryllium	
Calcium	
Chromium	
Cobalt	
Copper	
Iron	
Lead	
Lithium	
Magnesium	
Manganese	
Mercury	
Molybdenum	
Nickel	
Potassium	
Selenium	
Sodium	
Strontium	
Tin	
Thallium	

Thorium	
Uranium	
Vanadium	
Zinc	

62420	62420	62420	62420	62420

Nob's	Nob's	Nob's
Date		
Time		
Sampler		
Field results		
pH		
DO		
Cl		
EC (µS/cm)		
TDS		
Temp		
Lab results		
Conduct		
TDS		
SS		
Alkalinity		
Fluoride		
Sulfate		
Chloride		
Boron		
BOD		
Silica		
Oil and Grease		
Hardness		
Aluminium		
Arsenic		
Barium		
Beryllium		
Calcium		
Chromium		
Cobalt		
Copper		
Iron		
Lead		
Lithium		
Magnesium		
Manganese		
Mercury		
Molybdenum		
Nickel		
Potassium		
Selenium		
Sodium		
Strontium		
Tin		
Thallium		

Thorium		
Uranium		
Vanadium		
Zinc		

Nob's	Nob's	Nob's	Nob's

13030283	13030283	13030283	13030283
Date			
Time			
Sampler			
Field results			
pH			
DO			
Cl			
EC (µS/cm)			
TDS			
Temp			
Lab results			
Conduct			
TDS			
SS			
Alkalinity			
Fluoride			
Sulfate			
Chloride			
Boron			
BOD			
Silica			
Oil and Grease			
Hardness			
Aluminium			
Arsenic			
Barium			
Beryllium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Lithium			
Magnesium			
Manganese			
Mercury			
Molybdenum			
Nickel			
Potassium			
Selenium			
Sodium			
Strontium			
Tin			
Thallium			

Thorium			
Uranium			
Vanadium			
Zinc			

13030283	13030283	13030283

13030284	13030284	13030284	13030284	13030284
Date				
Time				
Sampler				
Field results				
pH				
DO				
Cl				
EC (µS/cm)				
TDS				
Temp				
Lab results				
Conduct				
TDS				
SS				
Alkalinity				
Fluoride				
Sulfate				
Chloride				
Boron				
BOD				
Silica				
Oil and Grease				
Hardness				
Aluminium				
Arsenic				
Barium				
Beryllium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron				
Lead				
Lithium				
Magnesium				
Manganese				
Mercury				
Molybdenum				
Nickel				
Potassium				
Selenium				
Sodium				
Strontium				
Tin				
Thallium				

Thorium				
Uranium				
Vanadium				
Zinc				

13030284	13030284

13030532	13030532	13030532	13030532	13030532	13030532
Date					
Time					
Sampler					
Field results					
pH					
DO					
Cl					
EC (µS/cm)					
TDS					
Temp					
Lab results					
Conduct					
TDS					
SS					
Alkalinity					
Fluoride					
Sulfate					
Chloride					
Boron					
BOD					
Silica					
Oil and Grease					
Hardness					
Aluminium					
Arsenic					
Barium					
Beryllium					
Calcium					
Chromium					
Cobalt					
Copper					
Iron					
Lead					
Lithium					
Magnesium					
Manganese					
Mercury					
Molybdenum					
Nickel					
Potassium					
Selenium					
Sodium					
Strontium					
Tin					
Thallium					

Thorium					
Uranium					
Vanadium					
Zinc					

13030532

13030128	13030128	13030128	13030128	13030128	13030128	13030128
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (μS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Thorium						
Uranium						
Vanadium						
Zinc						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
CallideLab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (μS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Nob's if req	Nob's if req	Nob's if req	Nob's if req	Nob's if req	Nob's if req
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Bore	68807	68807	68807	68807	68807	68807
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Bore
Date
Time
Sampler
Field results
pH
DO
Cl
EC (µS/cm)
TDS
Temp
Lab results
Conduct
TDS
SS
Alkalinity
Fluoride
Sulfate
Chloride
Boron
BOD
Silica
Oil and Greas
Hardness
Aluminium
Arsenic
Barium
Beryllium
Calcium
Chromium
Cobalt
Copper
Iron
Lead
Lithium
Magnesium
Manganese
Mercury
Molybdenum
Nickel
Potassium
Selenium
Sodium
Strontium
Tin
Thallium

Thorium						
Uranium						
Vanadium						
Zinc						

Thorium
Uranium
Vanadium
Zinc

68267	68267	68267	68267	68267	68267
e					

Bore	34330
Date	
Time	
Sampler	
Field results	
pH	
DO	
Cl	
EC (µS/cm)	
TDS	
Temp	
Lab results	
Conduct	
TDS	
SS	
Alkalinity	
Fluoride	
Sulfate	
Chloride	
Boron	
BOD	
Silica	
Oil and Grease	
Hardness	
Aluminium	
Arsenic	
Barium	
Beryllium	
Calcium	
Chromium	
Cobalt	
Copper	
Iron	
Lead	
Lithium	
Magnesium	
Manganese	
Mercury	
Molybdenum	
Nickel	
Potassium	
Selenium	
Sodium	
Strontium	
Tin	
Thallium	

Thorium	
Uranium	
Vanadium	
Zinc	

34330	34330	34330	34330	34330

Bore	62420	62420
Date		
Time		
Sampler		
Field results		
pH		
DO		
Cl		
EC (µS/cm)		
TDS		
Temp		
Lab results		
Conduct		
TDS		
SS		
Alkalinity		
Fluoride		
Sulfate		
Chloride		
Boron		
BOD		
Silica		
Oil and Grease		
Hardness		
Aluminium		
Arsenic		
Barium		
Beryllium		
Calcium		
Chromium		
Cobalt		
Copper		
Iron		
Lead		
Lithium		
Magnesium		
Manganese		
Mercury		
Molybdenum		
Nickel		
Potassium		
Selenium		
Sodium		
Strontium		
Tin		
Thallium		

Thorium		
Uranium		
Vanadium		
Zinc		

62420	62420	62420	62420

Nob's	Nob's	Nob's	Nob's
Date			
Time			
Sampler			
Field results			
pH			
DO			
Cl			
EC (µS/cm)			
TDS			
Temp			
Lab results			
Conduct			
TDS			
SS			
Alkalinity			
Fluoride			
Sulfate			
Chloride			
Boron			
BOD			
Silica			
Oil and Grease			
Hardness			
Aluminium			
Arsenic			
Barium			
Beryllium			
Calcium			
Chromium			
Cobalt			
Copper			
Iron			
Lead			
Lithium			
Magnesium			
Manganese			
Mercury			
Molybdenum			
Nickel			
Potassium			
Selenium			
Sodium			
Strontium			
Tin			
Thallium			

Thorium			
Uranium			
Vanadium			
Zinc			

Nob's	Nob's	Nob's

13030283	13030283	13030283	13030283	13030283
Date				
Time				
Sampler				
Field results				
pH				
DO				
Cl				
EC (µS/cm)				
TDS				
Temp				
Lab results				
Conduct				
TDS				
SS				
Alkalinity				
Fluoride				
Sulfate				
Chloride				
Boron				
BOD				
Silica				
Oil and Grease				
Hardness				
Aluminium				
Arsenic				
Barium				
Beryllium				
Calcium				
Chromium				
Cobalt				
Copper				
Iron				
Lead				
Lithium				
Magnesium				
Manganese				
Mercury				
Molybdenum				
Nickel				
Potassium				
Selenium				
Sodium				
Strontium				
Tin				
Thallium				

Thorium				
Uranium				
Vanadium				
Zinc				

13030283	13030283

13030284	13030284	13030284	13030284	13030284	13030284
Date					
Time					
Sampler					
Field results					
pH					
DO					
Cl					
EC (µS/cm)					
TDS					
Temp					
Lab results					
Conduct					
TDS					
SS					
Alkalinity					
Fluoride					
Sulfate					
Chloride					
Boron					
BOD					
Silica					
Oil and Grease					
Hardness					
Aluminium					
Arsenic					
Barium					
Beryllium					
Calcium					
Chromium					
Cobalt					
Copper					
Iron					
Lead					
Lithium					
Magnesium					
Manganese					
Mercury					
Molybdenum					
Nickel					
Potassium					
Selenium					
Sodium					
Strontium					
Tin					
Thallium					

Thorium					
Uranium					
Vanadium					
Zinc					

13030284

13030532	13030532	13030532	13030532	13030532	13030532	13030532
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Thorium						
Uranium						
Vanadium						
Zinc						

13030128	13030128	13030128	13030128	13030128	13030128	13030128
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						
Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						

Thorium						
Uranium						
Vanadium						
Zinc						

Post-spill

Surface	ADB	ADB	ADB	ADB	ADB	ADB
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (μS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

Surface	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing
Date						
Time						
Sampler						
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Callide Lab results						
Cond (mS/m)						
Turbidity						
pH						
Sulfate						
Chloride						
Lab results						
Conduct						
TDS						
SS						
Alkalinity						
Fluoride						
Sulfate						
Chloride						
Boron						
BOD						
Silica						
Oil and Grease						
Hardness						
Aluminium						
Arsenic						
Barium						
Beryllium						
Calcium						
Chromium						
Cobalt						
Copper						
Iron						
Lead						
Lithium						
Magnesium						

Manganese						
Mercury						
Molybdenum						
Nickel						
Potassium						
Selenium						
Sodium						
Strontium						
Tin						
Thallium						
Thorium						
Uranium						
Vanadium						
Zinc						

[redacted]

From: [redacted]
Sent: Tuesday, 11 January 2011 9:06 AM
To: [redacted]
Cc:
Subject: RE: Callide Valley Irrigator Advisory Committee Meeting

WE have established that SunWater have reactivated the gauging station downstream of the Callide Dam.

I will chase up this information this morning

We are hoping to get access today so we can get flow rates for the current release.

would suggest we use this site to do our water quality monitoring

will also need one further site downstream

Would suggest we get [redacted] to monitor the discharge and provide data.

We should also start water quality testing now so we have a reading prior to and ash dam discharge

regards

[redacted]
A Regional Manager
Water Services
Central West Region
Department of Environment and Resource Management
Telephone [redacted] **Facsimile** [redacted]
Mobile
Email [redacted]
www.nrw.qld.gov.au

From: [redacted]
Sent: Tuesday, 11 January 2011 8:38 AM
To: [redacted]
Cc:
Subject: RE: Callide Valley Irrigator Advisory Committee Meeting
Importance: High

G'day [redacted]

As discussed I think it's essential that we be present at this meeting to discuss the process. Are you available to attend with [redacted] I'd normally push for a rep from Water Services but know that they will have trouble physically getting there because of flood waters and have other water entitlement discussions planned which should not be mixed in with the CS Energy issue.

[redacted] please confirm our attendance. Will discuss how we should conduct ourselves prior to going.

Thanks ….. [redacted]

[redacted]
Incident Hotline - 1300 130 372

From: [redacted]
Sent: [redacted] 2011 8:13 AM
To: [redacted]
Subject: FW: Callide Valley Irrigator Advisory Committee Meeting

FYI

[redacted]
Environmental Officer, Regional Services
Telephone: [redacted] **Facsimile:** [redacted]
Email: [redacted]
www.derm.qld.gov.au

Department of Environment and Resource Management
136 Goondoon Street, Gladstone
PO Box 5065, Gladstone QLD 4680

*Nominations for the 2011 Premier's ClimateSmart Sustainability Awards, which recognise Queenslanders who are ClimateSmart champions achieving excellence in sustainability, are open until **Friday 4 March 2011**. For more information on how to enter visit www.derm.qld.gov.au/premiersawards*

From: [redacted]
Sent: Thursday, 6 January 2011 1:52 PM
To: [redacted]
Cc: [redacted]
Subject: Callide Valley Irrigator Advisory Committee Meeting

Advisory Committee

I would like to propose bringing forward our next meeting of the advisory group, which was to be held on the 19th.

The main topic for discussion will be regarding the Callide Power Station Ash Dam water level which has reached a historically high level.

I would suggest that the storage level of Callide Dam and timing of irrigation releases be also discussed.

Meting time: 10:00am
Date : Wednesday 12th of January
Venue: SunWater Conference Room, Gladstone Rd Biloela.

Please advise if you are able to attend.

Regards
[redacted]

Service Manager
SunWater Ltd
Address: [redacted]
Phone [redacted]
Fax [redacted]
Mobile [redacted]
Email [redacted]

[redacted]

From: [redacted]
Sent: Tuesday, 11 January 2011 10:42 AM
To: [redacted]
Cc:
Subject: RE: Proposed Callide Creek Groundwater and Surface Water Monitoring For TEP

Greetings [redacted]

The following provides some further comment on the draft TEP Please call if anything is not clear.

- Performance indicators

  The objective of the TEP is to implement water management measures that avoid environmental harm being caused by overflow of ash dam B. Therefore, one of the performance indicators needs to be that the water quality within Callide Creek continues to meet water quality objectives during any controlled release.

- Actions

  Discussions with Sun Water suggest that 300 Ml/day of flow is required to ensure that any release passes through the recharge area (action 1 suggests 150 ML/day) so 300 ML will be the minimum flow.

  Releases are to be limited to 5% of flow ie 15 ML/Day with 300 ML/Day flowing through the system.

  Triggers for ceasing release need to be explicit. These are:
  - When water quality within the creek reaches any of the trigger levels identified in Table A water quality performance indicators with the amendment that the trigger for conductivity is 1000 us/cm.
  - Flow expected to be below than 300 ML/Day in the next 24 hours.
  - When the water level in the dam is reduced to the MRL

- Monitoring

Some detail on responsibility, timing and methods of flow monitoring in Callide creek and of releases from the dam needs to be included.

Monitoring of quality of water being released from the ash dam is to be carried out at the release point (end of pipe) or at the inlet to the pipe / pump.

If monitoring of water being released from the ash dam indicates that a 20:1 dilution is insufficient then release flow rate must be adjusted accordingly.

Monitoring at 'Nobs Callide Creek site " is to be carried out during any release fro the dam

The monitoring plan needs to be lodged as an appendix to the TEP

- Reporting

During release, daily reports to DERM of EC, DO, Cl, pH, TDS and temp for water released from ash dam and at the Callide Creek surface monitoring sites as well as flow in Callide Creek and volume discharged from the ash dam.

When bore samples are taken, report to DERM EC, DO, Cl, pH, TDS.

Full analysis to be provided within 2 weeks of sampling

- Closure

This TEP remains in force until the Mandatory Reporting Level of RL 213.33 m is achieved or until 20 April 2011, whichever comes first.

Regards

[redacted]

A / Manager Environmental Services
Gladstone
Telepho[redacted] 6
Mobile[redacted]
Email: [redacted]

Clean and Healthy Air for Gladstone

Department of Environment and Resource Management
Level 3 Centrepoint Building, 136 Goondoon St.
Gladstone, Queensland 4680
P.O. Box 5065 Gladstone, Queensland 4680

From [redacted]
Se[redacted] 6:09 PM
To: [redacted]
Cc: [redacted]
Subject: Proposed Callide Creek Groundwater and Surface Water Monitoring For TEP

[redacted]

Further to our [redacted] discussion this afternoon, attached is the proposed monitoring schedule I offered to provide to you which will form part of the TEP. The following comments are relevant to this monitoring program.

Surface water monitoring

Since our discussion, and to address the concern you add that "Linkes Road Callide Creek" site was too far downstream for monitoring of Western Route releases, [redacted]nd I have reviewed the initial proposal we had developed and have added an additional surface water sampling site ("Callide Creek adjacent to Nob's Bore"). This location [redacted]ate land but we do not anticipate access issues. This site lies downstream of the "Callide Dam Access Road Causeway" and upstream of the "Linkes Road" site. It would be used as the near-release monitoring site at times when release is down the Western Route from the site. "Nob's Callide Creek" site lies about 1.5 km downstream of the Causeway site. The Causeway site would continue to be monitored to cover release from the Eastern Route.

Groundwater sampling

We have also increased the monitoring proposal for groundwater, over and above that specified in the Spill Management Plan. We have included Nob's Bore and CS Energy Bore 34S (adjacent to the Causeway) noting however that it will be impossible to sample 34S at most times when the Creek is flowing with any significant volume. We have also added 4 additional bores along the Creek down to the Biloela-Gladstone Road Bridge, that were sampled in December as part of the baseline monitoring undertaken in Callide Creek. This will give a total of 9 bores, plus MW34S when accessible.

Attached is the proposed Monitoring Plan. I have included the file saved as Office 2007 (developed in) and Office 2003. Note also that whereas the plan refers to Aurecon carrying out some monitoring, arrangements for this are still being finalised. We would probably prefer to leave the name of the consultant out of the final TEP version.

Finally, if you were able to forward a list of the changes you required to the TEP wording, I will amend the TEP accordingly and get it back to you ASAP for approval.

Regards

[redacted] from Callide Power Station

Mobile

Department of Environment and Resource Management

Procedural guide

Environmental Protection Act 1994
Transitional environmental program (TEP)

Part 1 – Notice requiring a draft TEP

This document is designed to assist Environmental Services officers to issue a notice requiring a draft TEP under the provisions of Chapter 7, Part 3 of the Environmental Protection Act 1994.

What is a TEP?

Section 330 of the *Environmental Protection Act 1994* (the Act) provides that a transitional environmental program (TEP) is a specific program which, when complied with, facilitates compliance with the Act for the activity to which the TEP relates by doing one or more of the following—

- reducing environmental harm caused by the activity
- detailing the transition of the activity to an environmental standard
- detailing the transition of the activity to comply with:
  - a condition (including a standard environmental condition) of an environmental authority or code of environmental compliance or
  - a development condition.

The legislative provisions in respect to TEPs can be found in Chapter 7, Parts 3 and 4 (ss330-357) of the Act.

Who can enter into a TEP?

A person or public authority may enter into a TEP voluntarily or may be required to submit a draft TEP by the Department.

When can a TEP be used?

TEPs are intended to be used where a significant change or changes are needed to be made by a person to achieve compliance. One of the reasons for this is that a person has some protection from prosecution for actions conducted under the TEP for the duration of the TEP.

(a) Requirement to submit a draft TEP

There are certain circumstances when the Department may require a person or public authority to prepare and submit for approval a draft TEP. These circumstances are set out in Section 332 of the Act.

(b) Voluntary TEP

Section 333 of the Act provides that a person or public authority may also, at any time, submit a draft TEP to the Department for an activity the person or public authority is carrying out or proposes to carry out.

(c) Program notices

A person intending to prepare and submit a voluntary TEP may give the Department a program notice under s350 of the Act. For further information in regard to program notices, see: Procedural Guide - Program notices TEP

(d) Fee for consideration of draft TEP

A person or public authority that submits a draft TEP to the Department for consideration and approval must pay the Department the fee prescribed by regulation. See: Operational policy - Transitional Environmental Program (TEP) fees

An invoice for the fees incurred should be issued to the person or public authority that has submitted the draft TEP for approval at the time when the notice stating the Department's decision is issued.

How do I successfully issue a notice requiring a draft TEP?

Officers must complete an assessment report to document the decision to issue a notice requiring a draft TEP, as well as completing the notice.

Step 1 - Complete the Assessment Report

Before completing the notice requiring a draft TEP, officers must complete an assessment report. The assessment report sets out the facts and circumstances relating to the matter and documents the decision-making process of the Department in determining whether or not to issue the notice.

The following sections of the procedural guide are a guide to completing the assessment report. The numbering and headings of the sections in the procedural guide correlate with those in the assessment report for ease of reference.

The assessment report is not intended to replicate the Departmental file. Rather it should capture all critical aspects considered by the Department in making a decision. Accordingly, officers should include relevant points only. A template assessment report may be found on the Compliance Support Materials page on the Departmental intranet.

1. Brief history of the matter

Briefly outline any historical information relevant to the decision. This information should be presented in succinct chronological dot points and include how the Department became aware of the issues that led the Department to consider issuing a notice requiring a draft TEP.

For example:

- *Previous compliance inspections have identified risks with stormwater controls and management on the site (CA123 – Ecotrack – May 2008) (CA456 – Ecotrack – May 2009).*
- *The operator made significant investments in stormwater management infrastructure in 2002, however the business has grown substantially since this period with no changes to stormwater management.*
- *Discussions with the operator during a compliance inspection on 10 May 2010 indicated an acceptance of the need to investigate and pursue further stormwater management improvements and included a discussion of the potential submission of a draft TEP.*

- *The Department wrote to the operator on 1 June 2010 to advise of the outcomes of the May compliance inspection.*
- *The Department received an Annual Return Form from the operator attaching stormwater release monitoring results demonstrating non-compliance with development approval conditions C11 and C12.*
- *The Department issued a notice requiring a draft TEP to another timber preservation/treatment operator in the region for non-compliance with development approval conditions associated with stormwater management issues.*

2. Grounds for issuing a notice requiring a draft TEP

The legislation provides in Section 332 that the Department may require the submission of a draft TEP—

- as a condition of an environmental authority or
- as a development condition of a development approval.

The Department may also require the preparation and submission of a draft TEP if satisfied that—

- an activity carried out, or proposed to be carried out by the person or authority is causing, or may cause unlawful environmental harm or
- it is not practicable for the person or public authority to comply with an environmental protection policy or regulation on its commencement or
- a condition of an environmental authority held by the person or public authority is, or has been, contravened or
- a standard environmental condition of a code of environmental compliance for a chapter 4 activity is, or has been, contravened by the person or public authority or
- a development condition of a development approval is, or has been, contravened and the person or public authority is:
    - an owner of the land for which the approval is granted or
    - another person in whom the benefit of the approval vests.

In this section, an officer must identify the relevant grounds upon which the decision to issue the notice requiring a draft TEP is based. For example:

A timber preservation/treatment operator is required under development approval conditions to ensure that stormwater released from the site meets specific limits. A compliance inspection was undertaken on the site that identified some issues with stormwater controls and management. Following the inspection, a letter was sent by the Department to the operator advising of the outcomes of the inspection and reminding the operator of its responsibilities. The operator submitted monitoring results indicating that on occasion, stormwater was released from the site in breach of the release limits.

A notice requiring a draft TEP was issued to the operator based on the following grounds:

1. *that an activity carried out, or proposed to be carried out, by the person is causing, or may cause, environmental harm and/or*
2. *that a development condition of a development approval is, or has been, contravened and the person is an owner of the land for which the approval is granted.*

3. Expand upon the grounds

The purpose of this section is to clearly identify the elements, or what the Department must 'prove' before deciding to use a notice requiring a draft TEP, and should be used to expand upon the grounds which have previously been identified. This can include identifying the specific offence or breach under investigation or any statutory requirements listed in the legislation which must be met by the Department prior to issuing the notice.

In instances where one action has resulted in multiple breaches, each breach should be listed independently. For example, a site inspection could potentially detect a number of breached conditions associated with a single development approval. In this situation each breach would need to be proven on its own merits and should be listed separately.

Each ground (including breaches or requirements) should be allocated a separate number.

4. Detail the matters considered

The purpose of the table in the assessment report is to link the elements of the breach to the evidence gathered and the conclusions formed. This is achieved by identifying:

- the elements of any specific breach or allegation
- the evidence which has been considered for each element and
- the conclusion that has been reached by the officer after considering the information sourced.

When documenting the evidence, officers should limit the information to relevant points only. This can include (but is not limited to):

- notes recorded in an officer's official notebook
- samples collected for analysis and any subsequent lab reports
- photographs and copies of documents and
- any observed actions and direct testimony received from individuals.

The last column in the table requires officers to detail the relevant facts and circumstances. Officers are encouraged to consider the accuracy and relevance of available evidence, historical details, professional expertise and the weight attributed to any direct testimony provided.

After considering the details, evidence, facts and circumstances, officers are required to set out how the TEP would deal with the issues.

5. Provide for Natural Justice

Prior to the Department making a decision which may adversely impact on an individual or group it must:

- **Notify** - Notify the individual that the Department is considering issuing a notice requiring a draft TEP
- **Respond** - Provide the individual with an opportunity to respond to the allegation and
- **Consider** - Consider any representations made by the affected person before finalising the decision.

The seriousness of the matter will dictate the process by which natural justice is provided and is likely to vary from case to case. Accordingly, officers should use their discretion in determining how to best ensure natural justice is afforded and the amount of time provided to the affected person to respond. In some circumstances it may be appropriate for an officer to discuss the above information with the affected person during a site inspection or a telephone interview and to take contemporaneous notes. In more serious circumstances a written notification which includes a specific closing date for submissions should be used.

Regardless of the manner in which natural justice is afforded, any information provided by the affected person is to be documented. The summary of information should include how natural justice was provided as well as any responses given by the affected person. For example:

Following each of the compliance inspections, the Department wrote to the site operator advising of the outcomes of the inspections and the risks identified with stormwater management on the site:

- *CA123 – May 2008*
- *CA456 – May 2009*
- *CA780 – May 2010*

On-site discussions with the operator during the May 2010 compliance inspection indicated an acceptance of the need to investigate and pursue further stormwater management improvements and included commitments to consider drafting a voluntary TEP.

Since the May 2010 compliance inspection the Department has had further discussions with the operator, raising the implications of the exceedances of the release limits observed in the stormwater quality monitoring results for the last 12 months. The operator was also informed that the Department's intention was to issue a notice requiring a draft TEP and given a period of five business days to submit any further information for consideration by the Department. The operator did not submit any formal submissions to the Department but has advised by telephone of an intention to engage a suitably qualified consultant to assist with drafting a plan of action for site upgrades.

6. Proposed requirements of the TEP

Officers are required to include the following things (amongst other things as set out in s332(4)) in the notice requiring a draft TEP—

- the matters to be addressed by the program and
- the period over which the program is to be carried out and
- the day (at least a reasonable period after the notice is given) by which the program must be prepared and submitted to the Department.

In instances where it is recommended that requirements are imposed upon the affected person, officers are required to develop proposed requirements for consideration by the delegate. As affected persons are able to seek a review of the Department's decision to impose one or more conditions/requirements, it is necessary for officers to provide justification for their inclusion.

Requirements must be specific, measureable, achievable, relevant to the activity and time-specific. For further information, refer to the Procedural Guide - Writing effective and enforceable conditions. For example:

Proposed requirement	Justification
The draft TEP must include a stormwater management plan in order to cease all unlawful releases of stormwater from the site on or before 30 November 2011 and be submitted to DERM by 1 July 2011.	*The development of a stormwater management plan is considered to be best practice and is a requirement which is currently being met at other ABC Pty Ltd development sites in Queensland.* *Compliance inspections conducted in May 2008, 2009*

The stormwater management plan must include the following— *1. An assessment of the existing site infrastructure, including but not limited to:* *(a) a determination of the effectiveness of existing stormwater infrastructure in controlling stormwater runoff and capturing contaminants to prevent or minimise the release of contaminants to waters and* *(b) a determination of the effectiveness of existing containment facilities associated with the storage, transport and production of materials in minimising the release of contaminants to the stormwater system and* *(c) a determination of the effectiveness of current management practices and procedures regarding the minimisation of stormwater contamination.* *2. An identification of measures to improve stormwater management on site, which must:* *(a) assess the adequacy of existing pollution control measures and* *(b) identify opportunities to reduce areas of surface contamination and minimise contact of stormwater with contaminants and* *(c) identify opportunities to separate the clean and contaminated stormwater catchments and* *(d) identify opportunities for harvesting clean stormwater for beneficial reuse and* *(e) identify the infrastructure (including its appropriate structural design) required to effectively manage stormwater in each of the stormwater catchments.* *3. A program of activities to construct measures to improve stormwater management on the site, including but not limited to:* *(a) a program of activities informed by 1 and 2 above and* *(b) stormwater quality monitoring to inform the effectiveness of (a) above.* *4. The operator is required to propose a reasonable timetable for consideration of approval by the*	*and 2010 have identified a number of exceedances of release limits of stormwater, with an increase in the last 12 months.* *The Department has consulted with the operator on a number of occasions and discussed the implications of the exceedances. However, such consultation has not resulted in any action by the operator in relation to reducing unlawful stormwater releases.* *The Department estimates that it will take at least 12 months for the operator to upgrade the site to a standard that results in compliance with stormwater release limits.* *After considering all of the issues and the estimated time-frame for the operator to achieve compliance, the Department considers that requiring the operator to provide a draft TEP is the most appropriate and effective course of action.* *As ABC Pty Ltd is currently operating in a regional area, the Department has allowed ABC Pty Ltd 9 weeks (5 weeks more than for an urban area) to develop the plan.*

administering authority for the above actions to be completed.	

7. Recommendation

The responsible officer is required to make a recommendation in relation to the alleged breach. For example:

It is the opinion of the Department that ABC Pty Ltd failed to comply with development conditions D11 and D12 of development approval IPDE123456 by allowing stormwater to leave 24 Jones Road and enter Murphy Creek. After considering all factors the Department has determined that requiring a draft TEP would be the most effective way of achieving the operator's compliance with the development conditions. It is recommended that a notice requiring a draft TEP be issued.

Administrative decisions are made based upon the balance of probabilities. This means that the decision-maker must be able to determine whether, based upon the information available, it was more likely than not that the event occurred.

Officers are encouraged to consider alternative actions/tools, the Department's enforcement guidelines, details of any consultations including site visit details and discussions with the ERA contact officer (if applicable) prior to making a recommendation. The reasonableness of proposed timeframes for the completion and submission of the draft TEP for consideration and approval, and the period over which the TEP is to be carried out, should be taken into account. For example, if the location is geographically isolated, or there is an impending wet season, the Department may consider allowing additional time for the recipient of the notice to prepare the draft TEP.

6. Approval

The assessment report is to be approved by an appropriately delegated officer. The Department's list of delegations can be found at: http://insite2.dnr.qld.gov.au/derm/delegations/

Step 2 - Complete the notice requiring a TEP

The notice requiring a draft TEP must meet a number of legislative requirements in order to be legally binding. A requirement to prepare and submit a draft TEP must be made by written notice which must state—

- the grounds on which the requirement is made and
- the matters to be addressed by the TEP and
- the period over which the TEP is to be carried out and
- the day (at least a reasonable period after the notice is given) by which the TEP must be prepared and submitted to the Department and
- the review or appeal details.

A template notice requiring a draft TEP is included in the TEP material.

The notice and the assessment report must be signed by the decision-maker.

Service of a notice requiring a draft TEP

Service means delivery to the party who will be responsible for actioning the notice. Officers are encouraged to use their discretion as to the most appropriate form of service, having regard to the recipient in question. Methods of service are provided for in ss39 and 39A of the *Acts Interpretation Act 1954* (AI Act).

A notice requiring a draft TEP may be served:

- on a person:
  - by delivering it to the person personally or
  - by leaving at, or by sending it by post, facsimile or similar facility (e.g. email) to the person's last known place of residence or business or
- on a body corporate - by leaving it at, or sending it by post, facsimile or similar facility (e.g. email) to the head office, a registered office or a principal office of the body corporate.

The date, time and method of service should be documented by contemporaneous notes, a file note, any receipts arising from the postage or any facsimile confirmations and email 'read' receipts.

What follow-up is required?

It is important that the matter is appropriately followed up to make sure that the person to whom the notice requiring a draft TEP is issued complies within the required time-frame. Follow-up is to be scheduled by the relevant officer and confirmed with the business area manager. The business area manager is responsible for ensuring follow-up is undertaken within the agreed time frame.

Once a notice has been issued, dates for the submission of the draft TEP and the review and appeal periods should be diarised and monitored. If the draft TEP is not submitted by the due date, follow-up should be carried out by way of a site visit or telephone call. The recipient should be reminded that the time-frame has expired and that non-compliance with the notice could lead to prosecution.

The recipient of the notice requiring a draft TEP may contact the Department during the period of the notice and establish legitimate reasons for non-compliance with the relevant time frame. In this instance the Department may consider granting an extension of time. However, it must be remembered that the affected person should communicate any issues with time-frames prior to their expiration. For further information regarding amendments to an issued notice requiring a draft TEP, please see the paragraph below headed 'Amendments to an issued notice requiring a draft TEP'.

What are my record-keeping responsibilities?

Officers are required to record all allegations of non-compliance in the EcoTrack system. This includes creating a complaint report, uploading copies of any relevant documents, updating the description field with commentary on actions and recording any decisions made on the enforcement measures screen (this includes a decision to take no further action). Hard copies of any relevant documents should be placed on the paper file. The Department is required to make and record an informed decision about all allegations of non-compliance.

Amendments to an issued notice requiring a draft TEP

If minor changes to the notice requiring a draft TEP or an extension of time to respond are required, the recipient of the notice should be notified in writing.

If significant changes are required, officers should, in order to avoid confusion, repeal (revoke) the original notice, and issue a fresh one on the same grounds with the necessary changes.

The repeal and issue of a fresh notice requiring a draft TEP should be carried out in the same way, and subject to the same conditions as the issuing of the original notice. Accordingly, a new assessment report should be completed and endorsed by the appropriate delegate.

It is preferable if the decision to issue a fresh notice is made by the original decision-maker. If this is not possible the decision should be made by a person with the appropriate delegation who holds a position equal to or higher than that of the original decision-maker.

Officers should also update and record the changes or the decision to repeal and re-issue the notice in EcoTrack or CIRaM and place hard copies of any documents on the paper file.

Review of decisions and appeals

The provisions regarding review of decisions and appeals may be found in Chapter 11, Part 3 of the Act.

The Act specifies that a person who is dissatisfied by a decision made by the Department in respect to a notice requiring a draft TEP may apply for a review of an original decision by submitting an application on the approved form to the Department—

- within 10 business days after the day on which the person received notice of the original decision or the Department is taken to have made the decision, or
- if there are special circumstances, whatever longer period the Department allows.

An approved form for the review of an original decision may be found at Application form - Review of Original Decision

A person who has made an application for review of an original decision may immediately apply to the Planning and Environment Court for a stay of the decision.

If the person is dissatisfied with the review decision, the person may appeal against that decision to the Planning and Environment Court by filing written notice of appeal with the registrar of the Court within 22 business days after the day the person receives notice of the decision or the decision is taken to have been made, unless the Court extends the period for filing the notice of appeal.

The court may grant a stay of a decision appealed against until such time the appeal is decided. An appeal against a decision does not affect the operation or the carrying out of a decision unless the decision is stayed.

Further information about review of decisions and appeals may be found in the Information sheet - Internal review (DERM) and appeal to the Planning and Environment Court

Non-Compliance with a notice requiring a draft TEP

Officers must respond and may take further action in relation to non-compliance with a notice requiring a draft TEP. The following issues should be considered—

- **Providing extra time** – If extra time to comply has been granted, officers should document the details of the extra time allowed and the reasons for giving the extension of time. Confirmation of these details should be provided in writing to the recipient of the notice.
- **Other tools** – It may be that using another compliance tool would be more likely to achieve compliance. For example, issuing an Environmental Protection Order (EPO) in relation to the non-compliance may be a more appropriate way to achieve compliance due to the far higher penalty for breaching the EPO.
- **Prosecution** – If no other action is likely to be effective, officers should consider prosecuting a non-compliant recipient of a notice requiring a TEP for both failure to comply with the notice as well as for the environmental harm being caused.

What penalties exist for non-compliance with a notice requiring a draft TEP?

A person must comply with a notice requiring a draft TEP, unless the person has a reasonable excuse (s332(5)).

Maximum penalty for non-compliance with a notice requiring a TEP—

For an individual – 100 penalty units or $10,000.00.

For a corporation – 500 penalty units or $50,000.00.

[redacted]

From: [redacted]
Sent: Monday, 10 January 2011 3:48 PM
To: [redacted]
Subject: FW: Callide

FY consideration ..... Don

[redacted]

Incident Hotline - 1300 130 372

From: [redacted]
Sent: Monday, 10 January 2011 3:37 PM
To: [redacted]
Cc: [redacted]
Subject: FW: Callide

Hi [redacted]
As per my email on Saturday, my drinking water team has briefly reviewed the TEP application. Comments are provided below. Anne had a brief discussion with Paul Florian (QH) regarding the TEP. [redacted] is very busy with other, more pressing public health matters at the moment and was not overly concerned about this matter.
Please don't hesitate to call if I can be of any further assistance.
Regards
[redacted]

Director, Recycled and Drinking Water Quality,
Office of the Water Supply Regulator
Telephone [redacted] **Mobile:**
Facsimile: [redacted]
Email: [redacted]
www.derm.qld.gov.au

Department of Environment and Resource Management,
Level 3, Mineral House, 41 George St, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

From: [redacted]
Sent: [redacted]ary 2011 1:48 PM
To: [redacted]
Subject: RE: Callide

Hi [redacted]

I have reviewed the information we have on the drinking water infrastructure at Biloela and calculated the dilution effects of the Ash Dam B with Callide Dam water on the monitored parameters prior to release. Given a worst case scenario of a 1 in 10 dilution and no treatment (as may be the case if water from the alluvium derived bores is delivered directly to consumers) then there is unlikely to be a concern with drinking water quality.

- Biloela WTP has a multistage treatment system (aeration, flocculation, lime and alum dosing, filtration as well as chlorination). Water from the Callide dam is normally blended with the water from 11 bores in Callide Creek and is supplied to the Biloela, Thangool and Callide region servicing over 6000 people.
- There are a number of parameters in the Ash Dam water that breach ADWG health guideline values however the dilution with Callide Dam water can manage these effectively to avoid any breach of ADWG health guideline values.
- A dilution of the Ash Dam B at a rate on one part in 10 parts with Callide Dam water means no parameters are likely to breach ADWG health guideline limits. However there are a number of parameters that breach aesthetic values or are close to levels of concern. The substances of concern are dissolved salts (specifically measured through chloride, sulfate, TDS and conductivity).
- Dilution of one in twenty would ensure that both the aesthetic values are under the guideline values. If the projected 1 in 30 dilution is achieved, there should be no issues with water quality.

Given the proximity of the town water offtake for Biloela water supply and the probability that the alluvium is recharged through Callide Creek, it is important that the dilution actually achieves the 1 in 10 dilution as a minimum and this dilution effectiveness is monitored. This can be achieved through continual monitoring of the conductivity to ensure the level does not exceed a set value. The Ash Dam B currently has a measured conductivity of 9120 micro semens and is being diluted with dam water of 345. A one in ten dilution should achieve a value of approximately 958, which is about double the ADWG aesthetic guideline of 500, but will achieve all health guideline values. If a monitoring benchmark is set closer to the ADWG aesthetic guideline that would be preferable and achievable with at least a 1 in 20 dilution. Note, the conductivity does not have a direct health impact but would be a good means of monitoring the dilution effectiveness.

Regards [redacted]

[redacted]
Principal Scientist
Office of the Water Supply Regulator
Telephone: [redacted]
fax [redacted]
Em[redacted]

Department of Environment and Resource Management
Level 3, Mineral House,
41 George St,
GPO Box 2454,
Brisbane Qld 4001

From: [redacted]
Sent: Monday, 10 January 2011 9:24 AM
To: [redacted]
Subject:

[redacted]
Director, Recycled and Drinking Water Quality,
Office of the Water Supply Regulator
Telephone [redacted] **Mobile:**
Facsimile: [redacted]
Email: [redacted]

www.derm.qld.gov.au

Department of Environment and Resource Management,
Level 3, Mineral House, 41 George St, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

Procedural guide

Environmental Protection Act 1994
Transitional environmental program (TEP)

Part 2 - Considering and making a decision about a draft TEP

This document is designed to assist users to critically evaluate the content of a draft TEP and assess whether or not the proposed objectives and actions meet the legislative requirements.

Consideration of a draft TEP submitted by a person or public authority

If a person submits a draft TEP to the Department of Environment and Resource Management (the Department), the Department is required to consider the draft TEP and make a decision whether to approve or refuse the draft TEP, or to approve it with conditions.

Section 337 of the *Environmental Protection Act 1994* (the Act) provides that the Department must make its decision within 20 business days after—

- if a public notice is required under s335—the day stated in the notice as the day by which public submissions may be made to the Department or
- otherwise—the application date.

The terms *application date* and *person* are defined below.

Application date (s552)

The *application date* is important because many actions in relation to a draft TEP must be made within a certain number of days from the application date. Subsection 552(2) of the Act states that the application date relating to a draft TEP is 10 business days after the day it has been submitted to the Department.

However, if the Department requires additional information about the draft TEP within 8 business days after the day it has been submitted, the application date is the day the Department states in a written notice to the applicant as being the application date (s552(3)). This day must not be earlier than two business days after the person has received the written notice (s552(6)).

If, within 8 business days after a person submits a draft TEP, the Department advises the person who made the submission that the TEP (or proposed amended TEP) does not contain or provide for a matter mentioned in s331 (content of a program), and the person is required by the Department to amend the submission so that the TEP (or proposed amended TEP) is compliant with s331 and to resubmit the submission to the Department, the application date is the day that is 10 business days after the day the amended TEP is submitted to the Department.

Or, if the Department requires additional information about the amended TEP within 8 business days after the day the amended TEP is submitted to the Department, the application date is the day the Department states in a written notice to the applicant as being the application date (s552(5)). This day must not be earlier than 2 business days after the person has received the written notice (s552(6)).

Person

The term *person* includes an individual, public authority or corporation.

Fee for consideration of a draft TEP (s334)

A person that submits a draft TEP to the Department for consideration and approval must pay to the Department the fee prescribed by regulation. See: Operational policy - Transitional Environmental Program (TEP) fees

An invoice for the fees incurred should be issued to the person that has submitted the draft TEP for approval at the time when the notice stating the Department's decision is issued.

What must be included in the content of a draft TEP? (s331)

Section 331 of the Act requires that a draft TEP must, for the activity to which it relates—

(a) state the objectives to be achieved and maintained under the TEP for the activity and

(b) state the particular actions required to achieve the objectives, and the day by which each action must be carried out, taking into account:

  (i) the best practice environmental management for the activity and

  (ii) the risks of environmental harm being caused by the activity and

(c) state how any environmental harm that may be caused by the activity will be prevented or minimised, including any interim measures that are to be implemented and

(d) if the activity is to transition to an environmental standard, state:

  (i) details of the standard and

  (ii) how the activity is to transition to the standard before the TEP ends and

(e) if the activity is to transition to comply with a condition of an environmental authority or code of environmental compliance, or a development condition, state:

  (i) details of the condition and how the activity does not comply with it and

  (ii) how compliance with the condition will be achieved before the TEP ends and

(f) state the period over which the TEP is to be carried out and

(g) state appropriate performance indicators at intervals of not more than six months and

(h) provide for monitoring and reporting on compliance with the program.

Is public notice required? (s335)

Public notice is required where the person submits a draft TEP for approval that states the TEP is to be carried out over a period of longer than three years. Within 2 business days after the application date, the person must give public notice of the submission by:

- an advertisement published in a newspaper circulating generally in the area in which the activity to which the draft program relates is, or is proposed to be, carried out and
- if the program relates to premises, a notice must also be placed on the premises and served on the occupiers of all adjoining premises

- invite submissions on the draft TEP (s335(3)(b)) and state the day (at least 10 business days after the advertisement and service of notice) nominated by the Department as the day by which submissions may be made to the Department.

The notice must meet the requirements of the Act,

In what circumstances may the Department call a Conference? (s336)

The Department may invite the person that has submitted a draft TEP, and another person that has made a submission under section 335 about the TEP, to a conference to help it decide whether or not to approve the draft TEP. See section 336 of the Act for details of notice and other requirements regarding conferences.

Other consultation and considerations

Depending on the content of the draft TEP, officers may need to consult with other business units or Departments in order to ensure that the risks from, and effects of, the draft TEP have been fully understood. For example, if the draft TEP involves releases of water, Queensland Health and/or the Office of the Water Supply Regulator should be consulted. Releases to air may also require consultation with Queensland Health.

Officers should consider whether a formal risk assessment should be undertaken to ensure that any risks from approving the draft TEP are identified and adequately managed.

Consideration of draft TEPs (s337)

The Department must decide whether to approve a draft TEP submitted to it within 20 business days after the application date. Or, if a public notice is required under s335, the Department must make a decision 20 business days after the day stated in the notice as the day by which submissions may be made to the Department. If public notice of the submission of the draft TEP is required to be given, the Department must be satisfied that public notice has been properly given before making a decision (s337(2)).

If the Department fails to decide whether to approve or refuse a TEP within the time it is required to make a decision, the failure is taken to be a decision by the Department to refuse to approve the program at the end of the time (s343).

What must be taken into consideration? (s338)

When deciding whether or not to approve the draft TEP or the conditions (if any) of the approval, the Department—

- must comply with any relevant regulatory requirement and
- subject to the above, must also consider the following:
  - the standard criteria
  - additional information given in relation to the draft TEP and
  - the views expressed at a conference held in relation to the draft TEP.

If the draft TEP is prepared because of a requirement of a development condition of a development approval, the Department may approve the draft TEP only if it is not inconsistent with other conditions of the approval.

Decision about draft TEP (s339)

Section 339 of the Act provides that the Department may—

- approve a draft TEP as submitted or
- approve a draft TEP as amended at the request, or with the agreement, of the Department or
- refuse to approve a draft TEP.

If the Department approves the draft TEP it may impose—

- any conditions the Department must impose under a regulatory requirement and
- any other conditions considered appropriate by the Department.

If the draft TEP is approved, the approval remains in force for the period stated in the notice of the approval given pursuant to s340 of the Act.

How does an officer successfully consider and make a decision about a draft TEP?

Officers must complete an assessment report to document the decision whether to accept the draft TEP (with or without conditions), to require amendments to the draft TEP or to reject the draft TEP. If the draft TEP is accepted (with or without conditions) or rejected, a notice of decision must be issued under s340 of the Act.

Step 1 - Complete the assessment report

Before issuing a notice of decision under s340 of the Act, officers are required to complete an assessment report which sets out the facts and circumstances relating to the matter and documents the decision-making process used in determining whether to approve or refuse the draft TEP (with or without conditions).

The assessment report lists all the matters that must be considered by officers during the decision-making process. This includes the criteria by which the TEP must be assessed, the matters that must be addressed by the draft TEP and the matters that officers must consider when making a decision about the draft TEP. Each matter has checkboxes beside it, as well as text fields for officers to provide further information if necessary. The text fields contain explanatory notes indicating the types of information that is to be provided. Officers should check the relevant checkboxes to indicate that the particular matter has either been adequately addressed or is not applicable to that particular draft TEP. If a matter is applicable, but has not been adequately addressed, the checkbox should not be checked, and details as to how the particular matter has not been adequately addressed should be inserted in the text field provided.

The following sections of the procedural guide are a guide to completing the assessment report. The numbering and headings of the sections in the procedural guide correlate with those in the assessment report for ease of reference. Officers should refer to the procedural guide for information while completing the assessment report.

The assessment report is not intended to replicate the Departmental file. Rather, it is designed to capture all critical aspects that have let to the Department's decision. Accordingly, officers should limit the information included to relevant points only.

A template assessment report may be accessed at the Compliance Support Materials site on the DERM intranet.

1. Brief history of the matter

Briefly outline any historical information relevant to this decision. This information should be presented in succinct, chronological dot points and should include the reasons why a draft TEP is now being considered, for example, as a result of a program notice, voluntary submission or in response to a notice requesting the submission of a TEP.

2. Matters that must be considered when making a decision about the draft TEP (s338)

A significant amount of care should go into checking and considering the potential effects of the draft TEP, because by approving the draft TEP, the officer is authorising everything it permits.

Accordingly, the assessment criteria are an instrumental part of the decision-making process. Firstly, they establish the critical objectives that the draft TEP must achieve and how the content of the draft TEP will deliver on these objectives. Secondly, from the view of compliance and enforceability, and to establish that the draft TEP passes the *SMART* test, the requirements must be specific, measureable, achievable, relevant and time-specific. These are vital considerations given that in future, the Department may have to establish beyond a reasonable doubt that the TEP has not been complied with in order to take action against the person for failure to comply with the TEP. For this reason, the contents of the draft TEP must be clearly drafted, unambiguous and easily auditable.

More information about drafting SMART requirements and conditions may be found in the Procedural guide - Writing effective and enforceable conditions

Achieving compliance with the Act (s330)

A TEP should, for the activity to which it is concerned, achieve compliance with the Act by doing one or more of the following things—

- reducing environmental harm caused by the activity
- detailing the transition of the activity to an environmental standard
- detailing the transition of the activity to comply with:
  - a condition, including a standard environmental condition, of an environmental authority or code of environmental compliance or
  - a development condition.

The term *environmental standard* is defined as being:

- an environmental standard (however called) set out, or otherwise provided for, in a regulation under the Act or
- an outcome or objective that is directed at protecting or enhancing environmental values set out in an environmental protection policy.

A *standard environmental condition* for an environmental authority or code of environmental compliance means a standard environmental condition approved by the Minister pursuant to s549 of the Act.

A *development condition* of a development approval means a condition of the approval imposed by, or because of a requirement of, the Department if it is the assessment manager or concurrence agency for the application for the approval.

The draft TEP must set out how the activity is currently in non-compliance with the Act and how the person proposes to make the activity compliant. If it is not clear from the information provided in the draft TEP that by doing one or more of these things compliance with the Act will be achieved by the end of the operative period of the TEP, the draft TEP must not be approved.

Content of the TEP (s331)

A TEP, for the activity to which it relates, must include the following—

(a) Objectives to be achieved and maintained under the TEP

A draft TEP must clearly set out what it is trying to achieve. For example:

EXAMPLE 1
To bring the operator into compliance with conditions G12 and H5 of development approval 123456
EXAMPLE 2
To prevent or minimise environmental harm caused by the migration of landfill gas.

The objectives should be as specific and clear as possible so that, if the draft TEP is approved, the Department can assess whether the objectives have been met.

(b) State the particular actions

The draft TEP must set out the actions that the person will carry out in order to achieve the objectives. It is important that the actions are as definite, specific and as clear as possible. If they are vague or uncertain, it will be difficult for the Department to assess whether the person is doing what they have said they will do, which may prevent the Department from taking enforcement action in future. Each action must have a due date by which it will be completed, and must comply with the SMART principles.

Progress reporting dates and final reporting dates should be included in the actions.

In stating the particular actions required to achieve the objectives, the draft TEP must take into account best practice environmental management. Officers should refer to s21 of the Act for a definition of *best practice environmental management.*

(c) Prevention and minimisation of environmental harm

The risks of environmental harm being caused by the activity should also be taken into account. The draft TEP must state how any environmental harm that may be caused by the activity will be prevented or minimised, including any interim measures that are to be implemented.

(d) Transition to an environmental standard

If the objective of the draft TEP is to transition to meet an environmental standard, the draft TEP must provide details of the standard and set out how the activity is to transition to the standard before the operative period of the TEP comes to an end. Please see 'Achieving compliance with the Act' above for a definition of *environmental standard.*

(e) Transition to comply with a condition of an environmental authority or code of environmental compliance, or a development condition

If the objective of the draft TEP is for an activity to transition to comply with a condition of an environmental authority or code of environmental compliance, or a development condition, the draft TEP must set out each condition and detail how the activity does not comply with the condition. The draft TEP must also state how compliance with the condition will be achieved before the end of the operative period of the TEP.

(f) Period over which the TEP is to be carried out

To be approved, the draft TEP must state the period over which the TEP is to be carried out. If the person has submitted for approval a draft TEP that states it will be carried out over a period longer than three years, the person must give public notice of the submission within 2 business days after the application date in accordance with s335 of the Act.

(g) Performance indicators

The draft TEP must state appropriate performance indicators at intervals of not more than 6 months. The performance indicators must show how the applicant is progressing in achieving the objectives of the TEP. The indicators must also be capable of being measured and be specific enough to enable the Department to assess with certainty whether or not they have been met. The date on which each performance indicator will be met must be set out in the TEP.

(h) Monitoring and reporting

The draft TEP must provide for sufficient monitoring and reporting on compliance with the program. It should provide for the person to monitor and report on—

- the carrying out of the actions
- whether or not the objectives are being achieved
- whether or not the required time-frames are being met and
- any environmental and scientific testing.

The draft TEP should also allow for the person to provide—

- reports on progress with the TEP, including any failure to carry out prescribed actions by the stipulated dates
- reports on any environmental monitoring requirements (including interpretation) and
- a final report to the Department demonstrating that compliance with the Act has been achieved.

Regulatory requirements (s338(1)(a))

Sections 46-64 of the *Environmental Protection Regulation 2008* specify the matters that must be considered when the Department is making environmental management decisions. An *environmental management decision* is a decision under the Act for which the Department is required to comply with regulatory requirements. All matters relevant to the draft TEP must be considered when making a decision about it, for example, if there are certain matters specified where release of water to land is contemplated.

Standard criteria (s338(1)(b)(i))

As stated above, the Department **must** consider the standard criteria, set out below, before deciding whether or not to approve the draft TEP—

- The **principles** of **ecologically sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development (ESD)'**

  Consider the following guiding principles:

  - Has the decision effectively integrated long- and short-term economic, environmental, social, and equity considerations?

  - Has due regard been given to the precautionary principle? In other words, 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.
  - Does the decision have due regard to the global dimensions of environmental impacts and policies?
  - Does the decision assist in the development of a strong, growing and diversified economy, which can enhance the capacity for environmental protection?
  - Has the need to maintain and enhance international competitiveness in an environmentally sound manner been considered when making the decision?
  - Have cost effectiveness and flexible policy instruments (for example, improved valuation, pricing and incentive mechanisms) been adopted?
  - Does the decision/action allow for broad community involvement on issues that affect them?
- **Any applicable Environmental Protection Policies (EPPs)**
  - Is the draft TEP consistent with the EPPs on water, air, noise and waste (where relevant)?
- **Any applicable Commonwealth, State or local government plans, standards, agreements or requirements**
  - Consider guidelines such as the State and Regional Coastal Plan, National Health and Medical Research Council (NHMRC) and the Australian and New Zealand Environment and Conservation Council (ANZECC) Guidelines.
- **Any applicable environmental impact study, assessment or report**
  - Consider any findings or recommendations that are relevant to the draft TEP.
- **The character, resilience and values of the receiving environment**
  - Does the draft TEP have regard to the environmental values of the receiving environment?
  - What is the impact on the values of the actions contained in the draft TEP?
- **All submissions made by the applicant and submitters**
  - Consider any submissions made by the applicant and anyone who properly makes a submission about the draft TEP.
- **Best practice environmental management for the activity to which the draft TEP relates**
  - Analyse how approving the draft TEP with or without conditions will ensure that best practice environmental management is achieved.
- **The financial implications of the requirements**
  - Explore the financial implications for the client in complying with conditions of the TEP. Are they reasonable in the particular circumstances?
- **The public interest**
  - Is it in the interest of the community that the draft TEP be approved?
- **Any applicable site management plan**
  - If there is a site management plan for contaminated land (approved under Chapter 7, Part 8 of the Act), and is the draft TEP consistent with the site management plan? If not, is the inconsistency necessary for addressing the matters in the draft TEP? How will any inconsistency be reconciled?

Consult with the Contaminated Land Unit as early as possible when there are any contaminated land issues.

- **Any relevant integrated environmental management system or proposed integrated environmental management system (IEMS)**
  - Is the draft TEP consistent with the IEMS? If not, is the inconsistency necessary for addressing the matters in the draft TEP? How will any inconsistency be reconciled?
- **Any other matter prescribed by a regulation**
  - See 'regulatory requirements' above.

Additional information (s338(1)(b)(ii))

The Department must consider any additional information given in relation to the draft TEP. Has all supporting information provided by the applicant been considered? Having considered the draft TEP and any supporting information, is it clear that the draft TEP achieves compliance with the Act?

Views expressed at a conference (s338(1)(b)(iii))

If a conference has been held as part of a public notice process, the views expressed at that conference in relation to the draft TEP must be considered and the reasons for having regard to, or not having regard to, those views must be recorded.

Consistency with development conditions of a development approval (s338(2))

If the draft TEP is prepared because of a development condition of a development approval, the Department must not approve the draft TEP unless it is consistent with other conditions of the development approval.

Public notice of submission of draft TEP (s337(2)) and substantial compliance with the Act (s342)

If public notice is required, before approving the draft TEP, ensure that the person or public authority submitting the draft TEP has properly given public notice and complied with the requirements of s335 of the Act.

The Department must be satisfied that the public notice has been properly given before making a decision (s337 of the Act). If the Department is not satisfied that public notice has been properly given, it may consider and decide whether to approve the draft program if it is satisfied there has been substantial compliance with the public notice requirements of the Act (s342).

See 'Is public notice required?' above for further information regarding public notice.

Satisfaction that the draft TEP meets the requirements of the Act

Having considered all of the above matters, officers completing the assessment report must decide whether they are satisfied the draft TEP adequately addresses all of the relevant matters. If any of the issues in the assessment report were answered 'no', officers should proceed to section 4. Otherwise, proceed to section 3.

3. Request for further information and/or amendments to the draft TEP

In some cases the draft TEP may substantially address the required matters, but cannot be approved because some matters have not been adequately addressed. In this situation, the Department may request that further information be provided or that particular amendments be made to the draft TEP. It is important to recognise that if there are major problems with the draft TEP, or a large number of matters that have not been addressed by the draft TEP, officers should recommend to the Delegate that it not be approved and a notice of decision should be sent to the person or public authority that submitted the draft TEP advising of this decision.

However, if it is likely that the draft TEP would be approved if further information is provided or some changes are made, it is preferable for the Department to write to the person submitting the draft TEP and request the further information and/or amendments, rather than approve the TEP subject to conditions, owing to the fact that conditions may be difficult to enforce. See 'Key considerations regarding conditions' below for further information.

Officers should consult with their supervisor when considering whether to request further information or amendments to the draft TEP, and in formulating the amendments required to be made (if any). A request for amendments to a draft TEP should be made in writing. If, after the draft TEP is amended, it is approved, the amended TEP will form part of the approved TEP.

It is highly recommended that a request for amendments be made within 8 business days after the draft TEP is submitted to the Department, as this means that the application date will then be 10 business days after the date that the amended TEP is submitted to the Department. Consequently, the Department will have additional time to consider the amended TEP and make a decision whether or not to approve it.

Time-frames

For information regarding a change in time-frames if further information is sought or the Department requests amendments to the draft TEP, see the section 'Application date' above.

Minor amendments and/or further information

If only very minor amendments are necessary, officers should consider suspending the decision-making process, so as to provide the opportunity to the person submitting the draft TEP to make the requested amendments. If the requested amendments are made, the assessment report can then be completed to reflect the amendments. Then, if all relevant matters have been adequately addressed, officers may recommend that the Delegate approve the draft TEP.

More significant amendments

If the amendments required are more significant or complicated, officers should list the requested amendments in the assessment report and recommend that the Delegate approve a request for the required amendments. Then, if the amendments are provided by the person submitting the draft TEP, officers must complete a fresh assessment report and provide a new recommendation to the Delegate.

4. Approval of the draft TEP

The assessment report lists all the matters that must be considered by officers during the decision-making process, with checkboxes beside each matter. At least one checkbox must be checked beside each matter before a decision can be made to approve the draft TEP.

Key considerations regarding conditions

The Act does make provision for an approval of a draft TEP to be subject to conditions the Department considers appropriate. However, the enforceability of conditions placed on a TEP is unclear. Accordingly, conditions should not be imposed except for minor matters. Conditions must not be used to alter the terms of the TEP itself. If the TEP is not satisfactory, it must be refused or amendments sought from the applicant. Conditions in the notice of decision should not be used as a quasi-development approval, or to alter or amend the TEP to meed the requirements of the Act.

Financial assurance conditions (ss364-367)

Under s364 of the Act, the Department may, by condition of an approval of a TEP, require the holder of the approval to give the Department financial assurance as security for—

- compliance with any conditions of the TEP and
- costs or expenses, or likely costs or expenses, that the Department incurs, or might reasonably incur, in taking action to:
  - prevent or minimise environmental harm or rehabilitate or restore the environment, in relation to the carrying out of an activity under a TEP approval or
  - secure compliance with the TEP, or any conditions of the TEP, for which financial assurance has been given.

However, under s364(2) the Department may impose a condition requiring a financial assurance to be given only if it is satisfied that the condition is justified, having regard to—

- the degree of risk of environmental harm being caused, or that might reasonably be expected to be caused, by the activity carried out, or to be carried out, under the program and
- the likelihood of action being required to rehabilitate or restore and protect the environment because of environmental harm being caused by the activity and
- the environmental record of the holder.

Section 365 of the Act provides that before approving a draft TEP subject to the condition that financial assurance be given, the Department must give the person who submitted the draft TEP a written notice that must –

- state the grounds for the condition and
- state the form and extent of the financial assurance and
- invite the person to make representations to the Department to show why the approval of the draft TEP should not be subject to the condition and
- state the period (at least 22 business days after the notice is given to the person) within which the representations may be made and
- the representations must be made in writing (s365(3)).

Within 20 business days after the end of the period stated in the notice (s365(4)), the Department must—

- consider the representations properly made by the person and
- if the Department gives the approval subject to the condition that the holder of the approval give financial assurance—the Department must give written notice to the person giving reasons for imposing the condition.

5. Refusal to approve a draft TEP

The draft TEP cannot be approved unless a checkbox has been checked next to each matter listed on the assessment report, either to confirm the matter has been adequately addressed, or to indicate that the matter is not applicable to the draft TEP. If a checkbox has not been checked next to a matter, officers are to provide details in the text field provided.

If any of the required matters are not addressed in the draft TEP, officers should either recommend a refusal of the draft TEP, or seek further information or amendments to the draft TEP from the person that submitted it. (See 'Request for further information and/or amendments to the draft TEP' above). If the deficiencies in the draft TEP are too serious to be addressed by further information and amendments, the Department should refuse to approve the draft TEP.

6. Provide for natural justice

The Department must ensure that decisions are made in a fair and consistent manner. This includes ensuring that the affected individual is provided with 'natural justice' (that they are given an opportunity to make their case for why the decision should go in their favour) and that people involved in making the decision are free from bias or the perception of bias.

Any submissions made by the applicant that have not already been considered earlier in the assessment report process must be documented in section 5 of the assessment report.

7. Recommendation

Officers are required to make a recommendation as to whether or not the draft TEP should be approved (with or without conditions) or refused.

8. Approval

An officer with the appropriate delegation must consider the contents of the assessment report and the recommendation and make a decision about whether to approve (with or without conditions) or refuse the draft TEP. The Department's list of delegations can be found on the Department's intranet at http://insite2.dnr.qld.gov.au/derm/delegations/.

Step 2 – Complete the notice of decision

Section 240 of the Act provides that within 8 business days of making a decision under s339, the Department must give the person or public authority that submitted the draft TEP a written notice of the decision (the notice of decision).

If the delegate approves the draft TEP, the notice of decision must—

- identify the documents forming the approved TEP, including any amendments under s339(1)(a)(ii) and
- state any conditions imposed on the approval by the Department and
- state the day the approval ends.

If the draft TEP is approved, the approval remains in force for the period stated in the notice of decision (s339(3)).

Content of approved program (s341)

An approved TEP consists of the following—

- the draft program submitted under section 332 or 333, as amended at the request, or with the agreement of the Department

- any conditions imposed on the program by the Department.

Information notice

If the Department refuses to approve the draft TEP, or approves it with conditions, the notice of decision given to the person or public authority that submitted the program must be an information notice (s340(3)).

An *information notice* means a written notice stating—

- the decision and
- the reasons for the decision and
- the review and appeal details.

Officers must issue an invoice for the fees for consideration of the draft TEP to the person or public authority that has submitted the draft TEP for approval at the time when the notice stating the Department's decision is issued. See: Operational policy - Transitional Environmental Program (TEP) fees

What is the effect of compliance with the approved TEP? (s346)

An approved TEP protects the holder, or a person acting under the approval, from enforcement action for non-compliance with the relevant—

- regulation or
- environment protection policy (EPP) or
- environmental authority (EA) held by the holder or
- development condition of a development approval (DA) or
- standard environmental condition of a code of environmental compliance for a chapter 4 activity or
- accredited environmental risk management plan (ERMP) under the Great Barrier Reef protection measures.

What follow-up is required?

It is an offence for the holder of an approved TEP to contravene the program. Officers should diarise all performance indicator requirements listed in the program or conditions and ensure they are monitored for compliance.

Officers are encouraged to use tools such as reminders in Microsoft outlook to ensure the matter is followed up in a timely manner.

Review of decisions and appeals

The provisions regarding review of decisions and appeals may be found in Chapter 11, Part 3 of the Act.

The Act specifies that a person who is dissatisfied by a decision made by the Department about a draft TEP, may apply for a review of an original decision by submitting an application on the approved form to the Department—

- within 10 business days after the day on which the person received notice of the original decision or the Department is taken to have made the decision, or

- if there are special circumstances, whatever longer period the Department allows.

An approved form for the review of an original decision may be found at Application form - Review of Original Decision

A person who has made an application for review of an original decision may immediately apply to the Planning and Environment Court for a stay of the decision.

If the person is dissatisfied with the review decision, the person may appeal against that decision to the Planning and Environment Court by filing written notice of appeal with the registrar of the Court within 22 business days after the day the person receives notice of the decision or the decision is taken to have been made, unless the Court extends the period for filing the notice of appeal.

The court may grant a stay of a decision appealed against until such time the appeal is decided. An appeal against a decision does not affect the operation or the carrying-out of a decision unless the decision is stayed.

Further information about review of decisions and appeals may be found in the Information sheet - Internal review (DERM) and appeal to the Planning and Environment Court

What penalties exist for a contravention of a requirement of a TEP (s432)?

The holder of an approval of a TEP, or a person acting under a TEP, must not wilfully contravene a requirement of the program.

Maximum penalty—1665 penalty units ($166,500.00) or 2 years imprisonment.

The holder of an approval of a TEP, or a person acting under a TEP, must not contravene the program.

Maximum penalty—835 penalty units ($83,500.00).

The maximum penalty for a corporation is five times the penalty for an individual.

What penalties exist for contravention of a condition of approval (s432A)?

A person must not, without reasonable excuse, contravene a condition of an approval of a transitional environmental program.

Maximum penalty—835 penalty units ($83,500.00)

The maximum penalty for a corporation is five times the penalty for an individual.

Department of Environment and Resource Management

Assessment report

Environmental Protection Act 1994
Transitional Environmental Program (TEP)

Part 1 – Notice requiring a draft TEP

This document is intended for internal use to assist Environmental Services officers to record the information considered by the Department when deciding to issue a notice requiring a draft TEP.

Identifying Details	
Compliance activity number	Number
EcoTrack number	Number
Permit number:	Permit number (if applicable)
File number:	File Number
Applicant number:	Number
Trading as:	Trading as details (if applicable)
Registered business address:	Registered business address

Note:

1. Assessment reports recommending a decision be made are to be structured in the format shown below.
2. Explanatory notes for completing the report are given under each heading.
3. The report is to be endorsed by the responsible officer, supervisor and the delegated decision-maker.

1. Brief history of the matter

Briefly outline any historical information relevant to this decision in chronological order.

Briefly outline the historical information in chronological order.

2. Grounds for issuing a notice requiring a draft TEP

Section 332 of the *Environmental Protection Act 1994* provides that the Department may require the submission of a draft Transitional Environmental Program (TEP) in certain circumstances. Identify on which of the following grounds the decision to issue a notice requiring a draft TEP is based.

The Department may require a person or public authority to prepare and submit to it for approval a draft TEP:

☐ As a condition of an environmental authority (EA).

OR

☐ As a development condition of a development approval (DA).

The Department may also require a person or public authority to prepare and submit to it for approval a draft Transitional Environmental Program if it is satisfied:

☐ An activity carried out, or proposed to be carried out, by the person or authority is causing, or may cause, unlawful environmental harm.

OR

☐ It is not practicable for the person or public authority to comply with an environmental protection policy or regulation on its commencement.

OR

☐ That a condition of an environmental authority held by the person or public authority is, or has been, contravened.

OR

☐ That a standard environmental condition of a code of environmental compliance for a Chapter 4 activity is, or has been, contravened by the person or public authority.

OR

☐ A development condition of a development approval is, or has been, contravened and the person or public authority is:

- ☐ an owner of the land for which the approval is granted or
- ☐ another person in whom the benefit of the approval vests.

3. Expand Upon the Grounds

Expand upon the grounds identified for issuing the notice requiring a draft TEP. This can include identifying an alleged offence or any statutory requirement which must be met prior to the Department issuing the notice.

Each ground should be listed independently and allocated a separate number.

Number	Specific Ground
1	Example: ABC Pty Ltd is a timber preservation/treatment operator. While conducting timber preservation/treatment activities, ABC Pty Ltd has released stormwater from its operating site that does not comply with release limits, thereby causing unlawful environmental harm. If ABC Pty Ltd does not upgrade its site and improve its stormwater management system, it is likely that non-compliant releases of stormwater from the site will continue, thereby causing further environmental harm.
2	
3	
4	

4. Detail the Matters Considered

The purpose of the following table is to ensure that there is evidence to support the use of the statutory tool. This is achieved by linking the elements of the breach to the evidence gathered and the conclusions formed (I.e. the facts and circumstances).

When analysing evidence or developing the facts and circumstances, officers are encouraged to consider the accuracy and relevance of the information available, historical details, professional expertise and the weight attributed to any direct testimony provided.

Elements of the offence or legislative requirement *List the elements of any grounds for issuing the notice requiring a TEP*	**Evidence** *Identify the evidence considered which is relevant to the elements or requirement (i.e. statements, photographs, and recordings)*	**Facts and Circumstances** *Detail the facts and circumstance that support the Department's findings.*
Number 1 (Number taken from Section 2)		
An activity carried out, or proposed to be carried out by the person.........	Compliance Inspection CA123: Notes from officer's official notebook taken during site inspection on 20 May 2008.	ABC Pty Ltd carries out timber preservation and treatment activities at its site at 123 Creek Road, Murphyville. The inspection has shown that whilst the operators have some stormwater controls in place, it is apparent that the current system would not be able to effectively manage an increase in production and/or increased rain levels.
	Photographs (x20) of the ABC Pty Ltd site taken during the site inspection on 20 May 2008.	Photographs taken of the existing stormwater management infrastructure, including the stormwater catchments show that the catchments are 80% full. An increase in production or heavy rain is likely to fill the catchments to overflowing.
Is causing, or may cause, unlawful environmental harm.....	Compliance inspection CA456: Notes from officer's official notebook taken during compliance inspection on 3 May 2009.	A visual inspection of the stormwater catchments show that they are 90% full.
	Copy of letter to ABC Pty Ltd from the Department dated 12 May 2010.	Letter to ABC Pty Ltd outlining the Department's concerns in relation to stormwater controls and management on the site and reminding the site operator of its responsibilities.

	Copy of the company's stormwater quality monitoring results for the past 12 months.	The stormwater quality monitoring results indicate that ABC Pty Ltd has exceeded its release limits on 2 occasions in the past 12 months.
	Compliance inspection CA780: Copy of the site operator's stormwater quality monitoring results for the previous 12 months collected from the operator during compliance inspection on 15 May 2010.	The stormwater quality monitoring results indicate that the operator has exceeded stormwater release limits on 6 occasions in the past 12 months.
	Compliance inspection CA780: Notes from officer's official notebook taken during compliance inspection on 15 May 2010.	During the site inspection, Departmental officer Mary Green had further discussions with the site operator regarding the implications of the repeated exceedances of the stormwater release limits. The site operator says that ABC Pty Ltd has made significant investment in stormwater management infrustructure in 2005. However, the business has grown substantially since this time. During the discussions the site operator indicated an acceptance of the need to investigate and pursue further stormwater management improvements and included a commitment to consider drafting a voluntary TEP.
	File note written by environmental officer Mary Green on 23 June 2010.	ABC Pty Ltd is carrying out timber preservation/treatment activities at a site at 123 Creek Road, Murphyville. Visual inspections of the site in 2008, 2009 and 2010 have indicated that the business has grown substantially and the stormwater managment system and infrastructure are no longer coping and require improvements. Annual stormwater release quality monitoring records for 2009 and 2010 indicate that ABC Pty Ltd has exceeded its stormwater relase limits on a number

		of occasions. The repeated exceedences of the stormwater release limits by ABC Pty Ltd are causing unlawful environmental harm and may cause further unlawful environmental harm. The operator indicated that it would voluntarily submit a draft TEP. However, a voluntary draft TEP has not been submitted. In the circumstances, the Deparment considers that a notice requiring a draft TEP should be issued to ABC Pty Ltd.
Number 2		
Number 3		

5. Natural Justice

The investigating officer is required to notify the affected person that the Department is considering issuing a notice requiring a TEP and that the individual may make representations to the Department as to why this action should not be taken. Any information provided by the affected person is to be documented and considered.

☐ The person has been provided with the opportunity to put their side of the story forward.

Describe how this was achieved.

☐ All information and/or defences provided were considered.

Describe any information or defences provided.

☐ The Department has considered the information or defences provided.

Describe the consideration given and the conclusions formed by the Department based on the information provided.

☐ The decision-maker and the environmental officer are free from bias or the perception of bias.

6. Recommended Conditions (if appropriate)

If appropriate, please list any proposed conditions below. In order to ensure conditions are enforceable, they should be SMART - Specific, Measureable, Achievable, Relevant and Time-specific. Refer to the Procedural Guide - Writing effective and enforceable conditions

To ensure the conditions are reasonable, officers are required to provide justification for the inclusion of the condition.

Proposed Requirement	**Justification**
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification
Proposed requirement	Justification

7. Recommendation

The responsible officer is required to make a recommendation in relation to the allegation.

Recommendation:

8. Approval

Environmental Officer	Supervisor
Print Name:	**Print Name:**
Position:	**Position:**
Date:	**Date:**

Delegate Decision-Maker	Approve / Reject Recommendation (Circle One)

Reasons for Decision *For example:* *I approve this recommendation based upon the information set out above.* *Or, I approve this decision for the reasons set out above and I note Mr Rodgers has previously received a warning letter in relation to this matter.* *Or, I reject the above recommendation as I consider it more appropriate for the Department to take an educational approach to this breach.*
Print Name:
Position:
Date:

Department of Environment and Resource Management

Assessment Report

Environmental Protection Act 1994
Transitional environmental program (TEP)

Part 2 - Considering and making a decision about a draft TEP

This document is for internal use to assist users in critically evaluating the content of a draft TEP and making a decision to either approve (with or without conditions) or refuse a draft TEP.

Identifying details	
Compliance activity number	Compliance activity number
Ecotrack number	Ecotrack number
Permit number	Permit number
File number	File number
Applicant name	Applicant name
Registered office or place of business	Registered office or place of business
Date draft TEP received.	Date *Note: The department has 20 business days after the application date in which to make a decision in relation to the draft TEP.*

Note:

1. Assessment reports recommending a decision be made are to be structured in the format shown below.
2. Explanatory notes for completing the report are given under each heading.
3. The report is to be signed by the investigating officer, supervisor and the delegated decision-maker.

Considering and making a decision about a draft TEP

The legislative provisions in regard to transitional environmental programs (TEPs) are found in Chapter 7, Part 3 of the *Environmental Protection Act 1994* (the Act).

A person or public authority may submit a draft TEP to the Department for consideration, either voluntarily under s333 of the Act or pursuant to a notice requiring a draft TEP issued by the Department under s332 of the Act. Once a draft TEP is received, the Department must consider it and decide whether or not to approve it within 20 business days after the application date or, if public notice is required under s335, within 20 business days of the day stated in the notice as the day by which submissions must be made to the Department. Detailed below are the matters that the Department must consider when making a decision about a draft TEP.

1. Brief history of the matter

Briefly outline any historical information relevant to this decision.

Provide historical information relating to the matter in succinct, dot point form.

2. Matters that must be considered when making a decision about the draft TEP

Achieving compliance with the Act (s330)

Identify how, if approved, the draft TEP will achieve compliance with the *Environmental Protection Act 1994* (the Act) by doing one or more of the following things—

☐ reducing environmental harm caused by the activity

☐ detailing the transition of the activity to an environmental standard

☐ detailing the transition of the activity to comply with:

- ☐ a condition, including a standard environmental condition, or an environmental authority or code of environmental compliance or
- ☐ a development condition.

Content of the TEP (s331)

To be approved, the draft TEP, for the activity to which it relates, must accomplish the following—

(a) Objectives to be achieved and maintained under the TEP

☐ The draft TEP clearly sets out the objectives to be achieved and maintained under the TEP (i.e. what the draft TEP is trying to achieve).

Provide a brief summary of the objectives to be achieved and maintained under the TEP.

(b) State the particular actions

☐ The draft TEP states the particular actions required to achieve the objectives, and the date by which each action must be completed.

Briefly state the actions required to achieve the objectives and the dates by which each action must be completed.

☐ When stating the required actions, the draft TEP takes into account—

- ☐ the best practice environmental management for the activity and

  Provide brief notes about how, when stating the required actions, the draft TEP takes into account the best practice environmental management for the activity.

- ☐ the risks of environmental harm being caused by the activity.

  Provide brief notes about how, when stating the required actions, the draft TEP takes into account the risks of environmental harm being caused by the activity.

(c) Prevention and minimisation of environmental harm

☐ The draft TEP states how any environmental harm that may be caused by the activity will be prevented or minimised, including any interim measures that are to be implemented.

Briefly describe how any environmental harm that may be caused by the activity will be prevented or minimised, including any interim measures that are to be implemented.

(d) Transition to an environmental standard

☐ If an objective of the draft TEP is for the activity to transition to an environmental standard, the draft TEP states—

- ☐ details of the standard and
- ☐ how the activity is to transition to the standard before the TEP ends.

Provide details of the standard and briefly describe how the activity is to transition to the standard before the TEP ends.

OR

☐ It is not an objective of the draft TEP for the activity to transition to an environmental standard.

(e) Transition to comply with a condition of an environmental authority or code of environmental compliance, or a development condition

☐ If an objective of the draft TEP is for an activity to transition to comply with a condition of an environmental authority or code of environmental compliance, or a development condition, the draft TEP states—

- ☐ details of the condition and how the activity does not comply with it and
- ☐ how compliance will be achieved before the end of the TEP.

Provide details of the relevant condition and how the activity does not comply with it, and describe briefly how compliance will be achieved before the end of the TEP.

OR

☐ It is not an objective of the draft TEP for the activity to transition to compliance with an environmental authority, or code of environmental compliance or a development condition.

(f) Period over which TEP is to be carried out

☐ The draft TEP states the period over which the TEP is to be carried out.

State the period over which the TEP is to be carried out.

(g) Performance indicators

☐ The draft TEP states appropriate performance indicators at intervals of not more than 6 months.

Provide brief details of the performance indicators.

(h) Monitoring and reporting

☐ The draft TEP adequately provides for monitoring and reporting on compliance with the program.

Briefly describe how the draft TEP provides for monitoring and reporting on compliance with the program.

If the Department has issued a notice under s332 requiring a person to prepare and submit a draft TEP to it for approval

☐ If the draft TEP was submitted in response to a written notice issued by the Department under s322 of the Act, the draft TEP has addressed all of the requirements stated in the notice.

If the draft TEP was submitted in response to a written notice under s322, and it does not address all of the matters required to be addressed, provide details of the matters that the draft TEP does not adequately address.

OR

☐ The draft TEP was not submitted in response to a written notice issued under s322 of the Act.

Regulatory requirements (s338(1)(a))

Chapter 4, Part 1 (ss46-64) of the *Environmental Protection Regulation 2008* (the Regulation), sets out the regulatory requirements that the Department is required to comply with when making a decision whether to accept (with or without conditions) or reject a draft TEP.

☐ When deciding whether accept (with or without conditions) or reject the draft TEP, the Department has complied with all relevant regulatory requirements stipulated in ss46-64 of the Regulation.

Briefly describe the relevant sections of the Regulation that were considered and how they relate to the draft TEP.

Note that regulatory requirements may also be contained in environmental protection policies.

☐ All relevant regulatory requirements contained in environmental protection policies have been considered by the Department.

If applicable, briefly describe any regulatory requirements contained in environmental protection policies and how they relate to the draft TEP.

OR

☐ There are no applicable regulatory requirements contained in environmental protection policies.

Standard criteria (s338(1)(b)(i))

☐ The Department has considered all relevant matters in the standard criteria.

Provide brief details in the table below of each relevant standard criterion and how it relates to the Department's consideration of the draft TEP. If a particular criterion is not applicable, write 'N/A'.

Standard criterion	Details
Ecologically sustainable development	
Environmental protection policies (EPPs)	
Plans, standards or agreements	
Environmental impact study, assessment or report	
Receiving environment	
Submissions made by the applicant and submitters	
Best practice environmental management	

Financial implications	
Public interest	
Site management plan	
Environmental management systems (IEMS)	

Additional information (s338(1)(b)(ii))

☐ The Department has considered additional information (if any) given in relation to the draft TEP.

If applicable, briefly describe the additional information provided.

OR

☐ No additional information has been provided.

Views expressed at a conference (s338(1)(b)(iii))

☐ If a conference has been held in relation to the draft TEP, the Department has considered the views expressed at the conference.

If applicable, provide brief notes of the views expressed at the conference and the consideration given to those views.

OR

☐ No conference has been held.

Consistency with development conditions of a development approval (s338(2))

☐ If the draft TEP has been prepared because of a development condition of a development approval, the draft TEP is consistent with other conditions of the development approval.

If applicable, describe how the draft TEP is not consistent with the other conditions of the development approval.

OR

☐ The draft TEP has not been prepared because of a development condition of a development approval.

Public notice of submission of draft TEP (s337(2)) and substantial compliance with the Act (s342)

☐ If public notice is required to be given at the submission of the draft TEP, the Department is satisfied that the public notice has been properly given.

OR

☐ The Department is not satisfied that the required public notice has been properly given, but is satisfied that there has been substantial compliance with the Act and will accept this as compliance.

Provide brief details of how the public notice has not been properly given and why the Department is satisfied that there has been substantial compliance with the Act which it will accept as compliance.

OR

☐ Public notice is not required.

Is the Department satisfied with the draft TEP?

For the draft TEP to be approved, at least one box should be checked next to each of the above matters for consideration. If any of the matters remain unchecked, then the draft TEP can not be approved.

☐ If a box has been checked next to each requirement - Proceed to section 3.

☐ If a box has not been checked next to each requirement - Proceed to section 4.

3. Request for further information and/or amendments to a draft TEP

If the draft TEP substantially addresses all of the relevant matters listed in s331 of the Act, but cannot be approved unless further information is provided or some amendments are made, the Department may request that the person or public authority provide further information or an amended TEP. Note that if there are significant problems with the draft TEP and it will require major changes or re-writing before it can be approved, the Department should refuse to approve it.

If it is appropriate that further information or a request for amendments be made, officers should consider the following alternatives—

☐ Further information is required.

Officers are to list the further information required about the draft TEP and suspend the assessment report process while waiting for the further information to provided.

☐ Minor amendments are required.

Officers are to list the minor amendments required and suspend the assessment report process while waiting for the person to provide the amended TEP.

☐ More substantial amendments are required.

Officers are to list the more substantial amendments required and present them to the Delegate for approval.

4. Approval of the draft TEP

Prior to making a recommendation to issue a notice of decision approving the draft TEP (with or without conditions), it is important to take into account that the Act stipulates that a TEP is a program that achieves compliance with the Act for the activity to which it relates.

If the draft TEP does not meet the requirements of the Act it must be refused. Whilst the Act does make provision for the approval to be subject to conditions, the conditions should address relatively minor issues only. Conditions stated in a notice of decision must not be used to rectify significant issues with a draft TEP.

A notice of decision must be issued within 8 business days of making the decision to approve the TEP. If the approval is subject to conditions, the notice of decision must be an information notice.

☐ The notice of decision identifies the documents forming the approved TEP, including any amendments under section 339(1)(a)(ii).

☐ The notice of decision sets out any conditions imposed on the approval by the Department.

☐ The notice of decision states the day the approval ends.

☐ If conditions have been imposed on the approval, the notice of decision is in the form of an information notice.

If the notice is in the form of an information notice, it must include:

☐ the decision and

☐ the reasons for the decision and

☐ any available rights of internal and external review.

5. Refusal to approve a draft TEP

The draft TEP cannot be approved unless at least one checkbox has been checked beside each of the matters required to be addressed by the draft TEP. If the draft TEP does not meet all of the requirements, and any deficiencies will not be addressed by a request for further information and/or amendments to the draft TEP, then the Department should refuse to approve the draft TEP.

If the Department refuses to approve the TEP, the notice of decision must be an information notice. Consequently, the notice of decision must include:

☐ the decision and

☐ the reasons for the decision and

☐ any available rights of internal and external review.

6. Provide for natural justice

In order to provide natural justice, the Department must advise the person that submitted the draft TEP if it intends to do one of the following things—

- request further information about the draft TEP and/or
- request amendments to the draft TEP or
- refuse to approve the draft TEP.

The Department must also provide the person with the opportunity to make submissions in response to the Department's intentions.

☐ The person has been provided with the opportunity to put their side of the story forward.

Describe how this was achieved.

☐ All information provided has been considered.

Describe any information or submissions provided.

☐ The Department has considered the information.

What consideration was provided and what conclusions have the Department formed?

☐ The decision-maker and environmental officer are free from bias or the perception of bias.

6. Recommendation

The environmental officer is required to make a recommendation in relation to the draft TEP.

Recommendation:

For example, "I recommend that the draft TEP be approved OR I recommend that the draft TEP be approved with the amendments agreed in the letter to the company dated XXX OR I recommend that the draft TEP be refused.

7. Approval

Environmental officer	Supervisor
Print name:	**Print name:**
Date:	**Date:**

Delegated decision-maker	Approve / Reject recommendation (circle one)
Reasons for decision.	
Print name:	
Date:	

standard criteria means—

(a) the principles of ecologically sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development'; and

(b) any applicable environmental protection policy; and

(c) any applicable Commonwealth, State or local government plans, standards, agreements or requirements; and

(d) any applicable environmental impact study, assessment or report; and

(e) the character, resilience and values of the receiving environment; and

(f) all submissions made by the applicant and submitters; and

(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

(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

(i) the public interest; and

(j) any applicable site management plan; and

(k) any relevant integrated environmental management system or proposed integrated environmental management system; and

(l) any other matter prescribed under a regulation.

standard environmental conditions, for an environmental authority or a chapter 4 activity, means the standard environmental conditions approved for the authority or activity under section 549.

GLT2011/371.

GLT1174.

APPLICATION FOR A TRANSITIONAL ENVIRONMENTAL PROGRAM

Under Section 339 of the *Environmental Protection Act 1994*

Name of applicant:	CS Energy
Address:	PO Box 392
	BILOELA QLD 4715
Telephone:	07 4992 9329
Contact:	[redacted] (Site Manager)
	[redacted] (Environmental Coordinator)

Background

CS Energy (CSE) is a Queensland Government owned corporation that operates the Callide Power Station, located approximately 10 kilometres east of the Biloela township.

Waste ash and waste water produced as a result of power generation is stored in Ash Dam B which has a 5 400ML capacity. The waste ash and waste water includes a range of contaminants that have the potential to cause environmental harm if not properly contained.

On the 20 December 2010, DERM was notified that the Level 1 trigger (MRL 213.33m) in the 'Callide Power Station Ash dam – Corrective Action Plan' had been reached. The height of the spillway is 214.95m.

Heavy rainfall occurred over the Ash dam between 22 December and 29 of December and as a result, DERM was notified on 30 December that the ash dam water level had risen to 214.35m.

A meeting with CSE, SunWater and DERM was held on the 5 of January 2011 to discuss options for reducing the ash dam water level. As there is a greater than 65 to 70% median rainfall (250-500mm) expected in the next 6-8 weeks, CSE has submitted a TEP as the risk of a spill is imminent.

Reasoning

The area of the Callide Creek, from just downstream of the Callide dam wall to the weir (near Biloela) is a recharge zone for the Callide Alluvium aquifer. Water is extracted for consumption and irrigation and stock purposes.

Current water quality in the Ash Dam is not suitable for drinking water or to be utilised for irrigation or stock purposes.

Therefore, to minimise risk of the impact on the water quality in the aquifer if the Ash Dam discharged water into the Callide Creek, the TEP proposes a series of scenarios that ensure a controlled discharge from Ash Dam B to the Callide Creek:

1. Callide Dam not spilling and Callide Creek flowing
2. Callide Dam not spilling but releasing and Callide Creek flowing

3. Callide Dam spilling or releasing and Callide Creek flowing.

CSE are required to release at least 1 750ML to reach an acceptable level in the dam for future predicated rainfall events.

Objective of the TEP

The objective of the TEP is to:

- Ensure compliance with the *Environmental Protection Act 1994* by implementing water management measures (what are these measures- for the delegate to sign he will need to know this) to avoid as far as practicable environmental harm being caused by overflow of Ash Dam B.
- Reduce the water level in Ash Dam B to below the Spill Warning Level of RL 214.45m.
- To reduce the water level in Ash Dam B to below the Mandatory Reporting Level of RL 213.33m.

Other

To counteract this risk to the aquifer, the following measures should be adhered to:

- flow rates of at least 300ML/d in the Callide Creek,
- controlled release of ash dam water of up to 5% of the measure flow at Linkes Road.
- non-contaminated tailing water to flow through the system.

A comprehensive monitoring plan of both surface and ground water will be undertaken. In-field analysis of surface water will be conducted daily during releases and if trigger values in Table A, 'Water Quality Performance Indicators' are exceeded the release will stop. Water samples will be collected and analysed for parameters not able to be tested in the field.

Groundwater bores with be sampled initially during release and then every fortnight. If contamination is noticed in the bores, the frequency of monitoring the bores will be increased.

Consultation
In considering this approval the following people were consulted;

[redacted] CS Energy
[redacted] Office of the Water Supply Regulator
[redacted] Water Quality and Aquatic Ecosystem Health, DERM
[redacted] Water Services, DERM
[redacted] SunWater

Criteria for Deciding the Approval

Section 338 of the *Environmental Protection Act 1994* requires the administering authority to consider the following matters;

The Standard Criteria	
The principles of ecologically sustainable development as set out in the National strategy for Ecologically Sustainable Development;	CSE are continuing to investigate ways to minimise the amount of water entering the ash dam such as: • Expansion of chook sprays (irrigation) • Purchasing RO unit • Cutting back/re-using water where possible.
Any applicable environmental protection policy;	The Environmental. Protection (Water) Policy 2009 has been considered. CS Energy is continuing to investigate ways to minimise the amount of water entering the ash dam. To ensure that water quality objectives of the Callide Creek and aquifer are maintained, the Ash Dam water will be diluted. Due to unprecedented rainfall in the ash dam catchment area, the measures in place and future preventative measures will not have an immediate impact on the ash dam water level. Predicted future rainfall for the next 6-8weeks is 250-500mm of rain. The ash dam is unable to accommodate this amount of water. To minimise potential environmental harm from uncontrolled releases from the ash dam, CSE are proposing controlled releases into Callide Creek. Scenario 1 'Callide Dam not spilling and Callide Creek flowing' involves the release of ash dam water during opportunistic flows (100ML – 350ML/d). This scenario states that release will occur during flows of greater than 150ML. This scenario as it currently stands, is not supported as: • a flow rate of at least 300-350ML/d is required for water to reach the weir and the flow may not be maintained down the length of the creek; • adequate dilution ratio may not be maintained and potential issues with the mixing zone; and • the possibility of non-contaminated tailing flows through the system not occurring. Scenario 1 can only occur if the flow rate is at least 300ML/day at Linkes Road and there will be sufficient flow for the next 24hours to ensure that the contaminants are flushed out of the system. Scenarios 2 (Callide Dam not spilling but releasing and Callide Creek flowing) and Scenario 3 (Callide Dam spilling or releasing and Callide Creek flowing) are considered more suitable options as the risk of environmental harm is reduced due to: • higher flow rates in the Callide Creek; • potential for higher dilution rates thus ensuring water quality guidelines (drinking water, stock, irrigation and aquatic ecosystems) are reached; • allowance for non-contaminated tailing flows through the system.
Any applicable Commonwealth, State or	As the discharge from the ash dam enters the recharge area for the Callide Alluvium in which water for domestic, irrigation and stock

local government plans, standards, agreements or requirements;	purposes is utilised, the guidelines for drinking water (Australian guidelines), irrigation and stock water quality (ANZECC guidelines) are relevant. CSE will release up to 5% of the measured flow at Linkes Road. This will ensure an adequate dilution factor to ensure the water quality performance indicators are met.
Any applicable environmental impact study, assessment or report;	
The character, resilience and values of the receiving environment;	As mentioned previously, the area downstream of the ash dam discharge area to the weir is a recharge zone for the Callide Alluvium aquifer. The capacity of this aquifer is extremely large. The aquifer is utilised for drinking water, irrigation and stock and is thus, very sensitive to the release of contaminants that are present in the ash dam water. To counteract this risk, the following measures should be adhered to: • flow rates of at least 300ML/d in the Callide Creek, • controlled release of ash dam water of up to 5% of the measure flow at Linkes Road. • non-contaminated tailing water to flow through the system.
All submissions made by the applicant and submitters;	The submission was not available for public comment.
The best practice environmental management for the activity under the authority, program, order or permit;	The CSE site is a closed system. There are no provisions for the discharge of ash dam water to the environment. Given the current circumstances and the risk of the ash dam spilling in an uncontrolled manner, controlled releases are the best management option. Additionally, flow rates, minimum dilution ratio and a comprehensive monitoring program will be implemented.
The financial implications of the requirements of the authority, program, order or permit as they would relate to the type of activity or industry carried on under the authority, program or order;	Without this approval, the operators are not in compliance with their obligations under the *Environmental Protection Act 1994*. As a result, enforcement action could be taken and financial penalties may be imposed. Uncontrolled releases that results in contamination of the aquifer will result in substantial financial implications for CSE, landholders and Banana Shire Council.
The public interest;	There is considerable public interest in this issue as there is potential for environmental harm to the aquifer as a result of contaminated ash dam water. Conditions will be in place to ensure that the risk of environmental harm is minimised.
Any applicable site management plan and/or IEMS	CSE Spill Management Plan details the action plan and monitoring process for releases from the ash dam.
Any other matter prescribed under a regulation.	

Recommendation
It is recommended that the CS Energy TEP be approved in accordance with the attached conditions.

Recommendation	Approved
[redacted] Environmental Officer Environmental Services – Gladstone	[redacted] A/Manager Environmental Services - Gladstone

Part 2 Regulatory requirements for all environmental management decisions

50 Application of pt 2

This part applies to the administering authority for making any environmental management decision.

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;

(aa) environmental values declared under this regulation;

(b) the characteristics of the contaminants or materials released from carrying out the activity;

(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;

(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;

(e) the characteristics of the receiving environment and the potential impact on it from carrying out the activity;

(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;

(g) the remaining capacity of the receiving environment to accept contaminants or wastes released from future activities while protecting environmental values;

(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.

(2) In this section—

affected person, for an activity, means a person affected, or who may be affected, by the release of a contaminant or waste from carrying out the activity.

52 Conditions to be considered for environmental management decisions

(1) The administering authority must, for making an environmental management decision relating to an activity, consider whether to impose conditions about the following matters—

(a) implementing a system for managing risks to the environment;

(b) implementing measures for avoiding or minimising the release of contaminants or waste;

(c) ensuring an adequate distance between any sensitive receptors and the relevant site for the activity to which the decision relates;

Examples of a condition for paragraph (c)—

a condition requiring riparian buffers, noise buffers or buffers for protecting endangered regional ecosystems

(d) limiting or reducing the size of the initial mixing zone or attenuation zone, if any, that may be affected by the release of contaminants;

(e) treating contaminants before they are released;

(f) restricting the type, quality, quantity, concentration or characteristics of contaminants that can be released;

(g) the way in which contaminants may be released;

Examples of a condition for paragraph (g)—

- a condition restricting the release of a contaminant at a particular temperature, velocity or rate or during particular meteorological conditions or water flows
- a condition restricting the release of a contaminant to a depth below the level of surface waters

(h) ensuring a minimum degree of dispersion happens when a contaminant is released;

Example of a condition for paragraph (h)—

a condition requiring the use of a diffuser for releasing a contaminant

(i) protecting environmental values, and meeting quality objectives, under relevant environmental protection policies;

(j) recycling, storing, transferring or disposing of waste in a particular way;

(k) rehabilitating land to achieve particular outcomes;

(l) measures for the ongoing protection of environmental values that are, or may be, adversely affected by the activity.

(2) In this section—

attenuation zone means the area around a release of contaminants to groundwater in which the concentration of the contaminants in the release is reduced to ambient levels through physico-chemical and microbiological processes.

sensitive receptor means a sensitive receptor under any relevant environmental protection policies.

53 Matters to be considered for decisions imposing monitoring conditions

(1) The administering authority must, for making an environmental management decision relating to an activity, consider whether to impose monitoring conditions about the release of contaminants from the activity on the receiving environment.

(2) For considering whether to impose a monitoring condition, the administering authority must consider the following matters—

(a) the potential impact on the receiving environment of—

(i) the activity to which the decision relates; and

(ii) the release of the contaminant;

(b) the characteristics of the contaminant;

(c) the potential for a control measure to fail and the effect of a failure of a control measure on the receiving environment;

(d) the protocols relevant to monitoring the release of the contaminant;

(e) whether the monitoring should be continuous or intermittent.

(3) In this section—

monitoring condition, about the release of contaminants from an activity on the receiving environment, means a condition about any of the following matters—

(a) monitoring the quantity, quality, characteristics, timing and variability of the release;

(b) monitoring indicators of the effective operation of control measures;

(c) monitoring the characteristics of the receiving environment;

(d) assessing the effectiveness of remedial or rehabilitation measures;

(e) monitoring the impact of the release on the values, objectives and biota in the receiving environment;

(f) analysing monitoring data against objectives and standards including, for example, by predictive modelling;

(g) reporting the results of monitoring in a stated form and timeframe;

(h) reporting on the time and way in which the release is made to the receiving environment.

Part 3 Additional regulatory requirements for particular environmental management decisions

54 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.

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***).

(2) The administering authority must consider the following matters—

(a) the topography, including the flooding potential of the relevant land;

(b) the climatic conditions affecting the relevant land;

(c) the available land on which the water or waste can be released;

(d) the storage of the water or waste in wet weather;

Example—

storage of water or waste in ponds or tanks

(e) the way in which the water or waste will be released to the relevant land;

(f) the need to protect soil and plants on the relevant land from damage;

(g) the potential for infiltration of the water or waste to groundwater;

(h) the potential for generation of aerosols or odours from the water or waste;

(i) the impact of any transfer or run-off of contaminants from the relevant land to surface waters;

(j) the ongoing availability of the land for the release of the water or waste.

(3) The administering authority must also consider whether to impose conditions about each of the following matters—

(a) developing and implementing a land release management plan for the relevant area that protects the environmental values affected, or that may be affected, by the activity;

(b) the way in which, or rate at which, the water or waste may be released;

(c) releasing the water or waste in a way that minimises infiltration to groundwater;

(d) if the water or waste is to be transferred to another entity—the circumstances under which the transfer may occur;

(e) releasing the water to a bio-retention system, including, for example, a constructed wetland, for the removal of nutrients from the water.

(4) In this section—

land release management plan, for the relevant area, means a plan that achieves the following outcomes for the area—

(a) the efficient application of water or waste using best practice methods;

(b) control of sodicity in the soil;

(c) minimal degradation of soil structure;

(d) control of the build-up, from water, waste or other sources, of nutrients and contaminants in the soil and subsoil;

(e) prevention of subterranean flows of contaminants to waters;

(f) prevention of impact of infiltration on groundwater resources;

(g) prevention of run-off by controlling the rate of application of water or waste, and by using structures, including, for example, tailwater dams;

(h) prevention of surface ponding;

(i) prevention of spraydrift or overspray from the relevant area;

(j) prevention of damage to native vegetation;

(k) reporting the results of monitoring, and an assessment of the impact on the groundwater in the relevant area of the release of the water or waste.

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.

(2) The administering authority must consider each of the following matters—

(a) any available toxicity data relevant to the release and the receiving environment;

(b) if there is an initial mixing zone—

(i) whether there is any practicable alternative that would reduce or eliminate the initial mixing zone; and

(ii) whether the size of the initial mixing zone is likely to adversely affect an environmental value or the ecological condition of the receiving environment, including, for example, a watercourse or wetland; and

(iii) whether concentrations of contaminants in the initial mixing zone are acutely toxic to the biota.

