

CLAYTON UTZ

Ensham Resources Pty Ltd

Queensland Floods Commission of Inquiry

Third Witness Statement of Pier Westerhuis

Volume 1 of 1

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**In the matter of the
Commissions Of Inquiry Act 1950**

Commission of Inquiry Order (No. 1) 2011

QUEENSLAND FLOODS COMMISSION OF INQUIRY

Third Witness Statement of Pier Westerhuis

Chief Executive Officer

Ensham Resources Pty Ltd (ACN 011 048 678)

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PW-30	Presentation provided to DERM	17 December 2009
PW-31	Letter to John Bradley, Director General, Department of Environment and Resource Management	21 December 2009
PW-32	Letter to Kate Jones, Minister for Climate Change and Sustainability	21 December 2009
PW-33	Ecotoxicology and Species Composition Occuring in A Pit Report	21 December 2010

PW-34	TEP Application	18 October 2011
PW-35	Saline Water Disposal Options Report	September 2008
PW-36	Emails to and from John Bradley, Director General, Department of Environment and Resource Management	December 2010 to 31 July 2011

Third Witness Statement of Pier Westerhuis

This written statement is provided in response to a notice dated 14 October 2011 ("**Notice**") requiring me to provide a written statement, under oath or affirmation, to the Queensland Floods Commission of Inquiry ("**Commission**") pursuant to section 5(1)(d) of the Commissions of Inquiry Act 1950 (Qld). A copy is annexed hereto and marked "**PW-18**".

I, **Pier Westerhuis**, Chief Executive Officer of Ensham Resources Pty Ltd (ACN 011 048 678) ("**Ensham Resources**"), c/ Level 18, AMP Place, 10 Eagle Street, Brisbane in the State of Queensland, state on oath as follows:

Background

1. I have previously provided two statements to the Commission dated 12 May 2011 ("**First Statement**") and 26 September 2011 ("**Second Statement**"). These First and Second Statements were provided in response to Commission Requirements dated 6 May 2011 and 13 September 2011 respectively.

Emergency directions following the 2008 flood event

2. The Commission has requested an account of any communication by the then Environmental Protection Agency ("**EPA**") to Ensham Resources of the reasons behind granting Ensham Emergency Directions after flooding in 2008.
3. The Notice refers to paragraph 81 of Mr Andrew Stuart Brier's statement to the Commission in relation to the Ensham mine ("**Mr Brier's Statement**"). I understand that this paragraph states:

"Significant flood events in January 2008 resulted in the flooding of a number of coal mines in Central Queensland. Ensham coal mine was one of the most severely affected mines with its four open cut pits flooded with an estimated 150,000 megalitres of water collected in the mining pits and a dragline submerged. With a view to assisting the mines becoming operational and protecting the securing of approximately 3000 jobs, the then Environmental Protection Agency approved a number of Emergency Directions (ASB-E07-01 - ASB-E07-03) and TEP's (ASB-E07-04 to ASB-E07-13) under the Environmental Protection Act 1994, allowing the affected mines to discharge flood waters to nearby waterways subject to certain conditions, including discharge limits based on ANZECC Water Quality Guidelines."

4. Ensham had a number of discussions with the then EPA regarding Ensham's request for the approval of an Emergency Direction to enable the immediate commencement of dewatering of open cut pits filled with flood water at the Ensham mine. Such communications included:
 - (a) Meetings in Brisbane on 29 January and 30 January 2008 between [REDACTED] from Ensham and Jon Womersley [REDACTED] and [REDACTED] from the then EPA; and
 - (b) Site visit of the Ensham Mine undertaken by [REDACTED] and [REDACTED] from the then EPA on 31 January 2008.
5. Ensham subsequently made a written request to the EPA seeking approval of an Emergency Direction on 1 February 2008. A copy of the written request for the approval of an Emergency Direction is annexed hereto and marked "**PW-19**".

6. On 1 February 2008, the then EPA issued an Emergency Direction to Ensham authorising the discharge of mine affected water from open cut pits at the Ensham mine. The Emergency Direction states that "the EPA considered the request to issue an emergency direction to discharge the mine water is:
- necessary and reasonable because it is an emergency; and
 - there are no practicable alternatives to the removal of river water that has inundated the affected mining pits".

A copy of the Emergency Direction is annexed hereto and marked "**PW-20**".

Declaration of the Ensham mine as a "prescribed project"

7. The Commission has requested an account of the declaration by the Deputy Premier of Ensham mine as a Prescribed Project under the State Development and Public Works Organisation Act 1971 (Qld) ("**SDPWO Act**") after the 2008 flooding:
- a. whether Ensham sought that declaration;
 - b. the process by which the declaration was made;
 - c. the reasons for that declaration; and
 - d. what the practical effect of that declaration was.
8. [REDACTED] the Chief Executive Officer of Ensham at the time, met with the Queensland Coordinator General and other heads of Queensland Government agencies on 2 April, to discuss the potential declaration of the Ensham Flood Recovery Project as a Prescribed Project under the SDPWO Act.
9. [REDACTED] wrote to the Deputy Premier (The Hon Paul Lucas MP) on 9 April 2008 requesting that the Ensham Flood Recovery Project be declared a prescribed project under Part 5A of the SDPWO Act. The letter of request attaches a detailed submission that summarises the background and the reasons for the prescribed project declaration being sought. A copy of the letter and attachment is annexed hereto and marked "**PW-21**".
10. The prescribed project declaration was sought by Ensham to expedite approvals that had been sought to extend the existing flood protection levees at the Ensham mine to ensure the successful recovery of the Ensham mine and to secure an increased level of flood protection at the mine prior to the 2009/2010 wet season. Prior to seeking the prescribed project declaration, Ensham had experienced difficulties in procuring the multiple approvals required to restore flood protection at the mine. In particular, the necessary approval required from the Nogoa River Flood Plain Board ("**NRFPB**") had stalled due to the amalgamation of the local governments and the local government elections. Further, as a small portion of the proposed B Pit levee was located outside the mining lease area, multiple agencies had jurisdiction for the assessment of the necessary approvals for the levee bank construction.
11. At the time the request seeking a prescribed project declaration for the Ensham Flood Recovery Project was made, it was my understanding that all of the State Government and local government agencies that had jurisdiction in the assessment of the approvals required for the construction of the proposed flood protection levees were supportive of the requested prescribed project declaration.

12. On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the SDPWO Act. A copy of the prescribed project declaration published in the Government Gazette is annexed hereto and marked "**PW-22**".
13. On 7 May 2008, the Queensland Coordinator-General issued two Progression Notices pursuant to section 76I of the SDPWO Act, requiring the NRFPB to provide a report prepared by the Director of Engineering Services that is required under section 11(4) of the Nogoa River Flood Plain Board Local Law (Levee Banks) No. 1 1997 in respect of the applications previously made by Ensham for the proposed upgrade and extension of the Nogoa River Southern Levee ("**NRSL**") and Nogoa River Northern Levee ("**NRNL**"), within 20 business days after service of the Progression Notices. Copies of the Progression Notices for the NRSL and NRNL are annexed hereto and marked "**PW-23**".
14. On 7 May 2008, the Queensland Coordinator-General issued Notices to Decide pursuant to section 76J of the SDPWO Act, requiring the NRFPB to decide the applications made by Ensham for the upgrade and extension of the NRSL and NRNL within 20 business days after service of the notice. Copies of the Notices to Decide the applications for the NRNL and the NRSL are annexed hereto and marked "**PW-24**".
15. On 1 July 2008, the Queensland Coordinator-General issued Step in Notices pursuant to section 76K of the SDPWO Act, whereby the Coordinator General assumed all further approval processes required of the NRFPB for the levee applications. A copy of the Step in Notices for the NRSL and NRNL are annexed hereto and marked "**PW-25**".
16. The practical effect of the declaration of the Ensham Flood Recovery Project as a Prescribed Project under the SDPWO Act was that the following approvals were issued by the Coordinator-General authorising the construction of the levee extension at the mine pursuant to the Step in Notices dated 1 July 2008:
 - (a) On 4 August 2008 the Coordinator General issued approval for the upgrade and extension of the NRSL by issue of "Levee Bank Permit No. 013"; and
 - (b) On 3 October 2008, the Coordinator General issued approval for the upgrade and extension of the NRNL by issue of "Levee Bank Permit No. 014".

A copy of the Levee Bank Permits for the NRSL and NRNL are annexed hereto and marked "**PW-26**" and "**PW-27**" respectively.

Approvals to upgrade levees

17. The Commission has requested an account of why approvals to upgrade the levees were sought from both the Department of Environment and Resource Management ("**DERM**") and the NRFPB.
18. On 22 September 2009, Ensham Resources lodged an application for a permit under the Nogoa River Flood Plain Board Local Law No. 1 seeking permission for proposed works to extend and modify the NRSL and NRNL for the purpose of providing up to

and including 1 in 1000 year ARI flood protection for the Ensham mine. A copy of Nogoia River Flood Plain Board Local Law No. 1 is annexed hereto and marked "PW-28".

19. An application for amendment of Environmental Authority MIM800086202 was made on 23 September 2009 to authorise proposed works under the environmental authority for the Ensham coal mine to raise the existing 1 in 100 year ARI flood protection levee banks up to the 1 in 1000 year ARI flood protection level. DERM issued a Notice of Decision approving the amendment on 24 December 2009. A copy of the Notice of Decision and amended Environmental Authority MIM800086202 is annexed hereto and marked "PW-29".

Ensham's concerns about the 2009 Fitzroy model conditions

20. The Commission has requested an account of Ensham's discussions and negotiations, if any, with DERM regarding Ensham's concerns that the 2009 Fitzroy model conditions would restrict the release of water from the mine even in high flow events for which dilution would prevent environmental harm occurring (with reference to paragraph 9(d) of my Second Statement) and:
 - a. DERM's response to Ensham's view about the restrictions imposed by the 2009 Fitzroy model conditions; and
 - b. any scientific studies available to Ensham which supported its view.
21. I stated in paragraph 9(d) of my Second Statement that one of the main flood-related concerns for the Ensham mine is:

"limitations on the ability of the mine to release stored flood and run-off water to the Nogoia River and the EA in circumstances where the flow in the Nogoia River provides sufficient dilution to protect the environment."
22. This is discussed further in paragraphs 40 to 46 of my Second Statement (see Annexure PW-20 of my Second Statement).
23. When the 2009 Draft Fitzroy Model Conditions ("**Draft Model Conditions**") were released by the DERM in 2009, approximately 9,000 mega litres of "legacy" water was being held in the pits as a consequence of the rainfall and flood event in 2008. It is my understanding that DERM was requesting all mines to make an application to amend their Environmental Authorities to incorporate the Draft Model Conditions. It was the view of Ensham staff that the very low electrical conductivity ("**EC**") end of pipe limits permitted under the then Draft Model Conditions did not allow for the controlled release of mine affected water that remained in the pits as a consequence of the 2008 high rainfall and flood events. This is because the end of pipe EC limits permitted under the Draft Model Conditions were lower than the lowest EC of mine affected water contained on site. Ensham does not hold any relevant scientific studies.
24. A meeting was held between DERM and representatives of Ensham on 17 December 2009, Ensham raised whether DERM would consider more flexible discharge conditions. I understood that DERM advised that every mine would be required to incorporate the Draft Model Conditions into their current environmental authorities as "standard conditions". A copy of the presentation provided to DERM on 17 December 2009 is annexed hereto and marked "PW-30". I then wrote to both John Bradley, then Director General of DERM, and Minister Kate Jones on 21 December 2009 to express my concern that even though Ensham had provided a sound scientific case for

inclusion of specific high flow release conditions in an EA amendment, that the model conditions would be applied. A copy of the letters to John Bradley and Kate Jones are annexed hereto and marked "PW-31" and "PW-32". I note that the copy of the letter to John Bradley in Annexure PW-32 is incomplete but it was identical in content to the letter to Kate Jones provided in Annexure PW-33.

25. **Wet weather release provision**

26. The Commission has requested an account of Ensham's discussions and negotiations, if any, with DERM regarding the insertion of a wet weather release provision into its environmental authority.

27. I refer to paragraph 24 above.

28. In about mid 2010 Ensham staff began preparations for an EA amendment to provide for the release of mine affected water during high flows in the Nogoia River. This follows general discussions between Ensham personnel and DERM staff about the potential to consider these types of conditions in the future. The relevant personnel have now left Ensham and I am not able to provide any further detail.

29. This EA amendment was not progressed by Ensham. Instead, Ensham made an application for a TEP. The TEP application made on 7 December 2010 is referred to at paragraph 26 of my Second Statement.

Ensham's view on the new Fitzroy model conditions

30. The Commission has requested an account of Ensham's view as to the ability of the new Fitzroy model conditions negotiated throughout 2011 to (with reference to attachment MFB-06-24b to Mr Birchley's statement):

- a. assist in water management at mines; and
- b. remove or decrease the need for transitional environmental programs during wet seasons.

31. It is my understanding that Attachment MFB-06-24b of Mr Birchley's statement is a copy of the Final Model Water Conditions for Coal Mines in the Fitzroy Basin dated July 2011.

32. It is my understanding that the new Fitzroy model conditions negotiated in 2011 will provide Ensham with the ability to release mine affected water during medium and high flow events in the Nogoia River. The practical effect of this should be that Ensham will have the ability to remove an amount of excess mine affected water beyond storage capacity which will assist Ensham to maintain water balance at the mine on an ongoing basis provided suitable flow events occur in the Nogoia River each year and provided the volume and quality of water to be released does not exceed that which the new Fitzroy model conditions will authorise. In any event, the amount of water that is likely to be able to be released under the new Fitzroy model conditions will not be sufficient to enable the release of the 20,000 mega litres of legacy water which remains on the mine as a consequence of the 2008 and 2010/11 flood events.

33. Discussions with DERM officers since the release of the 2011 model water conditions have confirmed that DERM are also of the view that the model conditions are unlikely to facilitate the release of the 20,000 mega litres of water currently stored at Ensham and consequently not enable water balance to be achieved at the Ensham mine.

Table 4 of the new Fitzroy model conditions

34. The Commission has requested an account of (with reference to Table 4 on page 4 to 7 of the new Fitzroy model conditions negotiated throughout 2011):
- a. whether a table of that sort would be usefully inserted into Ensham's environmental authority;
 - b. whether there are reasons militating against the introduction of such a table in water management, and if so, what;
 - c. whether there are particular circumstances in which the table proposed would not assist in, or would impeded [sic], water management, and if so, what; and
 - d. whether Ensham would be able to provide DERM with scientific studies to support the figures to be inserted into that table.
35. It is my understanding that the insertion of Table 4 on page 4 to 7 of the new Fitzroy model conditions into the EA for the Ensham mine would provide for the release of a relatively small volume of mine affected water during high flow stream events. The ability to release amounts of mine affected water from the Ensham mine on an ongoing basis under its EA conditions would assist Ensham to maintain water balance once the current legacy water (that was collected during the 2008 flood event and post-2008 high rainfall events) has been removed from the site.
36. In the event that the volume of mine affected water or its quality characteristics held in the pits exceed the limits specified in Table 4, the new Fitzroy model conditions will not assist in the release of such waters and it is likely that an application for a transitional environmental program ("TEP") would then be necessitated to regain water balance at the mine.
37. We have provided DERM with the following studies:
- (a) "Ecotoxicology and Species Composition Occurring in A Pit", dated 21 December 2010 (a copy of which is annexed hereto and marked "PW-33");
 - (b) "Environmental Authority Water Quality Report", dated 7 July 2009 (a copy of which was contained in Annexure PW-4 of my Second Statement).

Amendments to the Transitional Environmental Program sought in January 2011

38. The Commission has requested an account of, with respect to applications made by Ensham for amendments to the terms of its TEP in January 2011:
- a. why were those amendments necessary; and
 - b. if the higher release volumes and higher electrical conductivity limits were not likely to cause environmental harm, why were those higher limits not applied for by Ensham in the original transitional environmental program application.
39. A TEP was sought and approved on 10 December 2010 (MAN 11139) to release approximately 3,000 mega litres of mine affected rain water which had been unintentionally captured in the active mining pits (B, C, D, E and Y Pits) during a high rainfall period in November and early December 2010. The EC of that water was

expected to be less than 4,000 $\mu\text{S}/\text{cm}$. The TEP outlined the conditions under which Ensham Mine was approved to release mine waters into the Nogoia River and Boggy Creek including:

- (a) Release point (RP) locations and release limits;
- (b) Monitoring point (MP) locations and monitoring requirements, including downstream receiving waters; and
- (c) Minimum flow conditions of the Nogoia River.

40. Release commenced on 11 December 2010 under TEP 11139.

41. As mentioned earlier in this statement, Ensham was also storing more than 9,000 mega litres of "legacy" water, in the A Pits, that remained from the inundation of the mine in January 2008 and cessation of dewatering in September 2008. The EC of that stored water was approximately 7,600 $\mu\text{S}/\text{cm}$. Following approximately one month of successful water release under TEP 11139, since 11 December 2010, without any report of environmental harm, discussions between Ensham and DERM staff concluded that the release of stored "legacy" water in A Pits would be possible. An amendment to the TEP was approved on 5 January 2011 (MAN 11280) to include the release of water with an EC level of up to 8,500 $\mu\text{S}/\text{cm}$. As a consequence of the additional waters being stored in the A Pits, the following specific conditions of the original TEP were amended:

- (a) EC release limit for TEP release point RP4 was increased from 4,000 $\mu\text{S}/\text{cm}$ to 8,500 $\mu\text{S}/\text{cm}$. It is noted that the TEP amendment contained a typographical error by not also reflecting the discharge source from A Pit under this amendment that corresponds to RP4.
- (b) In situ monitoring frequency for TEP monitoring points TEP MP1, MP2, MP3 and MP4 was increased from twice daily to three hourly.
- (c) Additional downstream monitoring locations were specified (i.e. TEP MP6 through MP8).

42. A further amendment to the TEP was approved on 11 February 2011 (MAN 12039) and was in effect until 30 June 2011. This amendment was sought to further enable the release of remnant flood waters stored in mining pits. The amendment altered the following conditions:

- (a) EC release limit for TEP release point RP1 was increased from 4,000 $\mu\text{S}/\text{cm}$ to 8,500 $\mu\text{S}/\text{cm}$, to be consistent with TEP (MAN 11280) releases from RP4.
- (b) The minimum flow of the receiving waters (Nogoia River) was reduced from 10,000ML/day (116 m^3/sec) to 5,000ML/day (58 m^3/sec).
- (c) Laboratory testing requirements for TEP monitoring points MP1, MP2, MP3 and MP4 were reduced from 3 hourly to twice daily, to be consistent with the initial TEP (MAN 11139).
- (d) An EC value of 450 $\mu\text{S}/\text{cm}$ was listed as a trigger value for further investigation at Riley's Crossing downstream monitoring point (TEP MP6).

Ensham's plans to dewater the mine pit in the lead up to the 2010/2011 wet season

43. The Commission has requested an account of what Ensham's plans to dewater the pit leading up to the 2010/2011 wet season.
44. I refer to paragraphs 28 to 29 and 39 to 42 above.

Ensham's plans to dewater the mine pit in the long term

45. The Commission has requested an account of Ensham's plans to dewater the pit in the long term, including:
 - a. whether Ensham plans to take advantage of rainfall during the 2011/2012 wet season to release further water;
 - b. if so, whether that is planned to be undertaken under a transitional environmental program;
 - c. why dewatering cannot be done by releasing in accordance with the environmental authority; and
 - d. whether or not Ensham considers that the new Fitzroy model conditions will assist Ensham to dewater the pits fully, and why.

46. The Notice refers to paragraph 77 of Mr Brier's Statement. I understand that paragraph states:

"A meeting held with Ensham on 9 September 2011 (attachment ASB-E05-01) indicated that while the new Fitzroy Model Conditions may provide more opportunities for Ensham to release mine affected water to the environment, the new conditions will not enable the site to fully dewater mining operations in the short to medium term. Ensham indicated that a further TEP may be required to assist in dewatering the site fully. DERM supports this approach. Ensham has advised however that they would apply to amend to the new Fitzroy Model Conditions by June 2012."

47. The application seeking approval of a draft TEP Ensham recently lodged with DERM seeks approval for the controlled release of mine affected waters during high flow events. Such events may occur during the 2011/12 wet season.
48. As stated in paragraphs 31 to 33 above, the new Fitzroy model conditions do not allow for the release of the mine affected waters currently held in the mine pits. This is due largely to the EC end of pipe limits imposed under the new Fitzroy model conditions. However, it is my understanding that once water balance is achieved at the mine, the new Fitzroy model conditions will assist in the ongoing management and maintenance of water balance at the site.
49. Given that the 2011/2012 wet season is fast approaching, Ensham have been focused in recent times on securing an appropriate TEP approval that will facilitate the release of the existing mine affected waters during potential high flow events during this wet season and over the following two years.

Environmental impacts of releasing water during the 2010/2011 wet season

50. The Commission has requested an account of the environmental impacts of releasing water that was in the Ensham mine pits from the 2008 floods, during the 2010/2011 wet season, including:

- a. the deterioration of the quality of that water; and
 - b. a comparison, if Ensham has performed one, of the environmental impacts of the release in 2010/2011 versus a continued release in 2008/2009.
51. The objective of the TEP and subsequent amendments approved following the 2010/2011 wet season (MAN11139, MAN11280 and MAN12039) was to enable dewatering of accumulated flood water stored in mine pits in a controlled manner during high flow conditions. The terms and conditions of the TEP were designed to achieve stored water release activities in a manner to avoid environmental harm, as far as practicable. An application for a TEP to allow the release of accumulated water stored in the mine pits was made to DERM on 18 October 2011. A copy of the TEP application is annexed hereto and marked "PW-34".
52. I am not aware of any comparison Ensham has carried out in relation to the potential impacts of the release in 2010/2011 versus a continued release in 2008/2009.

Reverse osmosis desalination and the use of evaporation ponds

53. The Commission has requested an account of the basis of the contention that reverse osmosis desalination and the use of evaporation ponds are economically unviable or are inappropriate because of the creation of large quantities of brine at Ensham mine
54. The Notice refers to paragraph 60 of my Second Statement (see Annexure PW-19), in which I stated:

Ensham have examined and considered other methods of disposing of the surplus 20,000 ML of water currently stored at the mine including Reverse Osmosis desalination and use of Evaporation Ponds. Ensham considers these methods to be economically unviable for such a large volume of water, which also produce large volumes of saline brine requiring disposal."

55. Ensham's evaluation of the viability of the use of reverse osmosis to treat the 20,000 mega litres of mine affected legacy water currently held in the pits indicated that the cost of such an exercise would be in excess of \$1,000/ML of water treated. In addition, no appropriate solution was found to the difficulty of disposing of highly saline brine, which is the by product of the reverse osmosis treatment process. Ensham commissioned Haald Engineering to complete an initial "Saline Water Disposal Options" study and report in September 2008. The study examined cost estimates of each option, including Reverse Osmosis, Evaporation Ponds and Opportunity Release during high flow events in the Nogoia River. A copy of the Saline Water disposal Options Report dated September 2008 is annexed hereto and marked "PW-35".

Contact with John Bradley

56. The Commission has requested an account of all details of all contact between myself and Mr John Bradley during the period 1 October 2010 to 31 July 2011 regarding water management at mines.
57. During the period of the 2010/2011 heavy rain, I wrote to John Bradley via Email, then Director General of DERM, to provide regular updates as to the impact on the mine and seeking his assistance and intervention to ensure that appropriate urgency was applied to the proposed TEP being discussed with DERM staff. A copy of emails to and from John Bradley sent during the 2010/2011 heavy rain is annexed hereto and marked "PW-36".

58. In addition to these emails, I had one or two telephone conversations with John Bradley, the exact dates of which I am not able to recall.

I make this statement conscientiously believing the same to be true, and by virtue of the provisions of the Oaths Act 1867 (Qld).

Dated 2 November 2011

Signed and declared by Pier Westerhuis at
Brisbane in the State of Queensland
this day of 2 November 2011

Before me:

[Redacted signature area]

Signature of person before whom the
declaration is made

[Redacted signature area]

Signature of declarant

[Redacted name] - SOLICITOR

Full name and qualification of person before
whom the declaration is made

ENSHAM MINE DEWATERING APPLICATION FOR TRANSITIONAL ENVIRONMENTAL PROGRAM

1 INTRODUCTION

This report documents Ensham Resources' application for a Transitional Environmental Program (TEP) for activities related to the dewatering of open cut pits following flooding of active mining pits in 2008 and subsequent high intensity rainfall events in Central Queensland in the 2010/2011 wet season. Most of the mine water is being temporarily stored in the southern end of the mine in A Pit (Figure 1). Ensham Resources has previously been forced to declare force majeure on affected customers until mining pits can be recovered and requires removal of this water to recover access to the coal resource and enable the maintenance of the site water balance.

The TEP is sought to authorise the controlled release of mine affected water in a manner that does not cause environmental harm. Once the site water balance has been restored, Ensham considers it will be possible to maintain the site water balance under an EA Amendment that incorporates the Fitzroy Model Conditions.

The TEP application is structured as follows:

- TEP background;
- A description of the transitional works program;
- TEP objective;
- TEP timeframe;
- Description of dewatering activities, potential environmental impacts and proposed environmental management measures – designed to achieve TEP objective; and
- Monitoring and reporting, including performance indicators.

The proposed TEP conditions are included as an attachment to this report.

2 BACKGROUND

The Ensham Mine Environmental Authority (EA) No. MIM800086202 allows the controlled discharge of mine water to the Nogoia River and Boggy Creek. The discharge conditions include end of pipe limits, specified discharge locations and monitoring requirements.

A TEP (MAN11139 approved 10 December 2010) and subsequent amendments (MAN11280 approved 5 January 2011 and MAN12039 approved 11 February 2011) were sought and approved to enable flood waters stored in the active mining pits to be released in a controlled manner to the Nogoia River and Boggy Creek during high flow conditions. The TEP expired in June 2011.

This TEP application is consistent with previous TEPs approved by the DERM for the Ensham Mine Site.

The Holder is authorised to operate the Ensham Mine subject to the terms of this TEP.

3 TRANSITIONAL WORK PROGRAM

Ensham has undertaken the following works to transition from the current site situation and restore the site water balance. These works will also ensure the risk of accumulation of large volumes of flood water in the future is minimised.

- Upgrading and extending flood protection levees to increase the level of mine flood protection to the 1,000 year Average Recurrence Interval flood, at a cost in excess of \$40 million.
- Reduction in effective catchment areas of the mine pits by constructing catchment diversions around the mine site.

This infrastructure will substantially reduce the risk of future flooding of the Ensham mine site. The levee banks proved effective in preventing flood inundation of the mine site from the Nogoa River during the 2010/2011 wet season.

Ensham has also improved the site water management and release capability and monitoring by:

- Constructing a 9 km, large diameter HDPE Pipeline linking the northern section of the mine to the mine water reticulation system, at a cost of \$4 million and due to be completed in late 2011.
- 'In-stream' real time water quality monitors installed upstream and downstream of the site, at a cost of \$200,000.
- Pumping installations in place for release of water from A Pits and northern pits at up to 300 ML per day, at a cost of \$6 million.
- Flow meters are being installed on all release points for accurate water release quality dilution management, at a cost of \$60,000.
- Installation of scour protection works at the discharge points in the Nogoa River.

The completion of the transitional works program now requires adequate time for the discharge of approximately 20,000 ML of accumulated flood water during discharge opportunities.

The potential adverse impacts of the dewatering operations include:

- Contamination of downstream water quality; and
- Scouring and erosion of waterways by discharge waters.

The mitigation and management measures for these potential impacts are presented in Section 6.

4 OBJECTIVE

The objective of the TEP application is to enable dewatering of accumulated flood water stored in mine pits in a controlled manner during high flow conditions in order to facilitate the restoring of the mine's water balance.

The proposed stored water release activities, as outlined in Figure 1 will be conducted in a manner to avoid as far as practicable environmental harm.

The existing relevant conditions of the current Environmental Authority (EA) are W1 through W19 inclusive. The TEP will authorise variation from these EA discharge conditions on the terms of the approved TEP having particular regard to:

- Elevated EC levels
- Increased TSS
- Levels of flow in the receiving water; and
- Discharge locations.

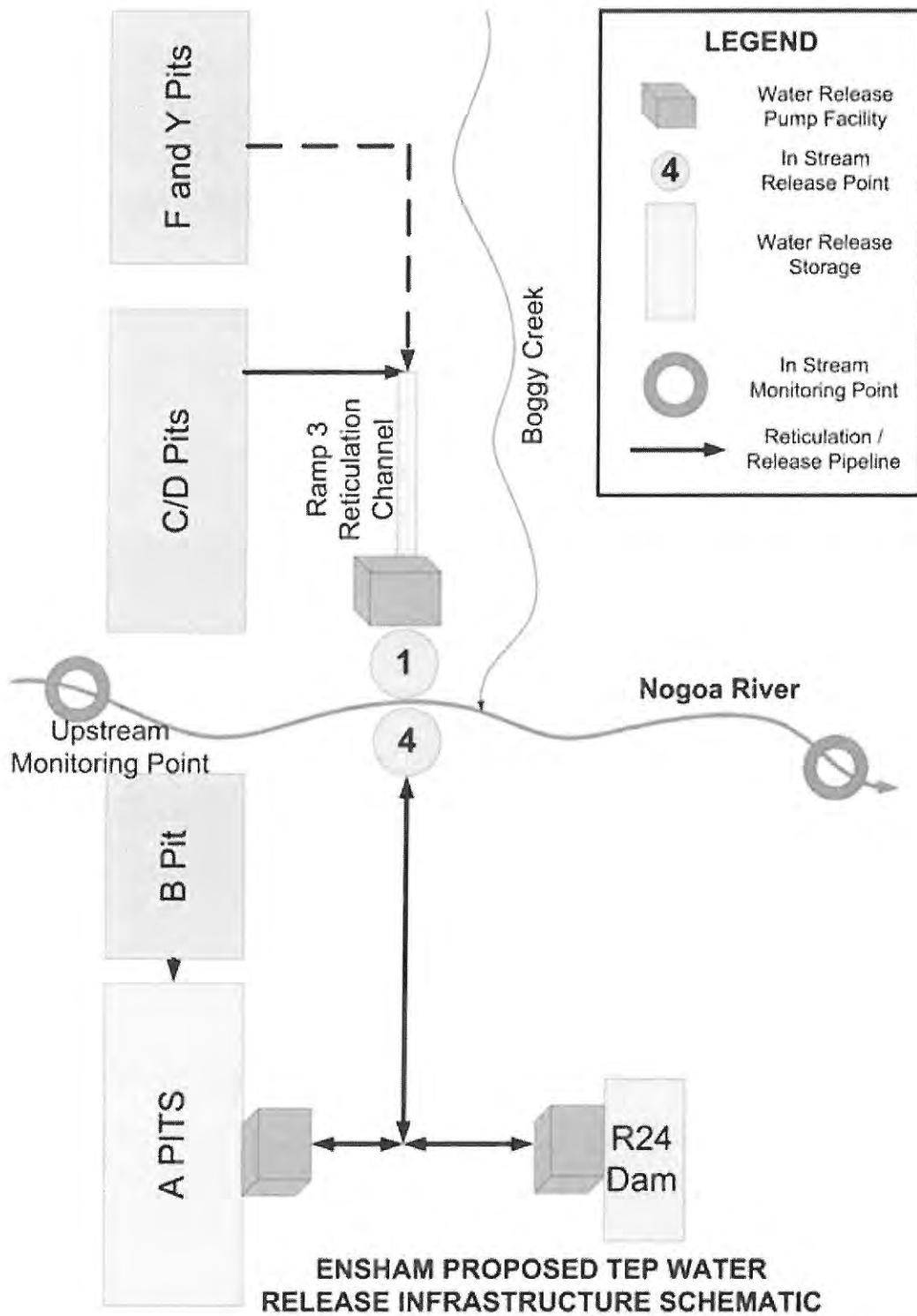


FIGURE 1

5 TIMEFRAME FOR THE TRANSITIONAL ENVIRONMENTAL AUTHORITY

The TEP will be required to remain in place for the duration of the pit dewatering and recovery activities. Currently, approximately 20,000 ML of water is contained on site, despite the release of approximately 7,000 ML from the site under approved TEPs during the 2010/2011 wet season. It is not possible to accurately determine how long it will take to dewater the mining pits as it will be dependent on the magnitude and frequency of high flows in the Nogoia River providing discharge opportunities. However, based on experience from the 2010/2011 wet season, it is anticipated that the dewatering activities would be completed within 3 years. The term of the TEP is 3 years from the date of approval.

6 DEWATERING ACTIVITIES AND ENVIRONMENTAL MANAGEMENT MEASURES

6.1 INTRODUCTION

The following sections describe the proposed dewatering operations in detail and the environmental management measures that are designed to achieve the TEP objective. The nature of the dewatering operations is such that they will require a degree of operational flexibility in order to cater for the varying site and operating conditions that will occur during the progress of the dewatering operations. The management measures allow for a suitable level of flexibility without compromising the achievement of TEP objective.

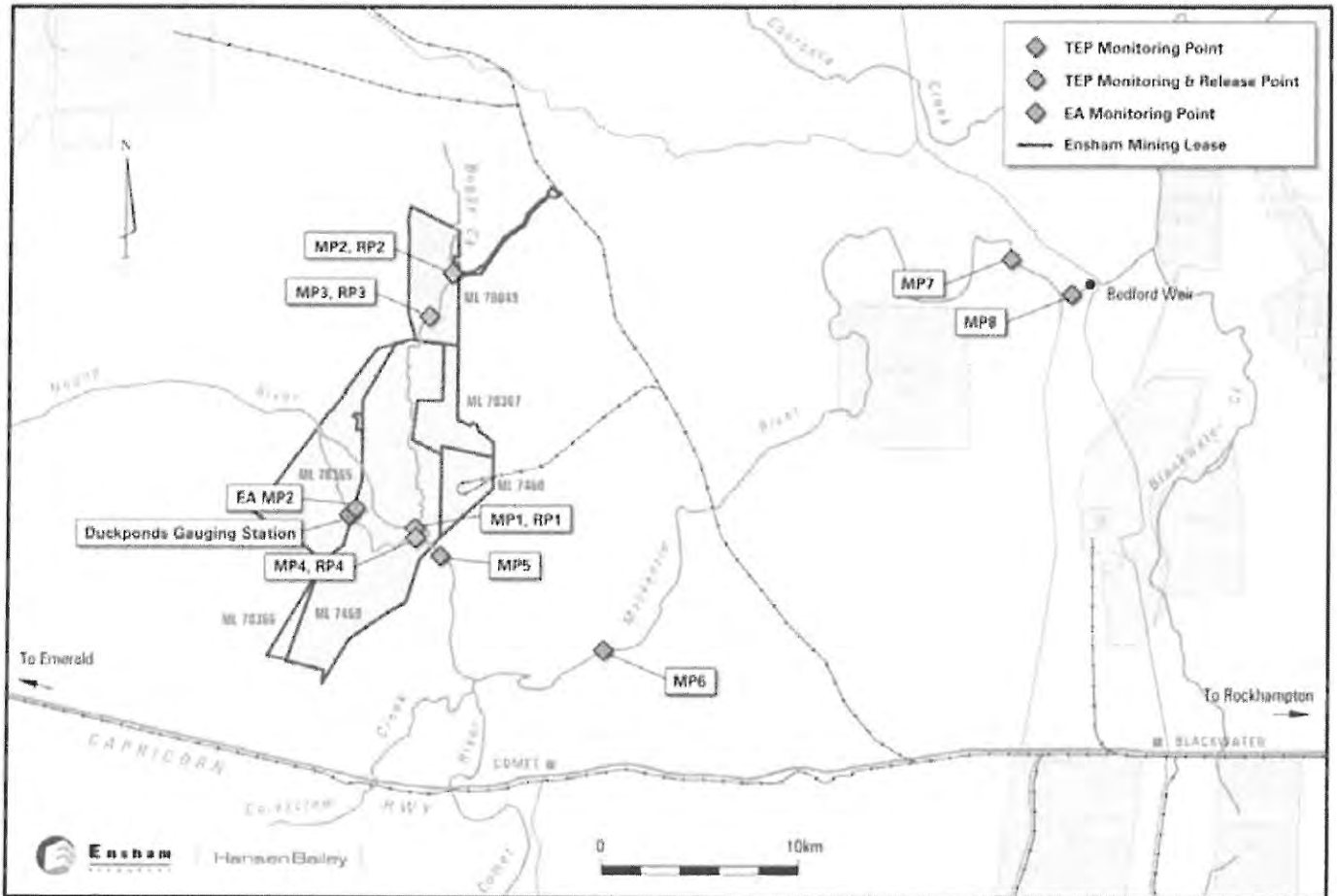
6.2 PIT DEWATERING

6.2.1 Release Points

The proposed release points will be located as shown in Figure 2 and Table 1. The monitoring points are also shown in Figure 2.