(3) The administering authority must also consider whether to impose conditions about the following matters—

(a) releasing the water to tidal waters only during particular tidal conditions, including, for example, phases of the tide;

(b) releasing the water to non-tidal waters only if the rate of flow of the surface water is greater than a particular level.

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.

(2) The administering authority must consider the following matters—

(a) the topography of, and climatic conditions affecting, the receiving environment;

(b) if the activity involves exposing or disturbing soil—the soil type, its characteristics and the way it is managed;

(c) if the activity involves the storage of materials or wastes that are exposed to rainfall or stormwater run-off—the characteristics and containment of the material or waste;

(3) The administering authority must also consider whether to impose conditions about the following matters—

(a) diverting upstream stormwater run-off away from the area contaminated or disturbed by the activity (the ***affected area***);

(b) minimising the size of the affected area;

(c) covering, paving, roofing and cleaning the affected area;

(d) cleaning the affected area without using water;

(e) analysing and managing soil;

(f) installing and maintaining appropriate control measures;

Examples of control measures—

bio-retention system, buffers for improving waste water quality, first flush stormwater diversion systems, oil separators, rubbish traps, sediment fences, sediment traps

(g) treating the affected area.

Examples—

mulching, revegetating, using surface covers or soil agglomerants

58 Release of water or waste to particular 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 referable wetland or a significant coastal wetland for treatment.

(2) The administering authority must refuse to grant the application if the authority considers that, because of the activity—

(a) the wetland will be destroyed or reduced in size; or

(b) the biological integrity of the wetland may not be maintained.

(3) In this section—

referable wetland means an area shown as a wetland on a document called 'Map of referable wetlands' made available by the chief executive.

Editor's note—

On the day this regulation was notified in the gazette, the document was available on the department's website.

significant coastal wetland has the same meaning as in the State coastal management plan.

State coastal management plan means the State coastal management plan prepared under the *Coastal Protection and Management Act 1995*.

Editor's note—

On the day this regulation was notified, the State coastal management plan was published on the department's website.

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.

(2) The administering authority must consider the following matters—

(a) the availability of facilities for collecting and disposing of wastes generated from the boat;

(b) whether to impose a condition to provide facilities for collecting and disposing of wastes generated from the boat.

Examples of waste generated from a boat—

bilge waste, garbage, sewage

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, metalliferous ores, quarried materials, woodchips

(2) The administering authority must consider each of the following matters—

(a) the chemical and physical characteristics of the material;

(b) the way in which the material is, or is to be, contained during each stage of the storage or movement of the material;

(c) the methods of cleaning up any spillage during movement of the material;

(d) if storage or movement of the material is likely to result in the release of part of the material into waters, the impact of the accumulation of the material on the bed of the waters.

(3) The administering authority must also consider whether to impose conditions about the following matters—

(a) installing and maintaining appropriate control measures;

Examples—

- installing devices for collecting dust at places where bulk material is being moved
- installing dust collectors at transfer points
- enclosing, roofing or screening equipment used for storing or moving bulk material

(b) managing stockpiles of the material in a particular way;

Example—

setting a maximum height for a stockpile

(c) collecting, removing or disposing of spillage released while moving the material;

(d) monitoring the impact of releases of contaminants or waste from storing or moving bulk materials on the receiving environment including, for example, the impact of environmental nuisance and impacts on the biota of adjacent waters.

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.

(2) The administering authority must consider—

(a) 'State Planning Policy 2/02—Planning and Managing Development Involving Acid Sulfate Soils' (***SPP 2/02***); and

(b) the guideline for SPP 2/02 (the ***guideline***).

Note—

The guideline states that it may be used as a source of general advice on investigation and management of acid sulfate soils for situations outside the scope of SPP 2/02.

Editor's note—

On the day this regulation was notified, SPP 2/02 and the guideline were available on the website of the Department of Infrastructure and Planning at <www.dip.qld.gov.au>.

(3) The administering authority must also consider whether to impose conditions about the following matters—

(a) minimising the generation of contaminated water;

(b) treating acid sulfate soils;

(c) treating or disposing of leachate and run-off;

(d) managing the fluctuations in the watertable;

(e) maintaining minimum levels of cover over any buried acid sulfate soils.

(4) In this section—

acid sulfate soil means actual acid sulfate soil or potential acid sulfate soil.

actual acid sulfate soil means soil or sediment containing highly acidic soil horizons or layers affected by the oxidation of iron sulfides.

disturbance, of acid sulfate soil, means disturbance of the soil by—

(a) excavating or removing the soil; or

(b) exposing the soil to air; or

(c) changing the level of groundwater.

potential acid sulfate soil means soil or sediment containing iron sulfides or other sulfidic material that has not been exposed to air and oxidised.

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

(2) The administering authority must consider the following matters—

(a) the physical and chemical characteristics of the rock;

(b) the potential of the rock to generate or neutralise acidity;

(c) the characteristics of the leachate leaching from, or potentially leaching from, the rock including, in particular, contaminants in the leachate that are likely to cause environmental harm if released to the environment.

(3) The administering authority must also consider whether to impose conditions about the following matters—

(a) the ways in which waste may be disposed of or stored, including for example, the location of areas for waste disposal or storage;

(b) minimising the ingress of oxygen or water to areas used, or to be used, for waste disposal or storage;

(c) inhibiting the generation of acidity from waste rock, including for example, through using particular treatments;

(d) processes for collecting, storing and treating any generated leachate;

(e) monitoring of the waste disposal and storage areas including, for example, the water balance and oxygen levels;

(f) monitoring the potential seepage zone for indications of the formation of acid rock drainage.

(4) In this section—

acid-producing rock means rock containing sulfidic minerals that have the potential to oxidise and generate acidity.

disturbance, of acid-generating rock, means disturbance of the rock by—

(a) excavating or removing the rock; or

(b) exposing the rock to air; or

(c) changing the level of groundwater.

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

(2) The administering authority must refuse to grant the application if the authority considers—

(a) for an application other than an application relating to an environmental authority for a petroleum activity—the waste is not being, or may not be, released entirely within a confined aquifer; or

(b) the release of the waste is affecting adversely, or may affect adversely, a surface ecological system; or

(c) the waste is likely to result in a deterioration in the environmental values of the receiving groundwater.

(3) In this section—

confined aquifer means an aquifer that is contained entirely within impermeable strata.

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

(2) The administering authority must consider the following matters—

(a) the geological stability of the relevant site for the activity;

(b) the location, quality and use, or potential use, of the receiving groundwater;

(c) the permeability of the earth under the place where the activity is carried out;

(d) the presence of containment devices at the relevant site for the activity and their effectiveness in preventing or minimising the release of the waste;

Example of a containment device—

a liner for a storage pond

(c) the distance separating the receiving groundwater from any containment device;

(f) the potential for fluctuations in the level of the receiving groundwater;

(g) the way in which materials, including contaminants, will be removed from the containment system;

(h) whether or not materials, including contaminants, will be removed from the containment devices and if so, the effectiveness of the methods that will be used for the removal.

(3) The administering authority must also consider whether to impose conditions about the following matters—

(a) the design, construction, function, protection and maintenance of containment devices;

(b) maintaining a particular distance between the receiving groundwater and the point of contact between each containment device and the underlying earth;

(c) removing materials from the containment devices.

329 Failure to make decision on environmental report taken to be refusal

If the administering authority fails to decide whether or not to accept an environmental report within the time it is required to make a decision on the report, the failure is taken to be a decision by the authority to refuse to accept the report at the end of the time.

Part 3 Transitional environmental programs

Division 1 Preliminary

330 What is a transitional environmental program

A *transitional environmental program* is a specific program that, when complied with, achieves compliance with this Act for the activity to which it relates by doing 1 or more of the following—

(a) reducing environmental harm caused by the activity;

(b) detailing the transition of the activity to an environmental standard;

(c) detailing the transition of the activity to comply with—

(i) a condition, including a standard environmental condition, of an environmental authority or code of environmental compliance; or

(ii) a development condition.

331 Content of program

A transitional environmental program must, for the activity to which it relates—

(a) state the objectives to be achieved and maintained under the program for the activity; and

(b) state the particular actions required to achieve the objectives, and the day by which each action must be carried out, taking into account—

(i) the best practice environmental management for the activity; and

(ii) the risks of environmental harm being caused by the activity; and

(c) state how any environmental harm that may be caused by the activity will be prevented or minimised, including any interim measures that are to be implemented; and

(d) if the activity is to transition to an environmental standard, state—

(i) details of the standard; and

(ii) how the activity is to transition to the standard before the program ends; and

(e) if the activity is to transition to comply with a condition of an environmental authority or code of environmental compliance, or a development condition, state—

(i) details of the condition and how the activity does not comply with it; and

(ii) how compliance with the condition will be achieved before the program ends; and

(f) state the period over which the program is to be carried out; and

(g) state appropriate performance indicators at intervals of not more than 6 months; and

(h) provide for monitoring and reporting on compliance with the program.

Division 2 Submission and approval of transitional environmental programs

332 Administering authority may require draft program

(1) The administering authority may require a person or public authority to prepare and submit to it for approval a draft transitional environmental program—

(a) as a condition of an environmental authority; or

(b) as a development condition of a development approval.

(2) The administering authority may also require a person or public authority to prepare and submit to it for approval a draft transitional environmental program if it is satisfied—

(a) an activity carried out, or proposed to be carried out, by the person or authority is causing, or may cause, unlawful environmental harm; or

(b) it is not practicable for the person or public authority to comply with an environmental protection policy or regulation on its commencement; or

(c) that a condition of an environmental authority held by the person or public authority is, or has been, contravened; or

(ca) that a standard environmental condition of a code of environmental compliance for a chapter 4 activity is, or has been, contravened by the person or public authority; or

(d) a development condition of a development approval is, or has been, contravened and the person or public authority is—

(i) an owner of the land for which the approval is granted; or

(ii) another person in whom the benefit of the approval vests.

(3) A requirement under subsection (1) or (2) must be made by written notice given to the person or public authority.

(4) The notice must state—

(a) the grounds on which the requirement is made; and

(b) the matters to be addressed by the program; and

(c) the period over which the program is to be carried out; and

(d) the day (at least a reasonable period after the notice is given) by which the program must be prepared and submitted to the administering authority; and

(e) the review or appeal details.

(5) A person of whom a requirement under subsection (1) or (2) has been made must comply with the requirement unless the person has a reasonable excuse.

Maximum penalty for subsection (5)—100 penalty units.

333 Voluntary submission of draft program

(1) A person or public authority may, at any time, submit for approval a draft transitional environmental program to the administering authority for an activity the person or public authority is carrying out or proposes to carry out.

(2) A person or public authority may submit a document under subsection (1) if it contains or provides for the matters mentioned in section 331, even though the document was not originally prepared for this Act.

(3) The document is taken to be a draft transitional environmental program.

334 Fee for consideration of draft program

A person or public authority that submits a draft transitional environmental program to an administering authority for approval must pay the authority the fee prescribed by regulation.

335 Public notice of submission for approval of certain draft programs

(1) This section applies if a person or public authority submits for approval a draft transitional environmental program that states a period longer than 3 years over which the program is to be carried out.

(2) Within 2 business days after the application date, the person or public authority must give public notice of the submission by—

(a) advertisement published in a newspaper circulating generally in the area in which the activity to which the draft program relates is, or is proposed to be, carried out; and

(b) if the program relates to premises—

(i) placing a notice on the premises; and

(ii) serving a notice on the occupiers of all premises adjoining the premises.

(3) The notice must—

(a) be in the approved form; and

(b) invite submissions on the draft program from government departments, public authorities, local governments, land-holders, industry, interested groups and persons and members of the public; and

(c) state the day (at least 10 business days after compliance with subsection (2)) nominated by the administering authority as the day by which submissions may be made to the authority.

336 Authority may call conference

(1) The administering authority may invite the person or public authority that has submitted a draft transitional environmental program and another person who has made a submission under section 335 about the program, to a conference to help it in deciding whether or not to approve the program.

(2) The administering authority must give written notice to all persons invited to attend the conference of when and where the conference is to be held.

(3) However, if the administering authority considers it is impracticable to give notice to all persons invited to attend the conference, the authority may give notice of the conference by publishing a notice in the newspapers the authority decides.

(4) The administering authority must endeavour to appoint an independent person to mediate the conference.

337 Administering authority to consider draft programs

(1) The administering authority must decide whether to approve a draft transitional environmental program submitted to it within 20 business days after—

   (a) if public notice is required under section 335—the day stated in the notice as the day by which submissions may be made to the administering authority; or

   (b) otherwise—the application date.

(2) If public notice is required to be given of the submission of the draft program, the administering authority must be satisfied public notice has been properly given before making a decision.

338 Criteria for deciding draft program

(1) In deciding whether to approve or refuse to approve the draft program or the conditions (if any) of the approval, the administering authority—

(a) must comply with any relevant regulatory requirement; and

(b) subject to paragraph (a), must also consider the following—

(i) the standard criteria;

(ii) additional information given in relation to the draft program;

(iii) the views expressed at a conference held in relation to the draft program.

(2) If the draft program is prepared because of a requirement of a development condition of a development approval, the authority may approve the draft program only if it is not inconsistent with other conditions of the approval.

339 Decision about draft program

(1) The administering authority may—

(a) approve a draft transitional environmental program—

(i) as submitted; or

(ii) as amended at the request, or with the agreement, of the administering authority; or

(b) refuse to approve a draft transitional environmental program.

(2) The administering authority may impose on an approval of a draft transitional environmental program—

(a) any conditions the authority must impose under a regulatory requirement; and

(b) any other conditions the administering authority considers appropriate.

(3) If the draft transitional environmental program is approved, the approval remains in force for the period stated in the notice of the approval given under section 340.

340 Notice of decision

(1) The administering authority must, within 8 business days after making a decision under section 339, give the person or public authority that submitted the program a written notice about the decision.

(2) If the administering authority approves the program, the notice must—

(a) identify the documents forming the approved transitional program, including any amendments under section 339(1)(a)(ii); and

(b) state any conditions imposed on the approval by the administering authority; and

(c) state the day the approval ends.

(3) If the administering authority refuses to approve the program or approves the program with conditions, the notice must be an information notice.

341 Content of approved program

An approved transitional environmental program consists of the following—

(a) the draft of the program submitted under section 332 or 333, as amended at the request, or with the agreement, of the administering authority;

(b) any conditions imposed on the program by the administering authority.

342 Substantial compliance with Act may be accepted as compliance

(1) This section applies if, under this Act, a person or public authority is required to give public notice of the submission of a transitional environmental program and the administering authority is not satisfied public notice has been properly given.

(2) The administering authority may consider and decide whether to approve the draft program if it is satisfied there has been substantial compliance with this Act.

343 Failure to approve draft program taken to be refusal

If the administering authority fails to decide whether to approve or refuse a transitional environmental program within the time it is required to make a decision on the program, the failure is taken to be a decision by the authority to refuse to approve the program at the end of the time.

Division 3 Amendment of approval for transitional environmental programs

344 Application

(1) Division 2 (other than section 335(1)) applies, with all necessary changes, to a submission by the holder of an approval for a transitional environmental program for an environmentally relevant activity to amend the approval.

(2) Without limiting subsection (1), if the holder submits for approval an amendment of the approval that extends the period over which the program is to be carried out to longer than 5 years, section 335(2) and (3) applies to the submission as if the submission were for the approval of a draft transitional environmental program.

(3) Also, the administering authority may approve the amendment only if it is reasonably satisfied it will not result in increased environmental harm being caused by the carrying out of the activity under the amended approval than the environmental harm that would be caused by carrying out the activity if the approval were not granted.

(4) Without limiting the matters to be considered in deciding the application, the administering authority must have regard to—

(a) the period under the original approval; and

(b) the period that remains under the original approval; and

(c) any change to the period under the original approval; and

(d) the nature of the risk of environmental harm being caused by the activity.

Division 4 Miscellaneous

345 Annual return

The holder of an approval of a transitional environmental program must, within 22 business days after each anniversary of the day of approval of the program, give to the administering authority an annual return in the approved form.

Maximum penalty—100 penalty units.

346 Effect of compliance with program

(1) This section applies if an approved transitional environmental program authorises the holder to do, or not to do, something under the program.

(2) The holder, or a person acting under the approval may do, or not do, the thing under the program despite anything in—

(a) a regulation; or

(b) an environmental protection policy; or

(c) an environmental authority held by the holder; or

(d) a development condition of a development approval; or

(e) a standard environmental condition of a code of environmental compliance for a chapter 4 activity; or

(f) an accredited ERMP.

(3) Without limiting subsection (2), the doing, or not doing, of the thing under the program is not a contravention of—

(a) a regulation; or

(b) an environmental protection policy; or

(c) a condition of an environmental authority held by the holder; or

(d) a development condition of a development approval; or

(e) a standard environmental condition of a code of environmental compliance for a chapter 4 activity; or

(f) an accredited ERMP.

347 Notice of disposal by holder of program approval

(1) This section applies if the holder of an approval of a transitional environmental program proposes to dispose of the place or business to which the program relates to someone else (the ***buyer***).

(2) Before agreeing to dispose of the place or business, the holder must give written notice to the buyer of the existence of the program.

Maximum penalty—50 penalty units.

(3) If the holder does not comply with subsection (2), the buyer may rescind the agreement by written notice given to the holder before the completion of the agreement or possession under the agreement, whichever is the earlier.

(4) On rescission of the agreement under subsection (3)—

(a) a person who was paid amounts by the buyer under the agreement must refund the amounts to the buyer; and

(b) the buyer must return to the holder any documents about the disposal (other than the buyer's copy of the agreement).

(5) Subsections (3) and (4) have effect despite any other Act or anything to the contrary in the agreement.

(6) Within 10 business days after agreeing to dispose of the place or business, the holder must give written notice of the disposal to the administering authority.

Maximum penalty for subsection (6)—50 penalty units.

348 Notice of ceasing activity by holder of program approval

Within 10 business days after ceasing to carry out the activity to which a transitional environmental program relates, the holder of the approval for the program must give written notice of the ceasing the activity to the administering authority.

Maximum penalty—50 penalty units.

349 Compliance with Act at completion of program

The holder of an approval for a transitional environmental program must achieve full compliance with this Act for the matters dealt with by the program at the end of the period over which the program is carried out.

338 Criteria for deciding draft program

(1) In deciding whether to approve or refuse to approve the draft program or the conditions (if any) of the approval, the administering authority—

(a) must comply with any relevant regulatory requirement; and

(b) subject to paragraph (a), must also consider the following—

(i) the standard criteria;

(ii) additional information given in relation to the draft program;

(iii) the views expressed at a conference held in relation to the draft program.

(2) If the draft program is prepared because of a requirement of a development condition of a development approval, the authority may approve the draft program only if it is not inconsistent with other conditions of the approval.

Administrative Practice Note x/10

Environmental Protection Act 1994

Assessing draft Transitional Environmental Programs

The following administrative practice is to be followed when assessing draft Transitional Environmental Programs under the Environmental Protection Act 1994. *In the Report of November 2008 by Professor Barry Hart to the Queensland Premier a recommendation was made that the procedures used to develop TEPs be reviewed. This administrative practice note is the outcome of that review.*

Background

A Transitional Environmental Program (TEP) is an environmental compliance program, drafted by the holder of a development approval or an environmental authority for an environmentally relevant activity or an environmental authority, for which approval is applied for to the administering authority.

Section 330 of the Environmental Protection Act 1994 provides the definition for a TEP:

A transitional environmental program is a specific program that, when approved, achieves compliance with this Act for the matters dealt with by the program by:

(a) reducing environmental harm; or

(b) detailing the transition to an environmental standard.

There are three ways in which a client may develop a TEP:

1. the administering authority may require a client to develop a TEP to address a specific issue (a compliance tool), by issuing a 'Notice to Prepare' under section 332 of the *Environmental Protection Act 1994*;
2. the client may voluntarily develop and submit a TEP under section 333 of the *Environmental Protection Act 1994*; or
3. a client may lodge a Program Notice to the administering authority under section 350 of the *Environmental Protection Act 1994* and be required to develop and lodge a TEP.

In circumstances where a person has given the administering authority a Program Notice about an act or omission that has caused or threatened environmental harm in the carrying out of an activity by the person and the activity is lawful apart from the provisions of the *Environmental Protection Act 1994*, the administering authority is required to give the person a notice nominating a day by which a draft TEP must be submitted.

The information given in a Program Notice is privileged and can not be used in evidence by the administering authority.

Formatted: Space Before: 0 pt, After: 0 pt, Line spacing: 1.5 lines, Don't adjust space between Latin and Asian text

Formatted: Space After: 0 pt, Line spacing: 1.5 lines

Formatted: Line spacing: 1.5 lines

Formatted: Indent: First line: 0 pt, Line spacing: 1.5 lines

Formatted: Font: Bold, Italic

Formatted: Normal, Indent: First line: 36 pt, Line spacing: 1.5 lines, Don't adjust space between Latin and Asian text, Don't adjust space between Asian text and numbers

Formatted: Font: Bold, Italic, Font color: Red

Formatted: Space After: 0 pt, Line spacing: 1.5 lines

Formatted: Bullets and Numbering

Formatted: Font: Italic

Formatted: Font: Italic

Formatted: Font: Italic

Deleted: <#>The administering authority may require the preparation of a TEP or a person or public authority may voluntarily submit a TEP.¶

Department of Environment and Resource Management
www.derm.qld.gov.au

Assessing draft Transitional Environmental Programs

A TEP is similar to a contract, in which the contents of the program are legally binding on its approval.

A person will make an application for approval of a TEP for some or all of the following reasons:

- An approved TEP can result in a person being provided immunity from charges specifically related to an incident which is the subject of a Program Notice;
- An approved TEP can result in a person being given a period of time in which to carry out certain specified activities that will enable them to comply with the conditions of an environmental authority or achieve an environmental standard. The person can not be prosecuted for non-compliance while the matters are being addressed in accordance with the requirements of the TEP.

A TEP especially when combined with a Program Notice is an extremely powerful tool so its approval should always be approached with care and due diligence as to the consequences of the shield that it may provide with respect to activities that may cause or potentially cause environmental harm.

Duties of the administering authority

Requiring a draft TEP to be prepared

The administering authority can require a TEP be drafted by a person if it is satisfied that the following events have occurred:

- The activity currently being carried out, or proposed to be carried out, is or may cause unlawful environmental harm;
- It is impractical for a person to comply with any policy or regulation on its commencement;
- That a condition of an environmental authority is or has been contravened;
- That a standard environmental condition of a Code of Environmental Compliance for a Chapter 4 activity is or has been contravened; or
- A development condition of a development approval is or has been contravened.

The administering authority may make this requirement as a condition of an environmental authority or development approval or by issuing a statutory notice.

Where a statutory notice is issued it must state:

- The grounds on which the requirement to prepare a draft TEP is made;
- The matters that are to be addressed by the TEP. These must be stated with sufficient particularity for the person to whom the notice is issued to understand and supply a draft document that meets these requirements;
- The period over which the TEP is to be carried out;
- The day by which the draft TEP must be prepared and submitted; and

Assessing draft Transitional Environmental Programs

- The review and appeal details that apply to the decision to require the submission of a draft TEP.

If the statutory notice clearly sets out the matters to be addressed (particularly in terms of setting up what will ultimately be the objectives or outcomes to be achieved through the TEP), then the negotiation of an approved TEP is more likely to result in the objectives or outcomes sought.

In drafting the statutory notice the administering authority should have regard to the matters that it is required to give consideration to in deciding to approve or refuse a draft TEP. These matters are set out in the *Environmental Protection Act 1994*, and the *Environmental Protection Regulation 2008*. Inclusion of details about relevant information that should be submitted as part of the draft TEP in the statutory notice will assist in the assessment of a draft TEP and avoid requests for additional information.

Assessing a draft TEP

General

A draft TEP must meet the content requirements of section 331 of the *Environmental Protection Act 1994*, while also meeting the purpose of a TEP. The legislation states that a TEP must:

- state the objectives to be achieved and maintained under the TEP,
- state how the objectives are to be achieved, taking into account:
  - the best practice environmental management for the activity, and
  - the risk of environmental harm being cause by the activity,
- state a timetable of the actions to be undertaken to achieve the objectives,
- state the performance indicators to be used to identify both the progress and completion of the objectives. The performance indicators are not to be spaced at intervals greater than six months, and
- make provisions for monitoring and reporting compliance with the TEP.

As an approved TEP can protect the holder from enforcement action for non-compliances with *the Act*, the commitments or terms of the TEP need to be clearly drafted, unambiguous and easily auditable.

Note: Failure to comply with the terms of a TEP is an offence so the terms outlined within the document act in a similar way to conditions contained within a Development Approval or Environmental Authority.

In deciding whether to approve or refuse a draft TEP, the criteria for making the decision outlined in section 338 of the *Environmental Protection Act 1994* must be considered. This section refers the assessor to:

- any relevant regulatory requirement, and
- the standard criteria.

The decision whether to approve or refuse a draft TEP is an "environmental management decision" as per the *Environmental Protection Regulation 2008*. In assessing a TEP the administering authority must comply with the regulatory requirements for making an environmental management decision, consider the standard criteria, any additional information that has been given in relation to the draft TEP, and the views that have been

Formatted: Font: Italic

Formatted: Bullets and Numbering

Formatted: Line spacing: 1.5 lines

Formatted: Font: Italic

Formatted: Space After: 0 pt, Line spacing: 1.5 lines

Formatted: Font: Italic

Formatted: Bullets and Numbering

Formatted: Font: Italic

expressed at any conference called by the administering authority to help it decide whether to approve or refuse a draft TEP.

It is also important for the assessor to consider, if the TEP was lodged due to a 'notice to prepare', whether the TEP meets the requirements of the statutory notice. If the administering authority considers that the submitted draft TEP will not achieve the objectives or outcomes specified in the statutory notice then it is critically important that all changes required by the administering authority to ensure that the TEP achieves the required objectives or outcomes are incorporated into the TEP before it is approved.

Deleted: ¶

Formatted: Line spacing: 1.5 lines

The assessment of a draft TEP must result in the preparation of an assessment report that is sufficiently detailed to demonstrate that all mandatory aspects have been considered. The assessment report must be provided to the delegate of the administering authority to assist with decision making and must be kept on the permanent file record to document the decision making process.

Where the assessment requires specific environmental and / or environmental knowledge or skills, and these are not available within the office with the responsibility for assessing the application, these shall be sought to assist with the assessment and the advice or information documented as part of the assessment report.

Risk Assessment

Undertaking a review of all the matters that must be statutorily considered will provide an informal risk assessment.

Notwithstanding the matters for consideration set out in the statute, should the nature of a proposed TEP be significantly complex and / or the nature of the receiving environment (including the potential impacts on people) be significantly sensitive, consideration must be given to undertaking a formal risk assessment in accordance with the Australian Standard AS/NZS ISO 31000:2009 Risk management –Principles and guidelines.

When deciding whether to undertake a formal risk assessment to assist with consideration of whether to approve or refuse a draft TEP the administering authority will consider the importance, including, but not limited to, aspects such as:

- The nature and quantity of any contaminants proposed to be released;
- The nature (e.g. pristine or otherwise) of the receiving environment;
- The number of people potentially affected by any release and the manner in which they may be affected.

Context of draft TEP

Assessing draft Transitional Environmental Programs

When assessing the draft TEP against the regulatory requirements set out in the *Environmental Protection Regulation 2008*, the requirements must be considered in the context of the proposal e.g. if the proposal is for a release to surface waters, assessment against subsections (1) (d) and (e) must be considered along with the additional requirements for the release of water, other than stormwater, to surface water, in the context of the nature of the waterway and the impact of the release on users of the waterway such as irrigators, local governments and others who draw water supplies from the waterway.

Community Interest

Where there is, or there is expected to be, significant public interest in the draft TEP and any decision to approve it, the administering authority will consider seeking comment from the public (or other interested parties) prior to making a decision. This will, if necessary, be done under the relevant provisions of the *Environmental Protection Act 1994*. Where this action is proposed by the administering authority, comments will be sought at least through a public notice in local newspapers.

Such information may also be sought by the administering authority directly contacting interested persons or organisations which may be able to contribute to the assessment process (e.g. local governments, other government departments).

Information obtained by such means must be considered by the administering authority when making a decision to approve or refuse a draft TEP.

Where there is likely to be ongoing community interest in the progress of the implementation of a TEP during its life, the administering authority will consider requiring the applicant to include community consultation as part of the TEP.

Assessing draft Transitional Environmental Programs

Approval of a TEP

A draft TEP may be approved, approved with conditions, or refused.

A draft TEP must only be approved if the administering authority is satisfied that it covers all of the matters and includes a program of specific actions that will allow it when complete to achieve the objectives or outcomes specified in the TEP.

A certificate of approval for a TEP may contain conditions, those conditions are not enforceable, therefore it is critically important that the draft TEP contains all of the matters that the administering authority considers are required to achieve the objective or outcomes of the TEP. The administering authority must negotiate variations to the draft TEP and not rely on the certificate of approval to vary or modify a draft TEP.

Delegation for decision making

The responsibility for decision making with respect to approving or refusing a draft TEP must be in accordance with the current Environmental Protection Delegation. Where it is appropriate, due to the technical complexity of the assessment and / or the potential impacts of the decision, the decision may be made by a delegate with greater seniority in the organisation.

Formatted: Space After: 0 pt, Line spacing: 1.5 lines

Formatted: Line spacing: 1.5 lines

Refusal of a TEP

If the administering authority is not satisfied with a draft TEP, and is unable to negotiate a satisfactory TEP, it may refuse an application for approval.

If a decision on whether to approve or refuse a draft TEP is not given within the statutory time, the decision is deemed to have been a refusal.

If the administering authority refuses a draft TEP it must provide an information notice about the decision.

Fees for assessment of a TEP

The *Environmental Protection Act 1994* provides for the administering authority to charge a person or public authority, the fee prescribed by regulation, for submitting a draft TEP for approval. For further information on the charging of fees for the assessment of a TEP refer to Operational Policy titled, *Transitional Environmental Program (TEP) fees.*

Amending a TEP

Assessing draft Transitional Environmental Programs

The administrative authority must give the same consideration to an application to amend an approved TEP as it would an original application for approval of a draft TEP.

If the amendment of an approved TEP would extend the period in which the TEP is carried out to longer than 5 years then the applicant must give public notice of the application to amend the approved TEP. In assessing the amendment application, the administering authority will look for evidence that these requirements have been complied with.

The administering authority may only approve an amendment application if it is reasonably satisfied that it will not result in increased environmental harm being caused by the carrying out of the activity under the amended approval than the environmental harm that would be caused were the approval not granted.

Annual Return

The holder of an approved TEP must, within 22 days of the anniversary day of the approval of the TEP, give to the administering authority an annual return in the approved form.

The administering authority should discuss the requirements for the content of the annual return at the time that the TEP is applied for and include in the draft TEP the form and content of the information that is to be provided in the annual return.

Notice of disposal of the benefit of a TEP

If the holder of an approved TEP proposes to dispose of the place or business to which the TEP relates to another person they must give written notice to the buyer of the place or business of the existence of the TEP. The importance of any failure of the holder of a TEP to give such notice is that it is a statutory grounds for rescinding any agreement.

The holder of an approved TEP must give the administering authority written notice within 10 days of the disposal of a place or business that is subject to an approved TEP.

Enforcing a TEP

If the holder of an approved TEP does not comply with the requirements of the TEP, as distinct from the requirements of a certificate of approval, the administering authority may prosecute the holder for a breach of the TEP.

Formatted: Space After: 0 pt, Line spacing: 1.5 lines

Assessing draft Transitional Environmental Programs

Where the TEP contains defined milestones that are clear and quantifiable, the administering authority may also prosecute the holder of an approved TEP for breach of those milestones. Given the time and effort required to compile a brief of evidence, it is, in the face of an investigation and action for breach, possible for the holder of an approved TEP to bring themselves into compliance, and thereby frustrate or mitigate the action for breach of the TEP.

Where the holder of an approval is recalcitrant in performing the obligations imposed through the approved TEP, action for breach of milestones should be considered, especially where the approved TEP has a period of more than a year.

All non-compliances with an approved TEP must be responded to in a timely and appropriate manner keeping in mind that the approval of a TEP is already a mechanism for dealing with an inability for the holder to comply with environmental requirements.

Approved by:
X
X
Department of Environment and Resource Management

Date: xx/mm/2010

Enquiries:
Permit and Licence Management
Ph: **1300 368 326**
Fax: (07) 3115 9600
Email:
eco.access@derm.qld.gov.au

Request for Statutory Approval

Department of Environment and Resource Management

s337 of the *Environmental Protection Act 1994*
CONSIDERATION OF A TRANSITIONAL ENVIRONMENTAL PROGRAM (TEP)

CLIENT:	XXXX
REGISTERED OFFICE ADDRESS:	XXXX
	XXXX
	XXXX
	XXXX
	XXXX
TENEMENT:	XXXX
ENV AUTHORITY NO.:	XXXX
	XXXX
FILE NO.:	XXXX
PROGRAM NOTICE/REQUIRED:	XXXX
REASON FOR TEP:	XXXX
DATE SUBMITTED:	XXXX
DECISION DUE DATE:	XXXX
(if approval required)	
TIME SPENT:	XXXX

1.0 SUMMARY

XXXX

Has the TEP been entered in EcoTrack:	Yes/No
EcoTrack Compliance Reference (if applicable): -	XXXX
EcoTrack TEP Reference Number: -	XXXX

If Approving the TEP

Has a notice approving the TEP been completed:	Yes/No
Has a certificate of approval been developed:	Yes/No
Were additional conditions set on the certificate of approval:	Yes/No

2.0 STATUTORY REQUIREMENTS

330 What is a transitional environmental program
A transitional environmental program is a specific program that, when approved, achieves compliance with this Act for the matters dealt with by the program by—
(a) reducing environmental harm; or
(b) detailing the transition to an environmental standard.
XXXX

337 Administering authority to consider draft programs
(1) The administering authority must decide whether to approve a draft transitional environmental program submitted to it within 20 business days after the application date.

XXXX

(2) If public notice is required to be given of the submission of the draft program, the administering authority must be satisfied public notice has been properly given before making a decision.

XXXX
338 Criteria for deciding draft program
(1) In deciding whether to approve or refuse to approve the draft program or the conditions (if any) of the approval, the administering authority—
(a) must comply with any relevant regulatory requirement;
and

XXXX

Environmental Protection Regulation 2008
Chapter 4 Regulatory Requirements

Part 2 Regulatory Requirements for all environmental management decisions

s51 Matters to be considered for environmental management decisions
XXXX

s52 Conditions to be considered for environmental management decisions
XXXX

s53 Matters to be considered for decisions imposing monitoring conditions
XXXX

Part 3 Additional regulatory requirements for particular environmental management decisions

s55 Release of water or waste to land
XXXX

s56 Release of water, other than stormwater, to surface water
XXXX

s57 Release of stormwater
XXXX

s58 Release of water or waste to particular wetlands for treatment
XXXX

s59 Activity involving berthing, docking or mooring a boat
XXXX

s60 Activity involving storing or moving bulk material
XXXX

s61 Activity involving acid sulphate soil
XXXX

s62 Activity involving acid-producing rock
XXXX

s63 Activity involving direct release of waste to groundwater
XXXX

s64 Activity involving indirect release of contaminants to groundwater
XXXX

(b) subject to paragraph (a), must also consider the following—
(i) the standard criteria;

- *The principles of ecological sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development'.*
  XXXX
- *Any applicable environmental protection policy.*
  XXXX
- *Any applicable Commonwealth, State or local government plans, standards, agreements or requirements.*
  XXXX
- *Any applicable environmental impact study, assessment or report.*
  XXXX
- *The character, resilience and values of the receiving environment.*
  XXXX
- *All submissions made by the applicant and submitters.*
  XXXX
- *The best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows – a transitional environmental program.*
  XXXX

  s21 of the *Environmental Protection Act 1994* - Best practice environmental management
  *(1) The **best practice environmental management** of an activity is the management of the activity to achieve an ongoing minimisation of the activity's environmental harm through cost-effective measures assessed against the measures currently used nationally and internationally for the activity.*
  *(2) In deciding the **best practice environmental management** of an activity, regard must be had to the following measures—*
  (a) strategic planning by the person carrying out, or proposing to carry out, the activity;
  (b) administrative systems put into effect by the person, including staff training and monitoring and review of the systems;
  (c) public consultation carried out by the person;
  (d) product and process design;
  (e) waste prevention, treatment and disposal.
  *(3) Subsection (2) does not limit the measures to which regard may be had in deciding the **best practice environmental management** of an activity.*

- *The financial implications of the requirements under an instrument, or proposed instrument, mentioned in paragraph (g) (above) as they would relate to the type of activity or industry carried out, or proposed to be carried out, under the instrument.*
  XXXX
- *The public interest.*
  XXXX
- *Any applicable site management plan.*
  XXXX

- *Any relevant integrated environmental management system or proposed integrated environmental management system.*
  XXXX

- *Any other matter prescribed under a regulation.*
  XXXX

  (ii) additional information given in relation to the draft program;
  Maps and background information was submitted and considered.

  (iii) the views expressed at a conference held in relation to the draft program.
  N/A.

(2) If the draft program is prepared because of a requirement of a development condition of a development approval, the authority may approve the draft program only if it is not inconsistent with other conditions of the approval.
XXXX

<u>**331 Content of program**</u>
A transitional environmental program must—
(a) state the objectives to be achieved and maintained under the program for an activity; and
XXXX

(b) state how the objectives are to be achieved, and a timetable to achieve the objectives, taking into account—
(i) the best practice environmental management for the activity; and
XXXX

(ii) the risks of environmental harm being caused by the activity; and
XXXX

(c) state appropriate performance indicators at intervals of not more than 6 months; and
XXXX

(d) make provision for monitoring and reporting compliance with the program.
XXXX

343 Failure to approve draft program taken to be refusal
XXXX

4.0 RECOMMENDATION
XXXX

XXXX
Senior Environmental Officer

Signed –

Date -

Reviewed & Endorsed By	
XXXX Senior Environmental Officer	**Delegate** Manager - Emerald

Signed – Date:	Signed – Date:

Queensland

Environmental Protection Act 1994

Environmental Protection (Water) Policy 2009

Reprinted as in force on 16 July 2010

Reprint No. 1B

**This reprint is prepared by
the Office of the Queensland Parliamentary Counsel
Warning—This reprint is not an authorised copy**

Information about this reprint

This policy is reprinted as at 16 July 2010. The reprint—

- shows the law as amended by all amendments that commenced on or before that day (Reprints Act 1992 s 5(c))
- incorporates all necessary consequential amendments, whether of punctuation, numbering or another kind (Reprints Act 1992 s 5(d)).

The reprint includes a reference to the law by which each amendment was made—see list of legislation and list of annotations in endnotes. Also see list of legislation for any uncommenced amendments.

This page is specific to this reprint. See previous reprints for information about earlier changes made under the Reprints Act 1992. A table of reprints is included in the endnotes.

Also see endnotes for information about—

- **when provisions commenced**
- **editorial changes made in earlier reprints.**

Spelling

The spelling of certain words or phrases may be inconsistent in this reprint or with other reprints because of changes made in various editions of the Macquarie Dictionary (for example, in the dictionary, 'lodgement' has replaced 'lodgment'). Variations of spelling will be updated in the next authorised reprint.

Dates shown on reprints

Reprints dated at last amendment All reprints produced on or after 1 July 2002, authorised (that is, hard copy) and unauthorised (that is, electronic), are dated as at the last date of amendment. Previously reprints were dated as at the date of publication. If an authorised reprint is dated earlier than an unauthorised version published before 1 July 2002, it means the legislation was not further amended and the reprint date is the commencement of the last amendment.

If the date of an authorised reprint is the same as the date shown for an unauthorised version previously published, it merely means that the unauthorised version was published before the authorised version. Also, any revised edition of the previously published unauthorised version will have the same date as that version.

Replacement reprint date If the date of an authorised reprint is the same as the date shown on another authorised reprint it means that one is the replacement of the other.

Queensland

Environmental Protection (Water) Policy 2009

Contents

Environmental Protection (Water) Policy 2009

[as amended by all amendments that commenced on or before 16 July 2010]

Part 1 Preliminary

1 Short title

This policy may be cited as the *Environmental Protection (Water) Policy 2009*.

2 Definitions

The dictionary in schedule 2 defines particular words used in this policy.

Part 2 Application and purpose of policy

3 Application of policy

This policy applies to all Queensland waters.

4 Purpose of policy

The purpose of this policy is to achieve the object of the Act in relation to Queensland waters.

Note—

See section 3 of the Act.

5 How purpose of policy is achieved

The purpose of this policy is achieved by—

(a) identifying environmental values and management goals for Queensland waters; and

(b) stating water quality guidelines and water quality objectives to enhance or protect the environmental values; and

(c) providing a framework for making consistent, equitable and informed decisions about Queensland waters; and

(d) monitoring and reporting on the condition of Queensland waters.

Part 3 Basic concepts

6 Environmental values to be enhanced or protected

(1) The environmental values of waters to be enhanced or protected under this policy are—

(a) for water mentioned in schedule 1, column 1—the environmental values stated in the document opposite the water in schedule 1, column 2; or

(b) for other water—the environmental values stated in subsection (2).

(2) For subsection (1)(b), the environmental values are as follows—

(a) for high ecological value waters—the biological integrity of an aquatic ecosystem that is effectively unmodified or highly valued;

(b) for slightly disturbed waters—the biological integrity of an aquatic ecosystem that has effectively unmodified biological indicators, but slightly modified physical, chemical or other indicators;

(c) for moderately disturbed waters—the biological integrity of an aquatic ecosystem that is adversely affected by human activity to a relatively small but measurable degree;

(d) for highly disturbed waters—the biological integrity of an aquatic ecosystem that is measurably degraded and of lower ecological value than waters mentioned in paragraphs (a) to (c);

(e) for waters that may be used for producing aquatic foods for human consumption—the suitability of the water for producing the foods for human consumption;

(f) for waters that may be used for aquaculture—the suitability of the water for aquacultural use;

(g) for waters that may be used for agricultural purposes—the suitability of the water for agricultural purposes;

(h) for waters that may be used for recreation or aesthetic purposes, the suitability of the water for—

(i) primary recreational use; or

(ii) secondary recreational use; or

(iii) visual recreational use;

(i) for waters that may be used for drinking water—the suitability of the water for supply as drinking water;

(j) for waters that may be used for industrial purposes—the suitability of the water for industrial use;

(k) the cultural and spiritual values of the water.

(3) In this section—

cultural and spiritual values, of water, means its aesthetic, historical, scientific, social or other significance, to the present generation or past or future generations.

primary recreational use, of water, means full body contact with the water, including, for example, diving, swimming, surfing, waterskiing and windsurfing.

secondary recreational use, of water, means contact other than full body contact with the water, including, for example, boating and fishing.

visual recreational use, of water, means viewing the water without contact with it.

7 Indicators and water quality guidelines for environmental values

(1) An ***indicator*** for an environmental value is a physical, chemical, biological or other property that can be measured or decided in a quantitative way.

Examples—

- The concentration of nutrients and pH value are types of chemical indicators.
- Secchi disc clarity is a type of physical indicator.
- Seagrass depth range, macro-invertebrate family richness and percentage of exotic fish are types of biological indicators.

(2) ***Water quality guidelines*** are quantitative measures or statements for indicators, including contaminant concentration or sustainable load measures of water, that protect a stated environmental value.

(3) For particular water, the indicators and water quality guidelines for an environmental value are—

(a) decided using the following documents—

(i) site specific documents for the water;

(ii) the QWQ guidelines;

(iii) the AWQ guidelines;

(iv) other relevant documents published by a recognised entity; and

(b) for water mentioned in schedule 1, column 1—the indicators stated in the document opposite the water in schedule 1, column 2.

(4) To the extent of any inconsistency between the documents mentioned in subsection (3)(a) for a particular water quality guideline, the documents are to be used in the order in which they are listed in that subsection.

(5) In this section—

sustainable load measure, of water, means the maximum concentration of contaminants the water can accommodate while achieving the water quality objectives for the water.

8 When environmental values are protected

For this policy, the environmental values for particular water are protected if the measures for all indicators do not exceed the water quality guidelines stated for the indicators.

Part 4 Management goals and water quality objectives for waters

9 Management goals

The management goals for water mentioned in schedule 1, column 1 are the goals, if any, stated in the document opposite the water in schedule 1, column 2.

Examples of management goals—

- to maintain an area, composition and condition of seagrass beds, reefs or mangroves
- to maintain a stated level of diversity of fish species

10 Water quality objectives

(1) The water quality objectives for water mentioned in schedule 1, column 1 are—

(a) the objectives stated in the document opposite the water in schedule 1, column 2; or

(b) if water quality objectives for the water are not stated in the document—the set of water quality guidelines that will protect all environmental values stated in the document.

(2) The water quality objectives for water not mentioned in schedule 1, column 1 are the set of water quality guidelines for all indicators that will protect all environmental values for the water.

(3) However, water quality objectives do not apply to—

(a) water in swimming pools; and

(b) drinking water in a domestic water supply system, including, for example, water in a local government or privately owned water supply system; and

(c) waste water in a storage including, for example, a sewage lagoon, mine tailings dam, irrigation tailwater dam and piggery or dairy waste water pond; and

(d) water in a pond used for aquaculture; and

(e) water in a stormwater treatment system.

11 Identifying environmental values etc. for waters

(1) This section applies to water not mentioned in schedule 1, column 1.

(2) For developing a document about particular water for inclusion in schedule 1, the chief executive may, in cooperation with the chief executive (fisheries), identify—

(a) the environmental values to be protected for the water; and

(b) the water quality objectives for the water; and

(c) ways to improve the quality of the water.

(3) In identifying the matters mentioned in subsection (2), the chief executive must ensure there has been—

(a) consultation with the community, including industry and commerce sectors; and

(b) consideration of the economic and social impacts of protecting environmental values for the water.

(4) Also, the chief executive may identify water quality objectives for the water that provide a lower level of protection of the environmental values for the water than the water quality guidelines mentioned in section 10(2) only if—

(a) the adoption of the water quality guidelines would involve unacceptable economic or social impacts on the community; and

(b) the water quality objectives are an improvement on existing water quality.

12 Amending waters in sch 1

(1) The chief executive may replace a document stated in schedule 1, column 2 for particular water only if—

(a) there has been consultation with the community, including industry and commerce sectors; and

(b) the chief executive has considered the economic and social impacts of protecting environmental values for the water.

(2) However, subsection (1) does not apply to a replacement document if—

(a) the purpose of the replacement is only to correct a minor error, or make another change that is not a change of substance; or

(b) the document being replaced states that an amendment of a stated type may be made to the document under this subsection, and the purpose of the replacement is only to make an amendment of the stated type.

Part 5 Management of activities

13 Management hierarchy for surface or ground water

(1) This section states the management hierarchy for an activity that may affect water.

Note—

See the *Environmental Protection Regulation 2008*, section 51.

(2) To the extent it is reasonable to do so, release of waste water or contaminants to waters must be dealt with using the following hierarchy of preferred procedures—

(a) step 1—evaluate water conservation measures to reduce the use of water and the production of waste water or contaminants;

(b) step 2—evaluate waste prevention options and implement appropriate waste prevention measures;

(c) step 3—if waste prevention does not, or is not likely to, eliminate the release of waste water or contaminants to waters, evaluate treatment and recycling options and implement appropriate treatment and recycling;

(d) step 4—if treatment and recycling does not, or is not likely to, eliminate the release of waste water or contaminants to waters, evaluate the following options for waste water or contaminants, in the order in which they are listed—

(i) appropriate treatment and release to a waste facility or sewer;

(ii) appropriate treatment and release to land;

(iii) appropriate treatment and release to surface waters or ground waters.

(3) In this section—

appropriate treatment, of waste water or contaminants, means—

(a) for release to a sewerage service provider's waste facility or sewer—treatment that meets the service provider's requirements for the release to the waste facility or sewer; or

(b) for release to land—treatment that ensures the release to land is ecologically sustainable; or

(c) for release to surface waters or ground waters—treatment that ensures the release will not affect the environmental values for the waters.

waste facility means a facility for the recycling, reprocessing, treatment, storage, incineration, conversion to energy or disposal of waste.

14 Management intent for waters

(1) This section states the management intent for waters subject to an activity that involves the release of waste water or contaminants to the waters.

Note—

See the *Environmental Protection Regulation 2008*, section 51.

(2) It is the management intent for the waters that the decision to release the waste water or contaminant must ensure the following—

(a) for high ecological value waters—the measures for the indicators for all environmental values are maintained;

(b) for slightly disturbed waters—the measures for the slightly modified physical or chemical indicators are progressively improved to achieve the water quality objectives for high ecological value water;

(c) for moderately disturbed waters—

(i) if the measures for indicators of the environmental values achieve the water quality objectives for the water—the measures for the indicators are maintained at levels that achieve the water quality objectives for the water; or

(ii) if the measures for indicators of the environmental values do not achieve the water quality objectives for the water—the measures for indicators of the environmental values are improved to achieve the water quality objectives for the water;

(d) for highly disturbed waters—the measures for the indicators of all environmental values are progressively improved to achieve the water quality objectives for the water.

Part 6 Environmental plans

Division 1 Preliminary

15 Purpose of policy to be considered

In developing and implementing an environmental plan under this part, a local government or sewerage service provider must consider the purpose of this policy and how the purpose is to be achieved.

Notes—

See sections 4 (Purpose of policy) and 5 (How purpose of policy is achieved).

See also section 358 (When order may be issued) of the Act for when the administering authority may issue an environmental protection order to secure compliance with this policy.

16 Development and implementation of environmental plans

(1) If, under this part, a local government or sewerage service provider must develop and implement an environmental plan about trade waste management, it must develop and start implementing the plan within 1 year after the commencement of this policy.

(2) If, under this part, a local government must develop and implement an environmental plan other than a plan about trade waste management, it must develop and start implementing the plan—

(a) for a distributor-retailer's participating local government—before 1 July 2012; or

(b) for a large local government, other than a distributor-retailer's participating local government—before 1 July 2013; or

(c) for another local government—before 1 July 2014.

(3) In this section—

large local government means a local government having a local government area with a population of more than 50000.

17 Reporting and review of environmental plans

(1) The local government or sewerage service provider must—

(a) after an environmental plan has been developed, and certified and endorsed under section 23—publish the plan on its website; and

(b) within 4 years after the plan is published under paragraph (a)—give the chief executive a report on the plan's implementation; and

(c) within 5 years after the plan is published under paragraph (a)—review and update the plan.

(2) The chief executive may at any time require a local government or sewerage service provider to review and amend its environmental plans.

18 Compliance with part

A local government may comply with a requirement under this part to develop and implement an environmental plan by using and implementing a plan prepared by it that complies with this policy, even though the plan was not originally prepared for this policy.

Division 2 Environmental plans—local governments and sewerage service providers

19 Total water cycle management—general

(1) A following local government must develop and implement an environmental plan about water cycle management for its local government area (a ***total water cycle management plan***)—

(a) a distributor-retailer's participating local government;

(b) a local government, other than a distributor-retailer's participating local government, if its local government area has a population of at least 25000;

(c) another local government if the chief executive requires it to develop and implement a total water cycle management plan, having regard to the water management requirements for the local government's area, including any results of ambient monitoring carried out under section 26.

Note—

In making a water netserv plan under the *South-East Queensland Water (Distribution and Retail Restructuring) Act 2009*, a distributor-retailer must, under section 99BQ(1)(c) of that Act, have regard to each of its participating local governments' total water cycle management plans.

(2) A local government's total water cycle management plan must include provisions about—

(a) the collection, treatment and recycling of waste water, stormwater, ground water and other water sources; and

(b) the integration of water use in its area.

(3) In developing and implementing the plan, the local government must have regard to—

(a) any guidelines published by the department about water cycle management; and

(b) any regional water security program made under the *Water Act 2000*, section 360M applying to its local government area; and

(c) any regional water supply strategy applying to its local government area; and

(d) for a local government within the SEQ region, each of the following plans, to the extent the plan applies to its local government area—

(i) SEQ regional plan;

(ii) any sub-regional total water cycle management plan under the SEQ regional plan.

(4) The local government must consider including in the plan—

(a) a strategy for demand management for water in its local government area; and

(b) ways to increase recycling of waste water and stormwater for purposes including, for example, industrial or agricultural purposes; and

(c) ways to use recycled waste water; and

(d) opportunities for stormwater harvesting for use as a water source; and

(e) the impacts of existing and future land use in the area on water cycle management, including the following—

(i) impacts of the use on the natural flow of waters;

(ii) impacts of the use on water quality objectives for waters;

(iii) the risks to drinking water supplies caused by the use; and

(f) a forecast of the water supply requirements for the area.

Note—

For other matters that must be included in the plan, see sections 20 to 22.

(5) If, under subsection (1)(b), the chief executive requires a local government to develop and implement a total water cycle management plan, the chief executive must advise the local government about the requirement in writing.

(6) In this section—

demand management, for water, see the *Water Supply (Safety and Reliability) Act 2008*, schedule 3.

regional water supply strategy means a document about short-term and long-term water supply security for particular regions, published by the department.

Note—

Regional water supply strategies are available on the department's website at <www.derm.qld.gov.au>.

SEQ regional plan means the regional plan for the SEQ region under the Planning Act.

20 Total water cycle management—sewage management

(1) A local government's total water cycle management plan must include provisions about the following for each waste water treatment plant in its local government area—

(a) effluent management;

(b) waste water recycling;

(c) sewerage system overflows;

(d) biosolids management.

(2) The local government must consider including in the plan provisions about—

(a) ways of improving effluent quality, reducing effluent contaminant loads and toxicity and increasing waste water recycling for the waste water treatment plant; and

(b) for water into which waste water may be released—

(i) the water quality objectives for the water; and

(ii) monitoring and reporting of releases of waste water; and

(iii) ambient monitoring of the water; and

(c) the maintenance of acceptable health risks; and

(d) ways of reducing infiltration to sewers; and

(e) minimising sewerage system overflows in a way that is consistent with the AWQ guidelines; and

(f) if the local government's area includes a boat harbour, marina or mooring, the management of sewage collected from vessels at the boat harbour, marina or mooring; and

(g) the management of biosolids in a way that is consistent with the document called 'Management for beneficial re-use of biosolids for sewage treatment plants July 2006', published by the department; and

(h) the health and safety of people working on the sewerage service.

21 Total water cycle management—urban stormwater quality management

(1) A local government's total water cycle management plan must include provisions about its stormwater quality management to improve the quality and flow of stormwater in ways that protect the environmental values of waters affected by the local government's urban stormwater system.

(2) The local government must consider including in the plan provisions about—

(a) identifying urban stormwater quality management needs for developed and developing areas that are consistent with the local government's priority infrastructure plan under the Planning Act; and

(b) the opportunities for stormwater harvesting, recycling or re-use; and

(c) incorporating water sensitive urban design in developed areas within a stated period; and

(d) managing urban stormwater quality and flows for development in the local government's area, having regard to the following documents—

(i) any site specific documents;

(ii) the QWQ guidelines;

(iii) relevant guidelines published by the department about stormwater quality; and

(e) monitoring and reporting processes for stormwater quality management.

22 Trade waste management

(1) This section applies to a local government or other entity that is a sewerage service provider, if the local government or entity permits trade waste to enter its sewerage services.

Note—

However, see the *South-East Queensland Water (Distribution and Retail Restructuring) Act 2009*, section 100A for how this section applies to a distributor-retailer under that Act.

(2) The local government or entity must develop and implement an environmental plan about trade waste management to control trade waste entering its sewerage services.

(3) The local government or other entity must consider including in the plan—

(a) requirements for waste prevention, treatment and recycling before the release of trade waste to a sewer may be authorised; and

(b) provisions about the effect of trade waste on—

(i) the receiving environment into which the trade waste is released; and

(ii) the end use of waters to which trade waste is being released; and

(iii) the materials used to construct the local government's or entity's sewerage service; and

(iv) the health and safety of people working on the sewerage service; and

(v) the treatment capabilities of waste water treatment plants; and

(c) a process for carrying out regular reviews of the quantity and content of trade waste entering the sewerage service.

(4) If a local government is required under section 19 to develop and implement a total water cycle management plan, the local government's plan about trade waste management must be included in its total water cycle management plan.

23 Certification and endorsement of plans

(1) This section applies to the following—

(a) a plan to which section 18 applies;

(b) a total water cycle management plan;

(c) a management plan about trade waste management.

(2) Each plan must—

(a) be independently certified by a registered professional engineer under the *Professional Engineers Act 2002* as complying with this policy; and

(b) if the plan is developed and implemented by a distributor-retailer's participating local government—be endorsed by the distributor-retailer.

(3) The certification must include the engineer's name and registration details.

Division 3 Other environmental plans

24 Healthy waters management plans

(1) The chief executive may, in cooperation with the chief executive (fisheries), develop and implement an environmental plan about water (a ***healthy waters management plan***) to decide ways to improve the quality of the water.

(2) Also, a recognised entity, in cooperation with the chief executive, may develop and implement a healthy waters management plan.

(3) A healthy waters management plan for water must—

(a) describe the water to which the plan applies; and

(b) include an assessment of the following for the water—

(i) any threats to water-dependent ecosystems;

(ii) any matters that may adversely affect the use of the water as a supply of drinking water;

(iii) any matters that may adversely affect the natural flows of the water; and

(c) if environmental values and water quality objectives for the water are stated in a document mentioned in schedule 1, column 2—include the environmental values and water quality objectives; and

(d) if environmental values and water quality objectives have not been established for the water—include proposed environmental values, management goals and water quality guidelines for the water; and

(e) if a water resource plan under the *Water Act 2000* applies to the water—include the environmental flow objectives for the plan and ecological outcomes stated in the plan for the water; and

(f) identify ways to protect the environmental values for the water, and to monitor and assess the effectiveness of the protection.

(4) In developing and implementing the plan, the chief executive or entity must have regard to any guidelines published by the department about healthy waters management plans.

Part 7 Functions of chief executive

25 Community awareness and involvement

(1) This section applies if the chief executive decides to develop and implement a plan to—

(a) raise community awareness of issues about water quality; and

(b) involve the community in water quality management.

(2) The chief executive must consider including in the plan—

(a) a description of the issues about water quality; and

(b) ways to raise community awareness and understanding about water quality policy, planning and management; and

(c) ways to improve levels of community consultation in relation to water quality management, including consultation carried out under this policy; and

(d) ways to better inform the community of issues about water quality management.

26 Ambient monitoring

(1) If the chief executive carries out a program of ambient monitoring of waters to assess the state of Queensland waters, the chief executive must—

(a) carry out the monitoring under—

(i) the document called 'Monitoring and Sampling Manual 2009' published by the department; and

(ii) the AWQ guidelines; and

Editor's note—

The document called 'Monitoring and Sampling Manual 2009' may be inspected at the department's office at level 3, 400 George Street, Brisbane and on the department's website at <www.derm.qld.gov.au>.

(b) publish the results of the monitoring on the department's website; and

(c) prepare a report about the results of the monitoring.

(2) To the extent of any inconsistency between the documents mentioned in subsection (1)(a), the document mentioned in subsection (1)(a)(i) prevails.

(3) If practicable, a comparison of ambient monitoring results with the water quality objectives for, and freshwater flows to, the water during the time of the monitoring must be included in the report.

(4) For a report prepared under this section, if the measure of an indicator does not comply with a water quality guideline because of a natural property of the water, the measure of the indicator is taken to comply with the water quality guideline.

(5) If the results of monitoring show the water quality objectives for the water have not been met, the chief executive may investigate the reasons why the water fails to meet the water quality objectives.

Part 8 Miscellaneous

27 Operation of sch 1

The boundaries of water mentioned in schedule 1, column 1 are the boundaries identified in the document stated opposite the water in schedule 1, column 2.

Editor's note—

A document mentioned in schedule 1 may be inspected at the department's office at level 3, 400 George Street, Brisbane and on the department's website at <www.derm.qld.gov.au>.

Part 9 Repeal and transitional provisions

Division 1 Repeal provision

28 Repeal

The Environmental Protection (Water) Policy 1997, SL No. 136 is repealed.

Division 2 Transitional provisions

29 Definitions for div 2

In this division—

commencement means the day this section commences.

repealed policy means the repealed *Environmental Protection (Water) Policy 1997*.

30 Effect of particular environmental plans

(1) This section applies if—

(a) a local government must, under this policy, develop and implement a total water cycle management plan; and

(b) on the commencement, the local government has any of the following plans developed under the repealed policy—

(i) an environmental plan about sewage management;

(ii) an environmental plan about stormwater quality management; and

(c) the plans mentioned in paragraph (b) comply with the requirements under this policy for a part of a total water cycle management plan.

(2) The local government's plan developed under the repealed policy is taken to be a plan to which section 18 applies.

31 Effect of trade waste management plan

(1) This section applies if—

(a) a local government must, under this policy, develop and implement an environmental plan about trade waste management; and

(b) on the commencement, the local government has an environmental plan about trade waste management developed under the repealed policy; and

(c) the plan mentioned in paragraph (b) complies with the requirements of this policy for an environmental plan about trade waste management.

(2) The local government's plan about trade waste management developed under the repealed policy is taken to be a plan about trade waste management under section 22.

32 Application of ss 16 and 17 to particular local governments

(1) This section applies to a local government required to develop and implement a total water cycle management plan under 19(1)(b).

(2) Sections 16 and 17 apply to the local government as if the references in the sections to the commencement of this policy were a reference to the day the local government was advised by the chief executive about the requirement under section 19(5).

33 References to repealed policy

In an Act or document, a reference to the repealed policy may, if the context permits, be taken as a reference to this policy.

Schedule 1 Environmental values and water quality objectives for waters

sections 6 and 10

Column 1 Water		Column 2 Document
Name	**Description**	
Albert River, including all tributaries of the river	part of basin 145	Albert River Environmental Values and Water Quality Objectives, published by the department in July 2010
Bloomfield River, including all tributaries of the river	part of basin 108	Bloomfield River Environmental Values and Water Quality Objectives, published by the department in July 2010
Bremer River, including all tributaries of the river	part of basin 143	Bremer River Environmental Values and Water Quality Objectives, published by the department in July 2010
Brisbane River, including all tributaries of the Brisbane River other than Bremer River, Lockyer Creek, Oxley Creek and Stanley River	part of basin 143	Brisbane River Environmental Values and Water Quality Objectives, published by the department in July 2010

Column 1 Water		Column 2 Document
Name	**Description**	
Brisbane creeks—Bramble Bay, including Bald Hills, Cabbage Tree, Downfall, Kedron Brook, Nudgee and Nundah creeks	part of basin 142	Brisbane Creeks—Bramble Bay Environmental Values and Water Quality Objectives, published by the department in July 2010
Broadwater, including— • Biggera and Loders creeks • the Broadwater and all creeks of the Broadwater catchment • Runaway Bay	part of basin 146	Broadwater Environmental Values and Water Quality Objectives, published by the department in July 2010
Burrum, Gregory, Isis, Cherwell and Elliott rivers, including all Hervey Bay coastal rivers and creeks	basin 137	Burrum, Gregory, Isis, Cherwell and Elliott Rivers Environmental Values and Water Quality Objectives, published by the department in July 2010
Caboolture River, including all tributaries of the river	part of basin 142	Caboolture River Environmental Values and Water Quality Objectives, published by the department in July 2010

Column 1 Water		Column 2 Document
Name	**Description**	
Coomera River, including all tributaries of the river	part of basin 146	Coomera River Environmental Values and Water Quality Objectives, published by the department in July 2010
Currumbin and Tallebudgera creeks and Pacific Beaches, including— • all tributaries of Currumbin and Tallebudgera creeks • all creeks of the Pacific Beaches catchment	part of basin 146	Currumbin and Tallebudgera Creeks Environmental Values and Water Quality Objectives, published by the department in July 2010
Daintree River, including all tributaries of the river	part of basin 108	Daintree River Environmental Values and Water Quality Objectives, published by the department in July 2010
Douglas central coastal creeks, including all coastal creeks between Mowbray River and Mossman River	part of basin 109	Douglas Central Coastal Creeks Environmental Values and Water Quality Objectives, published by the department in July 2010
Douglas coastal waters	adjacent to basins 108 and 109	Douglas Coastal Waters Environmental Values and Water Quality Objectives, published by the department in July 2010

Column 1 Water		Column 2 Document
Name	**Description**	
Douglas northern coastal creeks, including all coastal creeks north of Daintree River and east of Bloomfield River	part of basin 108	Douglas Northern Coastal Creeks Environmental Values and Water Quality Objectives, published by the department in July 2010
Douglas southern coastal creeks, including all coastal creeks between Mowbray River and Simpson Point	part of basin 109	Douglas Southern Coastal Creeks Environmental Values and Water Quality Objectives, published by the department in July 2010
Fraser Island waters	basin 139	Fraser Island Environmental Values and Water Quality Objectives, published by the department in July 2010
Great Sandy Strait and coastal creeks	part of basin 140 and adjacent to basins 137, 138 and 139	Great Sandy Strait and Coastal Creeks Environmental Values and Water Quality Objectives, published by the department in July 2010
Hervey Bay	adjacent to basins 137 and 139	Hervey Bay Environmental Values and Water Quality Objectives, published by the department in July 2010
Lockyer Creek, including all tributaries of the creek	part of basin 143	Lockyer Creek Environmental Values and Water Quality Objectives, published by the department in July 2010

Column 1 Water		Column 2 Document
Name	**Description**	
Logan River, including all tributaries of the river	part of basin 145	Logan River Environmental Values and Water Quality Objectives, published by the department in July 2010
Maroochy River, including all tributaries of the river	part of basin 141	Maroochy River Environmental Values and Water Quality Objectives, published by the department in July 2010
Mary River, including all tributaries of the river	basin 138	Mary River Environmental Values and Water Quality Objectives, published by the department in July 2010
Mooloolah River, including all tributaries of the river	part of basin 141	Mooloolah River Environmental Values and Water Quality Objectives, published by the department in July 2010
Moreton Bay	basin 144 and adjacent to basins 141 to 143, 145 and 146	Moreton Bay, North Stradbroke, South Stradbroke, Moreton and Moreton Bay Islands Environmental Values and Water Quality Objectives, published by the department in July 2010
Mossman River, including all tributaries of the river	part of basin 109	Mossman River Environmental Values and Water Quality Objectives, published by the department in July 2010
Mowbray River, including all tributaries of the river	part of basin 109	Mowbray River Environmental Values and Water Quality Objectives, published by the department in July 2010

Column 1 Water		Column 2 Document
Name	**Description**	
Nerang River, including all tributaries of the river	part of basin 146	Nerang River Environmental Values and Water Quality Objectives, published by the department in July 2010
Noosa River, including— • Kin Kin creek • Teewah coastal creeks • lakes Cooroibah, Cootharaba, Doonella and Weyba	part of basin 140	Noosa River Environmental Values and Water Quality Objectives, published by the department in July 2010
Oxley Creek, including all tributaries of the creek	part of basin 143	Oxley Creek Environmental Values and Water Quality Objectives, published by the department in July 2010
Pimpama River, including— • Behm and McCoys creeks • southern Moreton Bay coastal creeks	part of basin 146	Pimpama River Environmental Values and Water Quality Objectives, published by the department in July 2010

Column 1 Water		Column 2 Document
Name	**Description**	
Pine rivers and Redcliffe creeks, including— • Hays Inlet • all tributaries of the North Pine and South Pine rivers	part of basin 142	Pine Rivers and Redcliffe Creeks Environmental Values and Water Quality Objectives, published by the department in July 2010
Pumicestone Passage, including— • waters of Bribie Island • Bells, Coochin, Dux, Elimbah, Mellum, Ningi and Tibrogargan creeks	part of basin 141	Pumicestone Passage Environmental Values and Water Quality Objectives, published by the department in July 2010
Redland creeks, including Coolnwynpin, Eprapah, Hilliards, Lota, Moogurrapum, Tarradarrapin, Tingalpa and Wynnum creeks	part of basin 145	Redland Creeks Environmental Values and Water Quality Objectives, published by the department in July 2010
Saltwater Creek, including all tributaries of the creek	part of basin 108	Saltwater Creek Environmental Values and Water Quality Objectives, published by the department in July 2010

Column 1 Water		Column 2 Document
Name	**Description**	
Sandy, Six Mile, Wolston, Woogaroo and Goodna creeks including all tributaries of the creeks	part of basin 143	Sandy, Six Mile, Wolston, Woogaroo and Goodna Creeks Environmental Values and Water Quality Objectives, published by the department in July 2010
Stanley River, including all tributaries of the river	part of basin 143	Stanley River Environmental Values and Water Quality Objectives, published by the department in July 2010
Trinity Inlet	part of basin 111	Trinity Inlet Environmental Values and Water Quality Objectives, published by the department in July 2010

Editor's note—

A copy of each plan may be inspected on the department's website at <www.derm.qld.gov.au>.

Schedule 2 Dictionary

section 2

ambient monitoring, of water, includes assessing, analysing, examining, inspecting, measuring or reporting on the following—

(a) the quantity, quality and characteristics of water;

(b) the effectiveness of control, remedial or rehabilitation measures on the matters mentioned in paragraph (a).

aquatic ecosystem means a community of organisms living within or adjacent to water, including riparian or foreshore areas.

AWQ guidelines means the national guidelines made by the Commonwealth under the program known as the National Water Quality Management Strategy, published by the Natural Resource Management Ministerial Council.

basin, followed by a number, means the river basin of that number described in 'Australia's River Basins 1997', 3rd edition, published by Geoscience Australia, Commonwealth of Australia, in 2004.

Editor's note—

A map showing the river basins in Queensland can also be viewed on the department's website at <www.derm.qld.gov.au>.

biological integrity, of water, means the water's ability to support and maintain a balanced, integrative, adaptive community of organisms having a species composition, diversity and functional organisation comparable to that of the natural habitat of the locality in which the water is situated.

Examples—

The following are examples of biological integrity of water—

(a) the intrinsic value of an aquatic ecosystem that is effectively unmodified or highly valued;

(b) its ability to support associated wildlife;

(c) its ability to produce food for human consumption.

chief executive (fisheries) means the chief executive of the department in which the *Fisheries Act 1994* is administered.

commencement see section 29.

contaminated stormwater means stormwater that contains a contaminant.

distributor-retailer see the *South-East Queensland Water (Distribution and Retail Restructuring) Act 2009*, schedule.

environmental values means the environmental values mentioned in section 6.

ground water means water that occurs naturally in, or is introduced artificially into, an aquifer.

healthy waters management plan see section 24(1).

high ecological value waters means waters in which the biological integrity of the water is effectively unmodified or highly valued.

highly disturbed waters means waters that are significantly degraded by human activity and have lower ecological value than high ecological value waters or slightly or moderately disturbed waters.

indicator see section 7(1).

moderately disturbed waters means waters in which the biological integrity of the water is adversely affected by human activity to a relatively small but measurable degree.

participating local governments, for a distributor-retailer, see the *South-East Queensland Water (Distribution and Retail Restructuring) Act 2009*, section 5.

Queensland regional NRM body means a Queensland regional natural resource management body under the Commonwealth program known as 'Caring for Our Country'.

QWQ guidelines means the document called 'Queensland water quality guidelines 2009' published by the department.

Editor's note—

A copy of the guidelines may be inspected at the department's office at level 3, 400 George Street, Brisbane and on the department's website at <www.derm.qld.gov.au>.

recognised entity means—

(a) a local government; or

(b) a public sector unit; or

(c) an agency of the Commonwealth or another State, however called, with similar functions to the functions of the chief executive under this policy; or

(d) a ministerial council established by the Council of Australian Governments; or

(e) the Commonwealth Scientific and Industrial Research Organisation; or

(f) a research centre completely or partly funded by the Commonwealth; or

(g) an Australian university; or

(h) a Queensland regional NRM body; or

(i) Healthy Waterways Limited ACN 137 943 554.

recycling, of waste water, means—

(a) re-using the waste water in the process that generated it; or

(b) re-processing the waste water to develop a new product; or

(c) using the waste water (whether on or off the site where it is generated).

repealed policy see section 29.

sewerage service means—

(a) sewage treatment; or

(b) the collection and transmission of sewage through infrastructure; or

(c) the disposal of sewage or effluent.

sewerage service provider see the *Water Supply (Safety and Reliability) Act 2008*, schedule 3.

site specific document means a document that—

(a) contains specific information about a water, or part of a water; and

(b) is recognised by the chief executive as having appropriate scientific authority.

slightly disturbed waters means waters that have the biological integrity of high ecological value waters with slightly modified physical or chemical indicators but effectively unmodified biological indicators.

stormwater treatment system means a system used for managing stormwater quality, quantity and flows.

surface waters means waters other than ground waters.

total water cycle management plan see section 19(1).

trade waste see the *Water Supply (Safety and Reliability) Act 2008*, schedule 3.

waste prevention means the adoption of practices or processes that avoid generating waste or reduce the quantity of waste requiring subsequent treatment, recycling or disposal.

waste water means aqueous waste, and includes contaminated stormwater.

waste water treatment plant includes a sewage treatment plant, advanced waste water treatment plant, water reclamation plant, industrial waste water treatment system and any other plant whose primary function is to treat waste water.

water quality guidelines see section 7(2).

water quality objectives, for water, are the objectives identified under section 10 for protecting the environmental values for the water.

waters includes the bed and banks of waters.

water sensitive urban design means urban planning or design that integrates water cycle management.

Endnotes

1 Index to endnotes

2 Date to which amendments incorporated

This is the reprint date mentioned in the Reprints Act 1992, section 5(c). Accordingly, this reprint includes all amendments that commenced operation on or before 16 July 2010. Future amendments of the Environmental Protection (Water) Policy 2009 may be made in accordance with this reprint under the Reprints Act 1992, section 49.

3 Key

Key to abbreviations in list of legislation and annotations

Key		Explanation	Key		Explanation
AIA	=	Acts Interpretation Act 1954	(prev)	=	previously
amd	=	amended	proc	=	proclamation
amdt	=	amendment	prov	=	provision
ch	=	chapter	pt	=	part
def	=	definition	pubd	=	published
div	=	division	R[X]	=	Reprint No. [X]
exp	=	expires/expired	RA	=	Reprints Act 1992
gaz	=	gazette	reloc	=	relocated
hdg	=	heading	renum	=	renumbered
ins	=	inserted	rep	=	repealed
lap	=	lapsed	(retro)	=	retrospectively
notfd	=	notified	rv	=	revised edition
num	=	numbered	s	=	section
o in c	=	order in council	sch	=	schedule
om	=	omitted	sdiv	=	subdivision
orig	=	original	SIA	=	Statutory Instruments Act 1992
p	=	page	SIR	=	Statutory Instruments Regulation 2002
para	=	paragraph	SL	=	subordinate legislation
prec	=	preceding	sub	=	substituted
pres	=	present	unnum	=	unnumbered
prev	=	previous			

4 Table of reprints

Reprints are issued for both future and past effective dates. For the most up-to-date table of reprints, see the reprint with the latest effective date.

If a reprint number includes a letter of the alphabet, the reprint was released in unauthorised, electronic form only.

Reprint No.	Amendments included	Effective	Notes
1	none	28 August 2009	
1A	2009 SL No. 280	18 December 2009	
1B	2010 SL No. 185	16 July 2010	

5 List of legislation

Environmental Protection (Water) Policy 2009 SL No. 178
made by the Minister for Climate Change and Sustainability on 18 August 2009
notfd gaz 28 August 2009 pp 1491–6
commenced on date of notification
exp 1 September 2019 (see SIA s 54)
Notes—(1) The expiry date may have changed since this reprint was published. See the latest reprint of the SIR for any change.
(2) An explanatory note was prepared.

amending legislation—

Sustainable Planning Regulation 2009 SL No. 280 ss 1–2, pt 9 div 9
notfd gaz 27 November 2009 pp 1001–6
ss 1–2 commenced on date of notification
remaining provisions commenced 18 December 2009 (see s 2)

Environmental Protection (Water) Amendment Policy (No. 1) 2010 SL No. 185
notfd gaz 16 July 2010 pp 1142–3
commenced on date of notification

6 List of annotations

Environmental values to be enhanced or protected
s 6 amd 2010 SL No. 185 s 3

Development and implementation of environmental plans
s 16 sub 2010 SL No. 185 s 4

Reporting and review of environmental plans
s 17 amd 2010 SL No. 185 s 5

Total water cycle management—general
s 19 amd 2010 SL No. 185 s 6

Total water cycle management—urban stormwater quality management
s 21 amd 2009 SL No. 280 s 74

Trade waste management
s 22 amd 2010 SL No. 185 s 7

Certification and endorsement of plans
prov hdg amd 2010 SL No. 185 s 8(1)
s 23 amd 2010 SL No. 185 s 8(2)

SCHEDULE 1—ENVIRONMENTAL VALUES AND WATER QUALITY OBJECTIVES FOR WATERS
amd 2010 SL No. 185 s 9

SCHEDULE 2—DICTIONARY
def **"distributor-retailer"** ins 2010 SL No. 185 s 10
def **"participating local governments"** ins 2010 SL No. 185 s 10

Guideline

Protecting Environmental Values from Coal Seam Gas Water Discharged to Waters

Water and Ecosystem Outcomes Division, Water Quality and Accounting

Version 1.4

28 October 2010

Queensland Government

Guideline

Protecting Environmental Values from Coal Seam Gas Water Discharged to Waters

Version Number: 1.4

SIGN OFF BY DELEGATED OFFICER:

1. Operationally capable of being implemented			
Endorsed by:	**Position:** Director, Healthy Waters Policy	**Signature:**	
	Date:		
2. Meets business policy and legislative needs			
Endorsed by:	**Position:** General Manager, Water Quality and Accounting	**Signature:**	
	Date:		
3.			
Endorsed by:	**Position:** DDG, Water Division	**Signature:**	
	Date:		
4.			
Endorsed by:	**Position:** DG, DERM	**Signature:**	
	Date:		

Metadata

Item	Details
File No.	
WQA Subject leader	[redacted] Principal Policy Officer
Location	
Review trigger	Annual: Next Scheduled Review Date:

Version History

Version Number	Date	Changed by	Nature of amendment
1.0	20/08/10	[redacted]	Document created following internal consultation
1.1	02/09/10		Document review to incorporate internal comments
1.2	24/09/10		Document review to incorporate internal comments
1.3	04/10/10		Title change as per EMG CSG Sub-Committee comments: Interim Policy to Guideline
1.4	28/10/10		Document review to incorporate UWP&M comments

1. Purpose

The purpose of this document is to provide guidance to decision makers and information on the existing legislative framework to ensure that the disposal of Coal Seam Gas (CSG) water to Queensland waters, including surface and ground waters, is managed to avoid or minimise environmental harm. This includes the scenarios where CSG water is:

- Considered as waste water and disposed of to Queensland waters (including surface waters, and groundwaters via aquifer re-injection or re-charge); or

- Approved for re-use and is being transported and/or stored in waters or returned to waters via overland flow or aquifer recharge.

CSG water under the EP Act s310D (7) means underground water brought to the surface of the earth or moved underground in connection with exploring for or producing coal seam gas. The 'Coal Seam Gas Water Management Policy' provides information on the activity and the department's position with regard to the preferred options for the management of CSG water. The options for disposal of CSG water currently include injection into natural underground reservoirs or aquifers of equal or lesser water quality, direct use of treated CSG water and/or discharge of CSG water to surface waters. The disposal of CSG water directly to surface waters is not a preferred management option. Where injection is technically and economically feasible, operators should inject treated water into aquifers that are under developmental stress and/or are at risk of adverse impact from CSG activity, as a first priority for the use of treated CSG water.

2. Scope

This document is a guideline which outlines, and provides some interpretation of the broad statutory requirements, guidelines and supporting documents as they are relevant to the management of CSG water to protect environmental values. Future versions of this guideline document will include additional reference to the following areas:

- Monitoring and reporting standards;
- Approach to cumulative impacts; and
- Mapping the Department of Environment and Resource Management's roles and responsibilities.

3. Statutory Requirements and Supporting Documents

The statutory bases for managing CSG water discharged to Queensland waters along with supporting documents linked to these statutes are primarily as follows:

<u>State Legislation</u>

- *Environmental Protection Act 1994* (EP Act). The object of the EP Act is to 'protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (*ecologically sustainable development- ESD)'*. Chapter 5A of the EP Act provides for environmental authorities for petroleum activities which includes CSG activities. The supporting documents include:
    - ➢ Coal Seam Gas Water Management Policy

- Guideline: Preparing an Environmental Management Plan for Coal Seam Gas activities
- Guideline: Model conditions for level 1 environmental authorities for coal seam gas activities
- Operational Policy: Waste water discharge to Queensland Waters

- *Environmental Protection Regulation 2008* (EP Reg). This is subordinate legislation made under the EP Act to regulate the protection of the environment.

- *Environmental Protection (Water) Policy 2009* (EPP Water). The purpose of the EPP Water is to 'achieve the object of the EP Act in relation to Queensland waters'. Environmental values and water quality objectives are scheduled in this policy. The supporting documents include:
  - Monitoring and Sampling Manual 2009
  - Queensland Water Quality Guidelines 2009

- *Environmental Protection (Waste Management) Policy 2000*. The object of this policy is to achieve the object of the EP Act in relation to waste management. The policy provides a waste management hierarchy to be applied to the management of CSG water, and principle for identifying environmental protection commitments, objectives and control strategies. The supporting documents include:
  - Guideline: Approval of coal seam gas water for beneficial use

- *Water Act 2000*. To advance sustainable management and efficient use of water and other resources by establishing a system for the planning, allocation and use of water. Water Resource Plans (WRPs) and Resource Operation Plans (ROPs) are developed under the Act.

Commonwealth Legislation

- *Environmental Protection and Biodiversity Conservation Act 1999 (Cth)*. This Commonwealth Act provides a legal framework to protect and manage nationally and internationally important flora, fauna, ecological communities and heritage places - matters of national environmental significance. DERM is not the administering authority for this legislation.

- Murray Darling Basin Agreement - Schedule 1 of the *Water Act 2007 (Cth)*. The purpose of the agreement is to 'promote and co-ordinate effective planning and management for the equitable, efficient and sustainable use of the water and other natural resources of the Murray-Darling Basin, including by implementing arrangements agreed between the Contracting Governments to give effect to the Basin Plan, the *Water Act* and State water entitlements.' DERM is not the administering authority for this legislation.

4. DERM as an Administering Authority

Proponents will be required to meet all relevant statutory requirements as identified in the State and Commonwealth legislation. However, DERM is the administering authority when assessing and conditioning an environmental authority (EA) under the EP Act for discharging CSG water to Queensland waters. The administering authority must comply with any relevant regulatory requirement; consider standard criteria; and any additional information. The EP Reg s5 establishes a range of matters to be considered for environmental management decisions. S51 (1) (a) states that:

(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;

Section 13 of the *Environmental Protection (Water) Policy 2009* (EPP Water 2009) states the management hierarchy for an activity that may affect a water. The release of waste water or contaminants must be dealt with according to the stated hierarchy of preferred procedures under section 13 (2) (a) to (d).

Environmental values and water quality objectives for waters are addressed under Part 5 of this Guideline.

Section 14 of the EPP Water 2009 states the management intent for waters subject to an activity that involves the release of waste water or contaminants to the waters. The management intent depends on the level of aquatic ecosystem protection for the waters.

In order to protect the environment it is necessary to define any related impact. Under the EP Act, environmental harm is defined as any adverse effect, or potential adverse effect (whether temporary or permanent and of whatever magnitude, duration or frequency) on an environmental value, and includes environmental nuisance (s14). CSG activities are classified as either Level 1 or 2 activities (defined in Schedule 5 of the EP Reg) based on the risk of environmental harm being caused by the activities. Assessment processes for Level 1 activities are more comprehensive and may require the completion of an environmental impact statement (EIS).

An EA application for a Level 1 CSG activity must be accompanied by an environmental management plan (EM Plan) to demonstrate that the applicant has considered all potential impacts of the proposed petroleum activities. EM Plans must be prepared in accordance with s310D of the EP Act. The department has developed the guideline 'Preparing an environmental management plan for coal seam gas activities' to provide information to proponents on EM Plan preparation. The EM Plan as it refers to environmental values must among other things:

(b) describe each of the following—

(iv) the environmental values likely to be affected by the activities;

(v) the potential adverse and beneficial impacts of the activities on the environmental values; and

(c) state the environmental protection commitments the applicant proposes for the activities to protect or enhance the environmental values under best practice environmental management; and

(d) contain enough other information to allow the administering authority to decide the application and conditions to be imposed on

the environmental authority (chapter 5A activities); and

The guideline document 'Model conditions for level 1 environmental authorities for coal seam gas activities' provides a set of model conditions that can form the basis of environmental protection commitments given in the EM Plan and EA.

5. Environmental Values

Environmental values are defined in EP Act s9. For Queensland waters they are the aquatic ecosystem and human use values in s6 (2) of the EPP Water—

(a) for high ecological value waters—the biological integrity of an aquatic ecosystem that is effectively unmodified or highly valued;

(b) for slightly disturbed waters—the biological integrity of an aquatic ecosystem that has effectively unmodified biological indicators, but slightly modified physical, chemical or other indicators;

(c) for moderately disturbed waters—the biological integrity of an aquatic ecosystem that is adversely affected by human activity to a relatively small but measurable degree;

(d) for highly disturbed waters—the biological integrity of an aquatic ecosystem that is measurably degraded and of lower ecological value than waters mentioned in paragraphs (a) to (c);

(e) for waters that may be used in primary industry or for agricultural purposes, the suitability of the water for—
(i) agricultural use; or
(ii) aquacultural use; or
(iii) producing aquatic foods for human consumption;

(f) for waters that may be used for recreation or aesthetic purposes, the suitability of the water for—
(i) primary recreational use; or
(ii) secondary recreational use;

(g) for waters that may be used for drinking water—the suitability of the water for supply as drinking water;

(h) for waters that may be used for industrial purposes—the suitability of the water for industrial use;

(i) the cultural and spiritual values of the water.

If an environmental value for particular water has not been scheduled in Schedule 1 of the EPP Water then s7 states the following:

(3) For particular water, the indicators and water quality guidelines for an environmental value are—
(a) decided using the following documents—
(i) site specific documents for the water;
(ii) the Queensland Water Quality guidelines;

(iii) the Australian Water Quality guidelines;

(iv) other relevant documents published by a recognised entity;

For the management of ground waters, documents that would be identified under s(3) (iv) above include the National Water Quality Management Strategy (NWQMS) Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 2): Managed Aquifer Recharge. While it is recognised that this guideline does not specifically deal with injection of CSG water, there are a number of elements that may apply to injection of brine and treated and untreated CSG water. Therefore wherever applicable, this NWQMS guideline may be considered the basis for assessment of injection proposals.

In establishing and scheduling environmental values (EVs) for waters in the EPP Water, and the subsequent derivation of water quality objectives (WQOs) to protect the values, the process is independent of any release to receiving waters. In other words the environmental values are determined before any release to waters is considered, and is a completely independent process. Under s 8 of the EPP Water, the environmental values for a particular water are protected if the measures for all indicators do not exceed the water quality guidelines stated for the indicators. This encompasses a commonly used range of some 20 water quality guidelines but also extends to all measures for all indicators to protect the environmental values. The EPP Water defines water quality guidelines as 'quantitative measures or statements for indicators, including contaminant concentration or sustainable load measures of water, that protect a stated environmental value'. If the environmental values for an area have not been scheduled the ecological assets included in WRPs, which are developed under the Water Act, may also provide information. WRPs are recognised as other relevant documents as per s7 (3) (iv) of the EP Act.

6. Environmental Authorities

There are two key areas of risk to aquatic ecosystem and human use environmental values from the discharge of CSG water to Queensland waters that require management to ensure their protection:

1. Changes to water quality (including physical, chemical and biological characteristics); and
2. Changes to in-stream and groundwater hydrology (including associated ecosystem impacts due to the volume and timing of discharges).

A precautionary and adaptive management approach is advocated to address these areas of risk, which is consistent with the objectives of the EP Act and the EPP Water.

EAs are required under chapter 5A of the EP Act for environmentally relevant activities, including for petroleum activities. The administering authority may impose the conditions on the environmental authority (chapter 5A activities) it considers are necessary or desirable (s309z). For an EA to discharge CSG water to waters conditions to meet specified water quality and hydrological requirements to protect environmental values would be included.

6.1 Water Quality

<u>Background</u>

CSG water at all stages of the process should be fully characterised, this includes the quantity and quality of the water before and after production and treatment and at the point of discharge. This is consistent with the risk-based approach adopted in the National Water Quality Management Strategy (NWQMS). The NWQMS Guidelines for Fresh and Marine Water Quality, EPP Water and the Qld Water Quality Guidelines 2009 state that locally applicable guidelines for indicators should be used in preference to less specific regional and national guidelines. This requires a detailed risk assessment to be undertaken, and indicators of concern to be identified. The indicator for an environmental value is a 'physical, chemical, biological or other property that can be measured or decided in a quantitative way' (EPP Water s7(1)). Indicators are then conditioned in the EA (EP Act Ch 5) for the activity. If detailed characterisation is not undertaken, conditioning in the EA will be necessarily more stringent. This is consistent with the precautionary approach.

The general characterisation of CSG water quality as reported in the literature has identified a range of possible risks to environmental values. These values for aquatic ecosystems and human use (including suitability of the waters used for primary industry or agricultural purposes, primary and secondary recreation, drinking water, industrial purposes and cultural and spiritual values) are enhanced or protected by maintaining the water quality objectives (WQOs) for the receiving waters. To provide for appropriate environmental management, WQOs are identified to protect environmental values and are then scheduled in the EPP Water. In the absence of scheduled WQOs, water quality guidelines for all indicators that will protect environmental values for the water are used. To achieve this legislative requirement, any release of CSG water to receiving waters must be conditioned in accordance with s51 (1) (a) of the EP Reg.

Implementation

The required water quality for CSG water discharged to Queensland waters will be conditioned through an EA issued under the EP Act and in accordance with section 51 of the EP Reg (see Attachment 1).

As previously stated, under the EPP Water, the environmental values (values for aquatic ecosystem and human use) for particular water are protected if the measures for all indicators do not exceed the water quality guidelines stated for the indicators. To achieve this outcome, any proposed release is required to be assessed, in part with s51 of the EP Reg. Monitoring, reporting and incident management requirements will also be identified in the EA. A detailed risk assessment is to be undertaken using appropriate CSG water characterisation data. This will allow for parameters of concern to be identified and then included in the EA conditions for the activity.

To protect environmental values the quality of CSG water discharged to waters will need to be within an acceptable upper and/or lower bounds to ensure the WQOs required to protect the aquatic ecosystem health and relevant human use environmental values are achieved. This is of particular importance in the likely scenario of CSG water being treated with reverse osmosis and then discharged to ephemeral systems where at times CSG water is likely to flush and / or fill natural waterholes and make-up 100% of the flow. Attachment 2 discusses potential issues associated with discharging large quantities of CSG water to waters.

If CSG water is to be reinjected to an aquifer there are some key components of the injection proposal risk assessment to protect the environmental values and the groundwater resource values associated with the water quality impact zone and hydraulic impact zone where fluid is proposed to be injected. These components include:

a) the establishment of baseline data and hydrogeological conceptualisation of the aquifer;

b) the identification of potential hazards of re-injection and related activities and their inherent risk; and

c) the identification of injection standards (including proposed limits for contaminants of concern), requirements, preventative measures and residual risk.

Risk assessments of proposed discharges of CSG water to waters must be sufficient to demonstrate that the regulatory requirements of section 63(2) of the *Environmental Protection Regulation 2008* will be met. A guiding framework for risk assessments is provided in relevant NWQMS guidelines.

The requirements for monitoring programs and reporting should be included in the conditions of the EA for the activity. The monitoring programs and reporting should be designed to ensure EA conditions are being met and that strategic data collection to enhance the understanding of cumulative impacts is undertaken. The collection of this data will ensure that adaptive management to protect environmental values occurs. Specific monitoring programs include:

- Baseline conditions of the receiving environment: For surface waters ambient monitoring in accordance with the *Queensland Water Quality Guidelines (2009)*;
- Quality of the CSG water discharged; and
- Receiving environment impacts: This should include assessment of the impact of the release on the receiving waters with a requirement to implement a multiple before-after control impact design to assess changes as per the Australia New Zealand Guidelines for Fresh and Marine Water Quality (2000).

These requirements are further outlined in Schedule I of the guideline 'Model conditions for coal seam gas activities'. Specific requirements of the Receiving Environment Monitoring Program (REMP) are found in Appendix 1 (BA15-BA18) of the same document. Monitoring should be undertaken in line with the EPP Sampling Manual.

Implementation to align with Water Safety (Supply and Reliability) Act 2008 requirements

Legislative reforms to the *Water Safety (Supply and Reliability) Act 2008* (WS (S&R) Act) are proposed to provide purpose built rigorous requirements for CSG water which has a material impact on town drinking water supply sources, in order to protect public health. In the scenario where CSG water directly or in-directly augments a town drinking water supply source and there is a material impact on the supply source, the proposed reforms in the WS (S&R) Act will require the development of a Recycled Water Management Plan (RWMP). The regulated entity will be required to prove that the treatment process and supporting management arrangements will consistently deliver water of the quality required. Where there is direct supply of treated CSG water to a drinking water service provider for the use in a town drinking water supply source, then the drinking water service provider will also require a Drinking Water Quality Management Plan.

CSG water quality standards will be prescribed by Queensland Health (QH) under the *Public Health Regulation 2005.* This is currently being developed and in the interim, the regulator will set the water quality standard as part of the RWMP consistent with the standard prepared by QH.

If there is no material impact on a town's drinking water supply source, then there may be an exclusion from the requirement for a RWMP (for defined circumstances in a regulation for discharges into an aquifer or if these are not applicable, then through a regulator's exclusion decision and attached conditions).

The process under the EP Act, EP Reg and EPP Water to protect environmental values (including the suitability of the water for supply as drinking water) through conditions in the EA for the activity will also apply. This means that there will be co-regulation of the activity – both under the EP Act and the WS (S&R) Act. Consequently standards may be imposed under the EP Act as well as under the WS (S&R) Act. If there are different values for a particular indicator, then the holder of the EA/RWMP will need to meet the most stringent of the requirements. To make certain that there are no inadvertent conflicts in the EA conditions and RWMP conditions, DERM Project Managers will ensure that a detailed risk assessment and adaptive management process is undertaken, and that through feedback processes any inconsistencies are identified early and addressed. See Attachment 2. for a discussion on these issues. Conditions in the EA and RWMP will require notification to the relevant administrator of each Act, if the particular values in the EA or RWMP are triggered.

Until the new regulatory framework under the *Water Supply (Safety and Reliability) Act 2008* commences, the regulatory requirements under the EP Act, will be used to regulate CSG water which impacts on town drinking water supply sources.

6.2 Hydrology

Background

Discharge of water to a watercourse is not by default an environmental benefit, as ephemeral streams naturally have periods of dryness as well as periods of wetness. WRPs, under the *Water Act 2000*, are fundamentally designed for sustainable allocation and management of the water resources in the catchment. The management rules in the plan are tailored to minimise the impact of water extraction on the flow patterns that are of most importance to a WRP's ecological assets.

The environmental flow indicators of the WRP are primarily designed to determine how much water could be extracted from the watercourse. In assessing for the protection of the environmental value for aquatic ecosystems, it is not enough to assess if Environmental Flow Objectives (EFO) in Water Resource Plans (WRP) are met. This is because the EFOs are designed as a reference check when allocating water for extraction (which is a 'drying' action) and are not designed as a reference check when approving a discharge (which is a 'wetting' action).

Releases to receiving surface waters need to be regulated to protect environmental values. A water's flow supplemented with CSG water may be at most equivalent to but not in excess of a DERM approved pre-development flow regime. An example of this would be that wetting of the flow regime beyond 'naturalness' for an ephemeral stream would not be acceptable. It is critical that key ecological assets and aquatic ecosystem values are protected from artificial discharges to waters.

The underlying intent of maintaining or moving towards the natural flow regime in surface waters is to:

- Avoid localised erosion of bed and banks (including re-suspension of sediments and riparian zone erosion) and impacts on riparian ecosystems;
- Maintain natural variability in the flow regime. A single release rate will reduce the small scale variability patterns which contribute to maintaining the biological integrity

of a system such as stream habitat, wetting on macrophyte beds, inducing fish movement, entraining organic matter, scouring and primary production;

- Mimic natural seasonality (timing), frequency and duration of events of different magnitudes that support and trigger natural ecosystem processes (eg. nutrient cycling, migration and spawning cues, etc.); and
- Follow natural attenuation patterns, avoid bank slumping, maintain macroinvertebrate communities and minimise fish stranding, etc.

Implementation

The discharge strategy for CSG water discharged to waterways will be conditioned through the EA issued under the EP Act.

If the CSG discharge proposal is part of a beneficial re-use (as defined in *Environmental Protection (Waste Management) Policy 2000*) scheme, an amendment to the applicable resource operations plan may be required (e.g. water sharing rules, dam operating rules) to ensure there are no impacts on other entitlements.

CSG water discharges need to be managed to mimic seasonal flow volumes and allow for periods of low and no flow. A simplified example of this would see the discharge of larger volumes of CSG water during periods of higher natural flow and lower or nil discharges during naturally low and no flow periods. CSG water discharges should meet these variable flow requirements with the conditions incorporated in the environmental authority. These conditions may include volumetric release limits over time periods including per day or season, with modelling of pre-development flows using the Integrated Quality and Quantity Model as a guide in their calculation, and including the key ecological assets identified in the WRP process for the waters.

When CSG water is discharged to waters as part of a Water Supply Scheme or beneficial use approval, it is still necessary that the environmental values are protected.

7.0 Adaptive Management and Cumulative Impacts

To ensure that the conditions included in the EA are appropriate to protect the environmental values of the receiving waters, proponents will be required to undertake adequate monitoring of the implementation and effectiveness of the EA conditions. This includes assessing the effectiveness and reliability of any water treatment process (i.e. reverse osmosis), monitoring for changes in receiving water quality and aquatic ecosystem health, and for any other impacts to environmental values. If new impacts to environmental values are identified, future EAs will include conditions to adequately manage them.

To effectively protect waters from the as-yet unquantified cumulative impacts of CSG water discharged to waters, an adaptive approach will be used. Through this process, information collected through both monitoring and research, can be used to inform both new EAs and future management frameworks.

8.0 Definitions

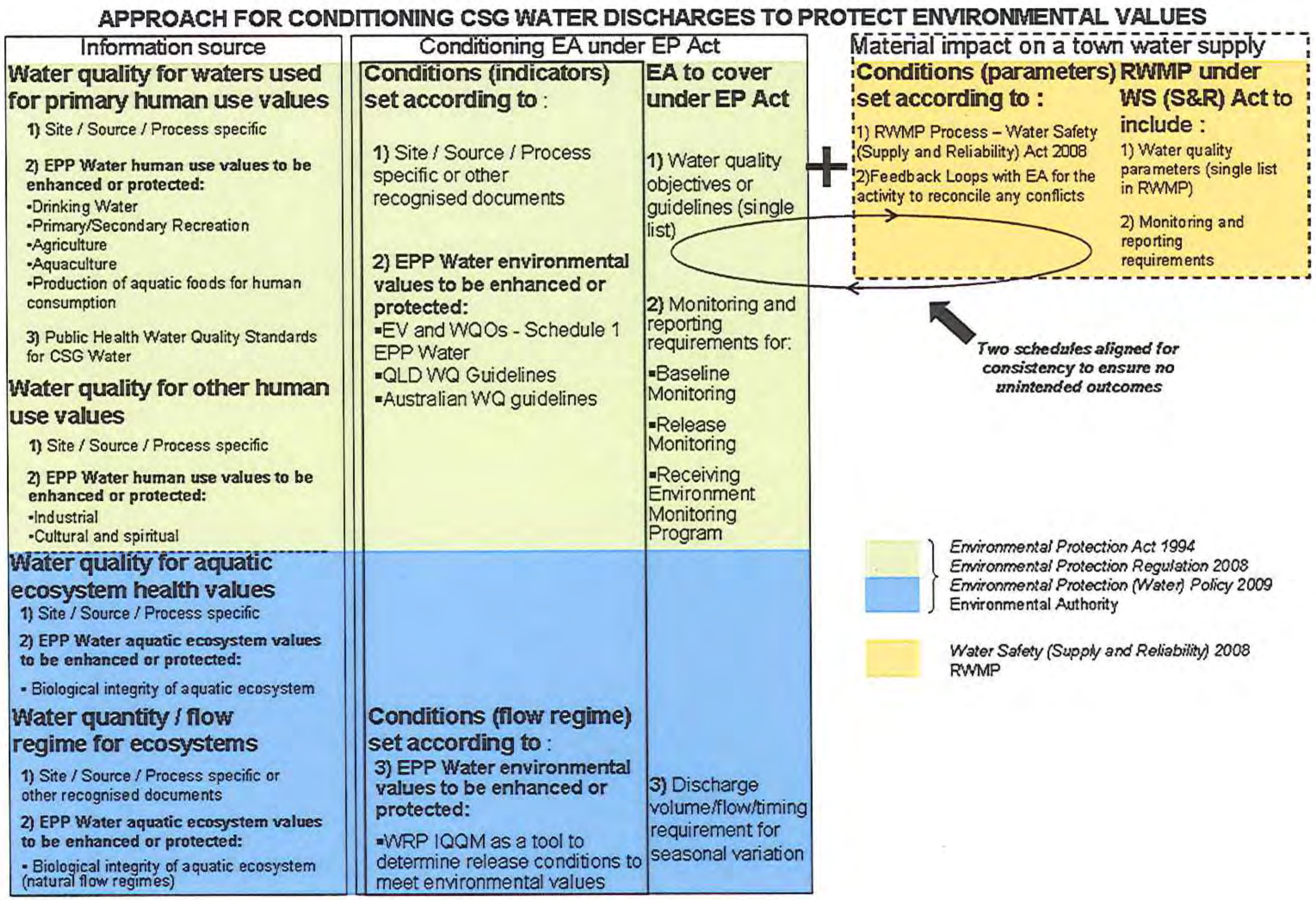
Note: Where a term is not defined in this guideline, the definition in the *Environmental Protection Act 1994*, its regulations and Environmental Protection Policies must be used.

Disclaimer:

While this document has been prepared with care it contains general information and does not profess to offer legal, professional or commercial advice. The Queensland Government accepts no liability for any external decisions or actions taken on the basis of this document. Persons external to the Department of Environment and Resource Management should satisfy themselves independently by consulting their own professional advisors before embarking on any proposed course of action.

Attachment 1.

Approach for Conditioning CSG Water Discharges to Protect Environmental Values



Attachment 2.

Review of Interim Public Health Water Quality Standards and Potential Impacts to Aquatic Ecosystem Values from Coal Seam Gas Water (CSG)

Acknowledgements: Water Quality & Aquatic Ecosystem Health Scientists, Environment & Resource Sciences Division

<u>*Background*</u>

Under the *Environmental Protection Act 1994* (EP Act), and its subordinate legislation, there is a process for identifying the environmental values of waters. In the scenario where a proponent is proposing to undertake an environmentally relevant activity in Queensland, including discharge of CSG water to waters, an environmental authority (EA) must be issued by the administrative authority - the Department of Environment and Resource Management (DERM). If an EA is issued, it must include conditions to manage any impacts to the identified environmental values of the waters from the activity. These conditions may include indicators for water quality with a set of guidelines / release limits for the discharge. The proposed regulatory reforms to the *Water Supply (Safety and Reliability) Act 2008* and the associated RWMP process will apply along with the process under the EP Act, EP Reg and EPP Water to protect environmental values (including the suitability of the water for supply as drinking water) through conditions in the EA for the activity. This means that there will be co-regulation of the activity – both under the EP Act and the WS (S&R) Act. Consequently standards may be imposed under the EP Act as well as under the WS (S&R) Act. If there are different values for a particular indicator, then the holder of the EA/RWMP will need to meet the most stringent of the requirements. To make certain that there are no inadvertent conflicts in the EA conditions and RWMP conditions, DERM Project Managers will ensure that a detailed risk assessment and adaptive management process is undertaken, and that through feedback processes any inconsistencies are identified early and addressed. This document aims to reconcile any potential conflicts. It also considers other issues for aquatic ecosystem health related to the discharge of CSG water to waters.

<u>*Interim Public Health Water Quality Standards under the WS (S&R) Act*</u>

Interim Public Health Water Quality Standards have been developed by Queensland Health for use where CSG water will impact on an urban community's drinking water supply source. These standards will be included in the Recycled Water Management Plan (RWMP) that will be required under the WS (S&R) Act. These standards will be prescribed under the *Public Health Regulation 2005.* The levels are set to allow for ingestion by humans of two litres per day for a lifetime. Existing water quality data for CSG water was examined, including Australian and overseas data, to inform the development of these standards. The standards are focused on coal associated compounds of health concern, or any hazards that may be added during treatment, storage or transport of the CSG water. The standards will be amended as more specific information on CSG source water quality in Queensland and associated treatment, storage and transport processes becomes available. It should be noted that this proposed schedule of standards is not intended to represent the ongoing monitoring program for CSG companies, it simply prescribes the health related standard if a particular compound is detected during monitoring.

<u>*Scientific Assessment*</u>

The following provides a comparison between the Interim Public Health Water Quality Standards (WQS) proposed for CSG and the toxicant trigger guidelines for protection of aquatic ecosystems. The purpose of this review is to determine potential conflicts between the Interim Public Health WQS and other guidelines. Note that the aquatic ecosystem guidelines are based on biological effects data and are meant to be trigger values. Where exceeded in the environment, background levels should be assessed and the triggers modified to reflect the risk involved.

In general, the review indicates the following:

- There are no obvious conflicts between the list of Public Health WQS and other guidelines for CSG;
- The list of indicators is substantial and it is likely that it could be reduced through source characterisation and associated risk assessment processes;
- For Reverse Osmosis (RO) treated CSG water, many of the indicators are unlikely to be relevant, even in the source water – see the table below;
- Areas of potential conflict where Public Health WQS are listed in an approval (or required to be monitored) and the limit listed is significantly higher than guidelines for aquatic ecosystem health protection. This is shown for 17 indicators in the table below. The major problem here is that a false impression may be given to proponents in terms of satisfactory standard for discharge if the standards in the RWMP are less stringent then those required to meet environmental values. Where these contaminants are of concern, they should be listed with appropriate limits in the EA, with the proponent meeting the most stringent ; and
- Note that such a review could also be done for primary industry guidelines such as irrigation. Similar conclusions from the comparison with aquatic ecosystem guidelines are expected.

For the discharge of 'good quality' RO treated CSG water, the potential risks to receiving water should be relatively small. The major issues that should be assessed on a case by case basis include:

1. The potential deficiency of cations/anions such as calcium that could have a detrimental effect on aquatic ecosystem biota. The proposed management action would be to dose the water to achieve appropriate cation/anion concentrations. Release limits for Sodium Adsorption Ratio, calcium, magnesium etc would generally be applied.
2. The potential change to flow regimes. This risk is potentially greatest for significant continuous releases to ephemeral streams. In most cases, this requires an assessment of key aquatic habitats and the potential extent of effect from the release. In many cases, sandy substrates may mean the water may have a limited extent of effect on surface waters. Alternative discharge locations may need to be considered and ongoing monitoring may be required during operation where potential risks exist.
3. Boron is not generally removed from the RO process and is often elevated in the discharge water. An assessment should be carried out on the potential effect on all downstream environmental values including aquatic ecosystem and irrigation. The levels are not typically high enough to be of major concern and there are limited management actions available to address this issue.
4. Given the water is very clear and the systems receiving the water are generally very turbid, there is potential for the water to impact on aquatic environments. The action risk from this effect is currently unknown and needs further research. In general, management as per issue 2 will also address this issue if it exists.

Table 1. Comparison of the Public Health WQS to Aquatic Ecosystem Toxicant Triggers and typically levels found in CSG Water.

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
1,2 Dichloroethane (DI)	107-06-2	3	ID	EV	NNS	Industrial solvent - chlorination of water does not appear to contribute to 1,2-dichloroethane in drinking water - Ethane is a constituent in the paraffin fraction of crude oil and natural gas - **may be produced inadvertently by chlorination reactions which take place during the disinfection of wastewater effluents or drinking water sources**
1,1 Dichloroethene (DI)	75-35-4	30	-	EV	NNS	Used in polymers and organic synthesis - Ethene is a natural product emitted by fruits, flowers, leaves, roots, and tubers, and is released to the atmosphere from biomass combustion and volcanos, and photodegradation of dissolved organic material - **may be produced inadvertently by chlorination reactions which take place during the disinfection of wastewater effluents or drinking water sources.**
1,2 Dichloroethene	540-59-0	60	ID	NHTV	NNS	
1, 2 Dichlorobenzene (DI)	106-46-7	1500	160	EV	NNS	Used as a chemical intermediate for the manufacture of dyes - **may be produced inadvertently by chlorination reactions which take place during the disinfection of wastewater effluents or drinking water sources**
1,4 Dichlorobenzene (DI)	106-46-7	40	60	EV	NNS	
2,2 Dichloropropionic Acid (DPA) (DI)	75-99-0	500	-	EV	NNS	Herbicide

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
2,4,5-Trichlorophenol	95-95-4	350	ID	EV	NNS	Chlorophenols - used as a biocide, disinfectant for the home, hospital, and farm, an antiseptic, manufacture of the insecticide profenofos, in the synthesis of the fungicides dichlorophen and triadimefon, in the synthesis of the cholesterol-reducing drug, denaturant for alcohol, and selective solvent in refining mineral oil and in organic syntheses of dyes - **may be produced inadvertently by chlorination reactions which take place during the disinfection of wastewater effluents or drinking water sources**
2,4,6-Trichlorophenol	88-06-2	20	3	EV	NNS	
2,4-Dichlorophenol (DI)	120-83-2	200	120	NHTV	NNS	
2-Chlorophenol (DI)	95-57-8	300	340	EV	NNS	
4-Chlorophenol (DI)	106-48-9	10	220	EV	NNS	
4-Methylphenol (p-cresol)	106-44-5	600	-	EV	NA	Cresols, including p-cresol, are a group of widely distributed natural compounds formed as metabolites of microbial activity and excreted in the urine of mammals. Cresols occur in various plant lipid constituents, including oils from jasmine, cassia and camphor. Oils from conifers, oaks, and sandalwood trees also contain cresols.
4-Nitrophenol	100-02-7	30	ID	EV	NNS	Used in the manufacture of pesticides, dyestuffs as well as a leather treatment agent. It is a photooxidation product of nitrobenzene in air and aromatic hydrocarbons such as benzene, toluene, and phenanthrene with nitric oxide in air. It is emitted in vehicular exhaust from both gasoline and diesel engines. 4-Nitrophenol is also a degradation product of parathion and an impurity in the parathion formulation Thiophos and, therefore, will be released

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						during the application of the insecticide
4-Nonylphenol	104-40-5	500	-	NHTV	NNS	Routinely used as a co-stabilizer with mixed-metal stabilizers for heat stabilization during plastic production; used as starting material for the production of phenolic resins.
Acenaphthene	83-32-9	20	SED	EV	Yes	A natural component of crude oil and coal tar, and is also a product of combustion and can be released to the environment via natural fires associated with lightening, volcanic activity, and spontaneous combustion.
Acenaphthylene	208-96-8	0.014	SED	NHTV	Yes	
Acrylamide	79-06-1	0.2	-	EV	Unlikely	Used in the production of polyacrylamide and amide monomers.
Aluminium		200	55			
Ammonia		500	900			
Anthracene	120-12-7	150	ID - SED	EV	Yes	Anthracene occurs in fossil fuels.
Antimony		3	ID - SED			
Arsenic		7	-			
Arsenic III			24			
Arsenic V			13			
Barium		700				
Benzene	71-43-2	1	950	EV	Yes	Benzene is found naturally in the environment from volcanoes, as a natural constituent of crude oil, from forest fires and as a plant volatile.
Benzo(a)pyrene	50-32-8	0.01	ID - SED	EV	Yes	Occurs naturally in crude oils, shale oils, and coal tars, and is emitted with gases and fly

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						ash from active volcanoes. There is some evidence for biosynthesis by plants, bacteria and algae. Emissions of polycyclic aromatic hydrocarbons, including benzo(a)pyrene, are a product of incomplete combustion of organic matter.
Bisphenol A	80-05-7	200	-	EV	NNS	Used as an intermediate in manufacture of epoxy, polycarbonate, phenoxy, polysulfone and certain polyester resins, rubber chemicals, flame retardants and in food packaging and coatings
Boron		4000	370			
Bromate	NA	20	-	EE	Unlikely	Bromate is a drinking water disinfection by-product formed during the ozonation of source water containing bromide.
Bromide	NA	7000	-			
Bromine	7726-95-6	7000	-	EV	Unlikely	Bromine does not exist in nature in its elemental state, molecular bromine (Br_2).
Bromochloroacetic acid (DI)	5589-96-8	0.014	-	NHTE	NNS	Formed as a chemical by-product of chlorination and chloramination of drinking water.
Bromochloroacetonitrile (DI)	83463-62-1	0.7	-	NHTE	NNS	Formed during the chlorination of water. In experiments bromochloroacetonitrile was found in water treated with chlorine, chlorine with bromide, chlorine with ozone and chloramination with bromide.
Bromochloromethane (DI)	74-97-5	40	-	NHTV	Unlikely	Bromochloromethane was found in remote ocean areas along with other naturally occurring bromo or chloro methanes produced by algae. Although it is possible

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						that bromochloromethane was produced by this natural source, the author suggested that it may be due to long range transport from anthropogenic sources. Bromochloromethane was released from cultivated species of the brown algae, Phaeophyta. This may be a major source of biogenic emissions of bromochloromethane from oceans. Bromochloromethane's production and use as a fire extinguisher fluid, especially in aircraft and portable units.
Bromodichloromethane (DI)	75-27-4	6	-	EV	Unlikely	Bromodichloromethane is biosynthesized and emitted to seawater (and eventually to the atmosphere) by various species of marine macroalgae which are abundant in the various locations of the world's oceans. Ice macroalgae from McMurdo Sound, Antarctic were found to contain and release to sea water bromodichloromethane. Bromodichloromethane's production and use in organic synthesis and as a solvent may result in its release to the environment through various waste streams. However, bromodichloromethane is not produced or used on a large commercial-scale indicating that large releases do not occur from these practices. **The predominant environmental release of bromodichloromethane results from its inadvertent formation during chlorination treatment processes of drinking, waste, and cooling waters.** The amount of bromodichloromethane which may

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						be produced during chlorination processes depends upon a variety of parameters which include temperature, pH, bromide ion concenntration of the water, fulvic and humic substance concentration, and actual chlorination treatment practices.
Bromoform (DI)	75-25-2	100		EV	Unlikely	Bromoform is produced by macroalgae and microalgae.
Cadmium		2	0.2			
Chlorate	NA	0.8mg/L	-	EV	Unlikely	The chlorite ion (ClO_2^-) is a **major degradation product resulting from the reaction of chlorine dioxide with inorganic and organic constituents in the water.** When free chlorine is used after the application of chlorine dioxide in the treatment process, chlorite is oxidized to chlorate. This conversion will continue over time as the water travels through the distribution system. Chlorate ion is also formed by photodecomposition of chlorine dioxide when treated water is exposed to bright sunlight in open basins. The rate at which chlorate forms affects the amount of chlorine dioxide or chlorite that remain in the finished drinking water.
Chlorine (DI)	7782-50-5	5 000	3	EV	Unlikely	The most important manmade emissions of chlorine are from processes involving the production, transportation, and use of chlorine.
Chlorine dioxide (DI)	10049-04-4	1000	-	EV	Unlikely	Chlorine dioxide is used as a disinfectant in water treatment plants in the USA.

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
Chlorite (DI)	NA	300	-	EE	Unlikely	Chlorite ion (ClO_2^-) is present in drinking water and there are two possible ways it ends up in the drinking water: 1) chlorine dioxide is produced via sodium chlorite used as a starting material and incomplete conversion of sodium chlorite into chlorine dioxide leaves residual chlorite ion in water and 2) the chlorite ion is a major degradation product resulting from the reaction of chlorine dioxide with inorganic and organic constituents in the water. When free chlorine is used after the application of chlorine dioxide in the treatment process, chlorite is oxidized to chlorate. This conversion will continue over time as the water travels through the distribution system. Chlorate ion is also formed by **photodecomposition of chlorine dioxide when treated water is exposed to bright sunlight in open basins**. The rate at which chlorate forms affects the amount of chlorine dioxide or chlorite that remain in the finished drinking water.
Chloroacetic acid (DI)	79-11-8	150	-	EV	Unlikely	Chloroacetic acid's formation as a **chemical by-product of chlorination and chloramination of drinking water**, and its use as a herbicide and in the manufacture of various dyes and other organic chemicals.
Chlorobenzene (DI)	108-90-7	300	ID	EV	Possible	Chlorobenzene's production and use as a chemical intermediate, solvent, and heat transfer medium.
Chloroform (Trichloromethane) (DI)	67-66-3	200	ID	EV		Chloroform is produced by tropical red algae, and by red seaweed and has been reported

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						to be produced by micro algae, in peat bogs, was produced in spruce forest soil and was found in wood degrading areas. Chloroform's production and use in the synthesis of hydrochlorofluorocarbon 22 (HCFC-22), use as an extractant or solvent, chemical intermediate, dry cleaning agent, fumigant ingredient, synthetic rubber production. Its indirect production in the manufacture of ethylene dichloride and as a **disinfection by-product in the chlorination of drinking water**, municipal sewage, cooling water in electric power generating plants. Chloroform is produced during the atmospheric photodegradation of trichloroethylenes and is produced from auto exhaust.
Chromium III			ID			
Chromium VI		50	1.0			
Copper		2000	1.4			
Cyanide		80	7			
Dibromoacetic acid (DI)	631-64-1	0.014	-	EV	Unlikely	Dibromoacetic acid's formation as a **chemical by-product of chlorination and chloramination of drinking water**.
Dibromochloromethane (DI)	124-48-1	100	-	EV	Unlikely	Chlorodibromomethane is produced naturally by various marine macroalgae and is present naturally in seawater.

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						Chlorodibromomethane's inadvertently formed during **chlorination treatment processes of drinking, waste, and cooling waters**; it is also used as a chemical intermediate.
Dichloroacetic acid (DI)	79-43-6	100	-	EV	Unlikely	Dichloroacetic acid's formation as a **chemical by-product of chlorination and chloramination of drinking water**, and its production and use as a chemical intermediate, in pharmaceuticals and medicine.
Dichloroacetonitrile (DI)	3018-12-0	2	-	EV	Unlikely	Dichloroacetonitrile formation as a **by-product of the chlorination of humic substances, algae and amino acids contained in drinking water** and pulp bleaching processes. Dichloroacetonitrile is a by-product of the chlorination of humic substances, algae and amino acids, such as when humic and fulvic acids from natural waters are chlorinated with sodium hypochlorite.
Ethylbenzene	100-41-4	300	ID	EV	Yes	Ethylbenzene's production and use as an intermediate for the manufacture of styrene and use as a resin solvent, intermediate for the production of diethylbenzene and acetophenone, and its use as a component of automotive and aviation fuels. Ethylbenzene is present in coke-oven tars.
Fluoride		1500	-			
Hydrazine	302-01-2	10 (ng/L)	-	EV	Unlikely	Hydrazine has been found to be a primary product of nitrogen fixation by *Azotobacter*

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						agile. Used as a chemical intermediate, reducing agent, as rocket fuel and as a boiler water treatment agent- **may be produced inadvertently by chlorination reactions which take place during the disinfection of wastewater effluents or drinking water sources**
1,2-diphenylhydrazine	122-66-7		ID	EV	Unlikely	1,2-Diphenylhydrazine's production and use as a chemical intermediate. It also may be produced in wastewater receiving azobenzene where conditions are reducing. This drug is primarily used as a veterinary medication.
Iodide		100	-			
Iodine		60	-			
Iron		300	300**			
Lead		10	3.4			
Manganese		500	1900			
Mercury		1	0.06			
Molybdenum		50	34**			
Monochloramine (DI)	10599-90-3	3000	-	EV	NNS	Chloramine is used as a chemical intermediate in the synthesis of various amines and hydrazine and as a disinfectant in drinking water for systems in which free chlorine radicals are difficult to maintain. Chloramine can be formed in situ by the combination of ammonia and chlorine

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						containing agents under basic conditions.
Nickel		20	11			
Nitrate – as N		50000	7200			
Nitrite		3000	-			
N-Nitrosodiethylamine (NDEA) (DI)	55-18-5	0.01	-	NHTE	Unlikely	Formed by the action of nitrate-reducing bacteria. N-Nitrosodiethylamine's production and use as a gasoline and lubricant additive, antioxidant and stabilizer may result in its release to the environment through various waste streams.
N-Nitrosodimethylamine (NDMA) (DI)	62-75-9	0.01	-	EV	Unlikely	Formation of DMN ... can occur by reaction of nitrites with dimethylamine produced by intestinal bacteria. Formed by the interaction of nitrite with dimethylamine and by the action of nitrate-reducing bacteria. One group that found N-nitrosodimethylamine in tap water concluded that the N-nitrosodimethylamine may have formed from the reaction of low concentrations of nitrite, an oxidizing agent (possibly chlorine), and secondary amines. Another researcher concluded that extensive nitrosamine formation in natural waters is not likely because of low nitrite concentrations, low levels of nitrosatable amines, and expected third order kinetics.
Phenanthrene	85-01-8	150	ID	EV	Likely	Phenanthrene occurs in fossil fuels.

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						Phenanthrene was detected in spruce needles, tree leaves and grass and plants.
Phenol	108-95-2	150	320	EV	Yes	Phenol is present in animal, leaf litter and other organic wastes as a result of decomposition. The level of phenol present in poultry manure has been shown to increase in time as degradation proceeds. Phenol is obtained from coal tar. Phenol's production and use as a chemical intermediate in the production of bisphenol-A, phenolic resins, caprolactam, aniline, alkylphenols and other chemicals, as well as its use as a disinfectant and antiseptic may result in phenol being released to the environment as emissions and in wastewater as a result of its production and use. Wood smoke from fireplaces and wood stoves contain high conc'ns of phenol. Phenol is found in gasoline and diesel engine exhaust, and emissions from refuse combustion, brewing, foundries, wood pulping, plastics mfg, lacquer mfg, and glass fibre mfg. Laboratory tests indicate that phenol would be found in leachate from tires. It is also released from some plastics when heated. Phenol is a photooxidation product of benzene, and would be produced in the atmosphere from benzene emissions.
Pyrene	129-00-0	150	SED	EV	Yes	Pyrene has been isolated in crude oil, coal

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						tar and fossil fuels.
Radiological Compounds		0.5 mSv/year				
Selenium		10	5			
Silver		100	0.05			
Strontium (Stable)(Total)		4000	-			
Sulfate		500 000	-			
Thallium (Stable)(Total)		Detection limit	0.03**			
Titanium (Total)		Detection limit	-			
Toluene	108-88-3	800	ID	EV	Yes	Toluene occurs in nature in natural gas deposits and has been detected in emissions from volcanos, forest fires and crude oil. Toluene is released into the atmosphere principally from the volatilization of petroleum fuels and toluene-based solvents and thinners and from motor vehicle exhaust. Toluene's production and use as an intermediate in the production of benzoic acid, benzaldehyde, explosives, dyes and many other organic compounds may also result in its release to the environment through various waste streams.
Total Petroleum Hydrocarbons (reported as separate fractions)		(Total) 200	-			
Trichloroacetic acid (DI)	76-03-9	100	-	EV	Unlikely	Trichloroacetic acid is produced photoxidatively when chlorinated ethenes and ethanes are converted to trichloroacetylchloride and finally hydrolyzed

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
						to the acid ... can also be formed during anthropogenically induced combustion processes if chloride and redox-sensitive elements such as Fe or Cu are present, e.g. forest fires, wood burning, waste incineration, etc. ... **also one of the main disinfection by-products during drinking water chlorination.**
Uranium		20	0.5**			
Vanadium		50	6**			
Xylenes	1330-20-7	600	-	EV	Yes	Common naturally occurring sources of xylenes are petroleum, forest fires, and volatiles of plants. Mixed xylenes are present in petroleum stocks and natural gas in small quantities. Commercial xylene's production and use in petroleum products and as a chemical solvent and intermediate may result in its release to the environment through various waste streams. Xylene use as an aquatic herbicide will result in its direct release to the environment. Xylenes are components of gasoline. Xylenes may be released to the environment through emissions from petroleum refining, coal tar and coal gas distillation, through emissions from the transport and storage of gasoline and from carburetors, and through leaks and evaporation losses during the transport and storage of gasoline and other fuels.
o-xylene	95-47-6		350	EV	Yes	

Chemical Compounds/ Parameters of concern	CAS Number	Interim Release Limits (µg/L)	Aquatic Ecosystem TTV*	TOXNET Hazardous Substances Data Bank	Found in CSG source water?	Comments
Zinc		3000	8			

DI indicates the parameter is a disinfection by-product and is not included in monitoring of active wells.

* TTV – 95% species protection toxicant trigger values taken from ANZECC/ARMCANZ (2000) Australian and New Zealand Guidelines for Fresh and Marine Water Quality.

** low reliability trigger

SED Appears in ANZECC/ARMCANZ (2000) as a sediment trigger value only

EE Ecotoxicity Excerpts are available in the Hazardous Substances Data Bank

EV Ecotoxicological Values or data are available in the Hazardous Substances Data Bank

NHTE Non-human Toxicity Excerpts are available in the Hazardous Substances Data Bank

NHTV Non-human Toxicity Values are available in the Hazardous Substances Data Bank

NNS – No natural sources

ID – Insufficient Data

Highlighted values are significantly below Public Health WQS

Conditions for Coal Mines in the Fitzroy Basin

Approach to Discharge Licensing

1. Introduction

This document describes the proposed approach for deriving consistent and appropriate limits and conditions for Coal mine discharges and supports the draft Conditions for Coal Mines in the Fitzroy Basin. The proposed approach aims to minimise the risk of discharges on downstream environmental values of receiving waters and be consistent with current legislation, departmental policy and State/National water quality guidelines. This includes the department's Policy for wastewater discharges to Queensland waters (http://www.epa.qld.gov.au/publications?id=2272), the Queensland Water Quality Guidelines (2006) and the ANZECC/ARMCANZ Fresh and Marine Water Guidelines 2000.

2. Managing and Characterising Discharges

The first step in assessing a licence proposing a wastewater discharges is to demonstrate the unavoidable need for that discharge. Water is a resource and most mines require substantial amounts of water even if for coal washing and/or dust suppression. A well planned and effective water management system is essential for having sufficient water for the mine during dry times but also having sufficient available storage/free-board to ensure discharges are infrequent and only associated with major storm events. Effective water management requires separate storage of water with varying water quality (such as storage of process water/groundwater, surface water runoff), appropriate infrastructure to accommodate sufficient water storage and appropriate flood design and control.

Where the need for a discharge is demonstrated, the next step is to characterise the wastewater and identify the potential contaminants or associated hazards that may exist. This may require an understanding of historical wastewater quality and/or information on local groundwater quality, geology types, the process/treatment systems involved and the broader water management strategies to be adopted. Currently, salinity (measured as electrical conductivity) and suspended sediment (and pH to a lesser extent) are known to be major water quality issues that require regulation. However, for other characteristics such as metals/metalloids, a legitimate need for regulation it is likely to vary from case to case. However, in the majority of cases there is currently a lack of data. Further information needs to be collected on both wastewater and natural waters. An interim approach is required for setting discharge conditions where water quality data insufficient or not currently available.

3. Environmental Values and Ephemeral Streams

After characterising the discharge, the next step requires environmental values and water quality objectives for waterways potentially affected by the discharge to be assessed. Depending on the risks from the discharge (based on its volume, contaminant concentrations, duration and location), this step will need to be done to a lesser or greater spatial extent. With greater risk, environmental values and potential impacts will need to be considered further a field. Environmental values and water quality objectives specified in the Environmental Protection (Water) Policy 1997 must be considered for assessment of all waterways including ephemeral streams. Environmental values for drinking water, stock watering, irrigation, recreation, industrial use and aquaculture may exist downstream of the discharge depending on the discharge location. The guidelines for these environmental values will form the basis of default water quality objectives and will typically not differ between permanent and temporary flowing streams. Various published guideline values are shown in Tables 1 to 6.

Many coal mines are situated in areas of ephemeral/intermittent streams. Current reference-based water quality guidelines for aquatic ecosystem protection (for example, in the Queensland Water Quality Guidelines, 2006) are available only for permanent flowing streams. Nonetheless, it is proposed that these guidelines be used for impact assessment and licensing discharges to ephemeral streams until local reference information becomes available. In addition, in mining areas it is common that background concentrations may be elevated as a result of historical anthropogenic activities and/or natural causes (certainly the case for some metals). Deriving local guidelines and background data is ideally needed but requires sufficient reliable data from monitoring of appropriate sites. Monitoring of ephemeral streams can be challenging given the infrequent and unpredictable nature of flow and the logistical issues involved with accessing and taking event related sampling. There is currently insufficient information for some contaminants as to how levels change with rainfall and flow. For electrical conductivity (EC) it is unlikely that high EC is associated with high flows in contrast to suspended sediment solids or turbidity which is typically elevated during rainfall-associated events.

For many sites there will be an absence of suitable monitoring data. In this case, reference-based guidelines from permanent flowing streams can be used for deriving end-of-pipe limits or trigger values in a precautionary sense, although consideration needs to be given to the above points. Where good local referenced data has been collected, this could be used to derive local reference-based guidelines (typically 75th percentiles for median EC, 80th percentiles for other reference-based water quality indicators such as pH, turbidity and suspended sediment). Typically at least 18 data points would be required and collected over at least 3 rain events. This may require 2 years of data but is dependant on rainfall frequency. Data from multiple reference sites could be amalgamated in most situations. The Queensland Water Quality Guidelines propose that this approach also be used for metals/metalloids where local reference conditions may be elevated.

4. Potential Water Quality Impacts

Effects of Salinity on Aquatic Organisms

Salinity has the potential to cause both acute and chronic toxicological effects in aquatic organisms. There is currently no nationally published toxicity trigger for salinity effects in freshwater environments although there is published information on the effects of salinity on fish, macroinvertebrates and other biota. Thus the recommended approach is to consider the ambient reference-based guidelines as discussed in Section 7. Generally, setting EC limits based on reference-based conditions will address potential concerns with toxicity given that discharge levels will typically be below toxicity thresholds. However, for situations where the stream has assimilative capacity for salinity, it may be possible to have discharge levels at or above toxicity thresholds and through dilution, still meet reference-based guidelines in-stream within a short distance downstream. The general policy position in this case is that the discharge should not result in any toxicity within the initial mixing zone.

Based on the comments by Hart (2008) in a recent review of water quality in the Fitzroy Basin, EC values of less than 1500 μS/cm are unlikely to affect adult fish although salinity around 1000-1500 μS/cm may effect early life stages of fish. Macroinvertebrates are unlikely to be affected at below around 1000μS/cm. However, for those species adapted to quite low salinity (200-300μS/cm) such as in the south of the Fitzroy Basin, permitting ambient EC concentrations to reach 1000-1500 μS/cm would adversely affect the community structure, especially at a species level. A conservative trigger used in the ANZECC guidelines (1992) was Total Dissolved Solids (TDS) of 1000 mg/L (this converts to an EC of approximately 1500μS/cm) which receiving waters should not exceed.

5. Monitoring of Metals/Metalloids

Metals/metalloids have the potential to cause both acute and chronic toxic effects in the short-term and bioaccumulate to have similar effects in the long-term. The comments on measuring EC in receiving waters are also relevant to applying limits to metals/metalloids in receiving waters. There are few examples of where metals/metalloid limits have been applied end-of-pipe at this stage for coal mines and in most cases, further review of data is required for this to be done. Ascertaining end-of-pipe total and dissolved metal concentrations is recommended. Trigger values for receiving environment monitoring can be applied. Trigger values should be based on relevant environmental values. Conservative trigger values are shown in Tables 5 and 6. For aquatic ecosystem protection (Table 5), the default trigger values are for slightly-to-moderately disturbed (SMD) systems protecting 95% of species. For highly disturbed systems (HDS), ANZECC/ARMCANZ (2000) guidelines recommend adopting SMD levels in the first instance but if there are known high levels naturally occurring, lower lesser level of species protection (such as 90% or even 80%) can be adopted. In some situations such as may occur in highly mineralised mining catchments, natural or historical effects have resulted in even higher background levels for some specific metals/metalloids. Guideline adjustment for metals such as aluminium, copper, iron and zinc is sometimes required. If this is the case, relevant reference data should be assessed to develop locally-relevant guidelines. Where reference data is not available, the use of upstream background could be negotiated as a surrogate where it can be demonstrated that the site has not been influenced by upstream mine or other industry-related activities that are likely to affect metal/metalloid concentrations. Guideline values for long-term medians can be developed from 80th percentiles of relevant reference data.

For aquatic ecosystems, the metals/metalloid limits could be applied to total (i.e. unfiltered) concentrations. If this is the case and the total concentration exceeds the trigger value, a hardness correction can be applied for some metals (cadmium, chromium III, copper, lead and nickel) up to a salinity of 2500 mg/L. See Table 3.4.3 of ANZECC/ARMCANZ (2000) Guidelines as to how to modify the trigger values for hardness for these metals. However, if exceedances still occur or are likely to occur then dissolved (i.e. filtered) metals/metalloid concentrations should also be measured and compared to the limits. Also note that speciation of some metals/metalloids is usually required for aquatic ecosystem protection (e.g. arsenic and chromium). For event-based sampling, measurement of dissolved metals/metalloids will be more problematic and logistically difficult. Samples need to be filtered, refrigerated and analysed within short time frames and this may not always be possible. However, at this stage it is proposed that for protection of aquatic ecosystem, metals are measured for dissolved metals/metalloids given the likelihood for exceedance of the guidelines. On the other hand, given the potential addition costs of speciated metals, it is proposed that all samples be analysis for dissolved total species (i.e. all species of the metal/metalloid, or 'total' species) for licensing. Where risks are identified, further assessment of speciated components may be required. For other environmental values, assessment of total metals/metalloids is needed to compare to guidelines but only for those that are specified in the guidelines. Where there is an absence of other information on potential sources or levels of metals/metalloids, a standard set of metals/metalloids is recommended until such information is made available. This might include characterising of the wastewater in dams or potential sources of wastewater (such as groundwater, waste characterisation or geological analysis).

6. Monitoring Receiving Waters

Water Quality Monitoring

Where data is available, background receiving water quality typically does not meet reference-base guidelines for all indicators. This may be due to both differences in natural conditions and from anthropogenic pressures. For this reason, application of guidelines to receiving waters as regulatory limits is likely to result in frequent non-compliance, regardless of whether the mine is discharging or not.

Therefore, receiving water assessments using water quality guidelines should only be used for triggering reporting (or investigation purposes) and not as a primary mechanism for regulation. This could include reporting of long-term medians of data (reference-based guidelines) or reporting against 95th percentiles (biological effect data). Maximum trigger values for certain indicators such as EC and pH may be adopted for some near-field monitoring sites as an additional trigger limit.

Reporting against guidelines for environmental values other than aquatic ecosystem protection should also be done where present. Monitoring should be done when the stream is flowing (this flow trigger would preferably be below the discharge flow trigger) and should ideally be done both when the discharge is and is not occurring. Reporting of the receiving environment monitoring program (REMP) could be done.

Water quality measurements of permanent water holes or other specific downstream environmental values are also appropriate where risks of potential impact are identified. For ephemeral streams, the current science suggests that the permanent and semi-permanent water holes need to be protected as a high priority. The concentrations of some water quality characteristics can increase significantly in water holes with time due to evaporation and no flow conditions whilst others decrease in concentration due to changes in water chemistry. Recent mine discharges have resulted in significant changes to salinity profiles within some downstream drinking water reservoirs and therefore impoundments, storages, weirs, dams, etc. should also be monitored given the potential for impacts.

Biological Monitoring

Biological monitoring (e.g. macroinvertebrate sampling) will generally only be required when the discharge quality and circumstances are such that they are considered to pose a significant risk to the affected receiving waters and associated habitat(s). For instance, this situation might arise when end-of-pipe EC levels are above 1000 µS/cm and there is a potential for discharge during times of low flow when limited dilution will be occurring. Having said that, biological monitoring should generally be limited to permanent and semi-permanent water bodies that could be potentially impacted by the discharge (for example, within 50km of the discharge), although this will depend on the quantity and duration of discharge. Note that specific ecosystem-type considerations must be taken into account, for example, in some areas of the catchment even short-term wetting of stream beds can play an extremely important role in the ecological cycle of the system and therefore may warrant biological monitoring.

Monitoring of macroinvertebrates must be carefully designed and interpreted in accordance with (i) the Queensland Australian River Assessment System (AusRivAS) Sampling and Processing Manual (August, 2001) and (ii) Chessman (2003), SIGNAL 2 – A Scoring System for Macro-invertebrate ('Water Bugs') in Australian Rivers, Monitoring River Heath Initiative Technical Report no. 31, Commonwealth of Australia, Canberra. Monitoring should be undertaken at both impact and control sites. (For further advice on this issue, contact Neil Tripodi on 3896 9241)

Sediment Sampling

Sediment sampling for toxicants such as metals and metalloids will generally only be required when the discharge quality and circumstances are such that they pose a significant risk to the receiving waters. This may be the case where end-of-pipe metals/metalloid concentrations are significantly above both background/guideline concentrations, discharge has occurred for extended periods of low flow and ANZECC/ARMCANZ (2000) water quality guideline values and background water quality concentrations are exceeded.

Sediment monitoring should be limited to permanent water bodies (such as weirs, water holes etc) that could be potentially impacted by the discharge and that possess the environment where muds (sediment) can accumulate. Sediment monitoring locations may be of similar nature to macroinvertebrate sampling sites (where required).

8. Setting End-of-pipe Limits and Links to Natural Flow

Discharging linked to natural flow in ephemeral streams is an essential mechanism for ensuring any discharge has reduced risk of impact on downstream environmental values. The specification of upstream monitoring sites and start/stop discharge triggers based in the environmental flow is also needed to ensure that this occurs. Large dilutions factors (e.g. 1 to 10 or 1 to 20) would generally result in reduced risk of both water quality and flow impacts, assuming the monitoring of the stream and discharge flow are closely linked and controlled.

The proponent should provide adequate data and modelling of the flow in their part of the catchment to determine the most suitable environmental flow trigger under which a discharge of certain maximum volume and flow rate should occur. The frequency or percentage of wet weather days that this will be possible should be assessed under a range of rainfall scenarios.

As part of the approval, the following will be required:

- A minimum natural receiving environment flow (m^3/s) should be defined at which wastewater discharge can take place – both commencement and cessation. It should be based on historical measurements of upstream natural flow and be designed to avoid times of poor mixing and permit significant post-discharge flushing (such as <20th percentile flow). Ongoing access to data from a suitably situated gauging station will be required.
- The maximum discharge rate should be set so that it does not exceed 20% of the minimum natural receiving environment flow rate (i.e. 1:4 – 1 part discharge wastewater : 4 parts natural flow).
- Daily discharge in cumecs (m^3/s) should be reliably measured and recorded.

An interim approach is required when no background receiving environment monitoring data is available. In this case, the dilution factors are not considered in setting limits as background water quality may exceed guidelines (i.e. there would be no assimilative capacity for any contaminant), although a 20 percent dilution with receiving waters will still be required.

Where discharge cannot be linked to sufficient natural flow, more detailed risk assessment should be undertaken for the waterways potentially affected by the discharge as the likelihood of impact is significantly increased. Any permanent water bodies (e.g. weirs or water holes) or locations of other environmental values potentially affected by the discharge should be identified. For such situations, more stringent water quality limits would typically be required such that it meets ambient or background water quality levels. Long-term continuous discharges in ephemeral streams should be generally discouraged. In the case of some mines in upper catchment areas, an interim approach may be adopted where discharge is permitted with flow measurements downstream. This will ensure that potential impacts are limited to near-field. Such an approach may be suitable for a transitional environmental program (TEP) or where the potential effects are considered low risk.

Monitoring of relevant physical chemical and toxicant indicators in Tables 1 to 6 should be undertaken end-of-pipe when a discharge is occurring, ideally coinciding with receiving environment monitoring. The limits/triggers are derived from ambient water quality data of permanent flowing streams in the Fitzroy and from drinking water guidelines. It is proposed that the EC discharge limit should vary depending on geographical location and whether a drinking water reservoir is located downstream of the discharge. Other issues that should be considered in setting end-of-pipe indicators and limits/triggers include laboratory detection limits and the relevance of the indicators to the activity and the risks involved.

End-of-pipe limits are required for EC and pH. The information is not currently available to set maximum values based on acute toxicity. A conservative approach would be to ensure discharge limits for EC end-of-pipe do not exceed 1500 µS/cm. Under certain circumstances, a higher end-of-pipe limit may be applicable where large mixing ratios are achieved and discharge is only for smaller durations/volumes. In these cases, the end-of-pipe limit may be increase up to 2250 µS/cm. The need for this would need to be demonstrated. The pH limits would ideally be between 6.5 and 8.5 when linked to 1:4 dilutions. Higher pH limits (say ≤9.0) end-of-pipe may be negotiated where appropriate dilution will be achieved. Limits for suspended solids concentrations can be negotiated with mines for sediment based on expected sediment removal from settling. Turbidity levels should be measured with the view of setting a relevant limit when sufficient background data is obtained.

In terms of metals/metalloid measurements end-of-pipe, it is recommended that no compliance limit be applied to this end-of-pipe monitoring unless adequate receiving environment data is collected and reviewed. However, trigger limits can be proposed for those metals/metalloids that currently have ANZECC/ARMCANZ (2000) trigger values for freshwater. Such trigger limits, if triggered, would firstly require a comparison of down stream water quality to trigger values, if exceeded, and then a comparison should be made to reference site data. If values are within local reference levels, no further action should be required.

There is a range of other indicators that may be monitored and regulated end-of-pipe (and in receiving waters). These include nutrients (ammonia, nitrate, total nitrogen, total phosphorus, filterable reactive phosphorus, phosphate, chlorophyll-a), sulphate, total hydrocarbons, fluoride and pathogens to mention only a few. Nutrients should be monitored where these are likely to be high in the discharge as a result of the activity, for example, where a sewage treatment plant is adopted or where there is a source of nutrients in the process. Ammonia and nitrate are potential toxicants (with toxicant trigger values) while total nitrogen, total phosphorus, ammonia, organic nitrogen, oxidised nitrogen, and filterable reactive phosphorus are indicators relating to potential eutrophication effects (and have related ambient water quality guidelines). Sulphate is currently regulated as a result of potential effects on drinking water (human and stock). Sulphate has no aquatic ecosystem trigger value although can change the interactions of other water quality contaminants. There are also no aquatic ecosystem guidelines for total petroleum hydrocarbons (TPHs) or polycyclic aromatic hydrocarbons (PAHs) other than naphthalene but this may be required to be monitored where mechanical workshops or petroleum-based chemicals/fuels are used on site.

9. Receiving Environment (RE) Monitoring and Triggers

Monitoring of all indicators listed for relevant environmental values in Tables 1 to 6 should be undertaken in the receiving waters at upstream and receiving environment monitoring points. Metals/metalloids as shown in Table 5 (and Table 6 if relevant) should also be monitored at upstream and downstream receiving environment monitoring points, at least until time where sufficient data is available to revise suitable monitoring indicators. Ideally, both total and dissolved metals should be monitored in the receiving environment relevant to the environmental value that the indicator relates to, e.g. total arsenic is required for assessment against drinking water guidelines.

Ideally, any associated local receiving environment monitoring program should include at least one far-field monitoring point situated much further downstream to represent post-mixing water quality. Note that the far-field monitoring point may be off the mining lease but should remain located within the nearest major flowing stream – this monitoring point should not be assessed for compliance purposes (or maximum triggers). A reference site un-impacted by mining activities (e.g. no mines within 20km upstream) should be identified and monitored for the sub-catchment. In situations where this is not possible, the least affected site, or unaffected site from another nearby sub-catchment should be identified for the purpose of collecting reference or "background" data. Collaborative monitoring programs involving more than one mining company may be applicable for monitoring such sites for local creek catchments.

Upstream and downstream receiving environment monitoring should occur during all flow events, not just during periods when discharges are taking place. This requirement is necessary for a number of reasons:

- To allow for condition assessment of these waterways
- To allow for potential assessing of impacts before and after discharge
- To allow assessment of background to assist with limit setting

Where end of pipe compliance limits apply for physical chemical indicators and are considered low risk, receiving environment monitoring and reporting should be based on long term assessment of consecutive measurements over a twelve month period and compared to ambient water quality objectives in the Queensland Water Quality Guidelines (2006) and background water quality.

Where end-of-pipe limits are considered to pose some potential risk to receiving waters, trigger values can be applied to sites immediately downstream from the discharge. The trigger values would generally be more stringent than end-of-pipe conditions but be achievable. For example, based on available information a receiving environment maximum trigger of 1000 µS/cm EC is proposed for near-field monitoring sites. Trigger values for metals/metalloids would typically be ANZECC/ARMCANZ (2000) toxicant trigger values for slightly moderately disturbed systems until sufficient reference data becomes available to review these limits.

Exceedance of these trigger values during discharge should require an in accordance with the ANZECC and ARMCANZ 2000 methodology. Where downstream water quality is within reference data, no further action should be required.

10. Modifying Limits and Triggers

Changes to compliance limits and trigger values may be appropriate where adequate and relevant reference monitoring data is made available and assessed as per the allowance in ANZECC/ARMCANZ (2000) and additional information. A reference site can be defined as a site without mine impacts (e.g. no mines within 20km upstream) for the sub-catchment with other requirements as per Appendix C in the QWQG (2006). In some cases it may be the least impacted site, or an unaffected site from another adjacent sub-catchment. An adequate number of valid data points are required to provide a reasonable confidence limit around the percentile based trigger values/guidelines. For example to develop an 80^{th} percentile guideline, a minimum of 18 samples is required to provide a 95% confidence level. Ideally, samples should be taken from multiple (minimum 3) flow events over at least a one to two year period.

The objective of water sampling for meta/metalloid concentrations discussed above is to help form an acceptable data set to allow site specific license limits or trigger values to be set for end-of-pipe and receiving waters. Elevated background levels of some metals such as aluminium, zinc, iron and chromium have been observed in the Fitzroy Basin.

Where assimilative capacity has been identified as part of monitoring, additional allowance may be incorporated into discharge limits.

Definitions

Background – In terms of water quality, background would typically be obtained by sampling upstream of the mining activity in times of natural flow. Background should not include times of discharges from other mines upstream or times of no flow.

Reference - A reference site is a site whose condition is considered to be a suitable baseline or benchmark for assessment and management of sites in similar waterbodies. The condition of the site is reference condition and values of individual indicators at that site are the reference values. Most commonly, reference condition refers to sites that are subject to minimal/limited disturbance. The key criteria quoted in the Queensland Water Quality that is applicable for most mining areas in the Fitzroy is that there is no major extractive industry (current of historical) within 20km upstream. Monitoring must occur when the stream is flowing.

Adequate Data – The Queensland Guidelines recommend a minimum of 18 samples collected over at least 12 months for estimates of 20th or 80th percentiles at a site. For 50th percentiles a smaller minimum number of samples (~ 10–12) would generally be adequate. For ephemeral streams, more than one sample should be taken for each flow event and all flow events in the period should be sampled.

Table 1. Reference-based EC guidelines for the protection of aquatic ecosystems in the Fitzroy Catchment (Qld Guidelines 2007). Units in µS/cm.

Sub catchment	95^{th} Percentile Guideline	90^{th} Percentile Guideline	75^{th} Percentile Guideline*
Fitzroy North	1400	1250	720
Fitzroy South	650	510	340

* guideline should be compared to median of long term data set.

Table 2. Guideline Values for EC for other values

	TDS (mg/L)	EC* (µS/cm)
Drinking Water	500	750
Irrigation**		1100
Stockwater***	2400	3600

* using theoretical conversion mg/L TDS = 0.67 x µS/cm EC;
** most stringent field/grass croop trigger - for corn in clay (depends on crop and soil types);
*** for dairy cattle, poultry trigger of 2000mg/L TDS

Table 3. Aquatic Ecosystem Guideline Values (for comparison against long term medians of 10-12 data points)

Parameter	Guideline (lowland)	Guideline (upland)
Ammonia N (ug/L)	20	10
Oxidised N (ug/L)	60	15
Organic N (ug/L)	420	225
Total N (ug/L)	500	250
Filtered Reactive Phosphorus (ug/L)	20	15
Total P (ug/L)	30	10
Chlorophyll-a (ug/L)	5.0	-
Dissolved Oxygen (% saturation)	85 to 110	90 to 110
Turbidity (NTU)	50	25
Suspended Solids (mg/L)	10	-
pH	6.5 to 7.5	6.5 to 8.0

Table 4. Selected Guideline Values for Stock, Crop and Drinking water (units in mg/L).

Parameter	Stock Drinking	Crop Irrigation	Drinking/ Household
Sulfate	1000		250
Chloride		350	
Calcium	1000		
Nitrate	400		
Nitrite	30		

Table 5. Aquatic Ecosystem Protection Toxicant Guideline Values

Parameter	ANZECC Guideline for slightly-moderately disturbed environ. (µg/L)	Comment
Aluminium	55	Trigger value for pH > 6.5
Ammonia	900	Based on a pH of 8
Antimony	9	Low reliability trigger
Arsenic (As III)	24	
Arsenic (As V)	13	
Beryllium	0.13	Low reliability trigger
Boron	370	See Note 1
Cadmium	0.2	
Chromium (Cr VI)	1	See Note 1
Copper	1.4	
Iron	300	Low reliability trigger
Lead	3.4	
Manganese	1900	See Note 1
Mercury (inorganic)	0.06	99% PL as can bioaccumulate
Molybdenum	34	Low reliability trigger.
Nickel	11	
Selenium (Total Speciated)	5	99% PL as can bioaccumulate
Silver	0.05	
Uranium	0.5	Low reliability trigger
Vanadium	6	Low reliability trigger
Zinc	8	See Note 1

Note 1: May not protect key species from chronic toxicity.

Table 6. Metal Guideline Values for Stock, Crops and Drinking Water (units in mg/L)

Parameter	Stock Drinking	Crop Irrigation	Drinking/ Household
Total Aluminium	5	200	0.2
Total Arsenic	0.5	0.1	0.007
Total Boron	5	0.5	4
Total Cadmium	0.01	0.01	0.002
Total Chromium (DW should be Cr (VI)	1	0.1	0.05
Total Cobalt	1		
Total Copper	1	200	1
Total Iron		0.2	0.3
Total Lead	0.1	2	0.01
Total Manganese		0.2	0.1
Total Mercury	0.002	0.001	0.001
Total Molybdenum	0.15	0.01	0.05
Total Nickel	1	0.2	0.02
Total Selenium	0.02	0.02	0.01
Total Zinc	20	2	3

eco access
Environmental licences and permits

Operational policy

Licensing

Waste water discharge to Queensland waters

Operational policies provide a framework for consistent application and interpretation of legislation by the Environmental Protection Agency, which incorporates the Queensland Parks and Wildlife Service. Operational policies will not be applied inflexibly to all circumstances. Individual circumstances may require an alternative application of policy.

This operational policy[1] provides both policy advice and technical information for officers assessing development applications or environmental authority applications under the Environmental Protection Act 1994, Environmental Protection (Water) Policy 1997, Integrated Planning Act 1997 *and* State Development and Public Works Organisation Act 1971 *for environmentally relevant activities discharging residual waste water to Queensland waters, including to waters of high ecological value. The operational policy includes the consideration of mixing zones, assimilative capacity, environmental offsets and environmental values and water quality objectives in assessing and deciding applications. It also informs applicants in preparing applications.*

Table of contents

[1] This operational policy supersedes the EPA Procedural guide *Licensing discharges to aquatic environments* and is informed by the EPA Procedural Guide *Procedural information for the operational policy Waste water discharge to Queensland waters.* (The latter document will remain draft and the subject of consultation until finalised late in the first quarter of calendar 2008.)

Environmental Protection Agency
www.epa.qld.gov.au ABN 87 221 158 786

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

1. Operational policy overview

1.0 Policy subject

This document summarises and explains the policies that apply when assessing applications under the _Environmental Protection Act 1994_ (the EP Act) that may involve discharge of waste water[2] to Queensland waters[3], including to waters of high ecological value (HEV). It also applies when assessing applications under other Acts that involve environmental values (EVs) of water or water quality objectives (WQOs), decisions made under the *State Coastal Management Plan 2001* and Regional Coastal Management Plans.

1.1 Key legislation and policy frameworks

The operational policy is based primarily on the EP Act and the _Environmental Protection (Water) Policy 1997_ (the EPP Water). The object of the EP Act is "to protect Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends (ecologically sustainable development)" (from Section 3 of the EP Act). The explanatory notes to Section 5 of the EP Act (Obligations of persons to achieve object of Act) require "all people who are given power under this Act, to use that power to protect the Queensland environment and do so consistent with the principles of ESD".

The current EPP Water includes statements of policy about assessment and decision making that resulted from consultation on the Regulatory Impact Statement for the _Environmental Protection (Water) Amendment Policy No 1 2006_ (the EPP (Water) AP). These are described in the corresponding explanatory notes. This operational policy provides further information on the implications of 'scheduling' EVs and WQOs under the EPP Water for residual waste water discharge. Refer also to the EPA Information sheet _Scheduling environmental values and water quality objectives._

The operational policy also informs officers and applicants on key provisions of the EPP Water, the _Queensland Water Quality Guidelines 2006_ and the ANZECC Water Quality Guidelines.

The environmental offsets policy at Section 2.5 is to be used in conjunction with the Queensland Government Environmental Offsets Policy.

Relevant legislation, intergovernmental agreements and other EPA Operational policies are listed at Section 4.

1.2 Application of policy

This operational policy applies when assessing or deciding applications (hereinafter referred to as development applications) relating to activities that are proposing to discharge residual waste water to waters, such as:

- development approvals under the _Integrated Planning Act 1997_ (IPA) for EP Act chapter 4 activities (non-mining and non-petroleum environmentally relevant activities (ERAs)) prescribed under the _Environmental Protection Regulation 1998_;
- environmental authorities under the EP Act for mining and petroleum activities;
- the assessment of *Environmental Impact Statements* prepared under the EP Act chapter 3 or the _Environmental Protection and Biodiversity Conservation Act 1999_ (the EPBC Act);
- projects declared to be significant projects by the Coordinator General under the _State Development and Public Works Organisation Act 1971_ (the SDPWO Act);

---

[2] Under the EPP Water, waste water means liquid waste and includes contaminated stormwater.
[3] Queensland waters means all waters that are within the limits of the State and includes all tidal (coastal and estuarine) and non-tidal (riverine) waters, groundwaters and wetlands (see the definition in the *Acts Interpretation Act 1954*).

- development that is the subject of designation of land for community infrastructure under the *Integrated Planning Act 1997*;
- when assessing transitional environmental programs or environmental evaluations under the EP Act; and
- when making environmental management decisions under the EPP Water involving waste water release on land, waste water recycling and the release of contaminated stormwater that may impact on surface waters or groundwaters.

In assessing development applications for EP Act chapter 4 activities the administering authority must comply with any relevant Environmental Protection Policy requirement and must consider the standard criteria of schedule 3 of the EP Act (see Glossary of Terms) and additional information given in relation to the application.

If the application seeks an increase in the scale or intensity, the administering authority must assess the application having regard to the proposed activity, the existing activity and the potential environmental harm the proposed activity and the existing activity may cause. Refer to section 73AA of the EP Act for applications in a wild rivers area.

Subject to IPA, the administering authority may impose **conditions on the development approval** it considers are necessary or desirable, and must include any condition the authority is required to impose under an Environmental Protection Policy requirement. For other conditions that may be imposed, refer to section 73B (3) and (4) of the EP Act.

In assessing and deciding applications for environmental authority (mining activity) for level 1 mining projects the administering authority may in granting the application impose the conditions on the environmental authority it considers necessary or desirable.

In deciding whether to grant or refuse the application or to impose a condition the authority must:

(a) comply with any relevant Environmental Protection Policy requirement; and

(b) subject to paragraph (a), consider application documents for the application, the standard criteria, the wild river declaration for the area—to the extent the application relates to mining activities in a wild river area, any suitability report obtained for the application and the status of any application under the *Mineral Resources Act 1989* for each relevant mining tenement.

The operational policy also informs the application of EVs and WQOs in the assessment of non-ERA development applications, including under the *State Coastal Management Plan 2001* and Regional Coastal Management Plans (State Planning Policies under IPA). Information on Implementing the State Coastal Management Plan includes the Planning Scheme Guideline and Development Assessment Guideline. These guidelines provide advice on reflecting the relevant policies of the State and Regional Coastal Management Plans into Local Government planning schemes and for development assessment. Relevant policies include 2.4.1 Water quality management, 2.4.4 Stormwater management and 2.4.5 Groundwater.

A glossary of terms is at Appendix 6.1.

2. Policy/technical issues determination

2.0 Policy statements

The statements of policy informing assessment and decision making on applications for ERAs discharging residual waste water to Queensland waters are at Explanatory notes for EPP (Water) AP and summarized as follows. The policy context is considered with respect to receiving waters that have the biological integrity of:

a. **Effectively unmodified (high ecological value) aquatic ecosystems**

"The management intent for high ecological value aquatic ecosystems is to maintain the natural values, including the physico-chemical, biological, habitat and flow attributes. For any new ERA a decision to release waste water to high ecological value surface waters, or groundwater, is the least preferred option. Under the waste management evaluation procedure of section 15 of the Environmental Protection (Water) Policy 1997 (the waste management evaluation procedure), the management hierarchy requires the sequential evaluation of waste water prevention and waste water treatment and recycling before the evaluation of the release of waste water to land, sewer or surface water.

In addition, the activity must be carried out in accordance with best practice environmental management for the activity.

However if some release of waste water from the activity to high ecological value surface water is environmentally acceptable after consideration of the waste evaluation procedure, and there are no practicable alternative surface water discharge locations, the ERA would need to demonstrate:

- *an equivalent outcome of no, or negligible, change[4] to the physico-chemical, biological, habitat and flow attributes beyond natural variation of the waters, excepting in limited circumstances, within a defined initial mixing zone measured near the waste water release outfall location. The intent is that beyond the mixing zone boundaries, current environmental quality is maintained and the aquatic ecosystem is conservatively protected over time, taking into account the precautionary principle;*
- *some environmental assimilative capacity[5] is preserved for future ecologically sustainable development;*
- *the proposal is in the public interest[6] and provides outstanding net benefits to the region, or State as a whole[7];*
- *where practicable, the proposal includes a like kind environmental offset[8]; and*
- *compliance with State Government obligations under intergovernmental agreements which include the management and protection of world heritage areas under the UNESCO Convention[9]; the management and conservation of wetlands under the* Ramsar Convention on Wetlands[10]; *and the management and protection of migratory birds and their environment under JAMBA and CAMBA[11]"; or*

[4] The method of assessing 'no change' to the physico-chemical, biological, habitat and flow ecosystem attributes of high ecological waters is given in the Queensland Water Quality Guidelines 2006 (Appendix D Compliance assessment protocols.)
[5] The environmental assimilative capacity is broadly the capacity of the environment to receive some human induced input of contaminants or alteration, without causing unacceptable change.
[6] Refer to the standard criteria listed under Section 3 of the *Environmental Protection Act 1994*.
[7] Refer to the Terms and abbreviations section of the *State Coastal Management Plan 2001*.
[8] To be of a 'like-kind' the environmental offset would need to be based on the same contaminant and preferably in the same water. However the environmental offset proposal would be considered by the administering authority on a case-by-case basis; seeking to deliver a net environmental gain to the water as a whole.
[9] The *Convention Concerning the Protection of the World Cultural and Natural Heritage (UNESCO) 1972.*
[10] *RAMSAR Convention on Wetlands, Iran 1971.*
[11] Japan Australia Migratory Bird Agreement and China Australia Migratory Bird Agreement. Australian Treaty Series, respectively 1981 No.6 and 1988 No.22. Department of Foreign Affairs and Trade. Canberra.

b. Slightly to moderately disturbed aquatic ecosystems

"The management intent for the release of waste water to surface waters having the biological integrity of slightly to moderately disturbed aquatic ecosystems is considered with respect to the existing water quality.

For any new ERA, if after consideration of the waste evaluation procedure the release of contaminants to surface water is environmentally acceptable, the management intent is summarised below:

- *where the existing water quality is better than the scheduled water quality objectives, the management intent is to maintain the current water quality; while allowing in some circumstances the use of some of the remaining assimilative capacity for future development and population growth; and*
- *where the existing water quality corresponds to the scheduled water quality objectives, the management intent is to maintain the water quality; and*
- *where the existing water quality is of a lower quality than the scheduled water quality objectives, the management intent is to improve the water quality and prevent further degradation. Attainment of the scheduled water quality objectives will be sought through continual improvement over time and, depending on existing water quality, may be a long-term goal. Environmental offsets of a 'like kind' may be considered by the administering authority where there are no feasible alternatives to the release of waste water.*

In addition, the activity must be carried out in accordance with best practice environmental management for the activity. For existing ERAs the continuous improvement requirement of development conditions applies…'; or

c. Highly disturbed aquatic ecosystems

"The management intent for the release of waste water to surface waters having the biological integrity of highly disturbed aquatic ecosystems is to halt the decline and reverse the trend in water quality.

For any new ERA, if after consideration of the waste evaluation procedure the release of contaminants to surface water is environmentally acceptable, the management intent is to halt the decline and reverse the trend in existing water quality. However it is recognised that attainment of scheduled water quality objectives is a long-term goal.

In addition, the activity must be carried out in accordance with best practice environmental management for the activity. For existing environmentally relevant activities the continuous improvement requirement of development conditions also applies.

Environmental offsets of a 'like kind' may be considered by the administering authority where there are no feasible alternatives to the release of waste water."

The above statements of policy are considered in the following sections 2.1 to 2.5, in conjunction with the Queensland and ANZECC Water Quality Guidelines and the role of EVs and WQOs in water quality assessment. An overall assessment flowchart is at Figure 1, the corresponding task list for assessing the discharge of residual waste water is at Table 1. A glossary of terms is at Appendix 6.1.

Figure 1 — Assessment flowchart

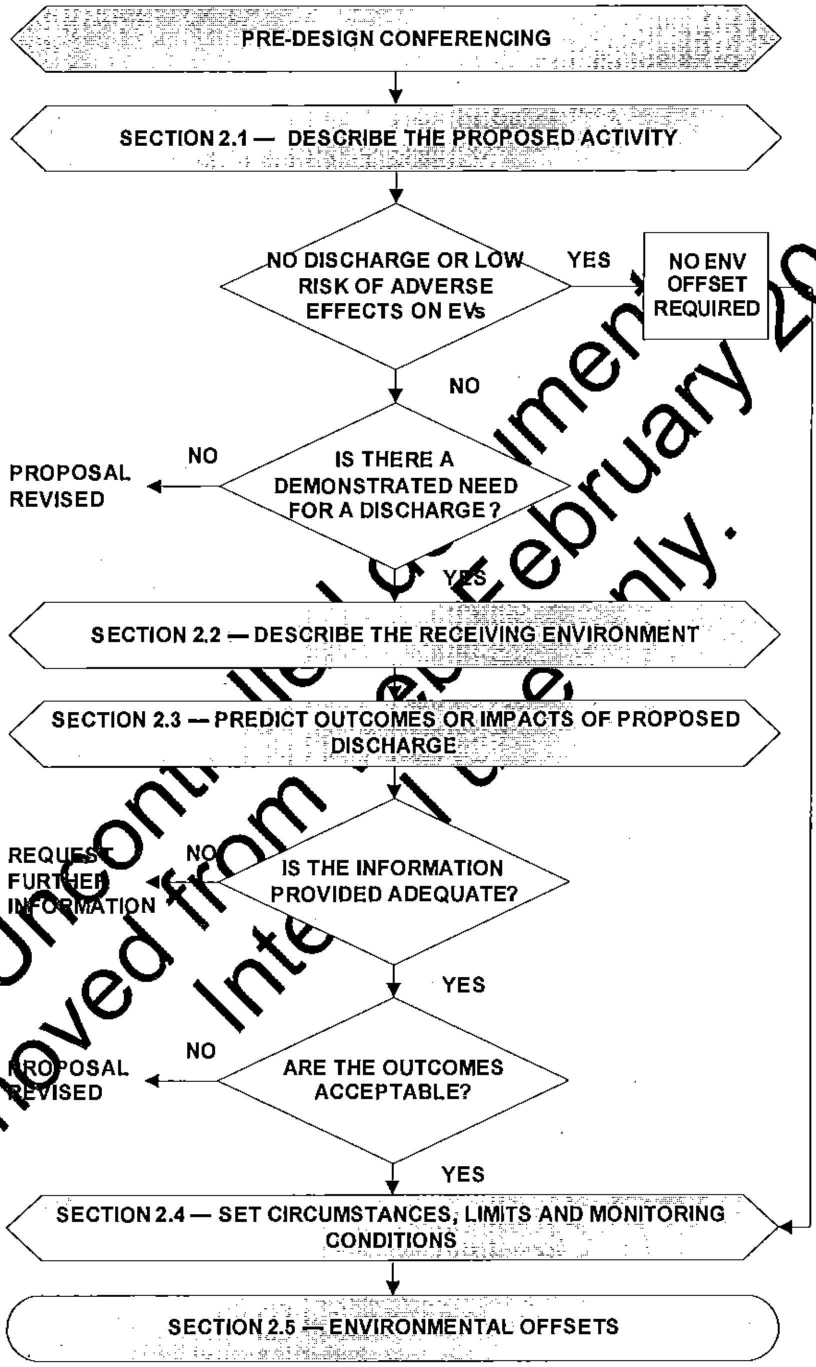


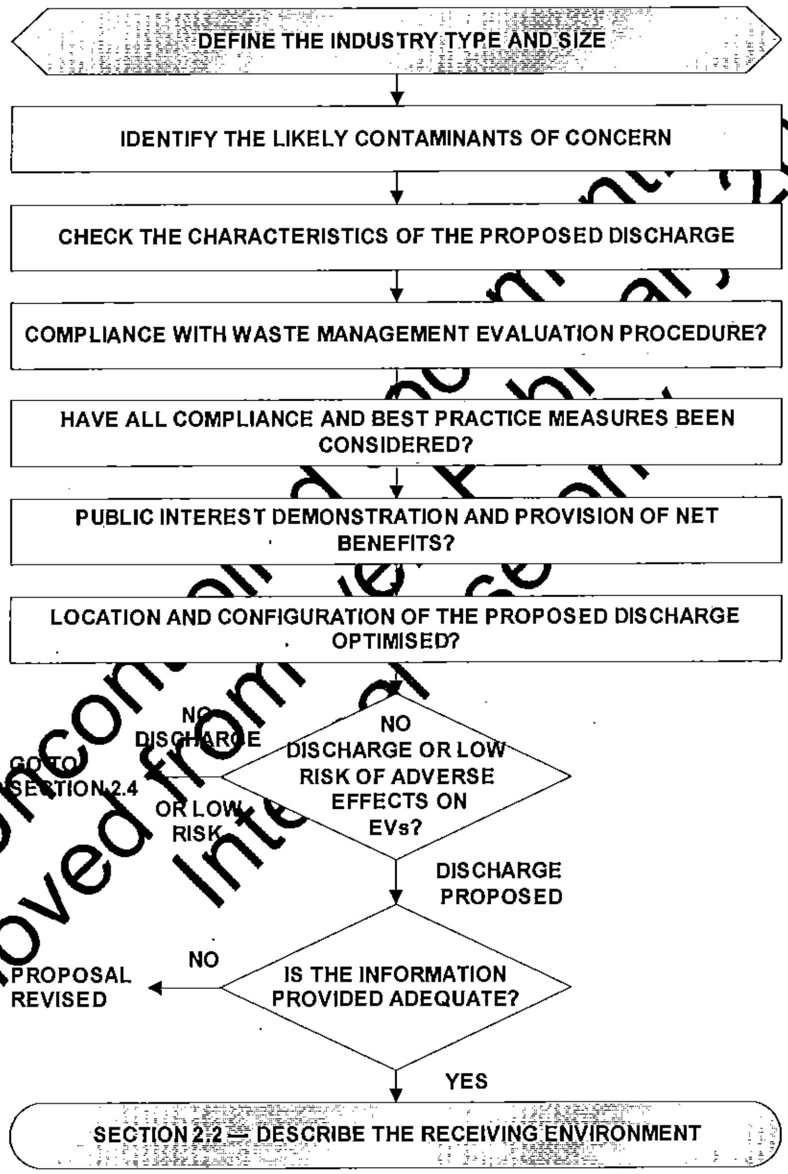
Table 1 — Task list for assessing the discharge of residual waste water

Section	Activity	Tasks list
2.1	[illegible]	Define the industry type and size (proposed production). Is a residual waste water discharge proposed, or is the discharge assessed as low risk of having an adverse effect on an environmental value? Identify the potential contaminants of concern in the proposed discharge. Check the characteristics of the proposed discharge (quality/quantity/variability). Check the location and configuration of the proposed discharge. Have all reasonable and practicable measures been used to avoid or minimise the discharge (for example best practice, source reduction, recycling)?
2.2	[illegible]	Identify water bodies potentially affected by the proposed discharge. For each water body, what are the sustainable loads for key contaminants? What proportion of the sustainable load is used by this proposal? Check government planning requirements that apply to these water bodies (e.g. Ramsar, EPA Referable Wetlands, National Parks and Fish Habitat Areas). Has relevant information on the receiving environment been provided? Is it adequately described given the contaminants and risks associated with the proposed discharge? Are the EVs and WQOs for these waters listed in the EPP Water Schedule 1? (If not EVs and WQOs from the *Queensland Water Quality Guidelines 2006* and ANZECC Water Quality Guidelines apply). Have other sources and loads of contaminants in the catchment, including future loads, and previous history, been considered?
2.3	[illegible]	Identify the need for predicting outcomes of the proposed activity (i.e. is modelling required?) and what predictive methods/models were used. Were the predictive methods used appropriately? If a mixing zone is proposed; check the EPP Water (Section 18) and ANZECC Water Quality Guidelines. For receiving water bodies, are WQOs met and EVs protected? If not, does the activity contribute to achieving them in the future? Determine the need for consideration of environmental offsets.
2.4	[illegible]	Specify any circumstances (for example limitations or timing issues) related to the approved discharge. Derive end-of-pipe limits from approved discharge loads/characteristics. Include compliance monitoring for the end-of-pipe/receiving environment Include reporting requirements for the approved activity. As required, condition the execution of an environmental offset agreement.

2.1 Describe the proposed activity and discharge

This section involves the assessment of information provided by the applicant on the description of the proposed activity, as shown in Figure 2 below and summarised in the following text.

Figure 2 — Activity description and assessment



2.1.1 Define the industry type and size (estimated production)

The industry type and scale will help to classify the potential environmental risk from the proposed activity and discharge of residual waste water. The scale of the activity can be specified in production quantities such as area of production for aquaculture farms, tonnes of throughput for processing industries or equivalent persons in the case of sewage treatment.

2.1.2 Identify the potential contaminants of concern in the discharge from the proposed activity

The first step in assessing the discharge of residual waste water from the proposed activity is identifying the source waste streams and potential contaminants of concern. Contaminants can be a gas, liquid or solid, an odour, an organism, energy (as in a thermal discharge) or a combination of contaminants. Common industry point source discharges and their likely effects are summarised in Table 2.

Note that some industries/ERAs are commonly associated with particular classes of aquatic contamination; for example Waste Water Treatment Plants and nutrients. The National Pollutant Inventory emission estimation technique manuals list 90 priority substances on the basis of health and environmental risk, by industry sector, and the USA EPA Toxic Release Inventory lists 313 priority substances.

These inventories may assist in identifying other key contaminants by industry/ERA. The information can be used as a guide to check information in the application. A search of the academic literature and the internet would be undertaken for more information on specific activities not mentioned. Contaminants are related to process inputs and outputs and can transfer from media other than water (for example leach from solids, scrubber effluent, etc). Contaminants in residual waste water may also occur as unintended by-products of processes (for example dioxins and metal compounds).

Depending on the character and resilience of the receiving environment and the degree of risk, direct toxicity assessment may be required on any available laboratory or pilot plant samples to complement literature evaluation of the additive toxicity of contaminants in the proposed discharge. Such analysis more closely resembles the situation in the natural environment than single chemical testing approach. Refer to the ANZECC Water Quality Guidelines — volume 2, Section 8.3.6.

Table 2 — Potential issues of concern and water quality contaminants

Point source discharges	Potential issues	Water quality contaminants
Sewage effluent	[illegible]	Carbonaceous material, nutrients, pathogens, suspended solids, toxicants (metals/metalloids, pesticides, residual disinfectants and pharmaceuticals).
Abattoir effluent	[illegible]	Carbonaceous material, suspended solids, nutrients, pathogens, residual disinfectants and toxicants.
Mine discharges	[illegible]	pH, sulphate, temperature, suspended solids, turbidity, salinity, toxicants (metals/ metalloids and other chemicals, including fluoride).
Aquaculture discharges	[illegible]	Carbonaceous material, suspended solids, nutrients and toxicants. Diseased organisms and antibiotics may be an issue in some operations.

Point source discharges	Potential issues	Water quality contaminants
Sugar mill cooling waters	[redacted]	Carbonaceous material, temperature and antifouling agents.
Chemical processing plants	[redacted]	pH, sulphate, toxicants (ammonia, metals/metal compounds (including sulphides)/metalloids, pesticides, and other chemicals), suspended solids, carbonaceous material, temperature, nutrients and by-products.
Power stations - blowdown water	[redacted]	Suspended solids, toxicants (metals, metalloids and chemicals), temperature and dissolved salts.

2.1.3 Check the characteristics of the discharge from the proposed activity

The quality and quantity of the discharge from the proposed activity should be clearly characterised. This must include concentrations, typically averages and worst case values of all potential contaminants of concern, assuming the treatment technology is working effectively. The quantity of the discharge must be similarly expressed for volumes and resulting contaminant loads. The expected variability with time is a further important consideration and percentiles may be used to express this. Wet weather influences must be considered and separate wet weather discharge characteristics defined where applicable.

The method used to estimate these characteristics must be clearly defined and realistically achievable from practical and economic viewpoints. This may be demonstrated with reference to guidelines, pilot plant results or previous applications of the adopted waste water treatment technology. Alternatively, process models may be used to predict these characteristics.

2.1.4 Have all best practice measures been used to avoid or minimise the discharge? Have all compliance matters been addressed?

The mandatory waste management evaluation assessment consideration is required under the EPP Water and the *Environmental Protection (Waste Management) Policy 2000* (EPP Waste). Assessment usually involves benchmarking against waste management principles, relevant best practice environmental management (BPEM) and evaluation of discharge alternatives. A range of processing options for the proposed activity are usually available to the applicant to prevent, abate or mitigate the waste water discharge and its impacts. These measures include segregating waste streams, source reduction, substitution of chemicals used, cleaning and processing with minimal water, recycling, reuse and best practice treatment and disposal alternatives.

a. Best practice environmental management for the proposed activity

The application should demonstrate that the management of the proposed activity will achieve an on-going minimisation of the activity's environmental harm through cost effective measures assessed against the measures currently used nationally and internationally for the activity. Best practice environmental management technology standards are industry and contaminant specific. Guidance is available from sources including environmental guidelines, research organisations, equipment manufacturers and performance records of industry sector leaders. A technology based standard using best practice environmental management would comprise a benchmark to satisfy the EPP Water waste minimisation provisions.

b. Compliance with the Environmental Protection Policies — waste management evaluation

The application must demonstrate that the proposed activity complies with the EPP Water provisions, including Sections 14 to 24, the EPP Waste provisions, including Sections 10 to 13 and 15 to 17 (as relevant) and consider the *Queensland Water Recycling Guidelines 2005* and the National Water Quality Management Strategy's *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks 2006*.

The latter guidelines provide the framework to encourage the adoption of sustainable water recycling to better manage water resources, and to support economic growth while protecting the environment and safeguarding public health. For industrial waste streams it should also be demonstrated that a release of effluent to sewer, subject to Local Government conditions, is not an acceptable option. A letter from the relevant Local Government advising that discharge to sewer would not be permitted is the common way that this may be demonstrated.

c. Some discharge of residual waste water shown to be unavoidable and environmentally acceptable

Waste water discharge to receiving waters is the least preferred option. The application must demonstrate that waste management evaluation procedures have been addressed and best practice environmental management measures have been used to avoid or minimise the residual discharge to water, and there are no alternate discharge locations or other residual waste water treatment, reuse or disposal options that cause less harm to the environment.

Environmentally acceptable in the context of this paragraph means incorporating all best practice and practicable waste minimization measures.

d. Compliance with State Government obligations under intergovernmental Agreements and other statutory instruments

The application must comply with and assessment and approval processes must address matters of State interest, including relevant State Government obligations under inter-government agreements including:

- *Intergovernmental Agreement on the Environment;*
- Agreement under the *Council of Australian Governments* (COAG) *Water Reform Framework;*
- *Convention on Wetlands (Ramsar, Iran, 1971);*
- *UNESCO World Heritage Convention 1972;* and
- International Agreements Relating to Migratory Birds and Wetlands (the Japan-Australia Migratory Bird Agreement (JAMBA), the China-Australia Migratory Bird Agreement (CAMBA) and the Directory of Important Wetlands Australia).

Inter-government agreements contain a range of State obligations. Examples include the promotion the sustainable use and conservation of Ramsar wetlands, protecting world heritage areas and adopting ecologically sustainable development in natural resource decision-making and approval processes. State obligations under COAG include the implementation of the *National Water Quality Management Strategy*.

Matters the subject of the agreements may be of national environmental significance under the EPBC Act and trigger Commonwealth assessment and approval processes. The applicant is responsible for self-assessment and referral to the Australian Government for impact assessment on a matter of national environmental significance. For further information refer to the Department of Environment and Heritage website, EPBC Act Policy Statements — Significant Impact Guidelines/Matters of National Environmental Significance.

Relevant statutory instruments having the effect of State planning policies include the *State Coastal Management Plan 2001,* Regional Coastal Management Plans (Wet Tropical Coast, Cardwell - Hinchinbrook, Curtis Coast, South-east Queensland) and the *South East Queensland Regional Plan 2005 – 2026.* **State planning policies** include SPP 2/02 (Planning and Managing Development involving Acid Sulphate Soils) and SPP 2/07 (Protection of Extractive Resources) that identifies those extractive resources of State or regional significance where extractive industry development is appropriate in principle, and aims to protect those resources from developments that might prevent or severely constrain current or future extraction when the need for use of the resource arises.

EPA Referable Wetlands datasets are available to State and Local Government through the Queensland Government *Infolink* and development triggers for land in or near are at Assessable development under *Integrated Planning Regulation 1998.*

e. ***For HEV waters — is the proposal in the public interest and does it provide outstanding net benefits to the region, or State as a whole?***

Public interest under the standard criteria of Schedule 3 of the EP Act may be ascribed as meaning the interest of the public as distinct from the interest of the individual(s).

Net benefits to the region, or the State as a whole, has the meaning under the *State Coastal Management Plan 2001.*

These matters may be addressed if, for example:

- the proposal provides a public service such as municipal sewage disposal or provides goods or services to the Queensland community to meet an identified demand and there is no alternative option that is capable of meeting that demand; and
- the potential environmental, economic and social impacts of the project (whether beneficial and adverse) have been assessed at a regional or State level depending on the project scale; and strongly supports the proposal.

Note the public interest and applicable environmental impact studies, assessments or reports are a part of the standard criteria under Schedule 3 of the EP Act that must be considered in assessing all applications.

2.1.5 Check the location and configuration of the discharge from the proposed activity

The location of the proposed discharge is important as it determines the receiving waters potentially affected. Further, the potential impacts of the proposed discharge are influenced by the configuration under which it is operated (for example some discharges may only occur in the wet season or under slack water, or flood or ebb-tide conditions). A further consideration is the diffuser or outfall configuration. A diffuser may be used to provide better mixing in the initial zone. Outfalls may be submerged to promote mixing or achieve aesthetic goals. The application should explain the rationale behind the proposed discharge location and configuration. Similarly, the rationale for rejecting alternatives to discharge should be explained.

It would typically be necessary and desirable for a discharge pipe to be submerged below low water spring datum, except in cases of denser than ambient waste waters where submergence may exacerbate adverse environmental effects.

2.1.6 ERAs with low assessed risk or no discharge of residual waste water

If the proposed ERA does not involve a direct or indirect discharge of residual waste water to waters, then conditions prohibiting waste water discharge would be included. If the ERA includes a discharge, but represents a low risk of having an adverse effect on an environmental value, then further detailed steps may not be required. Subject to addressing the matters in Section 2.1, and checking for any matters in Section 2.2 that would preclude the discharge, the assessment should proceed to Section 2.4.

A low risk of having an adverse effect on an environmental value would generally occur when pollutant loads are decreasing and are a relatively minor contribution to the receiving water, and when toxicant concentrations in the discharge are below trigger values listed in Section 3.4 of the ANZECC Water Quality Guidelines.

Another case may be a relatively infrequent discharge such as overtopping of waste water storage during flood conditions.

Where no toxicant trigger values are available but published information suggests a chemical may be of concern, direct toxicity assessment may be required on any available laboratory or pilot plant samples to ensure risks are low. Refer to the ANZECC Water Quality Guidelines — volume 2, Section 8.3.6 and Appendix 6.2 of this operational policy.

Development applications involving contaminants found to be low risk or involving no discharge of waste water require no further receiving water quality assessment.

Development conditions would require monitoring and reporting to annually confirm the absence of adverse effects on environmental values or would prohibit waste water discharge (in development applications where no discharge was proposed). Development conditions would also typically specify the nature of the permitted discharge and require monitoring of discharge volume and quality to ensure the activity was carried out as described in the application. In most cases, conditions also typically prohibit discharge of contaminated stormwater. For some activities, stormwater treated to render it less hazardous may comprise a waste water stream that is permitted to be discharged subject to conditions.

Summary

Is there a demonstrated need for a discharge of residual waste water? Are relevant EPP and other compliance issues addressed?

Note that in deciding whether to grant or refuse an application the administering authority must comply with any relevant EPP requirement and must consider the standard criteria of Schedule 3 of the EP Act.

Applications must demonstrate that the discharge of residual waste water from the proposed activity is unavoidable and environmentally acceptable, and other EPP requirements and other compliance requirements are addressed.

If not demonstrated the application should be revised following an information request.

Applicants are encouraged to discuss the above requirements at pre-design conferencing.

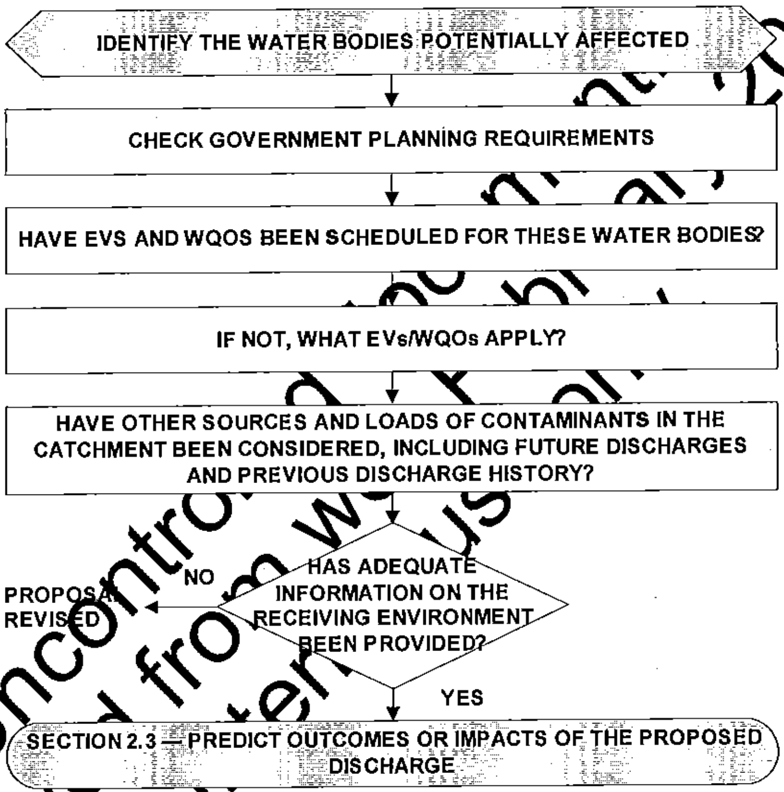
Pre-design conferencing is offered by the EPA to all prospective applicants seeking direction and advice on development applications; including on the preparation of development applications and the necessary documentation to ensure that lodged applications are supported by the requisite information to enable the administering authority to make a decision. Applicants are encouraged to compile information for pre-design conferencing of concepts and plans.

2.2 Describe the receiving environment

This section involves the assessment of information provided by the applicant on the description of the receiving environment, as shown in Figure 3 below and summarised in the following text.

For the receiving waters potentially affected by the proposed discharge, the applicant should identify the EVs and WQOs and provide a description of the existing character, resilience and environmental values of the receiving environment. Refer Appendix 6.1 for the glossary of terms.

Figure 3 — Description of receiving environment

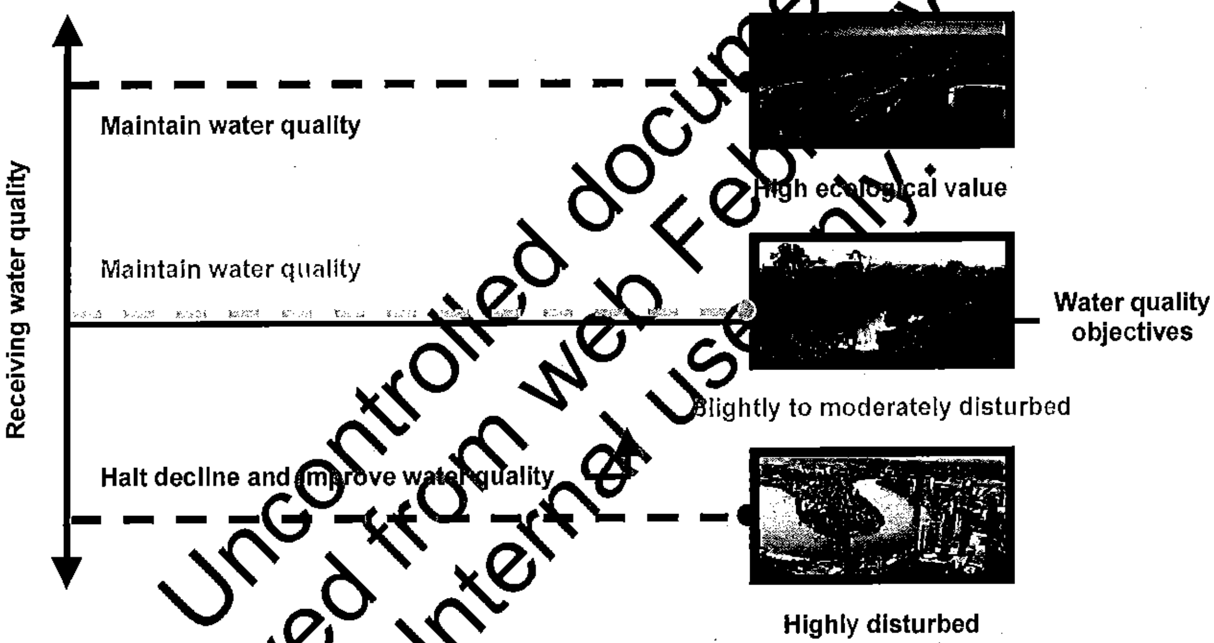


2.2.1 Identify the water bodies potentially affected by the proposed discharge

The intent is to characterize the receiving waters including EVs, WQOs and levels of ecosystem protection. Key information sources are the EPP Water (Schedule 1) and the *Queensland Water Quality Guidelines 2006,* for waters not listed under Schedule 1. As in Section 2.2.2, other State and regional planning documents may also be relevant.

It is important to determine what receiving water ecological health monitoring data is available and how it compares with the relevant water quality objectives and the policy intent (refer Figure 4 below, Section 2.2.3 and Section 2.3).

Figure 4 — Receiving water quality, water quality objectives and management intent



EVs relevant to the receiving waters should be used for the assessment of development applications. For example the affected water body might be a bay, an estuary or riverine waters, and different EVs and WQOs will apply to different parts of the water body. This information is either contained in the documents referenced in Schedule 1 of the EPP Water (accessible via the EPA website) or from the *Queensland Water Quality Guidelines 2006.* Local information may need to be obtained if the latter does not adequately characterise the receiving waters, refer Section 2.2.5.

Further, the levels of aquatic ecosystem protection need to be determined as either high ecological value (HEV) or slightly-to-moderately disturbed (SMD) or highly disturbed (HD). Levels of aquatic ecosystems protection may be available from a number of sources including the EPP Water, State and Regional Coastal Management Plans (Areas of State Significance (Natural Resources)), the Directory of Important Wetlands Australia and Marine Parks and National Parks designations for waters in areas of protected estate. Further guidance in assigning the level of aquatic ecosystem protection is given in Table 3, Section 2.2.2 and the ANZECC Water Quality Guidelines (Section 3.1.3).

2.2.2 Check applicable government plans or requirements

Environmental management objectives, levels of aquatic ecosystem protection and other relevant matters are often specified in applicable planning designations. These matters are a part of the standard criteria of Schedule 3 of the EP Act that must be considered by the administering authority in deciding the application. Examples of Commonwealth requirements include matters of national environmental significance, such as Ramsar listed wetlands and World Heritage Areas, threatened species, as well as Great Barrier Reef Marine Park requirements. Examples of State requirements include the State and Regional Coastal Management Plans, Marine Park zoning plans, Water Resource Plans, Fisheries Habitat Areas, National Parks, EPA Referable Wetlands (refer Section 2.1.4 *d*) and the Great Barrier Reef Water Quality Protection Plan. Local Government information may also include relevant designations in Local Government planning schemes.

2.2.3 Check applicable environmental impact studies, assessments or reports

Relevant information may be available through Commonwealth and State Government Agencies and Authorities, Non-Government Agencies and Local Government web sites, and internet and library searches; or required by the applicant.

2.2.4 Has relevant information on the receiving environment been provided? Is it adequately described given the contaminants and risks associated with the proposed discharge?

It is essential that ecosystem health and catchment information is obtained to assess the outcomes of the proposed activity. Information must be provided on both the character and resilience of the receiving environment to address the standard criteria of Schedule 3 of the EP Act and would include current local ecosystem health and water quality information, potential catchment pollutant sources and local catchment issues. This information may already exist; however it must be current and adequately address temporal and spatial variations to be representative of current conditions. The information may need to be established as part of special investigations prior to lodging the development application. **Pre-design conferencing to address these issues is strongly encouraged.**

Local or regional ecological health monitoring data may be available for the receiving waters (for example from EPA, Department of Natural Resources and Water (DRNW), regional natural resource management bodies or Local Government). The information will be required for comparing the existing water quality of the receiving waters with the WQOs, and must relate to the specific contaminants and assessed risks associated with the proposed residual discharge of waste water to the receiving waters. Current ecological health information may also be required for calibration of predictive models, refer Section 2.3 and Appendix 6.3.

In considering the proposed discharge of residual waste water, the policy intent relates to the level of ecosystem protection and the existing receiving water quality, as shown in Figure 4 and summarised in Table 3.

There may be reports, environmental studies or monitoring results that assist in characterising the receiving environment from sources such as the EPA, the DNRW, the Department of Primary Industries and Fisheries (DPIF), other State Government departments, Local Government, universities, external research organisations and industry groups. This information is a valid consideration under the standard criteria of Schedule 3 of the EP Act.

Note that the precautionary principle must be considered where EVs for waters are threatened and information on the resilience of the system is unknown or limited.

Table 3 — Levels of aquatic ecosystem protection, policy intent and environmental management decisions

High ecological value
The policy intent for high ecological value waters is to afford a high degree of protection of the EVs by ensuring no measurable change to water quality, biological diversity or flow condition. Applications proposing residual waste water discharge to HEV waters should be accompanied by local reference data and local biological effects data. Where practicable the proposal should include a 'like kind' environmental offset, seeking to deliver a net environmental gain to the water. For toxicants listed in Section 3.4 of the ANZECC Water Quality Guidelines, environmental management decisions would include trigger values for toxicants[12] to protect 99 percent of species in the affected water. HEV waters may include fish habitat areas, dugong protection areas, Marine Parks, National Parks and Areas of State Significance (Natural Resources) under State and Regional Coastal Management Plans. Additional HEV waters may be identified through State or regional strategies, ecological studies or stakeholder consultation.
Slightly to moderately disturbed
The policy intent for slightly to moderately disturbed waters is dependent upon current water quality. If the current water quality is better than the WQOs, the intent is to maintain current water quality — using some assimilative capacity. If the current water quality is worse than the WQOs, the intent is to prevent further degradation and improve water quality over time. Environmental offsets of a 'like kind' may be considered by the administering authority where there are no feasible alternatives to discharge of residual waste water. For toxicants listed in Section 3.4 of the ANZECC Water Quality Guidelines, environmental management decisions would include trigger values for toxicants[13] to protect 95 or 99 percent of species in the affected water. The applicant may also use risk analysis techniques, including direct toxicity assessment; all supporting documentation should be supplied with the development application. EPAofficers should request assistance from the Environmental Sciences Division in assessing the validity of the data.
Highly disturbed
The policy intent for highly disturbed waters is that receiving water quality should: a) improve towards achieving the WQOs to protect the EVs, over time; and b) not measurably deteriorate as a result of the proposed discharge. For toxicants listed in Section 3.4 of the ANZECC Water Quality Guidelines, environmental management decisions would include trigger values for toxicants for slightly to moderately ecosystems would be adopted first, although lower levels of protection (for example 90 percent of species) may apply in some cases. An application for a discharge into HD waters should be supported by reference to local monitoring data. Environmental offsets of a 'like kind' may be considered by the administering authority where there are no feasible alternatives to the discharge of residual waste water.

[12] See Table 3.4.2 of the ANZECC Water Quality Guidelines.
[13] Refer above.

2.2.5 Have EVs and WQOs for the waters been listed in Schedule 1 of the EPP Water?

EVs and WQOs for waters listed under Schedule 1 of the EPP Water must be adopted and considered in assessing development applications.

2.2.6 If EVs and WQOs are not listed under Schedule 1 of the EPP Water, what EVs/WQOs apply?

Where EVs and WQOs for the waters have not been specifically set in Schedule 1 of the EPP Water then, under Section 11(2) of the EPP Water, the WQOs are the set of water quality guidelines that will protect all EVs for the waters, including the Queensland and ANZECC Water Quality Guidelines.

Where the default guideline values are inappropriate for the receiving environment, for example due to non–anthropogenic reasons such as high organic carbon, WQOs would be based on water quality guidelines derived from data collected at appropriate local reference sites — refer <u>Section 3.1</u>.

Table 4 lists EVs for waters, refer also to Appendix 6.1. The EPA guideline *<u>Establishing draft environmental values and water quality objectives</u>* sets out the process for establishing EVs and WQOs under the EPP Water.

Table 4 — Environmental values for waters

EVs of water	Examples of suitability for use
[illegible]	Maintain or improve the biological integrity of the respective aquatic ecosystems condition (HEV, SMD, HD). Total to partial complement of aquatic and adjacent terrestrial habitat and biota diversity and abundance (depending on the level of protection), including water associated wildlife.
[illegible]	
[illegible]	Primary contact recreation (e.g. swimming). Secondary contact recreation (e.g. boating). Visual recreation (e.g. natural landscape).
Drinking water	Water sources used for drinking water.
Primary industries	Irrigation, general agricultural use and stock watering. Stock watering. Human consumption of aquatic foods (fish, crustacean and mollusks) — commercial and recreational sources. Aquaculture.
Industrial	Generic processes (heating and cooling). Specific industries (textile, chemical, paper and pulp). Power generation (hydro-electric).
Cultural and spiritual	Protection of cultural resources — places or objects of historic or indigenous significance or value.

2.2.7 Have other sources and loads of contaminants in the catchment been considered, including future discharges and previous discharge history?

For some contaminants such as nutrients and sediment it is necessary to consider other catchment sources and loads, and if the activity will be contributing to these loads. Considering catchments loads is particularly important where WQOs are not currently being achieved in receiving waters potentially affected by the discharge and multiple discharge sources exist.

It should be noted that the EPP Water also requires discharge of waste water from future developments to be considered in the decision making process. Possible sources of information include development applications, Local Government sewerage planning strategies, the EPA Point Source Database and the Department of Infrastructure and Planning. This aspect is important because the administering authority would not allocate all available assimilative capacity to a single application, and an application should not seek the discharge of a contaminant where the proposed load was a significant proportion of the sustainable load i.e. the contaminant load consistent with the maintenance of the WQOs for the receiving waters. The concept of sustainable load including consideration of assimilative capacity is addressed further under Section 2.3.4.

The sustainable load can be determined by studies of aquatic ecosystem health and modelling to predict the effect of natural catchment and anthropogenic loads (diffuse and point source) on the water quality objectives of the receiving water. This process is generally undertaken in collaboration with regional natural resource management bodies and other relevant stakeholders.

For some receiving waters, previous management actions have resulted in the reduction of contaminant loads in order to achieve water quality objectives. The administering authority would consider it important that improved environmental outcomes be maintained, rather than re-establish discharge loads. Load history may also give insight into the likely effect of certain levels of discharge on water quality. Environmental offsets may be considered by the administering authority for SMD and HD waters with no assimilative capacity for the contaminant, and where there are no feasible alternatives to the discharge of residual waste water.

Summary

Has adequate information been provided to describe the character, resilience and environmental values of the receiving environment? Have applicable government plans, requirements, environmental impact studies, assessments or reports been considered?

Note that the above relates only to part of the standard criteria of Schedule 3 of the EP Act. All the standard criteria and other prescribed matters must be considered by the administering authority in deciding whether to grant or refuse the application.

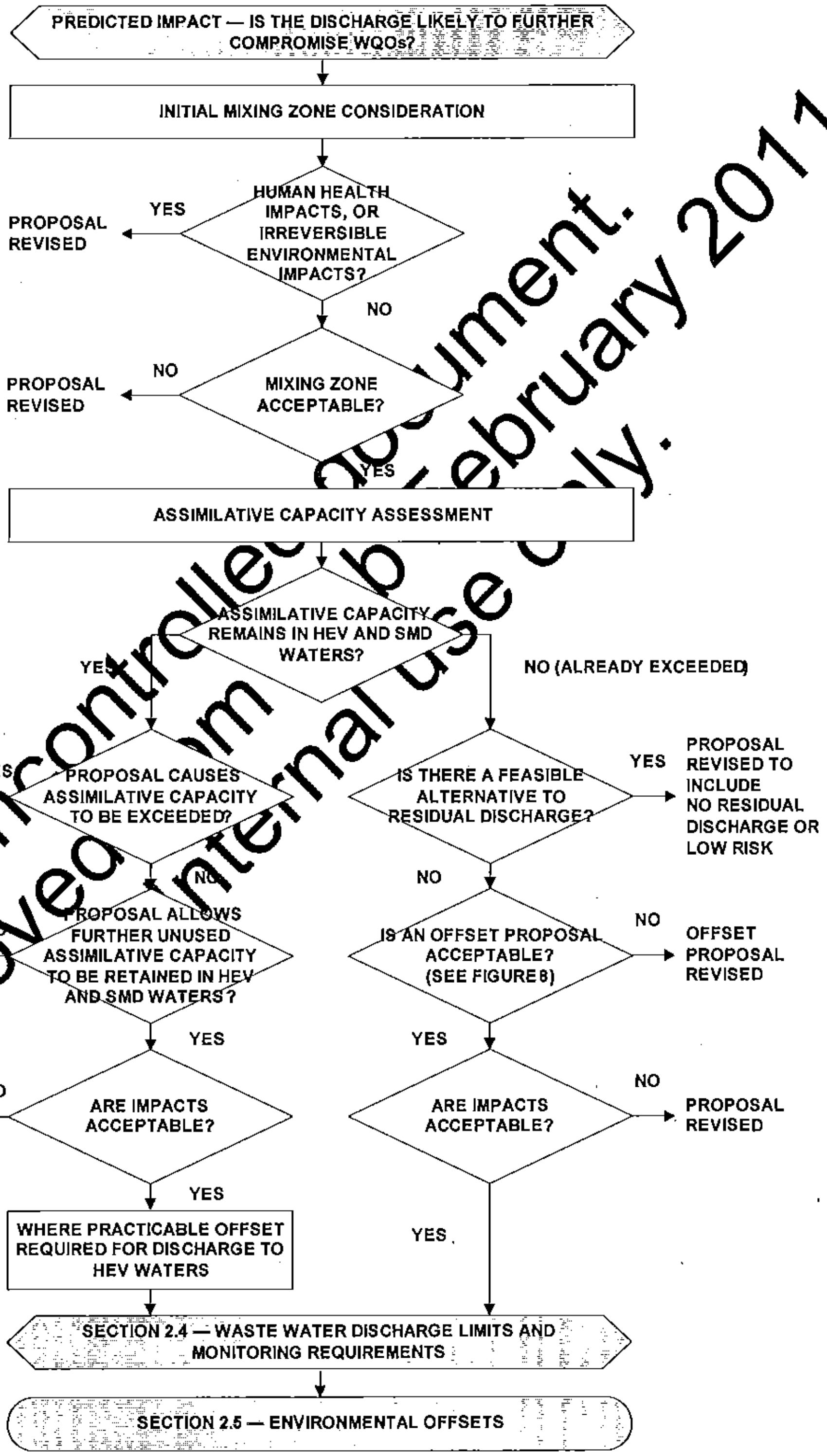
If not demonstrated, the application should be revised following an information request.