Table 1 Mine Affected Water Release Points, Sources and Receiving Waters

Release Point (RP)	Easting (GDA94)	Northing (GDA94)	Contaminant Source and Location	Monitoring Point	Receiving Waters
RP 1	653,714	7,401,500	C, D, E, F and Y Pits	End of pipe	Nogoia River
RP 4	653,674	7,401,350	A Pit	End of Pipe	Nogoia River



ENSHAM MINE - TEP MONITORING & RELEASE POINTS
FIGURE 2

6.3 PUMPING

The mine has installed a fleet of pumps with a total dewatering capacity of up to 300 ML/day. This capacity will enable the 20,000 ML of stored water to be released in the shortest possible time using the dilution available during wet season high flow events in the Nogoia River.

A slotted HDPE pipe will be used to disperse released water into the Nogoia River. The pipe will contain a series of 100 mm holes to maintain constant pressure. The pipe will be located in the deepest section of the river and will run lengthways to optimise mixing and avoid potential scouring of the banks.

6.4 RELEASE IMPACT MANAGEMENT

A suitably qualified and experienced person will undertake an inspection of the proposed discharge flow paths prior to the release of mine affected water, and record (including photographic record) the condition and form of the proposed flow path including any vegetative cover in the bed and on the banks.

The release of mine affected water will occur on a seven day cycle. At the end of each seven days, the release will cease and a suitably qualified and experienced person will undertake an inspection (including making a photographic record) of the discharge flow path to the mining lease boundary in the watercourse, noting any areas of erosion, scour, slumping and impacts to vegetation.

If on inspection, significant erosion, scour, slumping or impacts to vegetation to watercourses, including discharge flow paths to any watercourse, is detected, or flooding occurs:

- Release of mine affected water be suspended;
- DERM will be notified; and
- Appropriate rehabilitation, including earthworks, scour protection and flow velocity controls will be installed and approved by a suitably qualified and experienced person before the release of water continues.

Once the dewatering is completed any impact to the bed and banks of the Nogoia River will be rehabilitated.

7 WATER QUALITY

7.1 INTRODUCTION

Water proposed to be released through the TEP has accumulated as a result of a flood event in 2008 and significant rainfall events in Central Queensland in the subsequent wet seasons. Ensham has undertaken water quality monitoring in A Pit since June 2008 and has conducted extensive monitoring in accordance with the conditions of the previous TEP. Water quality monitoring results are discussed in the following sections.

7.2 PIT WATER QUALITY

Approximately 9,000 ML of remnant flood water was stored in mining pits on the southern part of the site after the 2008 flood event. The water quality in these pits has been continuously monitored since June 2008. Water quality results over this period have shown EC has increased over time to more than 7,500 EC uS/cm, as shown in Table 2. A summary of the pit water results taken prior to 2010, as well as upstream background water quality monitoring results, is contained in the water quality monitoring report previously submitted to DERM and titled *Environmental Authority Water Quality Monitoring Report July 2009*.

The most recent in situ results recorded from A Pit are outlined in Table 2.

Table 2 In Situ A Pit Water Quality Results – as at 9 September, 2011

Pit	EC ($\mu\text{S}/\text{cm}$)	pH	Temperature ($^{\circ}\text{C}$)
A Pit - surface	3,530	8.36	19.5
A Pit – 12.5 m depth	7,640	8.27	20.0

In addition to ongoing water quality monitoring, surveys have been conducted of aquatic fauna within the main A Pit (Ramp 22) water storage as part of an ecotoxicological assessment. A report describing the results of this assessment was submitted to the DERM in support of the previous TEP applications and is titled *Ecotoxicity and Species Composition Occurring in "A Pit", Assessment of Pit Waters Impact on Aquatic Fauna, December 2010*. The fish species collected/observed in this pit water that had an electrical conductivity of 7,500 $\mu\text{S}/\text{cm}$ included, Barred Grunter (*Amniataba percoides*), Fork-tailed Catfish (*Arius graeffei*), Spangled Perch (*Leiopotherapon unicolor*), Boney Bream (*Nematalosa erebi*), Hyrtli's Catfish (*Neosilurus Hyrtlii*), Rainbowfish (*Melanotaenia splendida splendida*) and Leathery Grunter (*Scortum Hillii*). The fish found in the mining pit appeared physically healthy. This was further reinforced by the observation of sexually reproductive species.

Direct toxicity assessments were also conducted by Hydrobiology using water from Ramp 22 storage on the following species:

- *Ceriodaphnia cf dubia* (freshwater cladoceran)
- *Lemna disperma* (aquatic duckweed)
- *Selenastrum capricornutum* (green algae)
- *Paratya australiensis* (freshwater shrimp)
- *Melanotaenia splendid* (rainbowfish).

The results from this assessment are described in C&R Consulting, 2010. In summary the direct toxicity assessments results indicated that to protect 95% of species within the receiving ecosystem, as required by ANZECC and ARNCANZ guidelines, the remnant flood water concentration must not exceed 23.3% of the receiving water which equates to a mixing ratio of approximately 1L of remnant flood water to 5L of receiving ecosystem water. To protect 99% of species within the receiving ecosystem the remnant flood water concentration must not exceed 16.5% of the receiving waters. This is a mixing ratio of 1L of remnant flood water to 7L of receiving ecosystem water. The dilution that will be achieved by the proposed release limits will achieve significantly higher mixing ratios providing further protection to aquatic species.

7.3 WATER QUALITY RESULTS FROM TEP RELEASES

A TEP (MAN11139 approved 10 December 2010) and subsequent amendments (MAN11280 approved 5 January 2011 and MAN12039 approved 11 February 2011) were approved by DERM to enable flood waters stored in the active mining pits to be released in a controlled manner to the Nogoia River and Boggy Creek during high flow conditions. The release of waters under high flow conditions aimed to dilute any mine affected water released from the site with the downstream receiving waters. This approach was designed to ensure any releases of mine affected water did not result in environmental harm.

Under these TEPs, Ensham intermittently released approximately 7,000 ML of water from the site between 11 December 2010 and 26 April 2011. Water was released from the site at three release points, namely TEP RP1 and TEP RP4 which discharge directly into the Nogoia River, and TEP RP3 which discharges into Boggy Creek. The bulk of the water was released from TEP RP4. A detailed review of the laboratory and in situ water quality monitoring results of waters released was undertaken.

The overall conclusions of this review were as follows:

- The majority of the TEP release monitoring results were below the release limits and within the trigger investigation limits outlined in the TEPs.
- A limited number of results was identified above the specified TEP limits. An investigation of these results showed:
 - A number of these results were considered to be erroneous as they were:
 - inconsistent with the level of dilution calculated based on flow monitoring results;
 - inconsistent with other water quality monitoring results at the same time and location; or
 - inconsistent with other downstream monitoring data collected at the same time.
 - The remaining results were considered unlikely to result in any significant environmental harm to the downstream receiving waters. This conclusion is based on the comparison of the monitored results with long-term background river water quality data. This comparison showed that these results, while above the TEP trigger levels, were within the range of water quality that occurs naturally in the Nogoia River.

7.4 PROPOSED WATER QUALITY LIMITS

The water quality limits applicable to discharges under the TEP are proposed to be consistent with the parameters contained in the previous TEP that expired on 30 June 2011 with the exception of electrical conductivity. The limit for electrical conductivity is proposed to be increased from 8,500 $\mu\text{S}/\text{cm}$ to 10,000 $\mu\text{S}/\text{cm}$ to allow for the increase in electrical conductivity of the stored flood water over the last 12 months and for consistency with the proposed Fitzroy Basin model conditions.

Water will not be discharged if it is in excess of the water quality limits specified in the TEP conditions in Attachment 1. Discharge will be suspended immediately in the event that field monitoring identifies that discharge water quality exceeds these limits.

7.4.1 RECEIVING WATER FLOWS

The minimum receiving water flow requirement has been decreased to 25 m^3/s for release of mine affected water to the Nogoia River. This flow rate has been proposed to provide the necessary dilution to limit the risk of environmental harm. Modelling has been undertaken on this revised minimum flow rate in the receiving waters as shown in Tables 3 and 4.

Table 3 Nogoia River Modelling Results for EC 7,500µS/cm and Dilution Ratio of 45:1

Receiving Water Conductivity	Discharge Water Conductivity	Mixing Ratio	Limiting Conductivity	River Flow Rate	Pipe Discharge Rate	DISTANCE DOWNSTREAM							
						50m	100m	200m	450m	500m	1000m		
180	7,500	45 : 1	339.13	25 m ³ /sec	0.5555 m ³ /sec	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	
				2,160 ML/day	48 ML/day								
				50 m ³ /sec	1.1111 m ³ /sec								
				4,320 ML/day	96 ML/day								
				57.87 m ³ /sec	1.286 m ³ /sec								
				5,000 ML/day	111.11 ML/day								
				100 m ³ /sec	2.3222 m ³ /sec								
				8,640 ML/day	192 ML/day								
				115.74 m ³ /sec	2.572 m ³ /sec								
				10,000 ML/day	222.22 ML/day								
				150 m ³ /sec	3.3333 m ³ /sec								
				12,960 ML/day	288 ML/day								
									491.53	390.66	361.89	348.28	347.32

Table 4 Nogoia River Modelling Results for EC 10,000µS/cm and Dilution Ratio of 60:1

Receiving Water Conductivity	Discharge Water Conductivity	Mixing Ratio	Limiting Conductivity	River Flow Rate	Pipe Discharge Rate	DISTANCE DOWNSTREAM										
						50m	100m	200m	450m	500m	1000m					
180	10000	60 : 1	340.98	20 m ³ /sec	0.3333 m ³ /sec	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm	µS/cm			
				1,728 ML/day	28.8 ML/day											
				50 m ³ /sec	0.8333 m ³ /sec											
				4,320 ML/day	72 ML/day											
				57.87 m ³ /sec	0.9645 m ³ /sec											
				5,000 ML/day	83.333 ML/day											
				100 m ³ /sec	1.666 m ³ /sec											
				8,640 ML/day	144 ML/day											
				115.74 m ³ /sec	1.929 m ³ /sec	60 : 1	340.98									
				10,000 ML/day	166.667 ML/day											
				150 m ³ /sec	2.5 m ³ /sec											
				12,960 ML/day	216 ML/day											
				200 m ³ /sec	3.333 m ³ /sec											
				17,280 ML/day	288 ML/day											
231.48 m ³ /sec	3.858 m ³ /sec															
20,000 ML/day	333.334 ML/day															
								496.84	393.52	363.59	350.59	349.24	345.01			

7.4.2 EXPECTED DILUTIONS AND DOWNSTREAM WATER QUALITY RESULTS

The increased end of pipe EC limit and the decreased minimum flow rate in the receiving waters proposed under the TEP have been addressed by increasing the dilution requirements for discharge from 50:1 to 60:1. The proposed minimum flow rate, EC end of pipe limits for mine affected waters and dilution ratios are shown in Table 5.

Figure 3 provides an outline of the expected dilutions and downstream water quality results in the Nogoia River. A detailed assessment of the necessary dilution rates and discharge ratios for mine affected water discharges was undertaken by C&R Consulting and previously submitted to the DERM in support of the previous TEP applications. This report is titled "Ensham Mine Water Dilution and Discharge Ratios into the Nogoia River, 2010." Additional modelling scenarios are also attached to this TEP that are applicable to these proposed conditions.

Table 5 Proposed Minimum Flow Rate, EC Limits and Dilution Rates

Receiving Water Minimum Flow (m ³ /s)	EC Limit of Mine Affected Water (µS/cm)	Dilution Ratio (mine affected water to receiving water)
25	10,000	60:1
58	8,500	50:1

7.4.3 ENVIRONMENTAL RISK ASSESSMENT

The proposed TEP release conditions and receiving water quality limits are designed to protect downstream water quality values including drinking water, irrigation water supply, and aquatic ecosystem protection. An environmental risk assessment has been undertaken to assess the residual risks to the receiving environment or people. This is shown in Table 6. Overall, there is a low residual risk of environmental harm due to the discharge of mine-affected water in accordance with the proposed TEP conditions.

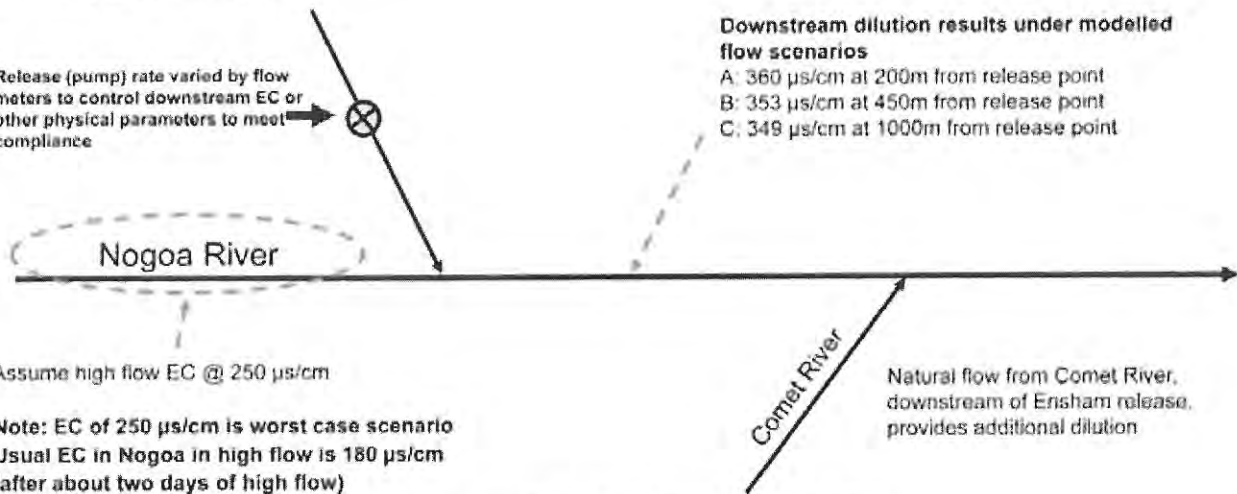
Table 6 Environmental Risk Assessment

Environmental Value	Potential Hazard from Discharge of Mine Affected Water	Management Strategy	Residual Risk
Drinking Water Supply	Downstream water quality unsuitable for drinking water supply (incl Bedford Weir)	Compliance with release conditions and receiving water quality limits	Low
Aquatic Ecology	Downstream water quality adversely impacts aquatic ecology	Compliance with release conditions and receiving water quality limits	Low
Irrigation Water Supply	Downstream water quality not suitable for irrigation water supply	Compliance with release conditions and receiving water quality limits	Low
River Channel Stability	Discharge of mine water causes scouring/erosion of the Nogoia River channel	Installation of scour protection at the discharge points in the Nogoia River Monitoring of release points and flow paths	Low

DOWNSTREAM WATER QUALITY MANAGEMENT MODEL SCHEMATIC

Direct release to Nogoia River rate example
300ML/day @ EC 10,000 $\mu\text{s/cm}$

Release (pump) rate varied by flow
meters to control downstream EC or
other physical parameters to meet
compliance



Key: EC - electrical conductivity
ML/day - megalitres/day
 $\mu\text{s/cm}$ - microsiemens/centimetre

FIGURE 3

7.4 PROVISION FOR POST DISCHARGE FLOWS

Ensham proposes to provide an additional measure to protect downstream water quality. From the Ensham water release location in the Nogoia River, to the outfall of the Fitzroy River Barrage, the full storage volumes of the designated supply weirs, including the Fitzroy River Barrage are provided in the following table:

STORAGE	FULL VOLUME CAPACITY (ML)
Bedford Weir	17,200
Bingegang Weir	8,060
Tartrus Weir	12,000
Eden Bann Weir	35,900
Fitzroy River Barrage	81,300
TOTAL	154,460

8. MONITORING AND REPORTING

During any discharge, water quality will be monitored and reported in accordance with the conditions specified in the TEP.

9. COMMUNITY INTEREST

Before the previous TEP application in December 2010, Ensham undertook a program of personal communication and consultation with key stakeholders in the region regarding the proposed TEP conditions. Those stakeholders included:

- Capricorn Conservation Council;
- Fitzroy Basin Association;
- Central Highlands Regional Council;
- Rockhampton Regional Council;
- Isaac Regional Council; and
- Immediate downstream landholders.

The feedback from those stakeholders was supportive of the proposed TEP which they understood minimized the risks of environmental harm through significant dilution of mine affected water afforded by the high natural flows available in the Nogoia River. Ensham also made available, on its website, the results of all water sampling and monitoring that was undertaken during the mine water releases, as well as further fact sheets about the releases and the TEP.

Ensham will undertake a similar round of consultation with the same stakeholders prior to the commencement of releases associated with this TEP application.

References

C&R Consulting (2010) Ensham Mine Water Dilution and Discharge Ratios into the Nogoia River, prepared for Ensham Resources Pty Ltd, 2010.

C&R Consulting (2010) Ecotoxicity and Species Composition Occurring in "A Pit", Assessment of Pit Waters Impact on Aquatic Fauna, prepared for Ensham Resources Pty Ltd on 21 December 2010.

Hansen Bailey (2009) Environmental Authority Water Quality Monitoring Report, prepared for Ensham Resources Pty Ltd, July 2009.

Hansen Bailey (2011) TEP Monitoring of Waters Released Between 11 December 2010 and 9 April 2011, September 2011.

Attachments

Proposed TEP Conditions

Nogoia River Flow Modelling Results

PROPOSED TEP CONDITIONS

In carrying out this Transitional Environmental Program, 'Ensham Resources' will undertake all activities in accordance with the following conditions.

Undertaking the release of mine affected water

- 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 Program – 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 Table 1 of this Transitional Environmental Program – Certificate of Approval.
- 3 The release of contaminants to waters must not exceed the release limits stated in Table 3 at the monitoring points specified in Table 1 and Table 2 of this Transitional Environmental Program – Certificate of Approval.
- 4 The release of contaminants to waters from the release points must be monitored at the locations specified in Table 2 for each quality characteristic and at the frequency specified in Table 3 and Table 4 of this Transitional Environmental Program – Certificate of Approval.
- 5 If quality characteristics of the release exceed any of the trigger levels specified in Table 4 during a release event, the Transitional Environmental Program holder must compare the downstream results in the receiving waters identified in Table 6 to the trigger values specified in Table 4 and:
 - a) where the trigger values are not exceeded then no action is to be taken
 - b) where the downstream results exceed the trigger values specified Table 4 for any quality characteristic, compare the results of the downstream site to the data from background monitoring sites and
 - i) if the result is less than the background monitoring site data, then no action is to be taken or
 - ii) if the result is greater than the background monitoring site data, complete an investigation in accordance with the ANZECC & ARMICANZ 2000 methodology, into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining
 - 1) details of the investigations carried out
 - 2) actions taken to prevent environmental harm.
- 6 If an exceedance in accordance with condition 5(b)(ii) is identified, the holder of the Transitional Environmental Program must notify the administering authority within 24 hours of receiving the result. The notification must include written verification of the exceedance forwarded to the administering authority either via facsimile (07 4982 2568) or email to Manager.MiningCWR@derm.qld.gov.au.

Table 1 - Contaminant release points, sources and receiving waters

Release point (TEP RP)	Easting (GDA94)	Northing (GDA94)	Contaminant source and location	Monitoring point	Receiving waters
TEP RP 1	653714	7401500	C,D,E, F and Y Pits – release via pipe	TEP MP 1,5,6,7	Nogoa River
TEP RP 4	653674	7401350	A and B Pits – release via pipe	TEP MP 4,5,6,7	Nogoa River

Table 2 - Contaminant release monitoring points

TEP Monitoring Point	Easting (GDA94)	Northing (GDA94)	Contaminant source and location	Monitoring point location	Receiving waters
TEP MP 1	653714	7401500	C,D,E, F and Y Pits – release via pipe	End of Pipe	Nogoa River
TEP MP 4	653674	7401350	A and B Pits – release via pipe	End of Pipe	Nogoa River
TEP MP 5	654688	7400679	A, B,C,D,E, F and Y Pits	Downstream of Ensham lease boundary	Nogoa River
TEP MP 6	663861	7395396	A, B,C,D,E, F and Y Pits	Rileys Crossing	Mackenzie River
TEP MP 7	683801	7415390	A, B,C,D,E, F and Y Pits	5km upstream of Bedford Weir Headwater (weir structure)	Mackenzie River

Table 3 - Contaminant release limits

Quality characteristic	Release Limit	Monitoring Frequency	Sample Type	Monitoring Point
Electrical conductivity (uS/cm)	10,000	Twice daily during release (the first sample must be taken within 2 hours of commencement of release)	<i>In situ</i> ¹	TEP MP 1 TEP MP 4
			Samples require laboratory analysis ²	
	360	Twice daily during release (the first sample must be taken within 2 hours of commencement of release)	<i>In situ</i> ¹	TEP MP 5
			Samples require laboratory analysis ²	
	360	Fortnightly during release	<i>In situ</i> ¹	TEP MP 7
			Samples require laboratory analysis ²	
	450	Daily during release (the first sample must be taken within 4 hours of commencement of release)	<i>In situ</i> ¹	TEP MP 6
			Samples require laboratory analysis ²	

Quality characteristic	Release Limit	Monitoring Frequency	Sample Type	Monitoring Point
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	Twice daily during release (the first sample must be taken within 2 hours of commencement of release)	<i>In situ</i> ¹	TEP MP 1 TEP MP 4
			Samples require laboratory analysis ²	
pH (pH Unit)	6.5 (minimum) 8.5 (maximum)	Twice daily during release (the first sample must be taken within 2 hours of commencement of release)	<i>In situ</i> ¹	TEP MP 5
			Samples require laboratory analysis ²	
		Daily during release (the first sample must be taken within 4 hours of commencement of release)	<i>In situ</i> ¹	TEP MP 6
			Samples require laboratory analysis ²	
		Fortnightly during release	<i>In situ</i> ¹	TEP MP 7
			Samples require laboratory analysis ²	
Total Suspended Solids (mg/L)	300	Twice daily during release (the first sample must be taken within 2 hours of commencement of release)	<i>In situ</i> ¹	TEP MP 1 TEP MP 4
			Samples require laboratory analysis ²	

Quality characteristic	Release Limit	Monitoring Frequency	Sample Type	Monitoring Point
Sulphate (SO ₄ ²⁻) (mg/L)	1000	Twice daily during release (the first sample must be taken within 2 hours of commencement of release)	<i>In situ</i> ¹	TEP MP 1 TEP MP 4
			Samples require laboratory analysis ²	

¹ In situ samples can be taken using electronic sampling equipment.

² Samples are required to be analysed at a NATA accredited facility in accordance with this Transitional Environmental Program – Certificate of Approval.

Table 4 - Release contaminant trigger investigation levels

Quality characteristic	Trigger levels (µg/L)	Monitoring frequency	Monitoring Point
Aluminium	55	Commencement of release and thereafter weekly during release	TEP MP 1 TEP MP 4
Arsenic	13		
Cadmium	0.2		
Chromium	1		
Copper	2		
Iron	300		
Lead	10		
Mercury	0.2		
Nickel	11		
Zinc	8		
Boron	370		
Cobalt	90		
Manganese	1900		
Molybdenum	34		
Selenium	10		
Silver	1		
Uranium	1		
Vanadium	10		
Ammonia	900		
Nitrate	1100		

Quality characteristic	Trigger levels (µg/L)	Monitoring frequency	Monitoring Point
Petroleum hydrocarbons (C6-C9)	20		
Petroleum hydrocarbons (C10-C36)	100		
Fluoride (total)	2000		

Table 5 - Contaminant release during flow events

Receiving waters	Release point (TEP RP)	Gauging station description	Easting (GDA94)	Northing (GDA94)	Minimum flow in receiving water required for a release event	Flow recording frequency
Nogoa River	TEP RP1 TEP RP 4	EA MP2	650392	7402391	25 m ³ /s	Continuous (minimum daily)

Table 6 - Receiving water downstream monitoring points

Monitoring points (TEP MP)	Receiving waters location description	Easting (GDA94)	Northing (GDA94)	Receiving waters
TEP MP 5	Downstream of Ensham lease boundary	654688	7400679	Nogoa River
TEP MP 6	Rileys Crossing	663861	7395396	Mackenzie River
TEP MP 7	5km upstream of Bedford Weir Headwater (weir structure)	683801	7415390	Mackenzie River

Contaminant Release Events

- 7 Notwithstanding any other condition of this Transitional Environmental Program – Certificate of Approval, the release of contaminants to waters must only take place during periods of natural flow events specified as minimum flow in Table 5 for the contaminant release point(s) specified in Table 1.
- 8 A stream flow gauging station must be operated and maintained to determine and record stream flows at the locations specified in Table 5 for any receiving waters into which a release occurs.
- 9 Notwithstanding any other condition of this Transitional Environmental Program, the release of contaminants to waters must only take place when:
 - a. The flow in receiving waters allows for the dilution of release waters at a ratio of 60:1 (60 parts receiving water to 1 part mine affected water) when the minimum flow in the receiving waters is 25 m³/s and EC limit is 10,000 uS/cm; or
 - b. The flow in receiving waters allows for the dilution of release waters at a ratio of 50:1 (50 parts receiving water to 1 part mine affected water) when the minimum flow in the receiving waters is 58 m³/s and EC limit is 8,500 uS/cm
- 10 The daily quantity of contaminants released from each release point in Table 1 must be measured and recorded.

Notification of Release Events

- 11 The Transitional Environmental Program certificate holder must notify the administering authority within 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 (either via facsimile (07 4982 2568) or email to Manager.MiningCWR@derm.qld.gov.au) 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
 - f) any details (including available data) regarding likely impacts on the receiving water(s).
- 12 The Transitional Environmental Program certificate holder must provide the administering authority daily during the release of mine affected water, information on the release of contaminants to waters. The information must be provided in writing (either via facsimile (07 4982 2568) or email to Manager.MiningCWR@derm.qld.gov.au) and include the following:
- a) all in situ monitoring data for that day
 - b) the receiving water flow rate
 - c) the release flow rate.
 - d) the volume of water released from each release point
- 13 The Transitional Environmental Program certificate 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 12 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

- 14 If the release limits defined in Table 3 are exceeded, the holder of the Transitional Environmental Program must notify the administering authority within 24 hours of receiving the results.
- 15 The Transitional Environmental Program certificate holder must, within 28 days of a notification under paragraph 14 that exceeds the conditions of this Transitional Environmental Program – Certificate of Approval, 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.

Erosions and Sediment Control

- 16 Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build up of sediment in such waters.
- 17 Erosion protection must be designed, installed and maintained at each release point authorised by this Transitional Environmental Program and must:
- a) designed and constructed by a suitably qualified and experienced person, and
 - b) be inspected by a suitably qualified and experienced person
 1. prior to the commencement of dewatering operations; and

2. following the cessation of release in accordance with the conditions of this Transitional Environmental Program – Certificate of Approval.

- 18 The holder of this Transitional Environmental Program certificate must provide a report to the administering authority within 10 business days following the cessation of release of mine affected water authorised under authority of this Transitional Environmental Program. The report must detail the performance of erosion protection measures, including:
- identification of erosion, slumping and scour impacts to vegetation,
 - rehabilitation, including earthworks, scour protection and flow velocity controls undertaken to minimise environmental harm, and
 - detailed engineering assessment of erosion protection works completed to date and any proposed works to be undertaken.

Requirements to cease the release of mine affected water

- 19 The release of mine affected waters must be suspended, pending investigation, following the receipt of an in situ sampling result that exceeds the limits as specified in Table 3.
- 20 The release of mine affected waters 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.
- 21 The release of mine affected waters must cease immediately if the holder of this Transitional Environmental Program is directed to do so by the administering authority.
- 22 The release of mine affected waters authorised under this Transitional Environmental Program must cease within three years of the date of this TEP.

Monitoring Requirements

- 23 Where monitoring is a requirement of this Transitional Environmental Program, ensure that a competent person(s) conducts all monitoring.
- 24 All monitoring undertaken as a requirement of this Transitional Environmental Program must be undertaken in accordance with the administering authority's Water Sampling Manual.

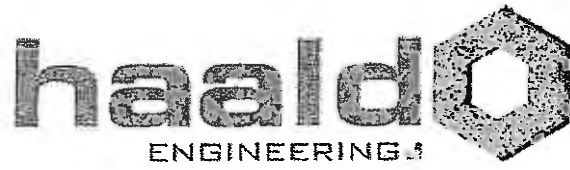
Notification of emergencies, incidents and exceptions

- 25 As soon as practicable after becoming aware of any emergency or incident which results in the release of contaminants not in accordance, or reasonably expected to be not in accordance with the conditions of this Transitional Environmental Program, the administering authority must be notified of the release by telephone, facsimile or email.
- 26 The notification of emergencies or incidents must include but not be limited to the following:
- the holder of the Transitional Environmental Program
 - the location of the emergency or incident
 - the number of the Transitional Environmental Program
 - the name and telephone number of the designated contact person
 - the time of the release
 - the time the holder of the Transitional Environmental Program became aware of the release
 - the suspected cause of the release
 - the environmental harm caused, threatened, or suspected to be caused by the release, and
 - actions taken to prevent any further release and mitigate any environmental harm caused by the release.

- 27 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.

Reporting

- 28 The holder of this Transitional Environmental Program certificate must submit a report to the administering authority on the fifth business day of each month detailing:
- a) All activities undertaken under the transitional Environmental Program;
 - b) How the Transitional Environmental Program holder has met the objectives of the Transitional Environmental Program, 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) How the Transitional Environmental Program holder has complied with all conditions contained within the Transitional Environmental Program – Certificate of Approval.
- 29 The holder of this Transitional Environmental Program certificate must submit a report to the administering authority by 30 December 2014 including:
- a) Details of the completion of the Transitional Environmental Program,
 - b) Details on all activities undertaken under the Transitional Environmental Program,
 - c) Identification of how the Transitional Environmental Program certificate holder has met the objectives of the Transitional Environmental Program, taking into account:
 - i) The best practice environmental management for the activity, and
 - ii) The risks of environmental harm being caused by the activity,
 - d) Identification of how the Transitional Environmental Program certificate holder has complied with all conditions contained with the Transitional Environmental Program – Certificate of Approval, and
 - e) Confirmation that at closure of the Transitional Environmental Program, the holder will be able to comply with the conditions of the current Environmental Authority issued for the Ensham Coal Mine, located at ML7459, ML7460, ML40326, MLA70365, MLA 70366 and MLA 70367 and the Environmental Protection Act 1994.



Ensham Resources Pty Ltd

Flood Recovery Project

Saline Water Disposal Options

SEPTEMBER 2008

Rev	Date	Description	Name	Company	Signed
c	27/10/2008	Draft - Preliminary Review		Ensham Resources HAALD Engineering	

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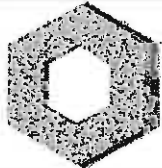
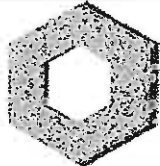
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<i>Equipment Name</i>	-	
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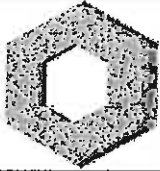
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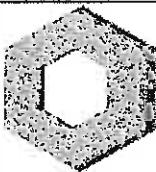
1 INTRODUCTION

Ensham Coal mine has recently been exposed to a severe flooding event which has resulted in the pits A, B C and D filling with water. With all of the low salinity water removed from the pits, phase three of the dewatering program is complete.

Phase four of the dewatering program is defined as the transfer of the remaining water from B pit and D pit into A pit. Phase five is defined as the disposal of this residual higher salinity water. There are numerous options available for the disposal of this water and it is the intent of this report to review these options.



Figure 1: Site Layout


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2 DESIGN DATA

Table 1 –Design Parameters 31 Oct 2008

<i>Item</i>	<i>Parameter</i>	<i>Value</i>	<i>Comments</i>
1.	RL water in B pit	106-m	
2.	Volume of water to be stored from B pit	7,600 MI	
1.	RL of water in A pit	131-m	
2.	Residual water currently in A pit	5,000 MI	
3.	Total Residual Water	12,600 MI	
4.	Total capacity of A pit at RL 148	9,500 MI	
5.	Volume of residual water in B pit	3,100 MI	
6.	Assumed conductivity of water in A pit	4000 $\mu\text{S}/\text{cm}$	
7.	Assumed conductivity of water in B pit	7000 $\mu\text{S}/\text{cm}$	
8.	Assumed conductivity of water for opportunity pumping	700 $\mu\text{S}/\text{cm}$	
9.	Assumed conductivity of water suitable for irrigation	2000 $\mu\text{S}/\text{cm}$	

Note - Though some residual water remains in D pit, this water will be used for levee construction and other mine uses.

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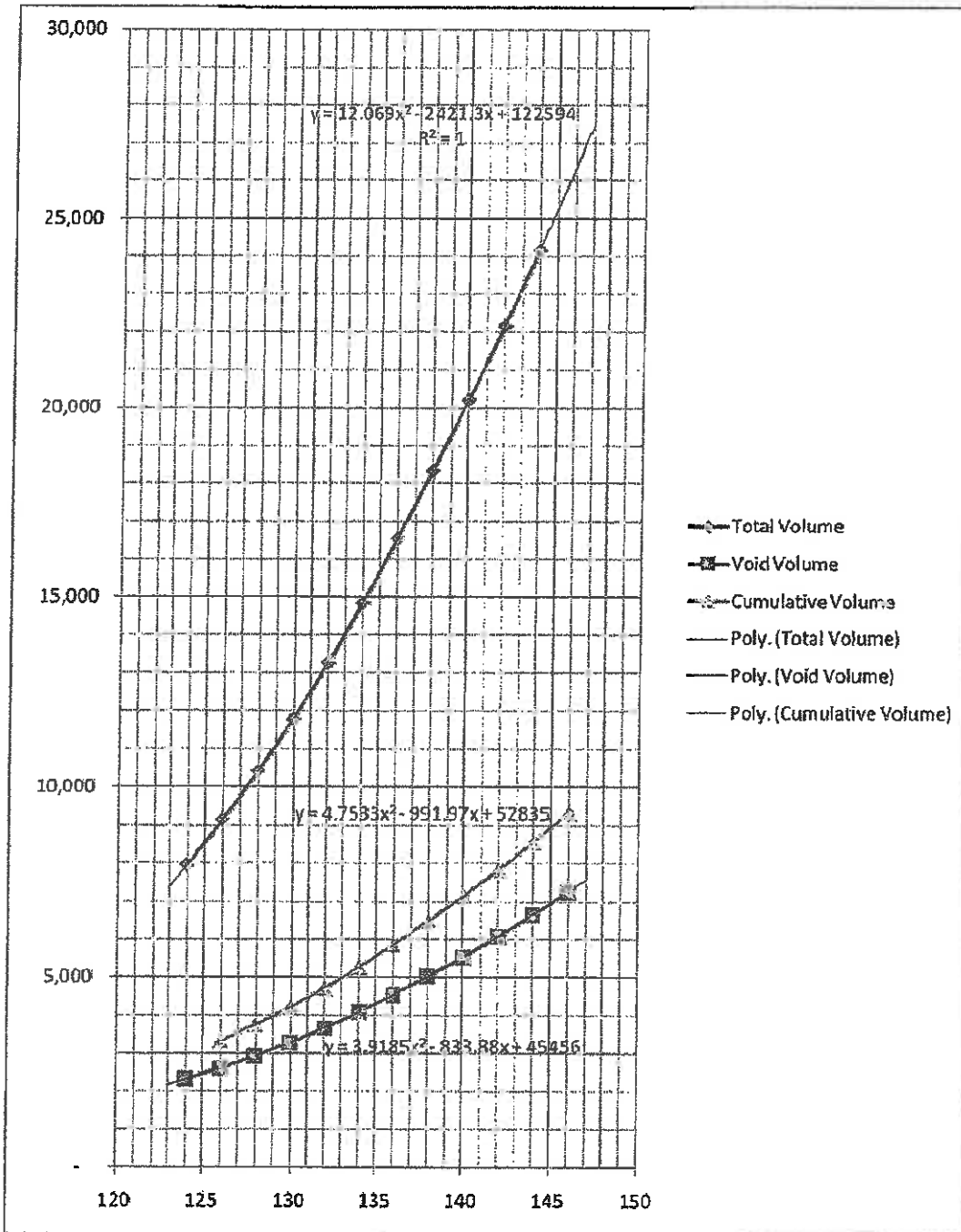
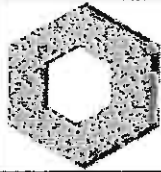


Figure 2 - A Pit Volume vs RL

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3 OPTIONS

Numerous options have been considered for the disposal of residual saline water. These options include;

- i. Evaporation
- ii. Misting
- iii. Opportunity Pumping
- iv. Reverse Osmosis Desalination

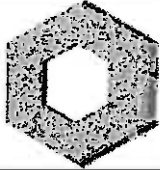
3.1 Evaporation

3.1.1 Pit Evaporation

For the purposes of this review evaporation is defined as surface evaporation from a stored body of water. For phase five of this project, the main stored body of water is in pit A. With pit A filled to RL 148, the surface area is only 31 hectares and this decreases as the water level falls.

Table 2 - Pit A Surface Evaporation

RL	Cumulative Volume c/w Voidage	Surface Area	Evaporation	Time to Evaporate Layer
		A Pit	A Pit	Pit Evaporation
146	10,192 MI	36 ha	1,456 m3/day	599 day
144	9,321 MI	30 ha	1,211 m3/day	627 day
142	8,561 MI	29 ha	1,169 m3/day	630 day
140	7,825 MI	27 ha	1,095 m3/day	635 day
138	7,129 MI	25 ha	1,028 m3/day	640 day
136	6,472 MI	24 ha	974 m3/day	641 day
134	5,847 MI	23 ha	918 m3/day	642 day
132	5,258 MI	21 ha	853 m3/day	645 day
130	4,708 MI	19 ha	774 m3/day	650 day
98	183 MI	3 ha	102 m3/day	628 day
96	120 MI	2 ha	75 m3/day	632 day
94	72 MI	1 ha	55 m3/day	617 day
92	38 MI	1 ha	39 m3/day	601 day
90	15 MI	1 ha	25 m3/day	594 day
				17,563 day

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Note from Table 2 that the evaporation rate with the pit near full is over 1300-m³/day but this rate falls rapidly as the pit levels drops and hence the available surface area is reduced.

3.1.2 Evaporation Ponds

The total surface area of assumed for the proposed evaporation ponds above pit A is 260 hectares.

Three options have been considered for the evaporation ponds.

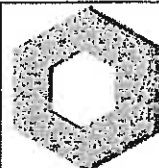
- i. High wall storage areas allowing storage capacity.
- ii. Reduced high wall storage areas allowing reduced storage capacity.
- iii. Low wall storage areas with 0.5-m increments storing minimum water volume
- iv. No wall storage area with surface area wetted by sprays.

3.1.2.1 Evaporation Ponds - Type One

The original high wall storage ponds use conventional banks with 3-m top, 1:1 batter and clayed cores. With no cut on sloping ground this option requires a significant volume of material. Cost for construction for these ponds is significant as indicated in Table 3 - Evaporation Ponds - Preliminary Design and Costing for PEP.

Table 3 - Evaporation Ponds - Preliminary Design and Costing for PEP

Item	DESCRIPTION	UNIT	QTY	RATE	COST
1.	Cluster A, Pond 175	m ³	72,118	14.75	1,063,613
2.	Cluster A, Pond 173	m ³	31,557	16.34	515,753
3.	Cluster A, Pond 170	m ³	83,676	16.11	1,348,393
4.	Cluster A, Pond 167.5	m ³	72,598	14.21	1,031,731
5.	Cluster A, Pond 165	m ³	71,768	14.80	1,062,437
6.	Cluster A, Pond 162.5	m ³	58,331	13.31	776,135
7.	Cluster A, Pond 160	m ³	68,514	11.29	773,644
8.	Cluster A, Pond 157.5	m ³	52,141	12.31	641,853
9.	Cluster A, Pond 155	m ³	39,575	15.01	594,139
10.	Cluster B, Pond 155	m ³	88,144	15.97	1,408,033
11.	Establish/maintain haul roads traffic control	Item	1	889,602.72	889,603
12.	Control devises and pond liners	Item	1	16,762,654.09	16,762,654
13.	Contractor OH incl engineering, supervision, offices, cribs, service vehicle.	Item	1	8,070,000.00	8,070,000
14.	Total of This Section (\$)	m ³	638,422		\$34,937,988

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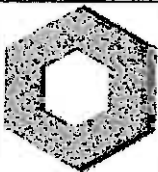
3.1.2.1 Evaporation Ponds - Type Two

To reduce construction costs, the ponds were redesigned to minimise the storage volume.

Table 4 - Evaporation Ponds - Revised 1-m Bund Design

POND	BANK LEVEL		Bank Material	Bank Material	CAPACITY (m ³)		SURFACE
	Bottom RL	Crest RL	Vol (lcm)	Vol (bcm@20%)	Water RL	Capacity	AREA (ha)
POND A175	175	176.2	26,440	31,728	RL176	384,592	67.31
POND A174	174	175.2	8,557	10,268	RL175	38,537	6.94
POND A173	173	174.2	7,429	8,915	RL174	28,819	4.78
POND A172	172	173.2	8,223	9,868	RL173	26,357	3.99
POND A171	171	172.2	19,183	23,020	RL172	146,397	29.93
POND A170	170	171.2	16,435	19,721	RL171	55,456	7.10
POND A169	169	170.2	14,971	17,965	RL170	40,302	5.15
POND A168	168	169.2	20,375	24,450	RL169	86,699	9.13
POND A167	167	168.2	20,138	24,166	RL168	73,716	9.09
POND A166	166	167.2	25,703	30,843	RL167	105,293	12.42
POND A165	165	166.2	17,745	21,293	RL166	52,633	6.98
POND A164	164	165.2	14,538	17,446	RL165	41,770	5.82
POND A163	163	164.2	12,930	15,517	RL164	43,722	8.31
POND A162	162	163.2	11,489	13,787	RL163	37,110	7.01
POND A161	161	162.2	14,187	17,025	RL162	35,988	5.10
POND A160	160	161.2	14,963	17,956	RL161	36,295	3.94
POND A159	159	160.2	14,401	17,281	RL160	36,767	3.51
POND A158	158	159.2	11,520	13,825	RL159	31,761	3.53
POND A157	157	158.2	11,308	13,569	RL158	35,300	4.17
POND A156	156	157.2	8,838	10,605	RL157	20,191	2.87
POND A155	155	157.0	20,313	24,376	RL156	146,315	13.09
			319685 m³	383622 m³		1504020	220.15

Table 4 indicates the material required for construction has reduced to 383622 m³. This is approximately 60% of the original design though still a considerable construction.

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3.1.2.2 Evaporation Ponds - Type Three

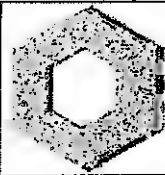
In an effort to minimise costs, it was determined the ponds should only store sufficient water to cover the ground at some minimum depth sufficient to allow for variation in ground RL. If the average depth of water is assumed as 200-mm, and the bund wall assumes a minimalist design with a 0.5-m top, the bund volumes fall significantly. The negative side of this though is that due to the slope of the ground the pond density increases significantly and the total length of bund also increases significantly to approximately 61-km.

Table 5 - Evaporation Ponds - Revised 0.5-m Bund Design Summary

Bank Material		
Inside	Outside	Total
98,611 m ³	16,532 m ³	120,736 m ³

Table 5 - Evaporation Ponds - Revised 0.5-m Bund Design indicates the material for the bund walls has now fallen to 120,736 m³, approximately 38% of the previous design. If a construct cost of \$14/m³ is used, the earthworks component is reduced to about \$1.7M for bund placement.

Note that the cost of construction of the ponds is not just the placement of material for the bund walls.

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3.1.2.3 Evaporation Ponds - Type Four

To better utilise this land area it is proposed no storage capacity is inherent in the design. Instead of utilising a stored body of water to give an evaporation surface, a sprinkler system is used to keep the ground surface wet.

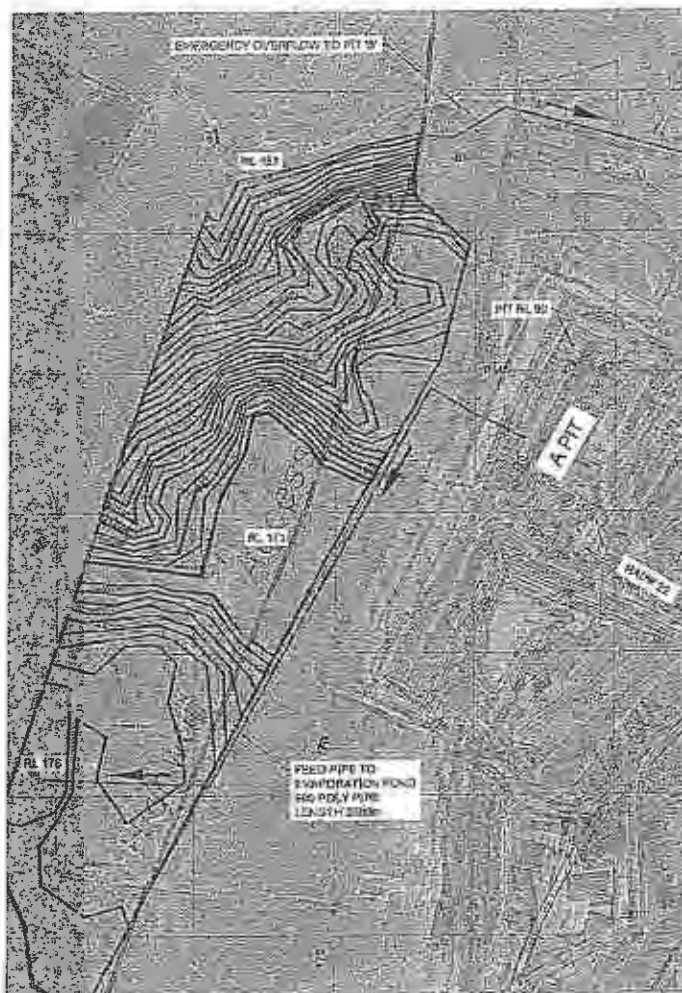
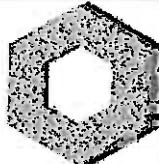


Figure 3 - Evaporation Area Type Four

An outer bund is still required to catch run off from a storm event and divert this runoff into pit B from where it can be pumped back into pit A. If the diversion channel is not terminated in pit B, the minimum RL for the evaporative area is increased from RL 154 to RL 170 significantly decreasing the available surface area from the current 234 hectares.

As the sprinkler system for this area is a low pressure type, saline mist contamination of adjacent areas is minimised. Options for the pre and post treatment of the topsoil in the wetted area include pre stripping and rehabilitation, or alternatively, using the area as a temporary storage site for mud from pit B, then on completion of the project, strip the mud and dump it back into pit B or pit A.

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3.2 Misting

The proposed misting operation is defined as pumping at high pressure through a series of sprays inducing a significant pressure drop across the spray nozzles to decrease the droplet size of the water into a fine mist. A significant portion of this mist diffuses into the surrounding air and is carried away. The performance of the misting operation is heavily dependent on the relative humidity of the air and the presence of wind to carry the moist air away from the spray zone.

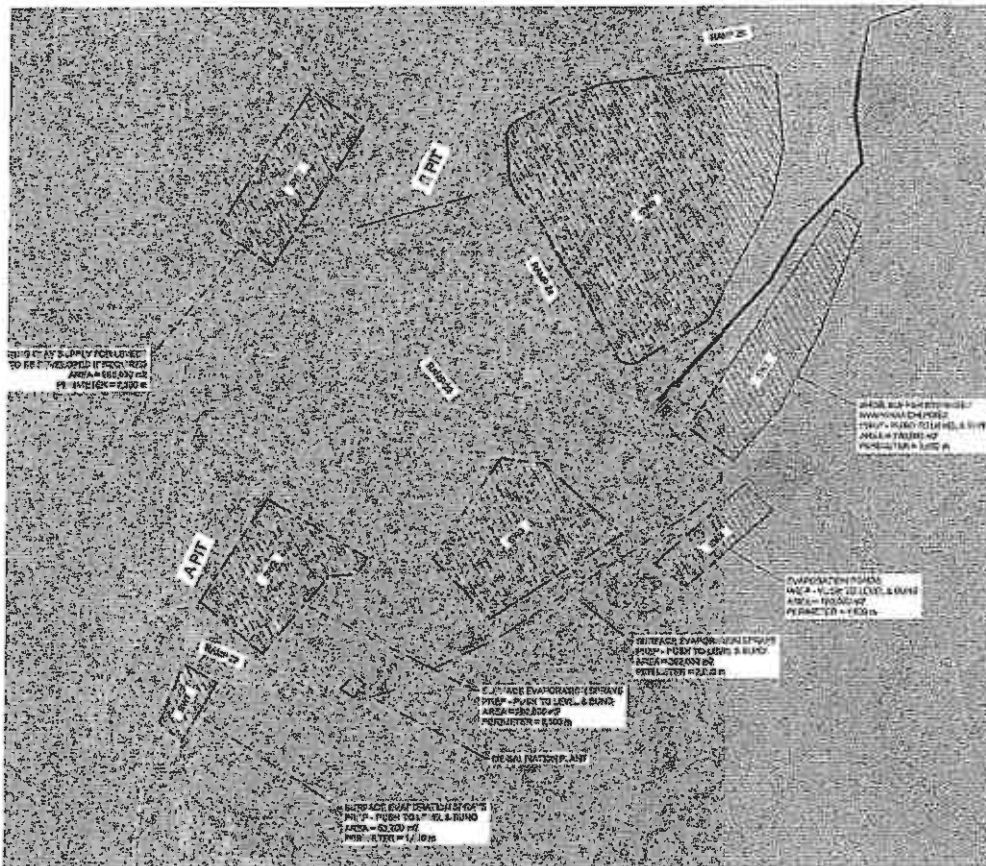
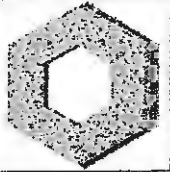


Figure 4 - Proposed Misting Area

3.2.1 Review

Engineering consultants Process Essentials have undertaken a review of the original calculations and have determined the assumptions made highly optimistic. The spray system efficiency of 50% suggested by HAALD has been reviewed by Process Essentials with a revised 10% efficiency suggested as being more realistic. Process Essentials also state a more realistic figure for nett evaporation as being 1.49-m per year. Using this figure over the proposed misting area SW7 gives an evaporation rate of 230-m³/hr. If we use the revised efficiency for misting of 10% for the available front width over area SW7 of 1500-m, the evaporation rate for misting is 198-m³/hr. These figures indicate a better evaporative performance from a still pond than misting into the air and this assumption is incorrect.

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3.2.2 Trials

Trials are currently being undertaken on site to validate the performance of the misting system. Two options are currently under consideration;

- i. Series of "Big Gun irrigator sprays run at high pressure
- ii. Series of FogJet misting sprays run at high pressure

The Big Gun Sprays are intended to operate at higher flowrates and have a significantly greater range (approx 50-m radius) than the FogJet sprays (approx 25-m radius). This allows for less sprays to be installed and potentially reduces the installation costs on uneven ground.

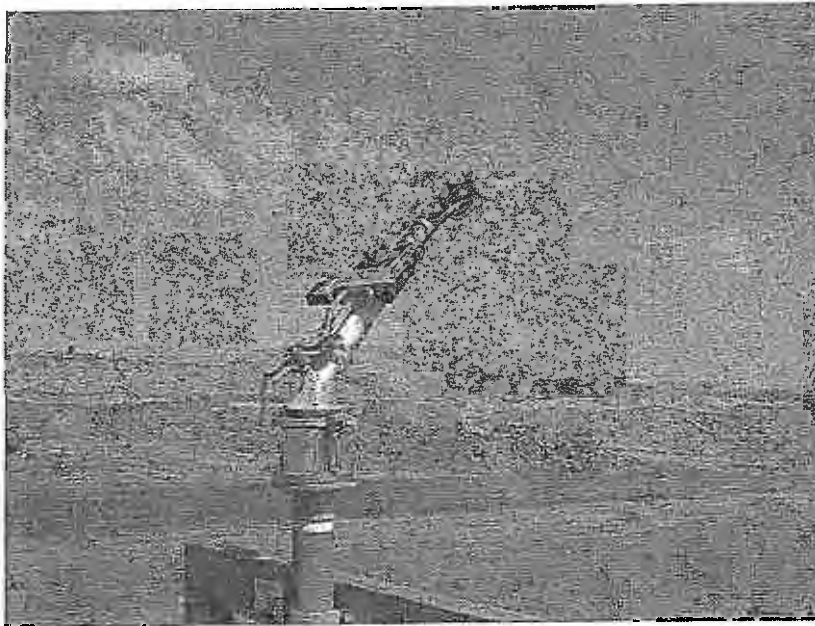
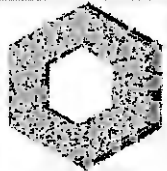


Figure 5 - Big Gun Spray

Two weather stations have been procured for the trials to allow monitoring of ambient conditions as well as the condition of the air leaving the spray zone. With trials to run over a three week period good data should be available to assist in making a more informed decision on the benefits of the misting system.

3.2.3 Cost

Preliminary budget pricing of approximately \$480,000 has been received for the installation of piping to support a misting system over SW6 (Figure 4 - Proposed Misting Area). This price includes all piping, components and labour to install. Excluded are all earthworks for site (establishment and rehabilitation), spray nozzles and extensions, valves, and all electrical.

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3.2.4 Preliminary Trials

Preliminary misting/evaporation trials have been undertaken using three different nozzles.

3.2.4.1 Nelson Big Gun

The Nelson *Big Gun* irrigator nozzle is designed to irrigate large areas with minimal piping. Flow through this nozzle was approximately 10.5 l/s and as can be seen from Figure 6 - Nelson Big Gun Irrigator, despite operating at 650 kPa the majority of this water reaches the ground. After only two hours of operation the ground around the spray was saturated.

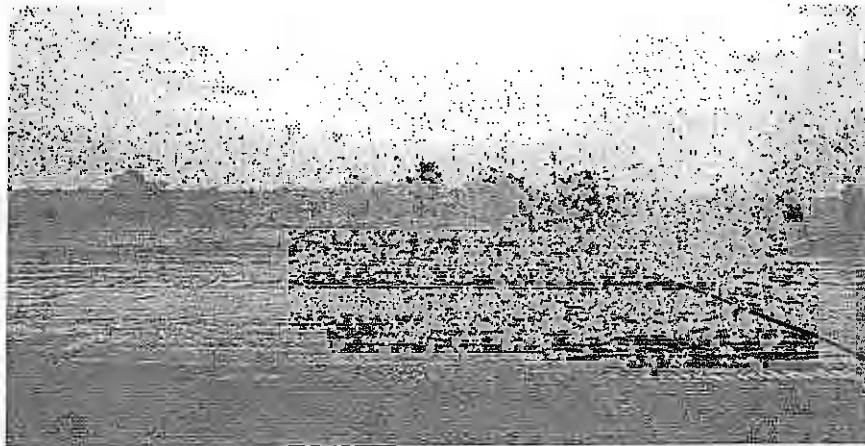


Figure 6 - Nelson Big Gun Irrigator

Rain gauges were placed on the ground radially at 10m intervals to measure the water reaching the ground. After two hours of operation the water level in the gauges was recorded (Table 6 - Rain Gauge Collection).



Figure 7 - Rain Gauge Placement

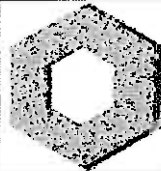
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Table 6 - Rain Gauge Collection

Direction from head	Distance from spray head				
	10m	20m	30m	40m	50m
South	22mm	15mm	5mm	0mm	0mm
North	25mm	25mm	20mm	7mm	0mm

3.2.4.2 FogJet Nozzle

The Spraying Systems FogJet nozzle is designed to provide a fine mist spray. This type of nozzle is more suited to the misting application where it is required a minimum volume of water contacts the ground surface.

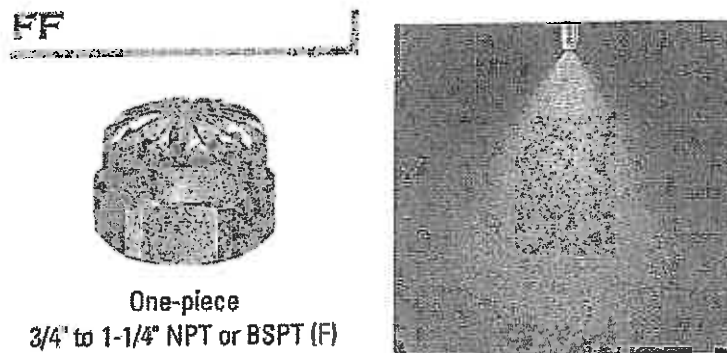
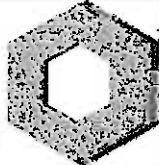


Figure 8 - FogJet Nozzle



Figure 9 - FogJet #18 Nozzle 60-l/min

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

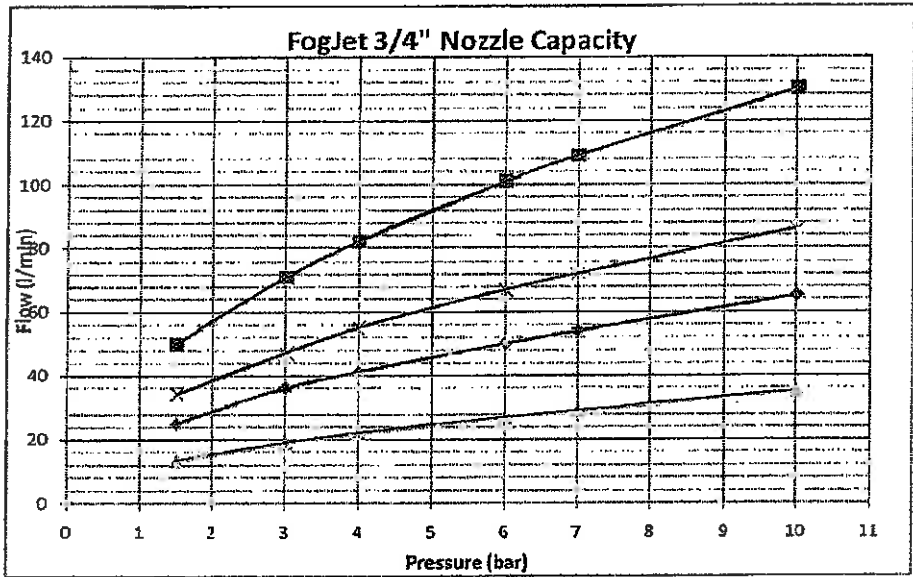


Figure 10 - FogJet Nozzle Capacity Chart

The #18 nozzle gave good misting and fine droplet size, however unless the wind speed remained relatively high the capacity of the nozzle was too high and too much water contacted the ground.

To increase the time available for air to vapour contact an extension was added to the stand by placing a 3-m length of pipe on top of the stand. With the nozzle size dropped to a #9, the droplet size reduced and the capacity of the nozzle at 1100-kPa was about 12-l/min.

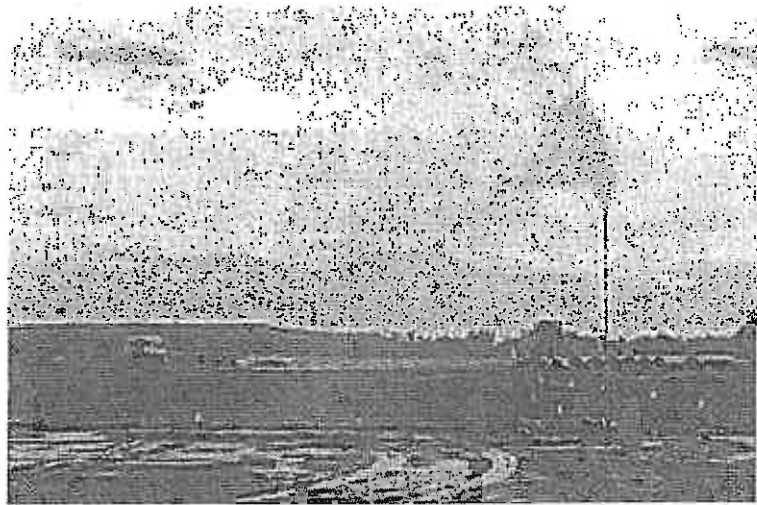
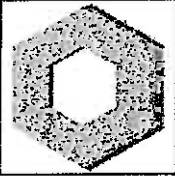


Figure 11 - FogJet Nozzle Capacity 4.8

The configuration as shown in Figure 11 worked very well over the short time observed. Variations of this configuration are to be tested in the coming weeks.

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

3.3 Opportunity Pumping

Opportunity pumping is defined as the safe disposal of water into the river at a time when the river has flowed at a pre determined depth and for a pre determined period such that the influx of saline water will have negligible impact on the quality of the water in the river system. This assumes then a reasonably significant rain event in the river catchment area.

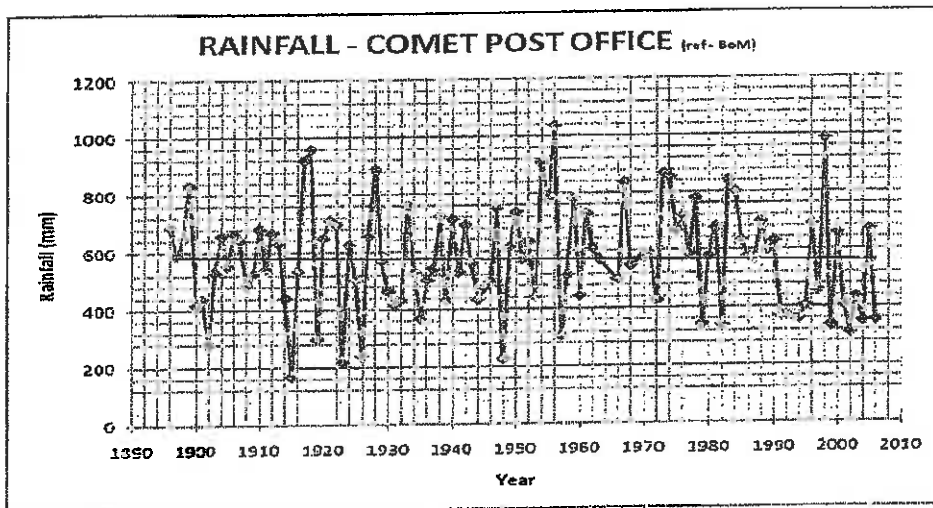


Figure 12 - Comet Rainfall

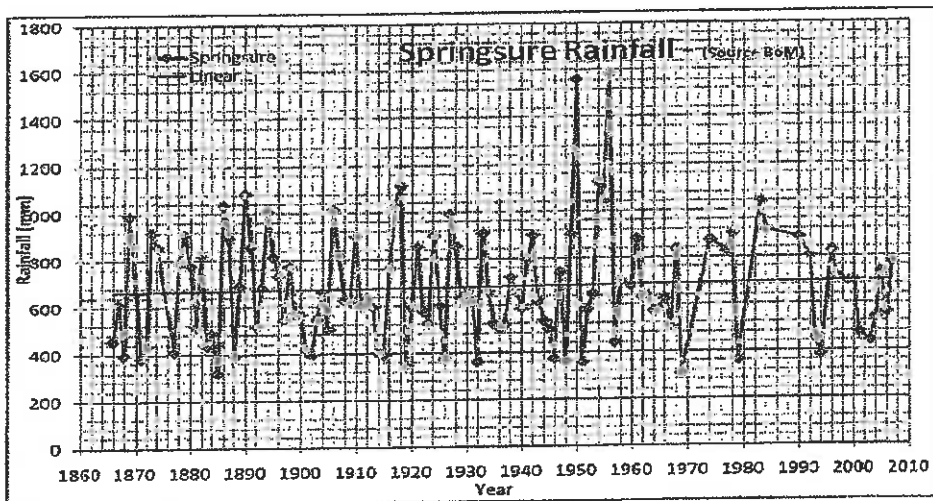
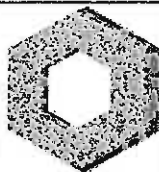


Figure 13 - Springsure Rainfall

From Figure 12 and Figure 13 it can be seen that the average yearly rainfall for Comet and Springsure is extremely variable. While Comet is not in the Nogoia catchment area it is in the Comet River catchment and the Comet and Nogoia rivers combine to form the McKenzie River about 9-km from the mine.

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

3.3.1 Potential Stream Flows

Independent water consultants 4T Consultants Pty Ltd were engaged by Ensham to undertake a study of potential stream flows past Ensham mine in an attempt to quantify the capacity of the Nogoia for mine water discharge.

If the stream flows for 30% and 40% of years are taken as a basis and 75%₁ of the flows from the Theresa system and 10%₂ of the flows from the Nogoia are combined, then the estimated monthly flows past Ensham for the 2008-09 Summer are shown in Table 8 - Ensham 2009 Potential Stream Flows¹.

Table 7 - Potential Stream Flows in Key Streams

NOGOIA R.	Sept	Oct	Nov	Dec	Jan	Feb	March	TOTAL
Median	46	390	7709	5872	13911	34676	9373	71977
40 th percentile	163	895	11356	8229	22979	41600	23077	108299
30 th percentile	254	1553	15821	9994	51550	67397	38963	185532

Source: Streamflow DPIF (Qld).

Actual flows past Ensham from the Nogoia system will depend on the level of the Fairbairn Dam and releases for irrigation and post-winter flows.

THERESA CK.	Sept	Oct	Nov	Dec	Jan	Feb	March	TOTAL
Median	12	112	384	4447	3910	24688	3709	37262
40 th percentile	128	573	812	6777	6764	33280	6020	54354
30 th percentile	281	679	1808	10307	15105	80161	10051	118392

Source: Streamflow DPIF (Qld).

It is noted that this data does not include flows from Borilla Creek which carries all the water from the Drummond catchment area (this is all the catchment between the Retreat and Nogoia catchment areas) and indicates some conservatism in the reported data.


Table 8 - Ensham 2009 Potential Stream Flows

NOGOIA R.	Sept	Oct	Nov	Dec	Jan	Feb	March	TOTAL
Median	8	70	558	2295	2455	12843	2138	20367
40 th percentile	66	303	933	3461	4193	17056	3863	29875
30 th percentile	139	383	1605	5138	9375	39442	6471	62553
Average (30 th and 40 th percentiles)	103	343	1269	4300	6784	28249	5167	46215

Source: Streamflow DPIF (Qld).

Even if the average EC of the stored water requires a dilution of 15:1 with the river water, there is still capacity within the Nogoia system for significant discharges.

It is noted a substantial stream flow is required to flush the river system of existing saline water before further discharges will be possible.

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

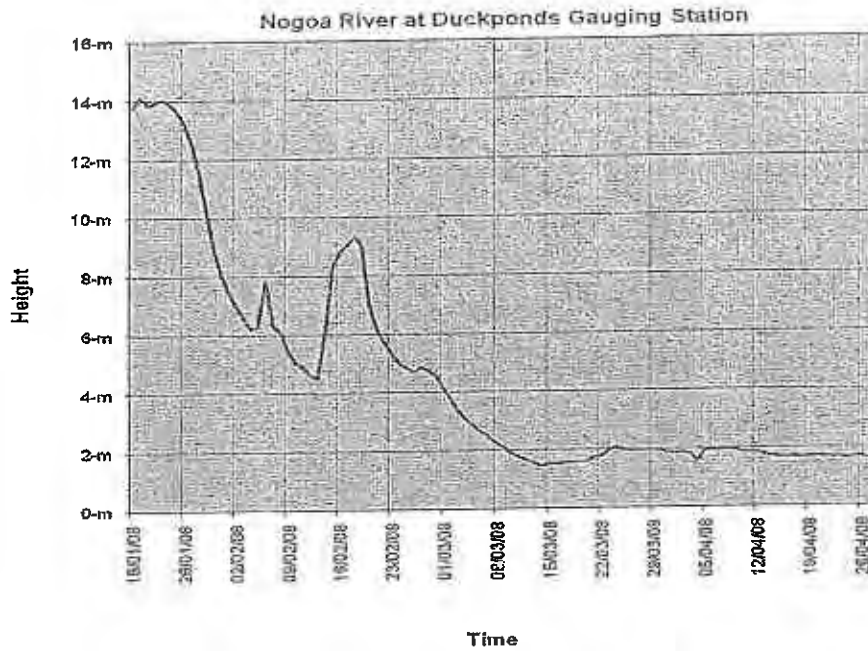
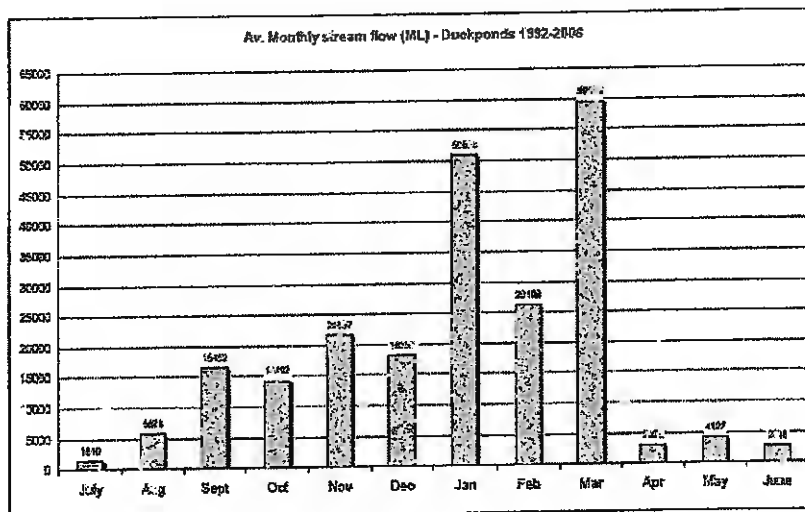


Figure 14 - Duckponds Gauging Station Flow Graph

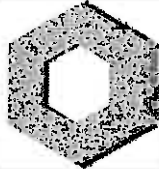
Figure 14 - Duckponds Gauging Station Flow Graph shows the Nogoa River flow at Duckponds gauging station during the January and February floods.

Figure 15 shows the average monthly stream flows past Ensham from 1992 to 2006. Note that this data conflicts with the 100 year data as February has a low average flow compared to January and March.



Source: BOM data.

Figure 15 - Ensham Monthly Average Stream Flows

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

For the purposes of estimating typical river flows during a future flood event, flow data from 13th February to the 8th March (Figure 14 - Duckponds Gauging Station Flow Graph) will be used. This period excludes the significant event causing the failure of the levee system. Using this data as a model for the rise and fall of the river, a factor is placed on the gauge height such that the rise and fall profile remains similar to the February event, but the total flow for the period analysed is approximately 50,000-MI, similar to the Ensham monthly averages.

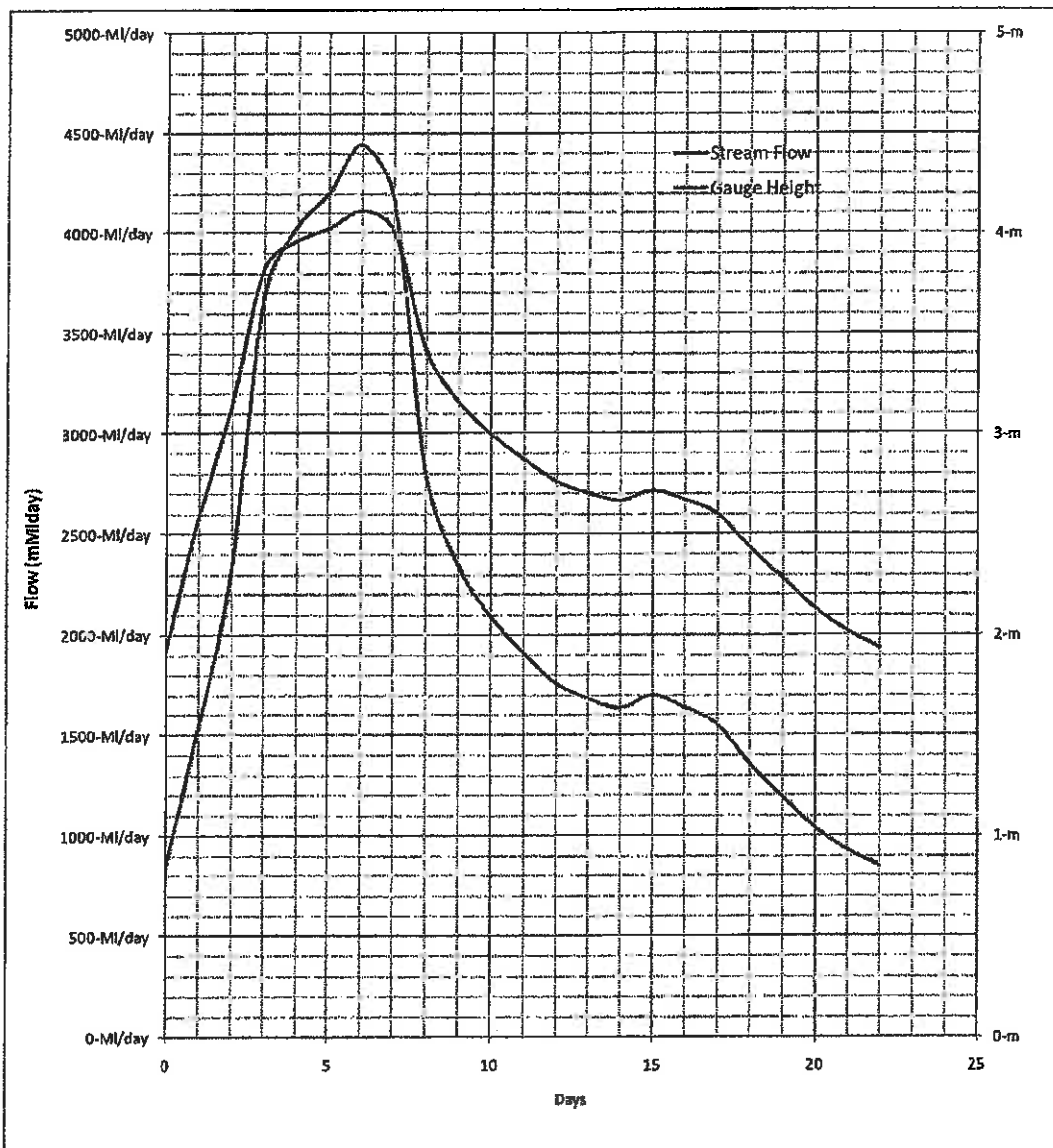


Figure 16 - Simulated River Flows

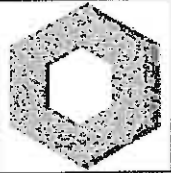
<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

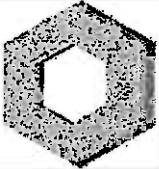
Table 9 - Simulated Stream Flow

Gauge Height Modified	Day	River Flow	Saline Water Discharge (15:1)	
			MI/day	m ³ /s
1.92	0	832-MI/day	55-MI/day	0.64-m ³ /s
2.58	1	1531-MI/day	102-MI/day	1.18-m ³ /s
3.13	2	2295-MI/day	153-MI/day	1.77-m ³ /s
3.82	3	3679-MI/day	245-MI/day	2.84-m ³ /s
3.96	4	4026-MI/day	268-MI/day	3.11-m ³ /s
4.02	5	4199-MI/day	280-MI/day	3.24-m ³ /s
4.11	6	4440-MI/day	296-MI/day	3.43-m ³ /s
4.01	7	4168-MI/day	278-MI/day	3.22-m ³ /s
3.42	8	2817-MI/day	188-MI/day	2.17-m ³ /s
3.16	9	2348-MI/day	157-MI/day	1.81-m ³ /s
3.00	10	2093-MI/day	140-MI/day	1.62-m ³ /s
2.88	11	1912-MI/day	127-MI/day	1.48-m ³ /s
2.76	12	1756-MI/day	117-MI/day	1.36-m ³ /s
2.71	13	1683-MI/day	112-MI/day	1.30-m ³ /s
2.67	14	1633-MI/day	109-MI/day	1.26-m ³ /s
2.72	15	1697-MI/day	113-MI/day	1.31-m ³ /s
2.67	16	1638-MI/day	109-MI/day	1.26-m ³ /s
2.60	17	1553-MI/day	104-MI/day	1.20-m ³ /s
2.44	18	1360-MI/day	91-MI/day	1.05-m ³ /s
2.29	19	1197-MI/day	80-MI/day	0.92-m ³ /s
2.13	20	1042-MI/day	69-MI/day	0.80-m ³ /s
2.02	21	929-MI/day	62-MI/day	0.72-m ³ /s
1.93	22	848-MI/day	57-MI/day	0.65-m ³ /s
Total		49675-MI	3312-MI	

From Table 9 - Simulated Stream Flow, the total stream flow for the event is 49675-MI. The total saline water discharge is given as 3312-MI, indicating a 15:1 discharge ratio.