Applicants are encouraged to discuss the above requirements at pre-design conferencing.

2.3 Predict outcomes or impacts of the proposed discharge

This section involves the assessment of information provided by the applicant on the predicted outcomes or impacts of the proposed discharge, as summarised in the following text and shown in Figure 5 below.

Figure 5 – Prediction of impacts of proposed discharge



2.3.1 Predicted impact of the proposed discharge of residual waste water on the EVs and WQOs of the receiving waters

Prediction of the environmental outcomes or impacts that would result from the proposed ERA requires the completion of quantitative assessments which may involve numerical modelling procedures to estimate contaminant loads, changes to receiving waters contaminant concentrations and the effects of mitigation actions. Refer to Appendix 6.3 — *Numerical modelling of environmental impacts and mitigation actions*.

Prediction of the impact of the proposed discharge of residual waste water on receiving water quality should be compared to the WQOs — in the context of the policy intent at Section 2.0, which is summarised below and shown at Figure 4. Existing receiving water quality should be the baseline comparison for impact assessment.

a. ***For the discharge of residual waste water to high ecological value (HEV) receiving waters***

The policy intent in considering an application to discharge residual waste water into high ecological value receiving waters is to maintain the natural values; including the physico-chemical, biological, habitat and flow attributes.

b. ***For the discharge of residual waste water to slightly to moderately disturbed (SMD) receiving waters***

The policy intent in considering an application to discharge residual waste water into slightly to moderately disturbed receiving waters is considered with respect to the existing water quality — either maintain (use some assimilative capacity) or improve (over time).

c. ***For the discharge of residual waste water to highly disturbed (HD) receiving waters***

The policy intent in considering an application to discharge residual waste water into highly disturbed receiving waters is to halt the decline and reverse the adverse trend in water quality. Highly disturbed receiving waters do not have any assimilative capacity. It is recognised that attainment of WQOs for highly disturbed receiving waters is a long-term goal.

2.3.2 Where WQOs are not currently being achieved, is the discharge likely to further reduce receiving water quality?

If the WQOs of the receiving waters that are potentially affected by the proposed discharge are not currently being achieved, a significant environment risk is associated with the proposed discharge as further environmental harm is likely to occur. In this case the EVs will not be protected and pre-design conferencing with the applicant should consider alternatives. Where the discharge of residual waste water from the proposed ERA may not otherwise be avoided, reused, recycled or other disposal alternatives adopted; further considerations by the administering authority should include environmental offsets where there are no feasible alternatives to the discharge of residual waste water — refer to Section 2.5.

2.3.3 Initial mixing zone

Mixing zones are a mandatory consideration under the EPP Water and applications must:

- comply with Section 18 of the EPP Water (waste water releases to surface water);
- consider the ANZECC Water Quality Guidelines for mixing zones;
- include the results of the baseline water quality monitoring in the area of the proposed mixing zone; and
- for HEV waters — provide predictive modelling results that demonstrate no or negligible change to the ecological attributes beyond the mixing zone, refer to Appendix 6.2.

A mixing zone is a permitted zone of non-compliance with the receiving WQOs and is primarily for managing soluble toxicants where concentrations in the discharge are above toxicant trigger values in Section 3.4 of the

ANZECC Water Quality Guidelines. Where this is the case, further risk assessment including direct toxicity assessment (DTA) for biological effects, should be considered prior to mixing zone assessment.

Refer to the ANZECC Water Quality Guidelines — volume 2, Section 8.3.6. Where the toxicant concentrations in the discharge are found to not cause toxicity, mixing zone assessment may not be required. Results of DTA will also be used to assess the actual dimensions of the mixing zone.

Various predictive models are available for estimating initial mixing zones, evaluating outfall diffuser designs and defining areas around the outfall where concentrations may exceed WQOs; refer Appendices 6.2 and 6.3.

The administering authority would not approve a mixing zone if inclusion would be likely to result in human health impacts, irreversible environmental impacts, unacceptable impacts to biota or where the discharge of residual waste water was characterised by a lack of effluent plume dispersion.

Mixing zone considerations include:

- only one mixing zone, minimised to the greatest practicable extent in accordance with the waste management hierarchy, is permitted for an ERA;
- spatially defining the mixing zone based on compliance with estimated receiving environment concentrations using mean flows and maximum expected toxicant concentrations for the discharge against chronic toxicant concentration (refer Appendix 6.2). The diameter (as depicted in Figure 6) should be measured from the diffuser port and should be defined by considering the maximum extent from a range of tidal conditions in tidal areas covering at least slack tides and mid-tide conditions for all toxicants present in the discharge. In non-tidal streams, the minimum consecutive seven day average flow with a 10-year recurrence interval is recommended as a guide to minimum dilution conditions;
- ensuring the mixing zone would not provide a barrier to the migration of aquatic fauna in riverine and estuarine waters, i.e. not take up the width of the stream. As a general rule, the maximum lateral dimension should be the lesser of 50m diameter or 30 percent of the waterway width for riverine and estuarine waters and a radius not exceeding 100m from the diffuser port for coastal/marine waters;
- avoiding overlap of mixing zones from neighbouring discharges. It is recommended that the edges of the mixing zones be at least 200m apart. The combined affect should be assessed;
- not impinging on the shore line; for example, based on the mean on the low water spring tide (Mean Low Spring Tide);
- the use of mixing zones is not appropriate for managing the discharge of nutrients, bio-accumulatory or particulate substances. For nutrients, see discussion below for management using reference based assessment;
- mixing zones are typically not applicable to waters with significant and regular use for primary contact recreation, existing aquaculture development approvals, areas allocated to aquaculture under planning frameworks, waters of high ecological value, conservation significance or scientific importance or near potable water intakes;
- the discharge limits should be set such that within the mixing zone the residual waste water discharge does not cause odours, surface discolouration, visible floating foam, oils, grease, scum, litter or other objectionable matter;
- contaminant concentrations in the mixing zone must not be acutely toxic to fish, other aquatic vertebrates, commercial species or endangered wildlife, cause significant irreversible harm including objectionable bottom deposits, the growth of undesirable aquatic life or the dominance of nuisance species (such as algal blooms). The use of toxicity-based guidelines or site-specific biological effects

data is usually required to define the boundary of the mixing zone (refer Figure 6 and Appendix 6.3); and

- for large flowing freshwater streams where effluent discharges are unlikely to have significant density difference to the receiving waters, the effluent plume may extend a considerable distance downstream. The applicant would need to confirm the proposed discharge did not violate the WQOs of the receiving waters after full lateral mixing.

When assessing thermal discharges and oxygen demanding substances, acute effects should not occur anywhere in the receiving waters, for example no harmful dissolved oxygen sags are caused. In these cases, maximum concentrations and loads should be modeled and assessed to assess potential impacts. Predicted environmental concentrations and levels should be compared to known acute effect levels.

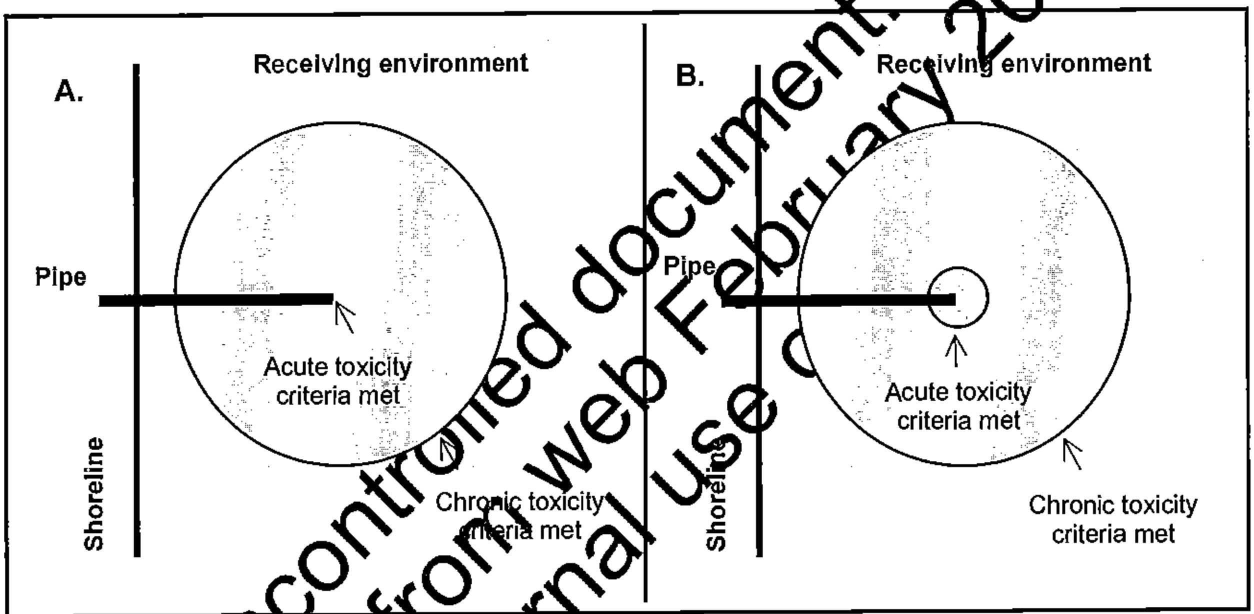


Figure 6 — Spatially defining an initial mixing zone.

A. Low risk configuration where acute toxicity levels are met end-of-pipe.

B. Configuration that involves a small zone within the mixing zone where acute toxicity criteria may not be met but have a low risk of causing acute toxicity.

When assessing effects of contaminants that are based primarily on a reference condition rather than direct effects, for example nitrogen and phosphorus concentrations, assessment typically requires water quality objectives to be met on a percentile basis (for example median concentration). It is not necessary that such concentrations are met directly at the discharge point as effects of dilution, assimilation and average receiving environment conditions should be considered. Prediction of effects of these discharges is typically a far-field issue and needs to consider the assimilative capacity of the waters (see Section 2.3.4).

Monitoring of effects of discharges in these cases is typically undertaken in the centre of waterway channel at various distances from the discharge point. Compliance with reference criteria should be met within 3 stream widths or 300m, whichever is the smaller as a general guide. Approval of zones with exceeded water ambient quality objectives greater than this size may be granted in specific cases where social and economic considerations support the discharge of residual waste water and there are no other feasible alternatives. Regardless, localised environmental harm should not occur, for example smothering of corals with benthic algae from nutrients.

For discharges involving contaminants that are not directly toxic, diffusers are still desirable and may also be required to achieve good initial dilution and avoid undesirable effects such as visible plumes or slicks and biological effects such as avoidance behavior. Modeling may be required to design the diffusers to optimize dilution and location. For example, it would generally be desirable to achieve at least a 1:50 dilution within 100m in any direction from the discharge point of the release. Discharges from pipes should also be located so that they are submerged under all tidal conditions, unless the discharge is denser than ambient. Discharges to poorly mixed waterways should be discouraged, for example upper estuaries, below barrages and small waterways with limited tidal exchange.

In cases where a mixing zone was permitted, development conditions would require the applicant to install measures such as diffusers on which the predictions were based and require a compliance monitoring program to verify that the minimum dilution ratios and concentrations predicted for mixing zone were achieved at the modelled or DTA determined mixing zone boundary.

Specific considerations include:

- Loss of aesthetic enjoyment or generation of an objectionable odour;
- **Public notification.** As the environmental values for waters may be prejudiced by the inclusion of a mixing zone, impact assessable development applications proposing a mixing zone should become public knowledge through the public notification stage of the application. Development conditions may require signage to identify the location of the adjacent mixing zone;
- **The precautionary principle** must be applied where environmental values are threatened and information on the resilience of the system is limited. Consequently the administering authority must, in considering the application and assessing risks to the ecological health of waters outside the mixing zone, adopt the precautionary principle to ensure that the current environmental quality is maintained beyond the mixing zone boundaries and that human health and aquatic ecosystems are conservatively protected within the mixing zone; and
- For HEV waters **peer review assessment of the** mixing zone proposal is required, including the demonstration of the lack of impacts beyond the mixing zone boundaries, and must be submitted with the development application. The EPA can advise of potential peer reviewers.

2.3 4 Assimilative capacity and sustainable load

a. Policy issues

Refer to Section 2.0

Assimilative capacity is the capacity of the receiving waters to receive some human induced input of contaminants, or alteration, while still achieving the water quality objectives.

b. Release of assimilative capacity in HEV and SMD waters for discharge of residual waste water

Decisions about the use of assimilative capacity in HEV and SMD receiving waters for the discharge of residual waste water must be considered after all options to manage the waste water have been assessed and managed by the administering authority in the context of sustainable and efficient use of scarce resources — see also sub-section *d* below, *Assimilative capacity of HEV water not to be exceeded by discharge of residual waste water.*

A development application should demonstrate that the assimilative capacity of the receiving waters is not exceeded and that some assimilative capacity is preserved for future ecologically sustainable development - the proportion proposed to be consumed should be determined.

As a guide, the majority proportion of the assimilative capacity should be retained for future ecologically sustainable development.

The administering authority may consider the role of market-based instruments in managing these issues (for example flexible or incentives based mechanisms). For HEV waters the policy intent is that, where practicable, the application includes an environmental offset proposal seeking to deliver a net environmental gain to the water as a whole, see Section 2.5.

c. *What are the sustainable loads for key contaminants?*

The sustainable load of a particular contaminant is the maximum amount that a water body can receive without failing to meet the WQOs and therefore adversely affecting EVs. The concept of sustainable load is particularly important for oxygen demanding substances, nutrients, sediments and toxicants. It should be noted that toxicants are generally a near-field issue[14] and that suspended sediments can have an adsorbed toxicant load which can adversely affect pelagic species and benthic fauna and flora directly, as well as indirectly through contamination of food sources (for example, seagrass and organic detritus)..

d. *Assimilative capacity of HEV water not to be exceeded by discharge of residual waste water*

The demonstration of 'no or negligible change' to the ecological indicators beyond the mixing zone boundaries also demonstrates that the HEV water assimilative capacity is not exceeded. Refer to Appendix 6.2.

e. *Where assimilative capacity is exceeded — prior to assessment*

In some SMD waters the assimilative capacity for specific contaminants may already be exceeded. This may be evident from ecological health monitoring and remedial programs may be underway to restore ecological health by reducing loads of specific contaminants.

Where the current receiving water quality does not meet the WQOs, the policy intent for slightly-to-moderately disturbed (SMD) waters is to prevent further degradation and improve water quality over time.

Highly disturbed (HD) waters do not have any assimilative capacity. The policy intent is to halt the decline and reverse the trend in water quality, recognising the attainment of receiving WQOs is a long term goal.

For ERAs seeking to discharge residual waste water to receiving waters without assimilative capacity, alternatives to the discharge and alternate discharge locations should be re-evaluated before undertaking an assessment of how worse water quality will become. If there are no feasible alternatives to prevent, control or abate the discharge of residual waste water or to mitigate the impacts through alternative discharge strategies, then environmental offsets may be considered by the administering authority — see Section 2.5.

For waters with no assimilative capacity, achieving the receiving WQOs would be sought on a catchment wide basis involving all ERAs discharging waste water to the receiving waters through continual improvement over time, and additionally considering diffuse source (urban and rural) emissions. Depending on the existing receiving water quality, achievement of the WQOs may be a long-term goal. The EPA *Strategic compliance management program* typically includes area/sub-catchment, industry sector and licensed activity inspections that seek, amongst other things, to improve receiving water quality on a catchment basis. The program may involve all activities discharging to a particular water body.

In the case of an existing industry that is a key contributor to the impaired water quality in SMD or HD waters, reductions in discharge loads would be considered for any application to increase scale or intensity, or as part of the above EPA program to restore waterway health.

[14] Sustainable loads should relate to an area of influence based on the issues of concern. For example, effects from sediment bound toxicants on benthic communities may be a localised issue.

The public interest consideration and other considerations under the standard criteria of Schedule 3 of the EP Act may be important in the assessment of applications proposing the discharge of residual waste water to SMD or HD receiving waters, where assimilative capacity is exceeded.

Relevant considerations may include:

- the proposal provides a public service such as municipal sewage disposal or provides goods or services to the Queensland community to meet an identified demand and there is no alternative option that is capable of meeting that demand; and
- applicable environmental impact studies, assessments or reports.

Summary

Is the information provided adequate?

Is sufficient information provided about the proposed activity that addresses the above matters? If necessary, further information should be requested.

Are the outcomes/impacts acceptable?

Further information may also be required to address deficiencies or achieve better environmental outcomes, for example using alternative technologies, management practices, discharge locations. Pre-design conferencing is important in raising issues and exploring options at the earliest possible time, and in seeking advice and direction on documentation, plans and information requirements.

Pre-design conferencing is encouraged to address the prediction of impacts of the discharge on receiving waters, mixing zone and assimilative capacity requirements.

2.4 Set residual waste water discharge limits, discharge and impact monitoring requirements

Once the outcomes of the proposed activity are deemed acceptable, it is necessary to determine the appropriate residual waste water discharge limits and monitoring requirements, the latter in compliance with Sections 26 and 27 of the EPP Water, for inclusion in the development conditions. The derived development conditions, including discharge characteristics, limits, release (discharge) and impact monitoring requirements should reflect the inputs used in predictions.

Other factors for consideration include the environmental risk of the industry type and the use of best practice environmental management for the activity. Appropriate discharge limits and performance monitoring can be decided upon by undertaking the following steps that are summarised at Figure 7.

Figure 7 — Consideration of specific development conditions

SPECIFY ANY LIMITING CONDITIONS TO THE APPROVED DISCHARGE

↓

DERIVE END-OF-PIPE LIMITS BASED ON THE APPROVED DISCHARGE LOADS AND CHARACTERISTICS

↓

INCLUDE COMPLIANCE MONITORING FOR THE END-OF-PIPE AND RECEIVING ENVIRONMENT

↓

INCLUDE REPORTING REQUIREMENTS FOR THE APPROVED ACTIVITY

2.4.1 Specify any circumstances related to the approved discharge

Approval to discharge must be constrained to the residual waste water, after waste minimisation measures have been implemented. The conditions must state that only approved waste water may be discharged. The location of the discharge, including any need for submergence or a diffuser, should be specified. Certain limitations or timing issues may also be conditional to the approval. For example, the discharge may only be permitted at outgoing tides (ebb-tide release), certain months of the year or only during wet weather flows exceeding a stated level. Outfall submergence below local low water to avoid visual impacts and enhance mixing is generally required, unless the discharge is not buoyant. Other precautions such as signage may be desirable depending upon the nature and the location of the discharge.

The protocols for monitoring must comply with Section 10 of the EPP Water and be in accordance with the EPA Water Quality Sampling Manual and the ANZECC Water Quality Guidelines. Compliance assessment protocols for different levels of aquatic ecosystems protection (HEV, SMD and HD waters) are at the Queensland Water Quality Guidelines.

2.4.2 Derive discharge limits based on the approved discharge loads and characteristics

WQOs would not normally be used directly for regulatory purposes and therefore discharge limits for the end-of-pipe need to be derived that will achieve these WQOs. The process of deriving the limits can be divided into selecting the indicator (for example dissolved oxygen concentration), determining the relevant limit type (for example minimum) and choosing the limit and units (for example 6mg/L). General guidance for setting limits is shown in Table 5. Derived information would be used in conditioning development approvals, environmental authorities, transitional environmental programs and environment protection orders.

a. *Indicators*

Limits should be placed on any indicators that can be practically measured at the end-of-pipe and are relevant to the discharge quality. These might include toxicants, nutrients, oxygen-consuming substances, suspended solids, dissolved oxygen, pH and pathogen indicators such as *Enteroccocus spp.* The discharge loads proposed for the activity and assessed in the above processes would be used as a basis for setting these limits. For waste streams that may vary over time, for example municipal sewage may receive varied trade waste inputs, an additional qualitative condition that requires that the release must not have any other properties nor contain any other organisms or other contaminants which are capable of causing environmental harm is recommended to address this issue.

b. *Discharge volume limits*

Maximum volumes permitted for discharge on any one day would be considered, including wet weather flows for waste water treatment plants (WWTPs),

c. *Percentiles and frequency*

Development conditions may include limits combining percentiles (for example the 80^{th} percentile) and must include maximum values (or minimum values in cases such as dissolved oxygen discharge of very cold water where adverse effects are related to low values rather than high values). Maximum values are particularly important for toxicants that have an acute impact on the environment (refer Table 3 and Table 3.4.2 ANZECC Water Quality Guidelines for trigger values for toxicants to protect 99, 95 and 90 percent of species). In addition, maximum values can be applied for compliance monitoring to a single sampling event whereas percentiles can only be applied over a number of sampling events. Maximum values also ensure a proper standard of treatment applies at all times. Percentiles may be employed where relevant to treatment technology and when percentile performance is used in impact assessment studies to evaluate medium to long term environmental outcomes, for example nutrient loads and risks of nutrient enrichment.

Table 3 —Guidance for setting limits for indicator types

Toxicants	[illegible]	No acute toxicity in initial mixing zone (i.e. end-of-pipe). No chronic effects outside initial mixing zone. Additional multiplying factors may be used in the case of bio-accumulating and bio-concentrating contaminants. No build-up in sediments, exceeding relevant trigger levels. No build-up in seafood species (Food Standards Code). Irrigation, stockwater and drinking water protected where these are relevant values.
Nutrients	50^{th} percentile Maximum Mass loads	50^{th} percentile to achieve mass load (and prevent local impacts). Maximums to prevent local impacts (generally three times limit for 50^{th} percentile). Mass loads based on systems sustainable load or capacity.
Sediments	Maximum	Use levels achievable by BPEM (e.g. 50 mg/L)
Salinity	Maximum	Maximum to prevent local impacts.
Pathogenic indicators	Maximum Median [illegible]	Limits based on 2005 National Health and Medical Research Council (NHMRC) Water Guidelines (e.g. for faecal coliforms, *Enterococcus spp.* and pathogenic protozoa).

[illegible]	[illegible]	
Temperature	[illegible]	Maximum temperature elevation based on receiving waters.
Residual disinfectant	[illegible]	Maximum based on likely decay time and effects on biota.
Dissolved oxygen concentration	[illegible]	Best practice environmental management.
Oxygen demand and suspended solids	[illegible]	Mass loads based on system's sustainable load or capacity. 80^{th} percentile to achieve mass load (and prevent local impacts). Maximums to prevent local impacts (generally three times limit for 80^{th} percentile).

Minimum values are necessary for dissolved oxygen concentration levels and pH in discharges. Percentiles are important as they encompass ongoing high quality treatment in the longer term, whilst allowing reasonable fluctuation in the treatment process. Note that percentiles are not suitable for some characteristics (for example residual chlorine) and should not be applied without relevant maxima or minima.

Activities with substantial discharges such as large WWTPs would typically be required to meet a long-term percentile (annual), short-term percentile (six week) and maximum limits. As this involves significant sampling effort (for example weekly), this may not be appropriate for a small-scale discharge such as that from a small caravan park's WWTP. In this case, monthly monitoring against maximum limits and annual percentile would be more reasonable. The method of determining maximums and percentiles should incorporate expected and acceptable fluctuations in concentrations and loads consistent with best practice.

Typically loads are implicitly conditioned through a combination of both concentration and volume limits. In some cases, load-based limits may be set (for example daily, weekly or annually).

This is done by setting a limit on the mass of a particular contaminant discharged per day, calculated by multiplying the volume released that day by the most recent monitoring result for the contaminant. Percentile load limits are expressed as the proportion of a number of consecutive daily loads that must meet the relevant limit (for example five out of 10 consecutive daily loads must not exceed a stated mass).

Where loads are used to quantify discharge limits, concentrations should also be included. This prevents the discharge of a smaller volume of very poorly treated effluent that would meet a load limit.

*d. **Limits and units***

Limits need to be set for each quality characteristic in appropriate units based on potential effects and available analytical methods (refer Table 5). Analytical methods are given in the EPA Water Quality Sampling Manual. Scientific experts should be consulted where required.

2.4.3 Include requirements for discharge monitoring and receiving environment impact monitoring

The administering authority must consider requiring the applicant to monitor waste water releases and to carry out impact monitoring of the effect of the waste water releases. Compliance monitoring decisions, monitoring frequency and indicators must be in accordance with the provisions of sections 26 and 27 of the EPP Water. Compliance monitoring may be applied to a combination of end-of-pipe, the local receiving environment and the regional receiving environment.

Further information on setting up monitoring programs can be obtained from the Australian Guidelines for Water Quality Monitoring and Reporting (2000) *Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ).* Refer also to Appendix 6.4 for the application of Multiple Before-After Control-Impact monitoring program for HEV water assessment.

Discharge or end-of-pipe monitoring should relate to the criteria and limits decided above. This type of monitoring is a direct measure of the performance of the activity and is necessary to assess compliance with a condition of a development approval, environmental authority, or transitional environmental program or environment protection order. It may also be required to determine whether a system is working true to its design specifications to avoid environmental harm. End-of-pipe monitoring does not provide direct information on the impact of the discharge on the receiving environment.

Impact or ambient monitoring within the local receiving environment should focus on protecting the EVs of the receiving waters through comparison of monitoring data with the WQOs. The ambient monitoring program may also be designed to monitor those locations near known discharges or other inputs into the waterway, where water quality objectives are most likely not be met (for example mixing zones). Ambient monitoring data may be used for performance assessment and for calibrating water quality models.

As the WQOs for the receiving waters may be affected by other activities in the catchment, non-compliance with WQOs may not be solely attributed to the performance of a particular point source discharge. This is particularly the case where impacts occur over time in tidal estuaries. An example of where ambient monitoring may more immediately relate to effects of an activity is measurement of sediment plumes downstream of a dredging operation and comparing it to up-current conditions. Other reasons for requiring ambient monitoring may be to monitor mixing zone characteristics, verify conclusions of an environmental impact assessment, study or report, to decide future disposal strategies or if there is concern about the levels of a particular contaminant in waters.

Ambient monitoring can provide information on regional ecosystem health and other relevant water quality information required to assess EVs. Such programs may be coordinated through regional partnerships comprising groups of stakeholders involved in the catchment. A contribution by the applicant to existing regional ecological health monitoring programs may be an alternate to applicant monitoring.

Compliance monitoring of residual waste water discharge and the receiving environment would normally commence when the approved activity commences, however baseline ecological health monitoring of receiving waters may be required by the applicant to characterise the receiving environment in the preparation of the development application. For further details refer to the Queensland Water Quality Guidelines Appendix C, Table C3 — Data for stand alone use in developing local guidelines (a minimum of 18 data values, over 12 months at two reference sites).

2.4.4 Include reporting requirements for discharge and impact monitoring

The provision of monitoring data and reports to the administering authority should be set out as development conditions. Requirements should include reporting performance against development approval, environmental authority, transitional environmental program or environment protection order conditions, prompt notification of breaches of development conditions and other incidents likely to cause environmental harm; and the assessment of impact monitoring of the effect of waste water releases. The EPA has a database to receive electronic data from licensees. This is currently available for WWTPs.

Summary

The administering authority must consider requiring the applicant to monitor the discharge of residual waste water against approval conditions and to carry out impact monitoring of the effect of the residual waste water releases.

Pre-design conferencing is encouraged, including addressing any requirement for baseline ecological health monitoring of the receiving waters prior to lodging an application.

2.5 Environmental offsets

a. Policy issues

Refer to Section 2.0 for detail. The policy intent is that for:

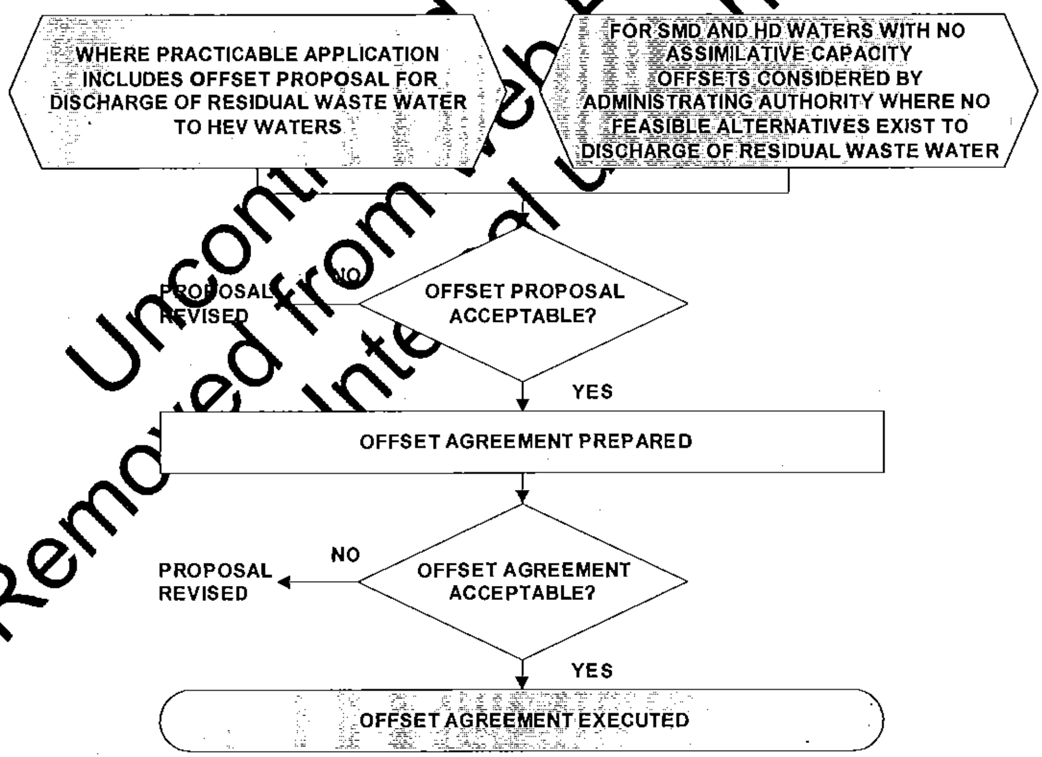
- HEV waters, where practicable the application includes a like kind environmental offset proposal - counterbalancing the discharge of residual waste water (the discharge) from the proposed ERA[15]; and
- SMD and HD waters with no assimilative capacity, environmental offsets (offsets) may be considered by the administering authority where there are no feasible alternatives to residual waste water discharge.

For the purposes of the EPA operational policy, environmental offsets will not apply to SMD waters where assimilative capacity exists. Refer to Section 2.3.4. By definition HD waters have no assimilative capacity.

In accordance with the above, and consistent with the overarching principles of the discussion paper[16] on the proposed Queensland Government Environmental Offsets Policy, the aim of providing environmental offsets is:

- to maintain the biological integrity of HEV waters, by counterbalancing the discharge of residual waste water (the discharge) from the proposed ERA with a like kind environmental offset; and
- to improve the water quality of SMD and HD waters by providing an offset that both counterbalances the proposed residual waste water discharge and provides additional assimilative capacity.

Figure 8 — Environmental offsets



Further to the above policy intent, where it is practicable and the discharge is suitable for management via offsets the application should include a like kind environmental offset proposal (offset proposal) that would be

[15] The Australian Government is considering environmental offsets as approval conditions under the EPBC Act when a proposed development impacts on a matter of national environmental significance. When finalised, EPBC Act requirements should be considered in conjunction with this operational policy.
[16] Subject to the finalisation of the proposed Queensland Government Environmental Offsets Policy in 2008, any inconsistencies will be addressed by further review of this operational policy.

considered by the administering authority on a case-by-case basis seeking to deliver a net environmental gain to the receiving waters as a whole.

The consideration of offsets must only occur after all options to avoid, reuse, recycle or adopt other disposal alternatives have been addressed in accordance with the waste management evaluation procedure under the EPP Water, and the discharge is demonstrated to be unavoidable and environmentally acceptable.

Figure 8 above depicts the matters that are detailed in the following sections.

b. Like kind offsets

To be of a 'like kind' offsets must be of the same contaminant and chemical form and preferably a point source emission impacting on the same waters as the proposed ERA discharge. To avoid further impairment of waters that have no assimilative capacity for the proposed ERA contaminants, offsets should impact on the same waters as the proposed ERA discharge. Where this is not practicable, offsets to waters in the same catchment would be considered by the administering authority.

Where it is not practicable to secure point source offsets, then diffuse urban offsets (from new and existing urban development) or diffuse rural offsets would be considered by the administering authority. The priority and spatial location of diffuse offsets would be advised by the administering authority during pre-design conferencing, reflecting catchment priorities established under planning processes completed by recognised entities under the EPP Water. Offset proposals must reduce contaminant discharges to a level below individual load limits for point sources and beyond minimum performance standards for diffuse sources.

c. Net environmental gain

The offset quantity should seek to deliver a net environmental gain to the water as a whole. Net environmental gain for a water, the subject of discharge from the proposed ERA, is based on a 'nil net discharge' and additionally takes account of the environmental risk and uncertainty and the policy intent for the waters (maintaining natural values or the lack of assimilative capacity and water quality objectives not being met-respectively for HEV and SMD/HD waters).

d. Equivalence ratios

Offset sources are assigned a quantity equivalence (or offset) ratio accounting for:

- environmental risk and uncertainty resulting from the effects of separation distance, attenuation, the nature of the offset (point or diffuse source), performance variation over time, delayed onset time, different chemical forms and bioavailability; and
- the maintenance of the biological integrity of HEV waters and to prevent further degradation and reverse the trend in water quality of SMD and HD waters. The latter aspect would be considered by the administering authority in the context of the whole catchment assessment and the contribution from point source discharges.

For like kind point source offsets emitting to the same water type and effective from the time of the proposed ERA discharge, an equivalence ratio greater than 1 is required.

Equivalence is less likely:

- with increased distance from the proposed ERA discharge location;
- where the offset load reduction is effected in different water types in the same catchment;
- where urban or rural diffuse source offsets are involved; or
- where the timing of offset reductions is delayed from the project commencement date.

Consequently higher quantity offset ratios would be assigned in these circumstances reflecting the increased risk of delivering a net environmental gain, quantified over the project life.

If diffuse rural offsets are included in the offset proposal, the offset should rehabilitate or restore degraded riparian or wetland habitats according to priority locations advised by the administering authority. Other land use management actions that reduce rural diffuse emissions may be considered by the administrating authority. Proposals to include urban diffuse offsets from either new or existing urban development should also be according the priorities advised by the administering authority.

The EPA procedural guide *Procedural information for the operational policy waste water discharge to Queensland waters*, provides guidance in determining environmental equivalence through minimum default offset ratios and determining riparian and wetland buffer widths.

e. Discharge contaminants must be suitable for management by offsets

Discharge contaminants that are potentially suitable for management by offsets include nutrients (nitrogen and phosphorus), sediment (TSS and TDS), organic carbon, contaminated stormwater or other contaminants where the scientific basis can be demonstrated and the contaminants do not have human health impacts, irreversible environmental impacts or unacceptable biota impacts.

f. Development application to include an offset proposal

Where required the development application must include an offsets proposal that meets the acceptability requirements listed below. The onus is on the applicant to provide sufficient information to allow the administering authority to consider whether the offset proposal is acceptable.

g. Acceptability of offset proposal

At pre-design conferencing the administering authority would advise on the requirements for an acceptable offset proposal, that must:

- meet statutory, regulatory and planning requirements and be enforceable—through development conditions, covenants or contracts;
- be additional to the consideration of ERP and EP Act provisions, as summarised in Sections 2.1 to 2.4;
- be enduring--offset the impact of the development from commencement and for the period that the impact occurs. Where onset is delayed, offsets must balance any initial shortfall over the project life;
- be suitable and targeted--contaminants must be suitable for management by offsets, be of the same contaminant and chemical form;
- be capable of being supplied and secured by the applicant or authorised agent;
- be appropriately located--apply to the same waters impacted by the proposed residual waste water discharge, or to other water types in the same catchment;
- initially consider point source offsets and then diffuse urban offsets or diffuse rural offsets (involving the restoration of degraded riparian or wetlands buffers) in accordance with catchment priorities as advised by the administering authority;
- seek to achieve a net environmental gain to the receiving waters;
- demonstrate compliance through emissions monitoring and reporting to the administering authority;
- be compatible with any flexible or incentive based mechanisms such as nutrient trading; and,
- address other elements, pending case by case assessment by the administering authority.

h. Offset agreement

If the offset proposal is acceptable to the administering authority and the application is approved, the administering authority must include development conditions that require the applicant:

- to secure the offsets proposal through an agreement between the applicant and the administering authority; and
- to execute the agreement before the commencement of site works, that:
  - includes a memorandum of agreement if the offset proposal involves either the State or a Local Government;
  - includes a deed of agreement for private developers; and generally use a financial guarantee, refundable on demonstrated offset establishment;
  - requires rural diffuse offsets to be legally secured with covenants or conservation agreements and addresses the on-going management and maintenance of offset sites, where relevant; and
  - requires the offset to be recorded on the appropriate register.

Other elements may need to be considered, pending case by case assessment by the administering authority.

i. Financial contribution

The discussion paper on a proposed Queensland Government Environmental Offsets Policy (QGEOP) provides for financial contributions to be made to meet offset requirements in certain circumstances. The discussion paper outlines several principles that must be complied with for a financial contribution to be acceptable. The use of financial contributions under the operational policy will be considered further upon the implementation of the QGEOP.

Summary

Pre-design conferencing is encouraged to address environmental offset requirements

3. Additional information

3.0 Process for using default EVs and WQOs

Where EVs for the waters have not been specifically set in Schedule 1 of the EPP Water, then, under Section 11(2) of the EPP Water, the WQOs are the set of water quality guidelines (the *Queensland Water Quality Guidelines 2006* and the ANZECC Water Quality Guidelines) that will protect all EVs for the waters.

Where the above guideline values are considered inappropriate for the receiving environment the following provides information on default EVs and WQOs based on water quality guidelines derived from data collected at appropriate local reference sites.

a. ***Define default EVs***

Information on existing and possible future EVs should be obtained from maps, site inspections, surveys, local knowledge, water abstraction licences, planning documents, scientific studies and monitoring data. It is recommended that any changes to default EVs be agreed upon through consultation with key stakeholders, such as representatives of government, community, and industry groups.

EVs may be discounted if sufficient information can be obtained to justify that this value does not currently exist and is unlikely to exist in the future. It should be noted that the protection of the aquatic ecosystems and visual aesthetics should always be included as an environmental value of any water body. However, the level of aquatic ecosystem protection can vary between water bodies or zones of water bodies.

b. ***Define default environmental goals***

Locally specific information on EVs can be used to propose environmental goals. These goals define in more detail what needs to be protected and represent major subdivisions of EVs. Examples of typical environmental goals for EVs include protection of specific habitats (such as seagrass beds), protection of specific aquatic species (such as wallum frogs), minimisation of algal blooms, and maintenance of biodiversity or protection of the public during swimming activities.

c. ***Define default water quality indicators***

The next step involves determining the water quality indicators and concentrations required to protect the identified EVs. This is a technical process to be conducted by the applicant and involves reference to water quality data and guidelines. The indicators and concentrations determined in this step will become the WQOs for the next step of the process.

Water quality indicators may include physical-chemical, biological or toxicant measures applying to a combination of water, sediment and biota. Some sources of information to determine suitable indicators for protection of EVs are included in Table 6 below.

d. ***Define default WQOs***

To determine default WQOs, trigger values can be taken from published guidelines (for all values) or from local reference data (for aquatic ecosystem protection only). Once the numerical criteria are determined, they should be listed in a matrix of water quality indicators versus EVs for each geographical zone that has different EVs. For some indicators in a particular zone, different guideline numbers may be quoted to protect more than one EV or goal. In these cases, the more stringent guideline should be adopted as the default water quality objective for that indicator.

Reference data for Queensland waterways can be obtained from the EPA, or as listed in Table 6. Guidelines for biological, toxicants and sediment indicators and for primary industry, recreational water quality and drinking water values can be obtained from the ANZECC Water Quality Guidelines. Local reference information may be particularly important in determining the water quality characteristics required to protect local aquatic ecosystems. This would be the case if there are known unique species, such as acid frogs that require low pH conditions.

Determining default WQOs to protect aquatic ecosystems often requires significant technical input and should be considered as trigger values, below which a very low risk to the environment from that pollutant may be assumed. Default WQOs may depend on the levels of aquatic protection assigned for each zone. Further information on how to determine levels of aquatic ecosystem protection is provided in Table 3.

The *Queensland Water Quality Guidelines 2006* will become a repository for such sub-regional and local information for Queensland waters as it becomes available, and should be referenced for the default WQOs. The ANZECC Water Quality Guidelines will remain important for a range of indicators (for example toxicants and pathogens).

3.1 Use of local reference data

The *Queensland Water Quality Guidelines 2006* and ANZECC Water Quality Guidelines recommend using data from local reference sites to derive WQOs. The three main steps in the process are to establish a suitable reference site, collect sufficient data and calculate typical reference ranges and objectives. For further detail refer to Section 7.4.4 of the ANZECC Water Quality Guidelines (Volume 1).

Table 6 — Guideline and reference information for determining WQOs

EVs of Water	Sources of guideline and reference information
Aquatic ecosystem	EPA website for the Queensland Water Quality Guidelines and physical-chemical reference data. National water targets online for nutrients, turbidity and salinity. National Water Quality Management Strategy website for biological, toxicant and sediment guidelines. Fact sheets on biological indicators and groundwater are at the above site.
Recreation and aesthetics	National Water Quality Management Strategy website. National water targets online for nutrients, turbidity and salinity. World Health Organisation Guidelines.
Drinking water	Australian Drinking Water Guidelines (NHMRC 2004).
Primary industries	National Water Quality Management Strategy website.
Industrial	National Water Quality Management Strategy website.
Cultural and spiritual	EIS assessments and other site specific information where relevant. Refer also the State Coastal Management Plan.

Reference sites are used to define the condition of a stream without impacts from discharges. They should ideally be in the same stream, a short distance upstream of the proposed discharge being assessed. If monitoring is possible before the discharge commences, a site downstream of the proposed discharge may be appropriate (note that it is not appropriate to use the same waterway to develop water quality criteria if it receives waste discharges or its quality is materially affected by non-point source runoff). If no suitable sites are identified in the stream, sites may be chosen in another local stream with similar hydrological, geological and ecological characteristics.

A list of reference sites for riverine, estuarine and coastal waters is included in the *Queensland Water Quality Guidelines 2006*.

For physical and chemical indicators and toxicants, the ANZECC Water Quality Guidelines recommend a minimum of two years of monthly data to define reference conditions. If objectives are derived from less data, they may be unreliable. Established Queensland or ANZECC Water Quality Guidelines reference conditions are preferred in this case. It is also crucial in researching reference conditions that appropriate quality assurance measures are applied to sample collection, preservation and analysis (refer to the EPA Water Quality Sampling Manual).

Once sufficient data have been collected, WQOs can be determined from the reference range of the data. This is the range from the 20th percentile to the 80th percentile of data and represents the typical range that would be expected for that indicator in the absence of the discharge. Most physical, chemical and toxicant indicators only require an upper water quality objective derived from the 80th percentile. For pH and dissolved oxygen where low values are also undesirable, lower WQOs are also derived from the 20th percentile.

3.2 Temporary streams

Temporary streams are defined as streams that do not flow continuously all year round. They include ephemeral streams, which only flow after significant rainfall, as well as intermittent streams, which only stop flowing during extended dry periods. Temporary streams go through a series of hydrological stages, from a wetting stage following rain (including the first flush), through a recessional stage, to a pooled stage or completely dry stage.

Discharge of waste water to temporary streams requires special consideration due to their unique hydrological and ecological characteristics. Such emissions are likely to disrupt the natural ecology and impact the aquatic ecosystem. Continuous or semi-continuous discharges during naturally dry stages should be avoided, and wet weather discharges occur when receiving water flows are sufficient, from a risk based assessment, to achieve the receiving water quality objectives. The nearest upstream gauging station should be used to determine the release period. Feasible alternatives should be investigated such as minimizing the production of waste water, reuse and retention to discharge during wet conditions. Specific mine water disposal issues of a 'one-off' nature would be considered on a case-by-case basis with the administering authority.

Receiving water quality objectives should be based on the most appropriate local reference data collected in the same stream above the discharge or in a similar stream in the area that is not affected by the discharge. Monitoring data should ideally cover the wetting stage as well as recessional or pool stages. In the absence of suitable reference data, default values from the Queensland and ANZECC Water Quality Guidelines should be adopted.

3.3 Hydrological impacts

The discharge of waste water may have adverse impacts on the hydrology of temporary and permanent surface receiving waters. The impacts relate to the volume and velocity of discharge relative to natural flows, and may include bed and bank erosion and changes to the particle size distribution of sediments. Other effects may occur on biota where there is insufficient time to complete life cycles due to changed flow regime. As a general guide, modelling of flow characteristics should be considered where the waste water flow would exceed 10 percent of the natural minimum flow of the waterway.

3.4 Riparian habitat impacts

Discharge of waste water may adversely affect riparian vegetation. For example, nutrient rich discharges may lead to weed infestation of habitats where vegetation is adapted to a low nutrient regime. Visual recreation is a declared environmental value of a water that likely to be adversely affected if a water way becomes weed infested. Similarly saline groundwater discharged into a freshwater stream or clearing may adversely affect riparian vegetation.

3.5 Public health impacts

Protection of public health usually requires that multiple barriers between effluent and drinking water or contact water be in place. The monitoring for typical water quality indicators such as *Enterococcus spp.* is not for pathogenic organisms, but indicators of possible contamination and hence does not necessarily guarantee safe levels. Apart from effluent treatment trains, barriers usually include dilution and significant distances between outfalls and places where potential exposure and water use occurs.

In some cases these barriers may not be present, for example where:

- the effluent is not substantially diluted by a watercourse/ocean prior to public access; and
- persons may come in contact with the effluent (for example, a beach or recreational area); or
- the waters are essentially fresh, which may encourage children to ingest the waters,

then alternative discharge locations should be evaluated, or more specialised public health assessment approaches adopted. Refer to the Guidelines for Managing Risk in Recreational Waters (NHMRC 2006) for further information on assessing suitability of recreational water quality.

3.6 Groundwater impacts

Additional considerations exist when applying the guidelines to groundwater, or to water bodies directly or indirectly affected by groundwater. An example of a direct impact is where the groundwater is suitable for drinking. In this case, the guideline values should be applied directly to the groundwater. An example of an indirect impact is where the groundwater is not directly used but the movement of the groundwater impacts on a secondary water body with defined values. In this case it is necessary to consider the values to be protected, as well as the effects of the attenuation zone, the flux rate of the groundwater and any dilution achieved.

4. Relevant legislation, intergovernmental agreements and EPA operational policies

Relevant legislation, intergovernmental agreements and EPA operational policies include:

- *Environmental Protection Act 1994*;
- *Environmental Protection (Water) Amendment Policy No 1 2006* — Subordinate Legislation No. 30 of 2006 and its explanatory notes;
- *Environmental Protection (Water) Policy 1997* — Subordinate Legislation No. 136 of 1997, including Sections 15–18 and Schedule 1, and the explanatory notes;
- *Environmental Protection (Waste Management) Policy 2000,* including Part 3 Waste management hierarchy and Part 4 Environmental management decisions concerning waste;
- *Queensland Water Quality Guidelines 2006*;
- *Queensland Water Recycling Guidelines 2005*;
- *State Coastal Management Plan — Queensland's Coastal Plan 2001*;
- *Integrated Planning Act 1997*;
- *State Development and Public Works Organisation Act 1971*;
- *Environment Protection and Biodiversity Conservation Act 2000*;
- *National Water Quality Management Strategy,* including the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000* (the ANZECC Water Quality Guidelines) and the *Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (Phase 1) 2006*;
- Intergovernmental Agreement on the Environment;

- Guidelines for Managing Risks in Recreational Water Quality (NHMRC 2005);
- Agreement under the Council of Australian of Australian Governments Water Reform Agenda;
- International agreements relating to migratory birds and wetlands (Japan-Australia Migratory Bird Agreement (JAMBA) and the China-Australia Migratory Bird Agreement (CAMBA));
- Directory of Important Wetlands Australia;
- *Australian and New Zealand Guidelines for Fresh and Marine Waters 2000* (Volume 2. Appendix 1 Mixing zones adjacent to effluent outfalls);
- EPA operational policy *Licensing waste water releases from existing marine prawn farms in Queensland*;
- EPA operational policy *Approval of sewage treatment plants including options for use of reclaimed water*;
- EPA Information sheet *Case study 1 — Licensing discharges from sewage treatment plants*; and
- EPA Information sheet *Case study 2 — Licensing discharges from sewage treatment plants*.

5. Further information

For further information please contact the EPA Ecoaccess Customer Service Unit on:

Ph. 1300 368 326
Fax. (07) 3115 9600
Email eco.access@epa.qld.gov.au

Disclaimer
While this document has been prepared with care, it contains general information and does not profess to offer legal, professional or commercial advice. The Queensland Government accepts no liability for any external decisions or actions taken on the basis of this document. Persons external to the Environmental Protection Agency should satisfy themselves independently and by consulting their own professional advisors before embarking on any proposed course of action.

Approved by
[redacted]
Executive Director
Environmental Operations Division
Environmental Protection Agency

Enquiries:
EPA Ecoaccess Customer Service Unit
Ph. 1300 368 326
Fax. (07) 3115 9600
Email eco.access@epa.qld.gov.au

6. Appendices

Appendix 6.1: Glossary of terms

Administering authority means the administering authority under the EP Act, and will be the chief executive of the Environmental Protection Agency or the Local Government's chief executive officer.

The chief executive of the DPIF has delegated authority for ERAs 3 and 4 (i.e. cattle feedlotting and pig farming). These ERAs have been delegated to the DPIF.

Applicant means the applicant for a development approval or environmental authority application. In the context of this operational policy it may also mean employees of organisations contracted by the applicant to assist in the preparation of the application.

Aquatic ecosystems is defined in the ANZECC Water Quality Guidelines as the animals, plants and micro-organisms that live in water, and the physical and chemical environment and climatic regime in which they interact. It is predominantly the physical components (for example light, temperature, mixing, flow, and habitat) and chemical components (for example organic and inorganic carbon, oxygen, nutrients) of an ecosystem that determine what lives and breeds in it, and therefore the structure of the food web. Biological interactions (for example grazing and predation) can also play a part in structuring many aquatic ecosystems.

Assessable development means development specified under Part 1, Schedule 8 of IPA and includes the carrying out of a chapter 4 activity, other than an activity (or part of an activity) for which a code of environmental compliance has been approved.

Assessment manager for an application for a development approval means the Local Government or the entity prescribed under the *Integrated Planning Regulation 1998*.

Assimilative capacity means the capacity of the receiving waters to receive some human induced input of contaminants, or alteration, without causing the water quality to deteriorate so the water quality objectives are no longer met.

Basin means the major hydrological drainage basins in the national spatial database provided by Geoscience Australia. Australia is divided into drainage divisions which are sub-divided into water regions which are in-turn sub-divided into river basins. The data, which includes the name and number of each Queensland drainage division, region and river basin, is available at the Australian Government Geoscience Australia website.

Best practice environmental management is defined in the EP Act as the management of the activity to achieve an on-going minimisation of the activity's environmental harm through cost effective measures assessed against the measures currently used nationally and internationally for the activity. Section 21(2) lists measures to be regarded in deciding best practice environmental management of an activity. These measures include, but are not limited to, strategic planning, systems and training, product and process design, public consultation, waste prevention/treatment and disposal.

Biological integrity of a water is defined in the EPP Water as the water's ability to support and maintain a balanced, integrative, adaptive community of organisms having a species composition, diversity and functional organisation comparable to the natural habitat of the locality in which the water is situated.

Catchment means the total watershed draining into a river, creek, reservoir or other body of water. The limits of a given catchment are the heights of land (such as hills or mountains) separating it from neighbouring catchments. Catchments can be made up of smaller sub-catchments.

Character, resilience and environmental values of the receiving environment – see **Resilience.**

Code of environmental compliance is a document that contains standard environmental conditions for an ERA, or part of an ERA.

Complete mixing means, with reference to mixing zone considerations, the effluent is completely dispersed through the receiving waters.

Compliance monitoring means the activity of monitoring the approved discharge and comparing against the specified development conditions. This will generally occur at the discharge pipe. Monitoring can also be required for the receiving environment. Compliance should not be based on the receiving environment monitoring results alone, particularly where other factors in the catchment may contribute to non-compliance.

Concurrence agency for an application for a development approval under IPA means an entity prescribed under a regulation as a concurrence agency for the application.

Contaminant is defined in Section 11 of the EP Act as a liquid, gas, solid or other forms, that is released into the environment.

Cultural resources is defined in the *State Coastal Management Plan 2001* as places or objects that have anthropological, archaeological, historic, scientific, spiritual, visual or ecological significance or value.

Development application means an application for a development approval or environmental authority under the EP Act and subordinate EPP Water, IPA or the SDPWO Act for ERAs proposing to discharge of residual waste water to Queensland waters.

Decision notice means the written notice issued under IPA by the assessment manager to notify an applicant of the decision for their application in relation to a development approval.

Development condition means a condition of a development approval imposed by the assessment manager or concurrence agency under IPA.

Direct toxicity assessment (DTA) means the assessment of the combined effects of a number of compounds of unknown identity and concentration in an effluent. DTA provides an integrated measure of the aggregate/additive toxicity of chemicals and accounts for interactions between compounds. The DTA approach has been adapted from conventional toxicity testing approaches using the same methods, species selection and extrapolation to receiving waters (refer to ANZECC Water Quality Guidelines Volume 2, Section 8.3.6).

Ecological health is defined in the ANZECC Water Quality Guidelines as the health or condition of an ecosystem. It is the ability of an ecosystem to support and maintain key ecological processes and organisms so that their species compositions, diversity and functional organisations are as comparable as possible to those occurring in natural habitats within a region (also termed ecological integrity). The concept of ecological health is applicable to all complex ecosystems and sustainability is a key element of the concept.

Ecologically sustainable development (ESD) is defined in the EP Act as the protection of Queensland's environment while allowing for development that improves the total quality of life, both now and in the future, in a way that maintains the ecological processes on which life depends. The principles for ESD as published in the <u>*National Strategy for Ecologically Sustainable Development 1992*</u> are a part of the standard criteria of Schedule 3 of the EP Act and include the precautionary principle. They must be considered when making decisions to grant or refuse an application.

Environmental authority application means an application under the EP Act for an environmental authority.

Environmental offsets in the context of this operational policy means the positive measures taken to counterbalance the adverse environmental impacts of the development resulting from the residual waste water discharge that cannot be avoided, reused, recycled or otherwise disposed in accordance with the waste management evaluation procedure under the EPP Water. An offset is to be of a like-kind (i.e. the same contaminant and chemical form), is located outside the development site and seek to deliver a net environmental gain to the waters.

Environmentally relevant activity (ERA) means a mining activity or an activity prescribed under a regulation as an ERA (where a contaminant will or may be released into the environment when the activity is carried out and the release will or may cause environmental harm). Schedule 1 of the *Environmental Protection Regulation 1998* lists the non-mining ERAs and section 39 (1) lists the ERAs devolved to Local Government.

Environmental values (EVs) is defined in the EPP Water as the qualities of a water that make it suitable for supporting aquatic ecosystems and human water uses (refer also Section 9 of the EP Act). EVs need to be protected from the effects of pollution, waste discharges and deposits to ensure healthy aquatic ecosystems and waterways that are safe for community use. Particular waters may have different EVs. The list of EVs and the waters they can potentially apply to, are tabulated below.

Environmental value	Potentially applicable to:	
	Tidal waters	Fresh (non-tidal) waters
Protection of aquatic ecosystems (Aquatic ecosystem EV) Protection of aquatic ecosystems, under three possible levels of protection relating to the following three ecosystem conditions: • High ecological value waters; • Slightly to moderately disturbed waters; and • Highly disturbed waters. (suitability for seagrass has also been specifically identified for some waters as a component of this EV)	✓	✓
EVs other than aquatic ecosystem EV (called human use EVs)		
Suitability for human consumers of wild or stocked fish, shellfish or crustaceans (suitability for oystering has also been specifically identified for some waters)	✓	✓
Suitability for primary contact recreation (for example swimming)	✓	✓
Suitability for secondary contact recreation (for example boating)	✓	✓
Suitability for visual (no contact) recreation	✓	✓
Protection of cultural and spiritual values	✓	✓
Suitability for industrial use (including manufacturing plants, power generation)	✓	✓
Suitability for aquaculture (for example red claw, barramundi)	✓	✓
Suitability for drinking water supplies		✓
Suitability for crop irrigation		✓
Suitability for stock watering		✓
Suitability for farm use		✓

Far-field waters means, in the context of an initial mixing zone, the waters beyond the specified boundaries of the mixing zone.

General environmental duty means the duty that applies to all persons in Queensland to take all reasonable and practicable measures to prevent or minimise environmental harm when carrying out an activity that causes, or is likely to cause, environmental harm. It is defined in Section 319 of the EP Act.

High ecological value (HEV) waters is defined in the *Queensland Water Quality Guidelines 2006*, as amended, as waters that have the biological integrity of effectively unmodified (intact) ecosystems or waters that are highly valued.

Information request means the additional information given about an application that is supplied by the applicant, at the request of the assessment manager or concurrence agency under IPA. It includes an EIS supplement.

Intergovernmental Agreement on the Environment means the agreement made on 1 May 1992 between the Commonwealth, the States, the Australian Capital Territory, the Northern Territory and the Australian Local Government Association.

Level of protection (for aquatic ecosystems) is defined in the *Queensland Water Quality Guidelines 2006*, as amended, as the level of aquatic ecosystem condition that the water quality objectives for that water are intended to achieve. The levels of aquatic ecosystem protection are:

- Level 1 High ecological/conservation value aquatic ecosystems — effectively unmodified or other highly valued systems;
- Level 2 Slightly to moderately disturbed aquatic ecosystems — ecosystems in which aquatic biological diversity may have been adversely affected to a relatively small but measurable degree by human activity; and
- Level 3 Highly disturbed aquatic ecosystems — measurably degraded ecosystems of lower ecological value.

Like kind environmental offsets means the offsetting load reductions from other point source and diffuse source emissions of the same contaminant (and chemical form).

Mixing zone (or initial mixing zone) is defined in the EPP Water as an area where residual waste water mixes rapidly with surface water because of the momentum or buoyancy of the waste water and turbulence of the surface water. Within the initial mixing zone dilution of the effluent contaminants takes place, water quality degradation occurs and certain water quality objectives may be exceeded.

Multiple Before-After Control-Impact (MBACI) means water quality assessment studies that are designed to assess change to the water body from a particular input or disturbance. Such water quality assessments give the greatest confidence that any observed differences between control and impacted sites are not simply a result of natural variation between places or times.

Near-field waters means, in the context of an initial mixing zone, the waters immediately adjacent to the specified boundaries of the mixing zone.

Net environmental gain for a water the subject of residual waste water discharge from the proposed ERA, means the counterbalancing environmental offsets produce a net environmental outcome -- based on a 'nil net discharge' and additionally accounting for the environmental risk/uncertainty and the lack of assimilative capacity and water quality objectives not being met.

Offsets agreement means the agreement between an applicant and the EPA, Local Government or other party that secures the offsets proposal.

Offsets proposal means the proposal acceptable to the administering authority that quantitatively offsets, for the life of the proposed development, the discharge of residual waste water from the ERA to achieve a net environmental gain to the receiving waters.

Peer review or expert peer review means the commissioning, by the applicant, of a nationally or internationally recognised expert in the relevant discipline, to provide independent expert written assessment of the technical/scientific work of either the applicant, or the applicant's consultant for inclusion in the application.

Precautionary principle is defined in the *National Strategy for Ecologically Sustainable Development 1992* as 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. In application of the precautionary principle, public and private decisions should be guided by careful evaluation to avoid, wherever practicable, serious or irreversible damage to the environment and an assessment of the risk-weighted consequences of various options. Decisions to grant or refuse an application must consider the precautionary principle as part of the standard criteria of Schedule 3 of the EP Act.

Public interest may be ascribed as meaning the interest of the public as distinct from the interest of the individual(s).

Queensland Water Quality Guidelines means the *Queensland Water Quality Guidelines 2006*, as amended, prepared by the EPA.

Queensland waters is defined in the *Acts Interpretation Act 1954* as all waters that are within the limits of the State or coastal waters of the State.

Resilience of the receiving environment means the ability of an ecosystem to adjust or respond to progressive impacts **and** the ability to recover following cessation of the natural or anthropogenic disturbance. Information on both the recovery and response phases is required to **characterise resilience and the sensitivity of the receiving environment.** In particular, information on the recovery phase is crucial because it is the indicator of reversibility or irreversibility of the impact.

Standard criteria is defined in Schedule 3 of the EP Act as:

(a) the principles of ecologically sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development'; and

(b) any applicable environmental protection policy; and

(c) any applicable Commonwealth, State or Local Government plans, standards, agreements or requirements; and

(d) any applicable environmental impact study, assessment or report; and

(e) the character, resilience and values of the receiving environment; and

(f) all submissions made by the applicant and submitters; and

(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; and
- (v) a development approval; and

(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

(i) the public interest; and

(j) any applicable site management plan; and

(k) any relevant integrated environmental management system or proposed integrated environmental management system; and

(l) any other matter prescribed under a regulation.

Stream order is a standard means of describing streams. The smallest streams in a drainage network have no tributary streams. These are called first order streams. Two first order streams unite to form a second order stream. Second order streams only have first-order streams as tributaries. Third order streams only have second and first order streams as tributaries, etc. As the order of the stream increases, the discharge increases, the gradient decreases, the velocity increases, and the channel dimensions (width and depth) increase to accommodate the increased discharge.

Sustainable load of a particular contaminant means the maximum amount of the contaminant that a water body can receive without exceeding the related WQOs, and therefore adversely affecting EVs.

Trigger values means the numerical criteria that if exceeded require further investigation for the pollutant of concern. If not exceeded, a low risk of environmental harm can be assumed.

Waste management evaluation procedure in making environmental management decisions about the release of residual waste water from an ERA means, under the EPP Water, the assessment processes for prioritising waste management practices (waste management hierarchy) to achieve the best environmental outcome.

Waste water treatment plants (WWTPs) means sewage treatment plants, advanced waste water treatment plants, water reclamation plants and all other synonyms for treatment plants whose primary function is to treat a water based waste stream.

Waste water means, under Schedule 2 of the EPP Water, a liquid waste and includes contaminated stormwater.

Water means the whole or any part of surface water or groundwater, tidal or non-tidal, and including any river, stream, lake, lagoon, swamp, wetland, unconfined surface water, natural or artificial watercourse, dam, tidal waters (estuarine, coastal and marine waters to the limit of Queensland waters) and underground or artesian water.

Water quality indicator (for an EV) is defined in the EPP Water as a property that can be measured or decided in a quantitative way. Examples of water quality indicators include physical indicators (for example temperature), chemical indicators (for example nitrogen, phosphorus, metals) and biological indicators (for example macroinvertebrates, seagrass and fish).

Water quality objectives (WQOs) are, the WQOs specified in Schedule 1 of the EPP Water to protect the EVs for waters. WQOs are long term goals for water quality management. They are numerical concentration limits or narrative statements established for receiving waters to support and protect the designated EVs for those waters. They are based on scientific criteria or water quality guidelines, but may be modified by other inputs (for example social, cultural, and economic).

Water types means waters with similar characteristics. The water types covered by this document are based on water types established in the *Queensland Water Quality Guidelines 2006*. Water types include coastal waters (open and enclosed), estuarine waters (lower, middle and upper), tidal canals, constructed estuaries, marinas and boat harbours, freshwaters (lowland, upland and dams/reservoirs), wetlands and ground waters. WQOs applying to different water types are outlined in the documents under Schedule 1 of the EPP Water.

Appendix 6.2: Mixing zone determination

Matters to be addressed in the development application must include:

a. Use of Direct Toxicity Assessment

The development application must demonstrate that the contaminants in the proposed residual waste water discharge are not acutely toxic to aquatic organisms inside the mixing zone or exceed the No Observed Effect Level, or equivalent (for example, the No Observed Adverse Effect Concentration) outside the mixing zone.

Where the proposed residual waste water discharge includes a contaminant(s) for which there is a lack of environmental effects data the development application must include the results of Direct Toxicity Assessment (DTA). Testing may be based on samples from demonstration plant, pilot plant or laboratory scale to complement a literature review.

This information is relevant to DTA of discharged effluent, whether required prior to licensing approval or as part of post-approval monitoring. DTA of effluent is also referred to as Whole of Effluent Toxicity testing.

DTA of an effluent is applicable to discharges that pose a potentially acute toxic exposure risk to aquatic fauna in the receiving environment. Typically, this involves cases where the concentrations of multiple chemical and/or elemental substances in the effluent exceed, or are likely to exceed, the known Toxicant Trigger Values presented in the ANZECC Water Quality Guidelines. The potential for synergistic toxicological effect can also be demonstrated through the use of DTAs. DTA of effluent would generally apply to residual waste water treatment plants that have the potential to receive commercial or industrial effluent as part of the trade waste system, or Advanced Waste water Treatment Plants (AWTPs) that produce a Reverse Osmosis Concentrate (ROC), or other similarly concentrated waste streams.

Specific requirements may include:

- The proponent should submit a DTA program and Toxicity Identification Evaluation (TIE) program for review and approval by the QLD EPA prior to commencement of the DTA program;
- DTA should be conducted on the effluent as it would be deliver to the end-of-pipe;
- The use of toxicity testing for licensing requirements should preferably employ cellular-based (mode of action) methods over whole organism tests where a QLD EPA and National Association of Testing Authorities (NATA) approved method for those tests exist[17]. This would negate any requirement for animal ethics approval (in most cases), standardises tests for marine and freshwater discharges, and provides more defined information on the form of toxicity;
- DTAs should be conducted on samples that are *representative of the discharge*,
- The frequency of licensed DTAs should initially be on at least an annual basis and in cases where there is seasonal variability in the quality of the effluent, on the effluent that represents the worst-case. Case-specific factors, such as the frequency and volume of the discharge, changing influent or effluent quality characteristics, and the Environmental Values (EVs) of the receiving environment should be taken into consideration when determining the frequency of the licensed DTA requirements for the discharge;
- The test organisms to be used for DTAs are to be chosen in accordance with Section 8.3.6.8 of the ANZECC Water Quality Guidelines, taking into consideration locally occurring species, the location of the discharge and nature of the receiving environment;

[17] There are very few validated cellular based/methods currently available. Consequently the great majority of DTA-related bioassays will be Whole of Organisms tests.

- The toxicity tests chosen for the DTA should demonstrate that the effluent is neither acutely toxic within the initial mixing zone, nor exhibit observable chronic (or alternatively sub-lethal) toxicity in the test specimens outside of the mixing zone;
- The toxicity limits derived from the DTA should be reported to the EPA as No Observed Effect Level or No Observed Adverse Effect Concentration (for example NOAEC at 10% effluent concentration);

Applicable TIE procedures, as provided in the approved DTA program, must be undertaken if, following the QLD EPA review of the reported DTA results, the QLD EPA requests in writing that TIEs are required to be performed.

b. Spatial definition

The development application must specify the proposed mixing zone; including the location, boundary and area. In cases where the proposed residual waste water discharge is to a river, the percentage of the width occluded or blocked by the mixing zone must also be specified.

The mixing zone boundary may be determined by indicator concentrations in the residual waste water. Where indicator concentrations are predicted to be statistically indistinguishable from the receiving water concentrations, complete mixing has occurred and the mixing zone is presumed to have ended. Only one mixing zone, minimised to the greatest practicable extent may be included in the development application.

Where the assessed environmental risk is low, spreadsheet calculations may be used to establish plume geometry and the dilution of contaminants. This circumstance may include, for example, a proposed discharge involving a small volume of residual waste water containing one or two well-studied contaminants at concentrations only several times greater than the receiving waters.

Commensurate with increased scale and risk, the use of predictive numerical modelling may be required to evaluate mixing processes and impacts in the near field. Model outputs would include the prediction of the size and behavior of the effluent plume and mixing zone impacts, in both the water column and sediments, over a range of input conditions. The development application must include both the results of numerical modelling and any experimental work for the assessment of impacts.

Predictive numerical modelling may incorporate relevant functional relationships between the contaminant discharge and environmental quality indicators likely to be affected. Where functional relationships are unknown, consistent with assessed environmental risk, additional laboratory or field experiments may be required to understand the likely effects of a discharge (for example to understand the impact of effluent contaminants on benthic communities in marine sediments).

General information on predictive numerical modelling is at Appendix 6.3.

c. Assessment of no or negligible change to HEV receiving waters

The development application must address both baseline monitoring of relevant indicators in the near-field, beyond the mixing zone boundary, and predictive impact modelling of the effects of the proposed waste water discharge to demonstrate no or negligible change to the physico-chemical, biological, habitat and flow attributes, above natural variation, in the near-field beyond the mixing zone boundaries. These matters and post operational water quality monitoring requirements are addressed below.

1. Establishment of baseline condition

The development application must establish the baseline water quality against which the no or negligible change requirement may be assessed for the natural range of values of physico-chemical, biological, habitat and flow indicators relevant to the proposed ERA.

To characterise the natural condition the baseline water quality monitoring program design should be consistent with the requirements of the *Before* component of a *Multiple Before-After Control-Impact* (MBACI) water quality assessment program (or equivalent assessment program). Refer Appendix 6.4 for MBACI water monitoring experimental design.

The adoption of MBACI water monitoring experimental design would allow the baseline data to be used in the predictive impact modelling of the effects of the proposed discharge to demonstrate no or negligible change in the near-field, beyond the mixing zone boundaries. The data may also be used for post operational compliance monitoring of impacts.

The baseline monitoring design must include at least two near-field monitoring sites adjacent to the proposed boundary of the mixing zone at the impact site. These near-field sites may comprise monitoring sites for the *Impact* location of the MBACI water quality monitoring design. A comparable number of indicators must be monitored at two control sites. Refer Appendix 6.4 for MBACI water monitoring experimental design.

The *Queensland Water Quality Guidelines 2006* recommend collection of a minimum of 24 samples over two years. However, this requirement may need to be adjusted for some biological and habitat indicators (for example indicators that represent an environmental response integrated over a longer timeframe). The two year time period is recommended to allow some measure of inter-annual variation. While two years will not capture the entire range of such variation it must provide some indication of its likely magnitude.

Notwithstanding, the aim is to properly characterise the whole natural range of the selected indicators and maximize the chance of detecting changes in environmental indicators beyond the effect sizes stipulated in the *Queensland Water Quality Guidelines 2006*.

2. ***Prediction of impacts of the proposed ERA—demonstration of no or negligible change***

Having established the natural baseline, the development application must determine the effects of the proposed residual waste water discharge within the initial mixing zone and the near-field immediately beyond the mixing zone boundaries. The no or negligible change test would be satisfied if no significant difference was predicted between the impact site and the two control sites. Operational risks must be addressed.

For technical detail refer to Sections 8.4.2, 8.4.3 and 8.4.4 of the *Queensland Water Quality Guidelines 2006* and Section 3.2.3.1 of the *Australian Guidelines for Water Quality Monitoring and Reporting (2000)*.

Peer review assessment must be submitted with the development application.

3. ***Post operational monitoring***

Development conditions must include the requirement for the applicant to initiate the *After* component of the *Multiple Before-After Control-Impact (MBACI)* monitoring program (or equivalent monitoring program) when the operation is at design capacity, or within 12 months of commissioning, to demonstrate actual compliance with the no or negligible change requirements.

As a guide, 24 sample sets over a 12-month period would be required.

Post operational non-compliance would require the implementation of expedited compliance actions under a *transitional environmental program* or other instruments under the EP Act.

After compliance is demonstrated, on-going water quality monitoring would be required. For some waters and contaminants there is the possibility of achieving this requirement through a contribution to a joint agency/stakeholder ecological health monitoring program.

In the context of continuous improvement the development conditions may also require the preparation and implementation of a *transitional environmental program* to reduce the size of the mixing zone, over time.

Appendix 6.3: Numerical modelling of environmental impacts and mitigation actions

Choice of model

The models used should be "fit for purpose" and any work based upon sound science and the best available information. The size and potential risk of the proposed activity will determine the scope and extent of the modelling required.

Predictive tools such as mathematical models are often required when assessing the benefits of various management options (or scenarios). Different types of computer models exist, including hydrodynamic (mixing and flow), water quality (biogeochemical), catchment (export) and groundwater models. The type of model used will depend on the application but generally a combination hydrodynamic and water quality models would be required to simulate receiving waters for decisions involving continuous point source discharges. Catchment models may be used to provide inputs into receiving water models. Hydrodynamic and water quality models are discussed further below.

The choice of hydrodynamic models needs to account for the properties of the discharge, bathymetry, as well as the local mixing conditions in the receiving waters. Some discharges such as brine concentrates from reverse osmosis plants have elevated salt concentrations or mineral processing effluents may have elevated temperatures. Receiving waters may also not be well mixed in all dimensions. For example some estuaries periodically stratify due to salt wedge formation. The model needs to be able to simulate the appropriate density effects or thermodynamic processes for the specific application.

Mixing models used to assess mixing zones are generally hydrodynamic models that simulate the initial dilution of the discharge with the receiving environment. To obtain concentration predictions in the mixing zone, background levels need to be added to the dilution predictions. These may be sourced from far-field models or estimates from monitoring.

Water quality models simulate the water quality processes occurring within waterways. The model of choice needs to include the relevant biogeochemical processes relevant to the contaminants in the discharge and the characteristics of the receiving environment. For example, for carbonaceous matter, the model will need to simulate the heterogenic bacteria activity that breaks down the carbonaceous matter. This process also consumes oxygen and therefore the models need to simulate surface re-aeration and solubility etc. For nutrients, the model will usually need to simulate the growth of algae and primary production.

A technical description of the model should be provided to the EPA covering the history of the model, development history, published articles and details of the conversion of the model into a software package. Details of the experience and training of the model users should be provided. Other requirements include a statement of objective to explain clearly the situation being modelled and the objectives of the modelling study and outputs required from the model. The choice of model should be justified to demonstrate that the model used is suitable for this study including examples of previous applications in similar situations and a conceptual diagram of how the model represents environmental processes.

Data inputs to the model

The quality of inputs to the model will greatly affect the predicted outcomes. All modelling assumptions should be stated. Initial assessment should include a review of the flows and contaminant concentrations for the proposed activity and other activities to be modelled. These usually form the basis of the scenarios used for the model runs. How well do they represent the likely release in terms of quantity and variability? For constant concentrations and flows, do they represent average or worst-case condition? For what period of time do the worst-case conditions exist, and how frequently? Further data inputs will include initial conditions (particularly for water quality variables) and boundary conditions (tidal flow and elevations at the seaward or upper catchment boundary of the model) of the model and these should be checked. The choice of environmental data such as rainfall will often be determined by the choice of baseline conditions. It is generally recommended that a statistical dry year is used to assess point source scenarios.

Data used for the modelling study and its source should be clearly defined, including the source, quality assurance and expected errors. Any data manipulation and related assumptions should be detailed. Raw data in electronic form should be made available to the EPA, on request.

Uncertainty of predictions (calibration)

The ability of the model to make reliable predictions will strongly depend on the above issues and should ideally be tested through both calibration (adjustment of model parameters to reproduce measured data) and validation (a comparison of predicted values against measured data). Validation is used to demonstrate the model accuracy. Without calibration or validation, model prediction should only be used for qualitative comparisons, rather than quantitative comparisons against water quality objectives. Sensitivity analysis can be used to demonstrate the effect of varying input data or parameters on key output variables. The uncertainty of model predictions should be stated and incorporated into any conclusions made by the applicant.

Appendix 6.4: Application of Multiple Before-After Control-Impact design to HEV water assessment

Introduction

The purpose of Multiple Before-After Control-Impact (MBACI) sampling designs is to allow a logically and statistically valid assessment of impact in the context of overall environmental variability. A discussion of these designs is available in Underwood (1992). Its application to HEV areas is aimed at determining whether or not the no change criterion has been met following commencement of an activity.

As its name implies, MBACI designs involve collecting samples before and after (BA) an impact may potentially occur to determine the significance of any change. It also involves collecting before and after samples at both control and impact (CI) sites. Inclusion of control sites makes it possible to infer whether changes detected at an impact site are due to the activity under investigation or are simply the result of broader scale natural variations that exist in the environment and are unrelated to the activity. The use of Multiple (M) control sites is to protect against the possibility of drawing erroneous conclusions from results at a single site, where an observed change may also be due the natural cycles occurring at different times in different places.

In scientific methodology, an experimental treatment is applied to some instances (for example fertiliser applied to a field or a new drug given to patients) and the results in these instances compared to those from testing instances where the treatment is absent (for example no fertiliser or a placebo given). An MBACI sampling program is essentially just a scientific experiment in which the experimental treatment is commencement of the subject activity, this being introduced at the project site and but not control sites.

The use of MBACI to assess change within HEV areas is essentially no different to its application elsewhere. It involves identification of adequate control and impact sites and collection of sufficient samples to allow a reasonable chance of detecting a predefined quantum of change. More detailed guidance on these issues with respect to HEV areas is provided below.

Indicators

The selection of indicators will of course be related and sensitive to the type of activity proposed. As a general guide, indicators must include:

- Indicators that reflect the potential direct physico-chemical impact of the activity in the water column;
- Where applicable, indicators that measure the potential impact on sediments; and
- Indicators that measure the biological response to the activity.

Control sites

Under the MBACI design, the smallest number of control sites is two. Additional sites will increase the strength of any inferences drawn from the program. The control sites must have similar hydrological, environmental and biological characteristics to the impact sites (in the before period). This may need to be verified through a pilot survey or existing information. In streams, control sites can be sited upstream of impact sites and/or in nearby similar (un-impacted) waterways. In embayments and estuaries, control sites must be located in physically and biologically similar locations but far enough away from the impact area to be unaffected once the activity commences. For small estuaries, use of similar nearby estuaries is preferable if this is practicable. Control sites must not be in a location in which material human activities take place (for example another waste water discharge or channel dredging).

Impact sites

It is undesirable to replicate the potential impact and thus there will typically be only one impact site. This will be located adjacent to the proposed mixing zone (if any) for the discharge or activity. For water quality assessment, at least two water quality monitoring sites must be located in the near-field adjacent to the mixing zone at the impact site. In smaller streams, the mixing zone must not be more than one third of the stream width. The near-field may be in the mid point of the stream adjacent and downstream of the mixing zone. In large estuaries or embayments, the near-field zone may be an area within 50m of the boundary of the mixing zone.

Number of samples

Where pre-existing data is unavailable or only available for some indicators, the data from the before phase of the MBACI program will be used establish both the environmental goals for environmental impact assessment and collect the before condition data for the requisite environmental monitoring program. The number of samples required is predicated on the need to achieve a relatively precise definition of existing condition (for the selected indicators) and also to have a reasonable chance of detecting an environmental change occurring at the requisite environmental effect size.

For HEV waters, the management aim is to have no change, but this is not logically or statistically testable. Instead, testing is carried out on the hypothesis that implementing the activity will significantly change monitored environmental variables. If the data do not support this, the null hypothesis that no significant change occurs is accepted.

As the testing is to determine if a change occurs, some minimum detectable environmental change needs to be defined. For physico-chemical water quality indicators, this issue is prescribed through a default method of assessing no change. This method is detailed in the Queensland Water Quality Guidelines in Section 8.4.2.1.1. In brief, during the before period, a minimum of 24 samples must be collected over a period of two years. The two-year time period is recommended to allow some measure of inter-annual variation. While two years will not capture the entire range of such variation it must provide some indication of its likely magnitude. These samples are taken as reasonably practicable at the same time at impact and control sites.

In the after period, an initial collection of 24 samples at each site is required. For continuous discharges or activities, this may need to be undertaken in a period of not less than 12 months. However, for intermittent discharges, the collection of samples must be tailored to the periods of discharge and potential impact.

For biological indicators the default approach described above may not be appropriate. Due to the wide range of possible biological indicators and differing time frames over which biological variables integrate impacts, it is not practicable to provide a prescriptive approach. However, the overriding aim remains the same i.e. to establish the natural range and to be able to detect any change to the natural range of values. The following general guidance is provided.

The before distribution of population values needs to be established with reasonable precision. This means that sufficient numbers of samples must be collected such that reasonably tight confidence intervals[18] (CI) around the estimated population 20/50/80 percentiles are established (CI ranges for the three percentiles must be clearly separated). What constitutes a sufficient number will vary depending on the indicator. The number of samples taken will depend upon natural variability of the chosen indicator(s). The number of samples is a compromise between degree of information gain with increasing replication and time, cost and practicality of increasing sampling effort. However, if the selected indicator is so variable that impractically high numbers of samples are required to achieve the desired outcome, then an alternative indicator must be considered.

The overall objective is to obtain a reasonable estimate of the sample population. A useful technique is to determine the coefficient of variation for increasing degrees of sample replication and sampling effort (for example plot size to estimate which techniques will give a reasonable estimate of variability).

---

[18] *In the default method for physico-chemical indicators, use of the 75^{th} rather than 95^{th} percentile CIs is recommended. This is similarly recommended for biological indicators. While this leads to an increase in the chance of making Type 1 errors, it considerably tightens up the CI ranges and decreases chance of Type II errors. This is considered a reasonable trade off for these HEV waters*

Sampling in the post-activity period must similarly aim to collect sufficient samples to be able to develop tight confidence intervals around the estimated population 20/50/80 percentiles. The before and after percentiles (with their associated confidence intervals) can then be compared for evidence of change. These percentiles are used so that monitoring may detect changes, which result in shifts in median levels as well as changes in variability.

Use of existing data

Where there is sufficient existing data from relevant sites for a particular indicator, the proponents may make use of this. The existing data could be used to characterise the environment and establish environmental goals for that indicator(s). If an environmental monitoring program is currently being conducted in relevant places, this data may be used for *before conditions* at control sites and/or the impact site as required.

Where long term data sets are available, information gained from assessment of spatial and temporal variation of an indicator could potentially be used to modify the program. For example, if spatial variation in an embayment was found to be very small for a particular indicator, this might justify a reduction in the number of control sites required to the minimum level.

In numerous waterways in Queensland, stakeholders jointly contribute to and carry out monitoring programs, a practice EPA encourages. A proponent proposing to use such data may need to contact stakeholders to discuss mutually acceptable arrangements for use of data and participation in the program.

An important caveat on the use of existing data is that it must be of proven high quality (i.e. it must have documented Quality Assurance information).

Reference

Underwood, A.J. (1992) Beyond BACI: the detection of environmental impacts on populations in the real, but variable world. *Journal of Experimental Marine Biology and Ecology.* 161: 145-178.

ecoaccess
environmental licences and permits

Procedural Guide
Environmental Operations

Procedural information for the Operational Policy *Waste water discharge to Queensland waters*

This procedural guide informs the EPA Operational Policy Waste water discharge to Queensland water. It provides specific technical information that may assist EPA officers undertaking water quality assessment for strategic planning purposes or when considering development applications or environmental authority applications under the Environmental Protection Act 1994, Environmental Protection (Water) Policy 1997, Integrated Planning Act 1997 and State Development and Public Works Organisation Act 1971.

Table of contents

Environmental Protection Agency
www.epa.qld.gov.au ABN 87 221 158 786

Note this is a draft document for internal EPA purposes only.
It is not Government policy.

For further information please contact the EPA Strategy and Policy Division on:

Ph: 1800 177 291

Interested parties are invited to provide email comments by 28 March 2008 to:

Email: EPA.EV@epa.qld.gov.au

Preamble

The purpose of the *Environmental Protection (Water) Policy 1997* (the EPP Water) is to achieve the protection of Queensland's water environment (surface tidal and non-tidal waters, groundwaters, lakes and wetlands) whilst allowing for development that is ecologically sustainable. The purpose is achieved by:

a) identifying environmental values (EVs) for Queensland waters;

b) deciding and stating water quality guidelines and objectives to enhance or protect the EVs – (ensuring healthy aquatic ecosystems and their ability to support human uses);

c) making consistent and equitable decisions about Queensland waters that promote efficient use of resources and best practice environmental management; and

d) involving the community through consultation and education, and promoting community responsibility.

The EVs for a water are protected if the measures for all indicators do not exceed the water quality objectives for the indicators.

1. Initial assessment of proposed activity

This Section informs Sections 2.1 and 2.4 of the Operational Policy

The initial assessment of the proposed activity should consider the industry type, materials used in processing, content and fate of waste streams and disposal options, reuse, recycling and re-treatment proposals, mass balance and water budget information, likely contaminants discharged in waste water to land or waters (including contaminated stormwater) and likely receiving water ecological and human health indicators potentially impacted by the waste water discharge. The waste management hierarchy for prioritising waste management practices under the EPP Water is at the Attachment to Section 1. Information that characterises the proposed waste water release should be included in applications seeking to discharge waste water to waters or land. Summary information is also at the Attachment to Section 1.

Particular industries and Environmentally Relevant Activities (ERAs) are associated with classes of aquatic ecosystem contaminants, e.g. waste water treatment plants and nutrients. The National Pollutant Inventory emission estimation technique manuals list 90 priority substances on the basis of health and environmental risk, by industry sector, and the USA EPA Toxic Release Inventory lists 313 priority substances. These inventories may assist in determining the likely waste water contaminants that may be associated with specific industry sectors or ERAs, and any potential issues with release to the environment (land or water).

The Modelling and Monitoring Assessment Decision Support System, refer Section 4.1, may also assist in identifying potential contaminants resulting from point or diffuse source emissions from specific industry sectors. The decision support tool includes relevant indicators and stressors and can be requested from water.tools@epa.qld.gov. Further information is at http://www.coastal.crc.org.au/3m/.

The e-Guides, refer Section 4.1, search facility includes links to all ANZECC Guidelines and may also assist in characterizing waste water toxicants that may be associated with specific industry sectors or ERAs. E-Guides are also available on request through water.tools@epa.qld.gov.

Attachment to Section 1

A. Waste management evaluation procedure

Figure 1 depicts the decision preference hierarchy in order to maximise the resource usage and minimise the impact on the EVs of the receiving waters under the EPP Water waste management evaluation procedure,

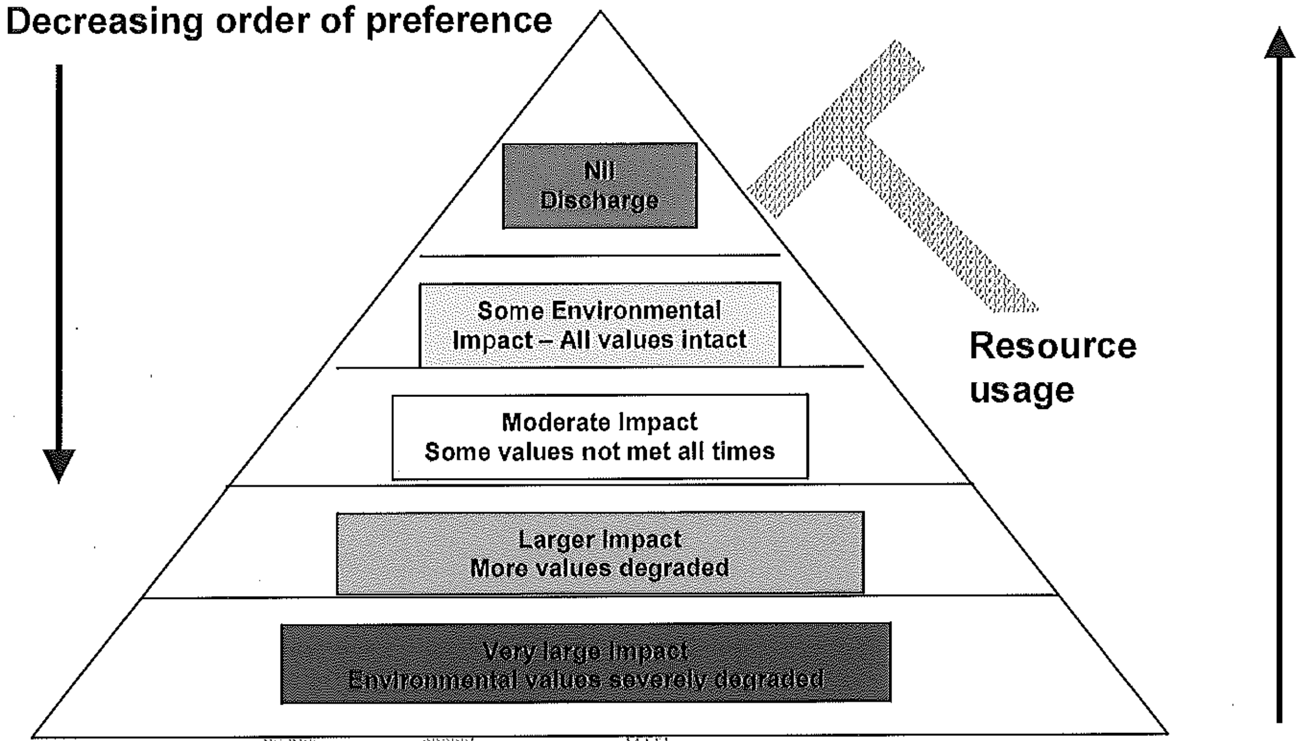


Figure 1. Decision preference hierarchy

Steps under the waste management evaluation procedure include:

Waste avoidance - Preventing the generation of waste water or reducing the amount of waste water generated.

Examples of practices for achieving avoidance include:

- input substitution;
- increased efficiency in the use of raw materials, energy, water or land;
- process redesign;
- product redesign;
- improved maintenance and operation of equipment; and
- closed-loop recycling.

Waste water re-use

Examples include:

- applying waste water to land in a way that gives agricultural and ecological benefits; and
- substituting waste water for potable water as input to a production process.

Waste recycling - Treating waste water that is no longer useable in its present form and using it to produce new products.

Energy recovery from waste - Recovering and using energy generated from waste.

Waste disposal - Disposing of waste water, or treating and disposing of waste water in a way that causes the least harm to the environment.

Examples of treatment before disposal include:

- employing a bio-treatment;
- employing a physico-chemical treatment (e.g., evaporation, drying, calcination, catalytic processing, neutralisation or precipitation); and
- blending or mixing waste to obtain a compound or mixture.

Examples of disposal include:

- disposal to storage dams.

B. Waste water assessment - contaminants, re-use, recycling, treatment and release, monitoring information

The following information should be included in applications involving waste water release to waters or land:

- source(s) of waste water;
- the key waste water contaminants released under steady state conditions, by concentration and load for key indicators. Identification of any toxicity concerns from the initial assessment and the inclusion of any screening results from direct toxicity assessment;
- the waste water avoidance measures incorporated in the process design and the waste water re-use, recycling and treatment proposals. The waste water disposal options considered prior to the final design should be included -- please attach diagram(s) of the treatment plant or process;
- quantitative comparisons of the above waste management measures with best practice environmental management for the activity;
- the proposed average, maximum and minimum daily and weekly volumes to be discharged, and maximum hourly discharge rate;
- the proposed times of discharge (and whether continuous or intermittent), wet weather and dry weather flow variation;
- the proposed diffuser details and the stated tidal or flow conditions of the waste water release;
- the facilities for measuring the volume or rate of discharge and for waste water discharge monitoring. List the proposed monitoring frequency and the indicators to be monitored;
- the name of the waters proposed to receive the waste water discharge and a plan or map showing the spatial location and latitude and longitude of the discharge outfall;
- the proposed impact monitoring program on the effect on the receiving environment (water or land) of the waste water release, specifying the proposed location of monitoring points (relative to the coordinates of the discharge outfall), the frequency of monitoring and the indicators to be monitored;
- the results of any investigations into the effects of waste waters discharged to land or receiving waters (please attach reports); and
- investigations assessing pre-development groundwater contamination should be in accordance with http://www.ephc.gov.au/pdf/cs/cs_01_inv_levels.pdf and

  http://www.ephc.gov.au/pdf/cs/cs_06_groundwater.pdf.

2. Receiving waters assessment – character, resilience and values of the receiving environment

This Section informs Sections 2.2, 2.3 and Section 3 of the Operational Policy

2.1 What EVs and WQOs and levels of aquatic ecosystems protection apply?

Environmental values (EVs) for waters

The EVs of waters to be enhanced or protected are listed in the documents in Schedule 1 of the EPP Water. For waters not listed in Schedule 1, the EVs are in the *Queensland Water Quality Guidelines 2006* (the QWQGs).

Water quality objectives (WQOs) - to protect or enhance the EVs for waters

The WQOs for a water are contained in the documents listed in Schedule 1. For waters not listed in Schedule 1, the WQOs are the set of water quality guidelines from the QWQGs and the Australian *Water Quality Guidelines for Fresh and Marine Waters 2001* for all indicators that will protect all EVs for the water.

Where do I find the information?

- For waters that are listed in Schedule 1 of the EPP Water the EVs and WQOs are available from the EPA website. The Schedule 1 documents for the water include the EVs and WQOs for different water types (upland and lowland freshwaters, upper, mid and lower estuarine waters, enclosed and open coastal waters, wetlands, lakes and reservoirs), the levels of aquatic ecosystems protection (HEV, SMD or HD) and river basin/sub-basin plans in jpeg format. Alternatively CD copies are available on request by emailing EPA.EV@epa.qld.gov.au, calling the free-call 1800 177 291 or contacting the local EPA office.
- For waters **that are not listed** in Schedule 1 of the EPP Water the Queensland Water Quality Guidelines provide EVs and WQOs for all other water types (see above) for Queensland regions/sub-regions. The default level of aquatic ecosystems protection is slightly to moderately disturbed. Both CD and printed copies are available on request as advised above. Note that the ANZECC Water quality guidelines for fresh and marine water quality provide concentration levels for indicators not included in the Queensland Water Quality Guidelines (for example, toxicants.). Other guidelines may also be relevant (for example food standards and recreation), see below and Section4.1.
- **Water quality guidelines are also available on-line through e-Guides,** refer Section 4.1. The current version contains:
  - ANZECC 2000 Water Quality Guidelines;
  - ANZECC 2000 Monitoring & Reporting Guidelines;
  - NHMRC 2005 Recreational Guidelines;
  - Queensland Water Quality Guidelines; and
  - Coastal CRC Users' Guide to Indicators for Monitoring.

Users can select the document that they would like to manually browse, or select the 'search' tab to search all the guides for key words. The searched items can be viewed, copied to another document or printed out for later reference. E-Guides are available on request from water.tools@epa.qld.gov.au.

Spatial datasets and metadata are available for:

- EPA staff through *Ecomaps* - Environment and Conservation category. Schedule 1 documents are available through the EPA Intranet system ROBIN (Fast find/EVs) or the QWQGs (link above);
- EPA GIS staff through Enterprise GIS ('O' drive). Schedule 1 documents as above;
- Other State Government Departments and Local Governments may access spatial data through the Queensland Government *Infolink*, accessible through the *GovNet* homepage at http://wwwhost.env.qld.gov.au/HomePage/GovNet.htm. Schedule 1 documents for the specific waters are available through the EPA website or the QWQGs (link above); and
- Consultants, stakeholders and members of the public, CD copies containing the spatial datasets, metadata and the EPP Water Schedule 1 documents are available on request through the EPA Environmental Information Systems Unit, by email from data.coordinator@epa.qld.gov.au or by telephone (07) 3227 6447.

Notes

1. The EPA has developed Queensland water quality guidelines (QWQGs) based on the ANZECC scientific principles and management protocols. The QWQGs are:

- based on data collected from un-impacted Queensland reference sites, that are listed in Appendix F (by region, site name and location (latitude and longitude.) The QWQGs are derived from the 20th and 80th percentiles of the reference sites' data - the 80th percentiles are used where high values of an indicator cause problems (e.g. nutrients or chlorophyll-a); the 20th percentiles where low values cause problems (Secchi depth) and both the 20th and 80th percentiles where high or low values could cause problems (pH and DO);
- given for different water types, to the limit of Queensland waters (three nautical miles). Water types include open and enclosed coastal waters, lower, mid and upper estuarine waters, lowland and upland fresh or riverine waters, freshwater lakes and reservoirs, wetlands and groundwaters; and
- based on geographic regions and subregions (river basins, sub-basins and localised guidelines) for southern, central and northern Queensland watersheds east of the Great Dividing Range.

2. The level of protection (for aquatic ecosystems) means the level of aquatic ecosystem condition that the water quality objectives for that water are intended to achieve. The stated levels of aquatic ecosystem protection are:

- Level 1 - High ecological value (HEV)— effectively unmodified or highly valued aquatic ecosystems;
- Level 2 - Slightly to moderately disturbed (SMD) — aquatic ecosystems in which biological diversity has been adversely affected by human activity to a relatively small but measurable degree; and
- Level 3 - Highly disturbed (HD) — measurably degraded aquatic ecosystems of lower ecological value.

2.2 Receiving water quality information sources

Water quality information:

- informs strategic planning and development assessment - assessing current condition and trends in water quality;
- provides raw data to a range of client groups and the general public;
- informs the spatial and temporal variability that provides a basis for assessing compliance with the EPP Water and the Queensland Water Quality Guidelines;
- informs the development of reference values for Queensland waters; and
- informs regional environmental monitoring programs e.g. the SEQ Ecological Health Monitoring Program, and State of Environment reporting.

Water quality information sources include:

The Queensland waterways database contains current and historic water quality information from the EPA water quality monitoring program. The database includes monthly monitoring from more than 500 (mostly estuarine) sites across Queensland. View a map of the sites monitored in Queensland and click on the area or catchment of interest.

What indicators of water quality are monitored?

Brief indicator descriptions, sampling and determination methods can be viewed here. The range of water quality indicators include:

- physico-chemical indicators (temperature, pH, conductivity, dissolved oxygen, turbidity);
- chlorophyll-a , suspended solids, nutrient concentrations; and
- sediment metal concentrations, plankton samples and faecal coliform (bacteriological) counts.

How do I access water quality monitoring data and published information?

Download published water quality reports and brochures from the website publications page.

For access to the water quality monitoring data please contact the EPA Environmental Sciences Division, Freshwater and Marine Sciences, by emailing water.data@epa.qld.gov.au or telephone 3896 9250. Further information can be obtained at http://www.epa.qld.gov.au/environmental_management/water/water_quality_monitoring

Other sources of water quality information include State and Commonwealth agencies, Local Governments, Queensland Port Authorities, Regional NRM Bodies and industry. Additionally Universities (particularly the University of Queensland, Griffith University, Central Queensland University and James Cook University of North Queensland), the Australian Institute of Marine Science, the CSIRO Division of Land and Water and the SEQ Healthywaterways Partnership conduct research projects that may inform water quality assessment.

Specific information sources include:

- Department of Natural Resources and Water (NRW) which collects, manages and delivers data on the quantity and quality of fresh water in the State's rivers and aquifers. NRW operates and maintains networks across the State to monitor:
    - quantity and quality of surface water;

  - groundwater quantity and groundwater quality; and
  - sediment transport and aquatic ecology.