Assuming a river water conductivity of 250- μ S/cm and discharge water conductivity of 6000- μ S/cm, the average conductivity will be around 650- μ S/cm which should be acceptable to downstream users.

Note the peak discharge rates for saline water are less than 3500-l/s with a five day period requiring approximately 3000-l/s to maintain the discharge rate.

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

3.3.2 Pumping System

To enable a sensible discharge of water into the river, it will be necessary to have a flexible pumping platform with a high turndown to ensure the conductivity of the water at the boundary remains below accepted limits.

3.3.2.1 Pipe Route

The original layout for opportunity pumping involved the placement of two KSB pumps on barges in A pit. These pumps would then discharge into pipelines running around the western end of B pit, to the north of the levee and into the river at the farm crossing.

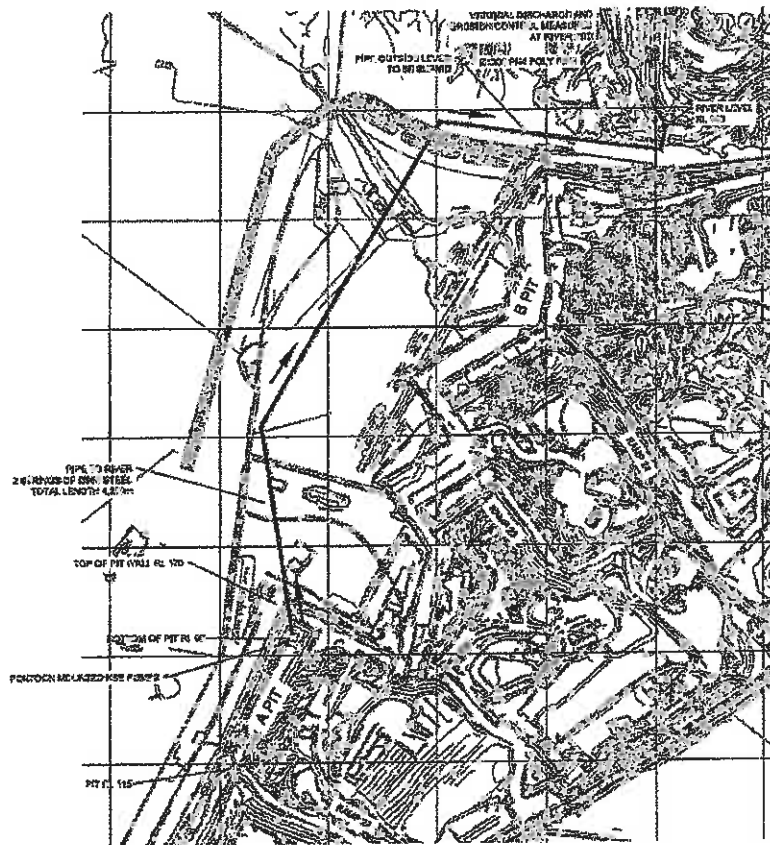


Figure 17 - Original Layout for Opportunity Pumping

With the western side of B pit currently utilised as a clay source for the levee construction, it is no longer possible to run the pipe system this way.

With an established pipe route from ramp 22 to ramp 24 (Figure 4), it is proposed the existing open channel from R24 to R26 is utilised. This means only the section from the barges in pit A to the existing pipe in R22, and the section from R26 to the river discharge is required.

3.3.2.2 Pumping System Options

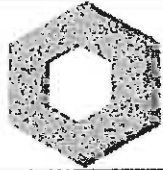
<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

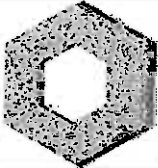
Table 10 - Opportunity Pumping Pump Options

	<i>Barge</i>	<i>Booster Station One</i>	<i>Booster Station Two</i>	<i>Booster Station Three</i>	<i>Total Capacity</i>	<i>Install Cost</i>	<i>Unit Cost</i>
<i>Option One</i>	KSB Ajax on Barge - Fitted with Diesel	China FL			4.2-m ³ /s	\$3,171,250	\$ 8,739 /MI/day
	High Head Warman x 1	China FL					
	High Head China x 1	China FL					
<i>Option Two</i>	KSB Ajax on Barge - Fitted with Diesel	China FL			4.2-m ³ /s	\$3,000,750	\$ 8,269 /MI/day
	High Head Warman x 1	China FL					
	High Head China x 1	China FL					
<i>Option Three</i>	High Head Warman x 1	China FL			2.0-m ³ /s	\$1,827,250	\$ 10,574 /MI/day
	High Head China x 1	China FL					
		China FL					
<i>Option Four</i>	China Pump - FL	China FL	China FL	China FL	2.6-m ³ /s	\$2,311,250	\$ 10,289 /MI/day
	China Pump - FL	China FL	China FL	China FL			
	China Pump - FL	China FL					
<i>Option Five</i>	High Head Warman x 1	China FL			3.5-m ³ /s	\$1,822,330	\$ 6,026 /MI/day
	High Head China x 4	China FL					
		China FL					

With the current level of salinity the maximum discharge capacity of 15.2-MI/hr of water into the river would require a significant flow event to maintain water quality. To achieve a suitable flow only one pump will be used and this pump will have an orifice plate fitted to restrict flow.

Another issue with the KSB pumps is the requirement to have a suitable 11-kV power supply available. These pumps have also proven difficult to start due to priming issues and would require a more reliable installation for use in this "on demand" application.

To give maximum flexibility to the installation a diesel engine can be fitted to one of the KSB pumps (4000-l/s) with a reduction ratio set to give a minimum 20% increase in pump speed to assist in increasing the maximum capacity of the pump. If this unit is installed with the Warman (1500-l/s) on a floating barge in pit A, significant turn down is available with a peak capacity of 475-MI/day. This peak capacity can only be provided

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
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however if the open channel from R24 to R26 can remain serviceable. A pump booster station will be required at the head of R22 and another at R26 for discharge to the river.

If a system with capacity of 2000-l/s is chosen, the existing CAT barge configuration can be used without the need to keep the R26 channel open. If the open channel is closed, an additional Ø960 pipe string will be required from R24 to R26.

3.3.3 Cost

The cost for the five pumping options considered are given in Table 10 - Opportunity Pumping Pump Options

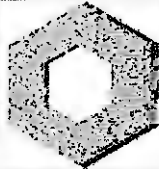
Notes

- i. The install cost for the KSB is high as option one requires a new 2000-kW diesel engine and clutch. While parts of the existing frame can be reused, some extra support frame will have to be fabricated.
- ii. Option two requires a new 66/11 kV transformer, switchgear and aerials. Preliminary enquiries indicates a minimum four month lead time plus shipping with some companies quoting up to nine months lead time.
- iii. Option three has the lowest install cost as only two existing pumps are installed. As these pumps are relatively high head only one booster station is required. This installation has the least discharge capacity however.
- iv. Option four has a low install cost, good capacity and utilises existing equipment.
- v. Option five gives reasonable install cost, reasonable capacity, good turndown and good redundancy. This option uses existing pump sets with new high head split case pumps, utilising existing engines and frames. Using the high head pumps reduces the number of booster stations required.

All barge mounted pumps are configured to operate in parallel such that pump flows are additive. Option four however uses a configuration with one pump installed as in redundant capacity.

Table 11 - Opportunity Pumping Options Evaluation

Option	Install Cost	Redundancy	Reliability	Capacity	Turndown	Operation	Total
1	3	2	4	5	4	5	23
2	3	2	3	5	2	3	18
3	5	5	4	3	4	5	26
4	4	2	4	2	4	5	21
5	5	5	5	4	5	5	29

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
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3.4 Reverse Osmosis Desalination

From section 3.2 it is noted that the misting/evaporation system requires warm, dry windy weather to achieve capacity. If weather conditions are such that the misting and evaporation performance are negligible and rainfall is such that stream flows are minimal, an alternative technology is required to ensure disposal of the saline water.

Reverse Osmosis (RO) desalination modules of 5.5-MLD capacity (total feed flow) are available which will produce a permeate of 200 $\mu\text{S}/\text{cm}$ at 70% of feed flow. This leaves a stream of brine to be treated and currently it is proposed the brine stream is disposed of using the misting/evaporation system.

The RO Permeate flow rate for these modules is 3.6-MLD (42-l/s - 150-m³/hr) with a brine flow of 1.9-MLD (22-l/s - 80-m³/hr). With a lease cost of \$28,300/ month for lease periods in excess of 25 months, a yearly cost would be about \$340,000 for a water disposal of 1,180-Ml per year (permeate). It is noted there are extra costs for mobilisation (\$185,000) plus demobilisation (\$90,000) taking the cost to \$615,000. This excludes costs for establishing a stable feedwater supply and a suitable discharge.

Some work is required on this option to determine a process for the processing or storage of the brine stream during periods when the misting/evaporation system will not function. During a ten day wet weather period for example the two units will produce approximately 38-Ml of brine and this stream has to be processed or stored for the desalination modules to continue functioning.

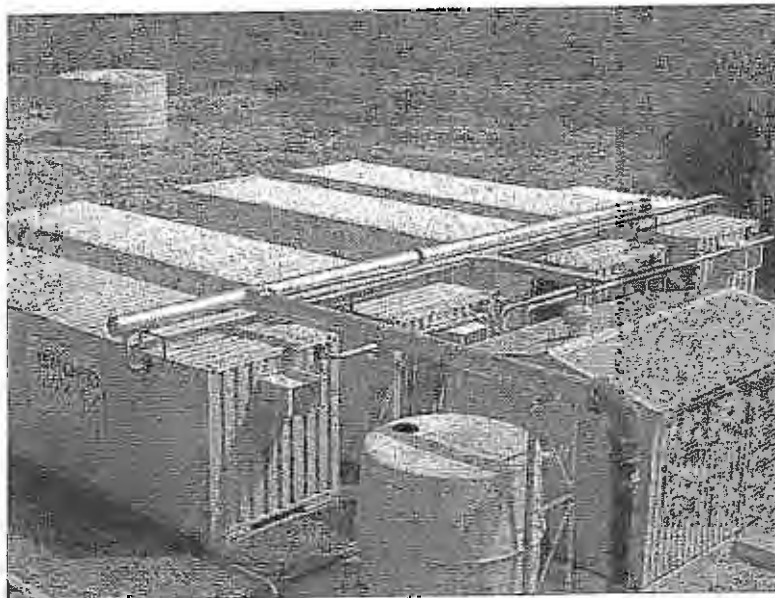
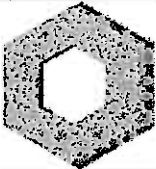


Figure 18 - Typical RO Modular Plant Installation

Initial discussions with suppliers has indicated prefiltering of the water is required to lower the Silt Density Index (SDI) to less than three. Without prefiltering the cartridge filters will require service at intervals as low as two days. With 36 filters per plant (72 for two) costing approximately \$60 per filter the cost over the period is approximately \$2.4M

<i>Project</i>	Flood Recovery Project	
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Note from Figure 19 - RO Plant PFD that there is some equipment required to;

- i. supply suitable water to the plant
- ii. dispose of the retentate stream
- iii. dispose of the permeate stream
- iv. dispose of the prefilter rejects stream

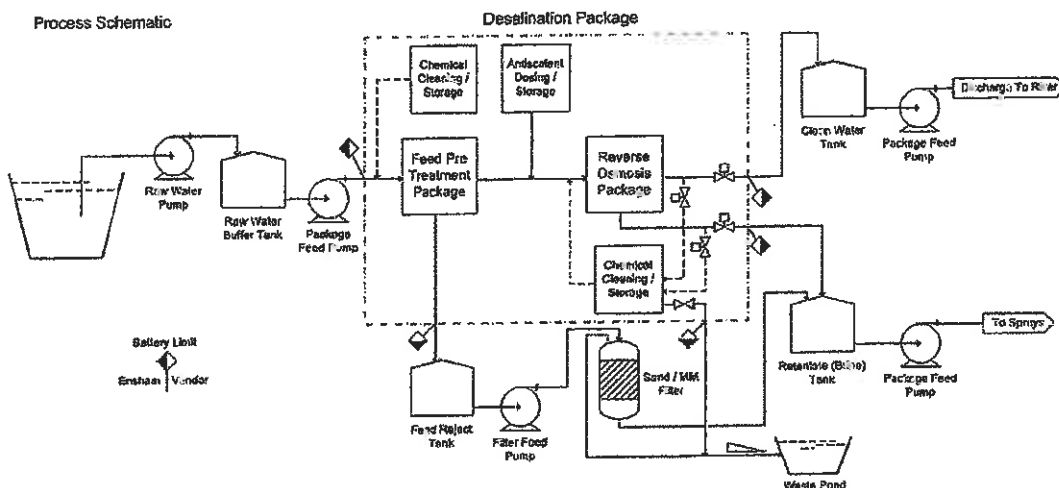


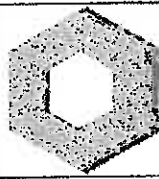
Figure 19 - RO Plant PFD

3.4.1.1 Prefiltering

Trials are to be undertaken to determine the extent of prefiltering required. To reduce the install cost of the prefiltering equipment, it is proposed the existing open channel from R24 to R26 is modified for use as a large open clarifier. Poly will be injected into the feedwater pipe a sufficient distance prior to discharge to give 30 seconds residence time. A wall will be placed across the channel about mid length to shorten the channel with water then flowing back along the channel to a small weir located near a discharge sump. The weir will be constructed using inverted culverts with headboards.

As the ramp 24 pump station has to be moved to allow unimpeded access to R24 stockpile, a new sump will be excavated north of the stockpile and sealed using shotcrete. The combination of the channel and sump will give a good storage buffer for the feedwater.

The feedwater will be supplied by two electric pumps (plus one redundant) located on a barge in A pit. It is proposed the cost of installing the required electrical infrastructure for these pumps is justified in comparison to the cost of running diesel engines continuously for the next three years.

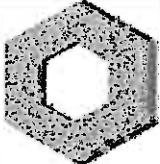
<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

3.4.2 Cost

Table 12 - Desalination Plant Cost

Item	Description	Capacity	Qty	Unit Cost	Total
P5 - 50 - 00	Desalination Plant	3,000M/yr			\$7,275,500
P5 - 51 - 00	Establish Feed Water Supply				\$ 595,000
P5 - 51 - 01	Pump system on barge in A pit - 350kW	300 l/s	-	\$ 120,000	-
P5 - 51 - 02	Pump system on barge in A pit - 75kW	250 l/s	3 ea	\$ 95,000	\$ 285,000
P5 - 51 - 03	Piping - Barge to Shore	DN1200	1 ea	-	-
P5 - 51 - 04	Piping - Ramp 22	DN900	1,200 m	-	-
P5 - 51 - 05	Piping - R22 to R24	DN1,000	1,500 m	-	-
P5 - 51 - 06	R24 to R26	DN500	1,500 m	-	-
P5 - 51 - 07	Piping - R22 to R24	DN1,000	1,500 m	-	-
P5 - 51 - 08	R24 to R26	DN500	1,500 m	-	-
P5 - 51 - 09	Fuel for Diesel (assume 50 l/hr)	21,024 hr	1,051,200 l	-	-
P5 - 51 - 10	Transformer - 11kV - 415V	300 kW	1 ea	\$190000 /ea	\$ 190,000
P5 - 51 - 11	Aerials	300 kW	1 ea	\$120000 /ea	\$ 120,000
P5 - 51 - 12	Electric motor	300 kW	-	\$60000 /ea	-
P5 - 52 - 00	Establish RO Facility				\$ 2,955,000
P5 - 52 - 01	Electricity - Aerials - 11kV	450 kW	1 ea	\$210000 /ea	\$ 210,000
P5 - 52 - 02	Transformer - 11kV - 415V	450 kW	1 ea	\$210000 /ea	\$ 210,000
P5 - 52 - 03	Tankage - Feed & Discharge	50,000 l	3 ea	\$20000 /ea	\$ 60,000
P5 - 52 - 04	Miscellaneous	-	1 ea	\$25000 /ea	\$ 25,000
P5 - 52 - 05	Clarifier - System	100,000 l	1 ea	\$450000 /ea	\$ 450,000
P5 - 52 - 06	RO Unit - Procure	5Ml/day	1 ea	\$2000000 /ea	\$ 2,000,000
P5 - 53 - 00	Ro Unit - Lease				\$ 1,656,000
P5 - 53 - 01	Mobilise	-	1 ea	\$250000 /ea	\$ 250,000
P5 - 53 - 02	Lease	-	3 yr	\$432000 /yr	\$ 1,296,000
P5 - 53 - 03	Demobilise	-	1 ea	\$25000 /ea	\$ 25,000
P5 - 53 - 04	Miscellaneous Tanks, pumps and piping	-	1 ea	\$85000 /ea	\$ 85,000
P5 - 53 - 00	Operation				\$ 739,500
P5 - 53 - 01	Polyelectrolyte	-	1 ea	\$600000 /ea	\$ 600,000
P5 - 53 - 02	Cartridge Filters	-	300 ea	\$65 /ea	\$ 19,500
P5 - 53 - 03	Maintenance Contract	-	1 ea	\$50000 /ea	\$ 50,000
P5 - 53 - 04	Chemicals - cleaning etc	-	1 ea	\$70000 /ea	\$ 70,000
P5 - 54 - 00	Miscellaneous				\$ 550,000
P5 - 54 - 01	Transformer - 11kV / 415V	-	-	-	-
P5 - 54 - 02	Cable - Water proof	-	1,250 m	\$ 350	\$ 437,500
P5 - 54 - 03	Pipe - Assume PN10 poly	DN300	250 m	\$ 450	\$ 112,500
P5 - 55 - 00	Engineering				\$ 780,000
P5 - 55 - 01	Pond design and certification	-	1 ea	\$ 250,000	\$ 250,000
P5 - 55 - 02	Approvals	-	1 ea	\$ 80,000	\$ 80,000
P5 - 55 - 03	Supervision - Construction & Running	-	3 yr	\$ 150,000	\$ 450,000
P5 - 55 - 04		-	-	-	-

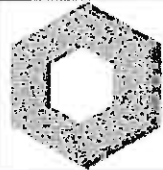
Note from Table 12 - Desalination Plant Cost the cost of the misting system has not been included. The misting system required to evaporate the brine stream will be the same as discussed previously in section 3.2.

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

4 DISPOSAL SUMMARY

Table 13 - Disposal Cost Summary

<i>Evaporation Ponds Type Two</i>	Establish	\$ 10,678,600	<i>Capital Cost</i>	\$ 18,661,600
	Rehabilitation	\$ 7,033,000	<i>Capacity (MI/yr)</i>	292MI/yr
	Miscellaneous	\$ 550,000	<i>Quantity (MI)</i>	701MI
	Engineering	\$ 400,000	<i>Capital cost per \$/MI</i>	\$ 26,629 /MI
<i>Evaporation Ponds Type Three</i>	Establish	\$ 7,611,400	<i>Capital Cost</i>	\$ 14,658,400
	Rehabilitation	\$ 6,097,000	<i>Capacity (MI/yr)</i>	292MI/yr
	Miscellaneous	\$ 550,000	<i>Quantity (MI)</i>	701MI
	Engineering	\$ 400,000	<i>Capital cost per \$/MI</i>	\$ 20,917 /MI
<i>Evaporation Area East of Pit A</i>	Establish	\$ 4,235,000	<i>Capital Cost</i>	\$ 7,577,500
	Rehabilitation	\$ 2,830,000	<i>Capacity (MI/yr)</i>	292MI/yr
	Miscellaneous	\$ 112,500	<i>Quantity (MI)</i>	701MI
	Engineering	\$ 400,000	<i>Capital cost per \$/MI</i>	\$ 10,813 /MI
<i>Misting Area SW7</i>	Pumping and Piping	\$ 1,610,000	<i>Capital Cost</i>	\$ 4,740,750
	Earthworks	\$ 659,000	<i>Capacity (MI/yr)</i>	2,208MI/yr
	Rehabilitation - SWS	\$ 787,500	<i>Quantity (MI)</i>	6,623MI
	Establish Electrical	\$ 646,250	<i>Capital cost per \$/MI</i>	\$ 716 /MI
	Miscellaneous	\$ 430,500		
	Engineering	\$ 607,500		
<i>Desalination Plant</i>	Establish Feed Water Supply	\$ 595,000	<i>Capital Cost</i>	\$ 7,275,500
	Establish RO Facility	\$ 2,955,000	<i>Capacity (MI/yr)</i>	2,161MI/yr
	Ro Unit - Lease	\$ 1,656,000	<i>Quantity (MI)</i>	6,482MI
	Operation	\$ 739,500	<i>Capital cost per \$/MI</i>	\$ 1,122 /MI
	Miscellaneous	\$ 550,000		
	Engineering	\$ 780,000		

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

<i>Opportunity Pumping - A Pit to River (Option 1)</i>	Establish - Option One	\$ 1,433,000	<i>Capital Cost</i>	\$ 3,171,250
	Establish Diesel Supply	\$ 931,000	<i>Capacity (MI/yr)</i>	3,400MI/yr
	Miscellaneous	\$ 459,000	<i>Quantity (MI)</i>	3,400MI
	Engineering	\$ 348,250	<i>Capital cost per \$/MI</i>	\$ 933 /MI
<i>Opportunity Pumping - A Pit to River (Option 2)</i>	Establish - Option Two	\$ 683,000	<i>Capital Cost</i>	\$ 3,000,750
	Establish Electrical	\$ 1,482,500	<i>Capacity (MI/yr)</i>	3,400MI/yr
	Miscellaneous	\$ 487,000	<i>Quantity (MI)</i>	3,400MI
	Engineering	\$ 348,250	<i>Capital cost per \$/MI</i>	\$ 883 /MI
<i>Opportunity Pumping - A Pit to River (Option 3)</i>	Establish - Option Three	\$ 425,000	<i>Capital Cost</i>	\$ 1,827,250
	Establish Diesel Supply	\$ 751,000	<i>Capacity (MI/yr)</i>	1,700MI/yr
	Miscellaneous	\$ 303,000	<i>Quantity (MI)</i>	1,700MI
	Engineering	\$ 348,250	<i>Capital cost per \$/MI</i>	\$ 1,075 /MI
<i>Opportunity Pumping - A Pit to River (Option 4)</i>	Establish - Option Four	\$ 705,000	<i>Capital Cost</i>	\$ 2,311,250
	Establish Diesel Supply	\$ 955,000	<i>Capacity (MI/yr)</i>	3,400MI/yr
	Miscellaneous	\$ 303,000	<i>Quantity (MI)</i>	3,400MI
	Engineering	\$ 348,250	<i>Capital cost per \$/MI</i>	\$ 680 /MI
<i>Opportunity Pumping - A Pit to River (Option 5)</i>	Establish - Option Five	\$ 465,000	<i>Capital Cost</i>	\$ 1,822,330
	Establish Diesel Supply	\$ 599,080	<i>Capacity (MI/yr)</i>	3,400MI/yr
	Earthworks	\$ 55,000	<i>Quantity (MI)</i>	3,400MI
	Miscellaneous	\$ 355,000	<i>Capital cost per \$/MI</i>	\$ 536 /MI
	Engineering	\$ 348,250		



Project
Flood Recovery Project
Document
Saline Water Disposal Options

4.1.1 Saline Water Disposal Summary
Table 14 - Water Disposal Summary

Level	Cumulative Volume c/w Volume	Surface Area (ha)		Cumulative Evaporation (m3/day)						Time to Evaporate Layer (days)								
		A Pit	Ponds	Pit Evaporation	With Misting	Misting & Ponds	Misting & Desal	With Area P5	With Area P5 & Desal	With Misting	Misting & Ponds	Misting & Desal	With Area P5	With Area P5 & Desal				
148	10841612	36	210	1464	6972	15477	19002	10497	6122	9647	304	64	29	23	42	73	46	
146	10396150	34	210	1395	6903	15408	18933	10428	6052	9578	616	124	56	45	82	142	90	
144	9537230	31	210	1272	6780	15285	18810	10305	5930	9455	630	118	52	43	78	135	85	
142	8736297	29	210	1169	6677	15182	18707	10202	5827	9352	642	112	49	40	74	129	80	
140	7985696	27	210	1095	6603	15108	18633	10128	5753	9278	648	108	47	38	70	123	77	
138	7275662	25	210	1028	6536	15041	18566	10061	5685	9210	653	103	45	36	67	118	73	
136	6604730	24	210	974	6482	14987	18512	10007	5631	9156	655	98	43	34	64	113	70	
134	5967181	23	210	918	6426	14931	18456	9951	5576	9101	656	94	40	33	60	108	66	
132	5365189	21	210	853	6361	14866	18391	9886	5510	9035	658	88	38	31	57	102	62	
130	4803875	19	210	774	6282	14787	18312	9807	5431	8957	664	82	35	28	52	95	57	
128	4290177	17	210	709	6217	14722	18247	9742	5366	8891	667	76	32	26	49	88	53	
126	3817225	16	210	647	6155	14660	18185	9680	5304	8829	672	71	30	24	45	82	49	
Rows omitted for clarity																		
110	1043204	9	210	376	5884	14389	17914	9409	5034	8559	615	39	16	13	25	46	27	
108	811793	7	210	289	5797	14302	17827	9322	4947	8472	634	32	13	10	20	37	22	
106	628398	5	210	201	5709	14214	17739	9234	4859	8384	671	24	10	8	15	28	16	
104	493347	4	210	180	5688	14193	17718	9213	4838	8363	649	21	8	7	13	24	14	
102	376460	4	210	165	5673	14178	17703	9198	4823	8348	629	18	7	6	11	22	12	
100	272660	3	210	137	5645	14150	17675	9170	4794	8319	628	15	6	5	9	18	10	
98	186751	3	210	102	5610	14115	17640	9135	4759	8284	640	12	5	4	7	14	8	
96	121732	2	210	75	5583	14088	17613	9108	4732	8257	645	9	3	3	5	10	6	
94	73472	1	210	55	5563	14068	17593	9088	4712	8238	628	6	2	2	4	7	4	
92	38946	1	210	39	5547	14052	17578	9073	4697	8222	611	4	2	1	3	5	3	
90	14876	1	210	25	5533	14038	17563	9058	4682	8207	603	3	1	1	2	3	2	
												18002	1549	645	521	972	1758	1065

<i>Project</i>	Flood Recovery Project
<i>Document</i>	Saline Water Disposal Options

5 RISK and OPPORTUNITY

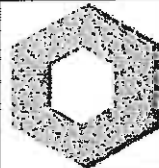
Item	Disposal Method	Capacity (Mil/yr)	Risk	Opportunity
1	Evaporation Ponds - Type Two		<ul style="list-style-type: none"> i. Extended periods still weather ii. High rainfall iii. Pond wall failure iv. Unsuitable solid available in the immediate area v. Unable to source suitable contractors to build ponds 	<ul style="list-style-type: none"> i. Extended periods of windy weather ii. Low rainfall
2	Evaporation Ponds - Type Three		<ul style="list-style-type: none"> i. Extended periods still weather ii. High rainfall iii. Pond wall failure iv. Unsuitable solid available in the immediate area 	<ul style="list-style-type: none"> i. Extended periods of windy weather ii. Low rainfall
3	Evaporation Area - East of Pit A		<ul style="list-style-type: none"> i. Extended periods still weather ii. High rainfall iii. Pond wall failure iv. Unsuitable solid available in the immediate area 	<ul style="list-style-type: none"> i. Extended periods of windy weather ii. Low rainfall
4	Misting - Area SW7	11.52	<ul style="list-style-type: none"> i. Extended periods still weather ii. High rainfall iii. High wear rate on nozzles 	<ul style="list-style-type: none"> i. Extended periods of windy weather ii. Low rainfall iii. Installation costs lower than budgeted
5	Desalination Plant	7	<ul style="list-style-type: none"> i. Unable to procure in suitable time ii. Poor performance processing water iii. EC of water continues to increase with time iv. High operating costs iv. Poor performance of brine disposal (see misting) 	<ul style="list-style-type: none"> i. EC of water remains stable ii. Processing capacity of plant higher than expected iii. Performance of misting is higher than anticipated so only one RO plant required



Project
Flood Recovery Project

Document
Saline Water Disposal Options

Item	Disposal Method	Capacity (MG/yr)	Risk	Opportunity
6	Opportunity Pumping - A Pit to River (Option 1)	259.2	<ul style="list-style-type: none"> i. Insufficient stream flow to allow discharge ii. Unable to renew license to discharge iii. Conditions of license to discharge significantly reduce Probability of suitable stream flow iv. Unable to get high power diesel engine installed in time v. 	<ul style="list-style-type: none"> i. Stream flows more frequent than budgeted ii. Stream flows more substantial than budgeted
7	Opportunity Pumping - A Pit to River (Option 2)	259.2	<ul style="list-style-type: none"> i. Insufficient stream flow to allow discharge ii. Unable to renew license to discharge iii. Conditions of license to discharge significantly reduce Probability of suitable stream flow iv. Unable to procure 66/11 transformer in time for coming season v. 	<ul style="list-style-type: none"> i. Stream flows more frequent than budgeted ii. Stream flows more substantial than budgeted
8	Opportunity Pumping - A Pit to River (Option 3)	129.6	<ul style="list-style-type: none"> i. Insufficient stream flow to allow discharge ii. Unable to renew license to discharge iii. Conditions of license to discharge significantly reduce Probability of suitable stream flow iv. 	<ul style="list-style-type: none"> i. Stream flows more frequent than budgeted
9	Opportunity Pumping - A Pit to River (Option 4)	259.2	<ul style="list-style-type: none"> i. Insufficient stream flow to allow discharge ii. Unable to renew license to discharge iii. Conditions of license to discharge significantly reduce Probability of suitable stream flow iv. high level of supervision and maintenance v. 	<ul style="list-style-type: none"> i. Stream flows more frequent than budgeted
10	Opportunity Pumping - A Pit to River (Option 5)	259.2	<ul style="list-style-type: none"> i. Insufficient stream flow to allow discharge ii. Unable to renew license to discharge iii. Conditions of license to discharge significantly reduce Probability of suitable stream flow iv. 	<ul style="list-style-type: none"> i. Stream flows more frequent than budgeted ii. Stream flows more substantial than budgeted

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

6 CONCLUSION

Five options have been considered for the disposal of the residual 10,000-Ml of saline water from pits A and B.

- i. Surface evaporation from pit A
- ii. Evaporation from a purpose built evaporation area
- iii. Misting and evaporation over an area near B pit
- iv. Opportunity pumping into the Nogoia River
- v. Reverse Osmosis Desalination

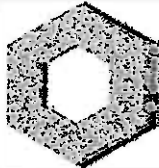
It has been determined that the water should be disposed of over a three year period which significantly reduces the disposal cost compared to the original time frame of one year.

Table 15 - Cost and Performance Summary

<i>Item</i>	<i>Option</i>	<i>Performance</i>	<i>Install Cost</i>	<i>\$/MI Disposal</i>
i.	Surface evaporation from pit A	Poor	Low	Nil
ii.	Evaporation from a purpose built evaporation area	Average	Very High ¹	\$10,813
				\$26,629
iii.	Misting and evaporation over an area near B pit	Good	Low	\$716
iv.	Opportunity pumping into the Nogoia River	Excellent	Minimal	\$536
				\$1075
v.	Reverse Osmosis Desalination	Average	Medium	\$1122

From Table 15 - Cost and Performance Summary it appears there is little difference in cost between misting and the RO desalination option. It is noted that the RO plant requires the misting to operate.

From Table 15 - Cost and Performance Summary it is apparent the least expensive option is to pump the water into the river during a flood event. With the possibility there will be no flood event during the next three years, the risk associated with relying a single option such as this is too high.

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

7 RECOMMENDATIONS

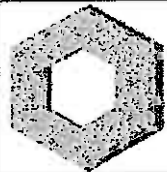
The disposal of the saline water is to be undertaken with considerations to

- i. safety
- ii. environment
- iii. environment - downstream neighbours
- iv. cost
 - a. installation
 - b. operation
- v. time

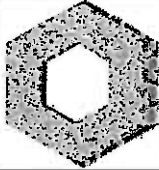
Due to the probability there will be insufficient stream flow to fully utilise the pump installation and achieve the specified discharge capacity, a full 10-MI/day (feed stream) Reverse Osmosis Desalination Plant has been selected with an accompanying misting system for brine disposal. It is recommended a single 5-MI/day unit is purchased initially which will allow time to determine the performance of the full misting system. If the weather is hot and windy for continued periods and the misting systems performs above the nominated rate, it may be possible to delay the installation of a second desalination plant until after the second flood season.

Table 16 - Recommended Options

Description	Capacity	Qty (3 yr period)	Unit Cost	Total
Desalination Plant	2,161MI/yr	6,482MI	\$1,122 /MI	\$7,275,500
Misting	2,208MI/yr	6,623MI	\$ 716 /MI	\$4,740,750
Opportunity Pumping - Option 5	1,133MI/yr	3,400MI	\$ 536 /MI	\$1,822,330
TOTAL	5,502MI/yr	16,505MI	\$ 838 /MI	\$13,838,580

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

8 APPENDICIES

<i>Project</i>	Flood Recovery Project	
<i>Document</i>	Saline Water Disposal Options	
<i>Equipment Name</i>	-	
<i>Equipment No.</i>	TBA	

A. COST ESTIMATES

[REDACTED]

From: Peter Westerhuis [REDACTED]
Sent: Wednesday, 2 November 2011 2:58 PM
To: [REDACTED]
Subject: FW: ENSHAM IN URGENT NEED OF ASSISTANCE

From: Bradley John [REDACTED]
Sent: Monday, 6 December 2010 11:11 AM
To: Peter Westerhuis
Cc: [REDACTED] Brown Damien
Subject: RE: ENSHAM IN URGENT NEED OF ASSISTANCE

Thanks Peter

I would be keen to discuss as you propose. I am free between 12 and 2pm if there is a slot there that suits you and would bring Damien Brown with me. I will get my office to check with yours.

As you know, we have been watching Ensham's situation closely for some time, and following [REDACTED] contact with [REDACTED] yesterday, I had asked him to have the discussion she'd proposed today.

It's been my understanding that Ensham has been working on a TEP application based on the staggered disposal of 2008's 9000 ML and that TEP was yet to be finalised and submitted to DERM.

Naturally the recent rain will bring forward the time imperative for Ensham and we're keen to assist you through the process as quickly as possible.

Look forward to discussing soon.

John Bradley
Director-General
Department of Environment and Resource Management
Telephone: [REDACTED]
Email: [REDACTED]
www.derm.qld.gov.au

Department of Environment and Resource Management
400 George Street, Brisbane Q 4000
GPO Box 2454, Brisbane Q 4001

From: Peter Westerhuis [REDACTED]
Sent: Monday, 6 December 2010 10:22 AM
To: Bradley John
Cc: [REDACTED]
Subject: ENSHAM IN URGENT NEED OF ASSISTANCE
Importance: High

Mr John Bradley – Director General
Qld. Dept. of Environment and Resource Management

Hi John

I hope you are well.

I am assuming that by now your staff will have alerted you to a very serious situation that is once again confronting the Ensham mine. Over the weekend we faced a very worrying flood inundation threat, following 2 days of torrential rain

(up to 200mm) on Thursday and Friday in the Theresa Creek and Fairbairn Dam catchments. This was on top of already soaked ground and fully charged water storages. Ultimately the height of the flooded Nogoia River at Ensham reached a peak of 13.6 metres, only 0.9 metre below the January 2008 level. The new levees did their job, noting that their reconstruction is still not complete following many months of delay in the Land Court. The fact that some sections of the levees are not at ARI 1000 did cause some anxious moments over the weekend.

Anyway, the prognosis for Ensham at this time is not good, viz:

1. The flooded Nogoia River has made a section of our haul road impassible. This will make it impossible to haul coal from B Pit (about 30% of mine production) for an estimated 3 or 4 weeks;
2. All mining locations are under water as a result of inflows coming from the torrential rain over the mine on Thursday and Friday.....refer photos. It is estimated that 1,000ML have entered the various mining locations this way, of which the majority is in mining areas on the Northern side of the flooded Nogoia River;
3. Consequently Ensham is unable to mine any coal. We have declared Force Majeure on all customers, a situation that will remain for as long as we have coal under water. There are many serious ramifications of this, one being we now have no revenue stream;
4. The majority of Ensham's water storage is on the Southern side of the Nogoia River where we are carrying in excess of 12,000 ML of water, of which approximately 9,000 ML is remnant water from the 2008 flood inundation. This storage is reaching its practical capacity and all other storage dams are operationally FULL. We are unable to make use of the major water storage on the Southern side of the river by transferring the water in the Northern mining areas due to the flooded Nogoia River which divides these areas;
5. It is inevitable that further rainfall in the coming weeks and months will further compound these difficult matters;
6. The significant flow occurring in the Nogoia River provides for the opportunity to virtually eliminate any risk of environmental harm occurring as a result of a release of water from the Ensham operation.

I have asked my people to obtain your Department's urgent cooperation to provide appropriate approval for Ensham to release a large volume of water via various drains and creeks at the mine surface that flow to the Nogoia River whilst this situation exists.

Ensham fully accepts any requirements around monitoring, measuring and reporting that would need to be imposed on us. I would be happy for Ensham staff to take instructions from DERM staff with respect to these things.

I am hoping that you can offer some urgent assistance here. I will call you later today, after you have had some time to contemplate this matter. Alternatively I would be happy to wander up to your office to give you a personal briefing, just let me know.

Kind Regards,

Peter Westerhuis
Chief Executive Officer
Ensham Resources

+-----+

Think B4U Print

1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere

3 sheets of A4 paper = 1 litre of water

+-----+

[REDACTED]

From: Peter Westerhuis [REDACTED]
Sent: Wednesday, 2 November 2011 2:57 PM
To: [REDACTED]
Subject: FW: ENSHAM IN URGENT NEED OF ASSISTANCE

From: Peter Westerhuis
Sent: Friday, 10 December 2010 7:38 AM
To: [REDACTED]
Subject: RE: ENSHAM IN URGENT NEED OF ASSISTANCE

Hi John & Damien

Thank you for your assistance on this, for us, business critical issue. You will be aware that Ensham submitted the TEP application on Tuesday evening and I am hopeful your department finds it suitable.

Our coal mining operations remain at a standstill at every mining face, awaiting authority to commence water clearance. Once we start the recovery process it will still be about 2 weeks before we get sufficient coal release to commence mining. Commencement of water pumping as soon as possible will also allow us to take advantage of the high-flowing dilution capacity of the Nogoia River for longer.

I, as did [REDACTED] spent a big part of yesterday in conversations with a range of Stakeholders about our application to discharge. I was encouraged by the level of support for Ensham and the understanding folks have about our unfortunate predicament.

Anyway, thanks for giving us a good hearing and we do appreciate the constructive advice. Please let me know if there is anything else I can do to expedite our TEP application.

Kind Regards,

Peter Westerhuis

From: Brown Damien [REDACTED]
Sent: Monday, 6 December 2010 3:51 PM
To: Peter Westerhuis
Cc: [REDACTED] Bradley John; [REDACTED]
Subject: RE: ENSHAM IN URGENT NEED OF ASSISTANCE
Importance: High

Peter

Apologies, I neglected to add in my previous email that if ER is able to provide a suitable TEP then a turnaround time of 2-3 days is possible.

regards

2/11/2011

Damien Brown

Assistant Director-General

Regional Service Delivery

Telephone: [REDACTED]

Mobile: [REDACTED]

Email: [REDACTED]

www.derm.qld.gov.au

Department of Environment and Resource Management

Level 13

400 George Street, Brisbane Q 4000

GPO Box 2454, Brisbane Q 4001

From: Brown Damien

Sent: Monday, 6 December 2010 3:40 PM

To: [REDACTED]

CC: [REDACTED]

[REDACTED], Bradley John; [REDACTED]

Subject: FW: ENSHAM IN URGENT NEED OF ASSISTANCE

Importance: High

Peter

I thought it worth following up on the key points from our meeting today.

Ensham Resources (ER) intends to submit a draft Transitional Environmental Program (TEP) to DERM that would allow ER to discharge mine affected water outside its current Environmental Authority (EA) conditions. From the discussion today I think the key points for ER include;

- Keeping the submission and the discharge plan to a scale, based on ER's priorities, that will allow timely consideration;
- Specifying which conditions of the EA can't be complied with;
- Providing a clear and specific plan covering at least discharge locations, volumes, timeframes, criteria and importantly, monitoring that ER will undertake;
- Using all relevant information from post 2008, any data relating to those releases, and any relevant information from current toxicity studies to support the plan;
- Clearly stating information gaps and why they exist (inability to sample etc), using any available information to make an inference on those gaps;
- Stating any assumptions;

A key aspect of timely response to the submission of the draft TEP is that the better the case and the more "work" done by ER to support that case then the easier the assessment process is for DERM.

I understand from our discussion that DERM can expect ER's application tomorrow morning. If you need further information from DERM as you prepare the submission, please don't hesitate to contact, Ed Donohue, Regional Manager (4938 4584 or 0418 154 914), Joe Pappalardo, Regional Service Director (4967-0770 or 0418 882 569), or myself (details below).

2/11/2011

Regards

Damien Brown

Assistant Director-General

Regional Service Delivery

Telephone: [REDACTED]

Mobile: [REDACTED]

Email: [REDACTED]

www.derm.qld.gov.au

Department of Environment and Resource Management

Level 13

400 George Street, Brisbane Q 4000

GPO Box 2454, Brisbane Q 4001

From: Peter Westerhuis [REDACTED]
Sent: Monday, 6 December 2010 10:22 AM
To: Bradley John [REDACTED]
Cc: I [REDACTED]
Subject: ENSHAM IN URGENT NEED OF ASSISTANCE
Importance: High

Mr John Bradley – Director General
Qld. Dept. of Environment and Resource Management

Hi John

I hope you are well.

I am assuming that by now your staff will have alerted you to a very serious situation that is once again confronting the Ensham mine. Over the weekend we faced a very worrying flood inundation threat, following 2 days of torrential rain (up to 200mm) on Thursday and Friday in the Theresa Creek and Fairbairn Dam catchments. This was on top of already soaked ground and fully charged water storages. Ultimately the height of the flooded Nogoia River at Ensham reached a peak of 13.6 metres, only 0.9 metre below the January 2008 level. The new levees did their job, noting that their reconstruction is still not complete following many months of delay in the Land Court. The fact that some sections of the levees are not at ARI 1000 did cause some anxious moments over the weekend.

Anyway, the prognosis for Ensham at this time is not good, viz:

1. The flooded Nogoia River has made a section of our haul road impassible. This will make it impossible to haul coal from B Pit (about 30% of mine production) for an estimated 3 or 4 weeks;
2. All mining locations are under water as a result of inflows coming from the torrential rain over the mine on Thursday and Friday.....refer photos. It is

estimated that 1,000ML have entered the various mining locations this way, of which the majority is in mining areas on the Northern side of the flooded Nogoia River;

- 3. Consequently Ensham is unable to mine any coal. We have declared Force Majeure on all customers, a situation that will remain for as long as we have coal under water. There are many serious ramifications of this, one being we now have no revenue stream;
- 4. The majority of Ensham's water storage is on the Southern side of the Nogoia River where we are carrying in excess of 12,000 ML of water, of which approximately 9,000 ML is remnant water from the 2008 flood inundation. This storage is reaching its practical capacity and all other storage dams are operationally FULL. We are unable to make use of the major water storage on the Southern side of the river by transferring the water in the Northern mining areas due to the flooded Nogoia River which divides these areas;
- 5. It is inevitable that further rainfall in the coming weeks and months will further compound these difficult matters;
- 6. The significant flow occurring in the Nogoia River provides for the opportunity to virtually eliminate any risk of environmental harm occurring as a result of a release of water from the Ensham operation.

I have asked my people to obtain your Department's urgent cooperation to provide appropriate approval for Ensham to release a large volume of water via various drains and creeks at the mine surface that flow to the Nogoia River whilst this situation exists.

Ensham fully accepts any requirements around monitoring, measuring and reporting that would need to be imposed on us. I would be happy for Ensham staff to take instructions from DERM staff with respect to these things.

I am hoping that you can offer some urgent assistance here. I will call you later today, after you have had some time to contemplate this matter. Alternatively I would be happy to wander up to your office to give you a personal briefing, just let me know.

Kind Regards,

Peter Westerhuis
Chief Executive Officer
Ensham Resources

+-----+

Think B4U Print

1 ream of paper = 6% of a tree and 5.4kg CO2 in the atmosphere

3 sheets of A4 paper = 1 litre of water

+-----+



[REDACTED]

Subject: FW: Ensham TEP release

----- Original Message -----

From: Bradley John [REDACTED]
To: Peter Westerhuis [REDACTED]
Cc: Brown Damien [REDACTED]
Sent: Fri Dec 10 19:43:36 2010
Subject: Ensham TEP release

Peter

For info, this is going out tonight from us re TEP approval. Thanks for your approach to working through issues this week.

Pls stay in touch as the operation gets underway if there are any issues or queries for Ensham,

Regards

John B

CLOSE WATCH TO BE KEPT ON ENSHAM MINE WATER RELEASE

The Department of Environment and Resource Management has today approved a request from Ensham Resources coal mine, near Emerald, to discharge mine affected water outside of its current Environmental Authority (EA) conditions. Ensham made the request so that it can resume its mining operations.

DERM Regional Services Director Central West Region [REDACTED] said the discharge would be closely monitored throughout the operation and the company was required to ensure there was no risk of environmental harm.

"Ensham has provided a clear and specific plan covering discharge locations, volumes, timeframes and monitoring requirements which will be undertaken during the discharge," [REDACTED] said.

"This Ensham water release is a much lower volume to the 2008 event when the mine released approximately 138,000 megalitres of water, at 2000 megalitres per day, compared with this latest release of approximately 3000 megalitres at 100 megalitres per day."

[REDACTED] said Ensham was permitted to release water from its open cut pit over a four week period while the Nogoa River was experiencing high flows providing significant dilution.

"The significant flow currently occurring in the Nogoa River provides the opportunity to dilute the released water, further eliminating the risk of any environmental harm or impacts on drinking water supplies, including the Rockhampton drinking water supply," he said.

Water will be released into Boggy Creek, which flows directly into the Nogoa River.

"The department will be conducting regular independent site inspections during the water discharge and Ensham is required to provide daily water quality monitoring to test for levels of Electrical Conductivity (EC), pH levels and turbidity," [REDACTED] said.

“Once a set EC level is reached, this will trigger a cease to the water discharge.”

██████████ said DERM was committed to protecting the quality of water in the Fitzroy Basin following concerns over water discharges in 2008.

“Companies can seek special approval to discharge outside of their normal authorities, but it is up to the companies to demonstrate there will not be any environmental harm,” he said.

“DERM and Ensham are working closely together to ensure that the relevant guidelines are being met during this controlled water release.

“If Ensham breaches the conditions set out by the department, appropriate action will be taken under the provisions of the Environmental Protection Act 1994.”

Ensham has notified potentially affected water users and landholders and local government authorities have also been made aware of the release and its water quality to avoid an impact on drinking water supplies.

Further information about Fitzroy Basin water quality is available at -
<http://www.fitzroyriver.qld.gov.au/>

+-----+
Think B4U Print
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3 sheets of A4 paper = 1 litre of water
+-----+

[REDACTED]

From: Peter Westerhuis [REDACTED]
Sent: Wednesday, 2 November 2011 2:58 PM
To: [REDACTED]
Subject: FW: Ensham Mine facing immediate and severe flood threat

From: Bradley John [REDACTED]
Sent: Friday, 31 December 2010 12:41 PM
To: Peter Westerhuis
Cc: [REDACTED] Brown Damien; Wall Terry; Best Debbie
Subject: Re: Ensham Mine facing immediate and severe flood threat

Peter

Thanks for this update and for Ensham's contribution to the enormous logistic effort currently underway.

Our staff are closely involved in the State Disaster Management arrangements and the CQ team are monitoring the mines situation.

I have copied in Debbie Best who is Acting Director General in my absence in NSW at present. I would appreciate it if you could continue to keep us posted.

If you need us urgently...Debbie's direct mobile number is [REDACTED] and Damien's is [REDACTED] (My number is [REDACTED]).

Thanks
John B

From: Peter Westerhuis [REDACTED]
Sent: Friday, December 31, 2010 10:48 AM
To: Bradley John
Cc: [REDACTED], Brown Damien
Subject: Ensham Mine facing immediate and severe flood threat

Hi John Bradley

I need to give you a heads-up regarding the situation at Ensham.

The situation at Ensham is not good - and is worsening. The new levees appear to be holding up OK but a threat of inundation is coming from the east. The levee at the adjacent Currimundi property collapsed at dawn, flooding the grain paddocks to the east of the Ensham light vehicle access road (on the right hand side as you drive to the mine office from the security gate). This water is now rising and pressing against Ensham's eastern levees. It is currently about 1m from the top. You will recall that Ensham was thwarted for many months in completing this levee to ARI1,000 by proceedings that were stuck in the QCAT process after two (2) distant landholders objected to the levee permit issued by the NRFPB. There is now a risk of over-topping or failure of this levee. Should that occur there is the risk of severe inundation of B pit (south of the Nogoia).

People and equipment have been fortifying this levee for several days and this work is continuing. However, it will likely get to a point that it is no longer safe to remain in the area so people and equipment will then need to be withdrawn.

2/11/2011

The situation is unpredictable. The swollen Comet River is exacerbating the effects of a rising Nogoia River and I suspect this has caused the Currimundi levee to be swamped.

Fingers are crossed - there ain't much more we can do. And the Nogoia is still rising, probably got another metre to go.

Peter Westerhuis
CEO
Ensham Resources

+-----+

Think B4U Print

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3 sheets of A4 paper = 1 litre of water

+-----+

[REDACTED]

From: Peter Westerhuis [REDACTED]
Sent: Wednesday, 2 November 2011 2:56 PM
To: [REDACTED]
Subject: FW: Ensham Update
Importance: High
Attachments: P1030498.JPG; P1030500.JPG; P1030504.JPG; P1030510.JPG; P1030512.JPG; P1030513.JPG; P1030514.JPG; P1030522.JPG; P1030523.JPG; P1030527.JPG; P1030528.JPG; P1030535.JPG; P1030539.JPG; P1030542.JPG; P1030543.JPG; P1030544.JPG

From: Peter Westerhuis
Sent: Friday, 31 December 2010 8:44 PM
To: [REDACTED]
Subject: Ensham Update

Importance: High

Good Evening

By way of update at Ensham.....

The situation at Ensham Mine is finely balanced but calm. The Nogoia River at Ensham/Duckponds is 14.93m and still rising, but the rate of increase is tapering off. We are already about 0.5m higher than the Jan 2008 peak. Difficult to predict but it looks like we may get to 15.3m, perhaps 15.5m tomorrow around midday. Fortunately the Comet River is falling which will ease the holdback.

The new levees appear to be holding up satisfactorily and it also looks like the fortification work on the east levees is working. If we can get thru the next 6 to 12 hours I think we will have seen the worst of it. However we do still remain at risk of a catastrophic levee failure until the Nogoia has substantially subsided. This is because structures have been stressed and remain under static and dynamic loading.

The attached photographs, taken about 3 to 4 hours ago depict the situation on the ground:

- 498 - Haulroad Ramp 3
- 500 - Ramp 3 levees
- 504 - Red hill - working as part of the levee
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- 523 - B pit east levee
- 527 - Curramundi - flood water in cotton crop
- 528 - Curramundi
- 535 - Curramundi
- 539 - Ensham haul road looking north

2/11/2011

542 - Water against B pit east levee

543 - Access road looking north

544 - Forification of B pit east levee

Unless something unexpected or dramatic happens you won't hear from me until 2011. Meanwhile I just might leave that bottle of Veuve Clicquot on ice for another 24 hours before I slip the cork out.

Kind Regards,

Peter Westerhuis

[REDACTED]

From: Peter Westerhuis [REDACTED]
Sent: Wednesday, 2 November 2011 2:56 PM
To: [REDACTED]
Subject: FW: Ensham Update

From: Peter Westerhuis
Sent: Saturday, 1 January 2011 8:18 PM
To: [REDACTED]
Cc: [REDACTED]
Subject: RE: Ensham Update

Good Evening

Ensham update.....

I can confirm that the Nogoia River at Ensham/Duckponds is, as expected, starting to slowly recede and at 1900 hrs was 14.88m, coming off the peak of 15.03m recorded yesterday morning.

Conditions at Ensham look satisfactory and all levees and fortifications appear to have held up well. Although this is very much a relief I will refrain from declaring the current flood threat over. Until the Nogoia has subsided further there remains the risk of an unexpected levee failure. This is because the structures have been stressed and remain under pressure. Current river height still exceeds the 2008 peak.

Watch this space.

Kind Regards,

Peter Westerhuis

From: Peter Westerhuis
Sent: Fri 31/12/2010 8:43 PM
To: [REDACTED]
Cc: [REDACTED]
Subject: Ensham Update

Good Evening

By way of update at Ensham.....

The situation at Ensham Mine is finely balanced but calm. The Nogoia River at Ensham/Duckponds is 14.93m and still rising, but the rate of increase is tapering off. We are already about 0.5m higher than the Jan 2008 peak. Difficult to predict but it looks like we may get to 15.3m, perhaps 15.5m tomorrow around midday. Fortunately the Comet River is falling which will ease the holdback.

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Kind Regards,

Peter Westerhuis

[REDACTED]

From: Peter Westerhuis [REDACTED]
Sent: Wednesday, 2 November 2011 2:56 PM
To: [REDACTED]
Subject: FW: Ensham Update
Attachments: P1030695.jpg; P1030699.jpg; P1030703.jpg; P1030719.jpg; P1030751.jpg; P1030780.jpg

From: Peter Westerhuis
Sent: Sunday, 2 January 2011 9:30 PM
To: [REDACTED]
Cc: [REDACTED]

Subject: Ensham Update

Good Evening

The Nogoia River at Ensham remains stubbornly high at 14.4m at 1900 today (about same level as January 2008 peak), but is falling slowly. There have been no unexpected incidents and on the basis the situation remains stable I have authorised the walking of Draglines back into working areas tomorrow. Coal mining is likely to resume in 2 or 3 days.

I try not to think about the fact we have 2 or 3 months of wet season still ahead of us.

Anyway, for now thank you for your enquiries as to our status, your offers of assistance and your support. These things I & other Enshamites do value very much and do not under-estimate.

Some parting photographs, taken this afternoon, illustrating current physical conditions.

695 – Temporary raising of east levee has worked

699 – Currimundi crops devastated. Landholder Carl Morawitz has asked for Ensham assistance to drain water & place temporary embankments. Ensham is obliging him with two (2) bulldozers going to work on his property today. He is doing it tough.

703 – More Currimundi wipe-out

719 – The 1st Currimundi breach, still taking flood water. Also illustrates the fortified east levee.

751 – Dragline 4 being prepared to walk back into R81.....tomorrow.

780 – C/D pit levee at Ramp 3.....looks good.

Hopefully you won't hear from me again, not about this stuff anyway.

Kind Regards,

Peter Westerhuis

From: Peter Westerhuis
Sent: Sat 1/01/2011 8:17 PM
To: [REDACTED]
Cc: [REDACTED]

Subject: RE: Ensham Update

Good Evening

Ensham update.....

I can confirm that the Nogoia River at Ensham/Duckponds is, as expected, starting to slowly recede and at 1900 hrs was 14.88m, coming off the peak of 15.03m recorded yesterday morning.

2/11/2011

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Watch this space.

Kind Regards,

Peter Westerhuis

From: Peter Westerhuis

Sent: Fri 31/12/2010 8:43 PM

To: [REDACTED]

Cc: [REDACTED]

Subject: Ensham Update

Good Evening

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The situation at Ensham Mine is finely balanced but calm. The Nogoia River at Ensham/Duckponds is 14.93m and still rising, but the rate of increase is tapering off. We are already about 0.5m higher than the Jan 2008 peak. Difficult to predict but it looks like we may get to 15.3m, perhaps 15.5m tomorrow around midday. Fortunately the Comet River is falling which will ease the holdback.

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Kind Regards,

Peter Westerhuis

[REDACTED]

From: Peter Westerhuis [REDACTED]
Sent: Wednesday, 2 November 2011 2:57 PM
To: [REDACTED]
Subject: FW: Ensham water release

From: Peter Westerhuis
Sent: Monday, 3 January 2011 9:35 AM
To: [REDACTED]
Cc: [REDACTED]
Subject: Ensham water release

Hi John Bradley and Damien Brown

Ensham continues to discharge water under the conditions of our present TEP and will continue to do so for some time.

I understand you are aware also of the water that currently resides in A Pit and A Pit-south. Total volume is approximately 12,000ML of which 9,000ML is 2008 remnant flood water with the balance accumulated since that time. The water is saline (up to 11,000 EC) but has no other contaminants. This water has long ago become a debillitating factor in Ensham's operations, for a number of reasons:

1. The wall structure separating the A pit water storage from operational B pit is a major safety concern. Wall failure would inundate B pit and potentially subject coalminers and equipment to the risk of an inrush. Many safeguards are in place (geotechnical inspections, radar wall movement detection, surveys, restricted blasting etc) but nevertheless failure of the wall remains a risk.
2. It is preventing us from accessing lower strip ratio coal in that area of the mine and hence is increasing our marginal cost of production.
3. A pit quality coal is necessary for several customer blends and we are ham-strung without it.
4. The inability to mine A pit is preventing us from obtaining sufficient strike-length for all draglines. It is highly probable that this will cause Ensham to stand-down one (1) dragline in 2011.
5. If we have any more localised rain events like early December then we will be completely out of storage capacity and run the risk of uncontrolled discharges.
6. Several times in December extra-ordinary flows in Corkscrew Creek presented a risk of breaching into A Pit-south. We have placed temporary embankments but need to replace these with purpose built defenses, something that can't be done effectively whilst these coal mining areas are being used for water storage.

Several months ago Ensham commenced the process of obtaining permitted authority to release this water under strictly controlled conditions. I am not sure if this is taking us down the path of an EA amendment or a TEP. In any case I have tasked [REDACTED] with the job of greatly expediting this work. Right now Ensham has a Sydney Harbour's worth of water flowing through it every two days. It makes sense from every possible angle that we commence the release of this water at a rate of 300ML/day into this enormous flow immediately.

The impact on the milieu of releasing this water over the next few months would be less than negligible and doing so would therefore be a very sensible and responsible decision.

The purpose of contacting you about this now is to ask you to brief your staff so that when CM and/or NB contact some of them in the next few days then hopefully we can be assured of their good guidance and assistance.

Kind Regards,

Peter Westerhuis
Chief Executive Officer
Ensham Resources

Our ref: 1751155

14 October 2011

RECEIVED

E-MAILED	
Date 14/10	By LM

BY:.....

[REDACTED]
Special Counsel
Clayton Utz
GPO Box 55
BRISBANE QLD 4001

Dear [REDACTED]

Requirement to Provide Statement returnable 26 October 2011

Please find enclosed a Requirement to Provide Statement directed to Mr Pier Westerhuis, Ensham Resources Pty Ltd.

The material is returnable to the Commission no later than 4 pm, Wednesday, 2 November 2011.

If you require further information or assistance, please contact Ms [REDACTED] on telephone 3 [REDACTED]

We thank you for your assistance.

Yours sincerely

[REDACTED]
Jane Moynihan
Executive Director

Encl.

Our ref. Doc 1751050

14 October 2011

Mr Pier Westerhuis
Chief Executive Officer
Ensham Resources Pty Ltd
GPO Box 814
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 Pier Westerhuis to provide a written statement, under oath or affirmation, to the Queensland Floods Commission of Inquiry, in which the said Pier Westerhuis gives an account of:

1. any communication by the then Environmental Protection Agency ('EPA') to Ensham Resources' of the reasons behind granting Ensham emergency directions after flooding in 2008 (refer to paragraph 81 of Mr Brier's statement to the Commission on Ensham mine)
2. with respect to the declaration by the Deputy Premier of Ensham mine as a Prescribed Project under the State Development and Public Works Organisation Act 1971 after the 2008 flooding:
 - a. whether Ensham sought that declaration
 - b. the process by which that declaration was made
 - c. the reasons for that declaration
 - d. what the practical effect of that declaration was
3. why approvals to upgrade the levees were sought from both the Department of Environment and Resource Management ('DERM') and the Nogoa Flood Plain Board
4. Ensham's discussions and negotiations, if any, with DERM regarding Ensham's concerns that the 2009 Fitzroy model conditions would restrict the release of water from the mine even in high flow events for which dilution would prevent environmental harm occurring (refer to paragraph 9(d) of Mr Westerhuis' second statement) and:
 - a. DERM's response to Ensham's view about the restrictions imposed by the 2009 Fitzroy model conditions

- b. any scientific studies available to Ensham which supported its view
- 5. Ensham's discussions and negotiations, if any, with DERM regarding the insertion of a wet weather release provision into its environmental authority
- 6. Ensham's view as to the ability of the new Fitzroy model conditions negotiated throughout 2011 to:
 - a. assist in water management at mines
 - b. remove or decrease the need for transitional environmental programs during wet seasons

(Refer to attachment MFB-06-24b to Mr Birchley's statement)

- 7. with reference to Table 4 on page 4 to 7 of the new Fitzroy model conditions negotiated throughout 2011:
 - a. whether a table of that sort would be usefully inserted into Ensham's environmental authority
 - b. whether there are reasons militating against the introduction of such a table in water management, and if so, what
 - c. whether there are particular circumstances in which the table proposed would not assist in, or would impeded, water management, and if so, what
 - d. whether Ensham would be able to provide DERM with scientific studies to support the figures to be inserted into that table
- 8. with respect to applications made by Ensham for amendments to the terms of its transitional environmental program in January 2011:
 - a. why were those amendments necessary
 - b. if the higher release volumes and higher electrical conductivity limits were not likely to cause environmental harm, why were those higher limits not applied for by Ensham in the original transitional environmental program application
- 9. what Ensham's plans were to dewater the pit leading up to the 2010/2011 wet season
- 10. Ensham's plans to dewater the pit in the long term, including:
 - a. whether Ensham plans to take advantage of rainfall during the 2011/2012 wet season to release further water
 - b. if so, whether that is planned to be undertaken under a transitional environmental program

- c. why dewatering cannot be done by releasing in accordance with the environmental authority
 - d. whether or not Ensham considers that the new Fitzroy model conditions will assist Ensham to dewater the pits fully, and why (refer to paragraph 77 of Mr Brier's statement to the Commission on Ensham mine)
11. the environmental impacts of releasing water that was in the Ensham mine pits from the 2008 floods, during the 2010/2011 wet season, including:
- a. the deterioration of the quality of that water
 - b. a comparison, if Ensham has performed one, of the environmental impacts of the release in 2010/2011 versus a continued release in 2008/2009
12. the basis of the contention that reverse osmosis desalination and the use of evaporation ponds are economically unviable or are inappropriate because of the creation of large quantities of brine at Ensham mine (refer to paragraph 60 of Mr Westerhuis' second statement)
13. details of all contact between Mr Pier Westerhuis and Mr John Bradley during the period 1 October 2010 to 31 July 2011 regarding water management at mines.

In addressing these matters, Mr Westerhuis 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 Westerhuis 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 4pm, Wednesday 2 November 2011.

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



Commissioner
Justice C E Holmes



Ensham

R E S O U R C E S

ENSHAM
RESOURCES
PTY LIMITED

ABN 23 011 048 678

As Operator of the
Ensham Coal Project

Level 18, AMP Place
10 Eagle Street
GPO Box 814
Brisbane Qld 4001
Australia

Telephone:
+61 7 3221 1201

Facsimile:
+61 7 3221 1225

Website:
www.ensham.com.au

The Ensham Coal Project
is a joint venture of the
following companies which
are liable severally in the
following proportions:

Bligh Coal Limited
ABN 20 010 186 393
47.5%

Idemitsu Australia
Resources Pty Ltd
ABN 45 010 236 272
37.5%

J-Power Australia Pty Ltd
ABN 59 002 307 682
10.0%

LG International
(Australia) Pty Limited
ABN 12 002 806 831
5.0%



A
COAL
FUND COMPANY

Environment Protection Agency
Emerald Office
PO Box 906
EMERALD QLD 4720

1 February 2008

Attention: [REDACTED]

Dear [REDACTED]

Further to our meetings on 29 and 30 January and site visit on 31 January, this letter seeks approval for an Emergency Direction to enable the immediate commencement of dewatering of open cut pits filled with flood water at the Ensham Mine. It is understood that the emergency direction would remain active until a Transitional Environmental Program for the dewatering operations in place.

This letter provides a description of the proposed dewatering works that are not strictly in accordance with current mine Environmental Authority discharge conditions. It explains how the potential water quality impacts of the dewatering operations will be managed and monitored to ensure that no adverse impacts occur.

Dewatering South of the Nogoia River (A Pit and B Pit)

Stage 1 – Excavated Drainage Channels for the Top 5 m of pit water

It is proposed to drain the top 5 m of water from the pits by excavating an engineered channel to a lower drainage discharge point that will drain back to the Nogoia River main channel. This is subject to the water level reached after natural outflow has ceased. There are two route options for this drainage channel (Figure 1). The first option involves the excavation of a channel from Ramp 24 through the haul road to Old Winton Creek. This option will require the permission of the neighbouring landowner and the point of discharge is indicated in Figure 3.

The excavated channel will be designed by an experienced hydraulics engineer so that the flow rate and velocity of discharge water is controlled to ensure that there is no flooding or scouring due to the drainage water. The channel flow rate will be designed to be within the capacity of the channel of Old Winton Creek to ensure that there is no downstream flooding. The flow rate of the drainage channel will be controlled by the



geometry of the excavated drainage channel (depth, cross-section and grade). Scour protection in the form of rock armouring will also be provided where necessary to ensure that the channel is protected from scouring and the channel geometry and flow rate control is maintained. Dependent on the capacity of Old Winton Creek, the drainage channel may be constructed progressively in stages to ensure the discharge flow volume and velocity is controlled. This would involve progressively increasing the channel depth to limit the head of water dictating the discharge flow rate, at any time.

Potential for scouring in Old Winton Creek will be assessed by the engineer prior to the commencement of discharge and additional scour protection will be installed if necessary. This may take the form of a series of rock weirs that would act as energy dissipaters to control flow velocity.

The second option will be considered in the event that landowner agreement is not obtained for discharge via Old Winton Creek. It would involve excavating a channel from Ramp 26 to the haul road and utilising the haul road drains to convey water to the Nogoia River. The approach, as described above, would be utilised to control discharge flow rate, velocity and potential scouring.

The discharge works will be supervised by an experienced hydraulics engineer to ensure that adjustments can be made, as necessary, during the discharge event to manage any unexpected adverse impacts. Excess fill material and large earthmoving equipment (large bulldozers and excavators) will remain on standby adjacent to the discharge channel to enable the channel to be closed, and discharge to cease, in the event that any unforeseen adverse impacts arise during discharge. An indicative typical section for the excavated channels (subject to site specific engineering assessment of geometry) is shown in Figure 2.

Pit water quality (pH, EC and TSS) will be monitored prior to the commencement of discharge and twice daily during the discharge event. Water quality will be monitored in the pit adjacent to the discharge point and in the Nogoia River at an accessible location downstream of the point where the discharge enters the river channel. Monitoring will also continue at the upstream and downstream compliance points in the Nogoia River, specified in the Environmental Authority. Pit water will not be discharged if it is in excess of the water quality limits specified in the Environmental Authority or if it is more than 10% above the TSS levels in the river.

Stage 2 and 3 Pumping

Concurrent with stage 1 dewatering, high capacity pumps will be installed to dewater the remainder of the pits. Ensham is obtaining a fleet of pumps with a total dewatering



capacity of up to 25 m³/s (2,000 ML/day) to ensure the pits can be dewatered before the quality of the contained floodwater adversely deteriorates.

The potential discharge flow routes are via Old Winton Creek and via Winton Creek or an alternative established drainage gully (Figure 3). Scour protection will be installed in the drainage paths from the pit to the river as necessary. An experienced hydraulics engineer will inspect the drainage paths prior to the commencement of pumping and will assess the need for scour protection taking into account the pumping rate. The drainage paths will be continuously monitored during pumping. If any unexpected scouring occurs, pumping will cease and scour protection will be installed. Indicative arrangements for scour protection for the pump discharge points and scour protection of drainage paths (subject to site specific engineering assessment) are shown in Figure 2.

Discharge water quality monitoring will be as for the stage 1 works, described above and locations indicated in Figure 3.

Once the dewatering operations are completed the drainage paths used to convey discharge water to the river will have temporary scour protection removed and will be rehabilitated.

Dewatering North of the Nogoia River (C Pit and D Pit)

There are two options for Stage 1 dewatering north of the river. These are an excavated channel from the C Pit highwall to a gully draining to the anabranch or a channel from Ramp 4 to the existing drainage system to Boggy Creek (Figure 1). The channel in the highwall would be in fresh rock and is not likely to be susceptible to scouring. Again, the excavation of this channel will depend on the water level after natural drainage has ceased.

The same approach, described above, would be adopted for the construction and operation of the discharge channels to ensure that there is no adverse water quality impacts, scouring or flooding due to the stage 1 discharge.

Stage 2 pumping will be conducted either using the same drainage paths as the stage 1 excavated channels or the existing network of pit dewatering drains and sediment dams draining to Boggy Creek and the Nogoia Anabranch (see Figure 4). The flow capacity and scour protection of the latter would be upgraded as necessary following engineering assessment.



Management and Supervision of the Works

We are confident that the proposed management measures and controls outlined in this letter effectively address all of the issues raised in our meetings. With these management measures in place we are confident that the pit dewatering operations can be conducted without any adverse impacts.

Please note that the nature of the dewatering operations are such that they will require a degree of operational flexibility in order to cater for the varying site and operating conditions that will occur during the progress of the dewatering operations. Consequently the type and locations of pumps and excavated channels will need to be changed to suit changing site and operational conditions.

Ensham Resources is committed to managing the dynamic nature of the dewatering operations in accordance with the commitments in this letter and to the satisfaction of the EPA. To that end Ensham will provide comprehensive daily reports on the dewatering operations detailing the location of channels, pumps and discharge flows, discharge flow rates and monitoring results. EPA officers and advisors are also invited to inspect the dewatering operations at any time subject to the necessary site safety induction requirements.

Please contact me on [REDACTED] or [REDACTED] should have any queries in relation to this application letter.