  Data access is via NRW website the Stream Gauging Stations Index using stream name, or gauging station number. The water monitoring program operates under a certified quality management system at Water monitoring data collection standards. The validated field data is entered into easy access databases using formats specified in the Water monitoring data reporting standards.

- NRW State of Rivers projects provide 'snapshots' of the ecological and physical condition of Queensland riverine systems. Survey information for specific rivers is at *State of the Rivers* report. Condition ratings include riparian vegetation condition, aquatic vegetation and habitat condition, recreational and conservation value.
- Local Governments throughout Queensland which conduct water quality monitoring programs, including recreational (biological) monitoring.
- Great Barrier Reef Marine Park Authority which conducts lower estuarine and coastal water quality monitoring.
- Regional Environment Monitoring Programs (REMPs) that are supported collaboratively by State and local government and industry in parts of the State, including Trinity Inlet, SEQ/Moreton Bay, Cleveland Bay, the Great Barrier Reef and Port Curtis. In some cases development conditions related to receiving waters monitoring may be addressed by applicants by contributing to such REMPs.
- OzCoast website which includes an estuary database and information on coastal indicators that can be accessed at http://www.ozcoasts.org.au/
- Water Quality Online website which includes products developed as part of the *National Action Plan for Salinity and Water Quality*. It includes water quality assessment tools that can be accessed at http://www.wqonline.info
- Ports Corporation Queensland undertakes water quality monitoring at each of its ports to assess trends in water quality parameters over time. The current program of water quality monitoring commenced in mid-2004 and the links below provide a summary of the results obtained to date. Each file contains a map of the sampling area and locations, as well as the sampling results from; Abbot Point/Bowen. Lucinda. Mourilyan. Thursday Island. Weipa.
- Other information sources include the Department of Primary Industries and Fisheries (declared fish habitat areas under the *Fisheries Act 1994,* mangroves and seagrass mapping), Sunwater, SEQ Water and other water authorities throughout the State.

For further information please search the respective websites or contact the organisations.

2.3 Assessing water quality – for DA and strategic planning

Comparison of ambient or receiving water quality data from site monitoring programs or test data should be made with the WQOs for the waters under the EPP Water, either listed under Schedule 1 or from the QWQGs/ANZECC.

Compliance with the WQOs for all indicators from the Schedule 1 documents for the specific waters (and water types) is assessed by comparing the annual median value for each indicator and site with the WQOs for the water - at the stated level of aquatic ecosystems protection.

In the second case compliance is assessed by comparison with the water quality objectives from the QWQGs/ANZECC for relevant regions/subregions/catchment level information. Compliance is assessed for all indicators by comparing the annual median value for each indicator, by site and water type against the QWQGs/ANZECC guideline values.

In both assessment cases the level of level of aquatic ecosystem condition that the water quality objectives for that water are intended to achieve should be determined from either the Schedule 1 document for the waters, or from the QWQGs in conjunction with planning designations for impacted or downstream waters (e.g. marine park/national park, fish habitat areas, significant wetlands (Ramsar/Directory of Important Wetlands etc.))

Assessment of sample or test data against the WQOs for the waters

Median, 20th and 80th percentile values for each indicator at each sample site, or test data from model predictions, are compared with the WQOs as follows:

- If the median value of the sample or test data falls within the water quality objectives (less than the WQOs for nutrients, suspended solids, turbidity or chlorophyll-a; greater than the WQO for Secchi depth; less than the maximum and greater than the minimum for pH and dissolved oxygen), the water quality objectives are met and the waters are ecologically healthy; or
- If the median value of the sample or test data is not within the water quality objectives, but the 20th or 80th percentile is within the water quality objectives (20th percentile less than the WQO for nutrients, suspended solids, turbidity or chlorophyll-a; 80th percentile greater than the guideline for Secchi depth; 20th percentile less than the maximum guideline or 80th percentile greater than the minimum guideline for pH and dissolved oxygen), the waters are slightly/moderately impacted (SMD waters) with some signs of poor ecological health; or
- If both the median value of the sample or test data *and* 20th or 80th percentile values fall outside the water quality objectives (20th percentile greater than the WQO for nutrients, suspended solids, turbidity or chlorophyll-a; 80th percentile less than the guideline for Secchi depth; 20th percentile greater than maximum or 80th percentile less than minimum for pH/dissolved oxygen), the water quality objectives are not met and the waters are moderately/heavily impacted (HD waters).

Compliance can be assessed by producing box plots of the sample or test data (using the median values, the 20th and 80th percentiles and the highest and lowest values (not outliers) for comparison with the WQOs for the waters. Refer to Figure 2 below.

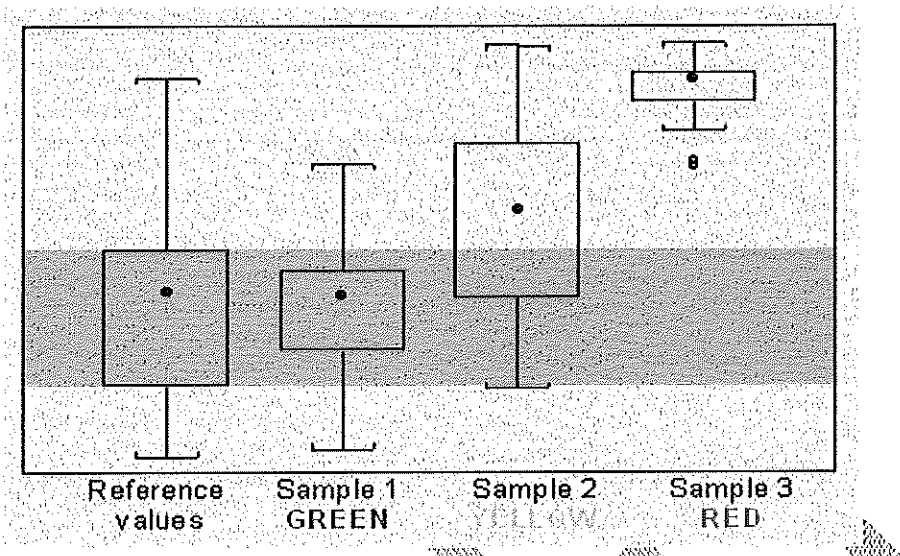


Figure 2. Box plot presentation of sample or test data against WQOs

Green: WQOs are met. Median value of sample or test data is within WQOs –.sample/test site is ecologically healthy/slightly impacted.

Yellow: Median exceeds WQOs, but 20th or 80th percentile is within the WQOs – sample/test site is sightly/moderately impacted with some signs of poor ecological health.

Red: WQOs not met. Median and 20th or 80th percentile exceeds WQOs – sample /test site is moderately/heavily impacted.

Integrated assessments of sample or test sites against the WQOs for the waters

Integrated assessment combines the results from the individual indicator/site assessments as follows:

Criteria			Result
	All sample or test sites green?	Yes	Green
			Yellow
	More sample/test sites yellow than green?	Yes	Yellow
	Any sample/test sites red?	Yes	Red
			Red

Notes

1. The S-PLUS statistical software package, or equivalent, to produce box plots for water quality assessment is the preferred method for sample/test data presentation and comparison with WQOs. S-PLUS software is available for EPA staff - contact the EPA Water Policy and Partnerships Unit by email at EPA.EV@epa.qld.gov.au, or telephone 1800 177 291.

2. The above assessment, based on annual medians, is not relevant for assessing the likely impact of toxicants, short term releases or pulse events on aquatic ecosystem values - refer to the ANZECC guidelines (via e-Guides) for approaches to these issues.

2.4 Assessing the contribution of multiple discharges to receiving waters

In assessing receiving water quality, the current condition reflects discharges from the whole catchment - including point source emissions, urban diffuse source emissions and rural diffuse source emissions. The relative contributions from the various emission sources should be understood in the assessment of applications for further waste water discharge or in strategic planning; particularly for slightly to moderately disturbed (SMD) waters without assimilative capacity or highly disturbed (HD) waters (that have no assimilative capacity.)

Possible information sources on existing waste water discharges to waters within a given catchment include:

- the EPA point source database and licensing database that provide information on existing point source discharges (quality/quantity/location);
- the results of compliance inspections conducted in specific areas of the State that may provide additional information on point source emissions and particular waterways/catchment issues;
- Local Government may have catchment level information on urban diffuse emissions;
- Healthy waterways strategies (including water quality improvement plans) and Regional NRM Plans may provide whole of catchment information, including rural and urban diffuse emissions; and
- EPA internal reports (via ROBIN) and external research publications via the Internet; also refer to Section 2.2.

2.5 Waste water discharge to ephemeral streams – ecological and hydrological impacts

Discharge of waste water to temporary streams requires special consideration due to their unique hydrological and ecological characteristics. The importance of maintaining water quality in the small number of permanent pools in ephemeral streams during naturally dry stages includes the protection of these habitats as refugia for aquatic species during the dry season. Waste water emissions during naturally dry stages are likely to disrupt the natural ecology and impact the aquatic ecosystem, and continuous or semi-continuous discharges of waste water should be avoided. Wet weather discharges of waste water should occur when receiving water flows are sufficient, from a risk based assessment, to maintain the water quality objectives of the receiving waters. (Data from any adjacent upstream gauging station may assist in determining the release period.) Feasible disposal alternatives should be investigated, including minimising the production of waste water, reuse opportunities and retention for discharge during wet conditions. Specific mine water disposal issues of a 'one-off' nature would be considered on a case-by-case basis with the administering authority.

Receiving water quality objectives should be based on the most appropriate local reference data collected from same stream above the discharge, or in an adjacent stream not affected by waste water discharges. Monitoring data should ideally cover the wetting stage as well as recessional or pool stages. In the absence of suitable reference data, default values from the Queensland and ANZECC Water Quality Guidelines should be adopted.

Information on methods to assess ephemeral stream water quality is available from
http://www.acmer.uq.edu.au/research/attachments/FinalReport TempWatersSep20042.pdf

The discharge of waste water may also have adverse impacts on the hydrology of temporary and permanent surface receiving waters. The impacts relate to the volume and velocity of discharge relative to natural flows and may include bed and bank erosion and changes to the particle size distribution of sediments. Other effects may occur on biota where there is insufficient time to complete life cycles due to changed flow regimes. As a guide, modelling of flow characteristics should be considered where the waste water flow exceeds 10% of the natural flow of the waterway.

2.6 EPA guidelines - sampling / experimental design / sample analysis / data analysis and pre-development water quality monitoring

The EPA Water Quality Sampling Manual, at http://www.epa.qld.gov.au/environmental_management/water/water_quality_monitoring/publications/, is to be used by relevant parties in deciding sampling, sample analysis and statistical analysis requirements under the EPP Water, including when:

- taking samples, or making tests and measurements; or
- preserving and storing samples, or performing analyses on samples; or
- performing statistical analyses on the results of sample analyses.

Manual methods or the S-PLUS statistical software package, or equivalent, should be used to produce box plots for water quality assessment of sample or test data against water quality objectives.

Where pre-development water quality monitoring is required:

- the QWQGs recommend the taking 18 samples to provide estimates of median, 20th and 80th percentiles at a reference site, refer to section 3.4.3.1 and Figure 3.4.1. As a minimum samples should be collected over a period of at least 12 months and cover seasonal variations, on the understanding that further samples would be collected to meet the recommended number of 18. Note the ANZECC Water Quality Guidelines recommend the taking of 24 samples to estimate the above percentiles at a reference site; and
- The Australian Guidelines for Water quality monitoring and reporting 2000 informs baseline studies that measure change, including the *Multiple Before After Control Impact* (MBACI) experimental design. MBACI examples detecting environmental impacts of marine aquaculture are at http://www.bio.usyd.edu.au/SOBS/TEACHING/ecol_04/marine/CAS%202004%20marine%20ecology%20lecture%2011.pdf.

The above protocols also inform the baseline studies required under the EPA Operational Policy *Waste water discharge to Queensland Waters* in demonstrating '*an equivalent outcome of no, or negligible, change to the physico-chemical, biological, habitat and flow attributes beyond natural variation of HEV waters, excepting, in limited circumstances, within a defined initial mixing zone measured near the waste water release outfall location. The intent is that beyond the mixing zone boundaries, current environmental quality is maintained and the aquatic ecosystem is conservatively protected over time, taking into account the precautionary principle.*" Appendix 6.4 of the Operational Policy, Application of MBACI design for HEV water assessment, provides further information.

Note

The method of assessing 'no change' to the physico-chemical, biological, habitat and flow ecosystem attributes of high ecological waters is given in the Queensland Water Quality Guidelines 2006 (Appendix D Compliance assessment protocols.)

2.7 Predicting the impacts of the proposed waste water discharge on the receiving waters

This Section informs Section 2.3 and Section 3 of the Operational Policy

When is predictive water quality modelling required to ascertain the impact from the proposed waste water discharge?

All development applications or environmental authority applications proposing waste water discharge to waters must quantitatively assess the impacts on the receiving waters.

- Where the assessed environmental risk of the proposed discharge is low (on the basis of toxicity assessment and contaminant load), the scale is small and spreadsheet calculations or simple box modelling indicates the increase in contaminant concentration does not exceed of the WQOs for the receiving waters, then more detailed predictive water quality modelling is not likely to be required. This circumstance may include a proposed discharge involving a small volume of waste water containing one or two well-studied contaminants at concentrations only several times greater than the well mixed mid/lower estuarine receiving waters. Refer to Attachment 2 to Section 2. Assimilative capacity must exist for the contaminant (that is the WQOs are not exceeded.)
- Commensurate with increased scale and risk, and including where the receiving waters are of high ecological value, the use of more complex predictive water quality modelling will be required to evaluate receiving waters impacts. Predictive modelling outputs would include the assessments over a range of input conditions or scenarios. Test data output should be analysed and compared with the existing receiving water quality and the WQOs of the receiving waters using box plots, refer Section 2.3.

What models / techniques should be used?

- **Mixing zone models** are used to assess water quality impacts from point source discharges. The most commonly used mixing zone model is Cormix available through the USEPA website is a water quality modeling and decision support system designed for environmental impact assessment of mixing zones resulting from waste water discharge from point sources. Although US focused, the compilation of mixing zone documents provides good background information.

  Mixing zone guidance includes:

  - to protect EVs, outfall diffusers would normally be required to ensure a minimum initial dilution level under the stated tidal or flow conditions (i.e. release during stated parts of the tide or above stated freshwater flows);
  - the maximum lateral dimension of the mixing zone should be the lesser of 50m diameter or 30 percent of the waterway width for riverine and estuarine waters; and a radius not exceeding 100m from the diffuser port for coastal waters;
  - boundaries of adjacent mixing zones be at least 200m apart, cumulative impacts should be assessed;
  - compliance with receiving water quality objectives should be met within 3 stream widths or 300m from the diffuser port, whichever is the smaller; and
  - application is primarily to toxicants. Nutrients should be assessed in terms of equilibrium concentrations at a certain distance (for example 300m) from the discharge port.

- **Catchment models** typically simulate the flows and loads of suspended sediment, total phosphorus and total nitrogen from freshwater catchments with consideration of land use, rainfall, soil characteristics, vegetation cover etc. Flows and loads are routed through stream networks, typically to the tidal limits of estuaries. Catchment models are available from a number of sources including CSIRO Land and Water, eWATER CRC and Regional NRM Groups.
- **Receiving water quality models** for estuaries and embayments are specific and complex models that simulate the hydrodynamic and water quality variations in the water body subject to external inputs. Receiving water quality models enable scenario modelling of water quality to be undertaken to predict the likely impacts of contaminants. Receiving water quality models are available through major consultant organisations for specific parts of the State, and are required to be used for significant projects.
- **Box models for estuarine water quality modelling** provide a simple computational framework that may be used to determine contaminant load estimates (e.g. N and P). Box models are relatively straightforward, available through most consultant organisations or may be developed for the estuarine waters of interest. A simple box model of steady state increase of contaminant concentration is at Attachment 1 to Section 2.

2.8 Considering the results of water quality assessments in accordance with the Operational Policy

Development applications and environmental authority applications proposing to discharge waste water to receiving waters should provide information to characterise the receiving environment and predicted impacts of the proposed discharge of waster water in accordance with sections 2.1 to 2.7 above, and in summary as follows.

- Environmental values, water quality objectives, water types and levels of aquatic ecosystem protection for the receiving waters should be provided, preferably with spatial datasets including application details and relevant overlays (e.g. protected estate and constraints mapping).
- Waste water contaminant assessment, discharge and monitoring information – refer Attachment to Section 1.
- Existing receiving water quality and ecological health information should be sourced and collated to include riverine, estuarine and coastal waters and the broadest range of indicators and indicator values.
- Future planning intent for the catchment and associated waters should be determined.
- Conduct baseline water quality monitoring for HEV waters, and as required for SMD/HD waters. Use agreed experimental design to establish pre-development water quality at control sites and proposed impact sites:
  - The QWQGs provide guidance on the number of site samples and time period to establish baseline development water quality, refer also to Section 2.6; and
  - The EPA Sampling Manual informs sampling techniques and sample analysis requirements. Sample data statistical analysis should include the calculation of median values, 20th and 80th percentiles and data outliers, by indicators, by sample sites for a given water type. Box plot presentation is preferred.

- All applications must quantitatively assess the impact of the proposed waste water discharge on receiving water quality. Information on the proposed waste water discharge contaminants (indicators concentrations and loads) should be provided. Depending on the degree of risk, scale and initial estimates of contaminant concentration increases above background, predictive modelling may be required.
- Collate test data or site sample data on existing water quality. Use S-PLUS statistical analysis software or equivalent, comparing site sample data or site test data with the WQOs for the water type for key indicators.
- Use box plots to present data and develop integrated water quality assessments (GREEN, YELLOW and RED ZONES) to provide an evidence base that informs the subsequent analysis in accordance with the EPP Water:
    - **Green:** Median of site sample data and test data is within WQOs – sample or test sites are ecologically healthy/slightly impacted, WQOs are met prior to, and post the proposed discharge of the waste water;
    - Yellow: Median values of site sample data or test data exceeds WQOs, but 20th or 80th percentile is within the WQOs – sample /test site is sightly/moderately impacted site; and
    - Red: Median of site sample data or test data and 20th or 80th percentile exceeds WQOs – sample or test site is moderately/heavily impacted. WQOs are not met by the existing water quality. Further decline in water quality would be expected with additional discharge.

Assessment and decision making guidance

In assessing and deciding applications for development approval and environmental authority, the administering authority must comply with any relevant EPP requirement, consider the standard criteria and other prescribed matters. **That is, the assessment and decision making processes are determined by consideration of multiple criteria – not single criterion.** Refer to Endnotes 1, 2 and 3 for further detail.

The current EPP Water includes statements of policy about assessment and decision making that resulted from consultation on the Regulatory Impact Statement for the *Environmental Protection (Water) Amendment Policy No 1 2006* (the EPP (Water) AP). These are described in the corresponding Explanatory notes and summarized in the EPA Operational Policy:

- For proposed waste water discharge to HEV waters there should be no impact beyond the mixing zone (minimized to the greatest extent) and where practicable environmental offsets used to provide a net environmental gain to the receiving waters (refer Section 3 Environmental Offsets). Some assimilative capacity is preserved for future ESD.

  Note that mixing zone considerations apply to all environmental management decisions involving waste water discharge to surface water in accordance with s18 of the EPP Water; considerations include the use of diffusers, limiting the size of the mixing zone and releasing waste water under stated tidal or flow conditions.
- For GREEN ZONE assessment - proposed discharge of waste water to SMD waters with assimilative capacity (WQOs met prior to and post the discharge):

    - seek to maintain current water quality, through innovative and proactive discussions working in close partnership with the applicant to investigate on feasible alternatives to waste water discharge - refer to the waste management hierarchy for guidance at the Attachment to Section 1);
    - retain some assimilative capacity for future ESD; and
    - limit non-compliance to the mixing zone, minimised to the greatest extent.
- For RED ZONE assessment - proposed discharge of waste water to SMD and HD waters that do not meet the WQOs (prior to or post the waste water discharge – i.e. the waters have no assimilative capacity for the discharge):
    - in constructive partnership with the applicant, seek innovative and proactive alternatives to waste water discharge (refer to the waste management hierarchy); and
    - consider the use of environmental offsets if there are no feasible alternatives to discharge.
    - Analyse key contributors discharging to catchment waters to understand the existing major emission sources. (Unrelated to the application being assessed, discussion with the Regional Manager may consider initiating a *strategic compliance management plan* involving area and industry sector inspection programs towards longer term improvements in receiving water quality).
- For YELLOW ZONE assessment - Median values of site sample data or test data exceeds WQOs, but 20th or 80th percentile is within the WQOs:
    - **Assess as above** - recognising there is no assimilative capacity in respect of the non-compliant water quality indicators and considering the use of environmental offsets where there is no feasible alternative to discharge. If the discharge will not affect a non-compliant indicator e.g. discharge of sediment where water clarity and any relevant biological indicators are met, assess as per green zone.

Endnotes

1. The *Environmental Protection Act 1994* (EP Act) s73A, AA, B and C informs the assessment of development applications for chapter 4 activities (other than for mining or petroleum activities), wherein the administering authority must comply with any relevant Environmental Protection Policy requirement and must consider the standard criteria of schedule 3 of the EP Act and additional information given in relation to the application. (This section does not limit the Integrated Planning Act (IPA), section 3.3.15 or chapter 3, part 5 (Decision stage) or division 2 (Assessment process) of that Act).

Section 73B of the EP Act specifies the conditions of any development approval that may and must be imposed; including s73B (1) subject to the Integrated Planning Act s3.5.30 (conditions must be relevant or reasonable), the administering authority may impose the conditions on the development approval it considers are necessary or desirable and (2) the conditions must include any condition the authority is required to impose under an EPP requirement.

2. In assessing and deciding applications for environmental authority (mining activity) for level 1 mining projects, under s 193 the administering authority may in granting the application impose the conditions on the draft environmental authority it considers necessary or desirable.

In deciding whether to grant or refuse the application or to impose a condition the authority must:

(a) comply with any relevant Environmental Protection Policy requirement; and

(b) subject to paragraph (a), consider the application documents for the application, the standard criteria, the wild river declaration for the area—to the extent the application relates to mining activities in a wild river area, any suitability report obtained for the application and the status of any application under the Mineral Resources Act for each relevant mining tenement.

3. The standard criteria under Schedule 3 Environmental Protection Act 1994 means:

(a) the principles of ecologically sustainable development as set out in the 'National Strategy for Ecologically Sustainable Development'; and

(b) any applicable environmental protection policy; and

(c) any applicable Commonwealth, State or local government plans, standards, agreements or requirements; and

(d) any applicable environmental impact study, assessment or report; and

(e) the character, resilience and values of the receiving environment; and

(f) all submissions made by the applicant and submitters; and

(g) the best practice environmental management for activities under any relevant instrument, or proposed instrument, as follows—

(i) an environmental authority;

(ii) an environmental management program;

(iii) an environmental protection order;

(iv) a disposal permit;

(v) a development approval; and

(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

(i) the public interest; and

(j) any applicable site management plan; and

(k) any relevant integrated environmental management system or proposed integrated environmental management system; and

(l) any other matter prescribed under a regulation.

Attachment 1 to Section 2

Box Model estimation of steady state increase in total nitrogen concentration

Question – What is the steady state increase in total nitrogen concentration in a "box" of water given a constant daily load and a first order decay due to denitrification?

Conservative assumptions include:

- No advection
- No dispersion
- Tidal prism based on neap tidal range

Other assumptions include

- Losses due to denitrification – first order decay with a rate constant K_T of 0.05 day^{-1} (derived by John Bennett from modelling work on Southeast Queensland estuaries.)

The basic relationship is

$$\frac{d\,\text{Total N}}{dt} = \text{Load TN} - K_T\,\text{Total N}$$

i.e. the change in total nitrogen (TN) (kg) wrt. time is the load of TN (kg/day) minus losses of TN due to denitrification

<u>Calculating tidal prism in ML</u>
Determine areal extent (m^2) of waters upstream from discharge point.

Obtain data from site inspection/map/field visit. Distance upstream is limit of tidal influence for small streams. For large streams, use mean tidal velocity for an average tide (m/s) multiplied by time of tidal cycle e.g. 6hrs X 60min X 60secs for 2 tides/day.

Calculate the tidal range under neap tides (m) from local tide data.

Tidal prism ML = areal extent (m^2) X depth (m) /1000

In this case, 40m wide X 3000 m long X 1.0m mean neap tide difference/1000

➔ **Tidal prism = 120 ML**

<u>Calculating aquaculture daily load of total nitrogen (TN)</u>

Daily Discharge in m^3 = 5% of growout pond volume
= 0.05 X 6 X 5000m^2 X 1m
= 1500 m^3

Daily Discharge in ML = discharge in m^3 /1000
= 1.5 ML

Max Daily Load TN (kg/day) = daily discharge (ML/day) x concentration TN (mg/L)
= 1.5 X 0.6
= 0.9 kg/day (Scenario 1)

<u>Calculating the change in total N (ΔTN)</u>

The Basic Relationship again is

$$\frac{d\ \text{Total N}}{dt} = \text{Load} - K_T\ \text{Total N}$$

Under steady state, change in Total N wrt. time is zero, therefore:

$$\frac{d\ \text{Total N}}{dt} = \text{Load} - K_T\ \text{Total N} = 0$$

transforming the equation gives:

Total N (kg) $= \dfrac{\text{Load (kg day}^{-1})}{K_T\ (\text{day}^{-1})}$ (Note from above, K_T (day^{-1}) value is a given factor)

= 0.9/0.05
= 18 kg

This is the steady state additional mass of TN in the tidal prism (i.e. the box) caused by the discharge

Calculating the change in total N concentration (ΔTN)

ΔTN mg/l = mass TN (kg) /volume (ML) of the tidal prism
= 18/120
= 0.15 mg/L

Assessing Impact

Add predicted increase in TN mg/L (i.e. 0.15mg/L) to ambient median TN

Scenario A: ambient median TN = 0.36mg/L
Scenario B: ambient median TN = 0.205 mg/L

Compare result to water quality objective for TN: 0.300mg/L

Alternate Scenario

Let's say that the discharge is instead to larger estuary with the following characteristics.

- Average width: 70 m for at least 12 km upstream
- Neap tidal range: same, 1.2 m
- Distance to extremity of tidal influence upstream from farm 20 km
- Average tidal current velocity during neap tides 0.5 metres per second.
- 2 tidal cycles per day i.e. approx. a 6 hour tidal cycle

To recalculate tidal prism:

1. Distance of tidal flow upstream = 0.5 m/sec X 6 hours
   = 0.5 m/sec X 60 X 60 X 6 sec
   = 10800 metres
2. Tidal prism

Tidal prism ML = areal extent (m^2) X depth (m) /1000

In this case, 70m wide X 10800 m long X 1.2 mean neap tide difference/1000
= 907.2 ML

Calculating the change in total N concentration (ΔTN)

ΔTN mg/l = mass TN (kg) /volume (ML) of the tidal prism
= 18/907.2
= 0.02 mg/L

Assessing Impact

Add predicted increase in TN mg/L (i.e. 0.03mg/L) to ambient median TN

Scenario A: ambient median TN = 0.36mg/L
Scenario B: ambient median TN = 0.205mg/L

Compare result to water quality objective for TN: 0.300mg/L

Environmental Protection Agency
www.epa.qld.gov.au ABN 87 221 158 786

Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service

Attachment 2 to Section 2

Steady state calculations – estimation of activity impact

A. Dilution Ratio in Creek Method
Assumptions:
- Constant flow in creek
- Constant flow of discharge
- Calculates ratio of flow in creek to flow in discharge
- Gives a guide to potential dilution available.

[Note: This does not take account of mixing zone impacts]

Assumed flows
- Turtle Creek North – 12.77 cumecs = 12.77 cubic metres per second
- Turtle Creek South – 25.3 cumecs = 25.3 cubic metres per second

Maximum waste water discharge
= 5 ML/day
= 5000 cubic metres per day
= 0.058 cubic metres per sec

Dilution Ratios

Turtle Creek North – 12.77/0.058 = 220:1

Turtle Creek South – 25.30.058 = 436:1

B. Estimated concentration in creek method

To calculate the resultant water concentration the following formula can be used:

$$Cres = \frac{(Qcreek * Ccreek) + (Qdis * Cdis)}{(Qcreek + Qdis)}$$

With:
Cres = *Resultant concentration in the creek in µg/L*
Q creek = *Flow in the creek in (m^3/s) upstream of discharge*
Ccreek = *Concentration in Creek upstream of discharge (µg/L)*
Q dis = *Discharge volume of activity (m^3/s)*
Cdis - = *Concentration in discharge (µg/L)*

Assumptions:
- Constant flow in creek in one direction
- Constant flow of discharge into the creek
- Assumes all mix together
- Note this ignores a mixing zone effect and hence any mixing zone impacts.

Example

Data

Q creek - 12.77 cumecs =12.77 cubic meters per second
Ccreek from data = 0.4 µg/L maximum dissolved copper
Q dis = 0.058 m^3/s
Cdis = 30 µg/L maximum (assume all dissolved copper)

$$Cresulting = \frac{(12.77 * 0.4) + (0.058 * 30)}{(12.77 + 0.058)} = 0.5\ \mu g/L$$

C. Estimated minimum dilution in creek method

Question: What if we want to know what minimum dilution is necessary to meet ANZECC trigger values?

Data

Cresulting = 1.4 (ANZECC criteria for copper)
Q creek - x cumecs = x cubic meters per second
Ccreek from data = 0.4 µg/L maximum dissolved copper
Q dis = 0.058 m^3/s
Cdis = 30 µg/L maximum (assume all dissolved copper)

Substituting from equation above gives:

$$Cresulting = \frac{(x * Ccreek) + (Qdis * Cdis)}{(x + Qdis)}$$

$$\rightarrow \quad 1.4 = \frac{(x * 0.4) + (0.058 * 30)}{(x + 0.058)}$$

$\rightarrow$ Qcreek = 1.6588

Flow in the creek (Q creek) must equal at least 1.6588 cumecs i.e. 1.6588 cubic meters per second if the resultant concentration is not to exceed 1.4 micrograms Cu per litre.

Minimum dilution ratio therefore is:

<u>1.6588 cubic meters per second flow in creek to achieve criteria</u>
Maximum daily discharge = 0.058 cubic meters per second

= 28.6 (rounded off say 29-30 times)

3. Environmental offsets

This Section informs Section 2.4 of the Operational Policy

3.1 What is an environmental offset in the context of waste water discharge?

Environmental offsets (offsets) means the measures taken to counterbalance the negative environmental impacts resulting from a residual waste water discharge that must first be avoided, then minimised before considering the use of offsets for any residual impacts. An offset is to be of a like-kind (i.e. the same contaminant and chemical form) and seeking to deliver a net environmental gain to the receiving waters. Offsets may be located within or outside a development site and should be legally secured.

Offsets will not replace or diminish existing environmental standards or regulatory requirements that must still be met; e.g. a discharge of poorly treated waste water or an activity that failed to incorporate best practice measures could not implement an offset to avoid adopting best practice environmental management. Offsets will not be used to allow development in areas where they could not otherwise occur or be used for purposes not otherwise allowed. They are simply intended be provide another tool that can be used during project design, environmental assessment and implementation to achieve the principles of ecologically sustainable development—the object of the EP Act.

Offsets counterbalance those impacts that still exist despite reduction through best practice waste avoidance, recycling and re-treatment, and adoption of environmentally sound discharge location and release circumstances in accordance with the EPP Water. Offsets should be distinguished from 'abatement measures' which refer to the range of actions that can be undertaken to reduce the level of impacts of a discharge (typically undertaken on-site and by adopting discharge strategies sensitive to environmental conditions).

3.2 When may an environmental offset be required?

The administering authority may require an offset or may approve an offset incorporated in a development proposal in making a decision about an application under the EP Act for a development approval for an environmentally relevant activity or environmental authority for a level 1 mining or petroleum activity. Refer to section 2.0 and 2.1 of the EPA Operational Policy. The policy intent is that for:

- HEV waters, where practicable the application includes a like kind environmental offset proposal - counterbalancing the discharge of residual waste water (the discharge) from the proposed ERA; and
- SMD and HD waters with no assimilative capacity, environmental offsets (offsets) may be considered by the administering authority where there are no feasible alternatives to residual waste water discharge.

For the purposes of the EPA Operational Policy, environmental offsets will not apply to SMD waters where assimilative capacity exists. Refer to the Operational Policy Section 2.3.4 Assimilative capacity and sustainable load. By definition HD waters have no assimilative capacity.

In all cases an environmental offset condition must only be imposed where it is considered to be either necessary or desirable in the context of the activity (see EP Act s 73B, 114 and 210). This means there must be a nexus between the offset and environmental protection of the subject waters, and the offset is either a necessary or desirable additional measure that assists in achieving the object of the EP Act.

Note
The Australian Government Department of Environment and Water Resources is addressing the use of environmental offsets in approval conditions under the EPBC Act, when a proposed development impacts on a matter of national environmental significance that is protected by that Act. When finalised, EPBC Act requirements should be considered in conjunction with this Operational Policy.

3.3 Queensland Government Environmental Offsets Discussion Paper

The consideration of environmental offsets is in accordance with the principles in the discussion paper on a proposed Queensland Government Environmental Offsets Policy, that are listed below.

- *Environmental impacts must first be avoided, then minimised before considering the use of offsets for any residual impacts.*
- *Offsets will not be used to allow development in areas where they could not otherwise occur, or for purposes not otherwise allowed.*
- *Offsets must achieve an equivalent or better environmental outcome.*
- *Offsets must provide environmental values as similar as possible to those being lost.*
- *Offsets must be provided with a minimal time-lag between the impact and delivery of the offset.*
- *Offsets must provide additional protection to values at risk or additional management actions to improve environmental values.*

3.4 Information on the development of an acceptable offsets proposal

In developing an offsets proposal under the EPA Operational Policy, offsets must be:

Enduring—they must offset the impact of the development for the period that the impact occurs. Where there is an approved increase in residual waste water discharge over time, a commensurate increase in offset quantity is required. Where the onset time is delayed, the offset will need to generate a larger amount of contaminant reduction in later years to balance any shortfall in the early establishment period. Development conditions or environmental authority conditions will specify the maintenance and monitoring requirements for the offset to ensure the achievement of the net environmental gain to the receiving waters over the life of the project.

Quantifiable and Monitored—the proposed environmentally relevant activity (ERA) discharge load increase and the counterbalancing offset load reduction must both be able to be measured or estimated with a reasonable level of confidence. Where the offset involves land-use change impacting on diffuse source contaminants, it is likely to be difficult to determine precisely the actual amount of pollution abated. In this case, measurement using a protocol agreed beforehand with the administering authority would be required. Measurement of baseline loads before implementation of the offset in accordance with the protocol would typically be included. Sound estimation tools should be based on the best available science and an acceptable level of understanding of how the offset measures work.

To measure the success of environmental offsets in delivering the desired environmental outcome, it is necessary that offset performance is monitored and audited, and the results included in reporting to the administering authority.

Targeted and located appropriately—they must offset the impacts on a 'like-for-like' basis (like kind offsets) of the same chemical type and form and be located appropriately. Offsets must impact on the same (receiving) waters and use offset ratios to achieve environmental equivalence between the proposed ERA discharge and offset sources. The administering authority will advise priority catchment locations for rural diffuse offsets.

Potential offset sources should discharge the same type and chemical form of contaminant and to the same waters as the proposed ERA discharge. In some cases a contaminant will be present in more than one form. For example, phosphorus is comprised of both soluble and non-soluble forms and most sources discharge a combination of these forms. As offset opportunities are considered, the form of the contaminant being discharged should be identified to ensure that offsets represent an equivalent impact on water quality.

The fate of a contaminant is also an important consideration in evaluating impacts. For example although an activity may discharge non-soluble phosphorus, if the environmental conditions result in indirect impacts these must also be considered (e.g. discharge to stratified receiving waters that solubilise phosphorus.) The applicant should establish:

- the type and form of the major contaminant proposed in the residual waste water discharge;
- catchment offset sources that discharge the same type and form of the contaminant;
- the impacts of concern for the contaminant and any variation based on different chemical forms; and
- the potential for differential impacts from the various forms of the contaminant.

Suitable—discharge contaminants that may be suitable for management by offsets include nutrients (nitrogen and phosphorus), sediment (TSS and TDS), organic carbon or other contaminants where the scientific basis can be demonstrated and the contaminants do not have human health impacts, irreversible environmental impacts or unacceptable biota impacts.

Criteria to determine if a particular contaminant is suitable for management by offsets include:

- the contaminant contributes to a chronic, cumulative environmental impact (load effect), not an acute, localized impact (concentration effect)—toxicants are not appropriate;
- practical off-site pollution abatement measures are available to remove the contaminant elsewhere in the catchment; and
- practical tools are available to measure or estimate diffuse and point source loads of the offset contaminant, including existing baseline loads before ERA discharge and the offset measures commence.

Contaminants such as pathogens, most heavy metals and other contaminants that are toxic, at very low levels, to humans and the environment cannot be addressed using offsets.

The Attachment to Section 3 informs phosphorus, nitrogen and sediment suitability for management by offsets.

Enforceable—the applicant is responsible for ensuring that the offset is implemented diligently and maintained in a proper and effective manner. The applicant must identify how offsite elements will be implemented. Where the applicant is not the owner of the land subject to the offset, evidence of owner consent should be included in the application and ongoing use of the land for offset activities. The location of the offset (lot and plan numbers) must be included in the Offset Agreement.

Supplementary—offsets must have been specifically proposed for the offset purpose and be beyond current regulatory requirements.

The offsets proposal must also consider financial assurance—the administering authority has discretion under Chapter 7 Part 6 of the EP Act, and applicants should discuss the possible requirement during pre-design conferencing with the administering authority. It is reasonable that any financial assurance be drawn down as offsets are progressively implemented.

3.5 Determining environmental equivalence of offsets at different discharge points - offset ratios

The application of an equivalence (or offset) ratio seeks to account for contaminant reductions (offsets) made at different points within a catchment and to ensure that the impact of the offsets from designated locations or areas are equivalent to the proposed ERA residual waste water discharge.

Offset ratios must be greater than 1:1

An offset ratio determines the quantity of contaminant that a proposed offset must reduce for each kilogram of contaminant emitted in the residual waste water discharge. The offset ratio 3:1 means that 3 kilograms of contaminant are offset for every 1 kilogram of contaminant discharged. Offset ratios account for:

- the policy intent for the management of HEV, SMD and HD waters (refer section 2.0 of the EPA Operational Policy);
- the scientific uncertainty in estimating the loads of contaminant emitted by the ERA proposal (the load being offset) and the load reduced by the offset actions; and
- the spatial, temporal, chemical and bioavailability differences between the contaminants released and offset.

Table 1 provides default offset ratios that may be used to provide a reasonable level of confidence that the contaminant discharge is offset. The default ratios are consistent with offset / trading ratios used nationally and internationally for a range of contaminants, refer http://www.environment.nsw.gov.au/resources/framework05260.pdf and http://www.epa.gov/owow/watershed/trading/traenvrn.pdf. Different default ratios may be needed to address the project contaminants and locality issues, and should be discussed at pre-design conferencing.

Table 1: Default offset ratios

Emission source of ERA contaminant	**Emission source of offset contaminant**	**Ratio (offset : impact)**	**Basis of ratio** (Offsets are in the same waters or different water types *upstream* of the ERA contaminant discharge.)
Point	Point	1.5:1	A 1:1 ratio is the minimum needed to achieve a nil net discharge. The ratio also reflects the risk and uncertainties of achieving the offset measure and to achieve a net environmental gain to HEV waters or SMD/HD waters not meeting WQOs.
Point	Diffuse (rural)	3:1	As above. In addition, the ratio has been increased to account for the greater uncertainty in achieving and quantifying rural diffuse offsets, in-stream processing effects and spatial, time and bioavailablity differences.
Point	Diffuse (urban)	3:1	As above.

Notes to Table 1

1. Table 1 provides **minimum default offset ratios** that may be used for point and diffuse offsets to waters in the same catchment. The ratios assume knowledge of the proposed ERA residual waste water discharge, over time, and the conduct of monitoring programs to inform offset compliance.

2. Applicants may choose to develop project specific offset ratios, based on catchment and offset modelling, for consideration by the administering authority. Where offsets are proposed to be implemented in waters of **adjacent catchments with common receiving waters**, this must be agreed with the administering authority at pre-design conferencing and the offset ratios determined from catchment and offset modelling.

3. Proposals to include **rural diffuse offsets** assumes the restoration or re-establishment of degraded riparian or wetland habitats, or other land management actions, according to priorities advised by the administering authority at pre-design conferencing.

4. Proposals to include **urban diffuse offsets** from either new or existing urban development should also be according to the priorities advised by the administering authority. (The use of modelling techniques to demonstrate treatment train effectiveness in reducing contaminant emissions from both existing and new urban development will be required by the administering authority. Note that with respect to new urban development, offset proposals would be required to address contaminants remaining after the application of best practice environmental management for urban stormwater.)

5. **Downstream offsets**. SMD and HD waters that have no assimilative capacity for the proposed ERA residual waste water discharge contaminants will show further deterioration in current condition and for HEV waters the natural values of HEV waters will not be maintained. Localized contaminant impacts post the ERA discharge may be exacerbated in riverine waters with low flows and/or a high capacity for contaminant retentiveness or in extended estuaries with limited tidal flushing. The adoption of downstream offsets in different water types (i.e. the offset is located in a different water type that is downstream of the proposed ERA discharge) has limited ability to address the policy intent of preventing further degradation and reversing the declining trend in water quality or maintaining natural values. Accordingly, the adoption of downstream offsets in different water types does not contribute to achieving the policy intent and is not considered suitable.

Offsets for proposed ERA residual discharge in riverine waters should be in the same water type, using the minimum default offset ratios as in Table 1.

3.6 Determining riparian and wetland buffer widths

The Department of Natural Resources and Water's *Regional Vegetation Management Codes* under the *Vegetation Management Act 1999* for the relevant Queensland bioregions (available through the website at www.nrm.qld.gov.au) should be used as **default buffer widths to re-establish degraded watercourse riparian or wetland function** — providing the offsetting contaminant load reduction to receiving waters by preventing bank erosion and filtering sediments, nutrients and other contaminants from stormwater run-off.

In the context of this Operational Policy the codes are used to provide default buffer widths — equivalent to the buffer widths under the codes to be retained in the clearing of vegetation to prevent loss of riparian function. Extracts in Table 2 below are for information only and reference must be made to the appropriate Queensland bioregion code for case-by-case assessment. Examples of degraded and functioning riparian buffers are at Figure 3.

Table 2 Default riparian and wetland buffer widths

Performance requirement	**Buffer width**
To re-establish degraded watercourse riparian or wetland function.	Guideline buffer widths to re-establish degraded watercourse riparian and wetlands function — shown below as ***bold/italics/underlined text***.
Watercourses To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes — remnant vegetation associated with any **watercourse** is protected to maintain — a) **bank stability by protecting against bank erosion**; b) **water quality by filtering sediments, nutrients and other pollutants**; c) **aquatic habitat; and** d) **wildlife habitat.**	***Buffer width*** Clearing does not occur — a) in any watercourse; b) within ***200 metres from each high bank of each watercourse with a stream order 5 or greater***; c) within ***100 metres from each high bank of each watercourse with a stream order 3 or 4***; and d) within ***50 metres from each high bank of each watercourse with a stream order 1 or 2***.
Wetlands To regulate the clearing of vegetation in a way that prevents the loss of biodiversity and maintains ecological processes — remnant vegetation associated with any **significant wetland** and/or **wetland** is protected to maintain — a) **water quality by filtering sediments, nutrients and other pollutants**; b) **aquatic habitat; and** c) **wildlife habitat.**	***Buffer Width*** Clearing does not occur — a) in any wetland; b) in any significant wetland; c) within ***100 metres from any wetland***; and d) within ***200 metres from any significant wetland***.

Alternatively, applicants may conduct site based modelling studies acceptable to the administering authority to determine **riparian and wetland buffer widths** for Queensland bio-regions; e.g. the CSIRO Land and Water at http://www.clw.csiro.au/publications/technical99/tr32-99.pdf. In either case (i.e. default or site specific study) the riparian vegetation structure design must restore full ecological function; e.g. according to CSIRO Land and Water management objectives at http://downloads.lwa2.com/downloads/publications_pdf/PN061234_34-36.pdf.

Best practice environmental management includes fencing to exclude stock at least 5m upslope from the top of the bank, ensuring the bank is fully vegetated, incorporating a grass strip filter of the design width (but at least 15m) between the stream and the land use, adding an additional width equal to the height of the bank where this is greater than 15m, and including 30m or three widths of native trees/shrubs along the top of the bank.

Note that determining the buffer length to satisfy offset load requirements will require case by case land use and locality assessment, as prioritised by the administering authority. Site based modelling will be required.

Figure 3 Examples of degraded and effectively managed riparian zones © Photographs CSIRO Land and Water

Attachment to Section 3

A. Offset suitability for phosphorus

Sources of phosphorus include point sources such as waste water sewage treatment plants and diffuse sources such as agricultural activities. Phosphorus discharges and in-stream concentrations can be readily measured and the contaminant is relatively stable as it travels through waterways. As a result, water quality equivalence can be established between offset load reductions and ERA load increases.

Contaminant forms. Phosphorus forms include:

- Soluble phosphorus, as dissolved ortho-phosphates, that is more bioavailable than nonsoluble forms.
- Non-soluble sediment-bound or particulate-bound phosphorus, that is not as likely to promote rapid algal growth but has the potential to become biologically available over time.

The concentration of total phosphorus is based on the sum of the soluble and non-soluble phosphorus. Due to phosphorus cycling in a waterbody (conversion between forms), offsets should consider total phosphorus expressed in terms of annual loads as a common metric with ERA discharge loads.

Actual forms of phosphorus being discharged should be identified to establish an equivalent impact on water quality. E.g., if offset reductions have substantially divergent chemical form to ERA discharges (e.g., one primarily discharges soluble phosphorus while another primarily discharges non-soluble phosphorus) then the two may not be environmentally equivalent. Most diffuse phosphorus from grazing/rural lands is sediment-bound, non-soluble phosphorus and from irrigation/horticulture in soluble form.

Impact. Excessive phosphorus concentrations have both direct and indirect effects on water quality. Direct effects include nuisance algae growth. Indirect effects include low dissolved oxygen, elevated pH, cyanotoxins from blue-green algae production and trihalomethane in drinking water systems.

Phosphorus **fate and transport** in waterways are well understood. The phosphorus "retentiveness" of a waterway describes the rates that nutrients are used relative to their rate of downstream transport. Areas of high retentiveness are usually associated with low flows, impoundments, dense aquatic plant beds and heavy sedimentation. Offsets that involve phosphorus discharges through these areas will likely require higher offsets to achieve water quality equivalence. In areas with swift flowing water and low biological activity, phosphorus is transported downstream faster than it is used by the biota, resulting in low levels of retentiveness and minimal aquatic growth. In reaches where phosphorus is transported rapidly through the system, lower offsets may be required.

Timing. The key consideration for phosphorus offsets is the seasonal load variability amongst emission sources. Agricultural diffuse source loadings will vary seasonally, with greater loadings likely during the growing season and during storm events associated with soil runoff. Point sources generally discharge continuously.

Refer *Water Quality Trading Assessment Handbook, US EPA, November 2004* available at http://www.epa.gov/owow/watershed/trading/handbook/docs/NationalWQTHandbook_FINAL.pdf.

B. Offset suitability for nitrogen

Anthropogenic sources of nitrogen discharging to receiving waters include point sources, such as waste water treatment plants and industrial discharge, and diffuse sources from agricultural activities and rural lands. Human activity has had an important influence on nitrogen cycles causing an increase of mobilized nitrogen. In particular nitrogenous fertilizer use has increased nitrogen input to receiving waters since widespread use began in the 1950's. In addition, both natural and human disturbances of natural ecosystems (e.g., forest fires, forest clearing) can contribute significant quantities of biologically available nitrogen to receiving waters.

Nitrogen discharges can be measured or calculated and tracked along a waterway.

Contaminant forms. Nitrogen forms include:

- Organic nitrogen that refers to nitrogen contained in organic matter and organic compounds, and may include both dissolved and particulate forms. Sources of organic nitrogen include decomposition of biological material, animal manure, soil erosion, waste water treatment plants and some industries. Organic nitrogen is not available for aquatic plant uptake, but over time organic forms may convert to inorganic, bioavailable forms.
- Inorganic nitrogen that includes nitrate ($NO3^-$), nitrite ($NO2^-$), ammonia (NH3) and ammonium ($NH4^+$). The primary sources of inorganic nitrogen are mineralized organic matter, nitrogenous fertilizers, point source discharges and atmospheric deposition. Inorganic nitrogen is bioavailable.

Total nitrogen is typically calculated based on the total load - it is assumed that all of the organic nitrogen will become bioavailable within a relevant time period. Offsets are based on total nitrogen load.

Impact. The effects of excessive nitrogen include those related to eutrophication—such as habitat degradation, algal blooms, hypoxia, anoxia and direct toxicity effects. While nutrient and eutrophication impacts associated with excess phosphorus may be more commonly of concern in freshwater systems, nitrogen is generally the limiting nutrient in marine environments and thus has a greater impact in estuarine systems. Some forms of nitrogen may pose particular problems; including ammonia that can cause localized toxicity problems and high concentrations of nitrate in drinking water may raise human health concerns.

A key consideration in determining offset requirements is to understand the nitrogen loss from the waterway. In addition to nitrogen exiting the waterway via irrigation diversions is nitrogen attenuation in the waterway, e.g. vegetation can draw dissolved inorganic nitrogen (NO3 and NH4) from the system. Another form of attenuation involves the process of "denitrification" whereby nitrate is reduced to gaseous nitrogen mainly by microbiological activity. Waterway reaches associated with high denitrification are usually associated with low, shallow flows. If offset nitrogen is mainly in the form of nitrate a (potentially large) portion of nitrogen may not reach the receiving waters and hence higher offset requirements. Conversely, nitrogen loads discharged to swiftly flowing, deep waters will have less opportunity for denitrification and have lower offset requirements.

Another factor important to water quality impacts in estuarine environments is the degree of flushing activity, particularly from tides. For example some estuarine waters may have a low level of tidal activity, mixing, and flushing. It is likely that these zones will retain the nitrogen for long periods of time and may have significant water quality concerns from discharge to such waters.

Timing. Nitrogen offsets are expressed in terms of annual loads as a common metric to ERA discharge loads. While point sources such as WWTPs are likely to have relatively consistent discharge timing, rural diffuse sources will have variable loadings that change seasonally based on land management activities and increased nitrogen levels during periods of high rainfall.

C. Offset Suitability for sediments

Sediment from erosion or unconsolidated deposits is transported by, suspended in, or deposited by water. The erosion, transport and deposition of sediment become a problem when increases in sediment supply exceed the water body assimilation capacity. Sediment problems involve the presence of excess fine sediment such as silt and clay particles that increase turbidity when suspended, and form muddy bottom deposits when they settle. Excessive fine suspended and bedload sediments cause aquatic ecosystem impairments.

Sources. Major sources include soil erosion carried by surface runoff and within-channel erosion of banks and bedload sediments.

In catchments where human activity has markedly increased overland flow and run-off, and in-channel erosion and sediment load, excess sediment may be a common event with resulting impairment. Diffuse sediment sources include streambank destabilization due to riparian vegetation removal, agricultural activities without adequate buffer zones, urban sources during stormwater runoff from construction and permanent land development activities, sand and gravel extraction and road construction and maintenance.

Impacts. Excessive amounts of sediment can directly impact aquatic life and fisheries. Deposition can choke spawning gravels, impair fish food sources and reduce habitat complexity in stream channels. Stream scour can lead to destruction of habitat structure. Sediments can cause taste and odour problems for drinking water, block water supply intakes, foul treatment systems, and fill reservoirs. High levels of sediment can impair swimming and boating by altering channel form, creating hazards due to reduced water clarity, and adversely affecting aesthetics.

Indirect effects include low dissolved oxygen levels due to the decomposition of organic sediment materials and water column enrichment of attached nutrients loads. Elevated stream bank erosion rates also lead to wider channels that can contribute to increased water temperatures.

Contaminant forms. Sediment sources discharge a range of particle sizes and loads based on:

- Suspended or "water column" sediments are particles that are small and light enough to remain suspended in the water column, generally less than 1 mm. Sources discharge two types of these suspended sediments: geological particles, which are derived from rock and soil, and biological particles such as planktons and other microscopic organisms.
- Bedload sediments are generally larger particles that are too heavy to be suspended in the water column. They are discharged by diffuse sources and are transported along the bed of the stream and range in size from fine clay particles to coarse material.

Timing. Sediment delivery to streams from diffuse sources is episodic and rainfall related. Metrics for sediment offsets are expressed as average load per year.

4. Science & Capacity Building

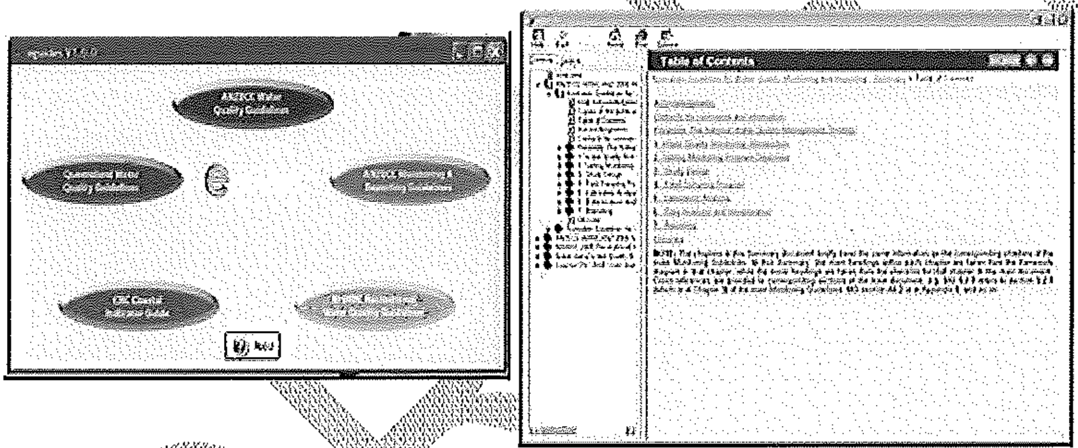
4.1 Decision Support Software

eGuides

eGuide is an electronic document which consists of a number of commonly referred to water quality guideline documents. The current version of eGuides contains the following documents.

- ANZECC/ARMCANZ 2000 Monitoring & Reporting Guidelines
- ANZECC/ARMCANZ 2000 Water Quality Guidelines
- NHMRC 2005 Recreational Guidelines
- Queensland Water Quality Guidelines
- Coastal CRC Users' Guide to Indicators for Monitoring

These documents have been compiled into a standard "HTML" version of Windows help systems (shown below) and can be installed in any personal computer for easy and quick access to information. Users can select the document that they would like to manually browse, or select the 'search' tab to search all the guides for some key words. The searched items can be viewed, copied to another document or printed out for later references. The beta version of this tool has been released and available on request from water.tools@epa.qld.gov.au.

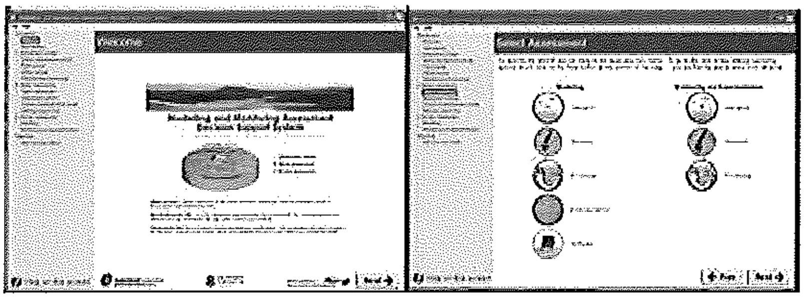


Modelling and Monitoring Assessment Decision Support System (MAMA DSS)

The Modelling and Monitoring Assessment Decision Support System (MAMA DSS) is a decision support tool to help choose and review modelling and monitoring undertaken as part of Environmental Impact Assessments (EIAs). Decision-making about activities in the coastal zone is generally underpinned by information from monitoring and modelling. The DSS is designed to provide a process for choosing and reviewing assessment techniques considering the management objective, the potential pollutants from point or diffuse sources, the features of the environment and the relevant indicators, stressors, and processes.

The DSS is supported by a help system containing information about water quality modelling approaches such as: biogeochemical modelling (also called process modelling), statistical modelling (also called non-process modelling), and monitoring and experimentation methods such as in-field monitoring, autosampling, remote sensing, and experimentation.

The MAMA DSS can be requested from water.tools@epa.qld.gov. Further information on the tool can be obtained from http://www.coastal.crc.org.au/3m/.

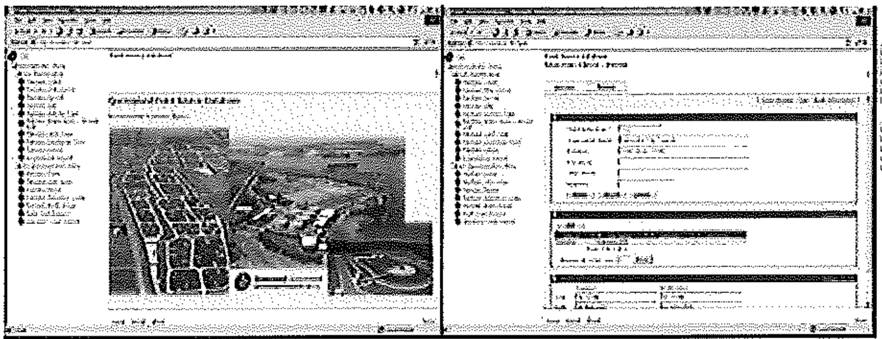


Queensland Waterways Database

The Queensland Waterways Database is a repository for all current and historical water quality monitoring data for Queensland waterways collected by the EPA. Approximately 350 sites across Queensland are monitored every month for a range of water quality indicators. Government agencies, research organisations and community groups use this information to assess the health of Queensland's waterways. Within the agency, water quality data is used in the production of reports, maps and models and to assist in compliance investigations, decision-making and planning.

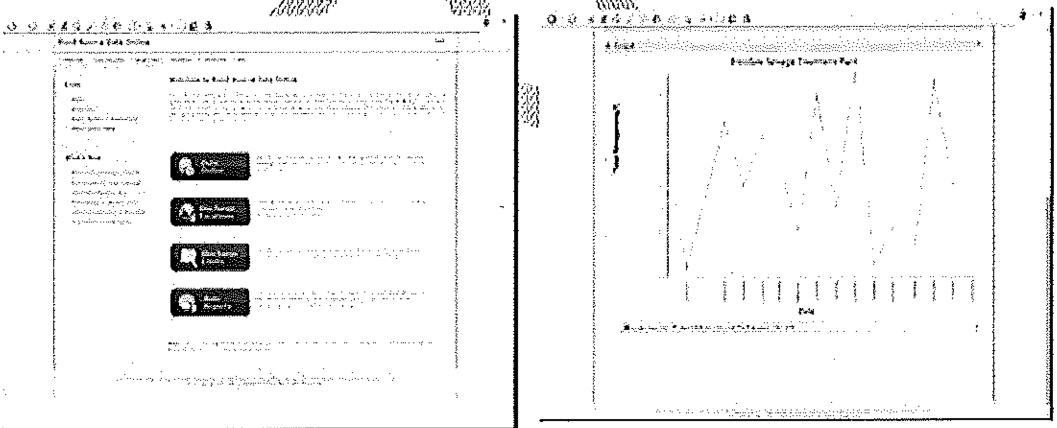
Further information can be obtained by emailing water.data@epa.qld.gov.au or from http://www.epa.qld.gov.au/environmental_management/water/water_quality_monitoring

Point Source Database
Information on licensed discharges to water is monitored as part of licensees' permits issues by the EPA. The EPA's Point Source Database has been developed since 2003 and allows electronic submission, automated checking and storage of data. It is aimed to assist compliance and allow improved access to discharge information for a range of other uses. The database currently contains information on major sewage treatment plants in Queensland but will be extended in the future to all industries with licensed discharges. Further information on the database is provided in Appendix 1.



In addition to monitoring data, licence limits and discharge locations have been collated and are available to EPA staff via Ecomaps (http://mudlark.env.qld.gov.au/website/index.htm). Further information on how to access this layer of Ecomaps is provided in Attachment 2.

A further initiative is Point Source Data (PSD) Online which will provides access to up-to-date information on licensed discharges to waters in Queensland. The current application is a prototype and a beta version should be available EPA in mid 2008. PSD Online will provides access to raw data and graphed data contained in the EPA database. Other features include load estimation and links to discharge locations and licence limits in Ecomap. Instructions on how to use PSD Online will be provided.



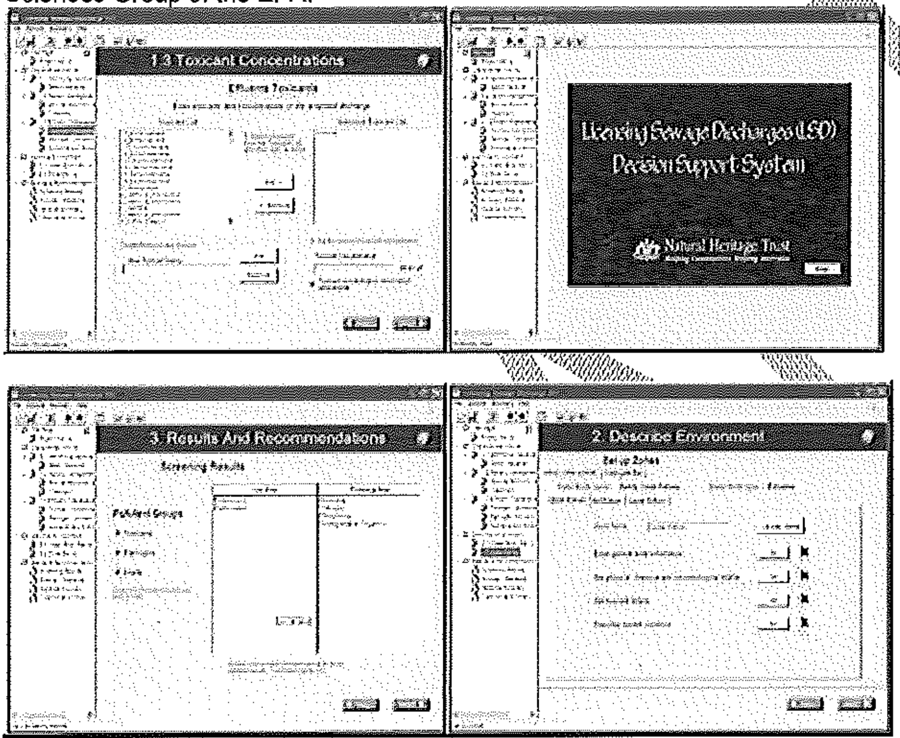
Point source data is available to EPA staff, other organisations and the community on request from water.data@epa.qld.gov.au. Information on the database is available to the public from http://www.epa.qld.gov.au/environmental_management/water/water_quality_monitoring/reporting_of_licensed_discharges_to_waterways/.
For further information, email psd.help@epa.qld.gov.au or contact the Freshwater & Marine Sciences Group of the EPA.

Licensing Sewage Discharges Decision Support System (LSD DSS)

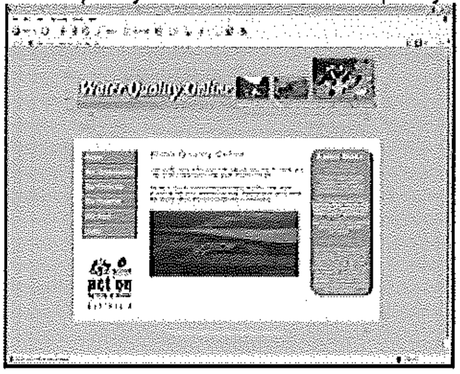
The Licensing Sewage Discharges Decision Support System (LSD DSS) is a support tool for the assessment of the aquatic aspects of proposed discharges from sewage treatment plants. It has been designed to be used by licensing officers in the early stages of screening a licensed application. There is an associated help system that is fully searchable. It includes screen explanations and the knowledge bases on typical sewer pollutants, waste water treatment, risk assessment protocols and relevant water quality guidelines.

The DSS was originally developed by the Queensland Environmental Protection Agency in collaboration with the Environment Protection Authority Victoria and the NSW Department of Environment and Conservation. The latest beta version was produced in collaboration with the e-Water Cooperative Research Centre.

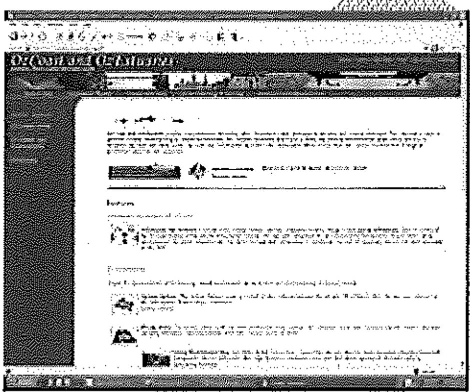
For further information about the DSS please contact water.tools@epa.qld.gov.au or the Freshwater & Marine Sciences Group of the EPA.



Water Quality Online Website
Water Quality Online is a website that contains information on water quality information and products developed as part of the National Action Plan for Salinity and Water Quality for regional managers in Queensland. It includes some of the tools discussed above in addition to a range of other tools that could assist water quality assessment. Water quality online is located at http://www.wqonline.info



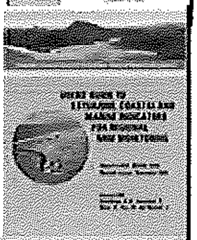
OzCoasts/OzEstuaries Website
The OzCoast and OzEstuaries provides comprehensive information about Australia's coast, including its estuaries and coastal waterways. This information helps to generate a better understanding of coastal environments, the complex processes that occur in them, the potential environmental health issues and how to recognise and deal with these issues. It includes a database on estuaries, information on coastal indicators, geomorphology and geology, conceptual models, the simple estuary response model (SERM) plus more. It can be accessed at http://www.ozcoasts.org.au/.



4.2 Relevant Water Quality Guidelines

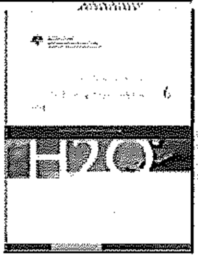
ANZECC & ARMCANZ - Australian and New Zealand Guidelines for Fresh and Marine Water Quality 2000. These guidelines provide substantial information on the nationally agreed approaches and trigger values for the protection of fresh and marine water. The guidelines are available with eGuides described above or can be downloaded from http://www.environment.gov.au/water/publications/quality/ index.html#nwqmsguidelines

ANZECC & ARMCANZ - Australian Guidelines for Water Quality Monitoring and Reporting 2000. These national guidelines present useful information on water quality monitoring covering planning, designing, fieldsampling, laboratory analysis and reporting. The guidelines are available with eGuides described above or can be downloaded from http://www.environment.gov.au/water/publications/ quality/index.html#nwqmsguidelines



The Coastal CRC's User's Guide to Estuarine, Coastal and Marine Indicators for Regional NRM Monitoring, Coastal Zone CRC. These guidelines were designed to assist regional natural resource managers choose indicators when dealing with estuarine and marine environment. It provides substantial information on the stressors and indicators that could be applicable to these environments. The guidelines are available with eGuides described above or can be downloaded from http://www.coastal.crc.org.au/Publications/indicators.html

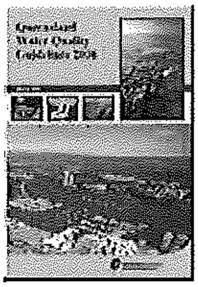
NHMRC Guidelines for Managing Risks in Recreational Waters, endorsed June 2005. These guidelines are the most recently published in Australia for the management of recreational waters. It covers of range of hazards including microbial contamination. It includes a new risk assessment approach including sanatory surveys and new indicators/classifications to assess risks from pathogens. The guidelines are available with eGuides described above or can be downloaded from http://www.nhmrc.gov.au/publications/synopses/eh38.htm.



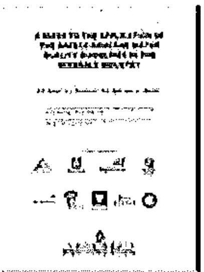
NHMRC Australian Drinking Water Guidelines 2006. The Australian Drinking Water Guidelines (the ADWG) are intended to provide a framework for good management of drinking water supplies. They are concerned with safety from a health point of view and with aesthetic quality. The guidelines are available from http://www.nhmrc.gov.au/publications/ synopses/eh19syn.htm.

Environmental Protection Agency
www.epa.qld.gov.au ABN 87 221 158 786

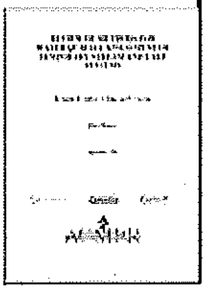
Queensland Government
Environmental Protection Agency
Queensland Parks and Wildlife Service



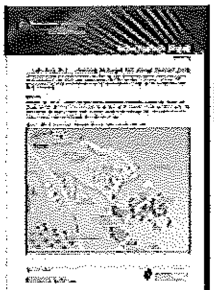
Queensland Water Quality Guidelines, Queensland EPA, March 2006. These guidelines were developed to complement the ANZECC/ARMCANZ Freshwater and Marine Guidelines. It includes site specific trigger values for regions of Queensland based on monitoring data from relevant reference sites. The guidelines are available with eGuides described above or can be downloaded from http://www.epa.qld.gov.au/environmental_management/water/queensland_water_quality_guidelines/#gen0



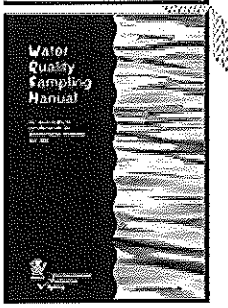
A guide to the application of the ANZECC/ARMCANZ Guidelines in the minerals industry, Australian Centre for Environmental Research (ACMER), September 2003. These guidelines provide advice on the application of the national guidelines to mining industry and includes relevant case studies. More information on obtaining this document is available at http://www.acmer.uq.edu.au/ publications/handbooks.html



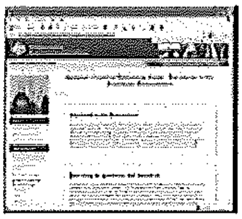
Review of Methods for Water Quality Assessment for Temporary Stream and Lakes Systems, Australian Centre for Environmental Research (ACMER), September 2004. This document provides information on methods used to assess ephemeral streams. The document is available from http://www.acmer.uq.edu.au/research/attachments/FinalReport TempWatersSep20042.pdf



Licensing Discharges from Sewage Treatment Plants, Case Study No.2, EPA. This document provides an example of how EPA licensing officers may apply the agency's Procedural Guide for Licensing Discharges to Aquatic Environments. It involves a large sewage treatment plant which discharges to an estuary. It is available from the EPA's Ecostep system.



Water Quality Sampling Manual, EPA, 1999. This document is the third edition of the Queensland EPA's Water Quality Sampling Manual. It is for used in deciding 'protocols' under section 10 of the Queensland Environmental Protection (Water) Policy 1997 (subordinate legislation 1997 No. 136). It can be obtained from http://www.epa.qld.gov.au/environmental_management/water/water_quality_monitoring/publications/



National Chemical Reference Guide - Standards in the Australian Environment. This is an Australian Government website that provides you with standards for chemicals such as in foods. It is found at http:// hermes.erin.gov.au/pls/crg_public/!CRG_OWNER.CRGPPUBLIC.pStart

4.3 Water Quality Advice & Technical Services

The Freshwater & Marine Sciences Group of the EPA provides services to internal EPA clients on request (see electronic form on requesting services). These services include general advice, review of documents, modelling, field investigations and monitoring services and will typically cover only water quality aspects of a project. In requesting services, you need to clearly state the objective of the project or the problem to be solved staff. Additional documents should be sent via email or post.

The general turn-around time for reviews of EIS/IAS or similar major documents is 10 working days. However, the time required to complete any particular project will depend on the scope of the work and the available staff resources within the group at the time of the request. In general, the Freshwater & Marine Sciences Group will provide staff time on an in-kind basis, subject to director's approval. The requestor should cover any additional project costs, such as analysis costs and airfares.

Contacts for the Freshwater & Marine Sciences Group
Email: water.workrequests@epa.qld.gov.au
Phone: (3896 9250) or fax (38969277)
Postal: Indooroopilly Sciences Centre
EPA (Botany Building)
80 Meiers Road, Indooroopilly
Brisbane, QLD, 4068

Attachment1 to Section 4

The Point Source Database Information Guide for EPA Staff
October 2007
Version 3.0

Overview

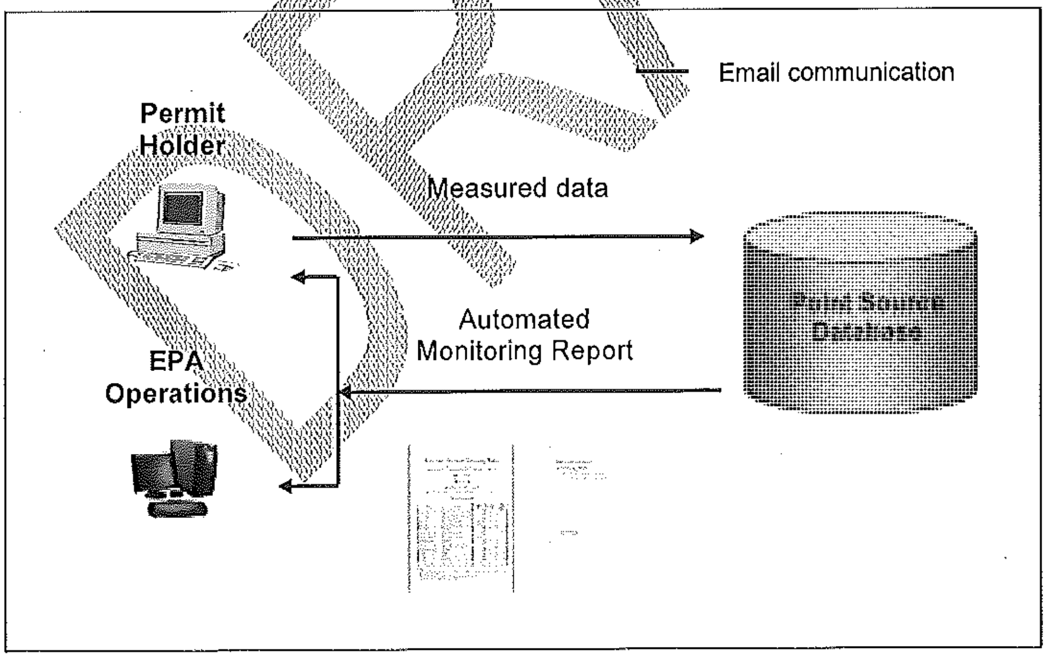
The Point Source Database (PSD) was designed and developed by the EPA to hold monitoring data for discharges to water required under EPA development permits for environmentally relevant activities (ERA's). It allows electronic submission of data and undertakes automated checks of the data against compliance limits. The submitted data can be viewed graphically by EPA staff while discharge locations and limits can be viewed using Ecomaps.

Benefits

The purpose of the PSD is to support compliance although it is not designed to replace notification requirements for non-compliance and incidents as prescribed in development permits. The database will also reduce the time taken by both EPA staff and registered operators in dealing with data requests and improve EPA decisions and projects through providing more complete and up-to-date information. Reporting of point source releases through mechanisms such as State of Environment Reporting, National Pollution Inventory and the Southeast Queensland's Ecosystem Health Report Card will be improved.

For registered operators submitting electronic data to the EPA, the requirement for this data and the related analysis to be submitted with the permit holder's annual return will be waived.

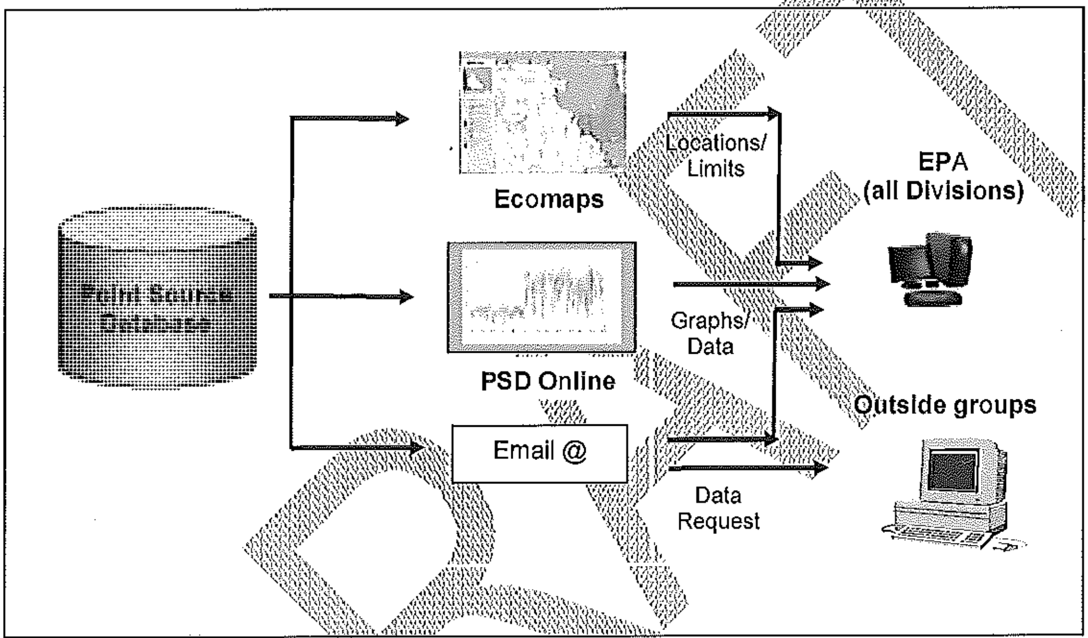
Electronic Submission and Reporting



Environmental Protection Agency
www.epa.qld.gov.au ABN 87 221 158 786

The PSD requires registered operators to prepare a text file of measured data using a specific Excel template and attached this file to an email which is sent to the database. For registered operators of sewage treatment plants, this is currently at least every three months. The email is then received by the database and the file is firstly checked, and if in a correct format, imported into the database. The database then compares the submitted measured data to permits limits that are stored in the database and an automated monitoring report is produced. This provides a summary of results for each permit limit of the release as well as more detailed information on any exceedences – see Automated Monitoring Report for more information. The automated monitoring report is then sent, along with a copy of the submitted data, via email to the specified permit holder's email address and the relevant EPA district office email address.

Getting Point Source Data and Information



Information will be available to EPA staff via Ecomaps, an internal website called Point Source Data Online or on request. The Ecomaps layers contain information on each the facilities, discharge locations and discharge limits. Point Source Data Online will provide direct access to most recent and historical data received by the database either as raw data or through viewing measured data via graphs. The data can be compared directly to permit limits and saved as an Excel file. Point Source Data Online also provides a facility to estimate pollutant loads for each facility based on submitted data. Guidance on accessing the ecomaps layer is provided in Appendix 2 (coming soon for Point Source Data Online). Requests for data or limits/locations can also be made to the Environmental Sciences Division – see contact details below.

External organisations do not have direct access to measured data, graphs, permit limits or discharge locations. However, the Environmental Sciences Division will respond to all reasonable data requests received in writing by an organisation or individual from government, universities, private industry or the general public. Data will generally be provided to partner organisations (those contributing to EPA monitoring programs) free of charge. The EPA will reserve the right to charge a nominal fee for services for any other data request.

Requests for data can also be made from Freshwater & Marine Sciences Group via email (water.data@epa.qld.gov.au). The GIS layer of locations and limits can be requested from the Environmental information Systems Unit via email (data.coordinator@epa.qld.gov.au).

Implementation Overview

The PSD has currently been implemented for all sewage treatment plants greater than 10,000 equivalent persons (ERA 15 (e), (f) and (g) under Schedule 1 of the *Environmental Protection Regulation 1998*) that involve a direct discharge to waters. Historical data for these discharges has been collected, in most cases back to the year 2000. Electronic submission of quarterly data commenced for these discharges in 2007.

The PSD has been initially set up to collect information on direct releases to water. However, flow measurements of "recycled water" leaving the registered operators premises are also being collected for sewage treatment plants. At this stage, flows or quality of waters release to land covered under the permits are not collected or checked against permit limits, although this may be implemented in the future.

The next phase of the implementation will target major industry and the remaining sewage treatment plants, firstly in South East Queensland (SEQ) and then the remainder of Queensland. Some historical data for major industry in SEQ has already been collected.

Guidance to Registered operators

Registered operators participating in electronic submission of data will generally have received a Point Source Database Implementation Manual and attended an information session run by the EPA. The following information is generally provided to the registered operator prior to submission.

The EPA will request participation from a registered operator in writing to submit their data electronically. The registered operator should notify the EPA in writing if they wish to participate. The EPA should also be notified in writing if the registered operator no longer wishes to submit electronic data to the EPA. In this case, reporting and data analysis is required as part of the licensees' annual return and data will need to be provided to the EPA on request. All correspondence with registered operators should be available on the relevant EPA files.

In preparing for electronic submission, the EPA will request the permit holder to provide historical data (preferably back to the year 2000) in an electronic format to the EPA. The data does not need to be in any specific format and existing Excel spreadsheets will suffice as long as they can be easily interpreted. The EPA will then import this data manually into the database. Automated checking of this data against permit limits is not usually undertaken. The data can then be used for data requests and to provide a previous history for assessment of long term limits that are usually up to 12 months when the first automatic submission is received.

Submission of electronic data to the EPA should be done using the templates provided by the EPA for the permit holder's specific plant or based on the EPA's electronic submission guide (available from psd.help@epa.qld.gov.au). The completed templates should be attached to an email as a .CSV file (comma delimited text file) and sent to psd.data@epa.qld.gov.au. For large point source emitters, data should be submitted to the EPA on no less than a quarterly basis and coincide with the end of the financial and calendar years. Data should be submitted for whole calendar months. Data submission will become due one calendar month after the end of the yearly/quarter. The EPA will provide an email reminder to each licensee at this time. Data is to be submitted within thirty days of becoming due.

The provision of correct and accurate data is the sole responsibility of the permit holder and should be undertaken as set out in the development permit/s. The EPA will not be held responsible for submission of incorrect data. If incorrect data has been submitted, please contact the database manager on psd.help@epa.qld.gov.au.

The licensee should provide the EPA with a single generic email address so that all electronic correspondence in relation to the Point Source Database can be emailed to this address. It is the responsibility of the licensee to manage this email address and notify the EPA of any changes.

Registered operators who submit monitoring data required under their development permit/s for the release to water are not required to submit this data or any related analysis with their annual return. However, submission of data to the Point Source Database does not remove an organization's obligation to report non-compliances and incidents as prescribed by their development permit/s.

New Permits or Change to Permit Limits

The PSD contains permit limits for every licensed discharge to water contained in the database. It is essential that these permits limits are kept up-to-date as they are used for automated checking against submitted data. The permit limits are also displayed in Ecomaps, which is currently updated periodically.

Project Managers in the Environmental Operations Division are responsible for notifying the PSD administrators of any new development permits involving a discharge to waters and of any amendments to existing discharge quality limits on a development permit. This is required to be completed prior to submission to the Delegate and the process is included in the standard template "Assessment Report – Environmentally Relevant Activities". If a new permit involving a discharge to waters has been approved and is not currently in the PSD, please contact the Freshwater & Marine Science (email psd.help@epa.qld.gov.au). If you become aware that the permit limits in the database, either from automated monitoring reports or from the layer in Ecomaps, also please contact Freshwater & Marine Sciences.

The PSD current holds information for all permits or amended permits but does not include details of Environmental Management Programs (EMPs). Please notify Freshwater & Marine Sciences if an EMP exists for a permit involved in electronic submission.

Automated Monitoring Report

The EPA will produce an automated monitoring report (see attached sample) when new monitoring data is received from registered operators. A copy of the automated monitoring report and the data submitted will be sent to the relevant EPA Environmental Operations office and to the registered operator. Limit exceeded events are highlighted in the report and correspond to when the monitoring data provided exceeds permit limits. These are provided as a guide but should not be used as the primary basis for non-compliance.

The automated monitoring report is produced for each discharge plant/monitoring point. The report shows the date of submission, a unique return ID allocated by the database, the date period for which the new data have been submitted and the plant/discharge point name. A summary of results is provided in a tabular form with each line corresponding to a different indicator and limit type set out in the relevant permit. The indicators column shows the indicator name and units. The limit type column shows a range of limit types including maximum, range (maximum and minimum), loads, medians and a combination of short-term and long-term percentiles. For medians and percentiles, the limit period over which the limit is applied is shown in the next column and can include numbers of days, weeks or months. The frequency of sampling is not specifically tested by the database. However, the number of data points submitted to the database are counted and presented in the summary report. This allows the reader to scan the column and for those indicators taken at the sample frequency, the number of data points should be the same. Note there are typically more flow data points (typically measured daily) than water quality concentrations.

More detailed information on limit exceedences is provided in the automated monitoring report after the summary table. For each indicator/limit type combination, information is presented on the limit values and the date and values of any exceedences. The time period and samples required for the limit are also shown for medians and percentile limit types.

If the automated monitoring report contains exceedences, it is important to note that this may not be because of non-compliance. The limits in the monitoring report should be checked against current known limits. The limits may not be up-to-date or there may be an Environmental Management Program (EMP) in place allowing higher discharge levels. The data should also be checked. The raw data is provided with the automated monitoring report. Alternatively, data can be obtained or visualised using Point Source Data Online which allows direct comparison against limits. It should be noted incorrect data can be submitted to the database and that the database and online tool may not correctly represent the limit calculations as set out in development permits. Therefore, even if the limits and exceedence appear correct, it is strongly recommended that the registered operator are contacted and provided an opportunity to confirm that the data and the limit exceeded events are correct. The limit exceeded events can also be checked against the non-compliances already notified to the EPA. If the limit exceeded events have not been reported, the registered operators should again be contacted. Based on the response from the registered operators, further actions may be required by the EPA.

Further Information

The Point Source Database is a joint initiative Environmental Sciences and Environmental Operations Divisions. For further information, please contact Freshwater & Marine Sciences on (07) 3896 9250 or psd.help@epa.qld.gov.au.

Sample Automated Monitoring Report

Automated Discharge Monitoring Report

Queensland Environmental Protection Agency

Date: 06/08/2007

Return Id: 845

Data Period: 01/04/2007 - 29/06/2007

***Discharge Point:** Coombabah / GCCCRP2*

Summary Results

Indicator	Limit Type	Limit Period	Data Points in Period	Limit Exceeded Events
BOD 5 (mg/l)	80th percentile (short-term)	5 Weeks	13	0
BOD 5 (mg/l)	50th percentile (long-term)	12 Months	13	0
BOD 5 (mg/l)	maximum		13	0
D.O. (mg/l)	minimum		13	0
Suspended Solids (mg/l)	maximum		13	0
Suspended Solids (mg/l)	80th percentile (short-term)	5 Weeks	13	0
Suspended Solids (mg/l)	50th percentile (long-term)	12 Months	13	0
Faecal Coliforms (CFU/100ml)	80th percentile (1 day)	1 Days	13	0
Faecal Coliforms (CFU/100ml)	median (1 day)	1 Days	13	0
Free Residual Chlorine (mg/L)	maximum		13	0
pH (Unit)	range		13	0
Total Phosphorus (mg/l)	maximum		13	2
Total Nitrogen (mg/l)	maximum		13	0
Total Nitrogen (mg/l)	50th percentile (long-term)	12 Months	13	0
N-NH3 (mg/l)	no limit		N/A	N/A
Total Nitrogen (mg/l)	Annual Load		13	0

Disclaimer

- It is the responsibility of the licensee to ensure samples are taken in accordance with their permit. Refer to permit for more information on limits.
- Although all care has been taken in the development of this report, the results may be incorrect and do not necessarily constitute compliance or non-compliance.
- This report does not constitute notification to EPA of any non-compliance.

1

Indicator	Limit Type	Limit Period	Data Points in Period	Limit Exceeded Events
Total Phosphorus (mg/l)	Annual Load		13	0
Flow (L)	maximum (dry day)		51	0
Flow (L)	maximum (wet day)		39	0

Details of Limit Exceedence

BOD 5 (mg/l), 80th percentile (short-term)
Lower/upper limit: < 15
Time period for limit application: 5 Weeks
Samples required in time period: 5
Date of exceedence (result):
Nil.

BOD 5 (mg/l), 90th percentile (long-term)
Lower/upper limit: < 10
Time period for limit application: 12 Months
Samples required in time period: 52
Date of exceedence (result):
Nil.

BOD 5 (mg/l), maximum
Lower/upper limit: < 30
Date of exceedence (result):
Nil.

D.O. (mg/l), minimum
Lower/upper limit: > 4
Date of exceedence (result):
Nil.

Suspended Solids (mg/l), maximum
Lower/upper limit: < 45
Date of exceedence (result):
Nil.

2

Attachment 2 to Section 4

Point Source Database – New Ecomaps Layers
Version 1.0

Introduction

Two new layers relating to point source discharges have been added to Ecomaps. The two layers are (i) Point source discharge plants and (ii) Point source discharges. They currently contain similar metadata information but have been included as the locations of the plants and the discharges are usually different. The layers shows the location of point source discharges/plants and a description of each including the plant name, ecotrack number, permit reference, Environmentally Relevant Activity (ERA) type, licensee, location details. There is also a link to permit limit details that are the indicators and numerical limits placed on each of those limits in the relevant permit.

This document provides instruction on how to access these layers on Ecomaps that is located at: http://mudlark.env.qld.gov.au/website/index.htm

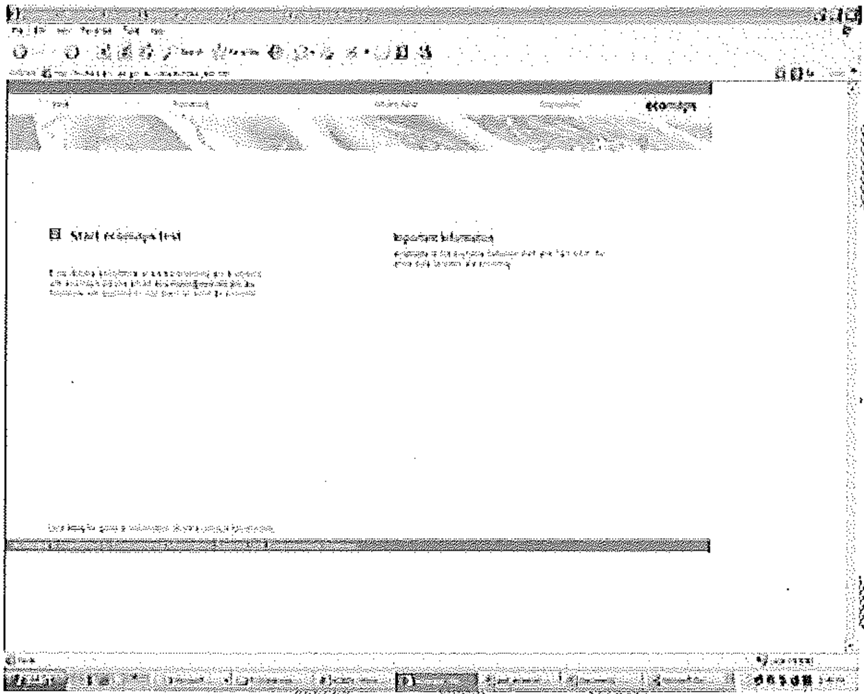
Although all care has been taken with the compilation of the data, please note that the information presented in this layer may contain errors or not be up-to-date. In terms of permit limits, Environmental Management Plans or other statutory mechanisms may be in place that are not recorded on these layers. Please contact the relevant Environmental Operations Office for the most recent information.

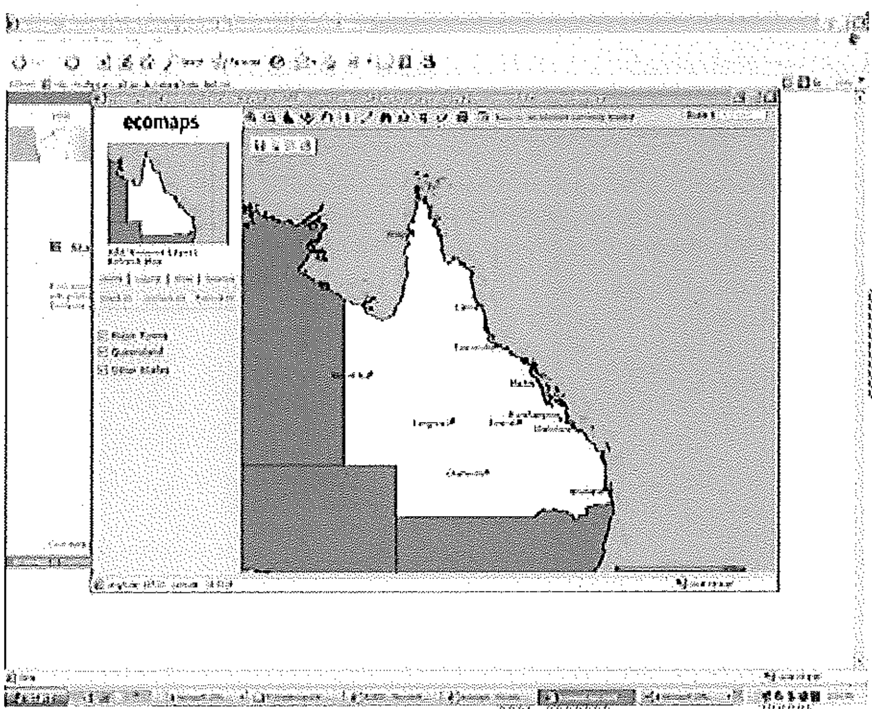
The Point Source Database is a joint initiative Environmental Sciences and Environmental Operations Divisions. For further information or feedback, please contact Freshwater & Marine Sciences on (07) 3896 9250 or psd.help@epa.qld.gov.au.

Instructions

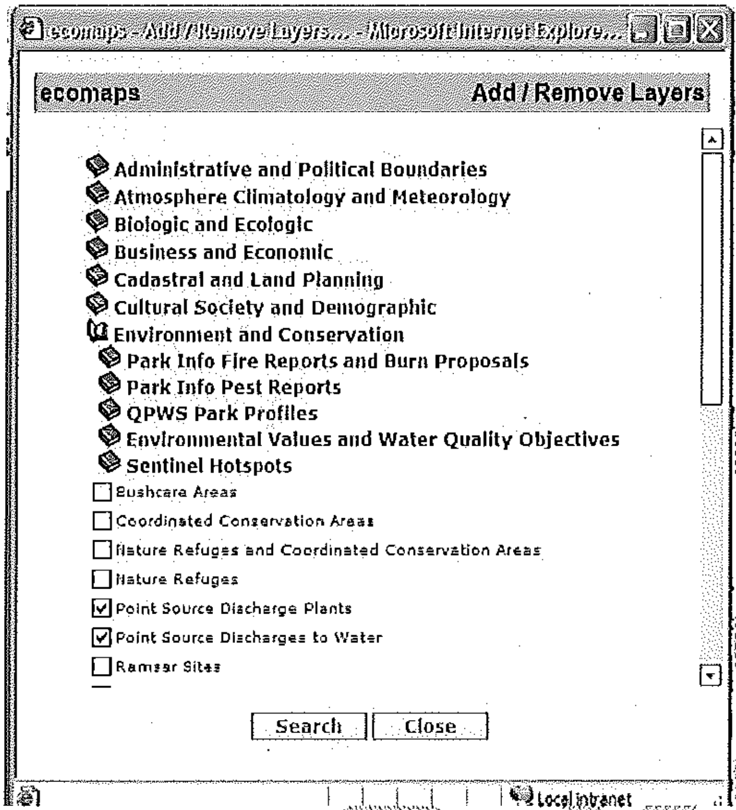
Step 1 – Start Ecomaps using the link and click on Start "ecomaps test"

http://mudlark.env.qld.gov.au/website/index.htm

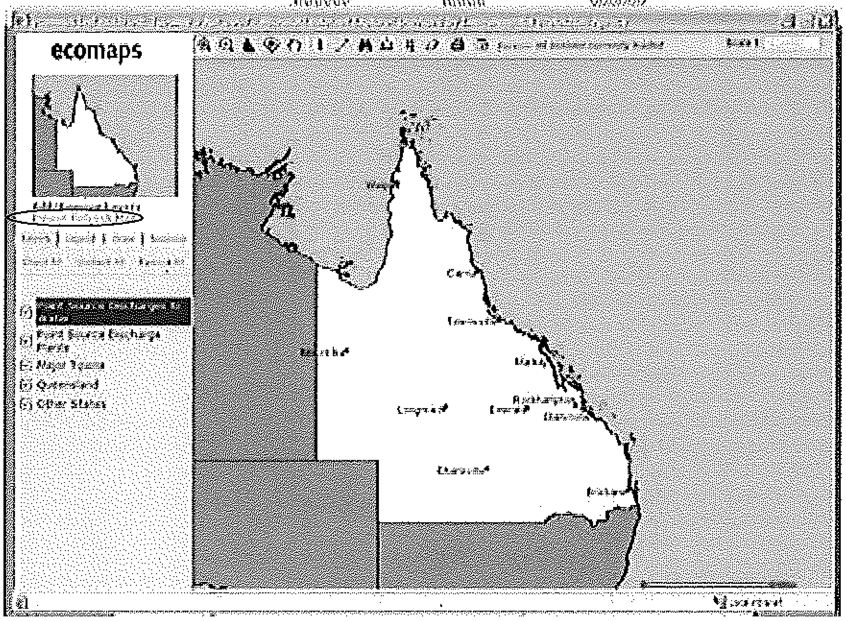




Step 2 – Click on Add/Remove Layers and choose Environment and Conservation. You can click the two boxes related to Point Sources and then Close



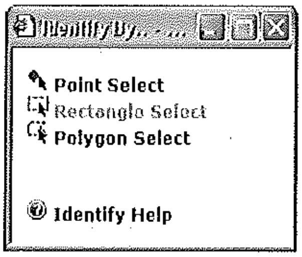
Step 3 – Check both boxes on the main screen and then Refresh Map

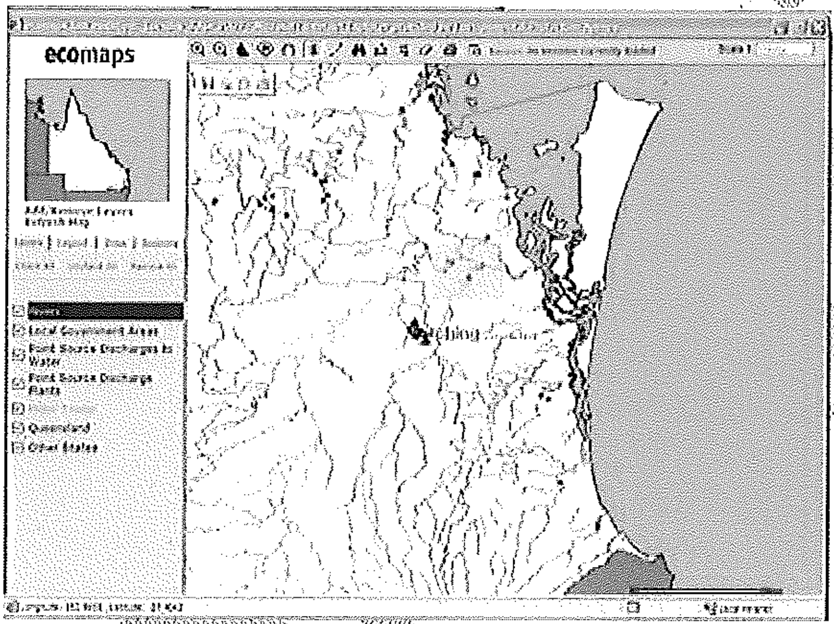


Step 4 – Add any other layers you want such as local government boundaries, rivers etc. and then Refresh Map

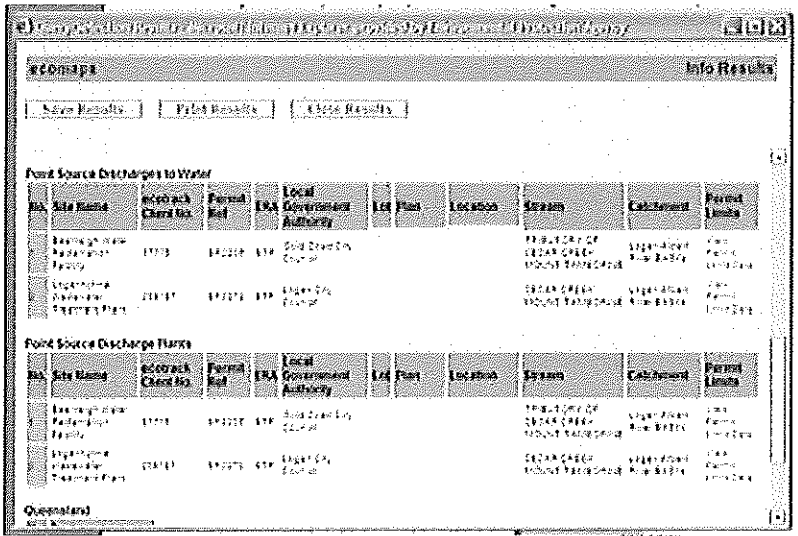
Step 5 – Zoom into some area of choice using the magnifying glass symbol

Step 6 – Click on i symbol and then choose Rectangle Select and select an area

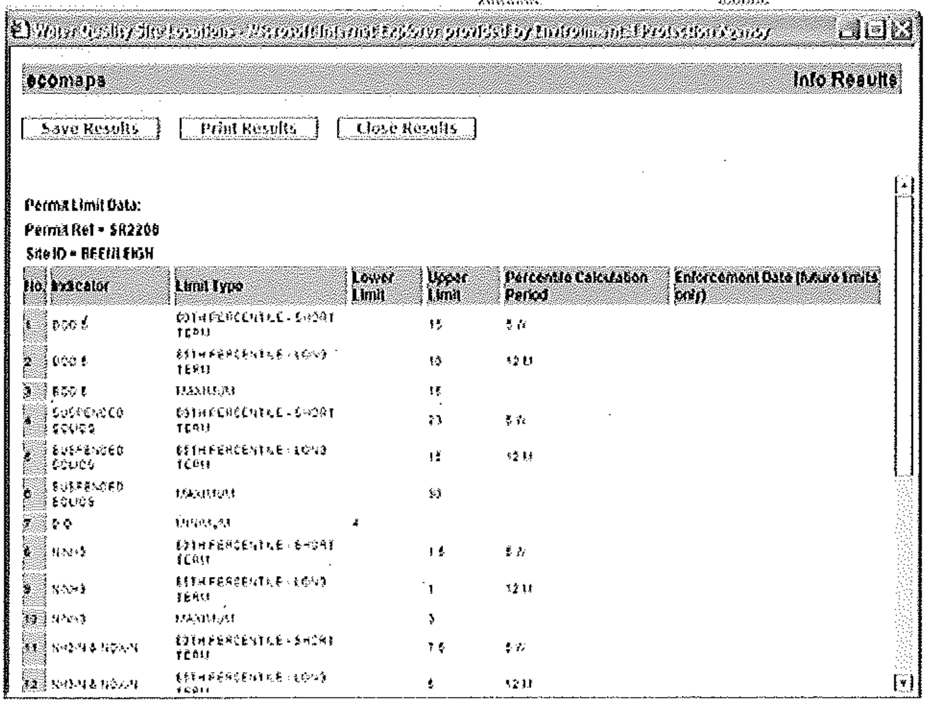




Scroll down till you see the point source information:



Step 7 – Click on View Permit Limit Data for your Plant/Discharge of choice:



5. Direct Toxicity Assessment

<u>This Section provides 'stand alone' information in considering a requirement for direct toxicity assessment. It also informs Section 2.3 of the Operational Policy.</u>

5.1 Introduction

This section of the *Procedural Guide* has been prepared by the Freshwater & Marine Sciences Unit (Environmental Sciences Division) for staff of the Environmental Protection Agency involved with regulating wastewater discharges to aquatic receiving environments.

The following subsections outline what assistance this document can provide for EPA staff contemplating the need to request or impose Direct Toxicity Assessment of an existing or proposed effluent discharge and what information would be required to make an informed decision. The following sections in the *Procedural Guide* will detail the specific effluent quality data required to determine whether or not there is a significant risk of toxic effects and therefore whether one-off, event-based or routine assessment for the toxic potential of the effluent is required. This assessment is referred to as a Direct Toxicity Assessment.

It should be noted that a Direct Toxicity Assessment (DTA) is also widely known as Whole Effluent Toxicity (WET) tests and both refer to an experimental procedure aimed at quantifying the potential toxicity of a sample of effluent through exposing a range of test specimens to that effluent. To remain consistent with the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC & ARMCANZ 2000), only the term DTA will be used hereafter.

This Document (the Procedural Guide/Policy)

This *Procedural Guide* will assist EPA officers who have reason to believe (or suspect) that:
- an effluent may have the potential of exhibiting toxic effects in aquatic biota, and consequently
- need to decide whether or not a DTA of the effluent is warranted.

A new Development Application (DA) or Amendment to an existing DA should contain detailed information that characterises the effluent and the receiving aquatic environment.

Information Submitted by the Proponent

The information provided in an Environmental Impact Assessment (EIA), Environmental Impact Statement (EIS), or other equivalent document, will form the basis of the assessment to determine whether or not there is a significant risk of toxic effects being caused by the effluent. If the required effluent quality data has not been presented in EIA/EIS then the priority would be to obtain it via a Request for Further Information (RFI).

In most cases however, the EIA/EIS should already contain detailed information that:
- identifies and quantifies the actual (or expected) effluent water quality characteristics;
- discusses whether or not the contaminants in the effluent comply with local Water Quality Objectives (WQOs) and preserve the Environmental Values (EVs) attributed to the specific receiving waters, and
- describes the effluent quality criteria in comparison to *Toxicity Trigger Values* (TTVs) presented in (ANZECC & ARMCANZ 2000) or alternate equivalent guideline.

5.2 Warranting Direct Toxicity Assessment

Performing a DTA usually involves initiating a series of laboratory-based toxicological bioassays that are designed to determine whether or not the effluent is toxic to any of a range of aquatic biota. The DTA of an effluent is both a time-consuming undertaking (at least several weeks) and expensive; hence for a DTA to be warranted there needs to be one or more issues of concern regarding some aspect of the:
- toxicant concentrations;
- discharge characteristics, and

- aquatic receiving environment.

Each of these aspects of an effluent is addressed below individually, however it must be pointed out that these are by no means separate issues; they are interrelated. An obvious example would be that a salinity concentration of 20 parts per thousand (ppt) would not be considered a toxicant in an estuarine or marine environment, but would be in a freshwater environment.

Toxicant Concentrations

The primary reason for warranting a DTA of an effluent relates directly to the expected or observed concentrations of potential toxicants. There is a need for a DTA of the effluent to be performed when:

- one or more toxicant concentrations in the effluent are shown to exceed the TTVs at the appropriate *Percentage Level of Species Protection* (refer to Section 3.4).

Additionally, a requirement to have a DTA conducted should also be considered when there is a notable lack of measured effluent quality data, such as when the effluent quality data are:

- incomplete;
- based only on:
    - medians, means or 50^{th} percentiles;
    - non-validated modelling outputs, or
    - best available estimations;
- relevant only for a short monitoring period and the quality of the effluent is:
    - likely to experience significant process-based fluctuations, or is
    - seasonally variable and the toxicant data is not representative of seasonality.

Characterising the effluent

In order to determine whether the effluent poses a significant toxicological risk in the receiving environment, the first step is to review the quality characteristics of the effluent. Toxicity or environmental harm could be caused by one or more of the following characteristics:

- physicochemical variables;
- known toxicants, and
- unknown toxicants.

Each of these aspects of an effluent is addressed individually below.

Physicochemical Variables

Although physicochemical variables are not toxicants per se, they may still cause harm to aquatic biota when they occur outside of a certain range or beyond certain limits. The main physicochemical variables that need to be considered when determining if a DTA is warranted are:

- pH (note that ammonia toxicity varies with pH; refer to ANZECC & ARMCANZ 2000);
- temperature;
- dissolved oxygen (DO) concentration/saturation, and
- conductivity/salinity/total dissolved salts
- hardness/total dissolved solids (TDS).

The acceptable ranges or limits for these water quality characteristics can be available for specific water bodies, climatic regions, aquatic environment types, or catchments, and can be available in either State or National publications, or by the private sector (i.e. generated by environmental consultants). Physicochemical variables are generally part of the WQOs and for Queensland, those can be found in the *Queensland Water Quality Guidelines* (QLD EPA 2006).

Known Toxicants

Known toxicants are toxicants that are known to be have the potential to harm the health of aquatic receiving environments and are therefore frequently analyses via chemical analysis. The following categories contain the names of known toxicants that should be considered when characterising an effluent and where appropriate, example ANZECC & ARMCANZ (2000) TTVs are presented.

Metals & Metalloids

A more complete list of metals and metalloids with the potential to cause toxic effects in aquatic biota is presented in Table 3.4.1 of the ANZECC & ARMCANZ (2000). The most commonly encountered metals and metalloids of concern have been reproduced below (Table 1) for the reader's convenience.

Table 1. Excerpt from Table 3.4.1 in ANZECC 2000 – Toxicity Trigger Values for most Metals & Metalloids at alternative levels of protection.

Values in grey shading are the trigger values applying to typical *slightly-to-moderately* disturbed systems.

Chemical		Toxicity Trigger Values for Freshwater (µg/L)				Toxicity Trigger Values for Marine Water (µg/L)			
		Level of Protection (% species)				Level of Protection (% species)			
		99%	95%	90%	80%	99%	95%	90%	80%
Metals & Metalloids									
Aluminium	pH >6.5	27	55	80	150	ID	ID	ID	ID
Aluminium	pH <6.5	ID	ID	ID	ID	ID	ID	ID	ID
Arsenic (As III)		1	24	94^{C}	360^{C}	ID	ID	ID	ID
Arsenic (As V)		0.8	13	42	140^{C}	ID	ID	ID	ID
Boron		90	370^{C}	680^{C}	1300^{C}	ID	ID	ID	ID
Cadmium		0.06	0.2	0.4	0.8^{C}	0.7^{B}	5.5^{B,C}	14^{B,C}	36^{B,A}
Chromium (Cr III)		ID	ID	ID	ID	8*	27*	50*	90*
Chromium (Cr VI)		0.01	1.0^{C}	6^{A}	40^{A}	0.14	4.4	20^{C}	85^{C}
Cobalt		ID	ID	ID	ID	0.005	1	14	150^{C}
Copper		1.0	1.4	1.8^{C}	2.5^{C}	0.3	1.3	3^{C}	8^{A}
Lead		1.0	3.4	5.6	9.4^{C}	2.2	4.4	6.6^{C}	12^{C}
Mercury (inorganic)		0.06	0.6	1.9^{C}	5.4^{A}	0.1	0.4^{C}	0.7^{C}	1.4^{C}
Mercury (methyl)		ID	ID	ID	ID	ID	ID	ID	ID
Nickel		8	11	13	17^{C}	7	70^{C}	200^{A}	560^{A}
Selenium (Total)		5	11	18	34	ID	ID	ID	ID
Silver		0.02	0.05	0.1	0.2^{C}	0.8	1.4	1.8	2.6^{C}
Zinc		2.4	8.0^{C}	15^{C}	31^{C}	7	15^{C}	23^{C}	43^{C}

* These figures are provided in the errata for the ANZECC & ARMCANZ (2000) Guidelines (http://www.mincos.gov.au/pdf/anz/water_quality/gfmwq-guidelines-vol1-errata.pdf)

A Figure may not protect key test species from acute (and chronic) toxicity – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.

B Chemicals for which possible bioaccumulation and secondary poisoning effects should be considered – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.

C Figure may not protect key test species from chronic toxicity – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.

H The figure has been calculated for a Hardness of 30 mg/L $CaCO_3$ and should be adjusted for site specific hardness – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.

ID Insufficient data to derive a trigger value – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.

Non-metallic Inorganics

Table 2 is a complete listing of non-metallic inorganic toxicants as per Table 3.4.1 of the ANZECC & ARMCANZ (2000).

Table 2. Excerpt from Table 3.4.1 in ANZECC 2000 – Toxicity Trigger Values for Non-metallic Inorganics at alternative levels of protection.

Values in grey shading are the trigger values applying to typical *slightly-to-moderately* disturbed systems.

Chemical	Toxicity Trigger Values for Freshwater (µg/L)				Toxicity Trigger Values for Marine Water (µg/L)			
	Level of Protection (% species)				Level of Protection (% species)			
	99%	95%	90%	80%	99%	95%	90%	80%
Non-metallic Inorganics								
Ammonia	320	900[C]	1430[C]	2300[A]	500	910	1200	1700
Chlorine	0.4	3	6[A]	13[A]	ID	ID	ID	ID
Cyanide	4	7	11	18	2	4	7	14
Nitrate*	4900	7200	8700[C]	12000[A]	ID	ID	ID	ID
Hydrogen Sulfide	0.5	1.0	1.5	2.6	ID	ID	ID	ID

* The TTVs for nitrate are officially under review (refer to ANZECC & ARMCANZ (2000) errata), however the values provided here have been recalculated by prominent Australian toxicologists involved in the writing of the Guideline and are therefore likely to be adopted.
A, B, C, H, ID – Refer to the footnotes to Table 1.
D Ammonia as total ammonia [NH_3-H] at pH 8 – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.
E Chlorine as total chlorine, as [Cl] – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.
F Cyanide as un-ionised HCN, measured as [CN] – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.
G Sulfide as un-ionised H_2S, measured as [S] – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.
J Figures protect against toxicity and do not relate to eutrophication issues – see Table 3.4.1 in ANZECC & ARMCANZ (2000) for more information.
* Note that these figures differ from those in ANZECC & ARMCANZ (2000) due to a subsequent review of the values {{XXXXXXXXX}}

Aromatic Hydrocarbons, Phenols & Xylenols, Organic Sulfur Compounds

If an effluent is shown to contain significant concentrations (i.e. as low as 1-10 µg/L or greater) of aromatic hydrocarbons, phenols, xylenols, organic sulphurous compounds or phthalates, then it may cause harm to an aquatic receiving environment. Table 3 provides some examples.

Table 3. Excerpt from Table 3.4.1 in ANZECC 2000 – Toxicity Trigger Values for some Aromatic Hydrocarbons, Phenols & Xylenols, Organic Sulfurous Compounds and Phthalates.

Values in grey shading are the trigger values applying to typical *slightly-to-moderately* disturbed systems.

Chemical		Toxicity Trigger Values for Freshwater (µg/L)				Toxicity Trigger Values for Marine Water (µg/L)			
		Level of Protection (% species)				Level of Protection (% species)			
		99%	95%	90%	80%	99%	95%	90%	80%
AROMATIC HYDROCARBONS									
Benzene		600	950	1300	2000	500	700	900	1300
o-xylene		200	350	470	640	ID	ID	ID	ID
p-xylene		140	200	250	340	ID	ID	ID	ID
Naphthalene		2.5	16	37	85	50[C]	70[C]	90[C]	120[C]
Nitrobenzene		230	550	820	1300	ID	ID	ID	ID
Polychlorinated Biphenyls (PCBs) & Dioxins									
Aroclor 1242	B	0.3	0.6	1.0	1.7	ID	ID	ID	ID
Aroclor 1254	B	0.01	0.03	0.07	0.2	ID	ID	ID	ID
PHENOLS & XYLENOLS									
Phenol		85	320	600	1200[C]	270	400	520	720
2,4,6-tetrachlorophenol	T,B	3	20	40	95	ID	ID	ID	ID
2,3,4,6-tetrachlorophenol	T,B	10	20	25	30	ID	ID	ID	ID
Pentachlorophenol	T,B	3.6	10	17	27[A]	11	22	33	55[A]
ORGANIC SULFUROUS COMPOUNDS									
Carbon Disulfide		ID	ID	ID	ID	ID	ID	ID	ID

PHTHALATES									
Dimethylphthalate		3000	3700	4300	5100	ID	ID	ID	ID
Dibutylphthalate	B	9.9	26	40.2	64.6	ID	ID	ID	ID

A,B,C,ID – Refer to the footnotes to Table 1.
T Tainting or flavour impairment of fish flesh may occur at lower concentrations – see Table 3.4.1 in (ANZECC & ARMCANZ 2000) for more information.

Pesticides (Insecticides, herbicides, fungicides) and other synthetic organic compounds

If an effluent is shown to contain significant concentrations (i.e. as low as 1-10 µg/L or greater) of aromatic hydrocarbons, phenols, xylenols or sulphurous compounds, then it may cause harm to an aquatic receiving environment. Table 4 provides some examples.

Table 4. Excerpt from Table 3.4.1 in ANZECC 2000 – Toxicity Trigger Values for some Pesticides, Herbicides and Fungicides.

Values in grey shading are the trigger values applying to typical *slightly-to-moderately* disturbed systems.

Chemical		Toxicity Trigger Values for Freshwater (µg/L)				Toxicity Trigger Values for Marine Water (µg/L)			
		Level of Protection (% species)				Level of Protection (% species)			
		99%	95%	90%	80%	99%	95%	90%	80%
ORGANOCHLORINE PESTICIDES									
Chlordane		0.03	0.08	0.14	0.27[C]	ID	ID	ID	ID
Heptachlor		0.01	0.09	0.25	0.7[A]	ID	ID	ID	ID
Lindane		0.07	0.2	0.4	1.0[A]	ID	ID	ID	ID
ORGANOPHOSPHATE PESTICIDES									
Chlorpyrifos	B	0.00004	0.01	0.11[A]	1.2[A]	0.0005	0.009	0.04[A]	0.3[A]
Diazinon		0.00003	0.01	0.2[A]	2[A]	ID	ID	ID	ID
Dimethoate		0.1	0.15	0.2	0.3	ID	ID	ID	ID
Parathion		0.0007	0.004[C]	0.01[C]	0.04[A]	ID	ID	ID	ID
HERBICIDES & FUNGICIDES									
Atrazine		0.7	13	45[C]	150[C]	ID	ID	ID	ID
Diquat		0.01	1.4	10	80[A]	ID	ID	ID	ID
2,4-D		140	280	450	830	ID	ID	ID	ID
2,4,5-T		3	36	100	290	ID	ID	ID	ID
Glyphosate		370	1200	2000	3600[A]	ID	ID	ID	ID
Simazine		0.2	3.2	11	35	ID	ID	ID	ID

A,B,C,ID – Refer to the footnotes to Table 1.

Endocrine Disrupting Chemicals

Endocrine Disrupting Chemicals (EDCs) are comprised of many elements and different groups of compounds from a variety of sources, including industrial reagents, and domestic, health and personal care products. Although many are also be toxicants capable of causing lethal effects when they occur at sufficient concentration, at much lower concentrations they are referred to as *micropollutants*. EDCs are believed to cause detrimental effects in biota through disrupting the proper function of glands of the endocrine system. The glands and the hormones they release influence almost every cell, organ, and function in an organism. The endocrine system is instrumental in regulating mood (in humans), growth and development, tissue function, and metabolism, as well as sexual function and reproductive processes. For more information refer to CRC-WQT (2007).

A list of common known EDCs is provided in 0

Pharmaceuticals

Pharmaceuticals, including veterinary chemicals should be screened for in effluents derived from wastes where hospitals and large-scale livestock operations occur. Some of these compounds have been shown to pass through secondary treatment trains more readily than others. Some of these substances act as EDCs. Please refer to CRC-WQT (2007).

A list of common known pharmaceutical EDCs is provided in 0.

Unknown Toxicants

Unknown toxicants can be of two types; *Known-Unknowns* and *Unknown-Unknowns*. These are explained below.

Known-Unknown Toxicants

Known-Unknown Toxicants are chemicals that are known to be in use and form a component of the effluent, but are unstable and degrade quickly to levels outside the detection capabilities of today's instruments, or there are no chemical analysis procedures or instruments capable of reliably detecting or quantifying them to-date.

Examples of Known-Unknown Toxicants would include undescribed disinfection by-products (making them undetectable in chemical analyses aimed at detecting specific compounds) and anti-scaling agents. Anti-scaling agents (such as orthanophosphates) are routinely used in Reverse Osmosis (RO) treatment of treated sewage effluent and sea water. At the present time there is no reliable method of detecting this group of compounds and their potential for toxicological effect have not yet been fully described, therefore, they are a potential Known-Unknown toxicant.

When Known-Unknown Toxicants are used in treatment processes and suspected to persist at significant concentrations in an effluent, and no readily available scientific literature exists that could be used to estimate the potential risk they pose to the aquatic receiving environment in question, then a DTA would be warranted.

Unknown-Unknown Toxicants

Unknown-Unknown Toxicants are chemicals suspected of being present in some effluent streams but cannot be quantified or detected. Unknown-Unknown Toxicants could be present due to:

- illegal or undeclared substances that either directly or indirectly enter the effluent stream;
- complex mixtures of organic compounds reacting with strong oxidising agents (e.g. chlorine) forming undescribed toxicants, and
- undescribed degradation products of pesticides and other complex substances.

When the effluent is likely to incorporate industrial and/or trade wastes that include chemicals of concern, and when the characteristics of the discharge are likely to match the scenarios presented under Section 0, it may be prudent to recommend that a DTA be performed.

Discharge Characteristics

There may be good reason to order that a DTA of the effluent be performed whenever the proposed effluent is:

- being discharged to an aquatic environment attributed with High Ecological Value (HEV);
- voluminous, and being discharged into a relatively small receiving environment; or
- being discharged without a diffuser into:
  - a moderately to poorly-mixed (medium to low kinetic energy) environment, or
  - a receiving environment with a significantly different density.

Some general information on mixing zones is presented below that will be helpful in determining whether or not adequate mixing is taking place to manage acutely toxic concentrations of contaminants.

Mixing Zone characteristics

The mixing zone of an effluent discharge is typically defined as the area or zone at which the concentrations of contaminants may be above water quality objectives. This means that the mixing zone could be a different size for different contaminants, depending on the:

- Concentration of the contaminant in the effluent;
- Ambient or baseline concentration of the contaminant; and the
- Water quality objectives for the contaminant.

For instance, if Contaminant A

- is typically present in the effluent at 10 mg/L and
- the water quality objective for that contaminant is 1 mg/L, and background concentrations will be very low, then;
- 10 times dilution would be required for Contaminant A to meet water quality objectives, and that level of dilution would be achieved within;
- Distance X of the discharge point, based on dilution modelling;

For Contaminant B, it:

- is typically present in the effluent at 30 mg/L and;
- the water quality objective for that contaminant is 1 mg/L, and background concentrations will be very low, then;
- 60 times dilution would be required for Contaminant B to meet water quality objectives, and that level of dilution would be achieved within;
- Distance Y of the discharge point, based on dilution modelling.

Note that Distances X and Y should typically be determined using the average dilution scenario (e.g. mean current velocity and tide). A worst-case dilution scenario with low velocity (e.g. 0.05m/s) at low tide should also be determined to check no overlap with other mixing zones or contact with the shore line.

Therefore, Contaminant A and B will mostly likely possess mixing zones of differing dimension. This applies to all contaminants. There are a multitude of factors that will influence the size and extent of a mixing zone and the dilution rate of an effluent, and these should be presented as the input variables and assumptions used in the modelling for the discharge. The validity and applicability of those input variables should be assessed.

(i) *Near-field Mixing Zone and Far-field Diffusion*

Near-field Mixing Zone occurs in the area within the mixing zone where the most rapid dilution takes place. This area is situated from the point of discharge to a certain distance away from that point, and the mixing is generally driven by the exit velocity of the effluent. Thereafter, where the effluent has lost its exit inertia and has become assimilated with the hydrodynamics of the aquatic receiving environment, a slower dilution-rate (a diffusion-based dilution rate) presides. The **Far-field Diffusion Zone** occurs from the extent of the near-field mixing to a distance where an elevation in the concentration of *any* contaminant from the effluent is no longer detectable from that in the ambient environment.

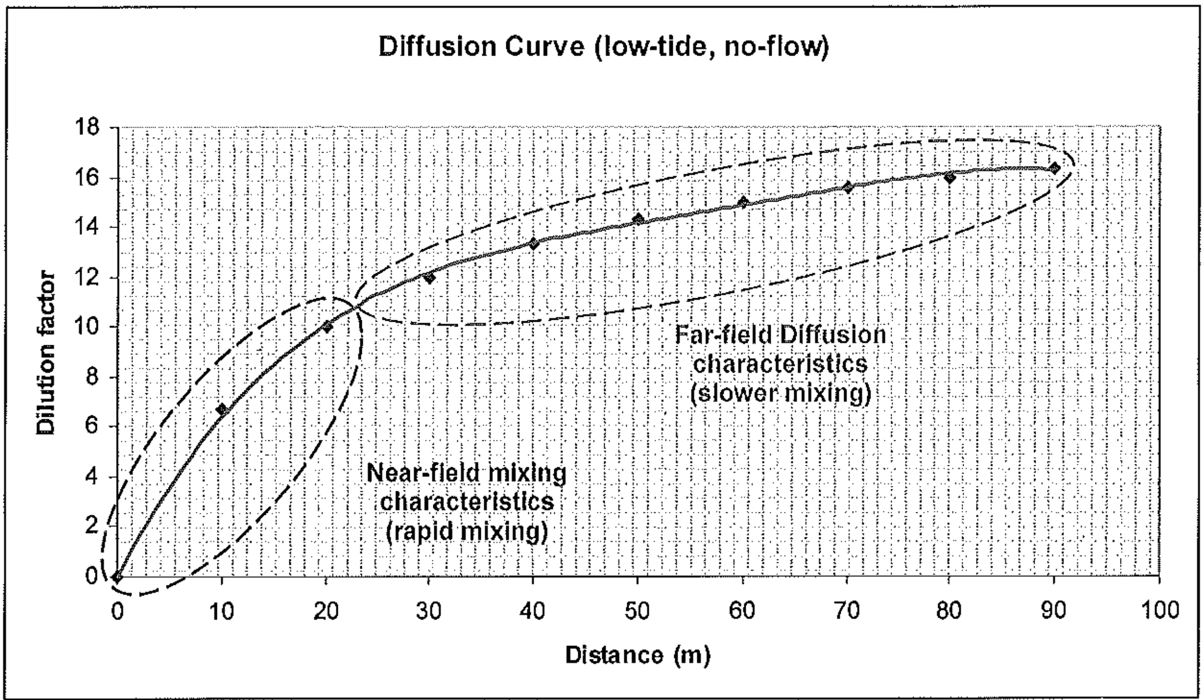
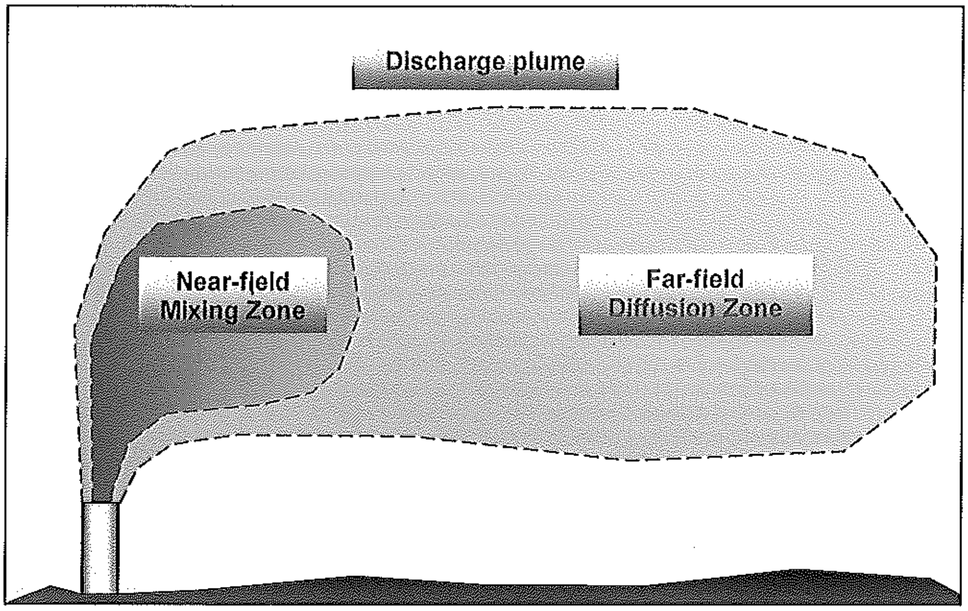


Figure 1. Example Diffusion Curve and related mixing characteristics

Hydrodynamic mixing models can provide estimates of the extent of these areas under differing conditions in the receiving environment, such as no-flow (worst-case), low-flow, and high-flow (best-case) conditions, and dilution curves (see Figure 1) can be produced for each scenario.

The dilution curves coupled with computer modelling of lateral diffusion dynamics are capable of producing a visual representation of the area likely to be affected by the discharge. This area is often described as the *plume* (see Figure 2). Both the near-field mixing zone and far-field diffusion occur within the boundary of the plume.


Discharge plume
Near-field
Mixing Zone
Far-field
Diffusion Zone

The EPA should always ensure, or negotiate toward, a no Acute Toxicity Zone scenario (see Figure 3 A.). It can be assumed that an acute toxicity zone is absent when all toxicant concentrations are below the acute toxicity criteria (i.e. ANZECC & ARMCANZ (2000) TTVs) at the end-of-pipe. In such a case, only a chronic toxicity zone may be present, and only long-term continuous exposure to these levels of toxicants would be likely to result in any observable adverse effects to the exposed biota.

Unfortunately however, having the effluent meet the (ANZECC & ARMCANZ 2000) TTVs at the end-of-pipe is not always achievable by the proponent. In such cases, the EPA needs to assess the risk posed to the receiving environment by the toxicants in the effluent.

Aquatic Receiving Environment

Effluents are generally discharged to surface waters that can be classified into four categories:

- Freshwaters;
- Brackish waters;
- Estuarine waters, and
- Marine waters.

Considerations that relate to a discharge to each of these environments are discussed below.

Discharges to Freshwaters

Freshwaters are by definition very soft (i.e. water hardness is very low; salinity 0.05-1.0 ppt (ANZECC & ARMCANZ 2000)) and this condition promotes the solubility and consequently the bioavailability of toxicants, especially heavy metals and metalloids. Therefore the same 'total' metal concentrations in freshwater will tend toward being more toxic in freshwater than the same concentration in marine waters (refer to Table 1).

Discharges to Brackish or Estuarine waters

Brackish waters are slightly-to-moderately saline waters (salinity between 0.5 and 30 ppt (ANZECC & ARMCANZ 2000)), often resulting from saline ocean waters mixing with, and being diluted by, freshwater sources, as in estuaries. This variability in salinity normally excludes freshwater species being used as the test specimens in toxicity bioassays, although some freshwater biota can tolerate a certain degree of brackishness.

It is common however that marine species are selected for assessing effluent being discharged into brackish or estuarine waters. This is possible by simply elevating the effluents' salinity to a concentration preferred by the test specimen through the addition of pure salt. Naturally, this approach is not appropriate if it is the toxicity of the salinity itself what is being assessed.

Discharges to Marine waters

Marine waters are saline waters (salinity between 30-40 ppt ANZECC & ARMCANZ (2000)) and the presence of salt generally suppresses the bioavailability of metal and metalloid toxicants. This does not always translate to less toxic effects being observed in marine environments because some marine species can be more susceptible to toxic reactions to specific toxicants than freshwater species (e.g. copper; refer to Table 1).

Only marine species should be selected for DTA of discharges to marine environments.

5.3 Essential Components of the DTA Design

Test-effluent Management

As mentioned in Section 0, the effluent needs to be characterised so that an appropriate DTA can be designed with applicable test specimens that can be used to determine the existence and magnitude of toxicological effects. Other important considerations that may affect the results of a DTA, such as the way the effluent is collected, stored and transported as well as the natural water used for dilutions are discussed in the following subsections.

Effluent Dilution Series

In order to determine the level of dilution required for an effluent to no longer exhibit observable toxic effect in the test biota, the DTA incorporates a dilution series into the design. The dilution series typically takes the form of serial 1:1 dilutions that result in the following concentrations of effluent:

Table 5. Effluent dilution series

Dilution ratio (parts effluent: parts dilution water)	**Resultant Percentage of the original effluent concentration**
(undiluted)	100%
1:1	50%
1:3	25%
1:7	12.5%
1:15	6.25%
1:31	3.125%

The most appropriate water that can be utilised for the dilutions would be collected from the actual receiving environment for the proposed discharge (refer to Section 0); otherwise tap water, deionised or demineralised water, artificially manufactured sea water, or some other uncontaminated dilution water would be required.

Normalising for Salinity

When the salinity of the effluent varies significant from the salinity of the receiving waters then there is the potential for an adverse impact on the environment to occur. This can be true for effluents more saline and for effluents less saline than receiving waters; however, the former is by far the more common case and of greater concern due to the potential of the denser brine solution sinking to engulf benthic biota.

In cases such as this, marine or estuarine test specimens should be selected (even for effluents proposed for a freshwater discharge) and the salinity of the effluent artificially increased to match that preferred by the test specimen (refer to {(58 Krassoi, R. 1995)}). In this way, any observable effects due to salinity are negated and the only effects from toxicants remain observable. Even though the test specimen is not representative of the receiving environment, the effects of elevated salinity are taken out of the toxicity equation.

Collection and Use of Effluent and Bulk Natural Water

Certain complications can arise with the bulk collection of natural water for purpose of diluting effluent for DTA. These complications arise due to fluctuations in water quality variables that may occur between the times of collection to the commencement of the bioassays. Critical water quality parameters should be measured in the field (at the time of collection) wherever possible using portable probes and spectrometers; then again prior to the commencement of the bioassay so that any deviation from the field values is documented:

- pH
- Temperature
- Dissolved Oxygen (DO) concentration
- Conductivity (Salinity)
- Ammonia
- Suspended Solids

Where suspended solids (SS) are in high concentration in the receiving environment, it can interfere with observing the test specimens and can be a cause for toxic effects in some test specimens and therefore the bulk water should be allowed to settle or should be filtered. Bulk natural water should also be refrigerated to slow the activity of microbes consuming carbonaceous compounds and dissolved oxygen, and transport times should be kept to a minimum (i.e. use of local laboratories are preferable to interstate arrangements). In all other aspects, bulk natural water should be collected as per the *Water Quality Sampling Manual* (QLD EPA 2008) or the latest issue.

Appropriate End Points

Ideally, a well designed DTA program that is in accordance with the guidelines stipulated in ANZECC & ARMCANZ (2000) must firstly incorporate five test specimens selected from four major taxonomical groups, but should also aim to examine multiple toxicological end point types (i.e. acute, sub-lethal and chronic effects) over the varying selected periods of exposure. These concepts are discussed in more detail below.

Acute Effects

Acute effects are observed when the substance(s) being tested causes death or severely incapacitates the organisms to the point where they are unable to maintain normal functions that will lead to certain death in the very near future (e.g. organisms become moribund through their inability to feed themselves, their nervous system has been irreparably damaged, etc.).

These are the most unlikely effects observable in the receiving environment, predominantly because the EPA will regulate the toxicant concentration levels in the discharge as to avoid acute toxicological effects from occurring, but also because biota are unlikely to remain in an unhospitable environment long enough for acute effect to manifest. On the contrary however, some biota are incapable of avoiding or vacating such inhospitable environments before permanent and lethal damage has occurred (e.g. slow-moving or sessile organisms).

Sub-lethal Effects

Sub-lethal effects are observed when a substance being tested causes detrimental effects that will certainly compromise the individual organisms' ability to survive (e.g. through retarding growth and/or development) or the species' ability to persist (i.e. affecting fecundity, gestation or other reproductive success rates).

These effects can be exhibited in an organism later on in life after a larval or early development life stage was exposed to a short-term or pulse exposure to a toxicant, or can be the effect of long-term chronic exposure. This type of effect is more likely to occur in the receiving environment than are acute effects however they are rarely observed due to lack of in-depth monitoring.

Chronic Effects

Chronic effects are observed when the substance causes the organism to be unable to maintain normal biological functions that will lead to certain death in the long-term (e.g. it compromises the organisms' ability to resist disease, causes biochemical changes that affect absorption rate of nutrient through the gut wall, etc.).

These effects are most likely to occur in the receiving environment but due to the lack of routine monitoring associated with effluent discharges, they are rarely observed. Even when the effects of chronic toxicity are observed, it is difficult to identify the specific effluent(s) or source(s) responsible for the observed effect because long-term chronic exposures are difficult to link back to specific point-source discharge(s).

Exposure Times

Toxicological effects are dependant on the concentration of the toxicant versus the time of exposure. To examine the potential short-term and long-term effects that a substance may exhibit on test specimens, short-term exposures (1 hour) and medium-term exposures (96 hours) should be incorporated into the DTA design. Although longer-term exposures (e.g. weeks, months or even years) may exhibit adverse effects on biota in the receiving environment, it is unfeasible to explore these effects within the scope of most DTAs. It may be necessary that a long-term monitoring program be implemented if the circumstances of the discharge warrant continued vigilance (refer to Section 0).

Appropriate Test Specimens

The best DTAs utilise test specimens that are directly relevant to the receiving environment for the discharge, however this may not always be possible for several reasons, including:

- Unavailability of the organism in sufficient numbers to perform the bioassays
- Inability to maintain the organism in the laboratory in a healthy state
- The organisms' relative sensitivity to a toxicant is unknown making its selection dubious
- State laws prohibited its use upon grounds of animal ethics (e.g. vertebrates)

In all other cases the best compromise should be sought. The most important considerations are:

- the test specimens should:
  - be sensitive to the main toxicant(s) of concern; this may be the case according to:
    - taxa versus toxicant type (e.g. use insect or crustacean macroinvertebrates for organophosphate pesticides),
    - life stage of the test organism (e.g. juveniles may be more sensitive than adults);
  - reasonably or closely relevant to the receiving environment, or
  - a standard test organism (see Section 0)

Acclimatised Species

It may be appropriate to capture and rear local specimens that have acclimatised to local background toxicant concentrations. This may be particularly applicable where background toxicants exceed the ANZECC 2000 TTVs but locally captured organisms don't seem adversely affected.

This approach is more in the realms of scientific research and therefore normally out of the scope of a general DA however if the proponent is willing to wait for the research to be performed and invest the money required then this should be considered by EPA officers.

Some Standard Test Specimens used in Australia

Table 6. Some generic Direct Toxicity Assessment toxicity bioassays

Organism	Test Type	Test Duration & Effect	Test Endpoint	Substance Tested	Receiving Environment	Sources
Plant						
Selanastrum capricornutum Freshwater micro alga	Laboratory	96 hours chronic	Growth inhibition	WE, chemicals, sediment, leachates, groundwater	Freshwater	USEPA Method 1003.0 OECD Method 201 Stauber 1994b Bailey et al 2000
Lemna gibba *Lemna minor* Duckweed	Laboratory	4-7 days chronic	Plant growth	WE, chemicals, sediment, leachates, groundwater	Freshwater (incl. turbid waters)	USEPA OPPTS 850.4300 ASTM (1998) OECD Guideline 221
Iscochrysis aff. galbana Marine microalga	Laboratory	72-96 hours chronic	Growth inhibition	WE, chemicals, sediment, leachates, groundwater	Marine	USEPA Method 1003.0 APHA Method 8111 Stauber et al. (1996)
Chlorella protothecoides	Laboratory	72 hours chronic	Cell division rate			
Fish (vertebrate)						
Insect (invertebrate)						
Mollusc (invertebrate)						
Saccostrea commercialis Rock oyster *Mimachlamys asperrima* Doughboy scallop	Laboratory	48 hours chronic	Larval abnormality	WE	Estuarine, marine	Krassoi et al. (1996)
Crustacean (invertebrate)						
Ceriodaphnia dubia *Ceriodaphnia cf. dubia* *Daphnia carinata* Freshwater water fleas	Laboratory	24-96 hours acute ~7 days chronic	Juvenile survival 3rd brood of neonates	WE, chemicals, sediment, leachates, groundwater	Freshwater	USEPA Method 1003.0 Stauber et al. (1996)

Daphnia magna Freshwater water flea	Laboratory				Freshwater	
Amphipod (invertebrate)						
Corophium cf. volutator Aquatic amphipod	Laboratory	10 days acute	Juvenile survival, emergence and reburial	Sediment	Freshwater, estuarine, marine	USEPA OPPTS 850.1020
Echinoderm (invertebrate)						
Heliocidaris tuberculata Sea urchin	Laboratory	1 hour acute	Fertilisation success	WE, chemicals, sediment, leachates, groundwater	Estuarine, marine	APHA Method 8810C Simon and Laginestra (1997)
		72 hours chronic	Larval development			APHA Method 8810D Simon and Laginestra (1997)

Region- and Habitat-specific Test Specimens

(ii) ***Queensland Freshwaters***

Table 7. Some Direct Toxicity Assessment toxicity bioassays appropriate for Queensland Freshwaters

Organism	Test Type	Test Duration & Effect	Test Endpoint	Substance Tested	Receiving Environment	Sources
Plant						
Chlorella sp. Green alga	Laboratory	72 hours chronic	Population growth	Cu, herbicides, WE	Lowland streams, floodplains	{{56 Riethmuller, N. 2003;}}
Chlorella sp. (2 tropical species)	Laboratory	48 or 72 hrs chronic	Cell division rate	WE		Franklin et al 1998 Franklin et al (in press)
Ceratophyllum dermersum Hornwort	Laboratory	96 hours chronic	Growth inhibition	Cu, herbicides, WE	Lowland streams, floodplains	{{56 Riethmuller, N. 2003;}}
Lemna aequinoctialis sp. Duckweed	Laboratory	4-7 days chronic	Plant growth	Cu, herbicides	Lowland streams, floodplains	{{56 Riethmuller, N. 2003;}}
Monoraphidium arcuatum Tropical green alga	Laboratory	72 hours chronic	Cell division rate	Cu		{{69 Levy, J.L. 2007;}}
Fish (vertebrate)						
Melanotaenia nigrans Black-banded rainbowfish	*In-situ/* Laboratory	96 hours acute	Larval survival	U, Cu, WE	Escarpment streams, floodplains	eriss notes
Magumda magumda Purple-spotted gudgeon	Laboratory	96 hours acute	Larval survival	U, Cu, WE	Upland streams, floodplains	{{56 Riethmuller, N. 2003;}}
Insect (invertebrate)						

Chironomus crassiforceps Chironomid	Laboratory	5 days chronic	Larval growth	U, Cu	Permanent billabongs, floodplains	eriss notes
Mollusc (invertebrate)						
Amerianna cumingii Freshwater gastropod	*In-situ*	96 hours chronic	Reproduction, juvenile survival	U, Cu, WE	Permanent billabongs, floodplains	eriss notes
Crustacean (invertebrate)						
Moinodaphnia macleayi Freshwater cladoceran	Laboratory	6 day sub-lethal	Reproduction (3 brood)	U, Cu, HCN, Mn, NO_3, Cd, WE	Permanent billabongs	{{56 Riethmuller, N. 2003;}}
		24 hours chronic	Feeding inhibition			
		6 day acute	Survival			
Cnidarian (invertebrate)						
Hydra viridissima Green hydra	Laboratory	96 hours chronic	Population growth	U, Cu, Mg, Na, WE	Permanent billabongs, floodplains	{{56 Riethmuller, N. 2003;}}

Cd – Cadmium
Na – Sodium
Cu – Copper
NO_3 – Nitrite
HCN – Cyanide
U – Uranium
Mg – Magnesium
WE – whole-effluent
Mn – Manganese
WS – whole-sediment

Queensland Brackish Waters

Queensland Marine Waters

Table 8. Some Direct Toxicity Assessment toxicity bioassays appropriate for Queensland Marine Waters

Organism	Test Type	Test Duration & Effect	Test Endpoint	Substance Tested	Receiving Environment	Sources
Plant						
Nitzschia closterium Marine microalga (diatom)	Laboratory	72-96 hours chronic	Growth inhibition	WE, chemicals, sediment, leachates, groundwater	Marine	USEPA Method 1003.0, APHA Method 8111, Stauber et al. (1996)
Nitzschia closterium (tropical) Marine microalga (diatom)	Laboratory	72 hours chronic	Cell division rate	WE	Marine	{{62 Johnson, H.L. 2007;}}
Phaeodactylum tricornutum Marine microalga (diatom)	Laboratory	72 hours chronic	Cell division rate	WE	Marine	{{63 Franklin, N.M. 2001;}}
Entomoneis cf *punctulata* microalga (diatom)	Laboratory	72 hours chronic	Cell division rate	WS	Marine	{{64 Adams, M.S. 2004;}}
		24 hour acute	Esterase inhibition			
Dunaliella tertiolecta Green alga	Laboratory	1 hour acute	Enzyme inhibition	WE	Marine	Peterson & Stauber
		72 hour chronic	Cell division rate			{{59 Stauber, J.L. 1994;}}
Fish (vertebrate)						
Insect (invertebrate)						
Mollusc (invertebrate)						
Tellina deltoidalis bivalve	Laboratory	10 days acute	Survival	WS	Estuarine, marine	{{68 Simpson, S.L. 2005;}}
	Laboratory	4 week chronic	Growth			Strom/simpson
Spiculla trigonella Bivalve	Laboratory	10 days acute	Survival	WS	Estuarine, marine	Strom spadaro simpson
Crustacean (invertebrate)						

Penaeus monodon Tiger prawn	Laboratory	96 hours acute	Juvenile survival	WE	Estuarine, marine	USEPA OPPTS 850.1045
Amphipod (invertebrate)						
Allorchestes compressa Marine amphipod *Hyale crassicornis* *Melita spp.*	Laboratory	96 hours acute	Juvenile survival	WE, chemicals, sediment, leachates, groundwater*	Marine	USEPA OPPTS 850.1020
Melita plumulosa Epibenthic deposit feeder	Laboratory	10 days acute	Survival, growth	WS	Estuarine, marine	{{66 King, C.K. 2006;}}
		6 week chronic	Reproduction			{{67 Gale, S.A. 2006;}}
		13 day chronic	Reproductive index			Hyne et al
Copepod (invertebrate)						
Acartia sinjiensis (tropical) Copepod	Laboratory	48 hours acute	Immobilisation	WE	Marine	{{65 Rose, A. 2006;}}
Nitocra ap. Copepod	Laboratory	7 day chronic	Life cycle (split) 7 day reproduction 7 day development	WE	Marine	?
Cnidarian (invertebrate)						

Toxicity Identification Evaluation

Once the toxicological bioassays of a DTA are complete and toxic effects have been observed, there may be a need to determine which constituents in the effluent were responsible for those observed effects. The process for this determination is described by a series of procedures published by the USEPA but basically takes the following approach; the following Phase I TIE manipulations of the effluent are performed and then a repeat of the initial DTA is initiated, with subsequent Phase II and Phase III manipulations if required:

- Phase I TIE manipulations:
  - EDTA chelation – removes divalent metal ions (e.g. Cu, Zn, Ag, Hg) to reduce toxicity of the effluent;
  - pH adjustment – ammonia and aluminium toxicity can be reduced significantly by adjusting the effluent of pH;
  - Aeration – oxidisable or volatile toxicants are stripped or converted in the effluent to reduce overall effluent toxicity
  - Sodium thiosulphate – binds oxidative chemicals (such as Cl and Br) and some metals (e.g. Cu) making them unavailable as toxicants;
  - Solid Phase Extraction (SPE) – columns with C18 or C8 resin absorb non- or moderately polar organic chemicals from the effluent;
  - Filtration and centrifugation – removes particulate-bound toxicants;
  - Sublimation and Foam fractionation – removes sublimatable compounds such as surfactants;
  - Piperonyl Butoxide (PBO) addition – affects the action of some metabolically activated pesticides for that their toxicity is reduced or eliminated but may enhance the toxicity of pyrethroids.
- Phase II TIE manipulations:
  - SPE elution pattern – an enhanced version of Phase I SPE extraction;
  - HPLC elution pattern – similar to SPE elution pattern but with higher resolution;
- Phase III TIE manipulations:
  - Confirmation (spiking) study – suspect toxicants are spiked into the sample at double the concentration they exist at in the sample to observe enhanced toxic effect.

Identification of the compound(s) responsible for the observed toxicological effects on DTA test specimens may assist in developing strategies to reduce or remove the toxicants in question from the effluent (through the addition or modification of a treatment step), or be used to support or negate other management options.

5.4 Related Matters

This section deals with when, why and how DTAs should be conditioned into Discharge Licenses and what needs to be considered in Receiving Environment Monitoring Programs (REMPs) so that the repercussions of the observations made in DTAs are adequately covered in the monitoring.

Routine DTAs

Where it is considered that there is continuing potential risk for an effluent to cause environmental harm then routine DTAs of the effluent may be required. Routine DTAs can be required:

- On an annual or bi-annual basis, or required at some other regular interval;
- whenever a treatment process change is implemented that is likely to significantly alter the effluent quality;
- whenever the influent quality into a sewage Treatment Plant (STP) for example, or Advanced Water Treatment Plant (AWTP), changes significantly, or
- when new information becomes available that puts into doubt the quality of the effluent so that the EPA can no longer confidently consider the effluent as being non-acutely toxic at the point of release.

An example of such a situation is where a ROC from a STP effluent that is being collected from a sewer catchment with a significant proportion of industrial effluents contributing to the bulk influent. Because of the many parties involved with contributing to the STP influent and the high potential for unreported process changes and/or reagent changes to occur, it would be appropriate that there be a requirement that DTA be conducted on the effluent on a regular (routine) basis.

Requirement for Regular DTA

NEGATIONS REGARDING THIS ISSUE ARE IN PROGRESS

Requirement for Irregular or Event-based DTA

NEGATIONS REGARDING THIS ISSUE ARE IN PROGRESS

No Requirement for DTA

NEGATIONS REGARDING THIS ISSUE ARE IN PROGRESS

Receiving Environment Monitoring Programs

Where an existing or proposed discharge is considered to present unknown risk of acute, sub-lethal or chronic toxicological effects for reasons beyond the results of the DTA, then it may be appropriate to condition a biota monitoring component into a Receiving Environment Monitoring Program (REMP). Such reasons would include:

- Effluent diffusion is poor (poor mixing) during certain tidal or other variables (see Section 0);
- Receiving environment is of special significance (e.g. Ramsar wetlands, Wetlands of State Significance, HEV areas, etc.; see Section 0);
- The DTA test specimens:
  - were not directly relevant to the receiving environment (see Section 0), or
  - did not include the taxa that are most sensitive to the toxicant(s) in the effluent, or
- The effluent tested was not truly representative of the long-term discharge.

Biota monitoring can be for an interim period, or indefinite. Generally, an interim period would be a minimum of 2-3 years in duration so that seasonal changes and patterns of subsequent years can be analysed.

5.5 References

ANZECC & ARMCANZ (2000). Australian and New Zealand Guidelines for Fresh and Marine Water Quality. National Water Quality Management Strategy; Paper No. 4, .

CRC-WQT. (2007). *Chemicals of Concern in Wastewater Treatment Plant Effluent: State of the Science in Australia.* The Cooperative Research Centre for Water Quality and Treatment, Occasional Paper No. 8.

QLD EPA (2006). *Queensland Water Quality Guidelines*, Environmental Sciences Division, Queensland Environmental Protection Agency.

QLD EPA (1999). Water Quality Sampling Manual. 3rd Edition.

5.6 Acronyms and Abbreviations

ANZECC	Australian and New Zealand Environment and Conservation Council
ARMCANZ	Agriculture and Resource Management Council of Australia and New Zealand
AWTP	Advanced Water Treatment Plant
CRC-WQT	Co-operative Research Centre for Water Quality and Treatment
DA	Development Application
DO	Dissolved Oxygen
DTA	Direct Toxicity Assessment
EC_{50}	median Effective Concentration for 50% of exposed specimens
EDC	Endocrine Disrupting Chemical
EIA	Environmental Impact Assessment
EIS	Environmental Impact Statement
eriss	Environmental Research Institute of the Supervising Scientist
EV	Environmental Value
HEV	High Ecological Value
LC_{50}	median Lethal Concentration for 50% of exposed specimens
mg/L	milligrams per litre
NATA	National Association of Testing Authorities of Australia
OPPTS	Office of Prevention, Pesticides and Toxic Substances
PCB	Poly-Chlorinated Biphenyl
pH	potential (of) Hydrogen
ppt	parts per thousand
QLD EPA	Queensland Environmental Protection Agency
RFI	Request for Further Information
RO	reverse osmosis
ROC	reverse osmosis concentrate
SPE	Solid-phase extraction
SS	Suspended Solids
STP	Sewage Treatment Plant
TDS	Total Dissolved Salts or Total Dissolved Solids
TIE	Toxicity Identification and Evaluation
TTV	Toxicity Trigger Value
µg/L	micrograms per litre
USEPA	United States Environment Protection Agency
WE	Whole effluent
WET(T)	Whole Effluent Toxicity (Testing)
WEMW	Whole effluent mine wastewater
WQO	Water Quality Objective

5.7 Glossary

Acute Toxicity — Acute toxicity is the ability of a substance or mixture of substances to cause lethal effects over a relatively short period of time, usually upon single or pulse exposures.

Aquatic Ecosystem — Any watery environment from small to large, from pond to ocean, in which plants and animals interact with the chemical and physical features of the environment.

Biota — The sum total of the living organisms in any designated area.

Chronic — Lingering or continuing for a long time; often for periods from several weeks to years. Can be used to define either the exposure of an aquatic species or its response to an exposure (effect). Chronic exposure typically includes a biological response of relatively slow progress and long continuance, often affecting a life stage.

Chronic Toxicity — Chronic toxicity is the ability of a substance or mixture of substances to cause harmful effects over an extended period, usually upon repeated or continuous exposure sometimes lasting for a significant proportion of the life of the exposed organism.

Cladoceran — Water flea; zooplankton belonging to the fourth Order of the Branchiopoda, the Cladocera.

Contaminant	Biological (e.g. bacterial and viral pathogens) and chemical (see **Toxicants**) introductions capable of producing and adverse response (effect) in a biological system, seriously injuring structure or function or producing death.
Direct Toxicity Assessment	The use of toxicity tests to determine the acute and/or chronic toxicity of waste water discharges or total pollutant loads in receiving waters. (Assesses the toxicity of mixtures of chemicals rather than individual chemicals).
EC_{50}	The concentration of material in water that is estimated to be effective in producing some response in 50% of the test organisms. The EC_{50} is usually expressed as a time dependant value (e.g. 24 hour or 96 hour EC_{50}).
Near-field mixing zone	The Near-field Mixing Zone (or the **Initial Mixing Zone**) is the area within the mixing zone where the most rapid dilution takes place. This area is situated from the point of discharge to a certain distance away from that point, and the mixing is generally driven by the exit velocity of the effluent.
Far-field Mixing Zone	The Far-field Mixing Zone (or the **Absolute Mixing Zone**) extends from the end of the **Near-field mixing zone** to a distance where an elevation in the concentration of *any* contaminant from the effluent is no longer detectable from that in the ambient environment. It may also be described as where the effluent has lost its exit inertia and has become assimilated with the hydrodynamics of the aquatic receiving environment; therefore a slower dilution-rate (i.e. a diffusion-based dilution rate) presides.
LC_{50}	The concentration of material in water that is estimated to be effective in producing some lethal response in 50% of the test organisms. The LC_{50} is usually expressed as a time dependant value (e.g. 24 hour or 96 hour LC_{50}).
TIE	Toxicity characterisation procedures involving use of selective chemical manipulations or separations and analyses coupled with toxicity testing to identify specific classes of chemicals and ultimately individual chemicals that are responsible for the toxicity observed in a particular sample.
Total Dissolved Salts	A measure of the inorganic salts dissolved in water. The organic component of the water has been removed via some laboratory technique.
Total Dissolved Solids	A measure of the inorganic salts (and organic compounds) dissolved in water.
Total Metal	The concentration of a metal in an unfiltered sample that is digested in strong nitric acid.
Toxicant	A chemical capable of producing an adverse response (effect) in a biological system at concentrations that might be encountered in the environment, seriously injuring structure and function or producing death. Examples include pesticides, heavy metals and biotoxins (i.e. domoic acid, ciguatoxin and saxitoxins).
Toxicity	The inherent potential or capacity of a material to cause adverse effects in a living organism.
Trigger Values	These are the concentrations (or loads) of the key performance indicators measured for the ecosystem, below which there exists a low risk that adverse biological 9ecological) effects will occur. They indicate the risk of impact if exceeded and should 'trigger' some action, either further ecosystem specific investigations or implementation of management/remedial actions.
Water Quality Criteria	Scientific data evaluated to derive the recommended quality of water for various uses.
Whole Effluent Toxicity Testing	The use of toxicity tests to determine the acute and/or chronic toxicity of effluents.

Source: ANZECC & ARMCANZ (2000)

5.8 Appendices

Endocrine Disrupting Chemicals (Pesticides)

Table 9 lists some commonly used pesticides and industrial chemicals that are known or believed to possess endocrine disrupting qualities. Use this list as a guide to help ascertain which compounds should be included in chemical analyses of wastewater effluents from systems with these activities taking place within the sewage catchment.

Table 9. Examples of known and suspected Agricultural and Industrial Endocrine Disrupting Chemicals

Chemical	Common Uses
Amitrol	Defoliant, a herbicide, photography, plant growth regulation, non-selective weed control
Atrazine	herbicide for weed control in agriculture
Arsenite	Sodium arsenite: Dyes, soap, treating scale diseases; insecticide (termites); antiseptic, topical acaricide, hide preservative, herbicide. Copper Acetoarsenite: Insecticide, wood preservative, larvicide, pigment (particularly for ships and submarines), fungicide, bactericide and molluscicide.
Benzophenone	Fixative for heavy perfumes, manufacture of antihistamines, hypnotics; insecticides.
Benzo(a)pyrene	Petrochemicals combustion by-product.
Bisphenol A	Basic building block of polycarbonate plastic, an intermediate in the manufacture of polymers, epoxy resins, , fungicides, antioxidants, dyes, phenoxy, polysulfone and certain polyester resins, flame retardants and rubber chemicals.
Butylated hydroxyanisole (BHA)	Preservative and antioxidant in fat-containing foods, in edible fats and oils; and in cosmetic formulations.
Cadmium	Heavy metal with widespread use: electroplating, photoelectric cells, soft solder and solder for aluminium; deoxidizer in Ni plating, Ni-Cd storage batteries; process engraving, electrodes for cadmium vapour lamps, photometry of ultraviolet sun-rays. The powder is also used as an amalgam (1 Cd: 4 Hg) in dentistry. Cadmium chloride: photography, paints, pigments, glass, glazes, electronic components, nemoticide, pesticide and a fungicide, dyeing and calico printing, in the manufacture of cadmium yellow, galvanoplasty, manufacture of special mirrors, ice-nucleating agent, lubricant, in analysis of sulfides to absorb hydrogen sulfide, polymerization catalyst. Cadmium oxide: electroplating, storage battery electrodes, catalyst, semi-conductors, silver alloys, ceramic glazes, nematocide, anthelminic, phosphors, glass, cadmium electroplating, and an aracaricide in pigs.
Dithiocarbamate	Sodium Diethyldithiocarbamate: pesticide, fungicide, chelating agent. It is used in the evaluation of T-cell deficient diseases, in the inhibition of superoxide dismutase in mice and of cisplatin nephrotoxicity in rats, in AIDS-related complex, in immunopharmacology and in cancer immunotherapy. It has clinical use in acute nickel carbonyl, cadmium and thallium poisoning. It is used in colorimetric determination of small quantities of copper and for its separation from other metals. It is also used as a latex accelerator in rubber processing and as a chemical intermediate in the production of other diethyldithiocarbamate metal salts, such as zinc selenium and tellurium salts. Sodium Dimethyldothiocarbamate: fungicide; corrosion inhibitor; rubber accelerator; intermediate; polymerization shortstop; nematocide and herbicide with a fumigant action. Lead Dimethyldothiocarbamate: vulcanization accelerator.

DDT	One of the 12 POPS listed by the Stockholm Convention on Persistent Organic Pollutants, DDT's allowed use is now restricted to disease vector control, specifically to kill mosquitoes spreading malaria in the developing world.
p, p'-DDE	One of the principal metabolites (breakdown products) of DDT
Dieldrin	Usage banned by the Stockholm Convention on Persistent Organic Pollutants. A non-systemic, persistent organic insecticide with contact and stomach action.
Endosulfan	Insecticide; pesticide. Very widespread modern use.
Ethylene thiourea	Polymer vulcanizing and curing agent, accelerator in curing polychloroprene (neoprene) and other elastomers. It is also used in electroplating baths, as an intermediate for anti-oxidants, in insecticides, dyes, pharmaceuticals and synthetic resins.
Furans	Usage banned by the Stockholm Convention on Persistent Organic Pollutants. Combustion by-products of combustion of organochlorine chemicals, furans have also been used as intermediates in the preparation of pharmaceuticals, insecticides, resins and in the formation of lacquers.
Heptachlor	Usage banned by the Stockholm Convention on Persistent Organic Pollutants. Heptachlor was used for control of the cotton boll weevil, termites, ants, grasshoppers, cutworms, maggots, thrips, wireworms, flies, mosquitoes, soil insects, household insects and field insects. It has some fumigant action, and was applied as a soil treatment, a seed treatment or directly to foliage.
Kepone	Used as an insecticide, fungicide, pesticide for control of the banana root borer and tobacco wireworm and bait for control of ants and cockroaches.
Lindane	Banned in many (but not all) countries, a pesticide to control lice and other ectoparasites, a foliar spray and soil application for insecticidal control of a broad spectrum of phytophagous and soil dwelling insects, animal ectoparasites and public health pests. It is used on ornamentals, fruit trees, nut trees, vegetables, tobacco and timber. This chemical is found in baits and seed treatments for rodent control. In pet shampoo it kill ticks, lice and sarcoptic mange mites.
Malathion	Insecticide on fruits, vegetables, ornamentals, household and livestock use, an acaracide, control of flies and other insect pests in animal and poultry houses, adult mosquitoes in public health programs, human body and head lice and in flea and tick dips. It is used in veterinary medicine as an ectoparasiticide.
Methoxychlor	Insecticide for a wide range of insect pests (particularly chewing insects) in field crops, forage crops, fruit, vines, flowers, vegetables, and in forestry, in animal houses and dairies, in household and industrial premises and in veterinary medicine as an ectoparasiticide.
Mirex	Usage banned by the Stockholm Convention on Persistent Organic Pollutants. Insecticide, pesticide, flame retardant for plastics, rubber, paint, paper and electrical goods; in antifouling paints, rodenticides and additives for antioxidant and flame retardant mixtures for stabilized polymer compositions, ablative compositions, anthelmintic compositions and lubricant compositions. Applied in paper, paint, rubber, electrical, adhesive and textile applications; also used in thermoplastic, thermosetting and elastomeric resin systems.
Nitrofen	Herbicide used on many vegetables, broad-leafed and grass weeds, cereals, rice, sugar beet, some ornamentals, broccoli, cauliflower, cabbage, brussel sprouts, onions, garlic, celery, roses and chrysanthemums.
Pentachlorophenol	Insecticide for termite control, pre-harvest defoliant, general herbicide, wood preservative, synthesis of pentachlorophenyl esters, molluscide, fungicide, bactericide, anti-mildew agent, slimicide and algaecide. The technical material finds extensive use in cooling towers of electric plants, as additives to adhesives based on starch and vegetable and animal protein, in shingles, roof tiles, brick walls, concrete blocks, insulation, pipe sealant compounds, photographic solutions, and textiles and in drilling mud in the petroleum industry.
Pentachloronitrobenzene	Fungicide for seed and soil treatment, herbicide, in slime prevention in industrial waters and to control damping off and other fungal infections.
Phenol, 4-tert-Butyl	Intermediate in the manufacture of varnish and lacquer resins, soap antioxidant;

	ingredient in de-emulsifiers for oil field use and motor oil.
Phthalates	Butyl benzyl phthalate (BBP) resins: solvent and a fixative in perfume. Di-n-butyl phthalate (DBP): plasticisers, cosmetics, safety glass, insecticides, printing inks, paper coatings, adhesives, elastomers and explosives; as a solvent in polysulfide dental impression materials, solvent for perfume oils, perfume fixative, textile lubricating agent and solid rocket propellant. Di-ethylhexylphthalate (DEHP): vacuum pumps; as a plasticizer for polyvinyl chloride (PVC) for medical devices, resins and elastomers. Solvent in erasable ink and dielectric fluid. Acaricide in orchards, an inert ingredient in pesticides, a detector for leaks in respirators, testing of air filtration systems and component in cosmetic products. Di-n-pentyl phthalate (DPP): plasticizer for nitrocellulose and resin lacquers; anti-foaming agent in the manufacture of glue; in rubber cements.
Thiram	Fungicide, bacteriostat, pesticide, rubber vulcanization accelerator, scarabicide, seed disinfectant, animal repellent, insecticide, lube oil additive, and wood preservative. Anti-septic sprays, lubricant oils. It is used against Botrytis, rusts and downy mildews and as a seed dressing against "damping off" and verticillium wilt. It is also used as an ethanol antagonist and deterrent in mixtures of the methyl, ethyl, propyl and butyl derivatives. Antioxidant in polyolefin plastics and a peptizing agent in polysulphide elastomers. Soaps and rodent repellents and as a nut, fruit and mushroom disinfectant.
Toxaphene	Usage banned by the Stockholm Convention on Persistent Organic Pollutants. Insecticide and pesticide. It was used on cotton crops, cattle, swine, soybeans, corn, wheat, peanuts, lettuce, tomatoes, grains, vegetables, fruit and other food crops; for control of animal ectoparasites, grasshoppers, army-worms, cutworms and all major cotton pests. It controls livestock pests such as flies, lice, ticks, scab mites and mange. It also controls mosquito larvae, leaf miners, bagworms, church bugs, yellow jackets and caterpillars.
Trifluralin	Pre-emergence herbicide, especially for cotton plants.
Zineb	Agricultural fungicide; insecticide.
Ziram	Fungicide and repellent to birds and rodents. Rubber vulcanization accelerator. Adhesives including those used in food packaging, paper coats for non-food contact, industrial cooling water, latex-coated articles, neoprene, paper and paperboard, plastics (polyethylene and polystyrene) and textiles.

Source: http://www.ourstolenfuture.org/Basics/chemuses.htm

Endocrine Disrupting Chemicals (Pharmaceuticals)

Table 10. Example known and suspected Pharmaceutical Endocrine Disrupting Chemicals

Aspirin	Analgesic
Bacitracin	Antibiotic
Carbamazepine	Antiepileptic
Chlorampenicol	Antibiotic
Ciprofloxacin[1]	Antibiotic
Clofibrate	Lipid regulator
Clofibric Acid	Lipid regulator
Enroflaxin[2]	Antibiotic
Eryrthromycin	Antibiotic
Fluvoxetine HCl	Antidepressant
Fluvoxamine	Antidepressant
Ibuprofen	Analgesic/Anti-inflammatory
Lincomycin[1,2]	Antibiotic
Naladixic acid[2]	Antibiotic
Naproxen sodium	Analgesic/Anti-inflammatory
Norfloxacin[2]	Antibiotic
Oleandomycin[2]	Antibiotic
Oxytetracycline	Antibiotic
Paracetamol	Analgesic
Paroxetine HCl	Antidepressant
Roxithromycin[2]	Antibiotic
Salicyclic Acid	Topical keratolytic
Sulfamethoxazole[1]	Antibiotic
Sulfamethazine	Antibiotic
Tetracycline	Antibiotic
Triclosan	Antibacterial
Trimethoprim[1,2]	Antibiotic
Tylosin[2]	Antibiotic

Source: CRC-WQT (2007)

1 Detected in STP and AWTP effluent {{57 Watkinson, A.J. 2007;}}

2 Detected in AWTP product water {{57 Watkinson, A.J. 2007;}}

Callide Release TEP Report

Issued to [redacted] of DERM for purposes of section 10 of the Transitional Environmental Program - CA22011

CS ENERGY LTD

March 8, 2011

Authored by: [redacted]

Callide Release TEP Report

Background

CS Energy in conjunction with Callide Power Management owns and operates Callide A, B and C power stations located on Biloela, Queensland and holds registrations certificates ENRE 00952209, and ENRE 00849808 respectively

The Callide ash containment dam operates within a statutory 0.01 AEP (Annual Exceedence Probability) annual risk level DSA (Design Storage Allowance) of RL 213.37m based upon the start of the wet season of 1st November of each year. Due to significant rainfall events in the area in December 2010 and subsequent rainfall for the January period, the water levels within the dam reached a peak of RL 214.92m, just below the spillway level of RL 214.95m.

A TEP (Transitional Environmental Program, certificate no: CA22011 issued 11/01/2011) was issued to the station authorizing a controlled release of ash dam water in conjunction with the nearby Callide Dam water release subject to set conditions.

Release

The Callide Ash Dam commenced release of its water at 1700 on January 11 with a total flow-rate of 23ML/d from the siphons located at the spillway. This water converged with the Callide dam release waters flow-rate of 1730ML/d approximately 600m upstream of the Calvale Rd crossing.

The Callide Ash Dam ceased release of its water at 0950 on January 20 to coincide with the reduction of release flow from the Callide dam as per the TEP requirements, (*the contaminant release flow rate not to exceed 5% of the receiving water flow rate*), which was noted to be 445ML/d at the start of the day with a reduction to 200ML/d within a 24 hour period.

Monitoring

Pre-discharge:

CS Energy selected 19 sub-artesian monitoring hores throughout the Callide Valley to provide a representative sample, of which 16 were sampled 13th-15th December 2010. The sampled bores consisted of 11 DERM, 3 CS Energy and 2 private properties. This was conducted as part of a separate study (CS Energy Environmental Investigation) which provided some background data prior to release.

Surface water points as nominated under the 'Callide Power Station ADB Spill Management Plan Feb 2009' were sampled on the 11th of January 2011 to provide some background data prior to release.

Discharge:

CS Energy selected 10 sub-artesian bores downstream of the discharge point based on an expanded selection nominated under the aforementioned Spill Management Plan. The bores were a mixture of DERM, Sun-Water, and private with the range located from around 1.5km downstream from the discharge point to Callide weir approximately 20km distant.

All previously noted surface water points were sampled on a daily basis from 12th to 20th January as required under the TEP.

Checks were also undertaken of the flow from site and the receiving waters beds and banks to monitor for any erosion or sediment build up; of which neither were noted.

Post:

A post-release sampling of the previously noted water surface points were sampled on the 21st and 24th January, and the aforementioned 10 sub-artesian bores was conducted on the 16th February as a further basis on gaining a greater understanding of the background water chemistry.

Discharge flow-rates:[1]

	11/1/11	12/1/11	13/1/11	14/1/11	15/1/11	16/1/11	17/1/11	18/1/11	19/1/11	20/1/11	Total
Callide Dam release (ML/d)	1,730	1,730	1,700	724	596	578	596	532	474	445	9,205
Callide Power Station release (Ml/d)	13.4	23	23	23	23	23	22	22	22	13.7	208.1

[1] Callide Power Station release flow rates taken from a 24 hour period of 0700 each day.

Sampling

Bore sampling was conducted through the contracted services of Aurecon and carried out in accordance with the sampling protocol specified in AS/NZS 5667:11:1998 (Water Sampling Guidelines – Part 11 Guidelines on Sampling Groundwaters). The locations of the sampled boreholes were tabulated using GPS, with reference photographs, and in-situ measurements taken for water level, electrical conductivity, dissolved oxygen and pH. All samples were submitted to an independent NATA accredited laboratory, (Australian Laboratory Services (ALS), Brisbane), where the water quality constituents[2] were analysed.

Surface water sampling was conducted by the CS Energy environmental staff and carried out in accordance with AS/NZS 5667.6:1998 Water Quality - Sampling - Guidance on sampling of rivers and streams. In-situ testing was conducted using the YSI Professional Plus field meter with samples sent to ALS for analysis. Duplicates of water samples were also analysed for conductivity (µS/cm), turbidity, pH, sulfate, and chloride through the Callide Power Station laboratory.

Results

Daily reports that contained data on in-situ monitoring results, receiving water flow rate, and discharge flow rate were submitted to DERM during the release.

Bore water and surface water analysis results from ALS were submitted to DERM once received. *See appendix for full results table.*

Both in-situ and ALS results were compared against the water quality performance indicators (as found in Table A of the TEP) which were based upon the Australian Drinking Water Guidelines (ADWG), as well as the stock-water and irrigation water guidelines. This was conducted to assess the receiving waters environmental status and provide an early warning for any potential issues.

The in-situ surface water results demonstrated a slight increase in conductivity, sulfate and chloride and a few trace elements such as calcium and boron levels at all monitoring points as was expected which quickly ranged back to background levels once the release ceased. At no time did any receiving water monitoring point indicate trace levels of concern with all results well within the water quality performance indicators.

It was noted during the first few days of release that the chloride levels on the field monitor appeared higher than expected, which was supported by the site laboratory results. Anomalous readings in DO and TDS were also noted. The meter's chloride probe was replaced and the meter recalibrated on the 18th January correcting the issue (*which is reflected within the results table*).

The borehole results for both pre-discharge and discharge dates are located within the results table. As there has been no history available for these there has been no way of determining any impacts, however based

[2] Full list of water quality constituents are located in the results section.

upon the positive surface water analysis there is no assessed degradation of these waters as a result of the release.

There were a number of bores that appeared to show anomalous readings for which there was no determined source. It was noted from the Aurecon report[3] that the laboratory measurements of salts and metals for Bore 13030127 were inconsistent with other bores in the area. In addition, stabilization of in-situ water quality parameters during purging of the bore prior to sample collection took considerably longer than all other bores and was found to be inconsistent with subsequent laboratory measurements. 'The combination of these factors suggest that chemical results for this bore are anomalous...it is recommended that the results be disregarded'[4]

Conclusion

CS Energy conducted a controlled, authorized release of water from its waste containment facility at Callide Power Station from the dates of the 11th to the 20th January.

Prior to that period, background water analysis was conducted of both ground and surface water of the receiving environment.

During the release ground water analysis was undertaken; in addition daily analysis of the surface water was conducted to monitor quality against agreed set guidelines, of which none were exceeded.

CS Energy is satisfied that it has met the TEP requirements for this release.

[3] Callide Creek Borehole Sampling Methodology Report for CS Energy, 16th Feb 2011, Rev1
[4] Callide Creek Borehole Sampling Methodology Report for CS Energy, 16th Feb 2011, Rev1, Review of Data, page 9'

<u>Sampling locations and results as stipulated in the 'Callide Power Station Ash Dam B Spill Management Plan, 27th Feb, 2009 Revision 7'.</u>

Pre -spill - **Surface Water -** Callide Dam. If dischar ge occurs via Western channel then o be added to sampling monito

Frequency One sample of each is require to be conducted prior to release

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency Numbered bores to be sampled once prior to release.

During spill - **Surface Water -** Callide Dam. If dischar ge occurs via Western channel then Callide Creek adjacent to Nob's bore to be added to sampling monito

Frequency All surface water to be sampled daily

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency Numbered bores to be sampled initially at a fortnightly interval, reduced to monthly after two sampling events. Landholders bores to be sampled prior ro any extraction and every 1ML that is irrigated.

NOTE - If plume is detected within the bores then sampling frequency is to be increased to weekly with sampling locations to be both d/stream and laterally from the creek.

Post spill - **Surface Water -** Callide Dam. If dischar ge occurs via Western channel then C to be added to sampling monito

Frequency As above until it has been been determined that the spill plume is within acceptable levels.

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency As above until it has been been determined that the spill plume is within acceptable levels.

Sampling to commence 11/1/11 Discharge started late on 11th January 2011.

<u> Note that if ash dam plume is detected then bore monitoring is required to be escalated to a weekly monitoring with sampling locations to be extended both downstream and laterally from the creek.</u>*

ring

ring

ring

Analytes	Sample container to be used	Sample size required	Preservation Methods	Maximum Storage Time
Field analytes - in field (using the YSI Field monitor	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C	72 hours
Conductivity, TDS, SS, Alkalinity, Fluoride, Sulfate, Chloride, Boron, Silica, Hardness	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C	24 hours
BOD	Plastic bottle - unpreserved	250 mL	Refrigerate at 4°C	24 hours
Aluminium, Arsenic, Barium, Beryllium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Sodium, Strontium, Tin, Thallium, Thorium, Uranium, Vanadium, Zinc	Plastic bottle - nitric acid supplied in bottle	250 mL	Filter on site to 0.45 µm Refrigerate at 4°C	28 days
Oil and Grease	Glass bottle - acid supplied within bottle	1000 mL	Refrigerate at 4°C	7 days

During - discharge

Surface water

Discharge commenced late 11th

Surface	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB
Date	11/01/2011	12/01/2011	13/01/2011	14/01/2011	15/01/2011	16/01/2011	17/01/2011	18/01/2011	19/01/2011	20/01/2011
Time	1415	1200	1130	915		840		1135		924
Sampler	J Dunlop	J Dunlop	J Dunlop	J Dunlop	J Dunlop	D P-Hughes	J Dunlop	J Dunlop	J Dunlop	J Dunlop
Field results										
pH	8.86	8.85	8.98	8.89	7.55	7.35	7.48	7.45	7.39	7.59
DO	7.07	5.53	5.16	4.31	4.81	6.04	6.09	8.86	8.45	4.8
Cl	>1000	>1000	>1000	>1000	>1000	> 1,000	> 1,000	949.49	978.34	1022.15
EC (µS/cm)	6450	6425	6705	6609	6464	6426	6493	6455	6527	6530
TDS	4321.5	4304.75	4492.35	4428.03	4330.88	4305.42	4545.1	4324.85	4373.09	4381.13
Temp	26.8	27.8	28	27.2	27.4	27.5	28.5	29	30	28.7
Callide Lab results										
Cond (µS/cm)	6300	6390	6620	6480	6360	6450	6390	6260	6270	6310
Turbidity	6.83	4.55	4.06	4.36	5.68	2.99	4.4	5.54	4.87	3.92
pH	8.43	8.41	8.22	8.22	8.24	7.44	8.32	8.26	8.27	8.24
Sulfate	1300	1350	9.5	1300	1300	1275	1325	1300	1300	1300
Chloride	1388	1403	1475	1446	1446	1441	1446	1446	1431	1427
Lab results										
Conduct	6400	6980	7130	7160	5720	5860	6960	6520	6570	6540
TDS	4460	4690	4830	5810	4860	6070	6210	4490	5310	4700
SS	14	12	16	14	<5	<5	8	19	21	18
Alkalinity	69	73	67	69	77	86	68	71	80	76
Fluoride	1.4	1.8	1.8	1.8	1.5	1.5	1.8	1.4	1.4	1.4
Sulfate	1420	1480	1640	1420	1360	1350	1400	1440	1440	1440
Chloride	1400	1400	1300	1300	1320	1290	1270	1460	1410	1440
Boron	1.76	1.77	2.05	1.95	2.44	2.42	1.91	1.99	2.05	1.93
BOD	<2	<2	<2	<2	4	<2	<2	<2		<2
Silica	5.4	5.6	5.9	5.6	5.4	5.5	5.9	5.8	6	6.1
Oil and Grease	<5	<5	<5	<5	<5	<5	<5	6		<5
Hardness										
Aluminium	0.06	0.06	0.05	0.06	0.06	0.07	0.07	0.08	0.05	0.09
Arsenic	0.003	0.004	0.003	0.003	0.003	0.004	0.003	0.004	0.004	0.004
Barium	0.092	0.09	0.098	0.094	0.095	0.097	0.098	0.106	0.099	0.102
Beryllium										
Calcium	348	361	354	316	361	360	306	366	372	372
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	0.002	<0.001	<0.001
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	0.004	0.004	0.001	0.002	0.002	0.002	0.002	0.003	0.002	0.002
Iron	<0.05	<0.5	<0.05	0.08	<0.05	<0.05	0.08	<0.05	<0.05	<0.05
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	0.231	0.237	0.278	0.255	0.354	0.364	0.257	0.276	0.258	0.253
Magnesium	246	254	298	260	262	262	252	260	268	268
Manganese	<0.001	<0.001	0.003	<0.001	0.001	0.004	<0.001	0.003	<0.001	0.002
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	0.14	0.144	0.149	0.14	0.139	0.14	0.145	0.142	0.157	0.141
Nickel	0.002	<0.005	0.002	0.002	0.001	0.001	0.002	0.002		0.002
Potassium	17	20	19	15	18	18	17	18	18	19
Selenium	<0.01	<0.01	<0.01	<0.01	0.01	0.01	<0.01	<0.01	<0.01	<0.01
Sodium	802	829	803	543	824	808	828	803	780	782
Strontium	3.95	3.93	4.38	4.03	4.39	4.47	4.15	4.39	4.54	4.35
Tin			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Thorium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001
Uranium	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002		0.002
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01
Zinc	<0.005	<0.005	<0.005	<0.005	0.008	0.006	<0.005	0.018	<0.005	0.016

Surface	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam	Callide dam
Date	11/01/2011	12/01/2011	13/01/2011	14/01/2011	15/01/2011	16/01/2011	17/01/2011	18/01/2011	19/01/2011	20/01/2011	21/01/2011	24/01/2011
Time	1110	815	1120	1135		810		1112		902	1205	
Sampler	D P-Hughes	J Dunlop	J Dunlop	J Dunlop	J Dunlop	D P-Hughes	J Dunlop	J Dunlop	J Dunlop	J Dunlop	J Dunlop	J Dunlop
Field results												
pH	7.77	8.22	8.2	8.14	6.82	6.91	7.17	6.97	6.86	6.91	7.08	7.33
DO	2.44	2.09	3.42	2.62	1.9	2.61	4.43	9.78	8.66	3.67	3.04	4.32
Cl	47.09	48.25	47.32	63.41	58.34	72.58	64.16	17.67	25.5	17.55	18.45	29.45
EC (µS/cm)	233.4	216.5	222.3	219.1	216.3	209.1	161.3	209.2	217.4	210.2	214.7	210.8
TDS	156.4	145.1	148.9	146.8	144.9	140.1	108.1	140.2	145.66	140.83	143.85	141.24
Temp	33.9	28.6	30.2	31.4	28.8	27.5	29.4	27.8	27.8	29.2	30.5	28.1
Callide Lab results												
Cond (µS/cm)	241	223	217	263.8	210.4	210.1	205.2	225.6	227.7	204.1		
Turbidity	138	74.6	376*	56.3	63	59	63.3	70.4	82.7	59.1		
pH	7.37	7.52	7.55	7.12	7.26	7.44	7.52	7.21	7.47	7.38		
Sulfate	5.5	4.5	9.5	6.5	9	12	9	11	11	8.5		
Chloride	19.8	19.3	20.2	20.2	21.2	20.2	19.3	18.3	18.3	18.3		
Lab results												
Conduct	259	248	229	226	206	192	216	200	203	210	208	202
TDS	130	189	194	169	203	218	175	183	180	164	268	210
SS	264	101	149	36	10	63	<5	41	22	41	40	54
Alkalinity	75	67	64	63	61	71	57	57	67	59	70	68
Fluoride	0.1	0.1	0.2	0.1	0.1	0.1	0.1	<0.1	<0.1	<0.1	<0.1	<0.1
Sulfate	6	6	7	6	6	5	8	6	6	6	6	6
Chloride	24	30	24	24	19	22	23	20	21	22	22	17
Boron	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05
BOD	6	<2	5	4	5	<2	3	<2		<2	2	<2
Silica	21.6	21.8	21.4	27.6	21.6	21.6	24.4	23.1	23.8	23.6	24.6	23.1
Oil and Grease	<5	<5	<5			<5	<5	6		<5	11	<5
Hardness												
Aluminium	0.31	0.43	0.53	1.4	1.36	0.46	1.52	0.31	0.5	0.15	0.21	0.25
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Barium	0.022	0.019	0.029	0.027	0.022	0.018	0.019	0.019	0.013	0.018	0.04	0.023
Beryllium												
Calcium	17	18	13	14	17	16	13	15	16	15	17	16
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	0.002	0.002	0.002	0.002	0.003	0.002	0.003	0.002	0.002	0.002	0.002	0.003
Iron	0.32	0.35	0.16	0.25	0.75	0.28	0.3	0.27	0.47	0.13	0.18	0.28
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Magnesium	6	6	6	6	6	6	6	6	6	6	6	6
Manganese	0.002	0.004	0.01	0.049	0.032	0.021	0.004	0.042	0.002	0.007	0.013	0.021
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	<0.001	<0.001	<0.001	<0.001	0.003	0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002
Nickel	0.001	0.001	0.001	0.001	0.002	0.001	0.002	0.002		0.001	0.002	0.002
Potassium	4	5	4	4	4	4	3	3	3	3	4	3
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	15	15	19	16	19	19	19	16	18	16	18	17
Strontium	0.103	0.101	0.11	0.105	0.102	0.102	0.096	0.094	0.089	0.096	0.104	0.106
Tin			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Thorium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Uranium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Zinc	<0.005	<0.005	<0.005	0.008	0.047	0.006	0.005	0.016	<0.005	0.016	0.009	0.006

Surface	Calv/coal crossing	Calv/coal crossing		Calv/coal crossing		Calv/coal crossing		Calv/coal crossing		Calv/coal crossing		Calv/coal crossing		Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing	Calv/coal crossing
Date	11/01/2011	12/01/2011		13/01/2011		14/01/2011		15/01/2011		16/01/2011		17/01/2011		18/01/2011	19/01/2011	20/01/2011	21/01/2011	24/01/2011
Time	1040	830		830		1050				730				1125		914	1210	
Sampler	D P-Hughes	J Dunlop		J Dunlop		J Dunlop		J Dunlop		D P-Hughes		J Dunlop		J Dunlop	J Dunlop	J Dunlop	J Dunlop	J Dunlop
Field results		North	South	North	South	North	South	North	South	North	South	North	South	Back to centre				
pH	8.03	8.51	8.5	8.25	8.52	8.55	8.25	6.64	7.02	6.93	7.15	7.05	7.12	6.97	6.97	7.01	7.21	7.41
DO	5.65	5.38	5.33	6.44	6.31	6.01	6.2	5.21	5.77	5.66	6.12	5.87	6.68	12.11	9.47	5.6	5.47	5.95
Cl	65.77	207.5	95.63	159	53.3	209.53	93.44	245.96	109.37	350.36	195.91	289.11	195.85	56.8	48.85	53.29	28.32	29.45
EC (µS/cm)	206.8	588	330.6	433.8	225.4	519	332.8	565	346.7	640	461.9	640	474.3	497.1	369.2	418.8	272.4	241.1
TDS	138.6	394.0	221.5	290.6	151.0	347.7	223.0	378.55	232.29	428.8	309.47	428.8	217.78	333.1	247.36	280.60	182.5	161.5
Temp	25.9	24.9	26.3	26.7	27.3	26.1	26.2	23.7	23.9	23.6	23.7	24.1	24.1	24.6	24.3	24.4	25.2	23.9
Callide Lab results																		
Cond (µS/cm)	210	619		435		516		559		647		632		521	442	430		
Turbidity	155	142		110		101		132		124		118		76	131	110		
pH	7.46	7.49		7.64		7.5		7.29		7.49		7.43		7.28	7.56	7.38		
Sulfate	9	105		64		85		107.5		95		115		87.5	55	64		
Chloride	20.7	93		61.7		75.7		88.7		102.2		86.8		73.7	62.7	58.8		
Lab results																		
Conduct	184	681		431		499		533		575		625		528	509	425	292	265
TDS	88	430		390		383		487		487		450		357	381	285	273	285
SS	56	96		12		46		13		10		32		23	124	33	21	76
Alkalinity	40	58		55		54		62		63		51		68	61	54	72	73
Fluoride	<0.1	0.2		0.2		0.2		0.2		0.2		0.2		0.1	0.2	0.1	<0.1	<0.1
Sulfate	9	82		83		72		71		79		94		59	63	46	19	14
Chloride	29	98		58		70		105		108		104		81	77	61	31	27
Boron	<0.05	0.13		0.08		0.14		0.21		0.21		0.14		0.11	0.09	0.08	<0.05	<0.05
BOD	<2	<2		<2		2		<2		2		<2		2		3	3	3
Silica	22.9	21.4		23.6		25.9		21.2		21.1		21.1		22.5	22.5	23.4	24.8	24.6
Oil and Grease	<5	<5		<5		<5		<5		<5		<5		9		5	<5	<5
Hardness																		
Aluminium	0.54	0.1		1.09		1.06		1.06		0.46		0.82		0.16	0.4	0.14	0.2	0.2
Arsenic	0.002	0.002		0.002		0.002		0.002		0.002		0.002		0.002	0.002	0.002	0.002	0.002
Barium	0.015	0.026		0.022		0.026		0.027		0.027		0.195		0.127	<0.001	0.03	0.028	0.02
Beryllium																		
Calcium	13	33		32		30		32		35		31		28	28	24	17	18
Chromium	<0.001	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	<0.001	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	<0.001	<0.001	<0.001	<0.001
Copper	0.003	0.002		<0.001		0.003		0.003		0.003		0.003		0.002	0.003	0.003	0.002	0.003
Iron	0.49	0.17		0.21		0.2		0.55		0.32		0.31		0.18	0.29	0.18	0.23	0.36
Lead	<0.001	<0.001		<0.001		<0.001		<0.001		<0.001		0.002		<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	<0.001	0.011		0.006		0.008		0.014		0.019		0.013		0.006	0.008	0.007	<0.001	<0.001
Magnesium	6	19		19		16		19		21		19		16	16	12	9	8
Manganese	0.003	0.002		0.01		0.006		0.015		0.029		0.019		0.192	0.071	0.029	0.056	0.13
Mercury	<0.0001	<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001		<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	<0.001	0.007		0.003		0.006		0.006		0.01		0.008		0.004	0.004	0.004	0.001	0.001
Nickel	0.001	0.002		0.001		0.002		0.002		0.002		0.002		0.001		0.002	0.002	0.002
Potassium	4	5		4		4		4		4		4		3	4	3	3	3
Selenium	<0.01	<0.01		<0.01		<0.01		<0.01		<0.01		<0.01		<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	15	49		36		52		50		55		53		48	46	35	24	23
Strontium	0.086	0.258		0.201		0.217		0.268		0.324		0.3		0.226	0.215	0.199	0.126	0.121
Tin				<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	<0.001	<0.001
Thallium	<0.001	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	<0.001	<0.001
Thorium	<0.001	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	<0.001	<0.001
Uranium	<0.001	<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001		<0.001	<0.001	<0.001
Vanadium	<0.01	<0.01		<0.01		<0.01		<0.01		<0.01		<0.01		<0.01		<0.01	<0.01	<0.01
Zinc	<0.005	<0.005		<0.005		<0.005		0.016		0.006		0.018		0.006	0.018	0.016	0.008	0.007

Surface	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing
Date	11/01/2011	12/01/2011	13/01/2011	14/01/2011	15/01/2011	16/01/2011	17/01/2011	18/01/2011	19/01/2011	20/01/2011	21/01/2011	24/01/2011
Time	1050	855	1110	1125		755		1100		850	1155	
Sampler	D P-Hughes	J Dunlop	J Dunlop	J Dunlop	J Dunlop	D P-Hughes	J Dunlop	J Dunlop	J Dunlop	J Dunlop	J Dunlop	J Dunlop
Field results												
pH	8.12	8.41	8.69	8.71	7.14	6.95	7.1	7.01	6.94	7	7.25	7.26
DO	4.68	5.23	4.92	5.23	5.24	5.27	5.74	11.21	9.46	5.01	5.13	5.05
Cl	68.72	121.61	166.7	136.5	149.56	257.72	281.86	73.78	79.5	76.4	47.49	44.9
EC (µS/cm)	241.6	416.7	509	407.7	442.2	526	568	592	483	534	368.5	303.1
TDS	161.9	279.2	341.0	273.2	296.27	285.42	380.56	396.6	323.61	357.78	246.90	203.08
Temp	26.5	25.1	26.9	26.2	24.2	24	24	25.2	24.7	25.1	25.8	25.1
Callide Lab results												
Cond (µS/cm)	234	396	514	368.2	426	536	573	585	479	538		
Turbidity	140	116	122	91.4	106	109	110	108	115	107		
pH	7.37	7.33	7.36	7.32	7.23	7.41	7.45	7.43	7.48	7.43		
Sulfate	9	47	78	43	67	95	102.5	100	65	82		
Chloride	24.6	54	78.1	57.8	64.1	81.9	86.8	89.7	71.8	78.1		
Lab results												
Conduct	255	445	495	401	388	502	553	591	495	534	361	298
TDS	170	302	426	295	361	438	408	400	347	369	288	281
SS	39	54	70	32	28	13	58	42	26	31	27	21
Alkalinity	58	64	57	58	62	64	56	58	66	58	68	73
Fluoride	0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.1	0.1	0.1	<0.1
Sulfate	10	37	57	49	44	59	84	73	56	65	30	16
Chloride	30	57	77	58	88	81	95	97	74	88	49	37
Boron	<0.05	0.07	0.09	0.08	0.11	0.13	0.11	0.12	0.09	0.11	0.05	<0.05
BOD	<2	<2	<2	<2	3	2	<2	3		3	4	<2
Silica	22.5	22.9	20.9	26.6	21.4	21.4	24.4	21.4	22.7	22.7	24	23.8
Oil and Grease	<5	<5	<5	<5	<5	<5	<5	<7		<5	<5	<5
Hardness												
Aluminium	0.37	0.3	0.71	1.39	1.28	0.47	0.8	0.16	0.27	0.13	0.18	0.14
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002
Barium	0.016	0.024	0.03	0.027	0.028	0.026	0.042	0.038	0.019	0.024	0.025	0.019
Beryllium												
Calcium	14	24	23	25	26	30	31	31	24	30	20	19
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	0.002	0.002	0.004	0.003	0.003	0.003	0.004	0.003	0.003	0.002	0.002	0.003
Iron	0.37	0.34	0.15	0.23	0.7	0.3	0.24	0.15	0.35	0.14	0.18	0.26
Lead	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	0.002	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	<0.001	0.004	0.006	0.004	0.008	0.012	0.01	0.011	0.008	0.009	0.003	<0.001
Magnesium	6	12	13	13	14	17	18	18	15	17	11	9
Manganese	0.003	0.003	0.014	0.006	0.018	0.018	0.019	0.016	0.003	0.013	0.013	0.015
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	<0.001	0.002	0.003	0.003	0.003	0.006	0.006	0.006	0.004	0.004	0.002	0.002
Nickel	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002		0.001	0.002	0.002
Potassium	4	5	4	4	4	4	4	3	4	4	3	3
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	17	30	41	36	41	47	53	52	43	50	31	26
Strontium	0.091	0.153	0.213	0.161	0.208	0.255	0.257	0.277	0.219	0.239	0.166	0.131
Tin			<0.01	<0.01	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Thorium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Uranium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Zinc	<0.005	0.012	<0.05	<0.005	0.009	0.01	0.014	0.006	<0.005	0.006	0.009	0.006

Surface	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy	Glad hwy
Date	11/01/2011	12/01/2011	13/01/2011	14/01/2011	15/01/2011	16/01/2011	17/01/2011	18/01/2011	19/01/2011	20/01/2011	21/01/2011	24/01/2011
Time	1130	845	1050	1110		745		1050		837	1140	
Sampler	D P-Hughes	J Dunlop	J Dunlop	J Dunlop	J Dunlop	D P-Hughes	J Dunlop	J Dunlop	J Dunlop	J Dunlop	J Dunlop	J Dunlop
Field results												
pH	8.42	8.37	8.45	8.72	6.84	6.94	7.54	6.95	7.01	7.1	7.21	7.2
DO	5.04	5.09	4.9	5.31	5.12	4.75	5.52	9.5	9	4.88	4.78	3.89
Cl	47.09	85.42	223	134.35	158.08	250.82	293.22	74.69	100.73	76.06	70.85	63.75
EC (µS/cm)	240.3	211.7	574	381.7	420.9	490.2	567.2	545	583	534	499	322.7
TDS	161.0	141.8	384.6	255.7	282.0	328.4	380.0	365.2	390.61	357.78	334.33	216.209
Temp	26.2	25.1	26.4	26.2	24.8	25.1	24.8	25.9	25.4	25.7	27.2	25.2
CallideLab results												
Cond (µS/cm)	238	311	568	376.1	411	497	561	569	574	525		
Turbidity	136	143	116	90.9	116	105	109	102	105	107		
pH	7.44	7.42	7.48	7.4	6.61	7.45	7.37	7.44	7.45	7.43		
Sulfate	9	19	85	38	61	67.5	100	100	76	82		
Chloride	25.1	39	89.2	52.5	61.7	75.2	85.8	86.8	88.7	78.1		
Lab results												
Conduct	272	348	553	374	504	445	554	575	590	531	502	317
TDS	180	274	437	307	460	406	399	362	427	353	304	348
SS	43	52	44	46	20	18	54	38	30	41	82	112
Alkalinity	54	61	60	58	66	62	56	58	66	29	69	75
Fluoride	<0.1	0.1	0.2	0.2	0.1	0.2	0.2	0.1	0.2	0.1	0.2	<0.1
Sulfate	11	23	74	39	42	53	76	70	73	64	55	18
Chloride	33	44	90	54	64	73	88	93	94	97	76	39
Boron	<0.05	0.05	0.1	0.08	0.11	0.13	0.11	0.11	0.12	0.11	0.09	<0.05
BOD	<2	<2	<2	<2	<2	<2	<2	2		2	3	3
Silica	21.8	22.7	23.4	22.7	21	21.6	19.5	22.1	22.7	23.1	23.8	23.6
Oil and Grease	<5	<5	<5	<5	<5	<5		<7		5	<5	<5
Hardness												
Aluminium	0.35	0.3	1.07	5.69	0.97	0.5	0.8	0.2	0.15	0.15	0.14	0.24
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002
Barium	0.016	0.02	0.029	0.033	0.026	0.027	0.031	0.034	0.022	0.123	0.028	0.019
Beryllium												
Calcium	15	20	31	21	23	28	28	31	32	27	28	20
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Copper	0.002	0.003	0.002	0.004	0.004	0.003	0.003	0.003	0.003	0.003	0.003	0.003
Iron	0.32	0.31	0.15	0.57	0.5	0.31	0.28	0.16	0.25	0.14	0.16	0.27
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001
Lithium	<0.001	0.002	0.006	0.004	0.007	0.01	0.009	0.01	0.01	0.009	0.008	<0.001
Magnesium	6	9	18	11	13	16	16	18	19	17	16	10
Manganese	0.002	0.003	0.007	0.025	0.012	0.008	0.006	0.006	0.002	0.008	0.023	0.021
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001
Molybdenum	<0.001	0.001	0.004	0.002	0.003	0.005	0.005	0.005	0.006	0.005	0.004	0.003
Nickel	0.001	0.001	0.001	0.002	0.002	0.002	0.002	0.002		0.002	0.002	0.002
Potassium	4	5	4	3	3	4	3	3	4	4	4	3
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01
Sodium	18	24	53	28	36	44	44	51	55	44	46	28
Strontium	0.097	0.153	0.239	0.16	0.188	0.24	0.25	0.269	0.262	0.242	0.235	0.142
Tin			<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Thallium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Thorium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Uranium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001
Vanadium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01
Zinc	<0.005	<0.005	<0.005	<0.005	0.019	0.006	0.006	0.007	<0.005	0.008	0.008	0.007

Bores

Bore	68078					
Date	18/01/2011					
Time						
Sampler						
Water depth						
Field results						
pH						
DO						
EC (µS/cm)						
TDS						
Temp						
Lab results						
pH	7.44					
Conduct	483					
Alkalinity	143					
Fluoride	0.1					
Sulfate	22					
Chloride	47					
Boron	0.05					
Hardness						
Arsenic	0.001					
Barium	0.023					
Calcium	33					
Chromium	<0.001					
Copper	0.01					
Lithium	<0.001					
Magnesium	<0.001					
Molybdenum	<0.001					
Potassium	1					
Selenium	<0.01					
Sodium	40					
Strontium	0.199					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.237					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	62420					
Date	18/01/2011					
Time						
Sampler						
Water depth						
Field results						
pH	6.77					
DO						
Cl						
EC (μS/cm)	1448					
TDS	970.16					
Temp						
Lab results						
pH	7.86					
Conduct	1160					
Alkalinity	106					
Fluoride	<0.1					
Sulfate	89					
Chloride	263					
Boron	0.07					
Hardness						
Arsenic	0.002					
Barium	0.07					
Calcium	81					
Chromium	0.07					
Copper	<0.001					
Lithium	<0.001					
Magnesium	41					
Molybdenum	<0.001					
Potassium	4					
Selenium	<0.01					
Sodium	86					
Strontium	0.453					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.161					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	33675					
Date	18/01/2011					
Time						
Sampler						
Water depth						
Field results						
pH	6.96					
DO						
Cl						
EC (µS/cm)	19280					
TDS	12917.6					
Temp						
Lab results						
pH	7.77					
Conduct	20200					
Alkalinity	176					
Fluoride	0.2					
Sulfate	21					
Chloride	7490					
Boron	0.1					
Hardness						
Arsenic	<0.001					
Barium	1.42					
Calcium	884					
Chromium	0.001					
Copper	0.002					
Lithium	0.002					
Magnesium	1180					
Molybdenum	0.002					
Potassium	24					
Selenium	<0.01					
Sodium	1590					
Strontium	13.3					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.009					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	weir 561					
Date	18/01/2011					
Time						
Sampler						
Water depth						
Field results						
pH	7.22					
DO						
Cl						
EC (µS/cm)	301					
TDS	201.67					
Temp						
Lab results						
pH	8.09					
Conduct	300					
Alkalinity	110					
Fluoride	0.2					
Sulfate	7					
Chloride	19					
Boron	<0.05					
Hardness						
Arsenic	0.002					
Barium	0.055					
Calcium	15					
Chromium	0.001					
Copper	0.002					
Lithium	<0.001					
Magnesium	7					
Molybdenum	0.002					
Potassium	<1					
Selenium	<0.01					
Sodium	70					
Strontium	0.137					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.02					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	89741					
Date	18/01/2011					
Time						
Sampler						
Water depth						
Field results						
pH	7.14					
DO						
Cl						
EC (μS/cm)	789					
TDS	528.63					
Temp						
Lab results						
pH	8.03					
Conduct	785					
Alkalinity	101					
Fluoride	<0.1					
Sulfate	63					
Chloride	146					
Boron	0.06					
Hardness						
Arsenic	0.002					
Barium	0.042					
Calcium	48					
Chromium	<0.001					
Copper	0.003					
Lithium	<0.001					
Magnesium	23					
Molybdenum	<0.001					
Potassium	3					
Selenium	<0.01					
Sodium	70					
Strontium	0.282					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.23					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030127	13030127				
Date	15/12/2010	19/01/2011				
Time						
Sampler	Sarah					
Water depth	14.2					
Field results						
pH	6.16	6.31				
DO	7.4					
Cl						
EC (µS/cm)	1284	952				
TDS		637.84				
Temp	24.7					
Lab results						
pH	3.5	5.23				
Conduct	5060	945				
Alkalinity	<1	2				
Fluoride	<0.1	0.1				
Sulfate	1900	300				
Chloride	952	110				
Boron	<0.05	<0.05				
Hardness	592					
Arsenic	0.003	0.002				
Barium	0.04	0.029				
Calcium	135	39				
Chromium	<0.001	<0.001				
Copper	0.01	<0.001				
Lithium	0.031	<0.001				
Magnesium	62	18				
Molybdenum	<0.001	<0.001				
Potassium	3	2				
Selenium	0.02	<0.01				
Sodium	58	51				
Strontium	0.413	0.198				
Uranium	<0.001	<0.001				
Vanadium	<0.01	<0.01				
Zinc	414	29.3				

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	68807					
Date	17/01/2011					
Time						
Sampler						
Water depth						
Field results						
pH	7.3					
DO	7.74					
Cl						
EC (µS/cm)	7730					
TDS	5179.1					
Temp						
Lab results						
pH	8.03					
Conduct	7680					
Alkalinity	342					
Fluoride	0.1					
Sulfate	843					
Chloride	2020					
Boron	0.39					
Hardness						
Arsenic	0.002					
Barium	0.068					
Calcium	427					
Chromium	<0.001					
Copper	<0.001					
Lithium	0.001					
Magnesium	301					
Molybdenum	0.002					
Potassium	7					
Selenium	<0.01					
Sodium	920					
Strontium	2.46					
Uranium	0.004					
Vanadium	<0.01					
Zinc	0.015					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	68267					
Date	17/01/2011					
Time						
Sampler						
Water depth						
Field results						
pH	6.92					
DO	4.03					
Cl						
EC (µS/cm)	1067					
TDS	714.89					
Temp						
Lab results						
pH	8.13					
Conduct	1060					
Alkalinity	136					
Fluoride	0.2					
Sulfate	89					
Chloride	209					
Boron	0.11					
Hardness						
Arsenic	0.002					
Barium	0.052					
Calcium	56					
Chromium	<0.001					
Copper	0.01					
Lithium	<0.001					
Magnesium	31					
Molybdenum	<0.001					
Potassium	3					
Selenium	<0.01					
Sodium	115					
Strontium	0.362					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.021					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030284	13030284				
Date	13/12/2010	18/01/2011				
Time						
Sampler	Sarah					
Water depth	9.51					
Field results						
pH	6.06	6.65				
DO	8.12					
Cl						
EC (µS/cm)	1339	1075				
TDS		720.25				
Temp	24.8					
Lab results						
pH	6.75	7.71				
Conduct	1360	1180				
Alkalinity	144	123				
Fluoride	<0.1	<0.1				
Sulfate	75	66				
Chloride	325	252				
Boron	0.07	0.06				
Hardness	443					
Arsenic	<0.001	0.003				
Barium	0.09	0.09				
Calcium	100	77				
Chromium	<0.001	<0.001				
Copper	<0.001	<0.001				
Lithium	<0.001	<0.001				
Magnesium	47	36				
Molybdenum	<0.001	<0.001				
Potassium	3	3				
Selenium	<0.01	<0.01				
Sodium	95	81				
Strontium	0.623	0.41				
Uranium	<0.001	<0.001				
Vanadium	<0.01	<0.01				
Zinc	3.97	2.06				

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030283	13030283				
Date	16/12/2010	18/01/2011				
Time						
Sampler	Sarah					
Water depth	14.1					
Field results						
pH	6.19	6.93				
DO	7.61					
Cl						
EC (μS/cm)	5915	5570				
TDS		3731.9				
Temp	25.9					
Lab results						
pH	6.92	7.44				
Conduct	6200	5670				
Alkalinity	167	160				
Fluoride	<0.1	<0.1				
Sulfate	755	733				
Chloride	1500	1520				
Boron	0.14	0.21				
Hardness	2480					
Arsenic	<0.001	0.003				
Barium	0.067	0.064				
Calcium	537	486				
Chromium	0.002	<0.001				
Copper	0.002	0.004				
Lithium	0.001	0.002				
Magnesium	278	253				
Molybdenum	<0.001	0.003				
Potassium	11	14				
Selenium	<0.01	<0.01				
Sodium	385	391				
Strontium	3.35	2.55				
Uranium	<0.001	<0.001				
Vanadium	<0.01	<0.01				
Zinc	83.8	37.4				

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Sampling locations and results as stipulated in the 'Callide Power Station Ash Dam B Spill Manage

Pre -spill - **Surface Water**

Frequency One sample of each is require to be conducted prior to release

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13

Frequency Numbered bores to be sampled once prior to release.