Yours faithfully

[REDACTED]
Manager Projects and Environment

Attachment: Figure 1
Figure 2
Figure 3
Figure 4

Excavation Of Drainage Channels to Nogoia River

Proposing Flood Risk Abatement to Nogoia River via Temporary Channel

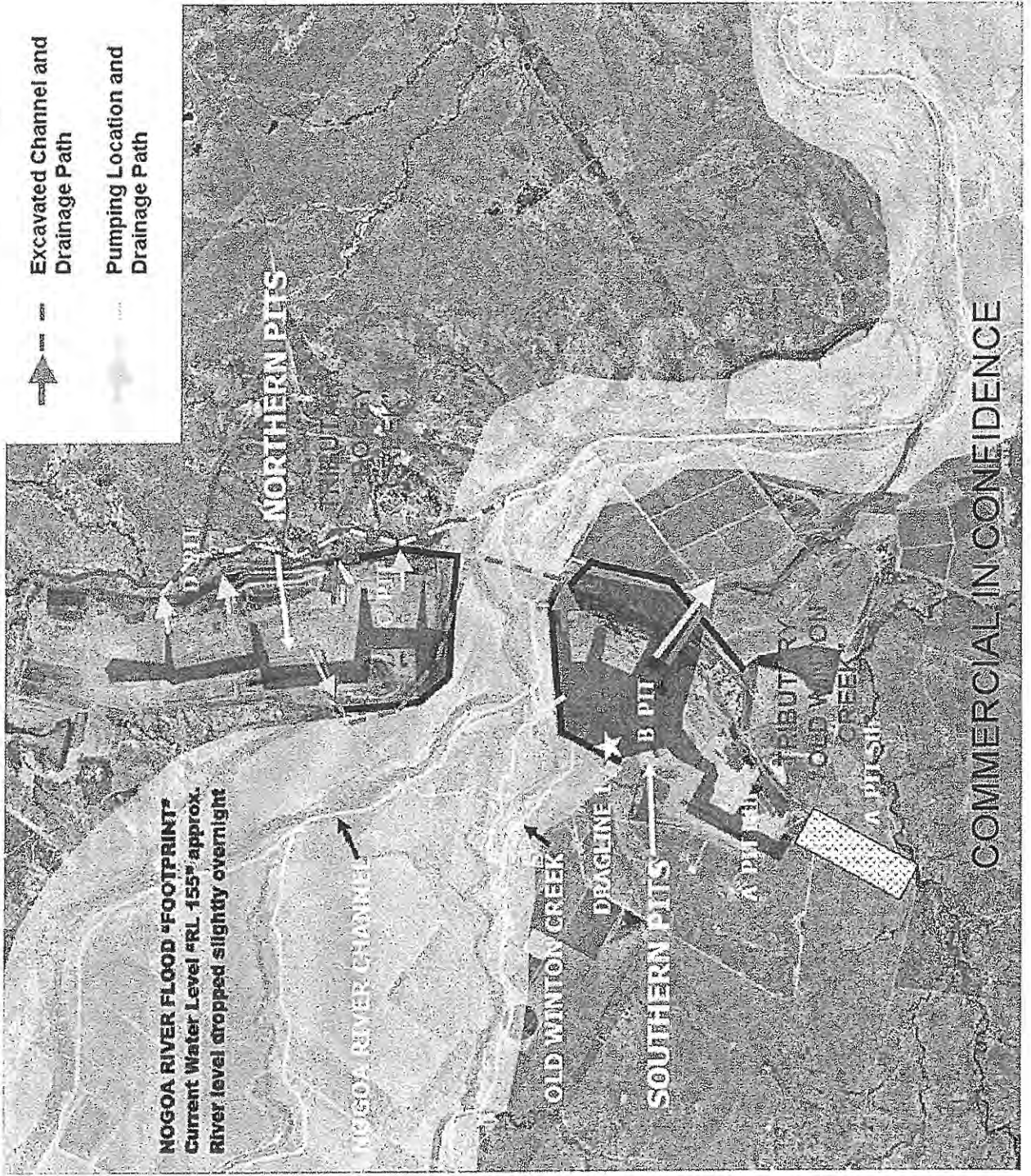
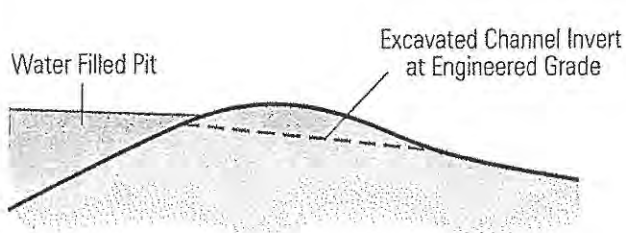
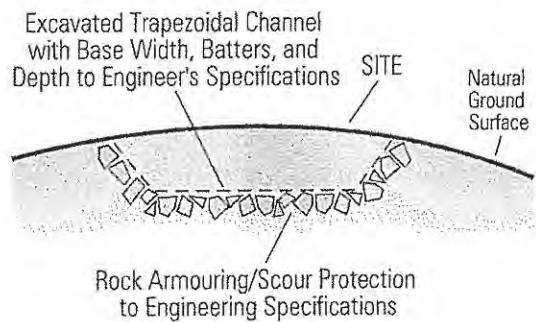


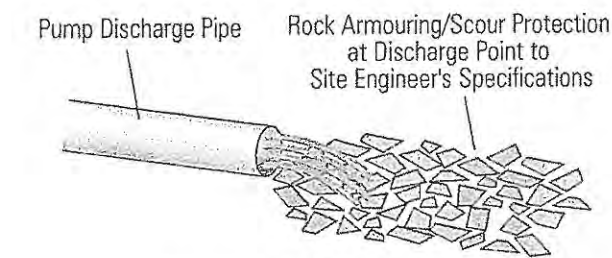
Figure 1



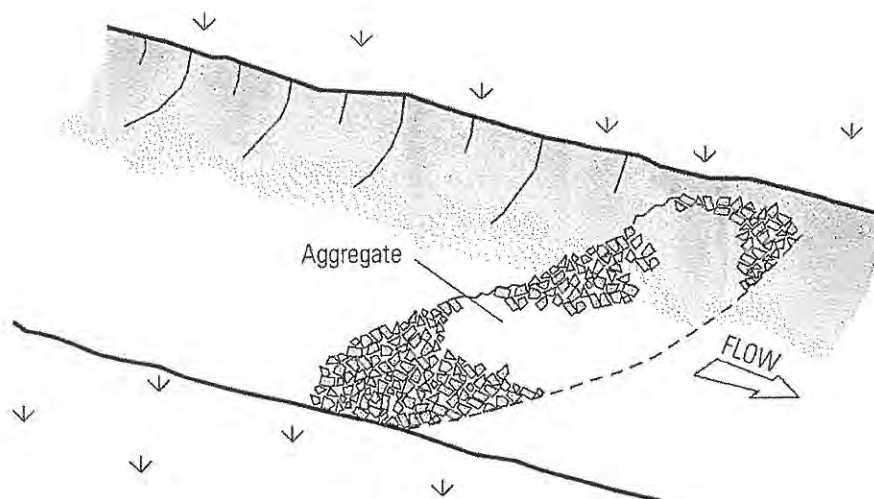
LONG-SECTION
(Not to scale)



CROSS-SECTION
(Not to scale)



**PUMP DISCHARGE POINT
SCOUR PROTECTION INDICATIVE ARRANGEMENT**
(Not to scale)



**DRAINAGE FLOW PATH
VELOCITY/SCOUR CONTROL**
(Not to scale)

FIGURE 3: B PIT DISCHARGE POINTS
1,000ML/day

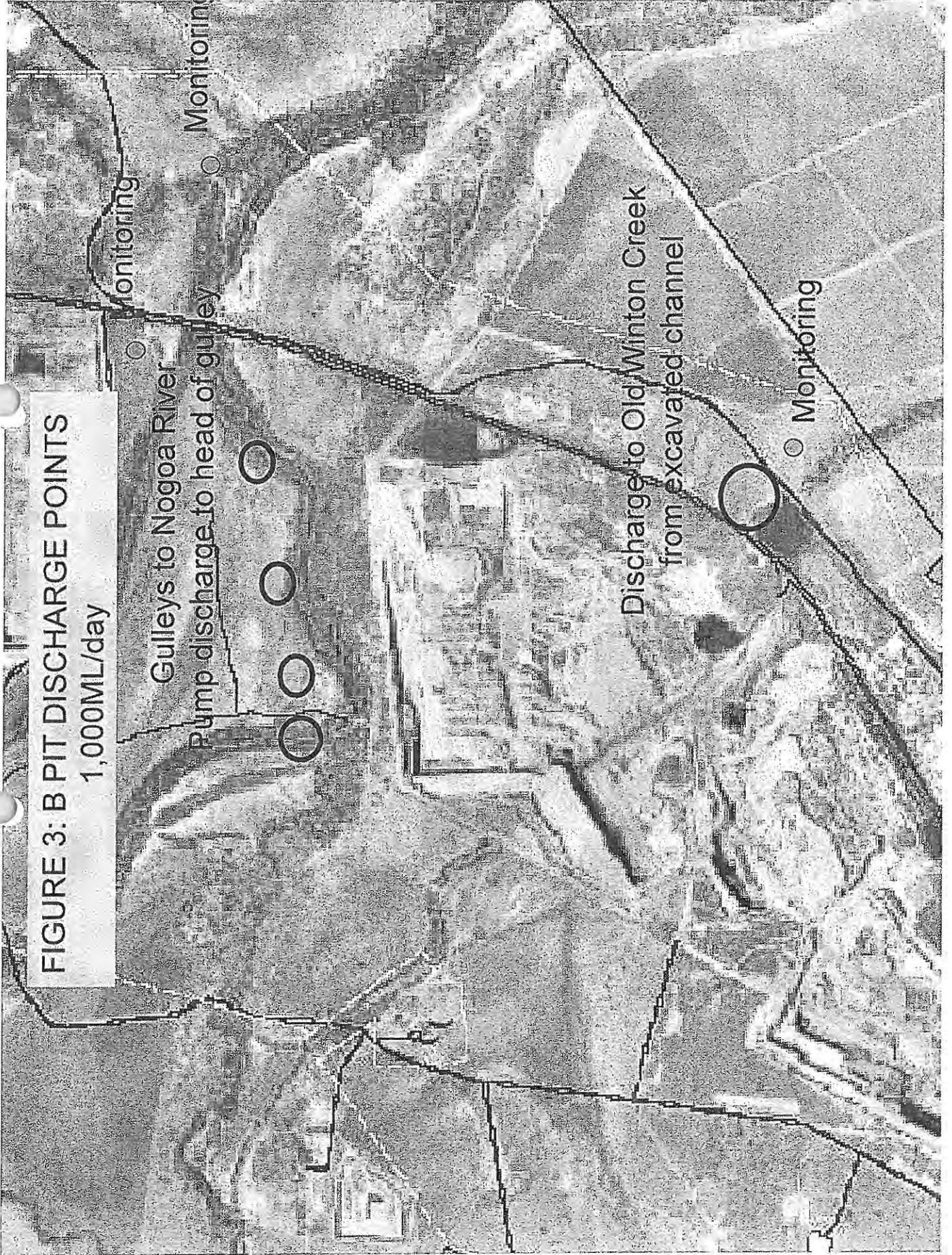


FIGURE 4: D PIT DISCHARGE POINTS
1,000ML/day





Enquiries
Telephone: [REDACTED]
Your reference: Ensham Coal Mine
Our reference: EMD6-11

1 February 2008

Environmental Protection Agency
Incorporating the
Queensland Parks and Wildlife Service

[REDACTED]
Manager Project and Environment
PO Box 1565
EMERALD QLD 4720

**RE: Emergency direction to discharge from mining pits B,C and D on ML7459
Ensham Coal Mine**

The Environmental Protection Agency (EPA) refers to meetings undertaken in Brisbane on 29 and 30 January 2008 between [REDACTED] from Ensham Resources Pty Ltd and Jon Womersley, [REDACTED] and [REDACTED] from the Environmental Protection Agency (EPA), and a site visit undertaken by [REDACTED] from the EPA on 31 January 2008, and supporting information provided to the EPA by [REDACTED] on 1 February 2008, regarding permission to discharge mine affected water from mining pit B on the southern side of the Nogoa River, and mining pits C and D on the northern side of the Nogoa River located on ML7459.

The EPA hereby issues an Emergency Direction to Ensham Resources Pty Ltd to discharge mine affected water from mining pits B, C and D located on ML7459. The EPA considers the request to issue an emergency direction to discharge the mine affected water is:

- necessary and reasonable because it is an emergency; and
- there are no practicable alternatives to the removal of river water that has inundated the affected mining pits.

Accordingly, the following is authorised under s468 of the *Environmental Protection Act 1994*:

Pit B dewatering south of Nogoa River

- Subject to landholder permission, mine affected water may be released via an engineered channel excavated from pit B, ramp 24, through the eastern haul road to the former tributary of Old Winton Creek; or
- In the absence of landholder permission, mine affected water may be released via an engineered channel excavated from pit B, ramp 26, running parallel to the haul road, and conveyed to the Nogoa River utilising existing haul road drains; and
- Concurrently with dot point one or two above, mine affected water may be released from pit B via high volume pumps to the excavated channel joining the former tributary of Old Winton Creek, Winton Creek and the head of a series of three gullies flowing into the Nogoa River.

Pits C and D dewatering north of Nogoa River

- Mine affected water may be released via an engineered channel excavated from the pit C highwall and conveyed to the anabranch of the Nogoia River via an existing gully; or
- Mine affected water may be released via an engineered channel excavated from pit C, ramp 4 and conveyed to Boggy Creek via the existing drainage system; and
- Concurrently with dot points one or two above, mine affected water may be released from pits C and D via high volume pumps to the Nogoia River anabranch and Boggy Creek.

The discharge of mine affected water must be in accordance with the following conditions:

- All reasonable and practicable measures must be implemented to minimise scour, erosion or flooding from the excavated channels and drainage flow paths;
- If unexpected scour, erosion or flooding from an excavated channel or drainage flow path occurs, releases of contaminated water must immediately cease and appropriate scour protection and flow velocity controls must be installed;
- The mine affected water proposed to be discharged must be monitored at its point of origin in pits B, C and D and downstream of its discharge point into Old Winton Creek, Boggy Creek, Nogoia River anabranch, and the Nogoia River.
- Water quality must also be monitored at the upstream and downstream lease boundary Nogoia River compliance points 1 and 2 specified in Schedule C - Table 1 (Water monitoring locations and frequency) of Environmental Authority MIM800086202;
- Water quality must be monitored twice daily at each point of origin and downstream location during the discharge events, and discharge must immediately cease if the quality of water exceeds the limits for pH, EC and TSS specified in Schedule C - Table 2 (Receiving water contaminant limits) of Environmental Authority MIM800086202, or is more than 10% above the TSS level at the upstream lease boundary Nogoia River compliance point 2;
- The discharge of contaminated water via engineered channels and high volume pumps from pits B, C and D is authorised until **15 February 2008**;
- No other discharges are authorised under this Emergency Direction; and
- A copy of a Temporary Environmental Program to replace the Emergency Direction and an amended Plan of Operations to accommodate the works proposed must be submitted to the EPA by **15 February 2008**.

If you have any questions regarding this emergency direction, please contact [REDACTED]

Yours sincerely

[REDACTED]
District Manager



Ensham

R E S O U R C E S

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ENSHAM
RESOURCES
PTY LIMITED

ABN 23 011 048 678

As Operator of the
Ensham Coal Project

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Website:
www.ensham.com.au

The Ensham Coal Project
is a joint venture of the
following companies which
are liable severally in the
following proportions:

Bligh Coal Limited
ABN 20 010 186 393
47.5%

Idemitsu Australia
Resources Pty Ltd
ABN 45 010 236 272
37.5%

J-Power Australia Pty Ltd
ABN 59 002 307 682
10.0%

LG International
(Australia) Pty Limited
ABN 12 002 806 831
5.0%



A
COAL
FUEL COMPANY

9 April 2008

The Honourable Paul Lucas, MP
Deputy Premier and Minister for Infrastructure and Planning
GPO Box 2644
Brisbane QLD 4001

Dear Mr Lucas

Prescribed Project Status: Ensham Recovery Project

Ensham Resources Pty Ltd (Ensham) is the Operator of the Ensham 8.5 Mtpa opencut export thermal coal Mine, near Emerald in Southern Bowen Coal Basin.

On 19 January 2008 and afterwards, the Emerald region experienced unprecedented, massive flooding. The inundation overwhelmed and destroyed the flood protection levees at Ensham Mine and filled B Pit and C/D Pit with around 110,000 megalitres of water, rendering these Pits inaccessible for mining and unprotected from further, even minor, weather events.

These pits are the source of high quality, low ash coal feedstock from the Mine. Their unavailability prevents the Mine accomplishing the necessary blends with coals from other Pits in the Mine, as needed to meet customer specifications. In turn, this inability places at risk the coal production, sales contracts, revenues, State royalties, GOC fees, and regional contributions including the extended employment of around 3,000 people which rely on the Ensham Mine.

The Ensham Recovery Project is a A\$269 million ($\pm 30\%$, P₅₀) project to reinstate the capabilities and capacities of the Ensham Mine, which currently are seriously downgraded by more than 50%.

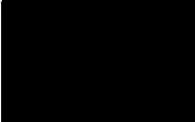
The Project includes dewatering the flooded Pits, recovering an inundated dragline and minimising the risk of further flooding by reinstating or constructing replacement flood protection levees around the Ensham Mine.

Ensham has experienced difficulties in procuring the multiple approvals required to restore the flood protection levees. In particular, the necessary approval from the Nogoa River Flood Plain Board, a joint local government entity, has stalled because of the recent local government elections. Further, as a small part of the flood protection levees are outside the Mining Lease although still on Ensham land, multiple agencies have jurisdiction for the required approvals.

Ensham now seeks your support to progress the required approvals to proceed with the Ensham Recovery Project as a matter of urgency. In particular, given the likely delay associated with the reconstitution of the Nogoa River Flood Plain Board and the importance of commencing the Ensham Recovery Project to the region, Ensham is seeking your support to declare this project as a prescribed project under Part 5A of the *State Development and Public Works Organisation Act 1971*. All relevant State Government and Local Government agencies support this request.

We have attached a detailed submission for your consideration and look forward to your reply.

Yours faithfully
for Ensham Resources Pty Ltd



Chief Executive Officer

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SUBMISSION TO DEPUTY PREMIER

PRESCRIBED PROJECT STATUS: ENSHAM RECOVERY PROJECT

EXECUTIVE SUMMARY

1. Submission

- 1.1 That the Ensham Recovery Project is declared a prescribed project under Part 5A of the *State Development and Public Works Organisation Act 1971 (SDPWO Act)*.

2. Issues

- 2.1 Ensham Resources Pty Ltd ("**Ensham**") is the Operator of the Ensham Coal Project, near Emerald in Queensland. In normal operation, the Mine produces around 8.5 Mtpa of (mainly) high grade **thermal coal** for export markets. Ensham Mine supports around 3,000 jobs in Queensland.
- 2.2 The Ensham Mine was inundated by extensive regional flooding in the Nogoa River Flood Plain on 19 January 2008. The flooding overwhelmed and destroyed the flood protection levees at the mine and rendered B Pit and C/D Pit flooded, inaccessible and unprotected. The flood also engulfed Ensham Dragline #1. This 3,000 tonne excavating machine valued at A\$110 million is used to remove overburden and uncover coal.
- 2.3 Coals from B Pit and C/D Pit are essential high quality blend ingredients required to meet customer specifications by blending with coals from other Ensham Pits. Without B Pit and C/D Pit coals, Ensham was forced to declare Force Majeure on its Sales Contracts to Customers in Japan, Taiwan, Malaysia, India and Korea until Recovery is well advanced. Sales Contracts will be lost as soon as Customers can find alternative supplies. Markets are tight, so some lesser grade coals can still be sold, with difficulty.
- 2.4 The Ensham Recovery Project is a project to reinstate the mine, including to dewater the flooded Pits and reinstate or construct replacement flood protection levees for the Mine. As at Friday 4 April 2008, Ensham has already spent or committed A\$36 million to mine recovery activities including dewatering and preparations for dragline repairs. These are the first steps in the Ensham Interim Project Execution Plan in which a P₅₀ cost estimate of A\$269 million ±30% has been identified for the Project.
- 2.5 Ensham is seeking the assistance of the Department of Infrastructure and Planning to facilitate the Ensham Recovery Project by ensuring that the required approvals are obtained in a timely manner. In particular, Ensham is requesting that the Ensham Recovery Project is declared a prescribed project under Part 5A of the SDPWO Act.
- 2.6 A prescribed project declaration enlivens a range of powers which may be used by the Coordinator-General to minimise unreasonable delays in statutory approvals required for the project and allow reinstatement of the mine as quickly as possible.

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- 2.7 The Ensham Recovery project is economically and socially significant to the region. It is critical that approvals for the project are progressed urgently as:
- (a) the flood damage has destroyed the existing levees at Ensham Mine. The Mine remains at risk without flood protection against even minor weather events. In turn, this puts even further at risk the Ensham supplies to Customers and the Ensham contribution to both the Queensland State economy and Central Queensland regional economy and the employment of around 3,000 people.
 - (b) Based upon lost production of four million tonnes of coal before mitigation, there will be a revenue shortfall of \$380 million for Ensham and subsequent royalties/revenue shortfall for State of \$49 million, arising from the flood event on 19 January 2008. These amounts may rise with rising prices.
- 2.8 Ensham has experienced difficulties in procuring the multiple approvals required to restore flood protection. In particular the necessary approval from the Nogoa River Flood Plain Board has stalled because of the local government elections. Further, as a small part of the B Pit levee (120 metres in length) is outside the mining lease, multiple agencies have jurisdiction. All of the levees are contained on land owned by Ensham.
- 2.9 The Ensham Recovery Project has a capital investment value in excess of A\$50 million which means that prescribed project consultation is not required for the prescribed project declaration.
- 2.10 Ensham understands that all relevant State Government and Local Government Agencies support the requested declaration.

3. Background

- 3.1 Under Part 5A of the SDPWO Act, the Minister may declare a project to be a prescribed project. Relevantly, a project can be declared to be a prescribed project where the Minister considers it is economically or socially significant to the State or the region in which the project is to be undertaken.¹

In deciding to declare a project to be a prescribed project, the Minister may have regard to any of the following:

- (a) the public interest or the general welfare of persons in the region in which the project is to be undertaken;
 - (b) whether voluntary environmental agreement is likely to be entered into in relation to the undertaking of the project;
 - (c) other matters the Minister considers relevant,²
- 3.2 The declaration has effect for two years unless a different period is prescribed in the declaration.

¹ Section 76E(1)(e)(i), *State Development and Public Works Organisation Act 1971*.

² Section 76E(2), *State Development and Public Works Organisation Act 1971*.

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SUBMISSION

1. **Ensham Recovery Project**
- 1.1 The Scope of the Ensham Recovery Project is set out in the "Ensham Interim Project Implementation Plan" and includes the following matters:
 - 1.1.1 Pump all the flooded river water back to the Nogoia River
 - 1.1.2 Monitor stability of pit slopes
 - 1.1.3 Recover, relocate and repair the inundated Dragline #1
 - 1.1.4 Protect human safety and physical assets by replacing the destroyed levee banks
 - 1.1.5 Remove silt and mud brought into pits by the floods
 - 1.1.6 Repair or replace essential infrastructure
 - 1.1.7 Construct infrastructure to support short-term mine plan
 - 1.1.8 Investigate enhancement of lesser quality coals by use of a coal washing plant
- 1.2 Ensham seeks such interventions that will enable the Ensham Recovery Project to proceed expeditiously, specifically in relation to:
 - (a) **Dewater the flooded mining pits.** Safely and quickly return approximately 110,000 million litres of flooded river water to the Nogoia River. This will involve the pumping of up to 2,000 million litres of flood water per day out of B, C and D Pits back into the Nogoia River. Whilst dewatering has commenced it cannot be completed until the levees described below are reinstated.
 - (b) **Minimise the risk of further flooding by:**
 - (i) **Reinstatement and construction of an extension of the flood protection levee for B Pit.** A new B pit flood protection levee is required as the existing levee has been damaged beyond repair. A section of this levee must cross a section of Ensham owned land and Old Winton Creek.
 - (ii) **Reinstatement or construction of flood protection levee for C Pit.** The C Pit flood protection levee may be repaired. However, this is not considered to require any further approval other than inclusion in the Plan of Operations for the mine.
 - (iii) **Reinstatement or construction of flood protection levee for D Pit.** An extension of the D Pit flood protection levee is required to protect against further large flooding events.
 - (c) **Recommissioning of the inundated dragline.**
 - (d) **Construction of a new box cut.** This will allow mining to recommence under an amendment to the Plan of Operations for the mine.
- 1.3 The flood protection levee works include the construction of a levee in the location shown in the attached plan. It can be seen from the Plan that a small part

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of the B Pit levee is outside of the mining lease area and crosses Old Winton Creek downstream from the old levee. These works involve both reconstruction of the levee that was damaged by the flood and an extension of that levee.

- 1.4 The Ensham Interim Project Execution Plan demonstrates that the P₅₀ estimate of the Project Cost for Mine Site Recovery is \$269 million \pm 30%.

2. Required Approvals

- 2.1 Subject to further regulatory advice, the approvals required for the Ensham Recovery Project are set out below:

Regulatory Body	Approval Required
Environmental Protection Agency (EPA)	Transitional Environmental Program (TEP). TEP to regulate the construction and environmental effects of the levee on and off lease. The TEP is intended to remain in place until the existing EA can be amended to regulate the levee.
	Plan of Operations amendment. The Plan of Operations must include the proposed levees.
Department of Natural Resources and Water (DNRW)	Degazettal of Old Winton Creek. Requires a regulation to be made under the Water Act declaring the upstream limit of Old Winton Creek from proposed levee location.
	Riverine Protection Permit: Approval to construct dewatering pipe discharge points and erosion control within the banks of Nogoia River.
Nogoia River Flood Plain Board (NRFPB)	Flood Levee Construction Permit: Approval to construct a flood protection levee within the flood plain of the Nogoia River.
Central Highlands Regional Council (CHRC) and EPA	Development Permit: Development approval required to quarry construction material from an off-lease area for use in the construction of the section of B Pit levee which exists outside of the mining lease.

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3. Approvals Strategy

- 3.1 Prior to the flood event, Ensham had lodged applications to allow the construction of the proposed extended flood protection levee with both the DNRW and the NRFPB. These applications were not approved prior to the flood event.
- 3.2 Options discussed with DNRW for authorisation include a change to the upstream limit of Old Winton Creek to the location of the replacement levee. DNRW has noted that the flood has permanently changed the landform so that Old Winton Creek no longer has defined bed and banks, but is a significant scour. Old Winton Creek is also blocked downstream by other flood levees on other properties. Subject to further advice from DNRW, this is Ensham's preferred approach. The alternative of amending the existing levee approval to allow construction of the replacement levee across Old Winton Creek cannot be delivered in time for the expedient implementation of the Recovery Project. Further, DNRW have indicated that before progressing this course of action the replacement levee should be authorised by the EPA under the mining lease. Ensham is progressing discussions with EPA and DNRW as to the most expedient form of this authorisation.
- 3.3 The NRFPB has publicly advertised the application, and no public submissions or objections were received. Ensham are still awaiting a decision from the NRFPB. The NRFPB is a joint local government. Ensham therefore urged the NRFPB to make a decision in relation to the approval prior to the local government elections, however, this did not occur. Ensham has no certainty as to when the new NRFPB can make a decision.
- 3.4 In response to the urgency of the situation, Ensham has proposed a strategy for progressing approval of the flood protection levee for the Ensham Recovery Project, as follows:
- (a) approval of a transitional environmental program by the EPA, to regulate the construction and environmental effects of the levee both on and off lease. The transitional environmental program is intended to remain in place until the existing environmental authority can be amended to regulate the levee;
 - (b) Old Winton Creek is degazetted from the proposed levee location. This will negate the need for the existing water licence and associated development approval be amended to allow for the new levee;
 - (c) the current application before the NRFPB be approved;
 - (d) the current development application before Emerald Shire Council (now Central Highlands Regional Council) and EPA for extraction of quarry material be approved.
- 3.5 Ensham is open to consider more time-effective or administratively effective proposals as may be devised by State Government or Local Government agencies or other parties.


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4. Actions to Date

- 4.1 The actions to date are set out in detail in the appendix to this submission.
- 4.2 Significant progress has been made towards securing the necessary approvals for the Ensham Recovery Project. Ensham has acknowledged the professional contribution of many officers of the relevant agencies in reaching this position.
- 4.3 However, there has been no resolution of the approval process which commenced on 16 July 2007 and which is still required for the provision of ongoing flood protection. This will require ongoing negotiation and collaboration between Ensham, EPA, DNRW and the NRFPB.
- 4.4 Particular difficulty has been experienced in obtaining the NRFPB approval. NRFPB is a joint local government entity and therefore, following the recent local government elections, a decision cannot be made until the NRFPB has been reconstituted. On 25 March 2008 the Acting CEO of CHRC advised Ensham that the NRFPB is reviewing its constitution and could not confirm when and how the NRFPB will be reconstituted, nor when the NRFPB approval application can be progressed

5. Prescribed Project Declaration

- 5.1 Ensham Mine supports the extended employment of more than 3,000 Queenslanders and at full production produces in excess of 8.5 Mtpa of High Quality Export Thermal coal. To restore this capacity, construction of the replacement levees must commence immediately. Without the construction of the replacement levees, it is unlikely that progress can be made on the recovery of productive capacity in B Pit during 2008, placing at risk the coal production, sales contracts, revenues and jobs which rely on the Ensham Mine.
- 5.2 B Pit is the source of high quality, low ash feedstock. Its unavailability prevents the ability of the Mine to accomplish the necessary blends from various Pits, as needed to meet customer specifications. In turn, this inability puts sales contracts at risk.
- 5.3 Ensham is seeking the support of the Deputy Premier and Minister for Infrastructure and Planning to progress the approvals strategy set out above in order to safely proceed with the Ensham Recovery Project as a matter of urgency. In particular, given the likely delay associated with the reconstitution of the NRFPB and the importance to the region and to Queensland of restoring the Ensham Mine by way of the Ensham Recovery Project, Ensham believes that consideration of this project as a Prescribed Project under the SDPWO Act can act to facilitate the necessary approvals.


Chief Executive Officer
Ensham Resources Pty Ltd
8 April 2008

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APPENDIX

Nogoa River Flood Plain Board (NRFPB)

- 16 July 2007
 - Ensham lodged application to Nogoa River Flood Plain Board for exemption to obtain permit for Extension to B and D Pit Flood Protection Levees.
- 24 August 2007
 - At request of NRFPB, presentation was given by Ensham on reasons for exemption.
- 25 August 2007
 - Notification by NRFPB that exemption was refused.
- Sep/Oct 2007
 - Ensham completed negotiations of neighbour compensation agreements.
- 15 November 2007
 - Ensham lodged levee permit application for B Pit and D Pit flood protection levee extensions.
- 28 November 2007
 - Levee permit application was advertised by NRFPB in the Central Queensland News, with the closing date for the receipt of submissions being 27 December 2007.
- 27 December 2007
 - Public consultation period closed.
- 4 January 2008
 - Ensham was advised by NRFPB that no submissions regarding the levee permit application were received by the end of the public consultation period.
- 19 January 2008
 - B Pit, and later C/D pits, were inundated by flood waters from Nogoa River.
- 28 February 2008
 - NRFPB acknowledges the levee permit application and that no submissions were received during the public notification period. A/CEO of CHRC agrees to discuss the need for an NRFPB meeting to progress levee permit application
- 3 - 5 March 2008
 - Ensham made three separate requests to NRFPB to hold discussions on progress of levee permit application. No reply was received.
- 6 March 2008
 - Ensham and A/CEO of NRFPB discuss the need for NRFPB to urgently progress levee permit application prior to the elections.
- 10 March 2008
 - Ensham submits letter to NRFPB requesting that a meeting of NRFPB be held to progress levee permit application.

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- 12 March 2008
 - Ensham request update on meeting date of NRFPB.
- 15 March 2008
 - Local government elections.
- 25 March 2008
 - A/CEO of CHRC advises Ensham that due to local government elections NRFPB has no members. Further, that the NRFPB is reviewing its constitution and cannot confirm when the application can be progressed
- 27 March 2008
 - Ensham is advised that a Sunwater report about the levees proposed by Ensham in the 2007 process had just been received by CHRC. No information was given about the contents of the report nor when a reply concerning the levee application process completed in 2007 might be received by Ensham.
- 31 March 2008
 - New Councillors of CHRC are sworn in.
- 3 April 2008
 - Ensham meeting with new Mayor and Acting CEO of CHRC to appraise them of the Ensham crisis and explain the need for Prescribed Project Status.

Environmental Protection Agency (EPA)

- 29 January 2008
 - Ensham provides briefing to EPA and requests support for approval to pump flood water from Ensham Mine back to Nogoia River.
 - Ensham meets with EPA officers to discuss dewatering approval conditions for Emergency Directive.
- 1 February 2008
 - Emergency Directive issued for 14 days by EPA.
 - Ensham commences work on application for TEP for pumping of flood waters.
- 15 February 2008
 - Second Emergency Directive issued for further 14 days by EPA.
 - Ensham continues to discuss required conditions for TEP.
- 29 February 2008
 - Draft TEP accepted by EPA, subject to 8 days statutory approval period.
- 6 March 2008
 - Certificate of approval for TEP issued by EPA.

Commercial in Confidence

- 31 March 2008
- Tripartite meeting at Ensham Mine including regional staff of DNRW, EPA and Ensham to establish pathways for moving forward for construction of levees and implementation of balance of works needed for recovery.

Department of Natural Resources and Water (DNRW)

- 25 July 2007
- Application made to DNRW for approval to extend B Pit levee across Old Winton Creek.
 - Various meetings and discussions held with DNRW officers over following 5 months
- 14 December 2007
- DNRW declines to progress approval for levee construction across Old Winton Creek until DME approves mining lease over the Duckponds Area.
- 11 January 2008
- Ensham meets with DNRW to discuss approval application.
- 19 January 2008
- B Pit, and later C/D pits, were inundated by flood waters from Nogoia River.
- 26 February 2008
- Ensham brief Director General of DNRW of Ensham flood crisis and seeks support for approval to construct new B Pit flood protection levee across Old Winton Creek.
- 27 February 2008
- Ensham has telephone conference with DNRW General Manager Water Accounting and Management to investigate options for approval.
- 28 February 2008
- Ensham offers inspection of mine site and B Pit levee location to DNRW General Manager Water Accounting and Management.
- 4 March 2008
- Ensham meets with DNRW General Manager Water Accounting and Management to provide additional information regarding application and Ensham Central Project Environmental Impact Study.
- 12 March 2008
- DNRW General Manager Water Accounting and Management and other senior DNRW officers attend mine site inspection.

Commercial in Confidence

- 14 March 2008
 - Ensham meets with DNRW General Manager Water Accounting and Management to discuss joint meeting with EPA officers to progress concurrent approvals required from EPA.
- 31 March 2008
 - Tripartite meeting at Ensham mine including regional staff of DNRW, EPA and Ensham to establish pathways for moving forward for construction of levees and implementation of balance of works for recovery.

Department of Mines and Energy (DME), Department of Premier and Cabinet (DPC), Department of Infrastructure and Planning (DIP) and Treasury

- 24 January 2008
 - Ensham reports details by telephone to Minister for Mines and Energy on Ensham flood crisis.
- 25 January 2008
 - Ensham brief Director General and Deputy Director General of DME on Ensham flood crisis.
- 30 January 2008
 - Briefing by Ensham and Idemitsu Australia Resources Pty Ltd (85% beneficial owner of Ensham) of the Premier and Director General of DPC on Ensham flood crisis.
- 6 February 2008
 - Ensham mine inspection by Minister for Mines and Energy and Director General of DME.
- 12 February 2008
 - Ensham and Idemitsu Kosan Co Ltd of Japan (through IAR, 85% beneficial owner of Ensham) provide briefing in Brisbane to Queensland Premier, Minister for Mines and Energy, Director General of DPC and Director General of DME.
- 22 February 2008
 - Ensham provide updated briefing to Director General and Deputy Director General of DME on Ensham flood crisis and approvals required.
- 28 March 2007
 - Ensham CEO updates Deputy Premier and Minister for Mines and Energy on critical issues preventing Ensham Mine recovery.
- 2 April 2008
 - Meeting called by Coordinator-General including Directors-General or Alternates of DPC, DIP, DME, EPA, DNRW and Ensham CEO to discuss approvals and timeframes. Ensham present two documents: *"Action Plan for Ensham Mine Recovery"* and *"2008 Flood – Interim Project Execution Plan – Ensham Operations Division"*.

Commercial in Confidence

- 2 April 2008
 - Ensham CEO updates Treasurer on critical issues preventing Ensham Mine recovery.
- 2 April 2008
 - Ensham CEO updates Minister for Mines and Energy on progress from morning Meeting with Coordinator-General and Directors-General / Alternates.
- 4 April 2008
 - At a meeting with the Queensland Premier in Tokyo, Idemitsu Kosan Co. Ltd (85% beneficial owner of Ensham through IAR) reiterates request for support by State and Local Governments in Queensland to expedite approvals.
- 7 April 2008
 - Ensham meeting with DIP officers to provide further explanation of the Ensham flood crisis.