During spill - **Surface Water** -

Frequency All surface water to be sampled daily

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13

Frequency Numbered bores to be sampled initially at a fortnightly interval, reduced t

NOTE - If plume is detected within the bores then sampling frequency is to be increa:

Post spill - **Surface Water** -

Frequency As above until it has been been determined that the spill plume is within a

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13

Frequency As above until it has been been determined that the spill plume is within a

Sampling to commence 11/1/11 Discharge started late on 11th January 2011.

** Note that if ash dam plume is detected then bore monitoring is required to be escalated to a weekly monito*

<u>'ment Plan, 27th Feb, 2009 Revision 7'.</u>

Callide Dam. If discharge occu rs via

}030128 and any extraction bores landholders are utilising.

Callide Dam. If discharge occu rs via

}030128 and any extraction bores landholders are utilising.

:o monthly after two sampling events. Landholders bores to be sampled prior ro any extraction ¿

sed to weekly with sampling locations to be both d/stream and laterally from the creek.

Callide Dam. If discharge occu rs via

ɜcceptable levels.

}030128 and any extraction bores landholders are utilising.

ɜcceptable levels.

<u>ring with sampling locations to be extended both downstream and laterally from the creek.</u>

to be added to sampling monitoring

to be added to sampling monitoring

and every 1ML that is irrigated.

to be added to sampling monitoring

Analytes	Sample container to be used	Sample size required	Preservation Methods
Field analytes - in field (using the YSI Field monitor	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C
Conductivity, TDS, SS, Alkalinity, Fluoride, Sulfate, Chloride, Boron, Silica, Hardness	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C
BOD	Plastic bottle - unpreserved	250 mL	Refrigerate at 4°C
Aluminium, Arsenic, Barium, Beryliium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Sodium, Strontium, Tin, Thallium, Thorium, Uranium, Vanadium, Zinc	Plastic bottle - nitric acid supplied in bottle	250 mL	Filter on site to 0.45 µm Refrigerate at 4°C
Oil and Grease	Glass bottle - acid supplied within bottle	1000 mL	Refrigerate at 4°C

Maximum Storage Time
72 hours
24 hours
24 hours
28 days
7 days

Pre-discharge

Surface water

Discharge commenced late 11th

Surface	ADB	ADB
Date	11/01/2011	12/01/2011
Time	1415	1200
Sampler	J Dunlop	J Dunlop
Field results		
pH	8.86	8.85
DO	7.07	5.53
Cl	>1000	>1000
EC (µS/cm)	6450	6425
TDS	4321.5	4304.75
Temp	26.3	27.8
Callide Lab results		
Cond (µS/cm)	6300	6390
Turbidity	6.83	4.55
pH	8.43	8.41
Sulfate	1300	1350
Chloride	1388	1403
Lab results		
Conduct	6400	6980
TDS	4460	4690
SS	14	12
Alkalinity	69	73
Fluoride	1.4	1.8
Sulfate	1420	1480
Chloride	1400	1400
Boron	1.76	1.77
BOD	<2	<2
Silica	5.4	5.6
Oil and Grease	<5	<5
Hardness		
Aluminium	0.06	0.06
Arsenic	0.003	0.004
Barium	0.092	0.09
Beryllium		
Calcium	348	361
Chromium	<0.001	<0.001
Cobalt	<0.001	<0.001
Copper	0.004	0.004
Iron	<0.05	<0.5
Lead	<0.001	<0.001
Lithium	0.231	0.237
Magnesium	246	254
Manganese	<0.001	<0.001
Mercury	<0.0001	<0.0001
Molybdenum	0.14	0.144
Nickel	0.002	<0.005
Potassium	17	20
Selenium	<0.01	<0.01
Sodium	802	829
Strontium	3.95	3.93
Tin		
Thallium	<0.001	<0.001
Thorium	<0.001	<0.001
Uranium	0.002	0.002
Vanadium	<0.01	<0.01
Zinc	<0.005	<0.005

Surface	Callide dam	Callide dam
Date	11/01/2011	12/01/2011
Time	1110	815
Sampler	D P-Hughes	J Dunlop
Field results		
pH	7.77	8.22
DO	2.44	2.09
Cl	47.09	48.25
EC (µS/cm)	233.4	216.5
TDS	156.4	145.1
Temp	33.9	28.6
Callide Lab results		
Cond (µS/cm)	241	223
Turbidity	138	74.6
pH	7.37	7.52
Sulfate	5.5	4.5
Chloride	19.8	19.3
Lab results		
Conduct	259	248
TDS	130	189
SS	264	101
Alkalinity	75	67
Fluoride	0.1	0.1
Sulfate	6	6
Chloride	24	30
Boron	<0.05	<0.05
BOD	6	<2
Silica	21.6	21.8
Oil and Grease	<5	<5
Hardness		
Aluminium	0.31	0.43
Arsenic	0.002	0.002
Barium	0.022	0.019
Beryllium		
Calcium	17	18
Chromium	<0.001	<0.001
Cobalt	<0.001	<0.001
Copper	0.002	0.002
Iron	0.32	0.35
Lead	<0.001	<0.001
Lithium	<0.001	<0.001
Magnesium	6	6
Manganese	0.002	0.004
Mercury	<0.0001	<0.0001
Molybdenum	<0.001	<0.001
Nickel	0.001	0.001
Potassium	4	5
Selenium	<0.01	<0.01
Sodium	15	15
Strontium	0.103	0.101
Tin		
Thallium	<0.001	<0.001
Thorium	<0.001	<0.001
Uranium	<0.001	<0.001
Vanadium	<0.01	<0.01
Zinc	<0.005	<0.005

Surface	Calv/coal crossing	Calv/coal crossing	
Date	11/01/2011	12/01/2011	
Time	1040	830	
Sampler	D P-Hughes	J Dunlop	
Field results		North	South
pH	8.03	8.51	8.5
DO	5.65	5.38	5.33
Cl	65.77	207.5	95.63
EC (µS/cm)	206.8	588	330.6
TDS	138.6	394.0	221.5
Temp	25.9	24.9	26.3
Callide Lab results			
Cond (µS/cm)	210		619
Turbidity	155		142
pH	7.46		7.49
Sulfate	9		105
Chloride	20.7		93
Lab results			
Conduct	184		681
TDS	88		430
SS	56		96
Alkalinity	40		58
Fluoride	<0.1		0.2
Sulfate	9		82
Chloride	29		98
Boron	<0.05		0.13
BOD	<2		<2
Silica	22.9		21.4
Oil and Grease	<5		<5
Hardness			
Aluminium	0.54		0.1
Arsenic	0.002		0.002
Barium	0.015		0.026
Beryllium			
Calcium	13		33
Chromium	<0.001		<0.001
Cobalt	<0.001		<0.001
Copper	0.003		0.002
Iron	0.49		0.17
Lead	<0.001		<0.001
Lithium	<0.001		0.011
Magnesium	6		19
Manganese	0.003		0.002
Mercury	<0.0001		<0.0001
Molybdenum	<0.001		0.007
Nickel	0.001		0.002
Potassium	4		5
Selenium	<0.01		<0.01
Sodium	15		49
Strontium	0.086		0.258
Tin			
Thallium	<0.001		<0.001
Thorium	<0.001		<0.001
Uranium	<0.001		<0.001
Vanadium	<0.01		<0.01
Zinc	<0.005		<0.005

Surface	Linke's crossing	Linke's crossing
Date	11/01/2011	12/01/2011
Time	1050	855
Sampler	D P-Hughes	J Dunlop
Field results		
pH	8.12	8.41
DO	4.68	5.23
Cl	68.72	121.61
EC (µS/cm)	241.6	416.7
TDS	161.9	279.2
Temp	26.5	25.1
Callide Lab results		
Cond (µS/cm)	234	396
Turbidity	140	116
pH	7.37	7.33
Sulfate	9	47
Chloride	24.6	54
Lab results		
Conduct	255	445
TDS	170	302
SS	39	54
Alkalinity	58	64
Fluoride	0.1	0.1
Sulfate	10	37
Chloride	30	57
Boron	<0.05	0.07
BOD	<2	<2
Silica	22.5	22.9
Oil and Grease	<5	<5
Hardness		
Aluminium	0.37	0.3
Arsenic	0.002	0.002
Barium	0.016	0.024
Beryllium		
Calcium	14	24
Chromium	<0.001	<0.001
Cobalt	<0.001	<0.001
Copper	0.002	0.002
Iron	0.37	0.34
Lead	<0.001	<0.001
Lithium	<0.001	0.004
Magnesium	6	12
Manganese	0.003	0.003
Mercury	<0.0001	<0.0001
Molybdenum	<0.001	0.002
Nickel	0.001	0.001
Potassium	4	5
Selenium	<0.01	<0.01
Sodium	17	30
Strontium	0.091	0.153
Tin		
Thallium	<0.001	<0.001
Thorium	<0.001	<0.001
Uranium	<0.001	<0.001
Vanadium	<0.01	<0.01
Zinc	<0.005	0.012

Surface	Glad hwy	Glad hwy
Date	11/01/2011	12/01/2011
Time	1130	845
Sampler	D P-Hughes	J Dunlop
Field results		
pH	8.42	8.37
DO	5.04	5.09
Cl	47.09	85.42
EC (µS/cm)	240.3	211.7
TDS	161.0	141.8
Temp	26.2	25.1
CallideLab results		
Cond (µS/cm)	238	311
Turbidity	136	143
pH	7.44	7.42
Sulfate	9	19
Chloride	25.1	39
Lab results		
Conduct	272	348
TDS	180	274
SS	43	52
Alkalinity	54	61
Fluoride	<0.1	0.1
Sulfate	11	23
Chloride	33	44
Boron	<0.05	0.05
BOD	<2	<2
Silica	21.8	22.7
Oil and Grease	<5	<5
Hardness		
Aluminium	0.35	0.3
Arsenic	0.002	0.002
Barium	0.016	0.02
Beryllium		
Calcium	15	20
Chromium	<0.001	<0.001
Cobalt	<0.001	<0.001
Copper	0.002	0.003
Iron	0.32	0.31
Lead	<0.001	<0.001
Lithium	<0.001	0.002
Magnesium	6	9
Manganese	0.002	0.003
Mercury	<0.0001	<0.0001
Molybdenum	<0.001	0.001
Nickel	0.001	0.001
Potassium	4	5
Selenium	<0.01	<0.01
Sodium	18	24
Strontium	0.097	0.153
Tin		
Thallium	<0.001	<0.001
Thorium	<0.001	<0.001
Uranium	<0.001	<0.001
Vanadium	<0.01	<0.01
Zinc	<0.005	<0.005

Bores

Bore	13030369					
Date	13/12/2010					
Time						
Sampler	Sarah					
Water depth	14.49					
Field results						
pH	6.52					
DO	6.9					
EC (µS/cm)	1150					
TDS						
Temp	24.6					
Lab results						
pH	7.01					
Conduct	1310					
Alkalinity	79					
Fluoride	0.1					
Sulfate	60					
Chloride	356					
Boron	0.08					
Hardness	425					
Arsenic	<0.001					
Barium	0.094					
Calcium	100					
Chromium	<0.001					
Copper	0.005					
Lithium	<0.001					
Magnesium	43					
Molybdenum	<0.001					
Potassium	4					
Selenium	<0.01					
Sodium	80					
Strontium	0.593					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	19.2					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030118					
Date	13/12/2010					
Time						
Sampler	Sarah					
Water depth	14.36					
Field results						
pH	6.06					
DO	6.98					
Cl						
EC (µS/cm)	1022					
TDS						
Temp	24.6					
Lab results						
pH	6.72					
Conduct	1020					
Alkalinity	195					
Fluoride	0.1					
Sulfate	21					
Chloride	197					
Boron	0.05					
Hardness	347					
Arsenic	0.001					
Barium	0.074					
Calcium	76					
Chromium	<0.001					
Copper	0.003					
Lithium	0.001					
Magnesium	38					
Molybdenum	<0.001					
Potassium	2					
Selenium	<0.01					
Sodium	71					
Strontium	0.515					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.09					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	Jens home (OOA)					
Date	15/12/2010					
Time						
Sampler	Sarah					
Water depth	Tap					
Field results						
pH						
DO						
Cl						
EC (µS/cm)						
TDS						
Temp						
Lab results						
pH	7.2					
Conduct	2430					
Alkalinity	166					
Fluoride	<0.1					
Sulfate	191					
Chloride	594					
Boron	0.09					
Hardness	838					
Arsenic	<0.001					
Barium	0.162					
Calcium	187					
Chromium	<0.001					
Copper	0.003					
Lithium	<0.001					
Magnesium	90					
Molybdenum	<0.001					
Potassium	4					
Selenium	<0.01					
Sodium	168					
Strontium	1.27					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.057					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030698					
Date	15/12/2010					
Time						
Sampler	Sarah					
Water depth	14.7					
Field results						
pH	6					
DO	8.9					
Cl						
EC (µS/cm)	1881					
TDS						
Temp	24.4					
Lab results						
pH	7.03					
Conduct	2050					
Alkalinity	209					
Fluoride	0.1					
Sulfate	53					
Chloride	514					
Boron	<0.05					
Hardness	679					
Arsenic	<0.001					
Barium	0.108					
Calcium	140					
Chromium	0.001					
Copper	0.002					
Lithium	0.001					
Magnesium	80					
Molybdenum	<0.001					
Potassium	2					
Selenium	<0.01					
Sodium	120					
Strontium	1.12					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.056					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030541					
Date	15/12/2010					
Time						
Sampler	Sarah					
Water depth	15.5					
Field results						
pH	5.99					
DO	8.32					
Cl						
EC (µS/cm)	1058					
TDS						
Temp	24.7					
Lab results						
pH	6.99					
Conduct	1080					
Alkalinity	209					
Fluoride	0.1					
Sulfate	53					
Chloride	514					
Boron	<0.05					
Hardness	398					
Arsenic	<0.001					
Barium	0.208					
Calcium	92					
Chromium	<0.001					
Copper	<0.001					
Lithium	0.001					
Magnesium	41					
Molybdenum	<0.001					
Potassium	2					
Selenium	<0.01					
Sodium	75					
Strontium	0.597					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.045					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030127					
Date	15/12/2010					
Time						
Sampler	Sarah					
Water depth	14.2					
Field results						
pH	6.16					
DO	7.4					
Cl						
EC (µS/cm)	1284					
TDS						
Temp	24.7					
Lab results						
pH	3.5					
Conduct	5060					
Alkalinity	<1					
Fluoride	<0.1					
Sulfate	1900					
Chloride	952					
Boron	<0.05					
Hardness	592					
Arsenic	0.003					
Barium	0.04					
Calcium	135					
Chromium	<0.001					
Copper	0.01					
Lithium	0.031					
Magnesium	62					
Molybdenum	<0.001					
Potassium	3					
Selenium	0.02					
Sodium	58					
Strontium	0.413					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	414					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030697					
Date	15/12/2010					
Time						
Sampler	Sarah					
Water depth	12.7					
Field results						
pH	5.79					
DO	6.9					
Cl						
EC (µS/cm)	1146					
TDS						
Temp	26.3					
Lab results						
pH	7.29					
Conduct	1320					
Alkalinity	265					
Fluoride	0.2					
Sulfate	57					
Chloride	274					
Boron	<0.05					
Hardness	453					
Arsenic	<0.001					
Barium	0.084					
Calcium	94					
Chromium	<0.001					
Copper	0.001					
Lithium	0.001					
Magnesium	53					
Molybdenum	<0.001					
Potassium	1					
Selenium	<0.01					
Sodium	101					
Strontium	0.639					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.141					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030126					
Date	15/12/2010					
Time						
Sampler	Sarah					
Water depth	14.7					
Field results						
pH	6.22					
DO	7.87					
Cl						
EC (µS/cm)	670					
TDS						
Temp	25.3					
Lab results						
pH	7.08					
Conduct	667					
Alkalinity	138					
Fluoride	<0.1					
Sulfate	30					
Chloride	113					
Boron	<0.05					
Hardness	213					
Arsenic	<0.001					
Barium	0.028					
Calcium	49					
Chromium	<0.001					
Copper	<0.001					
Lithium	<0.001					
Magnesium	22					
Molybdenum	<0.001					
Potassium	2					
Selenium	<0.01					
Sodium	51					
Strontium	0.304					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.059					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030539					
Date	15/12/2010					
Time						
Sampler	Sarah					
Water depth	15.8					
Field results						
pH	5.85					
DO	8.27					
Cl						
EC (µS/cm)	1810					
TDS						
Temp	25.8					
Lab results						
pH	6.77					
Conduct	1820					
Alkalinity	183					
Fluoride	0.1					
Sulfate	46					
Chloride	461					
Boron	0.1					
Hardness	434					
Arsenic	<0.001					
Barium	0.15					
Calcium	88					
Chromium	<0.001					
Copper	0.004					
Lithium	<0.001					
Magnesium	52					
Molybdenum	<0.001					
Potassium	1					
Selenium	<0.01					
Sodium	211					
Strontium	0.726					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.116					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030284					
Date	13/12/2010					
Time						
Sampler	Sarah					
Water depth	9.51					
Field results						
pH	6.06					
DO	8.12					
Cl						
EC (µS/cm)	1339					
TDS						
Temp	24.8					
Lab results						
pH	6.75					
Conduct	1360					
Alkalinity	144					
Fluoride	<0.1					
Sulfate	75					
Chloride	325					
Boron	0.07					
Hardness	443					
Arsenic	<0.001					
Barium	0.09					
Calcium	100					
Chromium	<0.001					
Copper	<0.001					
Lithium	<0.001					
Magnesium	47					
Molybdenum	<0.001					
Potassium	3					
Selenium	<0.01					
Sodium	95					
Strontium	0.623					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	3.97					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030691					
Date	15/12/2010					
Time						
Sampler	Sarah					
Water depth	13.17					
Field results						
pH	6.05					
DO	7.35					
CI						
EC (µS/cm)	941					
TDS						
Temp	24.9					
Lab results						
pH	6.94					
Conduct	943					
Alkalinity	142					
Fluoride	<0.1					
Sulfate	42					
Chloride	200					
Boron	<0.05					
Hardness	316					
Arsenic	<0.001					
Barium	0.05					
Calcium	72					
Chromium	<0.001					
Copper	<0.001					
Lithium	<0.001					
Magnesium	33					
Molybdenum	<0.001					
Potassium	2					
Selenium	<0.01					
Sodium	66					
Strontium	0.438					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	0.083					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore	13030283					
Date	16/12/2010					
Time						
Sampler	Sarah					
Water depth	14.1					
Field results						
pH	6.19					
DO	7.61					
Cl						
EC (µS/cm)	5915					
TDS						
Temp	25.9					
Lab results						
pH	6.92					
Conduct	6200					
Alkalinity	167					
Fluoride	<0.1					
Sulfate	755					
Chloride	1500					
Boron	0.14					
Hardness	2480					
Arsenic	<0.001					
Barium	0.067					
Calcium	537					
Chromium	0.002					
Copper	0.002					
Lithium	0.001					
Magnesium	278					
Molybdenum	<0.001					
Potassium	11					
Selenium	<0.01					
Sodium	385					
Strontium	3.35					
Uranium	<0.001					
Vanadium	<0.01					
Zinc	83.8					

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Callide Release TEP Report

Issued to [redacted] of DERM for purposes of section 10 of the Transitional Environmental Program - CA22011

CS ENERGY LTD

April 21, 2011

Authored by: [redacted]

Callide Release TEP Report

Background

CS Energy in conj Callide Power Managem ent owns and operates Callide A, B and C power stations located on Biloela, Queensland and holds registrations certificates ENRE 00952209, and ENRE 00849808 respectively

The Callide ash containment dam operates within a statutory 0.01 AEP (Annual Exceedence Probability) annual risk level DSA (Design Storage Allowance) of RL 213.37m based upon the start of the wet season of 1st November of each year. Due to significant rainfall events in the area in December 2010 and subsequent rainfall for the January period, the water levels within the dam reached a peak of RL 214.92m, just below the spillway level of RL 214.95m.

A TEP (Transitional Environmental Program, certificate no: CA22011 issued 11/01/2011) was issued to the station authorizing a controlled release of ash dam water in conjunction with the nearby Callide Dam water release subject to set conditions.

Release

The Callide Ash Dam commenced the second release of its water at 1315 on March 21 with an initial flow-rate of 19.9 ML/d from the siphons located at the spillway. This water converged with the Callide dam release waters flow-rate of 400ML/d approximately 600m downstream of the Ca sing. The site discharge flow rate increased to 30Ml/d to match the Callide dam release rate of 600ML/d and then dropped to 20ML/d to match the Callide dam release rate of 400Ml/d.

The Callide Ash Dam ceased release of its water at 1230 on March 29 to coincide with the reduction of release flow from the Callide dam as per the TEP requirements, (*the contaminant release flow rate not to exceed 5% of the receiving water flow rate*), which was noted to be 400ML/d at the start of the day with a reduction to 100ML/d within a 24 hour period.

Monitoring

Pre-discharge:

CS Energy revised the initial bore sampling locations and selected 11 sub-artesian monitoring bores throughout the Callide Valley to provide a representative sample, which were sampled 23rd-24th March 2011. The sampled bores consisted of DERM, SunWater and private properties.

Surface water points as nominated under the 'Callide Power Station ADB Spill Management Plan Feb 2009' were sampled on the 21st of March 2011 to provide some background data prior to release.

Discharge:

CS Energy selected 11 sub-artesian bores downstream of the discharge point based on an reviewed selection nominated under the aforementioned Spill Management Plan. The bores were a mixture of DERM, Sun-Water, and private with the range located from around 1.5km downstream from the discharge point to Callide weir approximately 20km distant.

All previously noted surface water points were sampled on a daily basis from 22nd to 29th March as required under the TEP with the only variance being the sampling at Nob's point rather than Calvale junction due to the location of convergence of site discharge and Callide dam release.

Checks were also undertaken of the flow from site and the receiving waters beds and banks to monitor for any erosion or sediment build up; of which neither were noted.

Post:

A post-release sampling of the previously noted water surface points were sampled on the 30th and 31st of March, and the aforementioned 11 sub-artesian bores was conducted on the 6th April as a required under the TEP.

Discharge flow-rates:[1]

	21/3/11	22/3/11	23/3/11	24/3/11	25/3/11	26/3/11	27/3/11	28/3/11	29/3/11	30/3/11	Total
Callide Dam release (ML/d)	400	400	600	600	400	400	400	400	400	100	4100
Callide Power Station release (Ml/d)	9.6	20	30	29	20	20	20	20	15	0	183.6

[1] Callide Power Station release flow rates taken from a 24 hour period of 0700 each day.

Sampling

Bore sampling was conducted through the contracted services of Aurecon and carried out in accordance with the sampling protocol specified in AS/NZS 5667:11:1998 (Water Sampling Guidelines – Part 11 Guidelines on Sampling Groundwaters). The locations of the sampled boreholes were tabulated using GPS, with reference photographs, and in-situ measurements taken for water level, electrical conductivity, dissolved oxygen and pH. All samples were submitted to an independent NATA accredited laboratory, (Australian Laboratory Services (ALS), Brisbane), where the water quality constituents[2] were analysed.

Surface water sampling was conducted by the CS Energy environmental staff and carried out in accordance with AS/NZS 5667.6:1998 Water Quality - Sampling - Guidance on sampling of rivers and streams. In-situ testing was conducted using the YSI Professional Plus field meter with samples sent to ALS for analysis. Duplicates of water samples were also analysed for conductivity (µS/cm), turbidity, pH, sulfate, and chloride through the Callide Power Station laboratory.

Results

Daily reports that contained data on in-situ monitoring results, receiving water flow rate, and discharge flow rate were submitted to DERM during the release.

Bore water and surface water analysis results from ALS were submitted to DERM once received. *See appendix for full results table.*

Both in-situ and ALS results were compared against the water quality performance indicators (as found in Table A of the TEP) which were based upon the Australian Drinking Water Guidelines (ADWG), as well as the stock-water and irrigation water guidelines. This was conducted to assess the receiving waters environmental status and provide an early warning for any potential issues.

The in-situ surface water results demonstrated a slight increase in conductivity, sulfate and chloride and a few trace elements such as calcium and boron levels at all monitoring points as was expected which ranged back to background levels once the release ceased. It was not initially noted that on the 23rd March the Nob's surface water point TDS level reached 562 as the in-situ levels indicated a reading of 480. This was picked up at a later date upon reviewing of ALS data results. This occurred during the initial day of the higher release flow timeframe and had a TDS reading of 444 the next day with the same flow rate. It is

[2] Full list of water quality constituents are located in the results section.

believed that this was attributed to poor mixing of the two waters at this point at the time with higher than expected chloride and sulfate levels which settled the next day appearing to support this.

The field meter's chloride probe failed during the sampling period but at no stage did the chloride levels have cause for concern. This was substantiated by both the Callide and ALS lab results.

The borehole results for both pre-discharge and discharge dates are located within the results table. Bores within the first 1.5km downstream of the Callide site did not demonstrate much change with the exception of bore 68267 with elevations in Conductivity, Alkalinity, and base parameters such as Chloride and Sulfate. As to why this has occurred is not currently understood, but the pending results from the Environmental Investigation may provide some clarity. Downstream of bore OOA there is a marked improvement of the water quality parameters which would more than likely be attributed to the repeated inflows of water.

Conclusion

CS Energy conducted a controlled, authorized release of water from its waste containment facility at Callide Power Station from the dates of the 21st to the 29th March.

Before, during and after the release period, water analysis was conducted of both ground and surface water of the receiving environment.

During the release ground water analysis was undertaken; in addition daily analysis of the surface water was conducted to monitor quality against agreed set guidelines, of which none were exceeded.

CS Energy is satisfied that it has met the TEP requirements for this release.

__Sampling locations and results as stipulated in the 'Callide Power Station Ash Dam B Spill Management Plan, 27th Feb, 2009 Revision 7'.__

Pre -spill - **Surface Water -** Callide Dam. If dischar ge occurs via Western channel then to be added to sampling monito

Frequency One sample of each is require to be conducted prior to release

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency Numbered bores to be sampled once prior to release.

During spill - **Surface Water -** Callide Dam. If dischar ge occurs via Western channel then o be added to sampling monito

Frequency All surface water to be sampled daily

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency Numbered bores to be sampled initially at a fortnightly interval, reduced to monthly after two sampling events. Landholders bores to be sampled prior ro any extraction and every 1ML that is irrigated.

NOTE - If plume is detected within the bores then sampling frequency is to be increased to weekly with sampling locations to be both d/stream and laterally from the creek.

Post spill - **Surface Water** Callide Dam. If dischar ge occurs via Western channel then to be added to sampling monito

Frequency As above until it has been been determined that the spill plume is within acceptable levels.

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency As above until it has been been determined that the spill plume is within acceptable levels.

Sampling to commence 21/3/11

__ Note that if ash dam plume is detected then bore monitoring is required to be escalated to a weekly monitoring with sampling locations to be extended both downstream and laterally from the creek.__*

ring

ring

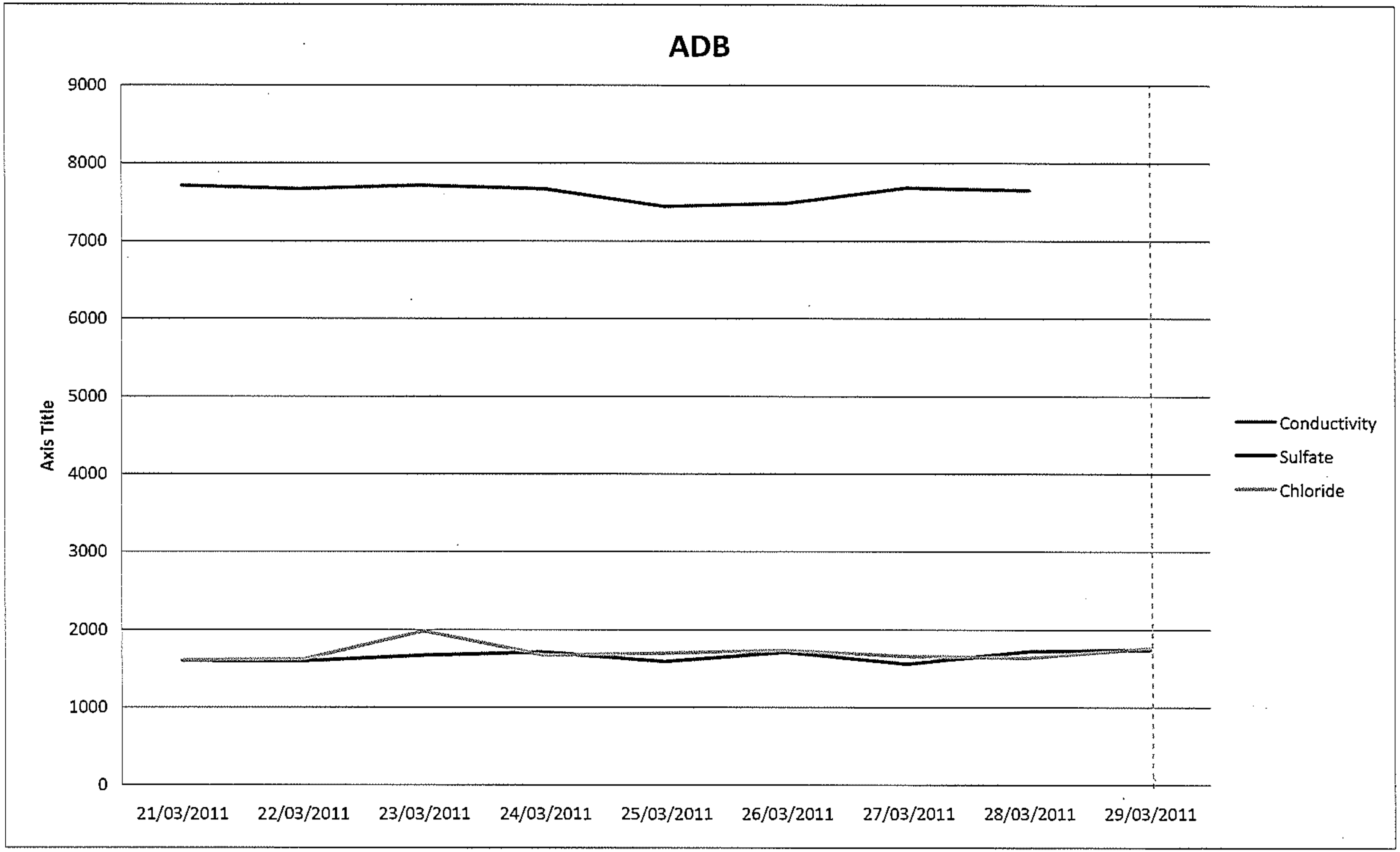
ring

Analytes	Sample container to be used	Sample size required	Preservation Methods	Maximum Storage Time
Field analytes - in field (using the YSI Field monitor	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C	72 hours
Conductivity, TDS, SS, Alkalinity, Fluoride, Sulfate, Chloride, Boron, Silica, Hardness	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C	24 hours
BOD	Plastic bottle - unpreserved	250 mL	Refrigerate at 4°C	24 hours
Aluminium, Arsenic, Barium, Beryliium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Sodium, Strontium, Tin, Thallium, Thorium, Uranium, Vanadium, Zinc	Plastic bottle - nitric acid supplied in bottle	250 mL	Filter on site to 0.45 µm Refrigerate at 4°C	28 days
Oil and Grease	Glass bottle - acid supplied within bottle	1000 mL	Refrigerate at 4°C	7 days

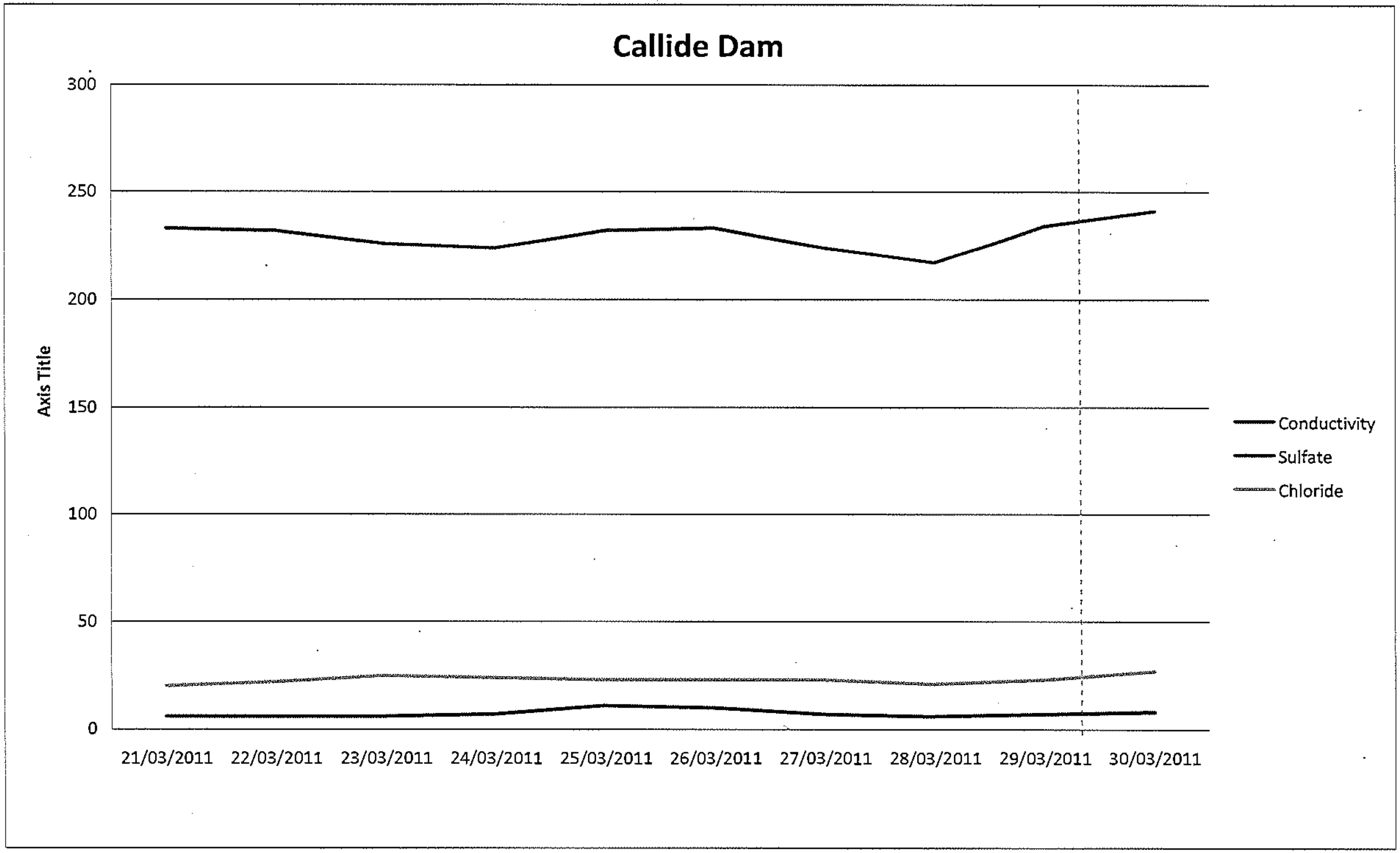
During - discharge

Surface water

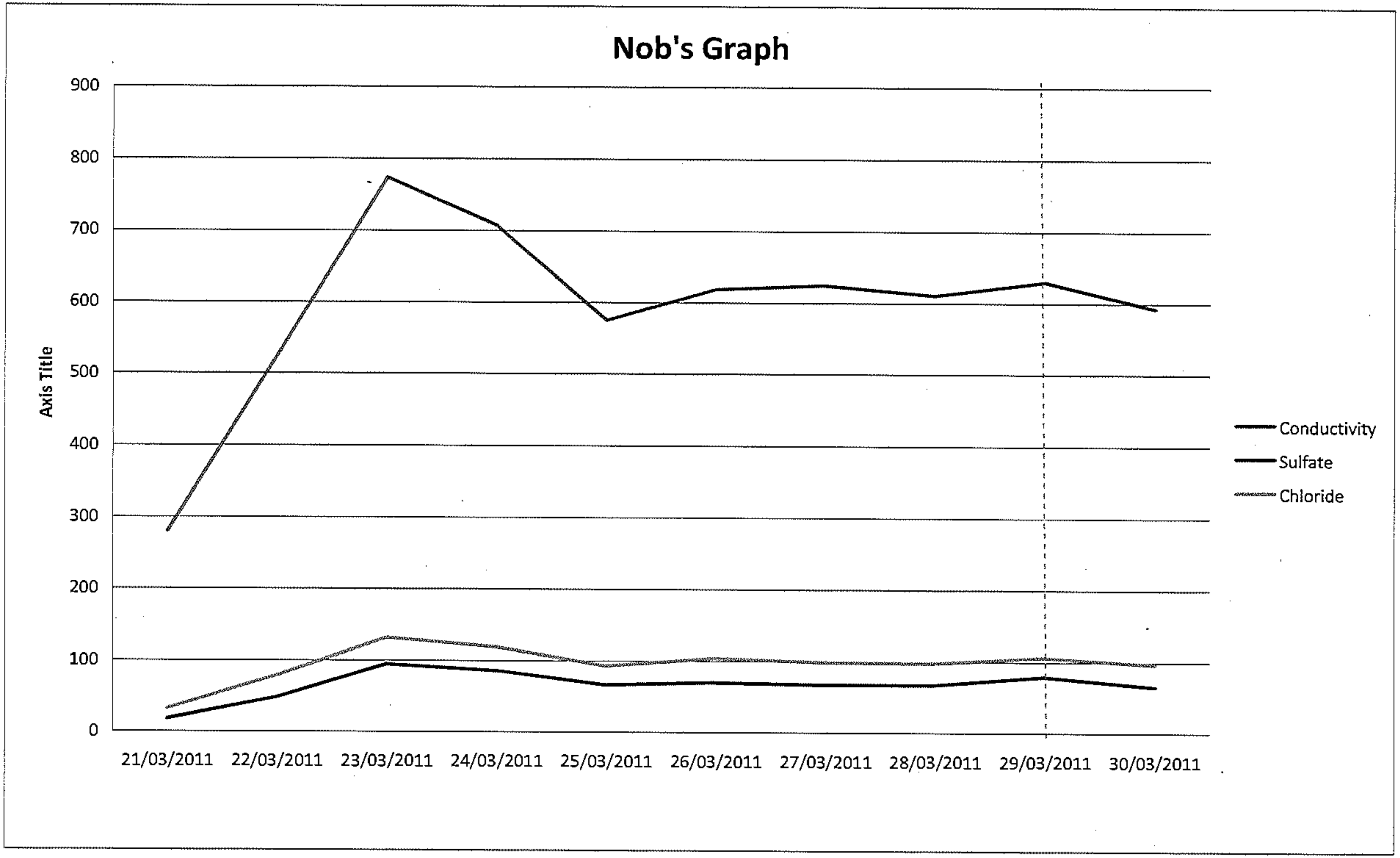
Surface	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB
Date	21/03/2011	22/03/2011	23/03/2011	24/03/2011	25/03/2011	26/03/2011	27/03/2011	28/03/2011	29/03/2011	30/03/2011
Time										
Sampler										
Field results										
pH	8.71	8.13	8.33	9.17	8.33	8.19	8.2			
DO	5.32		6.36	5.89	5.52	5.72	5.63		5.52	
Cl	1080.25									
EC (µS/cm)	7719		7130	7172	7166	7155	7152		7290	
TDS	5171.73	0	4777.1	4805.24	4801.22	4793.85	4791.84	0	4884.3	
Temp	26.9	27.1	27.9	28.8	27.3	26.8	28.2		24.7	
Callide Lab results										
Cond (µS/cm)	7440	7040	7450	7460	7500	7470	7510	7570	7570	
Turbidity	2.07	2.03	4.19	1.9	2	2.01	2.79	2.01	1.94	
pH	8.25	8.24	8.36	8.36	8.3	8.2	8.23	8.05	8.11	
Sulfate	1650	1600	1650	1700	1650	1575	1625	1600	1625	
Chloride	1711	1692	1692	1706	1711	1716	1725	1725	1755	
Lab results										
Conduct	7710	7670	7710	7670	7440	7480	7680	7650		
TDS	6410	6070	5440	4800	5760	5590	5370	6560		
SS	89	7	24	16	11	10	18	11	24	
Alkalinity	93	91	94	96	93	92	96	97		
Fluoride	1.8	1.8	1.9	1.8	1.8	1.7	1.9	1.9	0.2	
Sulfate	1610	1600	1670	1710	1590	1710	1560	1720	1740	
Chloride	1610	1620	1980	1670	1700	1730	1660	1640	1760	
Boron	2.23	2.26	2.16	2.42	2.32	2.49	2.08	2.62	2.48	
BOD	<2	<2	<2		<2	<2	<2	<2	3	
Silica	4.9	5	<0.1	5.4	6.1	5	4.8	5.1	5	
Oil and Grease	<5	<5	<5		<5	<5	<5	<5	<5	
Hardness										
Aluminium	0.05	0.04	0.04	0.18	0.04	0.03	0.03	0.03	0.03	
Arsenic	0.004	0.004	0.003	0.005	0.004	0.003	0.004	0.004	0.004	
Barium	0.114	0.11	0.105	0.116	0.109	0.102	0.109	0.113	0.109	
Beryllium										
Calcium	416	416	417	438	396	422	418	439	437	
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.001	
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	
Copper	0.002	0.002	0.002	0.002	0.002	<0.001	0.002	0.003	0.006	
Iron	0.4	0.39	0.2	0.08	0.05	0.11	<0.05	0.06	0.07	
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	0.002	
Lithium	0.278	0.272	0.211	0.308	0.307	0.319	0.279	0.328	0.322	
Magnesium	306	307	310	319	295	315	306	322	327	
Manganese	0.006	0.004	0.006	0.028	0.005	<0.001	0.004	0.056	0.002	
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	
Molybdenum	0.161	0.155	0.142	0.176	0.157	0.149	0.153	0.153	0.14	
Nickel	0.003	0.002	0.001		0.003	0.002	0.003	0.002	0.004	
Potassium	24	24	22	20	21	22	16	17	23	
Selenium	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	
Sodium	882	879	906	958	853	910	979	1010	941	
Strontium	5.04	4.85	4.91	5.63	5.05	4.98	5.14	5.03	5.32	
Tin	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	
Thallium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	
Thorium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	
Uranium	0.002	0.002	0.002		0.002	0.002	0.002	<0.001	0.002	
Vanadium	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	
Zinc	<0.005	<0.005	0.005	<0.005	0.01	<0.005	<0.005	0.006	0.074	


ADB
Axis Title
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
21/03/2011
22/03/2011
23/03/2011
24/03/2011
25/03/2011
26/03/2011
27/03/2011
28/03/2011
29/03/2011
Conductivity
Sulfate
Chloride

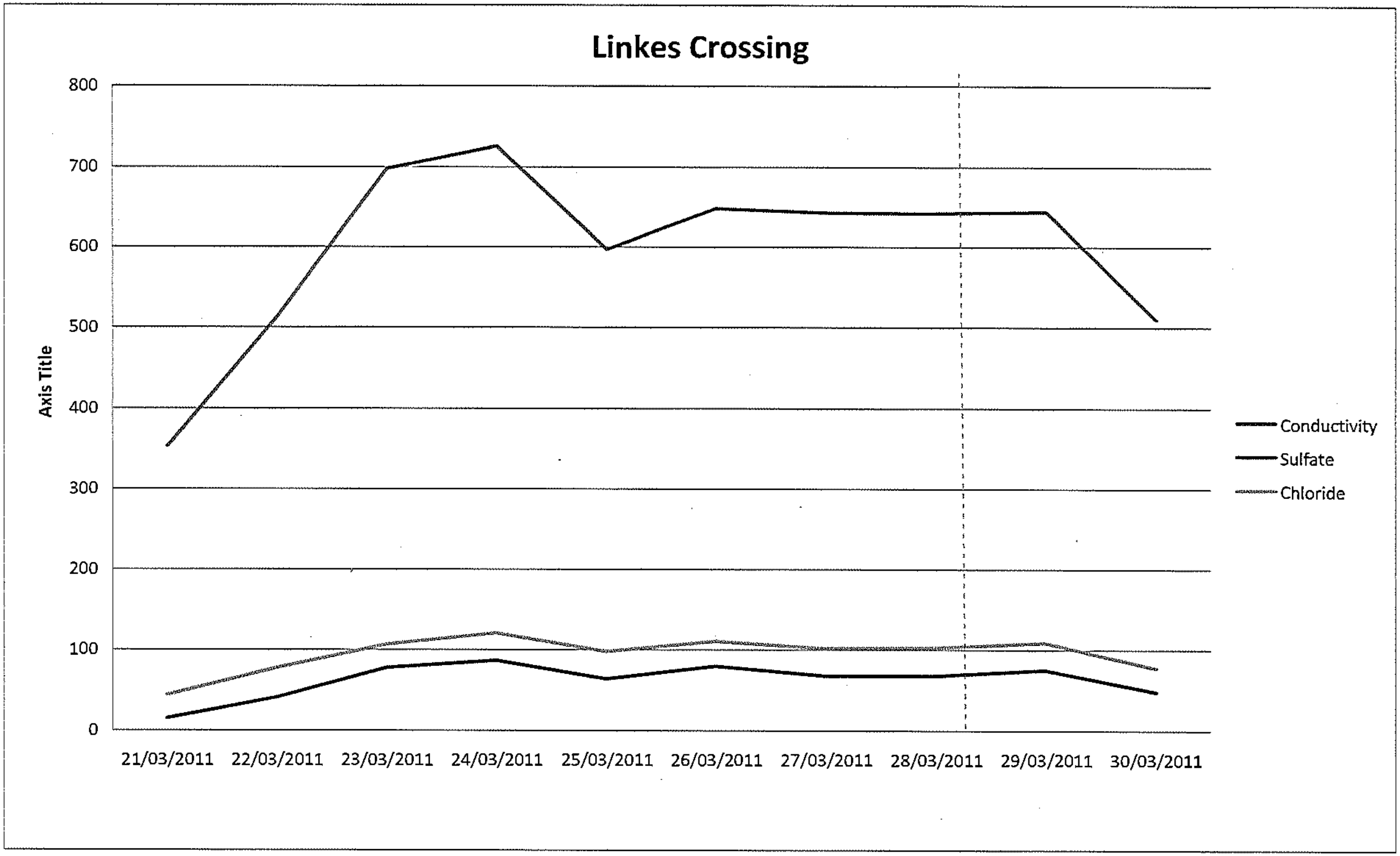
Surface	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam
Date	21/03/2011	22/03/2011	23/03/2011	24/03/2011	25/03/2011	26/03/2011	27/03/2011	28/03/2011	29/03/2011	30/03/2011	31/03/2011	
Time												
Sampler												
Field results												
pH	7.07	7.51	8.03	8.3	7.8	8.35	8.1			8.58		
DO	3.41	2.84	7.61	5.63	6.47	7.35	7.53		7.31	6.34		
Cl	23.92											
EC (µS/cm)	241.6	226.4	204.1	205	218.8	209	223		223.7	224.1		
TDS	161.9	151.7	136.7	137.4	146.6	140.0	149.4	0.0	149.9	150.1		
Temp	27	26.2	31	29.9	27.2	27.4	28.1		25.5	27.1		
Callide Lab results												
Cond (µS/cm)	265.9	235.1	232.8	231.3	251.7	265.6	240.5	268.3	237.3	236.8	238.5	
Turbidity	3.93	4.46	3.2	2.47	5.72	9.9	22.1	22.1	10.2	12.2	67.8	
pH	7.02	7.61	7.9	7.92	7.93	7.87	7.47	7.82	7.77	8.38	8.74	
Sulfate	35	17	16	16	16	16.5	16.5	17	16.5	16	12	
Chloride	31.8	22.2	21.2	21.2	22.2	20.2	22.2	22.2	22.5	22.5	22.5	
Lab results												
Conduct	233	232	226	224	232	233	224	217	234	241	Callide only	
TDS	203	166	183	194	145	146	154	148	193	145		
SS	119	41	11	17	20	53	654	150	224	11		
Alkalinity	72	73	75	72	73	72	74	74	72	72		
Fluoride	0.1	0.1	0.1	0.1	<0.1	<0.1	0.1	0.1	0.1	0.2		
Sulfate	6	6	6	7	11	10	7	6	7	8		
Chloride	20	22	25	24	23	23	23	21	23	27		
Boron	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05		
BOD	2	3	2		<2	<2	4	<2	3	4		
Silica	21.3	21.1	<0.1	23.1	21.8	21.3	22.5	21.3	5	21.4		
Oil and Grease	<5	<5	<5		<5	<5	<5	<5	<5	<5		
Hardness												
Aluminium	0.14	0.18	0.09	0.55	0.11	0.08	0.09	0.12	0.1	0.11		
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002	0.002		
Barium	0.019	0.016	0.015	0.016	0.011	0.015	0.021	0.018	0.018	0.014		
Beryllium												
Calcium	16	17	17	18	18	18	16	16	18	18		
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Copper	0.001	0.001	0.001	0.002	0.001	0.002	0.001	0.001	0.001	0.002		
Iron	0.15	0.16	0.11	0.59	0.12	0.1	0.08	0.12	0.12	0.12		
Lead	<0.001	<0.001	<0.001	0.003	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Lithium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Magnesium	7	7	7	7	8	7	7	6	7	7		
Manganese	0.012	0.004	0.006	0.046	0.003	0.002	0.002	0.005	0.001	0.022		
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Molybdenum	0.003	0.002	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Nickel	0.001	0.001	<0.001		<0.001	0.001	0.001	<0.001	<0.001	0.001		
Potassium	4	4	4	4	4	4	3	3	4	4		
Selenium	<0.01	<0.01	<0.01	<0.01	<0.1	<0.01	<0.01	<0.01	<0.01	<0.01		
Sodium	17	18	19	19	21	21	17	17	20	20		
Strontium	0.113	0.111	0.109	0.118	0.109	0.114	0.115	0.108	0.116	0.117		
Tin	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Thallium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Thorium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Uranium	<0.001	<0.001	<0.001		<0.001	<0.001	0.002	<0.001	<0.001	<0.001		
Vanadium	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zinc	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		


Callide Dam
Axis Title
300
250
200
150
100
50
0
21/03/2011
22/03/2011
23/03/2011
24/03/2011
25/03/2011
26/03/2011
27/03/2011
28/03/2011
29/03/2011
30/03/2011
Conductivity
Sulfate
Chloride

Surface	Nobs	Nobs	Nobs	Nobs	Nobs	Nobs	Nobs	Nobs	Nobs	Nobs	Nobs	Nobs
Date	21/03/2011	22/03/2011	23/03/2011	24/03/2011	25/03/2011	26/03/2011	27/03/2011	28/03/2011	29/03/2011	30/03/2011	31/03/2011	
Time												
Sampler												
Field results												
pH	7.77	7.34	7.8	8.15	7.59	8.33	8.15		8.76	8.66		
DO	3.07	3.02	6.21	6.48	5.02	5.15	5.26		6.73	8.22		
Cl	38.32											
EC (µS/cm)	282.5	460.8	716	655	531	567	565		608	560		
TDS	189.3	308.7	479.7	438.9	355.8	379.9	378.6	0.0	407.4	375.2		
Temp	28	25.5	28.1	26.5	26.7	26	27.1		24.6	25.5		
Callide Lab results												
Cond (µS/cm)	299.5	499	750	697	577	601	619	618	625	500	529	
Turbidity	2.55	1.41	4.37	1.33	1.35	1.28	3.46	9.71	2.58	5.07	6.25	
pH	7.02	7.41	7.14	7.53	7.36	7.45	7.82	7.65	7.3	8.37	8.56	
Sulfate	35	66	112.5	97.5	90	80	76	80	88	70	68	
Chloride	31.8	72	119	108	83	90.6	92.5	92.5	95.3	86	80.7	
Lab results												
Conduct	280	525	774	707	575	619	625	611	630	593	Callide only	
TDS	164	407	562	444	333	382	407	403	387	353		
SS	80	13	17	8	9	9	30	25	18	81		
Alkalinity	64	79	81	78	75	78	82	82	70	72		
Fluoride	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.3		
Sulfate	18	48	95	86	66	70	67	67	79	65		
Chloride	32	79	132	119	93	104	99	98	106	97		
Boron	<0.05	0.07	0.16	0.15	0.12	0.12	0.12	0.14	0.14	0.12		
BOD	8	4	6		2	<2	<2	4	2	11		
Silica	15.1	20.3	<0.1	22.1	20.9	20.5	20.4	20.2	20.2	18.6		
Oil and Grease	<5	<5	<5		<5	<5	<5	<5	<5	<5		
Hardness												
Aluminium	0.06	0.09	0.04	0.16	0.08	0.02	0.06	0.06	0.02	0.04		
Arsenic	0.002	0.003	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002		
Barium	0.021	0.029	0.029	0.033	0.026	0.025	0.021	0.022	0.019	0.018		
Beryllium												
Calcium	16	29	39	38	32	34	33	33	34	32		
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Copper	0.002	0.001	0.001	0.002	0.001	0.002	<0.001	<0.001	<0.001	0.002		
Iron	0.011	0.13	0.09	0.22	0.12	0.06	0.11	0.11	<0.05	0.09		
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Lithium	<0.001	0.005	0.01	0.013	0.01	0.01	0.01	0.011	0.011	0.009		
Magnesium	8	16	24	23	18	19	19	19	20	18		
Manganese	0.028	0.065	0.028	0.028	0.018	0.002	0.044	0.022	<0.001	0.016		
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Molybdenum	0.005	0.004	0.006	0.007	0.005	0.005	0.005	0.005	0.005	0.005		
Nickel	0.002	0.001	<0.001		0.001	0.001	0.001	<0.001	<0.001	0.001		
Potassium	3	4	4	4	4	4	3	3	4	4		
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Sodium	24	44	71	66	52	55	57	53	57	53		
Strontium	0.124	0.225	0.352	0.361	0.272	0.309	0.293	0.282	0.307	0.276		
Tin	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Thallium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Thorium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Uranium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Vanadium	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zinc	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		


Nob's Graph
Axis Title
900
800
700
600
500
400
300
200
100
0
21/03/2011
22/03/2011
23/03/2011
24/03/2011
25/03/2011
26/03/2011
27/03/2011
28/03/2011
29/03/2011
30/03/2011
Conductivity
Sulfate
Chloride

Surface	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing
Date	21/03/2011	22/03/2011	23/03/2011	24/03/2011	25/03/2011	26/03/2011	27/03/2011	28/03/2011	29/03/2011	30/03/2011	31/03/2011	
Time												
Sampler												
Field results												
pH	7.41	7.45	7.67	7.72	7.5	7.83	7.86	9.01	8.12	7.96		
DO	4.65	5.28	5.85	6.28	6.61	6.24	6.96		6.73	6.83		
Cl	82.11											
EC (µS/cm)	358	470.1	629	673	560	602	602		608	470.1		
TDS	239.9	315.0	421.4	450.9	375.2	403.3	403.3	0.0	407.4	315.0		
Temp	26.5	25.9	26.2	25.7	25.2	24.3	26.5	24.5	8.12	24.5		
Callide Lab results												
Cond (µS/cm)	344.6	500	696	710	593	645	672	637	642	500	493	
Turbidity	1.5	7.56	3.67	4.3	3.68	2.18	3.41	2.79	3.34	5.07	6.38	
pH	7.72	7.83	7.72	7.59	7.67	7.6	7.72	7.64	7.68	7.65	7.3	
Sulfate	17	56	92	100	85	85	78	85	82	60	51	
Chloride	44.4	71.3	102	108	88	98.3	94.5	95.4	98.8	70.4	71.4	
Lab results												
Conduct	353	513	698	726	597	648	643	642	644	510	Callide only	
TDS	196	389	470	449	366	402	485	410	383	283		
SS	5	7	<5	6	<5	<5	<5	7	18	<5		
Alkalinity	84	82	84	82	81	81	85	84	78	78		
Fluoride	0.1	0.1	0.2	0.2	0.2	0.2	0.2	0.2	0.2	0.2		
Sulfate	15	41	78	87	64	80	68	68	75	48		
Chloride	44	78	107	121	98	111	102	103	109	78		
Boron	<0.05	0.06	0.14	0.16	0.12	0.13	0.12	0.14	0.13	0.1		
BOD	<2	2	<2		<2	<2	<2	2	2	4		
Silica	20.5	21.2	<0.1	23.8	22.5	24	22.3	22.3	22.1	21.8		
Oil and Grease	<5	<5	<5		<5	<5	<5	<5	<5	<5		
Hardness												
Aluminium	0.09	0.11	0.08	0.3	0.08	0.07	0.08	0.08	0.04	0.08		
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.003	0.002	0.003	0.002		
Barium	0.02	0.031	0.029	0.036	0.024	0.028	0.025	0.026	0.021	0.02		
Beryllium												
Calcium	20	28	36	40	33	38	34	34	36	29		
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Copper	0.001	0.001	0.001	0.002	0.001	0.001	<0.001	0.001	<0.001	0.001		
Iron	0.13	0.14	0.09	0.47	0.12	0.12	0.16	0.15	0.08	0.13		
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Lithium	<0.001	0.004	0.01	0.013	0.01	0.011	0.009	0.01	0.01	0.006		
Magnesium	11	15	21	24	18	21	19	20	21	15		
Manganese	0.023	0.035	0.021	0.065	0.024	0.003	0.042	0.032	0.001	0.033		
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001		
Molybdenum	0.013	0.003	0.005	0.007	0.004	0.005	0.005	0.005	0.004	0.003		
Nickel	0.002	0.004	<0.001		<0.001	0.001	0.001	<0.001	<0.001	<0.001		
Potassium	4	4	5	4	4	5	3	3	4	4		
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Sodium	27	43	60	67	54	61	55	57	60	44		
Strontium	0.151	0.223	0.304	0.358	0.268	0.312	0.307	0.287	0.307	0.238		
Tin	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Thallium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Thorium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Uranium	<0.001	<0.001	<0.001		<0.001	<0.001	<0.001	<0.001	<0.001	<0.001		
Vanadium	<0.01	<0.01	<0.01		<0.01	<0.01	<0.01	<0.01	<0.01	<0.01		
Zinc	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005		


Linkes Crossing
800
700
600
500
400
300
200
100
0
Axis Title
21/03/2011
22/03/2011
23/03/2011
24/03/2011
25/03/2011
26/03/2011
27/03/2011
28/03/2011
29/03/2011
30/03/2011
Conductivity
Sulfate
Chloride

Surface	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir
Date	21/03/2011	22/03/2011	23/03/2011	24/03/2011	25/03/2011	26/03/2011	27/03/2011	28/03/2011	29/03/2011	30/03/2011	31/03/2011	
Time												
Sampler												
Field results												
pH								8.88	7.16	7.26		
DO								4.45	4.47	4.08		
Cl												
EC (µS/cm)								598	613	603		
TDS								400.7	410.7	404.01		
Temp								24.6	24.8	24		
CallideLab results												
Cond (µS/cm)								633	683	671	623	
Turbidity								1.86	2.25	3.46	3	
pH								7.47	7.55	7.52	7.63	
Sulfate								80	80	78	80	
Chloride								94.5	99.8	95.8	96.8	
Lab results												
Conduct								639	651	649	Callide only	
TDS								401	383	374		
SS								5	8	<5		
Alkalinity								77	81	82		
Fluoride								0.2	0.2	0.2		
Sulfate								74	75	68		
Chloride								101	112	106		
Boron								0.16	0.17	0.13		
BOD								<2	<2	3		
Silica								22.3	21.8	22.3		
Oil and Grease								<5	<5	<5		
Hardness												
Aluminium								0.07	0.03	0.11		
Arsenic								0.002	0.002	0.002		
Barium								0.033	0.032	0.036		
Beryllium												
Calcium								34	36	35		
Chromium								<0.001	<0.001	<0.001		
Cobalt								<0.001	<0.001	<0.001		
Copper								0.001	0.001	0.002		
Iron								0.11	0.08	0.2		
Lead								<0.001	<0.001	0.001		
Lithium								0.012	0.011	0.01		
Magnesium								20	20	19		
Manganese								0.01	<0.001	0.016		
Mercury								<0.0001	<0.0001	<0.0001		
Molybdenum								0.006	0.005	0.005		
Nickel								<0.001	0.001	0.002		
Potassium								3	5	4		
Selenium								<0.01	<0.01	<0.01		
Sodium								54	59	55		
Strontium								0.299	0.317	0.32		
Tin								<0.001	<0.001	0.018		
Thallium								<0.001	<0.001	<0.001		
Thorium								<0.001	<0.001	<0.001		
Uranium								<0.001	<0.001	<0.001		
Vanadium								<0.01	<0.01	<0.01		
Zinc								<0.005	<0.005	0.014		

Bore		68807	68807	68807	68807
Date		17/01/11	16/02/11	24/03/11	6/04/2011
Time			09:40:25	16:04:33	14:05:46
Sampler		smk	smk	smk	smk
Casing height (m)					
Water Level (m)		-	-	-	-
Bore depth (m)					

Field results	***UOM***				
pH		7.3	7.62	7.45	7.22
EC	µS/cm	7730	7720	6390	6740

Lab results	***UOM***				
pH		8.03	7.02	7.6	7.1
Conduct	µS/cm	7680	6840	6300	7200
TDS	mg/L	4830	4510	4200	4600
SS	mg/L	11	21	<5	<5
Total Alkalinity	mg/L	342	367	400	400
Sulfate	mg/L	843	788	600	720
Silicon	mg/L	12.4		13	11
Chloride	mg/L	2020	1940	1600	1800
Calcium	mg/L	427	370	310	340
Magnesium	mg/L	301	287	220	250
Sodium	mg/L	920	891	700	760
Potassium	mg/L	7	8	10	9.4
Fluoride	mg/L	0.1	0.1	0.15	0.13
BOD	mg/L	<2	<2	<2	2
Silica	mg/L	26.6	25.9	35	30
Aluminium	mg/L	<0.01	0.06	<0.05	0.034
Arsenic	mg/L	0.002	0.002	<0.006+	<0.006+
Barium	mg/L	0.068	0.074	0.066	0.064
Chromium	mg/L	<0.001	<0.001	<0.002+	0.003
Cobalt	mg/L	0.002	0.002	<0.002+	<0.002+
Copper	mg/L	0.003	0.002	<0.002+	<0.002+
Lead	mg/L	<0.001	<0.001	0.002	<0.001
Lithium	mg/L	0.001	0.002	<0.005	<0.005
Manganese	mg/L	1.72	1.82	1.9	1.9
Molybdenum	mg/L	0.002	0.002	<0.005	<0.005
Nickel	mg/L	0.01	<0.005	0.002	0.011
Selenium	mg/L	<0.01	<0.01	0.007	<0.003
Strontium	mg/L	2.46	2.79	2.7	2.4
Thallium	mg/L	<0.001	<0.001	<0.01	<0.002
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	0.004	0.004	<0.002+	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	0.015	<0.005	0.014	0.017
Boron	mg/L	0.39	0.6	0.5	0.54
Iron	mg/L	<0.05	<0.50	<0.005	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.04	0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		68267	68267	68267
Date		17/01/11	16/02/11	24/03/11
Time		10:58:25	10:10:25	15:38:23
Sampler		smk	smk	smk
Casing height (m)				
Water Level (m)		-	-	-
Bore depth (m)				

Field results	***UOM***			
pH		6.92	7.28	7.39
EC	µS/cm	1067	3520	2960

Lab results	***UOM***			
pH		8.13	6.59	7.1
Conduct	µS/cm	1060	3150	3000
TDS	mg/L	558	2080	2000
SS	mg/L	<5	<5	<5
Total Alkalinity	mg/L	136	173	220
Sulfate	mg/L	89	211	200
Silicon	mg/L	12		13
Chloride	mg/L	209	929	770
Calcium	mg/L	56	208	160
Magnesium	mg/L	31	127	110
Sodium	mg/L	115	291	270
Potassium	mg/L	3	7	8.7
Fluoride	mg/L	0.2	0.1	0.12
BOD	mg/L	<2	<2	<2
Silica	mg/L	25.7	26.1	35
Aluminium	mg/L	<0.01	<0.01	<0.05
Arsenic	mg/L	0.002	0.001	<0.005
Barium	mg/L	0.052	0.228	0.19
Chromium	mg/L	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005
Copper	mg/L	0.01	0.002	0.004
Lead	mg/L	0.002	<0.001	0.001
Lithium	mg/L	<0.001	0.001	<0.005
Manganese	mg/L	0.003	0.042	0.006
Molybdenum	mg/L	<0.001	<0.001	<0.005
Nickel	mg/L	<0.001	<0.001	<0.001
Selenium	mg/L	<0.01	<0.01	<0.003
Strontium	mg/L	0.362	1.63	1.6
Thallium	mg/L	<0.001	<0.001	<0.01
Thorium	mg/L	<0.001	<0.001	<0.002
Tin	mg/L	<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005
Zinc	mg/L	0.021	0.009	0.038
Boron	mg/L	0.11	0.18	0.19
Iron	mg/L	<0.05	<0.05	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.04

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		33675	33675	33675
Date		18/01/11	16/02/11	24/03/11
Time		11:44:29	10:57:23	15:03:51
Sampler		smk	smk	smk
Casing height (m)		0.8	0.8	0.8
Water Level (m)		11.2	13.4	12.2
Bore depth (m)		15.6	15.6	15.6
Field results	***UOM***			
pH		6.96	7.59	7.39
EC	µS/cm	19280	20780	18980
Lab results	***UOM***			
pH		7.77	6.69	7.2
Conduct	µS/cm	20200	18000	19000
TDS	mg/L	11700	12800	14000
SS	mg/L	448	10	16
Total Alkalinity	mg/L	176	199	240
Sulfate	mg/L	21	18	17
Silicon	mg/L	5.29		6
Chloride	mg/L	7490	7720	7300
Calcium	mg/L	884	826	1100
Magnesium	mg/L	1180	1160	1200
Sodium	mg/L	1590	1520	1300
Potassium	mg/L	24	24	39
Fluoride	mg/L	0.2	<0.1	0.12
BOD	mg/L	<2	<2	5
Silica	mg/L	11.3	13.6	16
Aluminium	mg/L	<0.01	<0.01	<0.05
Arsenic	mg/L	<0.001	0.003	<0.03+
Barium	mg/L	1.24	1.46	1.4
Chromium	mg/L	0.001	<0.001	0.008
Cobalt	mg/L	0.002	0.002	<0.005+
Copper	mg/L	0.002	0.003	0.005
Lead	mg/L	<0.001	<0.001	<0.01+
Lithium	mg/L	0.002	0.004	<0.005
Manganese	mg/L	1.76	2.86	4.6
Molybdenum	mg/L	0.002	<0.001	<0.005
Nickel	mg/L	<0.001	<0.005	0.022
Selenium	mg/L	<0.01	<0.01	0.03
Strontium	mg/L	13.3	15.3	14
Thallium	mg/L	<0.001	<0.001	0.02
Thorium	mg/L	0.002	<0.001	<0.002
Tin	mg/L	<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.01+
Vanadium	mg/L	<0.01	<0.01	<0.005
Zinc	mg/L	0.009	0.043	0.041
Boron	mg/L	0.1	0.14	0.12
Iron	mg/L	6.58	0.53	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	1.08		0.07

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenur	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		13030283	13030283	13030283	13030283
Date		16/12/2010	18/01/11	16/02/11	24/03/11
Time			15:04:58	15:29:48	12:30:00
Sampler		Sarah	smk	smk	smk
Casing height (m)			1.2	1.2	1.2
Water Level (m)			13.5	12.16	10.8
Bore depth (m)		14.1	16.28	16.28	16.28

Field results	***UOM***				
pH		6.19	6.93	7.24	7.16
EC	µS/cm	5915	5570	5690	5220

Lab results	***UOM***				
pH		6.92	7.44	6.53	6.9
Conduct	µS/cm	6200	5670	5180	5300
TDS	mg/L		4900	3530	4000
SS	mg/L		120	63	77
Total Alkalinity	mg/L	167	160	174	230
Sulfate	mg/L	755	733	658	630
Silicon	mg/L		7.06		7.7
Chloride	mg/L	1500	1520	1430	1400
Calcium	mg/L	537	486	447	420
Magnesium	mg/L	278	253	237	210
Sodium	mg/L	385	391	486	310
Potassium	mg/L	11	14	14	19
Fluoride	mg/L	<0.1	<0.1	<0.1	0.07
BOD	mg/L		<2	<2	2
Silica	mg/L		15.1	15.8	21
Aluminium	mg/L		<0.01	<0.01	<0.05
Arsenic	mg/L	<0.001	0.003	0.002	<0.006+
Barium	mg/L	0.067	0.064	0.072	0.075
Chromium	mg/L	0.002	<0.001	<0.001	<0.002+
Cobalt	mg/L		0.002	0.002	<0.002+
Copper	mg/L	0.002	0.004	0.002	<0.002+
Lead	mg/L		0.004	0.004	0.002
Lithium	mg/L	0.001	0.002	0.002	<0.005
Manganese	mg/L		1.42	1.64	1.6
Molybdenum	mg/L	<0.001	0.003	0.002	0.01
Nickel	mg/L		0.004	<0.005	0.004
Selenium	mg/L	<0.01	<0.01	<0.01	<0.003
Strontium	mg/L	3.35	2.55	2.87	3
Thallium	mg/L		<0.001	<0.001	0.04
Thorium	mg/L		<0.001	<0.001	<0.002
Tin	mg/L		<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001	<0.002+
Vanadium	mg/L	<0.01	<0.01	<0.01	<0.005
Zinc	mg/L	83.8	37.4	42.9	38
Boron	mg/L	0.14	0.21	0.19	0.14
Iron	mg/L		2.83	5.57	0.2

Mercury	mg/L		<0.0001	<0.0001	<0.0001
Total Phosphorus	mg/L		<0.01		0.12

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		Jensens 00A	Jensens 00A
Date		16/02/11	24/03/11
Time		08:42:13	14:14:22
Sampler		smk	smk
Casing height (m)			
Water Level (m)		-	-
Bore depth (m)			

Field results	***UOM***		
pH		6.88	6.77
EC	µS/cm	1981	1546

Lab results	***UOM***		
pH		6.68	7.1
Conduct	µS/cm	1640	1500
TDS	mg/L	1040	1000
SS	mg/L	<5	<5
Total Alkalinity	mg/L	158	170
Sulfate	mg/L	181	160
Silicon	mg/L		12
Chloride	mg/L	443	320
Calcium	mg/L	130	120
Magnesium	mg/L	63	51
Sodium	mg/L	148	130
Potassium	mg/L	4	3.8
Fluoride	mg/L	0.1	0.09
BOD	mg/L	<2	<2
Silica	mg/L	24.8	32
Aluminium	mg/L	<0.01	<0.05
Arsenic	mg/L	<0.001	<0.005
Barium	mg/L	0.128	0.093
Chromium	mg/L	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.005
Copper	mg/L	0.004	0.003
Lead	mg/L	<0.001	<0.001
Lithium	mg/L	<0.001	<0.005
Manganese	mg/L	0.005	<0.005
Molybdenum	mg/L	<0.001	<0.005
Nickel	mg/L	0.001	<0.001
Selenium	mg/L	<0.01	<0.003
Strontium	mg/L	0.904	0.82
Thallium	mg/L	<0.001	<0.01
Thorium	mg/L	<0.001	<0.002
Tin	mg/L	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.005
Zinc	mg/L	0.021	0.024
Boron	mg/L	0.12	0.093
Iron	mg/L	<0.05	<0.005
Mercury	mg/L	<0.0001	<0.0001

Total Phosphorus	mg/L		<0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		89741	89741	89741
Date		18/01/11	16/02/11	24/03/11
Time			08:43:52	13:15:00
Sampler		smk	smk	smk
Casing height (m)				
Water Level (m)		9.9	-	-
Bore depth (m)				

Field results	***UOM***			
pH		7.14	6.83	6.97
EC	µS/cm	789	612	492

Lab results	***UOM***			
pH		8.03	6.92	7.1
Conduct	µS/cm	785	478	480
TDS	mg/L	458	376	290
SS	mg/L	<5	<5	<5
Total Alkalinity	mg/L	101	103	120
Sulfate	mg/L	63	38	25
Silicon	mg/L	11.2		12
Chloride	mg/L	146	98	70
Calcium	mg/L	48	33	29
Magnesium	mg/L	23	17	15
Sodium	mg/L	70	56	49
Potassium	mg/L	3	3	2.5
Fluoride	mg/L	<0.1	0.1	0.11
BOD	mg/L	<2	<2	<2
Silica	mg/L	24	24	32
Aluminium	mg/L	<0.01	<0.01	<0.05
Arsenic	mg/L	0.002	<0.001	<0.005
Barium	mg/L	0.042	0.035	0.031
Chromium	mg/L	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005
Copper	mg/L	0.006	0.009	0.012
Lead	mg/L	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005
Manganese	mg/L	0.006	0.001	<0.005
Molybdenum	mg/L	<0.001	<0.001	<0.005
Nickel	mg/L	<0.001	0.001	<0.001
Selenium	mg/L	<0.01	<0.01	<0.003
Strontium	mg/L	0.282	0.245	0.24
Thallium	mg/L	<0.001	<0.001	<0.01
Thorium	mg/L	<0.001	<0.001	<0.002
Tin	mg/L	<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005
Zinc	mg/L	0.23	0.071	0.14
Boron	mg/L	0.06	0.1	0.066
Iron	mg/L	<0.05	<0.05	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		<0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		62420	62420	62420
Date		18/01/11	16/02/11	24/03/11
Time		08:25:20	09:20:08	13:48:12
Sampler		smk	smk	smk
Casing height (m)		0.4	0.4	0.4
Water Level (m)		9.8	10.35	9.7
Bore depth (m)		17.9	17.9	17.9

Field results	***UOM***			
pH		6.77	6.95	6.71
EC	µS/cm	1448	861	570

Lab results	***UOM***			
pH		7.86	6.69	7
Conduct	µS/cm	1160	658	560
TDS	mg/L	674	428	340
SS	mg/L	<5	<5	<5
Total Alkalinity	mg/L	106	117	130
Sulfate	mg/L	89	61	33
Silicon	mg/L	11.8		12
Chloride	mg/L	263	149	82
Calcium	mg/L	81	51	35
Magnesium	mg/L	41	26	16
Sodium	mg/L	86	70	56
Potassium	mg/L	4	4	2.6
Fluoride	mg/L	<0.1	0.1	0.09
BOD	mg/L	<2	<2	2
Silica	mg/L	25.3	23.8	32
Aluminium	mg/L	<0.01	<0.01	<0.05
Arsenic	mg/L	0.002	<0.001	<0.005
Barium	mg/L	0.07	0.056	0.039
Chromium	mg/L	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005
Copper	mg/L	<0.001	0.001	<0.001
Lead	mg/L	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005
Manganese	mg/L	0.019	0.014	0.009
Molybdenum	mg/L	<0.001	0.001	<0.005
Nickel	mg/L	0.006	0.007	0.002
Selenium	mg/L	<0.01	<0.01	<0.003
Strontium	mg/L	0.453	0.368	0.25
Thallium	mg/L	<0.001	<0.001	<0.01
Thorium	mg/L	<0.001	<0.001	<0.002
Tin	mg/L	<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005
Zinc	mg/L	0.161	0.051	0.074
Boron	mg/L	0.04	0.1	0.058
Iron	mg/L	0.75	<0.05	0.021
Mercury	mg/L	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.08

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		13030284	13030284	13030284	13030284
Date		13/12/2010	18/01/11	16/02/11	24/03/11
Time			14:40:00	14:59:09	11:39:00
Sampler		Sarah	smk	smk	smk
Casing height (m)			0.1	0.1	0.1
Water Level (m)		9.51	4.5	5.17	4.4
Bore depth (m)			12.74	12.74	12.74

Field results	***UOM***				
pH		6.06	6.65	6.99	6.95
EC	µS/cm	1339	1075	1215	954

Lab results	***UOM***				
pH		6.75	7.71	6.4	6.8
Conduct	µS/cm	1360	1180	800	720
TDS	mg/L		589	570	480
SS	mg/L		201	235	110
Total Alkalinity	mg/L	144	123	110	140
Sulfate	mg/L	75	66	52	45
Silicon	mg/L		10.7		11
Chloride	mg/L	325	252	222	130
Calcium	mg/L	100	77	61	51
Magnesium	mg/L	47	36	31	22
Sodium	mg/L	95	81	84	63
Potassium	mg/L	3	3	3	2.2
Fluoride	mg/L	<0.1	<0.1	<0.1	0.08
BOD	mg/L		<2	<2	<2
Silica	mg/L		22.9	18.7	30
Aluminium	mg/L		<0.01	<0.01	<0.05
Arsenic	mg/L	<0.001	0.003	<0.001	<0.005
Barium	mg/L	0.09	0.09	0.102	0.083
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L		0.002	0.003	<0.005
Copper	mg/L	<0.001	<0.001	<0.001	<0.001
Lead	mg/L		<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.001	<0.005
Manganese	mg/L		0.243	0.389	0.36
Molybdenum	mg/L	<0.001	<0.001	<0.001	<0.005
Nickel	mg/L		0.002	0.005	0.001
Selenium	mg/L	<0.01	<0.01	<0.01	<0.003
Strontium	mg/L	0.623	0.41	0.496	0.26
Thallium	mg/L		<0.001	<0.001	<0.01
Thorium	mg/L		<0.001	<0.001	<0.002
Tin	mg/L		<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001	0.003
Vanadium	mg/L	<0.01	<0.01	<0.01	<0.005
Zinc	mg/L	3.97	2.06	14	8.3
Boron	mg/L	0.07	0.06	0.1	0.053
Iron	mg/L		9.05	32.5	2.2
Mercury	mg/L		<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L		0.29		0.26

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		68759	68759	68759
Date		18/01/11	16/02/11	24/03/11
Time		14:00:00		16:33:03
Sampler		smk	smk	smk
Casing height (m)				
Water Level (m)		-	-	-
Bore depth (m)				

Field results	***UOM***			
pH		6.84	6.87	7.24
EC	µS/cm	504	583	579

Lab results	***UOM***			
pH		8.04	6.81	7.1
Conduct	µS/cm	483	458	560
TDS	mg/L	237	290	350
SS	mg/L	11	<5	<5
Total Alkalinity	mg/L	143	148	170
Sulfate	mg/L	22	24	22
Silicon	mg/L	14.3		15
Chloride	mg/L	47	68	74
Calcium	mg/L	33	34	40
Magnesium	mg/L	16	19	18
Sodium	mg/L	40	52	52
Potassium	mg/L	1	1	1.6
Fluoride	mg/L	0.1	0.1	0.11
BOD	mg/L	<2	<2	<2
Silica	mg/L	30.6	30	41
Aluminium	mg/L	<0.01	<0.01	<0.05
Arsenic	mg/L	0.001	<0.001	<0.005
Barium	mg/L	0.023	0.032	0.035
Chromium	mg/L	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005
Copper	mg/L	0.01	0.014	0.003
Lead	mg/L	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005
Manganese	mg/L	0.014	0.003	<0.005
Molybdenum	mg/L	<0.001	<0.001	<0.005
Nickel	mg/L	<0.001	0.001	<0.001
Selenium	mg/L	<0.01	<0.01	<0.003
Strontium	mg/L	0.199	0.257	0.25
Thallium	mg/L	<0.001	<0.001	<0.01
Thorium	mg/L	<0.001	<0.001	<0.002
Tin	mg/L	<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005
Zinc	mg/L	0.237	0.034	0.013
Boron	mg/L	0.05	0.06	0.041
Iron	mg/L	<0.05	<0.05	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		13030127	13030127	13030127	13030127
Date		15/12/2010	19/01/11	16/02/11	24/03/11
Time			07:50:00	11:44:34	10:46:00
Sampler		sarah	smk	smk	smk
Casing height (m)			0.1	0.1	0.1
Water Level (m)		14.2	10.9	10.9	10.3
Bore depth (m)			15.4	15.4	15.4

Field results	***UOM***				
pH		6.16	6.31	6.97	7.03
EC	μS/cm	1284	952	997	1006

Lab results	***UOM***				
pH		3.5	5.23	6.07	5.2
Conduct	μS/cm	5060	945	644	890
TDS	mg/L		752	448	570
SS	mg/L		91	68	100
Total Alkalinity	mg/L	<1	2	3	<5
Sulfate	mg/L	1900	300	261	220
Silicon	mg/L		2.62		1.4
Chloride	mg/L	952	110	117	140
Calcium	mg/L	135	39	36	38
Magnesium	mg/L	62	18	19	18
Sodium	mg/L	58	51	48	50
Potassium	mg/L	3	2	2	2.4
Fluoride	mg/L	<0.1	0.1	0.1	0.14
BOD	mg/L		5	<2	9
Silica	mg/L		5.6	4.8	<5
Aluminium	mg/L		<0.01	<0.01	<0.05
Arsenic	mg/L	0.003	0.002	<0.001	<0.005
Barium	mg/L	0.04	0.029	0.034	0.04
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L		0.015	0.009	0.011
Copper	mg/L	0.01	<0.001	<0.001	<0.001
Lead	mg/L		<0.001	<0.001	0.002
Lithium	mg/L	0.031	0.005	0.005	0.005
Manganese	mg/L		2.44	1.95	2.9
Molybdenum	mg/L	<0.001	<0.001	<0.001	<0.005
Nickel	mg/L		0.02	0.01	0.003
Selenium	mg/L	0.02	<0.01	<0.01	<0.003
Strontium	mg/L	0.413	0.198	0.212	0.25
Thallium	mg/L		<0.001	<0.001	0.04
Thorium	mg/L		<0.001	<0.001	<0.002
Tin	mg/L		<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001	0.31
Vanadium	mg/L	<0.01	<0.01	<0.01	<0.005
Zinc	mg/L	414	29.3	21.5	15
Boron	mg/L	<0.05	<0.05	<0.05	0.053
Iron	mg/L		99.2	109	23
Mercury	mg/L		<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L		<0.01		0.03

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		wier 561	wier 561	wier 561
Date		18/01/11	16/02/11	24/03/11
Time		09:55:46	13:40:55	09:30:00
Sampler		smk	smk	smk
Casing height (m)		0.4	0.4	0.4
Water Level (m)		10.3	10.5	9.1
Bore depth (m)		21.9	21.9	21.9

Field results	***UOM***			
pH		7.22	7.02	6.78
EC	µS/cm	301	518	645

Lab results	***UOM***			
pH		8.09	6.74	7.1
Conduct	µS/cm	300	415	630
TDS	mg/L	152	318	430
SS	mg/L	9	61	17
Total Alkalinity	mg/L	110	99	190
Sulfate	mg/L	7	35	28
Silicon	mg/L	16.9		21
Chloride	mg/L	19	68	89
Calcium	mg/L	15	25	52
Magnesium	mg/L	7	12	23
Sodium	mg/L	38	52	54
Potassium	mg/L	<1	1	1.4
Fluoride	mg/L	0.2	0.2	0.12
BOD	mg/L	<2	<2	<2
Silica	mg/L	36.2	38.6	57
Aluminium	mg/L	<0.01	0.01	<0.05
Arsenic	mg/L	0.002	0.001	<0.005
Barium	mg/L	0.055	0.141	0.3
Chromium	mg/L	0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005
Copper	mg/L	0.002	<0.001	0.004
Lead	mg/L	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005
Manganese	mg/L	0.341	1.01	2.2
Molybdenum	mg/L	0.002	<0.001	0.005
Nickel	mg/L	0.005	0.002	<0.001
Selenium	mg/L	<0.01	<0.01	<0.003
Strontium	mg/L	0.137	0.2	0.26
Thallium	mg/L	<0.001	<0.001	<0.01
Thorium	mg/L	<0.001	<0.001	<0.002
Tin	mg/L	<0.001	<0.001	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005
Zinc	mg/L	0.02	0.037	0.036
Boron	mg/L	<0.05	0.06	0.036
Iron	mg/L	<0.05	<0.05	0.006
Mercury	mg/L	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	0.01		0.12

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Callide Release TEP Report

Issued to [redacted] of DERM for purposes of section 10 of the Transitional Environmental Program - CA22011

CS ENERGY LTD

May 23, 2011

Authored by: [redacted]

Callide Release TEP Report

Background

CS Energy in conjunction with Callide Power Management owns and operates Callide A, B and C power stations located on [redacted] Biloela, Queensland and holds registrations certificates ENRE 00952209, and ENRE 00849808 respectively

The Callide ash containment dam operates within a statutory 0.01 AEP (Annual Exceedence Probability) annual risk level DSA (Design Storage Allowance) of RL 213.37m based upon the start of the wet season of 1st November of each year. Due to significant rainfall events in the area in December 2010 and subsequent rainfall for the January period, the water levels within the dam reached a peak of RL 214.92m, just below the spillway level of RL 214.95m.

A TEP (Transitional Environmental Program, certificate no: CA22011 issued 11/01/2011) was issued to the station authorizing a controlled release of ash dam water in conjunction with the nearby Callide Dam water release subject to set conditions.

Release

The Callide Ash Dam commenced the second release of its water at 1500 on April 19 with an initial flow-rate of 20 ML/d from the siphons located at the spillway. This water converged with the Callide dam release waters flow-rate of 600ML/d approximately 600m upstream of the [redacted] he Callide flow-rate did not need to change from 20ML/d to match the Callide dam release rate of 400Ml/d.

The Callide Ash Dam ceased release of its water at 0700 on April 23 to coincide with the reduction of release flow from the Callide dam as per the TEP requirements, (*the contaminant release flow rate not to exceed 5% of the receiving water flow rate*), which was noted to be 400ML/d at the start of the day with a reduction to 70ML/d later that day.

Monitoring

Pre-discharge:

CS Energy utilized the same bore sampling locations as per the March discharge event; 11 sub-artesian monitoring bores throughout the Callide Valley to provide a representative sample, which were sampled 6th April 2011. The sampled bores consisted of DERM, SunWater and private properties.

As this round of sampling occurred as part of the post March release date and so close to the April release date DERM directed that it was not necessary to conduct another pre-release round.

Surface water points as nominated under the '[redacted] Management Plan Feb 2009' were sampled early on the 19th of April 2011 t [redacted] prior to release.

Discharge:

CS Energy selected 11 sub-artesian bores downstream of the discharge point based on the previous March selection nominated under the aforementioned Spill Manage[redacted] DERM, Sun-Water, and private with the range located from [redacted]

All previously noted surface water points were sampled on a daily basis from 20th to 22nd April as required under the TEP.

Checks were also undertaken of the flow from site and the receiving waters beds and banks to monitor for any erosion or sediment build up; of which neither were noted.

Post:

A post-release sampling of the previously noted water surface points were sampled on the 23rd to 25th of April, and the aforementioned 11 sub-artesian bores was conducted on the 9th and 10th May as a required under the TEP.

Discharge flow-rates:[1]

	19/4/11	20/4/11	21/4/11	22/4/11	23/4/11	Total
Callide Dam release (ML/d)	600	400	400	400	70	1870
Callide Power Station release (Ml/d)	20	19.8	19.6	18.6	0	78

[1] Callide Power Station release flow rates taken from a 24 hour period of 0700 each day.

Sampling

Bore sampling was conducted through the contracted services of Aurecon and carried out in accordance with the sampling protocol specified in AS/NZS 5667:11:1998 (Water Sampling Guidelines – Part 11 Guidelines on Sampling Groundwaters). The locations of the sampled boreholes were tabulated using GPS, with reference photographs, and in-situ measurements taken for water level, electrical conductivity, dissolved oxygen and pH. All samples were submitted to an independent NATA accredited laboratory, (Australian Laboratory Services (ALS), Brisbane), where the water quality constituents[2] were analysed.

Surface water sampling was conducted by the CS Energy environmental staff and carried out in accordance with AS/NZS 5667.6:1998 Water Quality - Sampling - Guidance on sampling of rivers and streams. In-situ testing was conducted using the YSI Professional Plus field meter with samples sent to ALS for analysis. Duplicates of water samples were also analysed for conductivity (µS/cm), turbidity, pH, sulfate, and chloride through the Callide Power Station laboratory.

Results

Daily reports that contained data on in-situ monitoring results, receiving water flow rate, and discharge flow rate were submitted to DERM during the release.

Bore water and surface water analysis results from ALS were submitted to DERM once received. *See appendix for full results table.*

Both in-situ and ALS results were compared against the water quality performance indicators (as found in Table A of the TEP) which were based upon the Australian Drinking Water Guidelines (ADWG), as well as the stock-water and irrigation water guidelines. This was conducted to assess the receiving waters environmental status and provide an early warning for any potential issues.

The in-situ surface water results demonstrated a slight increase in conductivity, sulfate and chloride and a few trace elements such as calcium and boron levels at all monitoring points as was expected which ranged back to background levels once the release ceased. It was not initially noted that on the 20th April the Calvale surface water point TDS level reached 527 as the in-situ levels indicated a reading of 495, with low laboratory staffing levels allowing for a delay in the site analysis. This was picked up at a later date upon reviewing of ALS data results. However, it should be noted that the high TDS levels were of concern to site and the discharge rate was reduced to 18.6ML/d on the 22nd April to allow for greater dilution.

[2] Full list of water quality constituents are located in the results section.

The field meter's chloride probe failed again during the sampling period and was sent away for repairs, but at no stage did the chloride levels have cause for concern. This was substantiated by both the Callide and ALS lab results.

The borehole results for both pre-discharge and discharge dates are located within the results table. Bores within the first 1.5km downstream of the Callide site did not demonstrate much change and it should be noted that bore 68267 which had elevated readings from January onwards demonstrated a clear improvement in water parameters. Downstream of bore OOA there is a marked improvement of the water quality parameters which would more than likely be attributed to the repeated inflows of water.

Conclusion

CS Energy conducted a controlled, authorized release of water from its waste containment facility at Callide Power Station from the dates of the 19th to the 22nd April.

Before, during and after the release period, water analysis was conducted of both ground and surface water of the receiving environment.

During the release ground water analysis was undertaken; in addition daily analysis of the surface water was conducted to monitor quality against agreed set guidelines, of which none were exceeded.

CS Energy is satisfied that it has met the TEP requirements for this release.

__Sampling locations and results as stipulated in the 'Callide__ *__gement Plan, 27th Feb, 2009 Revision 7'.__*

Pre -spill - **Surface Water -** dded to sampling monitoring

Frequency One sample of each is require to be conducted prior to release

Bores - 68807, 68267, 33675, 62420, Jensens OOA, 89741,68759,13030283, 13030284, 13030127, weir 561, and any extraction bores landholders are utilising.

Frequency Numbered bores to be sampled once prior to release.

During spill - **Surface Water -** ded to sampling monitoring

Frequency All surface water to be sampled daily

Bores - 68807, 68267, 33675, 62420, Jensens OOA, 89741,68759,13030283, 13030284, 13030127, weir 561, and any extraction bores landholders are utilising.

Frequency Numbered bores to be sampled initially at a fortnightly interval, reduced to monthly after two sampling events. Landholders bores to be sampled prior ro any extraction and every 1ML that is irrigated.

NOTE - If plume is detected within the bores then sampling frequency is to be increased to weekly with sampling locations to be both d/stream and laterally from the creek.

Post spill - **Surface Water -** ded to sampling monitoring

Frequency As above until it has been been determined that the spill plume is within acceptable levels.

Bores - 68807, 68267, 33675, 62420, Jensens OOA, 89741,68759,13030283, 13030284, 13030127, weir 561, and any extraction bores landholders are utilising.

Frequency As above until it has been been determined that the spill plume is within acceptable levels.

__ Note that if ash dam plume is detected then bore monitoring is required to be escalated to a weekly monitoring with sampling locations to be extended both downstream and laterally from the creek.__*

ng monitoring

ng monitoring

ng monitoring

Sampling locations and results as stipulated in the 'Collide Power Station Ash Dam B Spill Management Plan, 27th Feb, 2009 Revision 7'.

Pre -spill - **Surface Water** ded to sampling monitoring

Frequency One sample of each is require to be conducted prior to release

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency Numbered bores to be sampled once prior to release.

During spill - **Surface Water** - dded to sampling monitoring

Frequency All surface water to be sampled daily

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency Numbered bores to be sampled initially at a fortnightly interval, reduced to monthly after two sampling events. Landholders bores to be sampled prior ro any extraction and every 1ML that is irrigated.

NOTE - If plume is detected within the bores then sampling frequency is to be increased to weekly with sampling locations to be both d/stream and laterally from the creek.

Post spill - **Surface Water** - added to sampling monitoring

Frequency As above until it has been been determined that the spill plume is within acceptable levels.

Bores - 68807, 68267, 34330, 62420, 34s, Nob's, 13030283, 13030284, 13030532, 13030128 and any extraction bores landholders are utilising.

Frequency As above until it has been been determined that the spill plume is within acceptable levels.

Sampling to commence 19/4/11

** Note that if ash dam plume is detected then bore monitoring is required to be escalated to a weekly monitoring with sampling locations to be extended both downstream and laterally from the creek.*

ring

ring

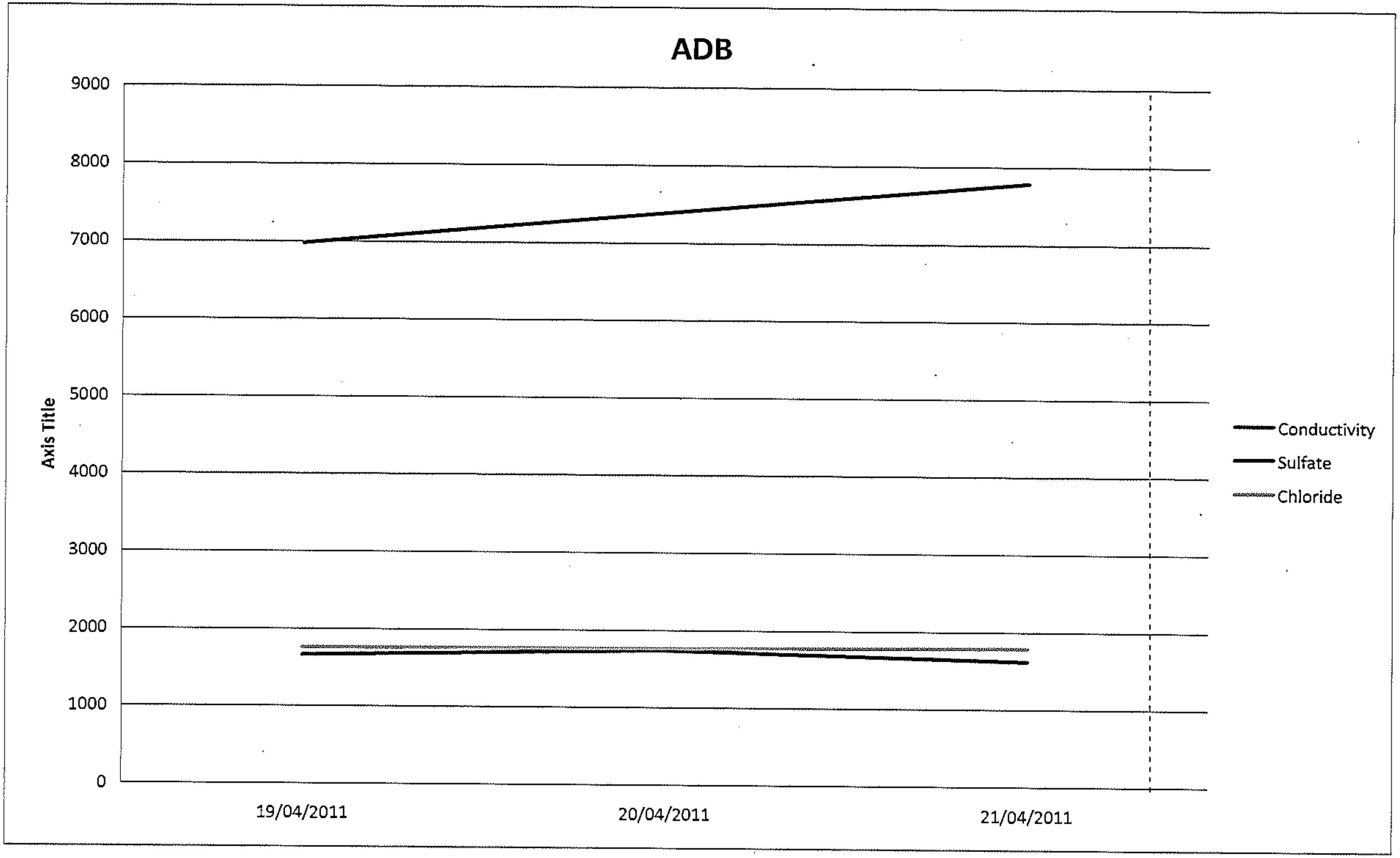
ring

Analytes	Sample container to be used	Sample size required	Preservation Methods	Maximum Storage Time
Field analytes - in field (using the YSI Field monitor	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C	72 hours
Conductivity, TDS, SS, Alkalinity, Fluoride, Sulfate, Chloride, Boron, Silica, Hardness	Plastic bottle - unpreserved	1000 mL	Refrigerate at 4°C	24 hours
BOD	Plastic bottle - unpreserved	250 mL	Refrigerate at 4°C	24 hours
Aluminium, Arsenic, Barium, Beryllium, Calcium, Chromium, Cobalt, Copper, Iron, Lead, Lithium, Magnesium, Manganese, Mercury, Molybdenum, Nickel, Potassium, Selenium, Sodium, Strontium, Tin, Thallium, Thorium, Uranium, Vanadium, Zinc	Plastic bottle - nitric acid supplied in bottle	250 mL	Filter on site to 0.45 µm Refrigerate at 4°C	28 days
Oil and Grease	Glass bottle - acid supplied within bottle	1000 mL	Refrigerate at 4°C	7 days

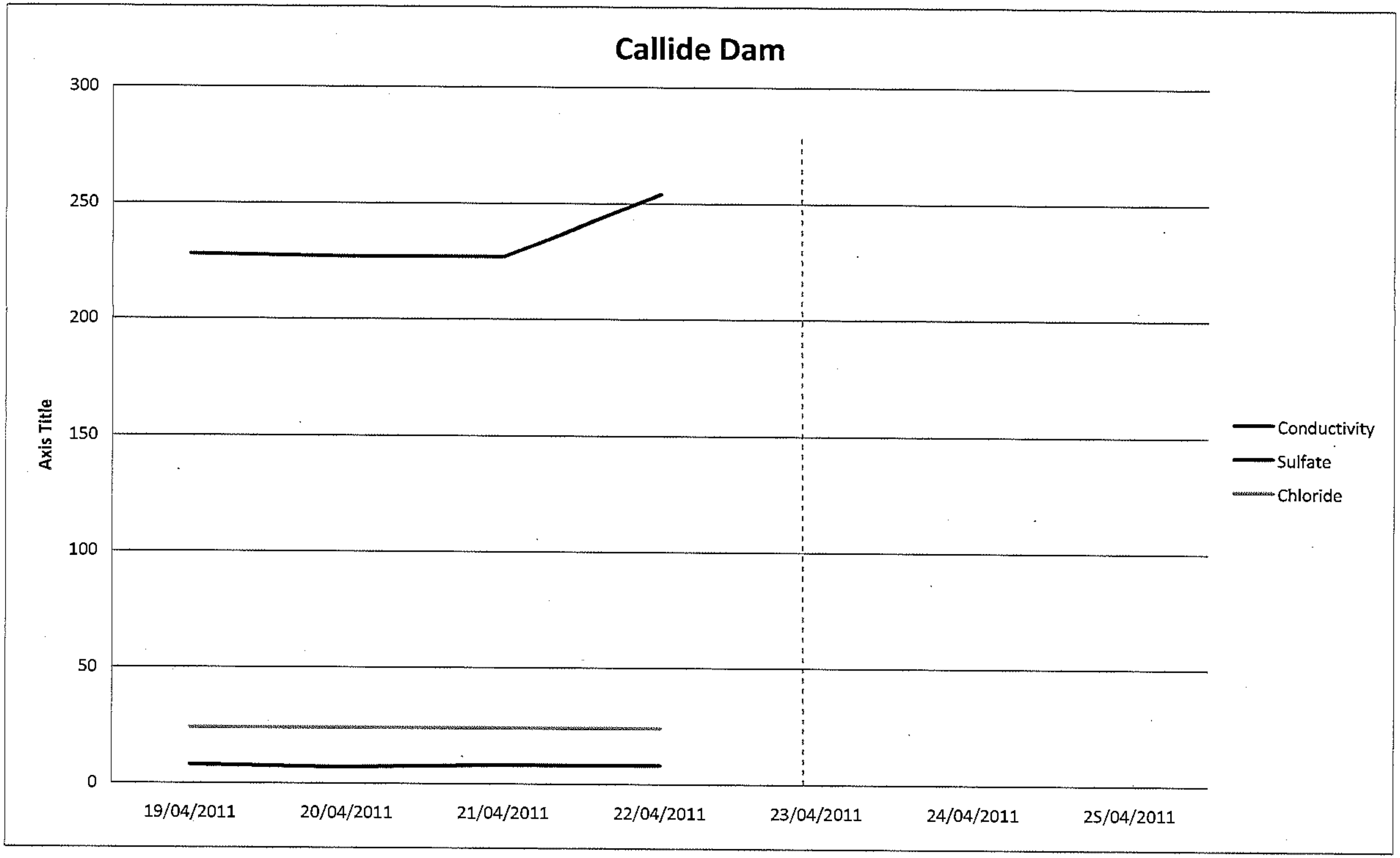
During - discharge

Surface water

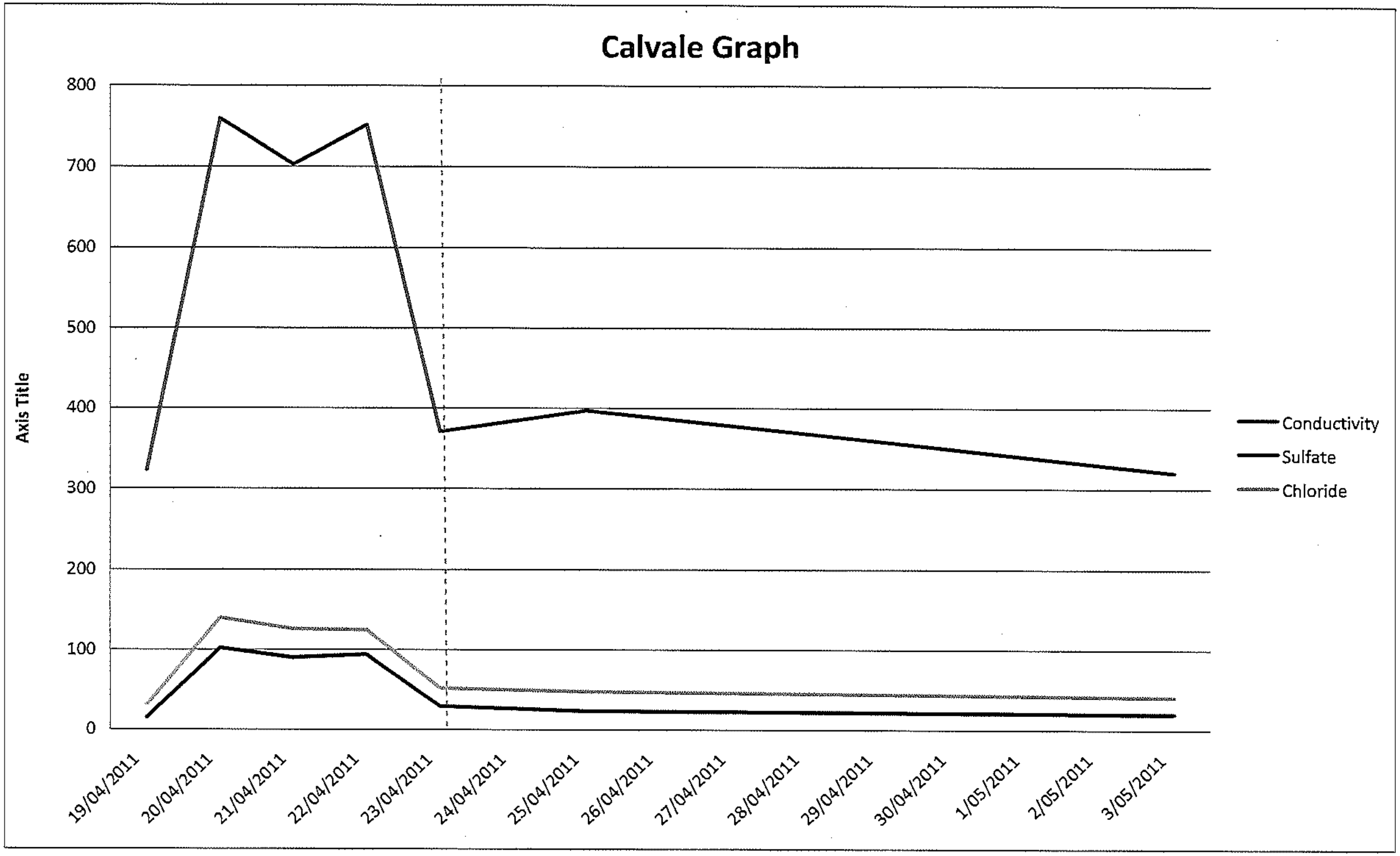
Surface	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB	ADB
Date	19/04/2011	20/04/2011	21/04/2011	22/04/2011	23/04/2011	25/04/2011				
Time										
Sampler										
Field results										
pH	*Not tested*									
DO	*Not tested*	*6.7*	6.91	6.35	Not req	Not req				
Cl	*Not tested*									
EC (µS/cm)	*Not tested*	*7297*	7300	7330						
TDS	*Not tested*	*4889*	*4891*	*4911.1*						
Temp	*Not tested*	*23.5*	22.5	23						
Callide Lab results										
Cond (µS/cm)	*Not tested*	*7810*	7680	7670						
Turbidity	*Not tested*		2.83	3.9						
pH	*Not tested*	*8.28*	8.17	8.26						
Sulfate	*Not tested*	*1650*	1650	1625						
Chloride	*Not tested*	*1804*	1809	1810						
Lab results										
Conduct	*Not tested*	*6980*	7380	7780						
TDS	*Not tested*	*6420*	6590	5560						
SS	*Not tested*	*34*	36	7						
Alkalinity	*Not tested*	*97*	95	99						
Fluoride	*Not tested*	*2.1*	2	2.1						
Sulfate	*Not tested*	*1660*	1740	1620						
Chloride	*Not tested*	*1760*	1760	1790						
Boron	*Not tested*	*2.47*	2.44	2.4						
BOD	*Not tested*	*2*	<2	N/A						
Silica	*Not tested*	*4*	4.1	4						
Oil and Grease	*Not tested*	*<5*	<5	N/A						
Aluminium	*Not tested*	*0.02*	0.02	0.02						
Arsenic	*Not tested*	*0.004*	0.004	0.003						
Barium	*Not tested*	*0.104*	0.104	0.106						
Calcium	*Not tested*	*437*	455	412						
Chromium	*Not tested*	*<0.001*	<0.001	<0.001						
Cobalt	*Not tested*	*<0.001*	<0.001	<0.001						
Copper	*Not tested*	*0.001*	0.001	0.001						
Iron	*Not tested*	*0.1*	0.13	<0.05						
Lead	*Not tested*	*<0.001*	<0.001	<0.001						
Lithium	*Not tested*	*0.321*	0.316	0.303						
Magnesium	*Not tested*	*312*	322	308						
Manganese	*Not tested*	*<0.001*	<0.001	0.002						
Mercury	*Not tested*	*<0.0001*	<0.0001	<0.0001						
Molybdenum	*Not tested*	*0.154*	0.146	0.155						
Nickel	*Not tested*	*0.002*	0.002	N/A						
Potassium	*Not tested*	*18*	19	16						
Selenium	*Not tested*	*<0.01*	<0.01	<0.01						
Sodium	*Not tested*	*905*	954	979						
Strontium	*Not tested*	*4.96*	4.95	5.18						
Tin	*Not tested*	*<0.001*	<0.001	N/A						
Thallium	*Not tested*	*<0..001*	<0.001	N/A						
Thorium	*Not tested*	*<0.001*	*<0.001*	N/A						
Uranium	*Not tested*	*0.002*	*0.002*	N/A						
Vanadium	*Not tested*	*<0.01*	*<0.01*	N/A						
Zinc	*Not tested*	*<0.005*	*<0.005*	<0.005						


ADB
9000
8000
7000
6000
5000
4000
3000
2000
1000
0
Axis Title
19/04/2011
20/04/2011
21/04/2011
Conductivity
Sulfate
Chloride

Surface	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam	Callide Dam
Date	19/04/2011	20/04/2011	21/04/2011	22/04/2011	23/04/2011	25/04/2011						
Time												
Sampler												
Field results												
pH												
DO	6.43	7.46	6.21	7.13	Not req	Not req						
Cl												
EC (µS/cm)	229	217	229	227								
TDS	153.4	145.4	153.4	152.1								
Temp	25.7	25.6	23	25.2								
Callide Lab results												
Cond (µS/cm)	241.8	244.4	242.4	242.5								
Turbidity	13.7		12.6	8.38								
pH	8.03	8.28	8.09	7.5								
Sulfate	17.5	18	18	21								
Chloride	23.5	23.5	23.5	23.5								
Lab results												
Conduct	228	227	227	254								
TDS	182	182	194	152								
SS	75	98	23	25								
Alkalinity	77	76	77	77								
Fluoride	0.1	0.1	0.1	0.2								
Sulfate	8	7	8	8								
Chloride	24	24	24	24								
Boron	<0.05	<0.05	<0.05	0.06								
BOD	2	2	3	N/A								
Silica	20.7	21	21.8	22.7								
Oil and Grease	N/A	<5	<5	N/A								
Aluminium	0.04	0.07	0.05	0.03								
Arsenic	0.002	0.002	0.002	0.002								
Barium	0.019	0.018	0.016	0.015								
Calcium	18	17	18	17								
Chromium	<0.001	<0.001	<0.001	<0.001								
Cobalt	<0.001	<0.001	<0.001	<0.001								
Copper	0.001	0.001	0.001	0.001								
Iron	<0.05	0.07	<0.05	<0.05								
Lead	<0.001	<0.001	<0.001	<0.001								
Lithium	<0.001	<0.001	<0.001	<0.001								
Magnesium	7	7	7	7								
Manganese	0.001	0.002	0.002	0.003								
Mercury	<0.0001	<0.0001	<0.0001	<0.0001								
Molybdenum	<0.001	0.039	0.007	0.005								
Nickel	<0.001	0.001	0.001	N/A								
Potassium	3	3	3	3								
Selenium	<0.01	<0.01	<0.1	<0.01								
Sodium	18	18	19	18								
Strontium	0.119	0.117	0.116	0.126								
Tin	<0.001	<0.001	<0.001	N/A								
Thallium	<0.001	<0.001	<0.001	N/A								
Thorium	<0.001	<0.001	<0.001	N/A								
Uranium	<0.001	<0.001	<0.001	N/A								
Vanadium	<0.01	<0.01	<0.01	N/A								
Zinc	<0.005	<0.005	<0.005	<0.005								

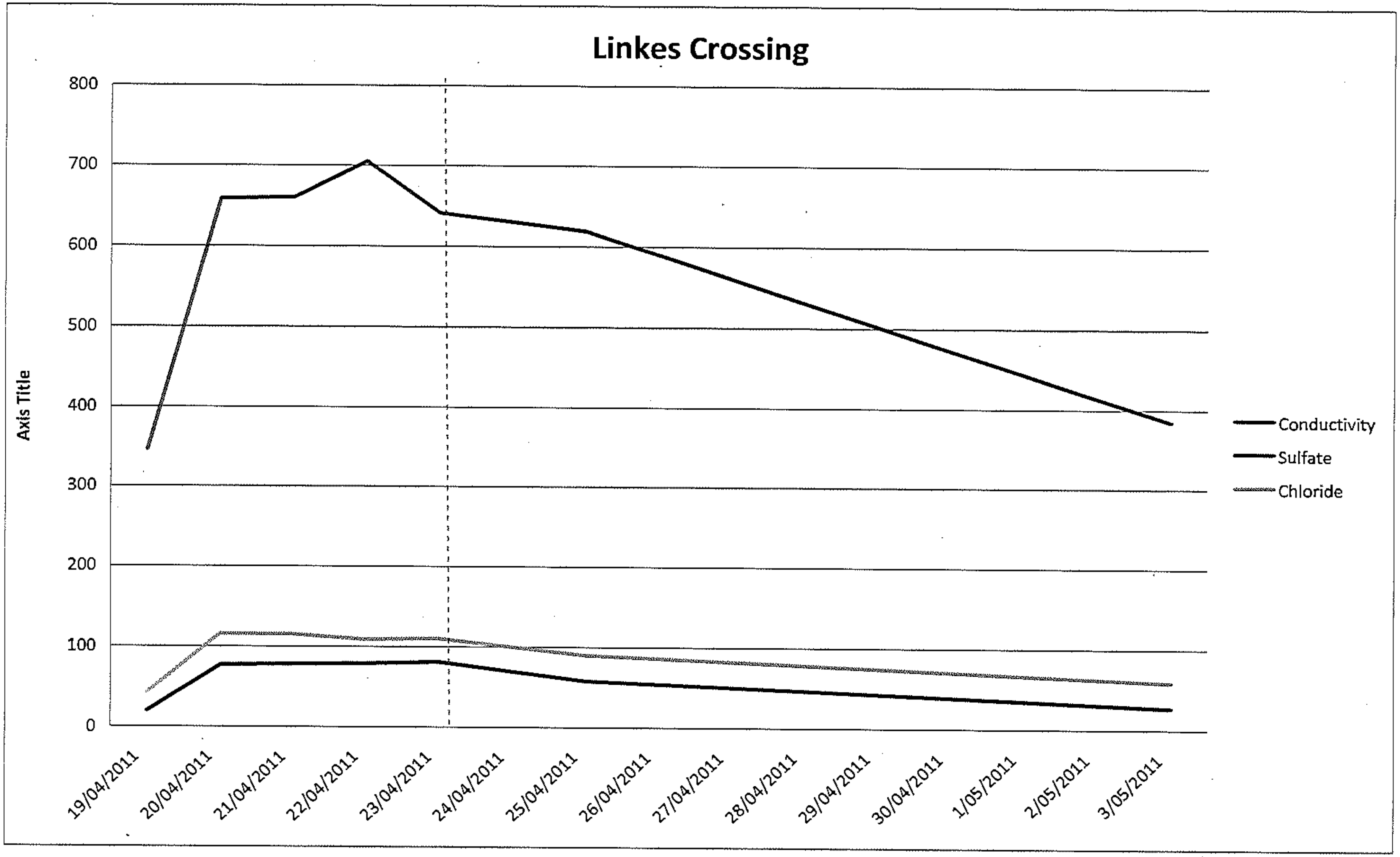

Callide Dam
Axis Title
300
250
200
150
100
50
0
19/04/2011
20/04/2011
21/04/2011
22/04/2011
23/04/2011
24/04/2011
25/04/2011
Conductivity
Sulfate
Chloride

Surface	Calvale	Calvale	Calvale	Calvale	Calvale	Calvale	Calvale	Calvale	Calvale	Calvale	Calvale	
Date	19/04/2011	20/04/2011	21/04/2011	22/04/2011	23/04/2011	25/04/2011	3/05/2011					
Time												
Sampler												
Field results												
pH												
DO	6.94	6.13	6.16	6.72	6.03	6.49	6.46					
Cl												
EC (µS/cm)	287	740	710	680	530	358	324					
TDS	192.3	495.8	475.7	-455.6	355.1	239.9	217.1					
Temp	24.3	22.8	22.9	23	24.6	21.9	20.8					
Callide Lab results												
Cond (µS/cm)	305	N/A	735	719	537	390	N/A					
Turbidity	4.28	N/A	5.73	7.18	4.23	8	N/A					
pH	7.91	7.73	7.79	7.81	7.64	7.71	N/A					
Sulfate	25	107.5	97.5	100	40.5	28	N/A					
Chloride	36	130	117	112	57	49.9	N/A					
Lab results												
Conduct	323	760	703	752	370	397	320					
TDS	295	527	505	479	267	239	207					
SS	11	11	9	9	<5	<5	6					
Alkalinity	82	78	78	78	97	90	88					
Fluoride	0.2	0.2	0.3	0.2	0.2	0.1	0.2					
Sulfate	15	102	90	94	29	23	20					
Chloride	31	140	126	125	52	48	41					
Boron	0.07	0.18	0.16	0.16	0.07	<0.05	<0.05					
BOD	3	2	2	N/A	N/A	N/A	N/A					
Silica	22.1	21.1	21.2	22.5	23.6	23.6	22.7					
Oil and Grease	N/A	<5	<5	N/A	N/A	N/A	N/A					
Aluminium	0.03	0.02	0.03	0.02	0.03	0.09	0.02					
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.002					
Barium	0.014	0.03	0.021	0.02	0.019	0.02	0.018					
Calcium	20	43	38	37	26	24	22					
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Copper	0.001	0.002	<0.001	<0.001	0.001	0.001	<0.001					
Iron	<0.05	<0.05	<0.05	<0.05	0.1	0.1	<0.05					
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Lithium	<0.001	0.017	0.015	0.015	0.001	<0.001	<0.001					
Magnesium	10	25	23	24	14	12	11					
Manganese	<0.001	0.016	0.014	0.034	0.114	0.099	0.077					
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					
Molybdenum	0.001	0.029	0.012	0.012	0.003	0.004	0.002					
Nickel	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Potassium	3	4	4	3	3	3	3					
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Sodium	24	76	69	66	35	32	28					
Strontium	0.145	0.378	0.342	0.369	0.201	0.181	0.165					
Tin	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Thallium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Thorium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Uranium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Vanadium	<0.01	<0.01	<0.01	N/A	N/A	N/A	N/A					
Zinc	<0.005	<0.005	<0.005	<0.005	0.005	<0.005	<0.005					



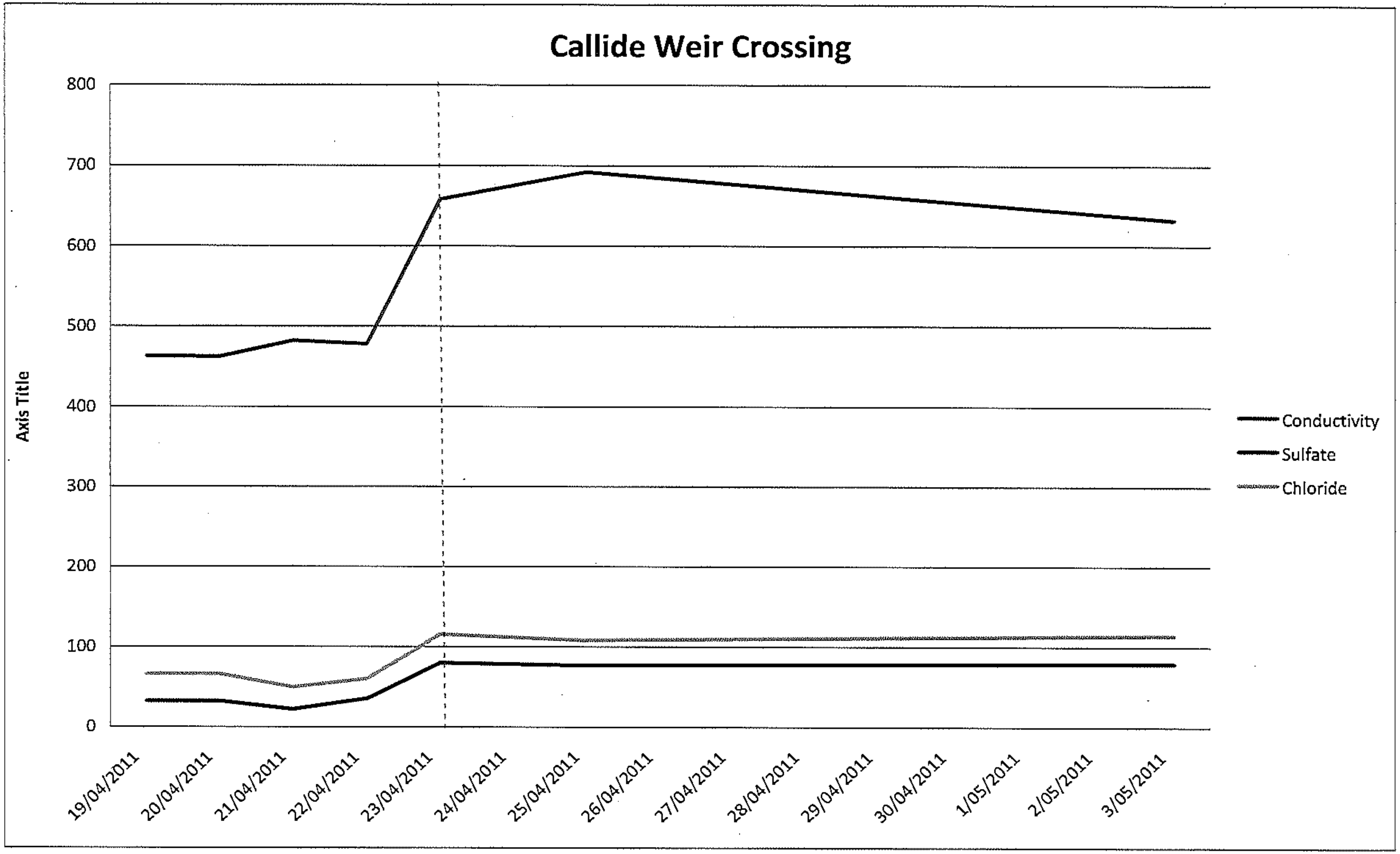
Calvale Graph
800
700
600
500
400
300
200
100
0
Axis Title
19/04/2011
20/04/2011
21/04/2011
22/04/2011
23/04/2011
24/04/2011
25/04/2011
26/04/2011
27/04/2011
28/04/2011
29/04/2011
30/04/2011
1/05/2011
2/05/2011
3/05/2011
Conductivity
Sulfate
Chloride

Surface	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing	Linke's crossing
Date	19/04/2011	20/04/2011	21/04/2011	22/04/2011	23/04/2011	25/04/2011	3/05/2011					
Time												
Sampler												
Field results												
pH												
DO	6.41	5.99	5.82	6.05	6.4	5.49	5.9					
Cl												
EC (µS/cm)	344	650	650	630	630	540	399					
TDS	230.5	435.5	435.5	422.1	422.1	361.8	267.3					
Temp	24.2	22.3	22.6	22.6	24.6	22.6	20.5					
Callide Lab results												
Cond (µS/cm)	376	714	690	678	674	585	N/A					
Turbidity	3.84	N/A	5.17	6.39	3.86	3.55	N/A					
pH	7.89	7.68	7.45	7.63	7.71	7.56	N/A					
Sulfate	18	87.5	90	87.5	90	66	N/A					
Chloride	47	109	109	105	103	87	N/A					
Lab results												
Conduct	346	658	660	705	641	619	384					
TDS	247	470	454	439	432	414	243					
SS	7	14	9	7	8	6	5					
Alkalinity	87	83	81	82	85	92	96					
Fluoride	0.2	0.2	0.2	0.2	0.3	0.2	0.1					
Sulfate	20	77	78	79	81	58	27					
Chloride	43	116	115	109	110	90	59					
Boron	0.06	0.14	0.13	0.14	0.16	0.1	0.06					
BOD	<2	<2	2	N/A	N/A	N/A	N/A					
Silica	20.6	21.2	21	21.8	23.1	21.6	20.5					
Oil and Grease	N/A	<5	<5	N/A	N/A	N/A	N/A					
Aluminium	0.02	0.02	0.02	0.02	0.02	0.02	0.01					
Arsenic	0.002	0.002	0.002	0.002	0.002	0.002	0.002					
Barium	<0.001	0.024	0.022	0.023	0.022	0.023	0.022					
Calcium	23	38	37	36	39	34	26					
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Copper	<0.001	0.001	0.001	<0.001	<0.001	<0.001	0.003					
Iron	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					
Lead	<0.001	<0.001	0.001	<0.001	<0.001	<0.001	<0.001					
Lithium	<0.001	0.01	0.012	0.012	0.014	0.006	<0.001					
Magnesium	11	21	21	23	23	18	13					
Manganese	<0.001	0.007	0.015	0.024	0.014	0.057	0.018					
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					
Molybdenum	<0.001	0.02	0.011	0.01	0.009	0.006	0.003					
Nickel	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Potassium	3	4	3	3	3	3	3					
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Sodium	30	64	64	60	60	52	36					
Strontium	0.161	0.301	0.307	0.336	0.311	0.285	0.193					
Tin	<0.001	<0.001	N/A	N/A	N/A	N/A	N/A					
Thallium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Thorium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Uranium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Vanadium	<0.01	<0.01	<0.01	N/A	N/A	N/A	N/A					
Zinc	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005	<0.005					



Linkes Crossing
800
700
600
500
400
300
200
100
0
Axis Title
19/04/2011
20/04/2011
21/04/2011
22/04/2011
23/04/2011
24/04/2011
25/04/2011
26/04/2011
27/04/2011
28/04/2011
29/04/2011
30/04/2011
1/05/2011
2/05/2011
3/05/2011
Conductivity
Sulfate
Chloride

Surface	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir	Callide Weir
Date	19/04/2011	20/04/2011	21/04/2011	22/04/2011	23/04/2011	25/04/2011	3/05/2011					
Time							Not spilling					
Sampler												
Field results												
pH												
DO	2.48	2.66	3.21	4.21	3.9	4.26	4.02					
Cl												
EC (µS/cm)	453	442	429	484	650	620	630					
TDS	303.5	296.1	287.4	324.3	435.5	415.4	422.1					
Temp	22.5	22.1	22	22.1	23.7	23.1	20.9					
CallideLab results												
Cond (µS/cm)	483	485.7	419	460	691	670	N/A					
Turbidity	2.9		1.6	3.01	1.4	1.67	N/A					
pH	7.4	7.31	7.36	7.3	7.5	7.56	N/A					
Sulfate	42	41	29	49	90	82.5	N/A					
Chloride	68	67	55	64	109	102	N/A					
Lab results												
Conduct	463	462	482	478	658	692	632					
TDS	325	332	288	279	448	463	434					
SS	5	6	<5	<5	<5	<5	<5					
Alkalinity	100	100	97	82	84	83	87					
Fluoride	0.2	0.2	0.1	0.2	0.2	0.4	0.2					
Sulfate	32	32	22	35	80	77	79					
Chloride	66	66	50	60	116	108	114					
Boron	0.06	0.07	0.05	0.07	0.15	0.14	0.14					
BOD	2	<2	2	N/A	N/A	N/A	N/A					
Silica	22.3	22.7	20.9	21.4	22.1	20.7	22.1					
Oil and Grease	N/A	<5	<5	N/A	N/A	N/A	N/A					
Aluminium	<0.01	<0.01	<0.01	0.01	<0.01	<0.01	<0.01					
Arsenic	0.002	0.002	0.002	0.002	0.002	0.001	0.002					
Barium	0.024	0.023	0.02	0.02	0.028	0.026	0.03					
Calcium	29	30	26	27	40	36	37					
Chromium	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Cobalt	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Copper	<0.001	<0.001	<0.001	<0.001	0.002	<0.001	<0.001					
Iron	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05	<0.05					
Lead	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001	<0.001					
Lithium	0.002	0.002	<0.001	0.003	0.013	0.011	0.012					
Magnesium	14	15	12	14	23	20	21					
Manganese	<0.001	0.001	0.009	0.006	0.008	0.008	0.006					
Mercury	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001	<0.0001					
Molybdenum	0.001	0.008	0.004	0.004	0.008	0.007	0.008					
Nickel	<0.001	0.001	<0.001	N/A	N/A	N/A	N/A					
Potassium	3	3	3	3	3	4	4					
Selenium	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01	<0.01					
Sodium	39	40	33	35	60	59	62					
Strontium	0.218	0.214	0.183	0.207	0.32	0.324	0.327					
Tin	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Thallium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Thorium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Uranium	<0.001	<0.001	<0.001	N/A	N/A	N/A	N/A					
Vanadium	<0.01	<0.01	<0.01	N/A	N/A	N/A	N/A					
Zinc	<0.005	<0.005	<0.005	<0.005	0.006	<0.005	<0.005					



Callide Weir Crossing
800
700
600
500
400
300
200
100
0
Axis Title
19/04/2011
20/04/2011
21/04/2011
22/04/2011
23/04/2011
24/04/2011
25/04/2011
26/04/2011
27/04/2011
28/04/2011
29/04/2011
30/04/2011
1/05/2011
2/05/2011
3/05/2011
Conductivity
Sulfate
Chloride

Bore		68807	68807	68807	68807
Date		17/01/11	16/02/11	24/03/11	6/04/11
Time		09:40:25	16:04:33	14:05:46	10:33:02
Sampler		smk	smk	smk	smk
Casing height (m)					
Water Level (m)					
Bore depth (m)					

Field results	***UOM***				
pH		7.3	7.62	7.45	7.22
EC	μS/cm	7730	7720	6390	6740

Lab results	***UOM***				
pH		8.03	7.02	7.6	7.1
Conduct	μS/cm	7680	6840	6300	7200
TDS	mg/L	4830	4510	4200	4600
SS	mg/L	11	21	<5	<5
Total Alkalinity	mg/L	342	367	400	400
Sulfate	mg/L	843	788	600	720
Silicon	mg/L	12.4		13	11
Chloride	mg/L	2020	1940	1600	1800
Calcium	mg/L	427	370	310	340
Magnesium	mg/L	301	287	220	250
Sodium	mg/L	920	891	700	760
Potassium	mg/L	7	8	10	9.4
Fluoride	mg/L	0.1	0.1	0.15	0.13
BOD	mg/L	<2	<2	<2	2
Silica	mg/L	26.6	25.9	35	30
Aluminium	mg/L	<0.01	0.06	<0.05	0.034
Arsenic	mg/L	0.002	0.002	<0.006	<0.006
Barium	mg/L	0.068	0.074	0.066	0.064
Chromium	mg/L	<0.001	<0.001	<0.002	0.003
Cobalt	mg/L	0.002	0.002	<0.002	<0.002
Copper	mg/L	0.003	0.002	<0.002	<0.002
Lead	mg/L	<0.001	<0.001	0.002	<0.001
Lithium	mg/L	0.001	0.002	<0.005	<0.005
Manganese	mg/L	1.72	1.82	1.9	1.9
Molybdenum	mg/L	0.002	0.002	<0.005	<0.005
Nickel	mg/L	0.01	<0.005	0.002	0.011
Selenium	mg/L	<0.01	<0.01	0.007	<0.003
Strontium	mg/L	2.46	2.79	2.7	2.4
Thallium	mg/L	<0.001	<0.001	<0.01	<0.002
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	0.004	0.004	<0.002	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	0.015	<0.005	0.014	0.017
Boron	mg/L	0.39	0.6	0.5	0.54
Iron	mg/L	<0.05	<0.50	<0.005	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.04	0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		68267	68267	68267	68267
Date		17/01/11	16/02/11	24/03/11	6/04/2011
Time		10:58:25	10:10:25	15:38:23	13:48:44
Sampler		smk	smk	smk	smk
Casing height (m)					
Water Level (m)		-	-	-	-
Bore depth (m)					
Field results	***UOM***				
pH		6.92	7.28	7.39	7.24
EC	µS/cm	1067	3520	2960	1672
Lab results	***UOM***				
pH		8.13	6.59	7.1	7
Conduct	µS/cm	1060	3150	3000	1700
TDS	mg/L	558	2080	2000	1000
SS	mg/L	<5	<5	<5	<5
Total Alkalinity	mg/L	136	173	220	190
Sulfate	mg/L	89	211	200	120
Silicon	mg/L	12		13	12
Chloride	mg/L	209	929	770	360
Calcium	mg/L	56	208	160	92
Magnesium	mg/L	31	127	110	50
Sodium	mg/L	115	291	270	150
Potassium	mg/L	3	7	8.7	4.6
Fluoride	mg/L	0.2	0.1	0.12	0.14
BOD	mg/L	<2	<2	<2	<2
Silica	mg/L	25.7	26.1	35	32
Aluminium	mg/L	<0.01	<0.01	<0.05	<0.005
Arsenic	mg/L	0.002	0.001	<0.005	<0.003
Barium	mg/L	0.052	0.228	0.19	0.088
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005	<0.005
Copper	mg/L	0.01	0.002	0.004	<0.001
Lead	mg/L	0.002	<0.001	0.001	<0.001
Lithium	mg/L	<0.001	0.001	<0.005	<0.005
Manganese	mg/L	0.003	0.042	0.006	0.013
Molybdenum	mg/L	<0.001	<0.001	<0.005	<0.005
Nickel	mg/L	<0.001	<0.001	<0.001	<0.001
Selenium	mg/L	<0.01	<0.01	<0.003	<0.003
Strontium	mg/L	0.362	1.63	1.6	0.59
Thallium	mg/L	<0.001	<0.001	<0.01	0.005
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	0.021	0.009	0.038	0.016
Boron	mg/L	0.11	0.18	0.19	0.17
Iron	mg/L	<0.05	<0.05	<0.005	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.04	0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		33675	33675	33675	33675
Date		18/01/11	16/02/11	24/03/11	6/04/2011
Time		11:44:29	10:57:23	15:03:51	13:02:09
Sampler		smk	smk	smk	smk
Casing height (m)		0.8	0.8	0.8	0.8
Water Level (m)		11.2	13.4	12.2	12.2
Bore depth (m)		15.6	15.6	15.6	15.6

Field results	***UOM***				
pH		6.96	7.59	7.39	7.69
EC	µS/cm	19280	20780	18980	18380

Lab results	***UOM***				
pH		7.77	6.69	7.2	7
Conduct	µS/cm	20200	18000	19000	20000
TDS	mg/L	117000	12800	14000	15000
SS	mg/L	448	10	16	31
Total Alkalinity	mg/L	176	199	240	240
Sulfate	mg/L	21	18	17	13
Silicon	mg/L	5.29		6	4.1
Chloride	mg/L	7490	7720	7300	7200
Calcium	mg/L	884	826	1100	1000
Magnesium	mg/L	1180	1160	1200	1200
Sodium	mg/L	1590	1520	1300	1600
Potassium	mg/L	24	24	39	35
Fluoride	mg/L	0.2	<0.1	0.12	0.11
BOD	mg/L	<2	<2	5	25
Silica	mg/L	11.3	13.6	16	11
Aluminium	mg/L	<0.01	<0.01	<0.05	0.016
Arsenic	mg/L	<0.001	0.003	<0.03+	0.003
Barium	mg/L	1.24	1.46	1.4	1.2
Chromium	mg/L	0.001	<0.001	0.008	<0.001
Cobalt	mg/L	0.002	0.002	<0.005+	<0.005
Copper	mg/L	0.002	0.003	0.005	<0.001
Lead	mg/L	<0.001	<0.001	<0.01+	0.002
Lithium	mg/L	0.002	0.004	<0.005	<0.005
Manganese	mg/L	1.76	2.86	4.6	4.8
Molybdenum	mg/L	0.002	<0.001	<0.005	<0.005
Nickel	mg/L	<0.001	<0.005	0.022	0.002
Selenium	mg/L	<0.01	<0.01	0.03	<0.003
Strontium	mg/L	13.3	15.3	14	12
Thallium	mg/L	<0.001	<0.001	0.02	<0.002
Thorium	mg/L	0.002	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	<0.01+	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	0.006
Zinc	mg/L	0.009	0.043	0.041	0.088
Boron	mg/L	0.1	0.14	0.12	0.14
Iron	mg/L	6.58	0.53	<0.005	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	1.08		0.07	0.31

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		13030283	13030283	13030283	13030283
Date		18/01/11	16/02/11	24/03/11	6/04/2011
Time		15:04:58	15:29:48	12:30:00	11:18:57
Sampler		smk	smk	smk	smk
Casing height (m)		1.2	1.2	1.2	1.2
Water Level (m)		13.5	12.16	10.8	12
Bore depth (m)		16.28	16.28	16.28	16.28

Field results	***UOM***				
pH		6.93	7.24	7.16	7.32
EC	µS/cm	5570	5690	5220	5060

Lab results	***UOM***				
pH		7.44	6.53	6.9	6.9
Conduct	µS/cm	5670	5180	5300	5400
TDS	mg/L	4900	3530	4000	3800
SS	mg/L	120	63	77	640
Total Alkalinity	mg/L	160	174	230	220
Sulfate	mg/L	733	658	630	700
Silicon	mg/L	7.06		7.7	7.2
Chloride	mg/L	1520	1430	1400	1400
Calcium	mg/L	486	447	420	420
Magnesium	mg/L	253	237	210	210
Sodium	mg/L	391	486	310	250
Potassium	mg/L	14	14	19	15
Fluoride	mg/L	<0.1	<0.1	0.07	0.06
BOD	mg/L	<2	<2	2	2
Silica	mg/L	15.1	15.8	21	19
Aluminium	mg/L	<0.01	<0.01	<0.05	0.019
Arsenic	mg/L	0.003	0.002	<0.006+	<0.006+
Barium	mg/L	0.064	0.072	0.075	0.066
Chromium	mg/L	<0.001	<0.001	<0.002+	<0.002+
Cobalt	mg/L	0.002	0.002	<0.002+	<0.002+
Copper	mg/L	0.004	0.002	<0.002+	<0.002+
Lead	mg/L	0.004	0.004	0.002	<0.002+
Lithium	mg/L	0.002	0.002	<0.005	<0.005
Manganese	mg/L	1.42	1.64	1.6	1.6
Molybdenum	mg/L	0.003	0.002	0.01	<0.005
Nickel	mg/L	0.004	<0.005	0.004	0.014
Selenium	mg/L	<0.01	<0.01	<0.003	<0.006+
Strontium	mg/L	2.55	2.87	3	2.5
Thallium	mg/L	<0.001	<0.001	0.04	0.004
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	<0.002+	<0.002+
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	37.4	42.9	38	33
Boron	mg/L	0.21	0.19	0.14	0.16
Iron	mg/L	2.83	5.57	0.2	0.007
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.12	0.19

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		Jensens 00A	Jensens 00A	Jensens 00A
Date		16/02/11	24/03/11	6/04/2011
Time		08:42:13	14:14:22	13:28:42
Sampler		smk	smk	SMK
Casing height (m)				
Water Level (m)		-	-	-
Bore depth (m)				

Field results	***UOM***			
pH		6.88	6.77	7.13
EC	µS/cm	1981	1546	1449

Lab results	***UOM***			
pH		6.68	7.1	7
Conduct	µS/cm	1640	1500	1500
TDS	mg/L	1040	1000	960
SS	mg/L	<5	<5	<5
Total Alkalinity	mg/L	158	170	170
Sulfate	mg/L	181	160	150
Silicon	mg/L		12	11
Chloride	mg/L	443	320	290
Calcium	mg/L	130	120	110
Magnesium	mg/L	63	51	49
Sodium	mg/L	148	130	110
Potassium	mg/L	4	3.8	3.4
Fluoride	mg/L	0.1	0.09	0.08
BOD	mg/L	<2	<2	2
Silica	mg/L	24.8	32	30
Aluminium	mg/L	<0.01	<0.05	0.018
Arsenic	mg/L	<0.001	<0.005	<0.003
Barium	mg/L	0.128	0.093	0.092
Chromium	mg/L	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.005	<0.005
Copper	mg/L	0.004	0.003	0.002
Lead	mg/L	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.005	<0.005
Manganese	mg/L	0.005	<0.005	0.005
Molybdenum	mg/L	<0.001	<0.005	<0.005
Nickel	mg/L	0.001	<0.001	<0.001
Selenium	mg/L	<0.01	<0.003	<0.003
Strontium	mg/L	0.904	0.82	0.65
Thallium	mg/L	<0.001	<0.01	<0.002
Thorium	mg/L	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.005	<0.005
Zinc	mg/L	0.021	0.024	0.046
Boron	mg/L	0.12	0.093	0.092
Iron	mg/L	<0.05	<0.005	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L		<0.02	<0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5

Bore		89741	89741	89741	89741
Date		18/01/11	16/02/11	24/03/11	6/04/2011
Time			08:43:52	13:15:00	15:25:29
Sampler		smk	smk	smk	smk
Casing height (m)					
Water Level (m)		9.9	-	-	-
Bore depth (m)					

Field results	*UOM*				
pH		7.14	6.83	6.97	7.02
EC	µS/cm	789	612	492	575

Lab results	*UOM*				
pH		8.03	6.92	7.1	7
Conduct	µS/cm	785	478	480	590
TDS	mg/L	458	376	290	350
SS	mg/L	<5	<5	<5	<5
Total Alkalinity	mg/L	101	103	120	120
Sulfate	mg/L	63	38	25	44
Silicon	mg/L	11.2		12	11
Chloride	mg/L	146	98	70	92
Calcium	mg/L	48	33	29	37
Magnesium	mg/L	23	17	15	17
Sodium	mg/L	70	56	49	44
Potassium	mg/L	3	3	2.5	2.6
Fluoride	mg/L	<0.1	0.1	0.11	0.1
BOD	mg/L	<2	<2	<2	2
Silica	mg/L	24	24	32	30
Aluminium	mg/L	<0.01	<0.01	<0.05	0.013
Arsenic	mg/L	0.002	<0.001	<0.005	<0.003
Barium	mg/L	0.042	0.035	0.031	0.034
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005	<0.005
Copper	mg/L	0.006	0.009	0.012	0.001
Lead	mg/L	<0.001	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005	<0.005
Manganese	mg/L	0.006	0.001	<0.005	0.015
Molybdenum	mg/L	<0.001	<0.001	<0.005	<0.005
Nickel	mg/L	<0.001	0.001	<0.001	<0.001
Selenium	mg/L	<0.01	<0.01	<0.003	<0.003
Strontium	mg/L	0.282	0.245	0.24	0.22
Thallium	mg/L	<0.001	<0.001	<0.01	<0.002
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	0.23	0.071	0.14	0.04
Boron	mg/L	0.06	0.1	0.066	0.067
Iron	mg/L	<0.05	<0.05	<0.005	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		<0.02	<0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		62420	62420	62420	62420
Date		18/01/11	16/02/11	24/03/11	6/04/2011
Time		08:25:20	09:20:08	13:48:12	15:04:00
Sampler		smk	smk	smk	smk
Casing height (m)		0.4	0.4	0.4	0.4
Water Level (m)		9.8	10.35	9.7	10.05
Bore depth (m)		17.9	17.9	17.9	17.9

Field results	***UOM***				
pH		6.77	6.95	6.71	6.94
EC	µS/cm	1448	861	570	610

Lab results	***UOM***				
pH		7.86	6.69	7	7
Conduct	µS/cm	1160	658	560	650
TDS	mg/L	674	428	340	370
SS	mg/L	<5	<5	<5	<5
Total Alkalinity	mg/L	106	117	130	150
Sulfate	mg/L	89	61	33	36
Silicon	mg/L	11.8		12	11
Chloride	mg/L	263	149	82	95
Calcium	mg/L	81	51	35	39
Magnesium	mg/L	41	26	16	18
Sodium	mg/L	86	70	56	48
Potassium	mg/L	4	4	2.6	2.5
Fluoride	mg/L	<0.1	0.1	0.09	0.09
BOD	mg/L	<2	<2	2	3
Silica	mg/L	25.3	23.8	32	30
Aluminium	mg/L	<0.01	<0.01	<0.05	<0.005
Arsenic	mg/L	0.002	<0.001	<0.005	<0.003
Barium	mg/L	0.07	0.056	0.039	0.038
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005	<0.005
Copper	mg/L	<0.001	0.001	<0.001	<0.001
Lead	mg/L	<0.001	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005	<0.005
Manganese	mg/L	0.019	0.014	0.009	0.009
Molybdenum	mg/L	<0.001	0.001	<0.005	<0.005
Nickel	mg/L	0.006	0.007	0.002	0.001
Selenium	mg/L	<0.01	<0.01	<0.003	<0.003
Strontium	mg/L	0.453	0.368	0.25	0.22
Thallium	mg/L	<0.001	<0.001	<0.01	<0.002
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	0.161	0.051	0.074	0.047
Boron	mg/L	0.04	0.1	0.058	0.071
Iron	mg/L	0.75	<0.05	0.021	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.08	0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		13030284	13030284	13030284	13030284
Date		18/01/11	16/02/11	24/03/11	6/04/2011
Time		14:40:00	14:59:09	11:39:00	10:27:11
Sampler		smk	smk	smk	smk
Casing height (m)		0.1	0.1	0.1	0.1
Water Level (m)		4.5	5.17	4.4	4.97
Bore depth (m)		12.74	12.74	12.74	12.74

Field results	***UOM***				
pH		6.65	6.99	6.95	6.95
EC	µS/cm	1075	1215	954	628

Lab results	***UOM***				
pH		7.71	6.4	6.8	6.8
Conduct	µS/cm	1180	800	720	590
TDS	mg/L	589	570	480	360
SS	mg/L	201	235	110	130
Total Alkalinity	mg/L	123	110	140	130
Sulfate	mg/L	66	52	45	37
Silicon	mg/L	10.7		11	12
Chloride	mg/L	252	222	130	87
Calcium	mg/L	77	61	51	41
Magnesium	mg/L	36	31	22	18
Sodium	mg/L	81	84	63	44
Potassium	mg/L	3	3	2.2	2.1
Fluoride	mg/L	<0.1	<0.1	0.08	0.09
BOD	mg/L	<2	<2	<2	6
Silica	mg/L	22.9	18.7	30	32
Aluminium	mg/L	<0.01	<0.01	<0.05	0.007
Arsenic	mg/L	0.003	<0.001	<0.005	<0.003
Barium	mg/L	0.09	0.102	0.083	0.057
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	0.002	0.003	<0.005	<0.005
Copper	mg/L	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	<0.001	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005	<0.005
Manganese	mg/L	0.243	0.389	0.36	0.41
Molybdenum	mg/L	<0.001	<0.001	<0.005	<0.005
Nickel	mg/L	0.002	0.005	0.001	<0.001
Selenium	mg/L	<0.01	<0.01	<0.003	<0.003
Strontium	mg/L	0.41	0.496	0.26	0.22
Thallium	mg/L	<0.001	<0.001	<0.01	<0.002
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	0.003	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	2.06	14	8.3	0.67
Boron	mg/L	0.06	0.1	0.053	0.064
Iron	mg/L	9.05	32.5	2.2	0.032
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	0.29		0.26	0.16

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		68759	68759	68759	68759
Date		18/01/11	16/02/11	24/03/11	6/04/2011
Time		14:00:00		16:33:03	15:43:40
Sampler		smk	smk	smk	smk
Casing height (m)					
Water Level (m)		-	-	-	-
Bore depth (m)					

Field results	***UOM***				
pH		6.84	6.87	7.24	6.82
EC	µS/cm	504	583	579	580

Lab results	***UOM***				
pH		8.04	6.81	7.1	6.9
Conduct	µS/cm	483	458	560	590
TDS	mg/L	237	290	350	330
SS	mg/L	11	<5	<5	<5
Total Alkalinity	mg/L	143	148	170	170
Sulfate	mg/L	22	24	22	22
Silicon	mg/L	14.3		15	15
Chloride	mg/L	47	68	74	75
Calcium	mg/L	33	34	40	40
Magnesium	mg/L	16	19	18	19
Sodium	mg/L	40	52	52	43
Potassium	mg/L	1	1	1.6	1.4
Fluoride	mg/L	0.1	0.1	0.11	0.11
BOD	mg/L	<2	<2	<2	2
Silica	mg/L	30.6	30	41	41
Aluminium	mg/L	<0.01	<0.01	<0.05	0.011
Arsenic	mg/L	0.001	<0.001	<0.005	<0.003
Barium	mg/L	0.023	0.032	0.035	0.03
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005	<0.005
Copper	mg/L	0.01	0.014	0.003	0.013
Lead	mg/L	<0.001	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005	<0.005
Manganese	mg/L	0.014	0.003	<0.005	<0.005
Molybdenum	mg/L	<0.001	<0.001	<0.005	<0.005
Nickel	mg/L	<0.001	0.001	<0.001	<0.001
Selenium	mg/L	<0.01	<0.01	<0.003	<0.003
Strontium	mg/L	0.199	0.257	0.25	0.22
Thallium	mg/L	<0.001	<0.001	<0.01	<0.002
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	0.237	0.034	0.013	0.037
Boron	mg/L	0.05	0.06	0.041	0.038
Iron	mg/L	<0.05	<0.05	<0.005	<0.005
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.02	0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		13030127	13030127	13030127	13030127
Date		19/01/11	16/02/11	24/03/11	6/04/2011
Time		07:50:00	11:44:34	10:46:00	09:31:13
Sampler		smk	smk	smk	smk
Casing height (m)		0.1	0.1	0.1	0.1
Water Level (m)		10.9	10.9	10.3	10.37
Bore depth (m)		15.4	15.4	15.4	15.4

Field results	***UOM***				
pH		6.31	6.97	7.03	7.16
EC	μS/cm	952	997	1006	880

Lab results	***UOM***				
pH		5.23	6.07	5.2	4.9
Conduct	μS/cm	945	644	890	770
TDS	mg/L	752	448	570	480
SS	mg/L	91	68	100	99
Total Alkalinity	mg/L	2	3	<5	<5
Sulfate	mg/L	300	261	220	160
Silicon	mg/L	2.62		1.4	1.5
Chloride	mg/L	110	117	140	130
Calcium	mg/L	39	36	38	35
Magnesium	mg/L	18	19	18	16
Sodium	mg/L	51	48	50	50
Potassium	mg/L	2	2	2.4	2.3
Fluoride	mg/L	0.1	0.1	0.14	0.13
BOD	mg/L	5	<2	9	7
Silica	mg/L	5.6	4.8	<5	<5
Aluminium	mg/L	<0.01	<0.01	<0.05	0.008
Arsenic	mg/L	0.002	<0.001	<0.005	<0.003
Barium	mg/L	0.029	0.034	0.04	0.04
Chromium	mg/L	<0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	0.015	0.009	0.011	0.008
Copper	mg/L	<0.001	<0.001	<0.001	<0.001
Lead	mg/L	<0.001	<0.001	0.002	0.001
Lithium	mg/L	0.005	0.005	0.005	<0.005
Manganese	mg/L	2.44	1.95	2.9	2.2
Molybdenum	mg/L	<0.001	<0.001	<0.005	<0.005
Nickel	mg/L	0.02	0.01	0.003	0.004
Selenium	mg/L	<0.01	<0.01	<0.003	<0.003
Strontium	mg/L	0.198	0.212	0.25	0.21
Thallium	mg/L	<0.001	<0.001	0.04	<0.002
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	0.31	0.12
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	29.3	21.5	15	11
Boron	mg/L	<0.05	<0.05	0.053	0.054
Iron	mg/L	99.2	109	23	22
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	<0.01		0.03	<0.02

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Bore		wier 561	wier 561	wier 561	wier 561
Date		18/01/11	16/02/11	24/03/11	6/04/2011
Time		09:55:46	13:40:55	09:30:00	08:20:45
Sampler		smk	smk	smk	smk
Casing height (m)		0.4	0.4	0.4	0.4
Water Level (m)		10.3	10.5	9.1	9.1
Bore depth (m)		21.9	21.9	21.9	21.9
Field results	***UOM***				
pH		7.22	7.02	6.78	6.92
EC	µS/cm	301	518	645	519
Lab results	***UOM***				
pH		8.09	6.74	7.1	7
Conduct	µS/cm	300	415	630	540
TDS	mg/L	152	318	430	320
SS	mg/L	9	61	17	37
Total Alkalinity	mg/L	110	99	190	170
Sulfate	mg/L	7	35	28	20
Silicon	mg/L	16.9		21	19
Chloride	mg/L	19	68	89	64
Calcium	mg/L	15	25	52	37
Magnesium	mg/L	7	12	23	17
Sodium	mg/L	38	52	54	42
Potassium	mg/L	<1	1	1.4	1.1
Fluoride	mg/L	0.2	0.2	0.12	0.13
BOD	mg/L	<2	<2	<2	<2
Silica	mg/L	36.2	38.6	57	51
Aluminium	mg/L	<0.01	0.01	<0.05	0.009
Arsenic	mg/L	0.002	0.001	<0.005	<0.003
Barium	mg/L	0.055	0.141	0.3	0.2
Chromium	mg/L	0.001	<0.001	<0.001	<0.001
Cobalt	mg/L	<0.001	<0.001	<0.005	<0.005
Copper	mg/L	0.002	<0.001	0.004	0.001
Lead	mg/L	<0.001	<0.001	<0.001	<0.001
Lithium	mg/L	<0.001	<0.001	<0.005	<0.005
Manganese	mg/L	0.341	1.01	2.2	0.41
Molybdenum	mg/L	0.002	<0.001	0.005	<0.005
Nickel	mg/L	0.005	0.002	<0.001	0.002
Selenium	mg/L	<0.01	<0.01	<0.003	<0.003
Strontium	mg/L	0.137	0.2	0.26	0.22
Thallium	mg/L	<0.001	<0.001	<0.01	<0.002
Thorium	mg/L	<0.001	<0.001	<0.002	<0.01
Tin	mg/L	<0.001	<0.001	<0.05	<0.05
Uranium	mg/L	<0.001	<0.001	<0.001	<0.001
Vanadium	mg/L	<0.01	<0.01	<0.005	<0.005
Zinc	mg/L	0.02	0.037	0.036	0.034
Boron	mg/L	<0.05	0.06	0.036	0.045
Iron	mg/L	<0.05	<0.05	0.006	0.011
Mercury	mg/L	<0.0001	<0.0001	<0.0001	<0.0001

Total Phosphorus	mg/L	0.01		0.12	0.12

	Water quality criteria			
	Callide creek WQO	ADWG	Stock	Irrigation
pH	6.5-8.5	6.5-8.5	6.5-9.0	6.5-8.5
Conduct	1000			
Fluoride	1.5	1.5	2	2
Sulfate	500	500-250		
Chloride	500	250		
Boron	4	4	5	0.5
Barium	0.7	0.7		
Calcium	200	200	1000	
Chromium	0.05	0.05		
Copper	1	1		
Magnesium				
Molybdenum	0.05	0.05	0.15	0.05
Selenium	0.01	0.01	0.02	0.05
Sodium	180	180		
Uranium	0.003	0.003		
Vanadium	0.01	0.01	0.1	0.5
Zinc	3	3		

Callide creek water quality monitoring program daily report - No. 5 25-1-11.
Craig Thornton, Central West Science, Biloela Research Station.

Site details

Site 1

Callide creek at causeway beneath spillway.

Adjacent to S 24o 21'49.3, E 150o 36' 25.0

Upstream

Downstream

Site 2

Callide creek at Dawson highway.

Adjacent to S 24o 22' 10.8, E 150o 31' 57.2

Upstream

Downstream

Site 3

Callide creek at Jambin Dakenba road (meatworks)

Adjacent to S 24o 21' 34.6, E 150o 29' 57.8

Upstream

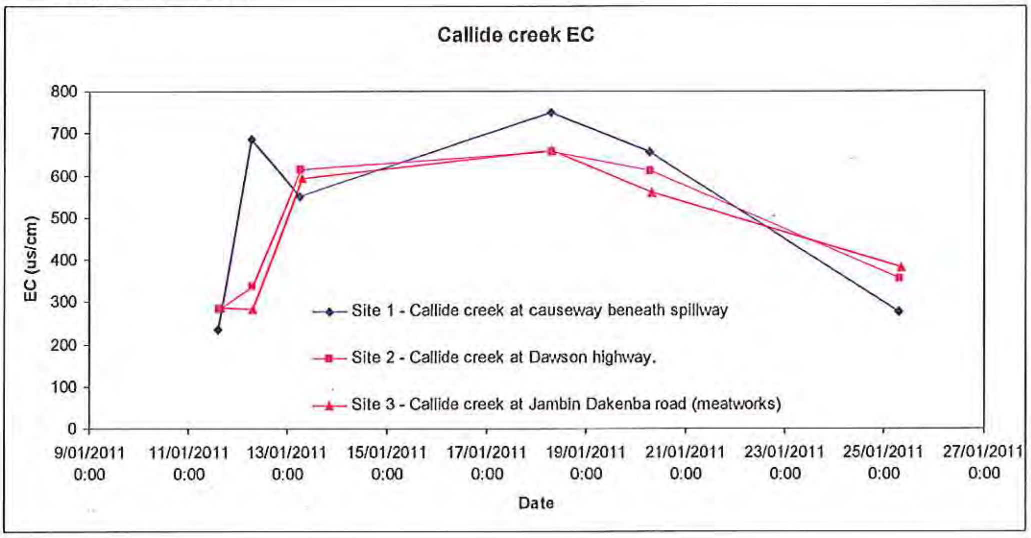
Downstream

Methods

Two one-litre Bottle D samples are taken from as close to the centre of the flow as possible.

Results

Daily sampling is no longer occurring. Sampling is now conducted on Tuesday and Thursday each week.



Summary 25/1/11

Conductivities are markedly down at all sites with conductivity at site 1 approaching baseline level. There was no evidence of release water from Callide power station. Flow at site 1 is fully contained by the culvert under the causeway.

Date	Site	Time	Bottle	Conductivity (us/cm)	Temperature (o C)
25-1-11	1 – Spillway	7:08	1	277	23.4
		7:16	2	275.6	22.7
		7:12	Mean	***276.3***	***23.05***
	2- Dawson Hwy	7:45	1	353	24.9
		7:56	2	357	25.1
		7:50	Mean	***355***	***25***
	3 – Jambin Dakenba Rd	8:12	1	380	25.2
		8:18	2	381	25.7
		8:15	Mean	***380.5***	***25.45***

Summary 20/1/11

As for 18/1/11. Flow at site 1 has dropped again, now being fully contained by the culvert under the causeway.

Date	Site	Time	Bottle	Conductivity (us/cm)	Temperature (o C)
20-1-11	1 – Spillway	6:18	1	681	24.1
		6:24	2	632	24.2
			Mean	***656.5***	***24.15***
	2- Dawson Hwy	7:02	1	600	26.2
		7:12	2	619	26.4
			Mean	***609.5***	***26.3***
	3 – Jambin Dakenba Rd	7:30	1	557	26.1
		7:35	2	560	26.3
			Mean	***558.5***	***26.2***

Summary 18/1/11
Conductivity levels are highest immediately beneath the spillway at site 1. All sites continue to have conductivities higher than background levels. Release water from Callide power station was evident adjacent to S 24o 21; 28.4, E 150o 37' 03 however little or no water was observed exiting Callide dam via the spillway. This is supported by the lowest flow height yet observed at site 1.

Date	Site	Time	Bottle	Conductivity (us/cm)	Temperature (o C)
18-1-11	1 – Spillway	06:30	1	749	24.2
		06:36	2	749	24.2
			Mean	***749***	***24.2***
	2- Dawson Hwy	07:03	1	652	25.8
		07:12	2	658	25.9
			Mean	***655***	***25.85***
	3 – Jambin Dakenba Rd	07:29	1	662	26.3
		07:35	2	655	26.2
			Mean	***658.5***	***26.25***

Daily summary 13/1/11
Conductivity levels are lowest immediately beneath the spillway at site 1. All sites have conductivities higher than background levels. Levels at site 1 are lower than the previous day however levels at sites 2 and 3 are higher. Release water from Callide power station was evident adjacent to S 24o 21; 28.4, E 150o 37' 03. Water level at site 1 was the highest observed to date (0.2 m). Water level at site 3 was the lowest observed to date, level with the top of the culvert inlet.

Date	Site	Time	Bottle	Conductivity (us/cm)	Temperature (o C)
13-1-11	1 – Spillway	06:08	1	557	25.1
		06:13	2	546	25.1
			Mean	***551.5***	***25.1***
	2- Dawson Hwy	06:41	1	612	25.8
		06:53	2	613	25.9
			Mean	***612.5***	***25.85***
	3 – Jambin Dakenba Rd	07:09	1	591	26.5
		07:15	2	591	26.5
			Mean	***591***	***26.5***

Daily summary 12/1/11
Release water from Callide power station was evident adjacent to S 24o 21; 28.4, E 150o 37' 03. Conductivity levels have increased nearly three fold immediately beneath the spillway at site 1. Conductivity decreases with distance downstream with baseline levels recorded at site 3.

Date	Site	Time	Bottle	Conductivity (us/cm)	Temperature (o C)
12-1-11	1 – Spillway	06:38	1	679	24.9
		06:43	2	690	25

			Mean	***684.5***	***24.95***
	2- Dawson Hwy	07:09	1	336	24.9
		07:18	2	338	25
			Mean	***337***	***24.95***
	3 – Jambin Dakenba Rd	07:34	1	277	25.9
		07:40	2	286.7	26.1
			Mean	***281.85***	***26***

Daily summary 11/1/11
Conductivity levels are lowest immediately beneath the spillway at site 1, and increase downstream with similar levels recorded at sites 2 and 3. No release water was evident from Callide power station.

Date	Site	Time	Bottle	Conductivity (us/cm)	Temperature (o C)
11-1-11	1 – Spillway	14:00	1	237.5	26.3
		14:05	2	234.4	26.3
			Mean	***235.95***	***26.3***
	2- Dawson Hwy	14:39	1	282.5	28
		14:43	2	282.5	28
			Mean	***282.5***	***28***
	3 – Jambin Dakenba Rd	15:07	1	285.5	27.7
		15:13	2	284.3	27.4
			Mean	***284.9***	***27.4***

Quality assurance
These readings should be used for comparative purposes only rather than as absolute values. Instrument performance has only been able to be checked against expired conductivity standards. Cross calibration with a second meter and current standards should be performed before these values are interpreted as absolute values.

[redacted]
Telephone: [redacted] **Facsimile:** [redacted] **Mobile:**
Email: [redacted]

CTS No. 00366/11

Department of Environment and Resource Management
JOINT MINISTERIAL BRIEFING NOTE

TO: Minister for Natural Resources, Mines and Energy and Minister for Trade
AND: Minister for Climate Change and Sustainability

SUBJECT: Water Release from Callide Power Station Ash Dam

TIMEFRAME

- Noting of this brief is urgent as there is potential for adverse community comment.

RECOMMENDATION

It is recommended that the Ministers **note:**

- CS Energy was issued a Transitional Environmental Program (TEP) under section 339 of the *Environmental Protection Act 1994* (the EP Act) on 11 January 2011 and commenced a controlled discharge of water from their Ash Dam B on that day.
- Ash Dam B is a regulated storage under the EP Act.

BACKGROUND

- CS Energy is a Queensland Government owned corporation that operates the Callide Power Station located approximately 10 kilometres east of Biloela.
- CS Energy holds a Development Approval (DA) (number CG0039) issued by the Department of Environment and Resource Management to authorise the ongoing operation of the power station and associated infrastructure. This approval also authorises the storage of contaminants on site in a number of Waste Containment Facilities (ash dams) located to the west of the power station.
- The DA does not authorise the release of water from these storage facilities.
- There are a number of groundwater and surface water users downstream of the power station in Callide Creek and the Callide Creek alluvium. The Biloela town water supply bore field is in the Callide Creek alluvium, approximately 15 kilometres downstream of the power station.
- Callide Dam is a short distance upstream from the point where the power station intends to discharge. This dam is owned by SunWater and is operated in accordance with an Interim Resource Operations Licence (IROL) authorised under the provisions of the *Water Act 2000*. One of the purposes of the dam is to make releases in accordance with the IROL to recharge the Callide Valley alluvium aquifers. SunWater supplies water to groundwater and surface water entitlement holders.
- The department issued an Environmental Evaluation notice to CS Energy on 30 June 2010, requiring CS Energy to investigate groundwater contamination from seepage from Ash Dam B. Details of this issue are provided in CTS 08914/10, 09791/10 and 13529/10 (see Attachments A, B and C).
- On 20 December 2010, CS Energy notified the department that the water level in Ash Dam B had reached the mandatory reporting level. As part of the notification, departmental staff recommended to CS Energy that it consider lodging a TEP in case further rainfall continued to raise water levels in Ash Dam B, creating a very real risk that the dam will spill contaminated water through an uncontrolled release into Callide Creek.

Rec'd - ODG 24 JAN 2011

Autho[redacted] Position: A/Manager, Environmental Services, Gladstone, Central West Region Tel No[redacted] Date: 13/01/11	Cleared by Name: [redacted] Position: Regional Services Director, Central West Region Tel No:[redacted]	Cleared by Name: Mike Birchley ✓Endorsed Position: A/Assistant Director-General, Regional Service Delivery Tel No[redacted] Rec'd: 14/01/2011
	Name: Terry Wall Position: Associate Director-General, Operations and Environmental Regulator Tel No:[redacted] 20.1.11 Date::	Name[redacted] Positi[redacted]uty Director-General, Water and Ecosy[redacted]Outcomes Tel No:[redacted] 8. 24/01/2011

- The contaminants of most concern held in the waters of Ash Dam B are sulphate, chloride, sodium, boron, arsenic, molybdenum, fluoride and salinity. These contaminants are at concentrations that are up to 10 times greater than water quality guidelines for drinking water or irrigation.
- Staff from the department inspected the site and met with CS Energy and SunWater on 5 January 2011 and discussed options for managing the risks associated with rising Ash Dam B water levels. At this meeting, CS Energy was advised to consider applying for a voluntary TEP.
- On 7 January 2011 CS Energy provided the department with a notice to advise of the risk of an imminent uncontrolled release from the Callide Power Station Ash Dam B under section 320 of the EP Act (duty to notify of environmental harm). At that time, there was 130 millimetres freeboard with 43 millimetres of rainfall likely to result in the Ash Dam B running the spillway.
- Following close of business on Friday 7 January 2011, CS Energy lodged a voluntary TEP to discharge waters from Ash Dam B.
- At 11:00am on 8 January 2011 Callide Dam was at 101% and SunWater commenced discharging at approximately 2000 megalitres per day. Discharge will continue at approximately the rate of inflow to the dam.
- Following negotiations with CS Energy and consultation with the department's Office of the Water Supply Regulator and the Water Quality and Ecosystem Health Group, a TEP was approved on 11 January 2011.

CURRENT ISSUES

- Actions aimed at lowering the water level in Ash Dam B to minimise the risk of uncontrolled releases and ensuring that any contaminants released are diluted and carried past the groundwater recharge area include:
  1) Controlled releases from Ash Dam B combined with simultaneous controlled releases from Callide Dam using CS Energy's water entitlement held in Callide Dam;
  2) Increasing controlled releases from Ash Dam B in the event of Callide Dam overflowing which is the current situation.
- The TEP includes requirements for a substantial surface and groundwater monitoring effort before, during and after any releases from Ash Dam B.
- The TEP limits releases from Ash Dam B to a maximum volume of 5% of the flow in Callide Creek. If monitoring identifies contaminant concentrations greater than drinking water or irrigation guidelines, the discharge from Ash Dam B is to cease immediately.
- Release from Ash Dam B during lower flows (<300 megalitres per day) is currently precluded.
- It is anticipated that CS Energy will seek amendments to the TEP in the future once reliable monitoring data from any high flow releases is available.
- Callide Power Station began releasing water from the ash dam at a rate of 23 megalitres per day on the evening of 11 January 2011 when Callide Creek was flowing at a rate of 1730 megalitres per day. This release is expected to continue for some days depending on flows from the Callide Dam.
- Staff from the department met with the local water users' advisory group along with CS Energy and SunWater representatives on 12 January 2011 to explain the situation to the water users. An outcome of this meeting is that CS Energy will extend surface and groundwater monitoring further downstream in Callide Creek beyond the requirements of the TEP.

Auth[redacted]Positi[redacted], Environmental Services, Gladstone, Central West Regio[redacted] Date: 13/01/11	Cleared by Name: [redacted] Position: Regional Services Director, Central West R[redacted] Tel No: [redacted]	Cleared by Name: Mike Birchley Position: A/Assistant Director-General, Regional Service Delivery Tel N[redacted] Rec'd: [redacted]
	Name: Terry Wall Position: Associate Director-General, Operations and E[redacted]ulator Tel N[redacted] Date::	Name: Debbie Best Position: Deputy Director-General, Water and Ecosystem Outcomes Tel No: [redacted]

- CS Energy issued a media statement advising the community of the approved discharge on 13 January 2011 (Attachment D).

RESOURCE/IMPLEMENTATION IMPLICATIONS

- There are no resource/implementation implications.

PROPOSED ACTION

- The department will actively monitor the discharge to ensure compliance with the approved TEP and no risk to the water supply users downstream of the discharge.

OTHER INFORMATION

Consultation:

- Queensland Health and Banana Shire Council have been consulted and will be kept informed as water monitoring results are made available.
- The department has drafted a media holding statement should there be media interest (Attachment E).

ATTACHMENTS

- Attachment A – Copy of CTS 08914/10
- Attachment B – Copy of CTS 09791/10
- Attachment C – Copy of CTS 13529/10
- Attachment D - Media statement from CS Energy 12 January 2011
- Attachment E - Departmental media holding statement

.. 28/1/11 **Director-General**

Approved **Comments:**	Not approved	Noted
.... 8/2/11 **Minister for Natural Resources, Mines and Energy and Minister for Trade**		.... 2/2/11 **Principal Advisor**
Approved **Comments:**	Not approved	Noted
.... 19/2/11 **Minister for Climate Change and Sustainability**		.... 19/2/11 **Principal Policy Advisor**

Author Name [redacted] Position: A/Manager, Environmental Services, Gladstone, Central West Region Tel N [redacted] Date: 13/01/11	**Clear** [redacted] Name [redacted] Position: Regional Services Director, Central West Region Tel No: [redacted]	**Cleared by** Name: Mike Birchley Position: A/Assistant Director-General, Regional Service Delivery Tel No: [redacted] Rec'd: 14/01/2011
	Name: Terry Wall Position: Associate Director-General, Operations and Environmental Regulator Tel No: [redacted] Date::	Name: Debbie Best Position: Deputy Director-General, Water and Ecosyst [redacted] Tel No: [redacted]

Department of Environment
and Resource Management

Notice

Environmental Protection Act

Decision to grant an approval for draft transitional environmental program

This statutory notice is issued by the administering authority pursuant t section 340 of the *Environmental Protection Act 1994*, to advise you of a decision or action.

Your reference : CA23294
Our reference : MAN13320

[redacted]
Callide Site Manager
CS Energy Ltd
PO Box 392
BILOELA QLD 4715

C/C [redacted]
Production Environment Technical Manager
CS Energy Ltd
GPO Box 769
BRISBANE QLD 4001

Attention: [redacted]

Re: Application for an approval for transitional environmental program for management of seepage from Ash Dam B at Callide Power Station

Thank you for your application for an approval for a transitional environmental program – 'TEP – Management of seepage from Ash Dam B'.

Your application, which was received by this office on 9 August 2011, has been approved.

A copy of the certificate of approval is attached.

Fees apply for the assessment of a draft transitional environmental program and any subsequent annual returns. The fees are outlined in the attached operational policy *Transitional Environmental Program (TEP) fees.*

A fee of $375.40 (includes GST) is payable.

You may apply to the Department of Environment and Resource Management for a review of this decision within 10 business days of 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.

Department of Environment and Resource Management

Notice

Should you have any queries in relation to this Notice, [redacted] of the Department on telephone [redacted] would be happy to assist you.

[redacted]	12\ 8 |2011
SIGNATURE	DATE

[redacted]
Manager, Environmental Services.

Enquiries:
Department of Environment and Resource Management
Level 3, 136 Goondoon Street
GLADSTONE QLD 4680
P[redacted]
F

Queensland Government

Department of Environment
and Resource Management

Environmental Protection Act 1994

Transitional environmental program certificate of approval number MAN13320

This certificate of approval is issued by the administering authority pursuant to section 339 of the *Environmental Protection Act 1994*. A transitional environmental program is a specific program that, when approved, achieves compliance with the *Environmental Protection Act 1994* for the matters dealt with by the program by reducing environmental harm, or detailing the transition to an environmental standard.

Under the provisions of the *Environmental Protection Act 1994*, this certificate of approval is hereby granted to:

[redacted]
Callide Site Manager
CS Energy Ltd
PO Box 392
BILOELA QLD 4715

C/C [redacted]
Production Environment Technical Manager
CS Energy Ltd
GPO Box 769
BRISBANE QLD 4001

Approving the draft transitional environmental program (TEP); titled 'TEP – Management of seepage from Ash Dam B' for management of seepage from Ash Dam B at Callide Power Station.

The draft transitional environmental program, dated 8 August, was received by this office on the 9 August 2011.

The draft transitional environmental program is approved. The TEP remains in force until **10 August 2014**.

You may apply to the Department of Environment and Resource Management for a review of this decision within 10 business days of 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, [redacted] of the Department of Environment and Resource Management on telephone [redacted] would be happy to assist you.

[redacted]

Signature

12 / 8 / 2011

Date

[redacted]
Manager, Environmental Services.

Enquiries:
Department of Environment and Resource Management
Level 3, 136 Goondoon Street
GLADSTONE QLD 4680
Ph[redacted]
Fa[redacted]

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

Queensland Government

cs energy

DEPARTMENT OF ENVIRONMENT & RESOURCE MANAGEMENT
RECEIVED
9 AUG 2011
GLADSTONE

CALLIDE POWER STATION

DRAFT TRANSITIONAL ENVIRONMENTAL PROGRAM (TEP)

TITLE: TEP - Management of Seepage from Ash Dam B

DATE: 8 August 2011

LOCATION: CS Energy Lot 1 on Plan RP615528
Callide A and B, and Callide C Power Stations
Coal and Callide Roads respectively
BILOELA QLD 4715

EXISTING DEVELOPMENT APPROVALS:
Integrated Authority CG0039 issued 30 July 2004
Integrated Authority CG0117 issued 17 June 2004.

REGISTRATION CERTIFICATE HOLDERS:
CS Energy Limited ACN 078 848 745 holds ENRE 00952209
Callide Power Management Pty Ltd ACN 082 468 700 holds ENRE 00849808

ACTIVITIES:

ENRE 00952209

- ERA 8 Chemical Storage Threshold 1
- ERA 8 Chemical Storage Threshold 3(b)
- ERA 14 Electricity Generation Threshold 2(b)
- ERA 56 Regulated Waste Storage Threshold 2
- ERA 60 Waste Disposal Threshold 1(d)
- ERA 63 Sewage Treatment Threshold 2(b)

ENRE 00849808

- ERA 14 Electricity Generation Threshold 2(b)
- ERA 56 Regulated Waste Storage Threshold 2

FINISH DATE: This TEP will conclude within 3 years of the date of approval of the draft transitional environmental program.

BACKGROUND

Ash Dam B is an earth and rock fill dam that came into service in December 1988 to store fly ash and associated process water from the Callide B power station. The storage also receives site rainfall runoff and excess plant operational flows and in some cases seepage from the evaporation ponds, Ash Dams 3 and 4 and the Drains Reclaim Dam. With the construction of the Callide C station in 2001, Ash Dam B also stores reject waste streams from the Blowdown Water Treatment Plant. Ash was traditionally disposed as "lean phase" slurry, but since 2001 "dense phase" disposal has been progressively introduced and is now the major ash disposal method. The above facilities including various seepage collection works are collectively referred to as the Waste Containment Facility (WCF).

Whilst a small number of bores were monitored prior to dam construction, a significant groundwater monitoring network was separately constructed in 1996. The network has been upgraded on several occasions, and by 2010 over 40 bores were in place. The bores have been routinely monitored on at least an annual basis as part of the Receiving Environment Monitoring Program (REMP).

On 30 June 2010 the Department of Environment and Resource Management (DERM) issued a Notice to CS Energy Ltd to conduct or commission an Environmental Evaluation (Investigation) for CS Energy's Waste Containment Facility (Ash Dam B) on land described as Lot 1 on Plan RP615528. The Notice required a number of specific investigations to be carried out. A Report was delivered to DERM on 4 March 2011, which described the actions CS Energy had undertaken to investigate and address the seepage and potential Callide Creek impacts associated with Ash Dam B. The report discussed the merits of each of the proposed actions and made recommendations as to which actions were to be implemented by CS Energy to best address seepage management.

Prior to the submission of the Environmental Evaluation report in March 2011, an unusually high rainfall summer resulted in substantial runoff into Ash Dam B, increasing water levels above the Mandatory Reporting Level by approximately 1.5 m. In addition, the level in the adjacent Callide Dam increased substantially, reaching 100% capacity and spilling for the first time since becoming operational. A voluntary TEP was approved by DERM for the release of water from Ash Dam B into Callide Creek during periods of flood releases from the Callide Dam. This TEP was subsequently amended to a finish date of 1 November 2011 to enable any further flood releases from Callide Dam to be utilised for a co-release from Ash Dam B. Actions to reduce the water level in Ash Dam B under this voluntary TEP and additional parallel actions to reduce the water level to below the MRL are consistent with, and are complementary to, a number of the recommendations in the Environmental Evaluation report.

As a result of the increased water in Callide Dam, Sunwater is conducting controlled releases for the purposes of aquifer recharge. With the volume of retained water, this recharge can continue for a period of around 2 years. The controlled release, in combination with seepage from the Callide Dam, has altered the hydrogeology of the aquifer between Ash Dam B and the Callide Dam (the location of the first identified presence of Ash Dam B seepage) and has reduced the potential for environmental harm resulting from any seepage from Ash Dam B during this period.

Subsequent to DERM's assessment of the Environmental Evaluation Report, a Notice to Prepare a draft transitional environmental program was issued to CS Energy on 16 June 2011.

The TEP forms the basis for the identification and implementation of appropriate seepage management measures as developed in the Environmental Evaluation report. There are four primary aspects to the TEP:

1. Waste water management
2. Seepage interception and control
3. Receiving environment monitoring
4. Other (to assist in the understanding of groundwater movement)

AUTHORISATION

The operation of Callide A and B stations is authorised by Integrated Authority CG0039 and Registration Certificate ENRE 00952209.

"Schedule 2E – Land Application" of Integrated Authority CG0039 authorises the Registration Certificate Holder to release ash and effluent to the Waste Containment Facility from A, B and C stations.

"Schedule 2C - Water" of Integrated Authority CG0039 authorises the release of contaminants from the licensed place at Release Points R1 and R2 from Ash Dams 1 and 2 respectively.

The "Waste Containment Facility" is defined in Integrated Authority CG0039 and includes Ash Dam B.

The operation of Callide C station is authorised by Integrated Authority CG0117.

"Schedule 2E - Land Application" of Integrated Authority CG0117 authorises ash from the combustion process, other coal material, boiler blowdown and chemical cleaning waters and treated sewage effluent to be placed in the Waste Containment Facility.

CS Energy is authorised to continue to operate the Callide A and B Stations and to continue to direct ash and effluent from A, B and C Stations to the Waste Containment Facility under the terms of the development approval and this TEP.

Callide Power Management as the Callide C Registration Certificate holder is authorised to continue to direct ash from the combustion process, other coal material, boiler blowdown and chemical cleaning waters and treated sewage effluent to the Waste Containment Facility from Callide C Station under the terms of the development approval and this TEP.

RELEVANT DEVELOPMENT APPROVAL CONDITIONS

The relevant Development Approval conditions related to activities under this TEP are listed above.

OBJECTIVE OF THE TEP

The objective of this Transitional Environmental Program is to ensure compliance with the Development Approvals and the *Environmental Protection Act 1994* by implementing water and seepage management measures to avoid as far as practicable environmental harm being caused or threatened by seepage from Ash Dam B.

In particular, actions proposed to be conducted as part of this TEP supplement the work undertaken during the Environmental Evaluation and implement the key recommendations for continued improvement of seepage management from Ash Dam B.

ACTIONS TO ACHIEVE THE OBJECTIVES

Waste Water Management

1. During the Environmental Evaluation, the operational policies, procedures and management practices of the WCF were evaluated against the relevant components of the Queensland Dam Safety Management Guideline, 2002. For this TEP, an independent review of the operational performance of Ash Dam B against the Technical Guideline for Site Water and Tailings Management from the Technical Guidelines for the Environmental Management of Exploration and Mining in Queensland (DME 1995) will be undertaken.
2. As part of the ongoing improvement in the management of ash water and salt at the Callide power stations, the Waste Management Improvement Program was initiated in early 2010 to advance the coordination and implementation of a range of projects. The Environmental Evaluation identified a number of these projects as recommended activities to assist with the improvement of seepage management. These activities will be progressed and implemented as outlined in Table 1.

Seepage Interception and Control

3. The Environmental Evaluation recommended some key actions to improve the interception and control of existing seepage from Ash Dam B. These actions will undergo further engineering development to facilitate their evaluation of effectiveness for seepage control using the numerical model developed during the Environmental Evaluation. The selected actions and their implementation timeframes will be defined.

Receiving Environment Monitoring

4. The Receiving Environment Monitoring Program has been in place at Callide for many years and has been progressively modified as the seepage control infrastructure has been upgraded. As part of the TEP, the REMP will be modified to include the new monitoring bores installed during the Environmental Evaluation and generally revised to include additional existing off-site bores further downstream in Callide Creek and to provide sufficient background data for the ongoing monitoring of seepage.
5. The existing monitoring bores downstream from Ash Dam B are generally shallow in nature with most under 20 metres in depth. With the potential for deeper aquifer systems to underlie the alluvial aquifers located closer to the surface, additional bores will be constructed up to 30 metres in depth to facilitate enhanced monitoring. These bores will be located based on the results of the numerical model and a geophysical investigation that has been separately conducted and for which interpretation is ongoing. The optimal location for these bores may be within the surface flow channel of Callide Creek. With the ongoing release from Callide Dam, the timing to access these locations for the purposes of bore installation is uncertain.
6. The REMP program will be consolidated into a detailed manual that identifies:
    - An outline of the revised groundwater and surface water REMP monitoring networks.
    - The method of monitoring for the various parameters, making specific reference to achieving suitable laboratory detection limits for comparison to the relevant trigger values.
    - The frequency of monitoring for each group of parameters.

- The parameters to be monitored, making specific reference to end users of the environmental waters actually or potentially impacted, the environmental values of those waters and relevant guideline trigger values as determined by Item 7 below.

7. As part of the preparation of the REMP manual, a particular action will investigate water quality objectives for the Callide Creek Alluvial Aquifer. This will be undertaken in two parts. Firstly, historical data will be assessed for both suitability and for any gaps that could be addressed through revision of the REMP. Secondly, suitable guideline trigger values will be proposed making specific reference to the data requirements as provided in the ANZECC/ARMCANZ Water Quality Guidelines (2000).

Other

8. To facilitate the numerical model development in the Environmental Evaluation, the pre-existing available geological information was consolidated and interpreted. This information was included in the Environmental Evaluation to support particular presentations of modelling results. The majority of the pre-existing data was generated to assist with design and construction of the dam wall and, as such, significant areas of the dam floor have limited information. As part of this TEP, a general geological map of the floor of Ash Dam B will be prepared from the available existing data.
9. As part of the Environmental Evaluation a hydrogeological numerical model of the Ash Dam B system was developed to facilitate ongoing assessment of management options and to project future seepage migration. As part of this TEP, the model results will be incorporated into a geographical representation of the seepage plume as estimated at the baseline date of the model and the projected seepage plume 10 years from the baseline.
10. The Dam Safety Review in the Environmental Evaluation identified some minor surface seepage areas in the southern, eastern and western areas of Ash Dam B. As part of this TEP, these will be subject to further investigation, particularly taking into account the higher water levels in Ash Dam B when the site inspections were completed, as well as the geophysical investigation that has been separately undertaken.

The Program to achieve the objectives is outlined in Table 1: TEP Program.

REPORTING

The actions to be undertaken as part of this TEP will be progressively reported to DERM within a report provided every 6 months they are completed. The target completion dates for each action is shown in Table 1. Each report will include:

- Identification of the relevant action that has been completed and its contribution to the TEP Objectives.
- A summary of the results of any investigation.
- Identification of any future additional work to be actioned.
- Two copies of the deliverable, manual or report that comprises the action.

In addition, a bi-annual progress report will be provided each year the TEP is current. The progress report will include:

- Description of the progress achieved for each action under the TEP.
- A performance indicator of progress on each action.
- Issues encountered that could impact on the ability to meet the TEP objectives or planned schedule for action completion.
- Key results from the annual REMP to indicate status of seepage from Ash Dam B.

- Assessment of compliance with the TEP objectives.
- A completed Annual Return for the Transitional Environmental Program.

PREVENTION OR MINIMISATION OF ENVIRONMENTAL HARM

The potential environmental harm arising from the continuing ash dam seepage under investigation in this TEP will continue to be mitigated through maintaining the existing seepage interception and control works and the investigation of longer-term implementation of additional works in Point 3 above.

RECEIVING ENVIRONMENT MONITORING

For the term of this TEP, CS Energy will sample and analyse the receiving environment (surface water sites and groundwater monitoring bores) in accordance with the current Receiving Environment Monitoring Program (REMP) and as required by the site Development Approval, notwithstanding the changes envisaged to the REMP as per Points 4-7 above.

REVIEW AND EVALUATION

Following the completion of the actions identified in this TEP, CS Energy will review how well the objectives have been achieved and report the findings to DERM.

CLOSURE

This TEP will conclude within 3 years of the date of approval of the draft transitional environmental program.

RESPONSIBLE OFFICER

[redacted] Site Manager Callide Power Station
CS Energy Limited

Table 1: TEP Program			
Actions – TEP Notice Requirements	**Actions – Further Detail**	**Performance Indicators**	**Timeframe**
Waste Water Management			
1. Assess operational performance of ash dam B against the Technical Guidelines (for Site Water and Tailings Management Technical Guidelines) for the Environmental Management of Exploration and Mining in Queensland (DME 1995).	Guidelines located at: http://www.derm.qld.gov.au/environmental_management/land/mining/technical_guidelines.html	Site ash dam management procedure to incorporate noted guidelines and submitted to DERM as per Condition 2 (E6) *amendments to ash dam management plan* of Integrated Authority CG0039.	6 months from TEP approval date.
2. Investigations and implementation actions associated with the Waste Management Improvement Program as stated in section 15 "Recommendations Arising from Environmental Investigation" (pages 134-135) and 'Waste Management Improvement Program – Ongoing Works" (pages 130, 135-136) of the Environmental Investigation Report Part B.	• A program of field assessment and monitoring established to assess dense phase ash field behaviour. • Monitor water quality across the evaporation ponds (electrical conductivity) with detailed analysis in selected ponds. Review suitability of REMP monitoring point SW10. • Review condition of seepages in light of the elevated dam levels post the exceptional December 2010/January 2011 rainfall. • Detailed chemical analysis of new bores.	• Program developed and documented with established timeframes. • Water quality results documented and retained at site. Sampling schedule developed and implemented. REMP scope reviewed to incorporate nominated changes. • Designated key bore depths and analysis conducted quarterly. • Analysis to be conducted with results included in bore database.	3 years from TEP approval date.

	• Implement extended REMP monitoring to include bores up to a distance of 2.4 km downstream of the Callide Dam road crossing and include DERM bores 13030283, 13030284 and 13030369 and Jensen's Home bore. • Investigate/confirm influence of Callide Dam leakage on groundwater quality. • Install additional monitoring bore(s) required downstream of existing monitoring bores in Callide Creek. (Addressed by Actions listed in Point 5 below.) • Undertake groundwater flow and salt transport modelling for Callide Creek alluvium. • Undertake a geophysical survey to provide additional seepage information as a basis for planning additional investigations on the western side of ADB. • Consider engineering improvements to existing open seepage interception trenches and drains. • Test pump the proposed recovery bores and selected monitoring bores.	• REMP scope reviewed to incorporate nominated changes • Investigation undertaken. • Modelling undertaken. • Survey conducted with results to be included with the report on Point 2. • Review of seepage interception systems conducted. • Pump test results analysed and documented.	

	• Install pumps in recently installed recovery bores with suitable yields and investigate telemetry to allow for remote monitoring of recovery pump operation.	• Pumps installed in nominated recovery bores with results documented.	
	• Continue to investigate remedial options such as recovery bore(s) in Callide Creek and subsurface barrier walls high permeability zone.	• Investigation report prepared.	
	• Works to improve management of lean phase ash disposal	• Site focus on improvements to lean and dense phase management.	
	• Ongoing investigations of alternative control strategies of the dense phase pumping operation to reduce flushing water volumes	• Site focus on improvements to lean and dense phase management.	
	• A new system for diversion of excess dense ash flushing water is planned for commissioning in the first quarter of 2011.	• Piping system commissioned and operational	
	• Modifications to BDWTP reagent dosing systems and changes to piping systems for improved system reliability	• Targeted uptime and throughput achieved	
	• Ongoing assessment of a potential ash water treatment facility.	• Investigation report prepared.	
	• Expansion of ash beach irrigation spray trial areas from 4.5 to 11 ha	• Irrigation systems installed and commissioned	
	• Enhancement and expansion of the existing chook spray systems	• Expansion of chook sprays installed and commissioned	

	• Investigations for the trial of a Callide B stack ash water injection system • Concept development of an evaporation pond·spray system • Ongoing consideration of Ash Dam B augmentation and new ash disposal options. • Concept design development for brine storage and disposal cells • Technical investigations to evaluate conditions for improved salt retention in ash.	• Investigation report prepared. • Investigation report prepared. • Incorporation of options within the ash management plan document. • Design investigation report prepared. • Investigation report prepared.	
Seepage Interception and Control			
3. Determination of implementation actions and timeframes to improve seepage interception and control to minimise impact on the receiving environment. The numerical model must be used to predict the effectiveness of the proposed seepage mitigation measures.		• Investigation report prepared.	18 months from TEP approval date.

Receiving Environment Monitoring			
4. Revision of the groundwater and surface water Receiving Environment Monitoring Program (REMP) including monitoring of the deep tertiary aquifer (greater than 20 m) and revision of the surface water REMP.		• REMP scope reviewed to incorporate nominated changes	6 months from TEP approval date.
5. Installation of up to three bores to a depth of 30 m to enable monitoring of deeper aquifer systems and incorporate into a revised REMP when appropriate.		• Bores installed at locations nominated by technical expert. • REMP scope reviewed to incorporate nominated changes	3 years from TEP approval date.
6. Preparation of a REMP Manual monitoring program report detailing:	• An outline of the revised groundwater and surface water REMP monitoring networks determined in Point 4 above; • Method of monitoring for the various parameters, making specific reference to achieving suitable laboratory detection limits of reporting for comparison to the relevant trigger values; • Frequency of monitoring for each (group of) parameters;	• REMP scope reviewed to incorporate nominated changes	6 months from TEP approval date.

	• Parameters to be monitored, making specific reference to end uses of the environmental waters actually or potentially impacted, the environmental values of those waters and relevant guideline trigger values, as determined in Point 7 below.		
7. Determination of Water Quality Objectives for Callide Creek Alluvial Aquifer	• Analysis of historical data for suitability in developing locally-derived guideline values (water quality objectives), identifying potential gaps in the data, and where appropriate addressing those gaps in the revision of the REMPs (Point 4 above); and • Proposing locally-derived guideline values (where appropriate) making specific reference to the data requirements for such determinations as provided in the ANZECC/ARMCANZ (2000) water quality guidelines.	• REMP scope reviewed to incorporate nominated changes	6 months from TEP approval date.
Other			
8. Detailed mapping of the geology of the dam floor from historical CS Energy the bore logs.	•	• Map developed	6 months from TEP approval date.

9. Graphical presentation of the numerical modelling outcomes showing the extent of the Ash Dam B seepage plumes (current baseline and future projected to 10 years from the baseline).		• Graphical presentation to be developed and submitted with report.	9 months from TEP approval date.
10. Investigation of seepage areas six (6) (Southern Seep) and seven (7) (Eastern Seep; and the western seepage area of Ash Dam B; to assist the understanding of groundwater movement.		• Investigation report prepared.	18 months from TEP approval date.

Department of Environment and Resource Management

Information sheet

Environmental Protection Act

Internal review (DERM), and appeal to Planning and Environment Court

This information sheet forms part of an information notice under the Environmental Protection Act 1994 *(EP Act). It gives a summary of the process for review and appeal to the Planning and Environment Court under the EP Act and subordinate legislation. Refer to sections 519–539 and Schedule 2 of the EP 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 not later than the review date; and
   b) be supported by enough information to enable the authority to decide the application.

Queensland Government

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

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 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 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 section *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 tribunal 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 section 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 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

The judge hearing an appeal may appoint one or more assessors to assist where the appeal involves a question of special knowledge and skill.

Section 538 Appeals may be heard with planning appeals

Where an appeal is also made under the *Integrated Planning Act 1997* for a premises, the court may order that both appeals be heard together or consecutively, or one stayed until the other is decided. This may occur even if the parties to the appeals are not the same. This ensures that needless delays are minimised.

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.derm.qld.gov.au>. Note: where available, the publication number (e.g. EM1866 for this document) can be used as a search term.

---

[1] The original decisions under the subordinate legislation are subject to change. As at 11 May 2010 they are listed in:
- Section 110 of the *Environmental Protection Regulation 2008*; and
- Section 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 Sections 519 to 539.