End

(iii) voting for all elections for representatives for District No. 2 must be by a system of preferential voting as described in the *Electoral Act (Qld) 1992*;

(iv) subject to Rule 37(c)(iv), the provisions of Rule 37(b) apply with respect to all elections for District Representatives for District No.2 but with all necessary adoptions including:

(A) in relation to elections by Members in a subregional grouping, reading references to 'District' as references to the particular subregional grouping; and

(B) reading the power of the Executive Director to give directions as including power to give directions as to the specific methods or procedures of the system of preferential voting to be used.

(d) District Representatives elected or appointed in accordance with this Rule take office on the first day of June in the year of election or appointment and, subject to these Rules, remain in office until the thirty-first day of May following the next ensuing quadrennial election.

(e) An election of District Representatives is valid despite the fact that one or more of the Members included in a District fails or refuses to vote.

(f) In the event that the Members included in a District fail to nominate any or sufficient persons for election to the position(s) of District Representative(s), the Executive is empowered to take such action as it may consider necessary for the purpose of giving the District concerned appropriate representation on the Executive and the Executive may itself appoint a person or persons as the Representative or Representatives for that District.

(g) Subject to paragraph (h), where a vacancy arises in a position of District Representative for any District at any time prior to the date which is three months before a quadrennial election, the Executive Director must take action to provide for the filling of that vacancy as provided by this Rule (by requesting an appointment or holding an election, as the case requires) as though the Executive were being constituted following a quadrennial election.

(h) Where such a vacancy arises within a period of three months prior to a quadrennial election, the vacancy must not be filled.'

4 Repeal of Rule 4

Rule 4 is repealed and the following new Rule 4 inserted in its stead:-

'-Membership-

4. The Brisbane City Council and local governments constituted under the *Local Government Act 1993* are entitled to be members of the Association.'

5 Repeal of Rule 37A

Rule 37A (Transitional Rule for District 13 consequent upon the commencement of the *Local Government (Community Government Areas) Act 2004*) is repealed.

ENDNOTES

- Made by the Local Government Association of Queensland (Incorporated) on 14 December 2007.
- Approved by the Governor in Council on 17 April 2008.
- Published in the Gazette on 18 April 2008.
- Not required to be laid before the Legislative Assembly.
- The administering agency is the Department of Local Government, Sport and Recreation.

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.

ENDNOTES

- Made by the Minister on 14 April 2008
- Published in the gazette on 18 April 2008.
- Not required to be laid before the Legislative Assembly.
- The administering agency is the Department of Infrastructure and Planning.

State Development and Public Works Organisation Act 1971
Acquisition of Land Act 1967

TAKING OF LAND NOTICE (No. 5) 2008

Short title

- This notice may be cited as the *Taking of Land Notice (No. 5) 2008*.

Land taken

- The Land described in Schedule 1 is taken by The Coordinator-General for the purpose of providing for the establishment of an infrastructure corridor as defined in section 82 of the *State Development and Public Works Organisation Act 1971* for the Townsville State Development Area, and vests as freehold in The Coordinator-General on and from 18 April 2008.

SCHEDULE 1

Land Taken

An area of about 2.60 hectares being part of Lot 1 on Registered Plan 734574 contained in Title Reference 21158169 and shown on Plan TSDA37 dated 21 May 2007 held in the office of The Coordinator-General.

The whole of Lot 2 on Registered Plan 721599 contained in Title Reference 20750122.

An area of about 7.032 hectares being part of Lot 2 on Registered Plan 737885 contained in Title Reference 21243180 and shown on Plan TSDA42 dated 26 October 2007 held in the office of The Coordinator-General.

An area of about 7.985 hectares being part of Lot 2 on Registered Plan 737886 contained in Title Reference 21244017 and shown on Plan TSDA43 dated 26 October 2007 held in the office of The Coordinator-General.

An area of about 0.0692 hectares being part of Lot 206 on Crown Plan EP1967 contained in Title Reference 21282247 and shown on Plan TSDA44 dated 14 March 2007 held in the office of The Coordinator-General.

An area of about 20.612 hectares being part of Lot 2 on Registered Plan 732945 contained in Title Reference 21079067 and shown on Plan TSDA45 dated 26 October 2007 held in the office of The Coordinator-General.

An area of about 23.013 hectares being part of Lot 2 on Registered Plan 724555 contained in Title Reference 21001092 and shown on Plan TSDA46 dated 26 October 2007 held in the office of The Coordinator-General.

An area of about 10.908 hectares being part of Lot 67 on Crown Plan EP856 contained in Title Reference 20645162 and shown on Plan TSDA47 dated 14 March 2007 held in the office of The Coordinator-General.

An area of about 3 hectares being part of Lot 1 on Survey Plan 199852 contained in Title Reference 50690813 and shown on Plan TSDA48 dated 14 March 2007 held in the office of The Coordinator-General.

(SCHEDULE ENDS).

STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

PROGRESSION NOTICE

for a 'prescribed project' declared pursuant to section 76E by the Minister for Infrastructure and Planning

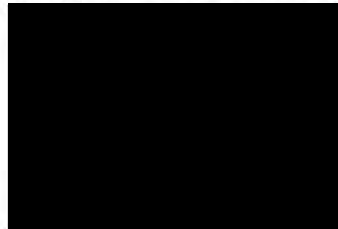
Pursuant to section 76I of the *State Development and Public Works Organisation Act 1971*, I hereby give notice to the Nogoa River Flood Plain Board (the decision maker) that it is required to undertake an administrative process for a prescribed process on or before 20 business days after service of notice.

Details of the prescribed decision are:

- Prescribed process:** Decision under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11.
- Administrative process:** Preparation of a report by the Director of Engineering Services of the Nogoa River Flood Plain Board required under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11(4).
- Project:** Ensham Mine Flood Recovery Project
- Applicant:** Ensham Resources Pty Limited
- Date of Application:** 13 November 2007
- Nature of Works:** Extension of current Nogoa River Southern levee at mine site.
- Type of Application:** Levee Bank Permit under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*
- Location:** 30 kilometres East of Emerald, Central Queensland
- Subject Site:** The area identified on the attached map titled 'Ensham Coal Project, Existing and Proposed Flood Protection Levee Locations'.

Pursuant to section 76I(2)(c)(ii) the decision maker must inform the Coordinator-General of the completion of the process within 5 business days after it is completed.

As required by section 76I(2)(a) a copy of the declaration for the prescribed project to which the prescribed process relates is set out in Schedule 1 to this notice.



Delegate of the
Coordinator-General

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.

ENDNOTES

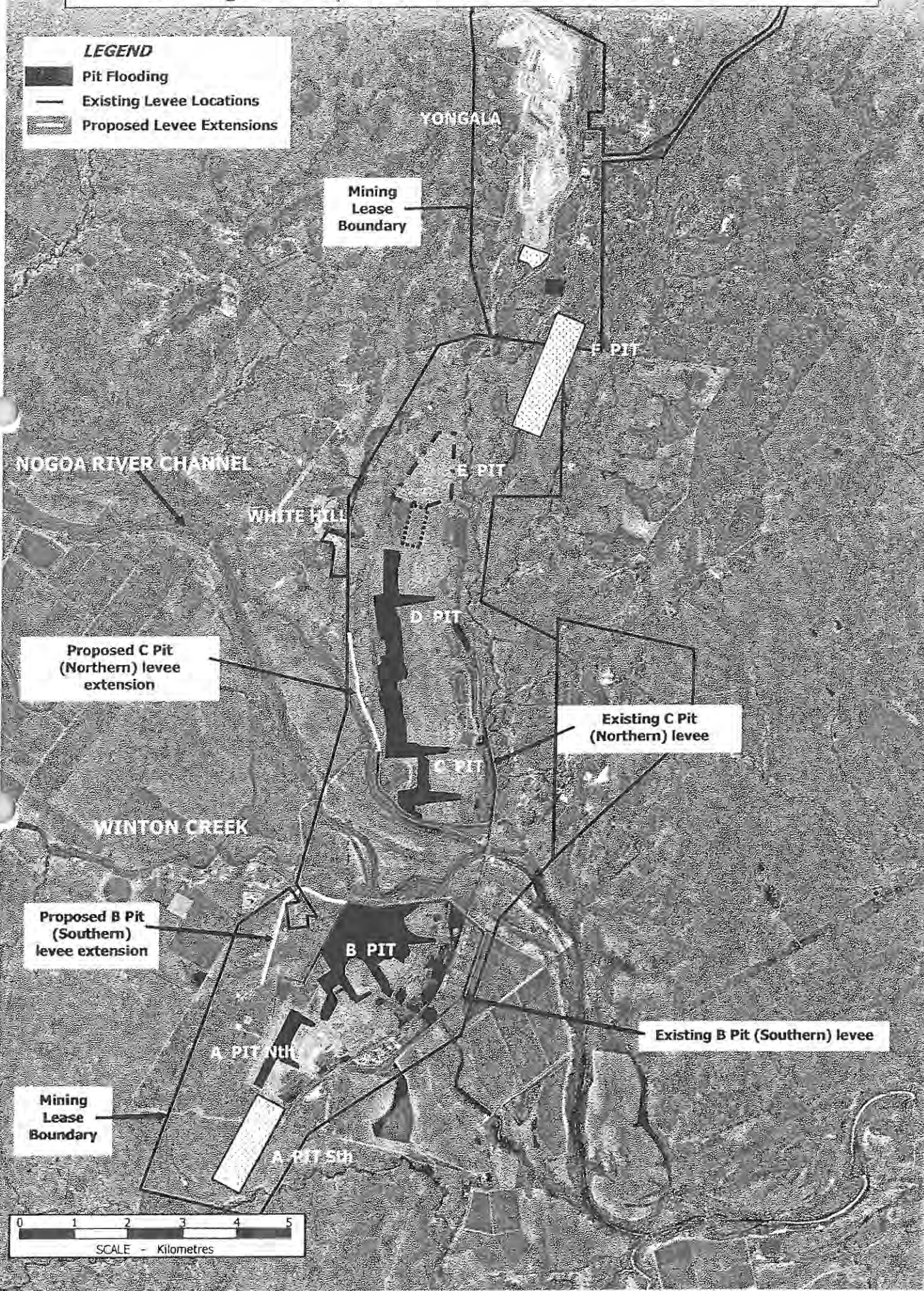
1. Made by the Minister on 14 April 2008
2. Published in the gazette on 18 April 2008.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Department of Infrastructure and Planning.

ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

- Pit Flooding
- Existing Levee Locations
- Proposed Levee Extensions



STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

PROGRESSION NOTICE

for a 'prescribed project' declared pursuant to section 76E by the Minister for Infrastructure and Planning

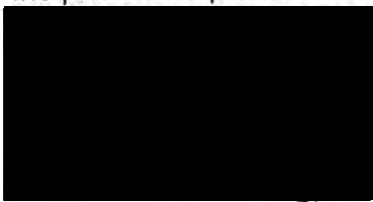
Pursuant to section 76I of the *State Development and Public Works Organisation Act 1971*, I hereby give notice to the Nogoa River Flood Plain Board (the decision maker) that it is required to undertake an administrative process for a prescribed process on or before 20 business days after service of notice.

Details of the prescribed decision are:

- Prescribed process:** Decision under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11.
- Administrative process:** Preparation of a report by the Director of Engineering Services of the Nogoa River Flood Plain Board required under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11(4).
- Project:** Ensham Mine Flood Recovery Project
- Applicant:** Ensham Resources Pty Limited
- Date of Application:** 13 November 2007
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- Subject Site:** The area identified on the attached map titled 'Ensham Coal Project, Existing and Proposed Flood Protection Levee Locations'.

Pursuant to section 76I(2)(c)(ii) the decision maker must inform the Coordinator-General of the completion of the process within 5 business days after it is completed.

As required by section 76I(2)(a) a copy of the declaration for the prescribed project to which the prescribed process relates is set out in Schedule 1 to this notice.



Delegate of the
Coordinator-General

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.

ENDNOTES

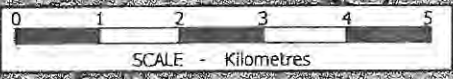
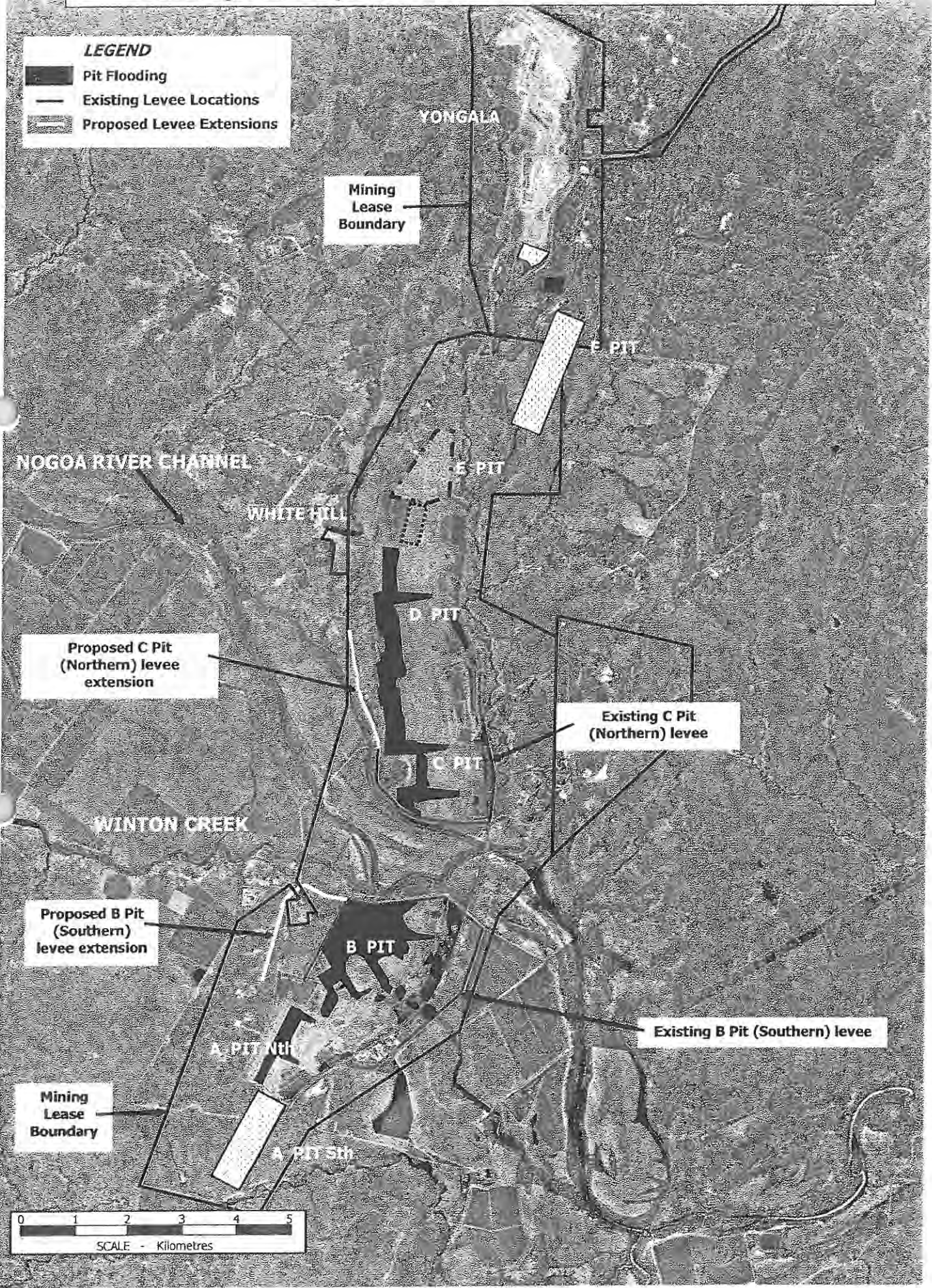
1. Made by the Minister on 14 April 2008
2. Published in the gazette on 18 April 2008.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Department of Infrastructure and Planning.

ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

- Pit Flooding
- Existing Levee Locations
- Proposed Levee Extensions



STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

NOTICE TO DECIDE

**for a 'prescribed project' declared pursuant to section 76E by the Minister for
Infrastructure and Planning**


Pursuant to section 76J of the *State Development and Public Works Organisation Act 1971*, I hereby give notice to the Nogoa River Flood Plain Board (the decision maker) that it is required to make a decision in relation to the prescribed decision on or before 20 business days after service of notice.

Details of the prescribed decision are:

- Prescribed decision:** Decision under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11.
- Project:** Ensham Mine Flood Recovery Project
- Applicant:** Ensham Resources Pty Limited
- Date of Application:** 13 November 2007
- Nature of Works:** Extension of current Nogoa River Southern levee at mine site.
- Type of Application:** Levee Bank Permit under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*
- Location:** 30 kilometres East of Emerald, Central Queensland
- Subject Site:** The area identified on the attached map titled 'Ensham Coal Project, Existing and Proposed Flood Protection Levee Locations'.

Pursuant to section 76J(4)(b) the decision maker must inform the Coordinator-General of the decision within 5 business days after it is made.

As required by section 76J(3)(a) a copy of the declaration for the prescribed project to which the prescribed decision relates is set out in Schedule 1 to this notice.



**Delegate of the
Coordinator-General**

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.




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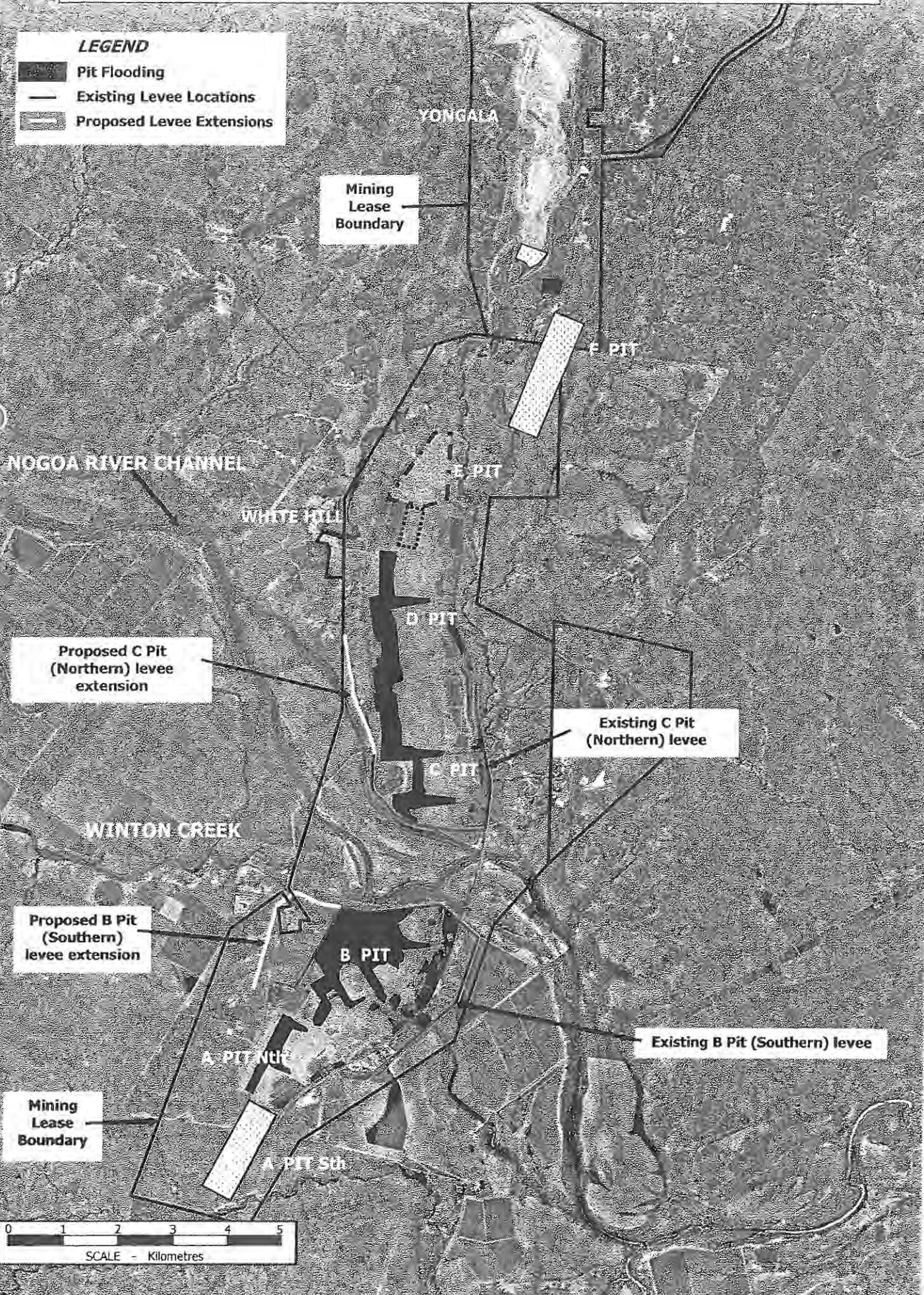
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4. The administering agency is the Department of Infrastructure and Planning.

ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

-  Pit Flooding
-  Existing Levee Locations
-  Proposed Levee Extensions



Mining Lease Boundary

F PIT

E PIT

WHITE HILL

D PIT

Existing C Pit (Northern) levee

C PIT

Proposed C Pit (Northern) levee extension

WINTON CREEK

Proposed B Pit (Southern) levee extension

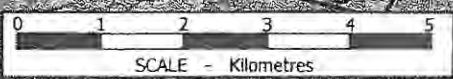
B PIT

Existing B Pit (Southern) levee

A PIT Nth

Mining Lease Boundary

A PIT Sth



STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

NOTICE TO DECIDE

for a 'prescribed project' declared pursuant to section 76E by the Minister for Infrastructure and Planning

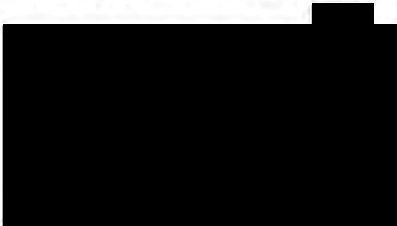
Pursuant to section 76J of the *State Development and Public Works Organisation Act 1971*, I hereby give notice to the Nogoa River Flood Plain Board (the decision maker) that it is required to make a decision in relation to the prescribed decision on or before 20 business days after service of notice.

Details of the prescribed decision are:

- Prescribed decision:** Decision under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11.
- Project:** Ensham Mine Flood Recovery Project
- Applicant:** Ensham Resources Pty Limited
- Date of Application:** 13 November 2007
- Nature of Works:** Extension of current Nogoa River Northern levee at mine site.
- Type of Application:** Levee Bank Permit under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*
- Location:** 30 kilometres East of Emerald, Central Queensland
- Subject Site:** The area identified on the attached map titled 'Ensham Coal Project, Existing and Proposed Flood Protection Levee Locations'.

Pursuant to section 76J(4)(b) the decision maker must inform the Coordinator-General of the decision within 5 business days after it is made.

As required by section 76J(3)(a) a copy of the declaration for the prescribed project to which the prescribed decision relates is set out in Schedule 1 to this notice.



Delegate of the
Coordinator-General

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.




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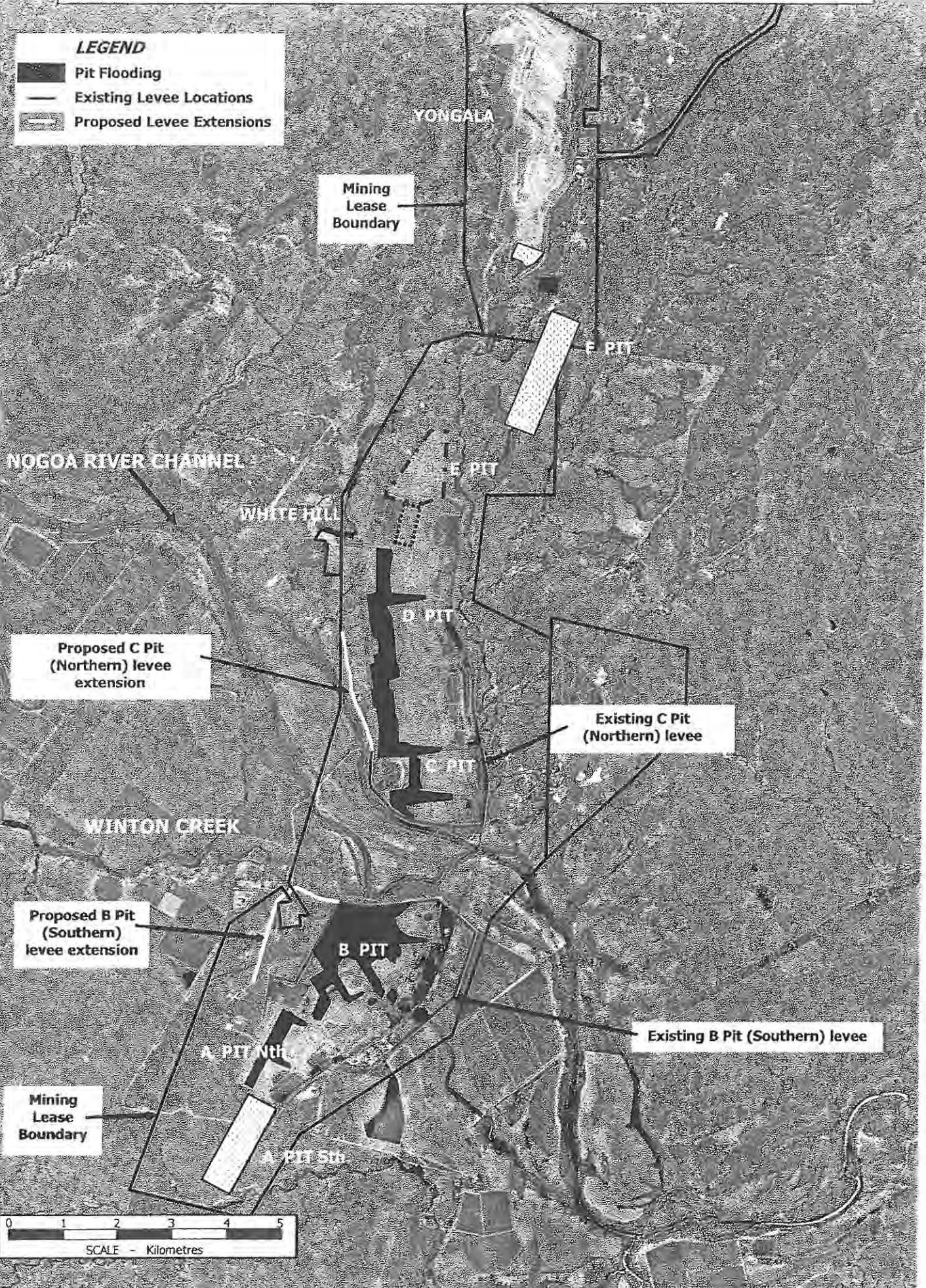
1. Made by the Minister on 14 April 2008
2. Published in the gazette on 18 April 2008.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Department of Infrastructure and Planning.

ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

-  Pit Flooding
-  Existing Levee Locations
-  Proposed Levee Extensions



STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

STEP IN NOTICE

for a 'prescribed project' declared pursuant to section 76E by the Minister for
Infrastructure and Planning

Pursuant to section 76K of the *State Development and Public Works Organisation Act 1971*, and with the approval of the Honourable Paul Lucas, Deputy Premier and Minister for Infrastructure and Planning, I hereby give notice to:

- the Nogoa River Flood Plain Board (the decision maker); and
- Ensham Resources Pty Limited (the applicant);

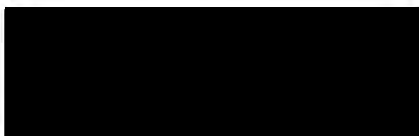
that the Coordinator-General will make an assessment and a decision about a prescribed decision.

Details of the prescribed decision are:

Prescribed decision:	Decision under the <i>Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997</i> , Part 2, section 11
Project:	Ensham Mine Flood Recovery Project
Date of Application:	13 November 2007
Nature of Works:	Extension of current Nogoa River Southern levee at mine site.
Type of Application:	Levee Bank Permit under the <i>Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997</i>
Location:	30 kilometres East of Emerald, Central Queensland
Subject Site:	The area identified on the attached map titled 'Ensham Coal Project, Existing and Proposed Flood Protection Levee Locations'

Pursuant to section 76K(2)(c) the Coordinator-General is the decision maker for the prescribed process from the time the notice is given until the Coordinator-General makes a decision about the prescribed decision.

As required by section 76K(2)(a) a copy of the declaration for the prescribed project to which the prescribed decision relates is set out in Schedule 1 to this notice.



Colin Jensen
Coordinator-General

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.

ENDNOTES

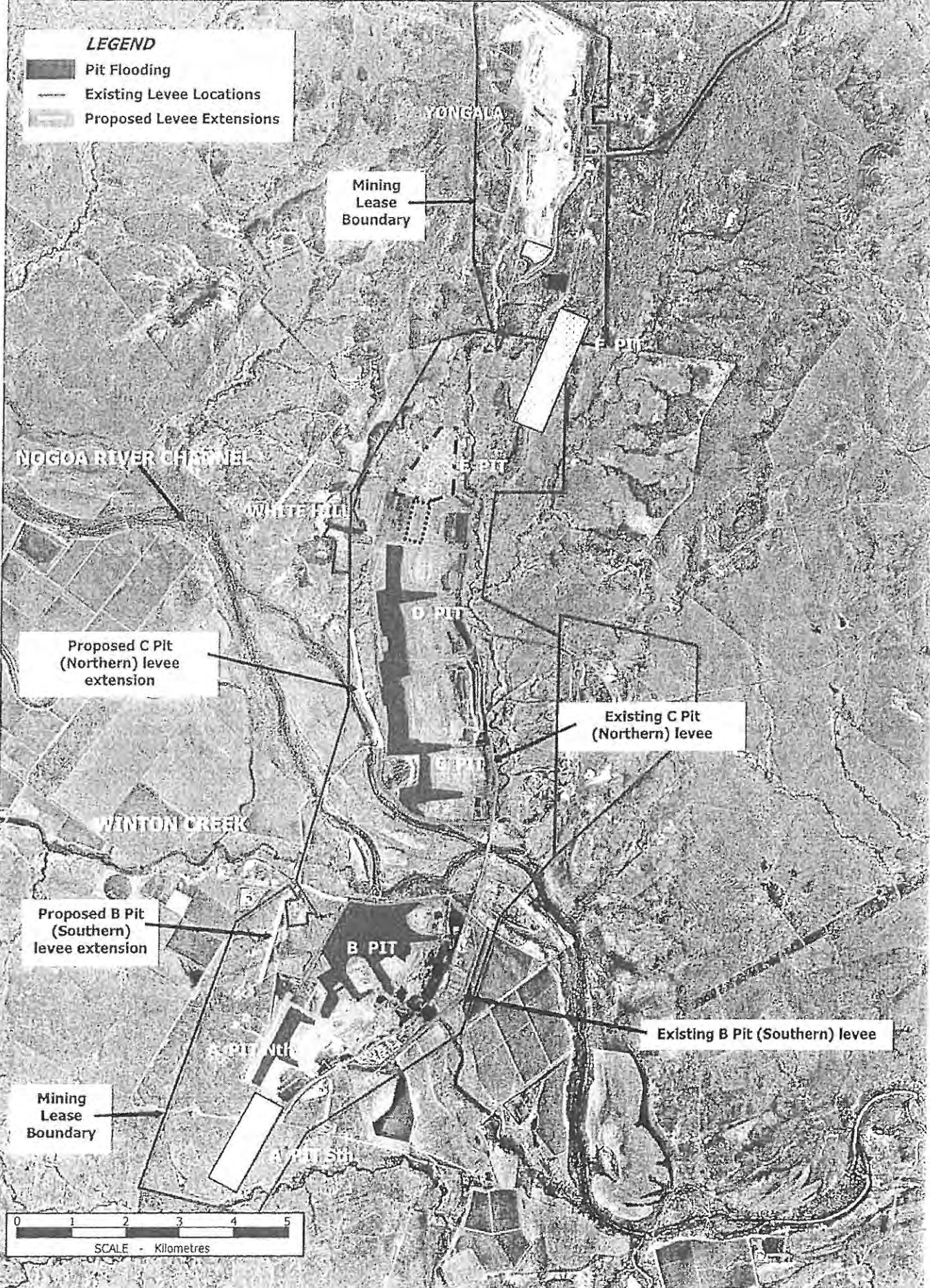
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4. The administering agency is the Department of Infrastructure and Planning.

ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

- Pit Flooding
- Existing Levee Locations
- Proposed Levee Extensions



STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

STEP IN NOTICE

for a 'prescribed project' declared pursuant to section 76E by the Minister for
Infrastructure and Planning

Pursuant to section 76K of the *State Development and Public Works Organisation Act 1971*, and with the approval of the Honourable Paul Lucas, Deputy Premier and Minister for Infrastructure and Planning, I hereby give notice to:

- the Nogoa River Flood Plain Board (the decision maker); and
- Ensham Resources Pty Limited (the applicant);

that the Coordinator-General will make an assessment and a decision about an administrative process for a prescribed process.

Details of the prescribed process are:

- Prescribed process:** Decision under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11
- Administrative process:** Preparation of a report by the Director of Engineering Services of the Nogoa River Flood Plain Board required under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11(4)
- Project:** Ensham Mine Flood Recovery Project
- Date of Application:** 13 November 2007
- Nature of Works:** Extension of current Nogoa River Southern levee at mine site.
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Pursuant to section 76K(2)(c) the Coordinator-General is the decision maker for the prescribed process from the time the notice is given until the Coordinator-General makes a decision about the prescribed process.

As required by section 76K(2)(a) a copy of the declaration for the prescribed project to which the prescribed process relates is set out in Schedule 1 to this notice.
decision



Colin Jensen
Coordinator-General

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.




ENDNOTES

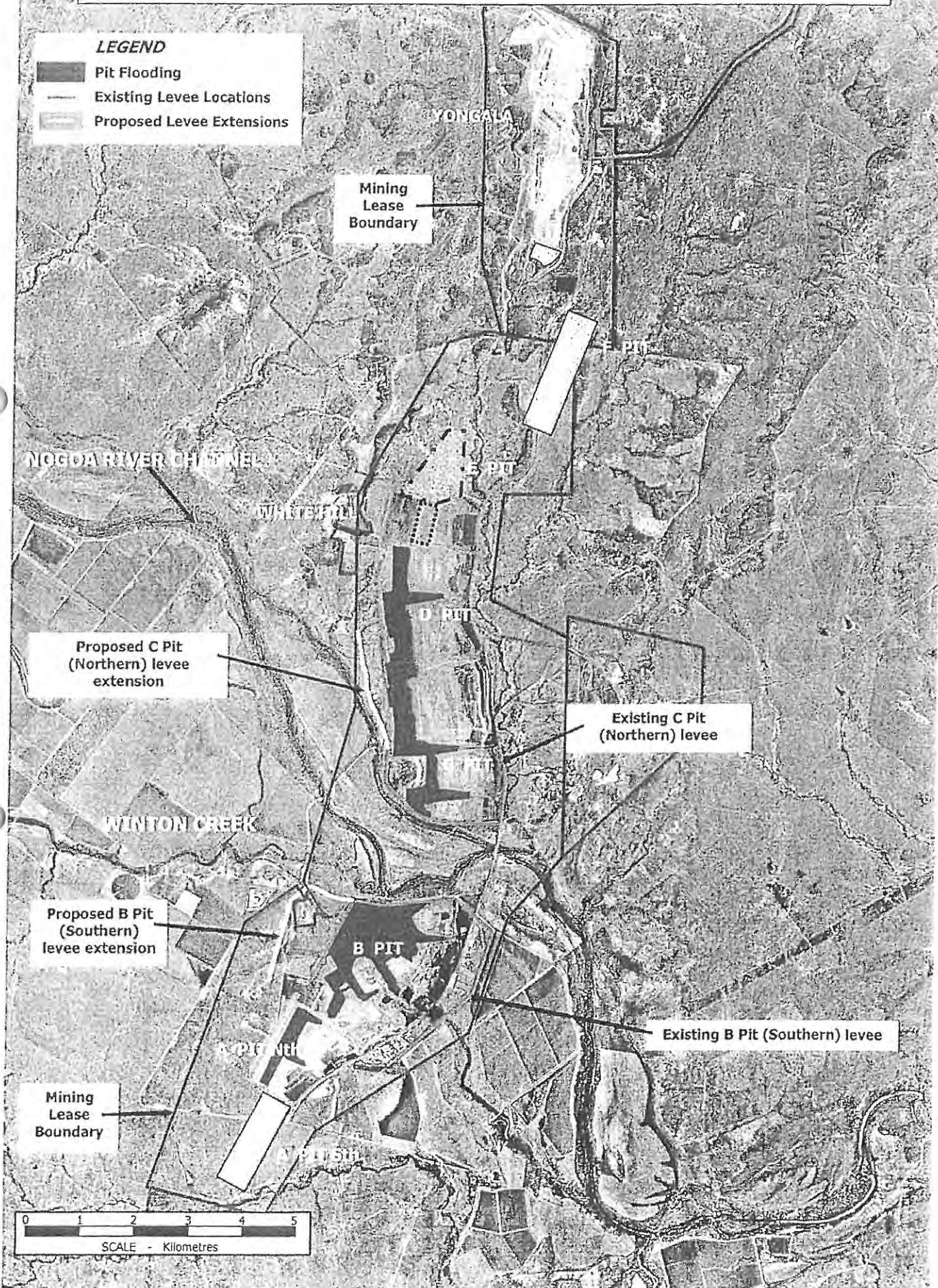
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ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

-  Pit Flooding
-  Existing Levee Locations
-  Proposed Levee Extensions



STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

STEP IN NOTICE

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- the Nogoa River Flood Plain Board (the decision maker); and
- Ensham Resources Pty Limited (the applicant);

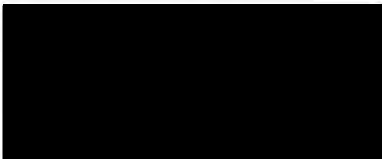
that the Coordinator-General will make an assessment and a decision about a prescribed decision.

Details of the prescribed decision are:

Prescribed decision:	Decision under the <i>Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997</i> , Part 2, section 11
Project:	Ensham Mine Flood Recovery Project
Date of Application:	13 November 2007
Nature of Works:	Extension of current Nogoa River Northern levee at mine site
Type of Application:	Levee Bank Permit under the <i>Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997</i>
Location:	30 kilometres East of Emerald, Central Queensland
Subject Site:	The area identified on the attached map titled 'Ensham Coal Project, Existing and Proposed Flood Protection Levee Locations'

Pursuant to section 76K(2)(c) the Coordinator-General is the decision maker for the prescribed process from the time the notice is given until the Coordinator-General makes a decision about the prescribed decision.

As required by section 76K(2)(a) a copy of the declaration for the prescribed project to which the prescribed decision relates is set out in Schedule 1 to this notice.



Colin Jensen
Coordinator-General

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.




ENDNOTES

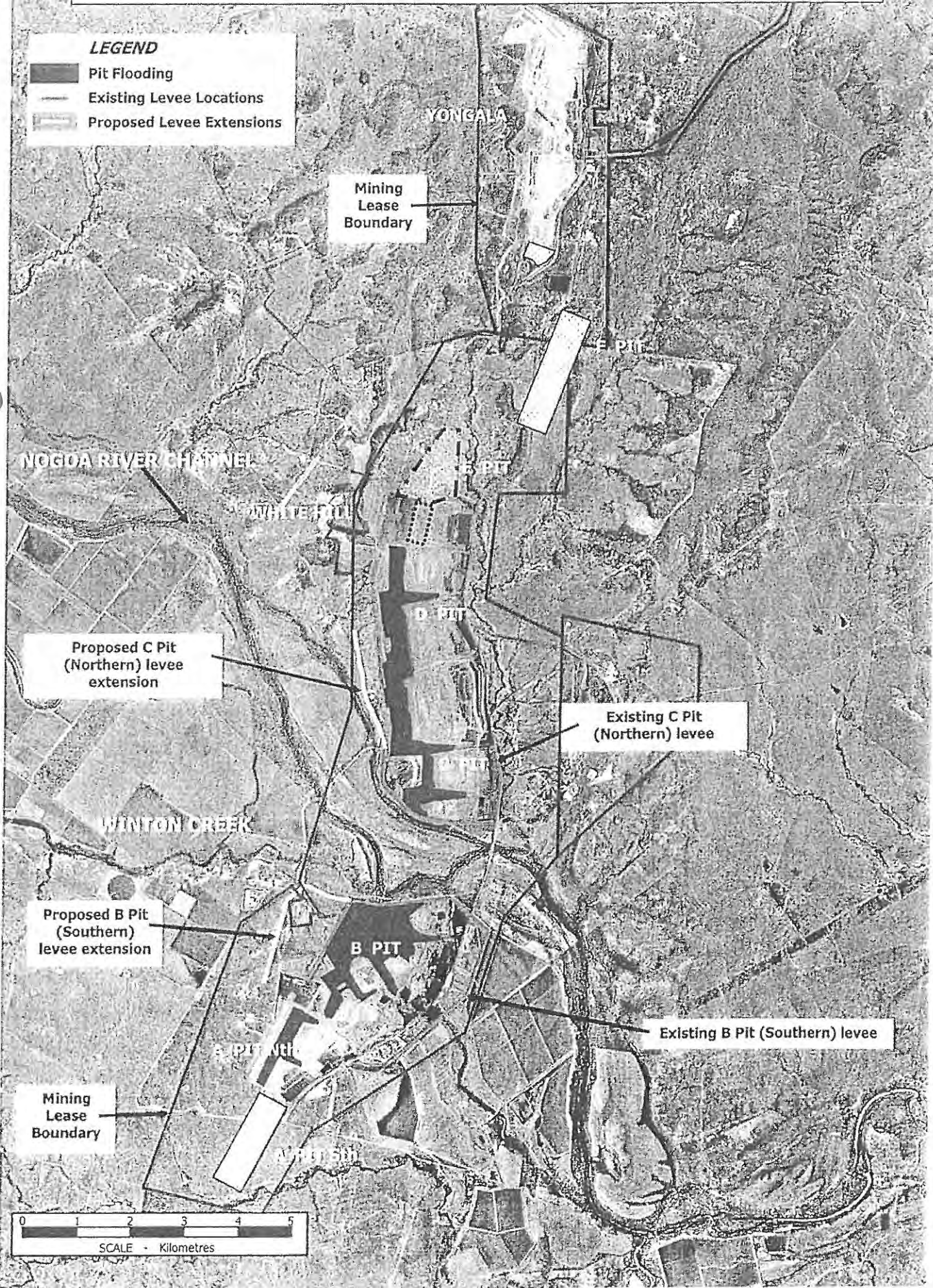
1. Made by the Minister on 14 April 2008
2. Published in the gazette on 18 April 2008.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Department of Infrastructure and Planning.

ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

-  Pit Flooding
-  Existing Levee Locations
-  Proposed Levee Extensions



STATE DEVELOPMENT AND PUBLIC WORKS ORGANISATION ACT 1971

STEP IN NOTICE

for a 'prescribed project' declared pursuant to section 76E by the Minister for
Infrastructure and Planning

Pursuant to section 76K of the *State Development and Public Works Organisation Act 1971*, and with the approval of the Honourable Paul Lucas, Deputy Premier and Minister for Infrastructure and Planning, I hereby give notice to:

- the Nogoa River Flood Plain Board (the decision maker); and
- Ensham Resources Pty Limited (the applicant);

that the Coordinator-General will make an assessment and a decision about an administrative process for a prescribed process.

Details of the prescribed process are:

Prescribed process: Decision under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11

Administrative process: Preparation of a report by the Director of Engineering Services of the Nogoa River Flood Plain Board required under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*, Part 2, section 11(4)

Project: Ensham Mine Flood Recovery Project

Date of Application: 13 November 2007

Nature of Works: Extension of current Nogoa River Northern levee at mine site.

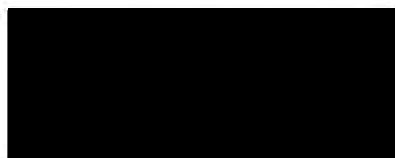
Type of Application: Levee Bank Permit under the *Nogoa River Flood Plain Board Local Law (Levee Banks) No.1 1997*

Location: 30 kilometres East of Emerald, Central Queensland

Subject Site: The area identified on the attached map titled 'Ensham Coal Project, Existing and Proposed Flood Protection Levee Locations'

Pursuant to section 76K(2)(c) the Coordinator-General is the decision maker for the prescribed process from the time the notice is given until the Coordinator-General makes a decision about the prescribed process.

As required by section 76K(2)(a) a copy of the declaration for the prescribed project to which the prescribed process relates is set out in Schedule 1 to this notice.



Colin Jensen
Coordinator-General

State Development and Public Works Organisation Act 1971

DECLARATION OF A PRESCRIBED PROJECT

On 14 April 2008, the Deputy Premier and Minister for Infrastructure and Planning declared the Ensham Mine Flood Recovery Project involving dewatering, stability monitoring, dragline repair, mud disposal, construction of coal wash plant, repair and construction of levee banks and other essential infrastructure, to be a Prescribed Project pursuant to section 76E of the *State Development and Public Works Organisation Act 1971*.

ENDNOTES

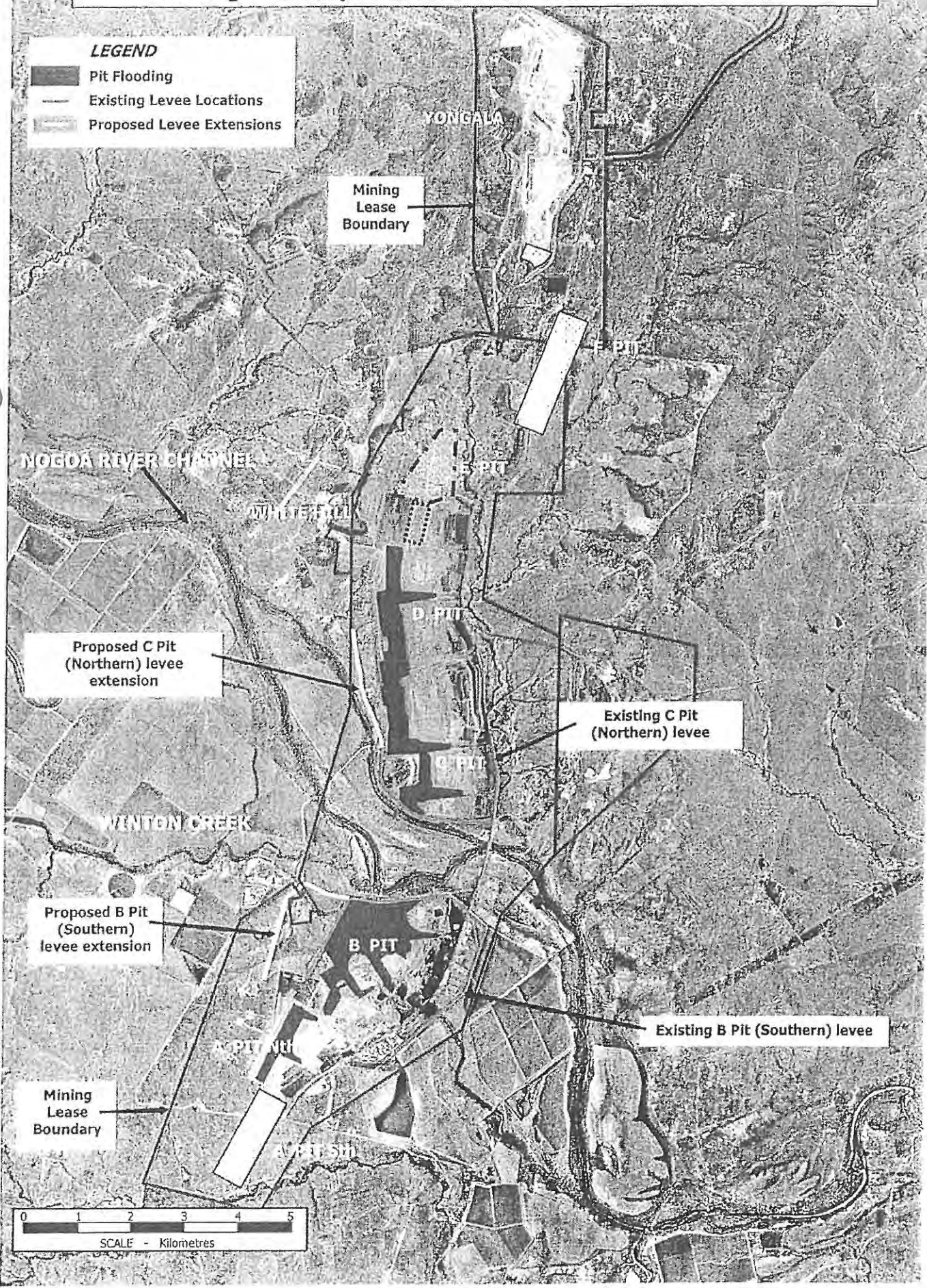
1. Made by the Minister on 14 April 2008
2. Published in the gazette on 18 April 2008.
3. Not required to be laid before the Legislative Assembly.
4. The administering agency is the Department of Infrastructure and Planning.

ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

- Pit Flooding
- Existing Levee Locations
- Proposed Levee Extensions



Coordinator-General Levee Bank Permit

Permit No. 013

Ensham Mine Southern Levee Bank Application lodged 16 November 2007

Owner: Ensham Resources Pty Ltd
Address: PO Box 1565
Emerald Qld 4720

Property Description:

Lot 30 CP864574 & Lot 32 RP908643, Parish of Middarra, County of Talbot.

Reference Document:

SunWater Limited, Ensham Mine Rehabilitation of Flood Levees P-AEXP-0405-AB-02-03, July 2008

Reference Map:

Ensham Coal Project – Existing and Proposed Flood Protection Levee Locations, July 2008 (attached)

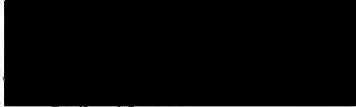
Conditions:

- (a) the proposed works are to be undertaken in accordance with the details included in the application, referred to above, and where necessary amended by the reports referred to in condition (b);
- (b) construction of the levee bank shall comply with the following reports: Kellogg Brown & Root Pty Ltd, Ensham Mine Flood Levees, Proposed Levees Design Report, BEE603-W-REP-005 Rev 0, 23 June 2008 and Kellogg Brown & Root Pty Ltd, Ensham Mine Proposed Flood Levees, Technical Specification for Civil Works, BEE603-Z-SPEC-001 Rev 5, 23 June 2008 and associated technical drawings;
- (c) the work is to be undertaken under the supervision of a Registered Professional Engineer, Queensland (RPEQ) and certified accordingly upon completion.
- (d) advice, in writing, shall be given of commencement of the works, and expected duration of works;
- (e) the works proposed are to be completed within six (6) months of the date of issue of this permit;
- (f) the permit is issued for a period of ten (10) years, expiry date being ^{4 August} July 2018; ⁰⁷
- (g) "as constructed" details of the works shall be provided including coordinates of the structures, upon completion, together with a certification that all works are in accordance with the approved plans referred to condition (b). This certification shall be signed by a Registered Professional Engineer, Queensland;
- (h) the provisions of the *Nogoa River Flood Plain Board Local Law (Levee Banks) No. 1, 1997* and Local Law Policy No. 1 – Levee Banks shall be complied with at all times;
- (i) the owner shall advise any proposed purchaser that the property is the subject of a levee bank permit;
- (j) the owner shall identify any proposed subdivisional application of the property as being subject to a levee bank permit.

The Central Highlands Regional Council will be advised of this levee bank permit to enable the records of the affected property to be duly noted.

This permit is issued pursuant to the step-in notice issued on 1 July 2008 under section 76k of the *State Development and Public Works Organisation Act 1971*.

4.12.2008

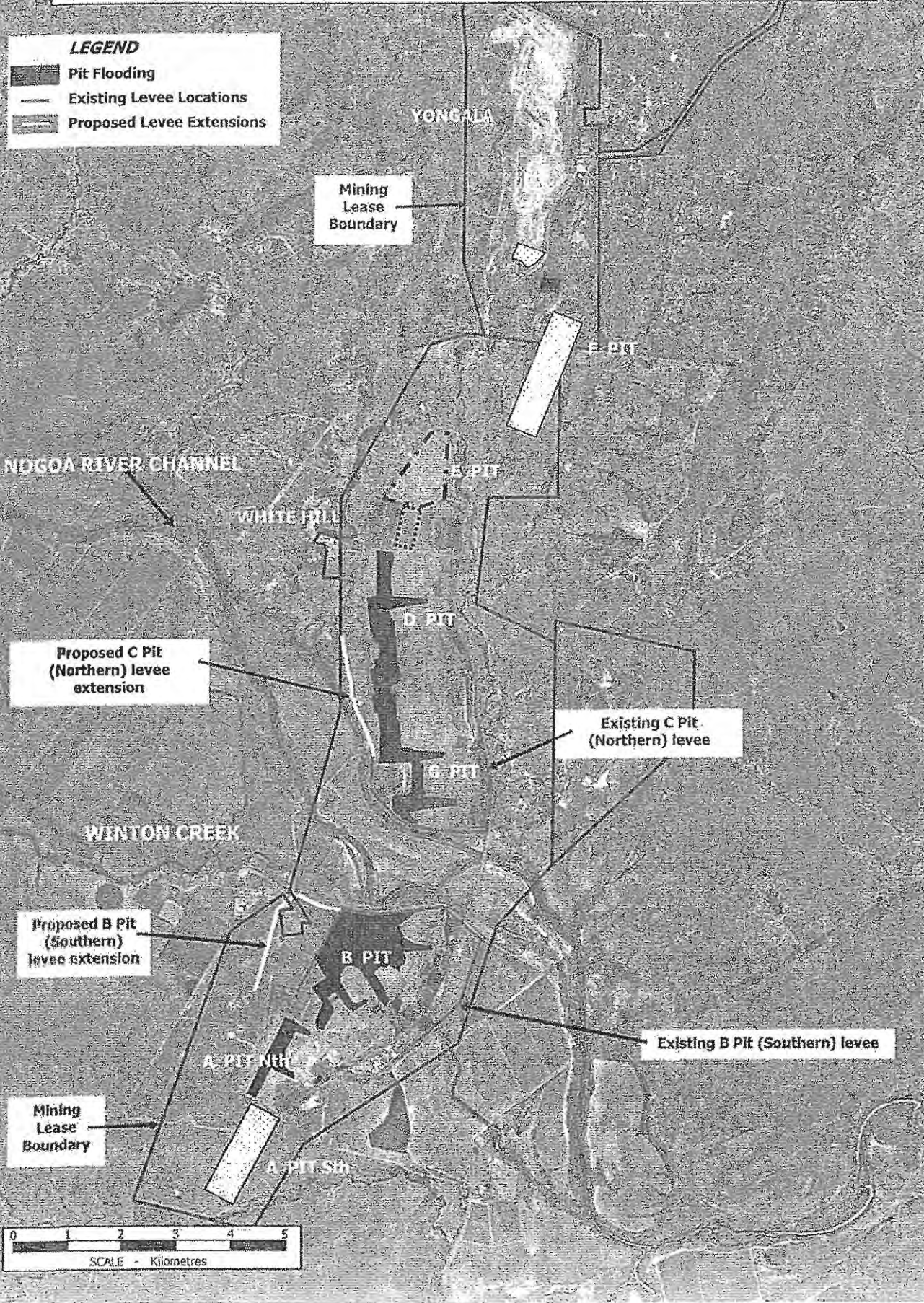

Colin Jensen
Coordinator-General

ENSHAM COAL PROJECT

Existing and Proposed Flood Protection Levee Locations

LEGEND

- Pit Flooding
- Existing Levee Locations
- Proposed Levee Extensions



Nogoa River Flood Plain Board Levee Bank Permit

Permit No. 014

Ensham Mine Northern Levee Bank
Application submitted 15 November 2007

Owner: Ensham Resources Pty Ltd
Address: PO Box 1565
Emerald Qld 4720

Property Description:

Lot 31 CP864573, Parish of Middarra, County of Talbott.

Reference Document:

Prescribed Project assessment and decision – Ensham Mine Flood Recovery Project, Northern Levee Bank, October 2008

Reference Map:

Ensham Coal Project – Existing and Proposed Flood Protection Levee Locations, July 2008

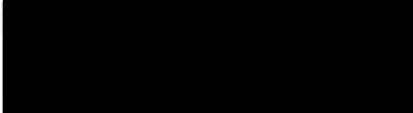
Conditions:

- (a) the proposed works are to be undertaken in accordance with the details included in the application, referred to above;
- (b) construction of the levee bank shall comply with the following reports: Kellogg Brown & Root Pty Ltd (23.6.2008) Ensham Mine Flood Levees, Proposed Levees Design Report, BEE603-W-REP-005 Rev 0, and Kellogg Brown & Root Pty Ltd (23.6.2008) Ensham Mine Proposed Flood Levees, Technical Specification for Civil Works, BEE603-Z-SPEC-001 Rev 5 and associated technical drawings;
- (c) the work is to be undertaken under the supervision of a Registered Professional Engineer, Queensland (RPEQ) and certified accordingly upon completion.
- (d) advice, in writing, shall be given of commencement of the works, and expected duration of works;
- (e) the works proposed are to be completed within six (6) months of the date of issue of this permit;
- (f) the permit is issued for a period of ten (10) years, expiry date being 3rd October 2018;
- (g) "as constructed" details of the works shall be provided including coordinates of the structures, upon completion, together with a certification that all works are in accordance with the approved plans. This certification shall be signed by a Registered Professional Engineer, Queensland;
- (h) the provisions of the *Nogoa River Flood Plain Board Local Law (Levee Banks) No. 1, 1997* shall be complied with at all times;
- (i) the owner shall advise any proposed purchaser that the property is the subject of a levee bank permit;
- (j) the owner shall identify any proposed subdivisional application of the property as being subject to a levee bank permit.

The Central Highlands Regional Council will be advised of the levee bank permit to enable the records of the affected property to be duly noted.

This permit is issued pursuant to section 76Q of the *State Development and Public Works Organisation Act 1971*.

3/10/2008


Colin Jensen
Coordinator-General

NOGOA RIVER FLOOD PLAIN BOARD

LOCAL LAW NO. 1

LEVEE BANKS

PART 1- PRELIMINARY

- Citation
- Objects
- Definitions
- Non-Application of Local Law

PART 2 - APPLICATION FOR PERMIT

- Application for Permit
- Proof of ownership of land
- Application fee and expenses
- Exemptions
- Application to be advertised
- Objections
- Support of application

PART 3 - DETERMINATION OF APPLICATIONS AND ISSUE OF PERMITS

- Determination of application
- Issue of permit and permit plan - Requirements of permit
- Permit transferred on transfer of land

PART 4 - APPLICATION FOR NEW PERMIT ON EXPIRY OF ORIGINAL PERMIT

- Application for new permit on expiry of original permit

PART 5 - REVOCATION OF PERMIT

- Revocation of Permit

PART 6 - DEMOLITION OF LEVEE BANKS

- Applications to demolish levee bank
- Order to Demolish Levee

PART 7 - APPEALS

- Appeals

PART 8 - LOCAL LAW POLICIES

- Local Law Policies

NOGOA RIVER FLOOD PLAIN BOARD

LOCAL LAW NO. 1 1997

(LEVEE BANKS)

PART 1- PRELIMINARY

Citation

1. This Local Law may be cited as Local Law (Levee Banks) No. 1 1997.

Objects

2. The objects of this Local Law are to ensure that Levee Banks:
 - (1) do not alter overland water flow in a way which injuriously affects other land; and
 - (2) are constructed in accordance with a Permit granted under this Local Law.

Definitions

3. In this Local Law the following definitions apply:
 - (1) "**Act**" means the Local Government Act 1993;
 - (2) "**Board**" means the Nogoia River Flood Plain Board;
 - (3) "**Contiguous**" with reference to land, includes land which is separated only by a gazetted road, stock route, watercourse, drainage easement or similar reserve or easement, and which is situated in the State of Queensland;
 - (4) "**Department**" means the Department of Environment Heritage and Natural Resources or the Government Department in which the Water Resources Act 1989 or its replacement shall be administered from time to time;
 - (5) "**Director of Engineering Services**" means the Director of Engineering Services for the Board;
 - (6) "**Final Plan**" means the Plan or Plans to which the granting of a Permit is subject;
 - (7) "**Levee Bank**" has the meaning given to that term in the Act;
 - (8) "**Nogoia River Flood Plain**" means any part of the Shires of Emerald and/or Peak Downs subject to flood inundation from the Nogoia River or Theresa Creek or their tributaries and as designated as part of the Nogoia River Flood Plain in the map held by the Nogoia River Flood Plain Board showing the boundaries of the flood plain;
 - (9) "**Permit**" means a permit for the construction of a new Levee Bank or to keep an existing Levee Bank granted pursuant to this Local Law; and

- (10) "Permittee" means the person or persons to whom a permit is granted under this Local Law or in whom a permit is vested from time to time."

Non-Application of Local Law

4. This Local Law does not apply to an area included in an approved plan within the meaning of the Soil Conservation Act 1986.¹

PART 2 - APPLICATION FOR PERMIT

Application for Permit

5. (1) A person must not construct or cause to be constructed a Levee Bank on any land other than pursuant to a Permit.

Maximum penalty 50 penalty units.

- (1A) A person must not have or allow to remain on land a Levee Bank for which there is not a current Permit issued under this Local Law.

Maximum penalty 50 penalty units.

- (1B) If, when this Local Law commences, there is on land to which this Local Law applies a Levee Bank that, in the Board's opinion, affects or is likely to affect natural drainage to an extent that it causes or may cause damage to land or a public work, service or undertaking, the Board may, by written notice require the owner of the land to apply to it within a specified reasonable period for permission to keep the Levee Bank or part of the Levee Bank.

- (2) Application for a Permit must be made to the Board in the form set out in Schedule 1 to this Local Law.

- (3) The Application should be accompanied by:

- (a) Plans and specifications of the levee bank;
- (b) A Report on the impact of the levee bank on the hydraulic characteristics of the Nogoia River Flood Plain prepared by the Department, an Engineer currently registered pursuant to Section 12 of the Professional Engineers Act 1988 or a registered Engineer under the Local Government Act 1993; and
- (c) The Application fee fixed by the Board in accordance with Section 7 of this Local Law;

- (4) A person may apply for exemption from obtaining the permit in the same manner as a person may apply for a permit.

¹ Footnote 1 Section 533 of the Local Government Act 1993 states, "The jurisdiction of a local government under this Part to prohibit or regulate the construction and maintenance of levee banks does not extend to a part of its area included in an approved plan within the meaning of the Soil Conservation Act 1986. "

- (5) This Local Law applies with respect to the construction, maintenance or keeping of a Levee Bank under, subject to and in compliance with an order, licence, permit or other authority made or granted under any other law and the applicant must obtain a permit under this Local Law in addition to any order, licence, permit or other authority required under any other law.

Proof of ownership of land

6. The applicant must give to the Board with the application evidence that the applicant owns the land on which the Levee Bank is situated or is to be constructed, or that the owner of the land consents to the application.

Application fee and expenses

7. The Board may from time to time fix by a resolution an application fee which may include the estimated cost of placing any advertisement required by this Local Law.

Exemptions

8. Upon consideration of an application for exemption under this local law, the Board may exempt an Applicant from obtaining a permit, where the Board considers that the levee bank will not have any affect on the hydraulic characteristics of the Nogoia River Flood Plain.

Application to be advertised

9.
 - (1) Upon receipt of an application for a Permit under the provisions of this Local Law, the Board must, before considering such application, notify by advertisement published twice in a newspaper circulating generally in the areas of the Emerald Shire Council and the Peak Downs Shire Council, that such application has been received and that the Board will receive submissions in relation to the application.
 - (2) The Chief Executive Officer of the Board must appoint the twenty-first day after the date of the last publication of such advertisement as the last day for the receipt of objections to the application.
 - (3) The application must be open to inspection at the Board's office from the date of the first publication of such advertisement until the day nominated as the last day for the receipt of submissions.
 - (4) The advertisement must be in the form set out in Schedule 2 of this Local Law.
 - (5) The Chief Executive Officer of the Board must forward a copy of the notice required under sub-section 9(1) to the owners of contiguous land and the Department at the same time as it is lodged for publication.

Submissions

10.
 - (1) A person may make a submission to the Board with respect to the granting of a Permit.
 - (2) A submission must be in writing and must contain:

- (a) the submitter's full name and address;
 - (b) the description of any property owned or occupied by the submitter affected or likely to be affected by the Levee Bank; and
 - (c) the grounds for the submissions.
- (3) A submission must be given to the Board on or before the last day for receipt of submissions stated in the advertisement of the application.
- (4) A submission may contain details of suggested alterations to a proposed Levee Bank and a plan in respect of those alterations.
- (5) A submission may be in support of or in opposition to the granting of an application.

Determination of application

11. (1) The board may in its absolute discretion require the applicant for a Permit to undertake any studies (including environmental impact studies) and provide any information (including a proposed environmental management plan) it deems necessary in order for it to properly assess and determine the application.
- (2) Copies of all other approvals, permits or authorities required for the Levee Bank under any other law must be provided to the Board with the application.
- (3) Where submissions have been lodged pursuant to section 10, the Board may invite the submitters to be present before the Board Meeting to give a verbal explanation of their submission and any alternatives they may have suggested.
- (4) The Board must not determine an application until it is in receipt of all relevant information including a report from the Director of Engineering Services.
- (5) After the last day for receipt of submissions, the Board must promptly consider:
- (a) the application and all material accompanying it;
 - (b) all submissions and material accompanying them;
 - (c) a report from the Director of Engineering Services;
 - (d) any information or report provided by the applicant pursuant to sub-section 11(1);
 - (e) if the Board invites oral submissions, any oral submissions made to it by the applicant or any submitter;
 - (f) the requirements of any other relevant laws and any consent or approval obtained by the applicant under those laws; and
 - (g) any other information that the Board considers relevant;
- and must either grant or refuse to grant the application.

- (6) The board may impose conditions that it considers necessary on the granting of the permit.
- (7) The Board must promptly notify in writing:
 - (a) the applicant; and
 - (b) each submitter; and
 - (c) the Department;

or its decision in respect of the application.

PART 3 – ISSUE OF PERMITS

Determination of application

12. (1) The Board must not issue a permit before the end of 30 days after giving notice of its decision in accordance with subsection 11(7) of this Local Law.
- (2) If an appeal against the Boards decision is started in accordance with section 942 of the Act, a Permit must not be issued unless the appeal is withdrawn, struck out or disposed of other than by a decision of an appeal tribunal to which section 943(3) of the Act applies.
- (3) A decision of an appeal tribunal which:
 - (a) confirms a decision of the Board; or
 - (b) substitutes a decision permitting construction of a Levee Bank either wholly or in part; or
 - (c) substitutes a decision permitting an existing Levee Bank to be kept either wholly or in part;is taken to be a Permit issued by the Board under this Local Law.
- (4) A Permit must:
 - (a) specify the conditions to which the grant of the Permit is subject; and
 - (b) have attached to it a copy of the final Plan on which the Permit was issued.
- (5) The factors that the Board may have regard to when considering an application for a Permit include but are not limited to:
 - (a) the level of risk of failure of a Levee Bank and the hazard such failure represents;
 - (b) whether a Levee Bank generally conforms to the natural drainage pattern of the Nogoia River Flood Plain;
 - (c) the environmental; cultural and social impacts of a Levee Bank;

- (d) whether a Levee Bank complies with any requirements under any other law;
- (e) the impact of a Levee Bank on flow rates, flow distribution, flood timing and depth of flow in the Nogoia River Flood Plain;
- (f) whether a Levee Bank is designed and is or is to be constructed to appropriate standards having regard to the risk of failure of the Levee Bank and the consequences of failure;
- (g) design reports, including plans and specifications, addressing the impacts of overtopping or failure of the works, including hazards such a failure represents, and appropriate management guidelines;
- (h) whether a Levee Bank is or will be constructed and maintained in accordance with an approved design report (including approved plans and specifications) to the satisfaction of the Board;
- (i) the full height of a Levee Bank;
- (j) whether the discharge pattern from the land on which a Levee Bank is situated is or will be similar to the discharge pattern of that land prior to the development of the Levee Bank;
- (k) whether a Levee Bank blocks any general flow paths within the land on which it is situated;
- (l) the total increase in peak water elevation at or outside the boundary of the land on which the Levee Bank is situated or to be constructed arising from all development (including existing Levee Banks and proposed Levee Banks) on that land;
- (m) the anticipated water level rise on the flood plain at any property boundary on the Nogoia River Flood Plain having regard to the total cumulative effect of all works likely to be constructed on the flood plain;
- (n) whether significant change in flood timing or flood flow distribution has occurred or will occur;
- (o) whether significant change is likely in the duration of inundation of lands outside the boundaries of the land on which the Levee Bank is situated or to be constructed such that the normal use or potential use of that land is adversely impacted;
- (p) whether any change in flood velocity arising from the proposed Levee Bank or existing Levee Bank will result or has resulted in increased erosion on the flood plain and water courses (including localized scour effects); and
- (q) whether sufficient pondage has been retained in the flood plain system so that the characteristics of the flood hydrographs, in particular their general shape, timing and peak height are not unduly altered.

- (6) Unless the applicant expressly requests otherwise at the time of lodging the application, and the request is agreed to by the Board, the work authorised under a Permit must be completed within 6 months after the date of issue of the Permit otherwise the Permit will lapse upon the expiry of that period.
- (7) The Board may if requested so to do by a Permittee extend the period for completion of such work provided a request is made to the Board before the expiration of the Permit.
- (8) The Permittee must, prior to commencement of construction of the work specified in the Permit, notify the Board in writing of the day and date of intended commencement.
- (9) The Permittee must at all times throughout the currency of a Permit, construct repair and maintain the Levee Bank in accordance with:
 - (a) the conditions to which the Permit is subject;
 - (b) the final plan; and
 - (c) any directions received from the Director of Engineering Services.

Maximum penalty - 50 penalty units

- (10) If required by the Board the Permittee must on expiration of the Permit carry out, at the Permittee's own cost, any work on or in relation to the Levee Bank which the Board may consider necessary.
- (11) The Permit will be deemed to be held by and operate for the benefit of the lawful owner for the time being of the land whereon the Levee Bank is constructed or proposed to be constructed.
- (12) It will be incumbent upon the Permittee or the Permittee's personal representative or successor in interest to notify the Board immediately of any change or divestment of interest in the land upon which the Levee Bank is constructed or proposed to be constructed.
- (13) A Permit shall not be issued for a period exceeding 10 years.

Permit Transferred on Transfer of Land

13. (1) A Permit granted by the Board pursuant to the provisions of this Local Law will be deemed transferred to any successor in title or interest of the subject land and will expire on the earlier of the date shown on it or 10 years from the date on which it is issued.
- (2) The obligations contained in the Permit and in this Local Law will apply to any successor in title or interest of the subject land, as if that successor were the Permittee.

PART 4 - APPLICATION FOR NEW PERMIT ON EXPIRY OF ORIGINAL PERMIT

Application for New Permit on Expiry of Original Permit

14. (1) A Permittee must apply to the Board for the renewal of a Permit issued under this Local Law no later than:
 - (a) 30 September of the preceding year if the Permit is due to expire in the 6 months ending 30 June in any year; or
 - (b) 30 March of the same year if the Permit is due to expire in the 6 months ending 31 December in any year.
- (2) The provisions of this Local Law and the Act apply to an application for renewal of a Permit in the same way that they applied to the application for the original Permit.

PART 5 - REVOCATION OF PERMIT

Revocation of Permit

15. (1) Subject to the following sub-sections, the Board may revoke any Permit issued by the Board under the provisions of this Local Law or where more than 1 Levee Bank is authorised by such Permit revoke or partly revoke the Permit as regards any one or more Levee Bank thereby authorised.
- (2) Such revocation or part revocation must not be made until the Board has given the Permittee not less than 2 months notice of its intention so to do.
- (3) If the Permittee upon whom such notice has been served, within the period of the notice, shows good cause to the Board why the Permit should not be revoked or partly revoked as the case may be, the Board must not proceed with such revocation or partial revocation.
- (4) Before proceeding with such revocation or partial revocation, the Board must notify the Permittee in writing of its decision and the reasons for the decision.
- (5) If, within the period of the notice referred to in section 15.(2), the Permittee has not shown to the Board good cause why the Board should not proceed with the revocation or partial revocation as the case may be, then after the expiration of the period of notice the following shall apply:
 - (a) if the Board resolves to proceed with the revocation, the Board must revoke or partly revoke the Permit as the case may be, by resolution to that effect;
 - (b) the Board must cause notice of the revocation or partial revocation to be served on the Permittee; and
 - (c) the notice must be in writing under the Seal of the Board and must specify the date on which the revocation or partial revocation is to take effect, being not sooner than 1 month after the date of the service of the notice.
- (6) In determining whether to revoke a Permit under this section, the Board must consider the following factors:

- (a) the extent to which the Permittee has complied with the conditions upon which the Permit was granted;
 - (b) the impact on the Permittee and the impact on the Permittee's land, of not being entitled to construct a Levee Bank; and
 - (c) the impact of the Levee Bank or its removal on the other land within the Nogoia River Flood Plain.
- (7) If a Permit is revoked or partly revoked, as the case may be, the owner of the land on which the Levee Bank is constructed must within 1 month after the date of service of the notice referred to in sub-section 15(5) of this Local Law demolish such Levee Bank to the satisfaction of the Board.

PART 6 - DEMOLITION OF LEEVE BANKS

Applications To Demolish Levee Bank

16. (1) If a Permittee wishes to demolish a Levee Bank, the Permittee must make application to the Board in the form set out in Schedule 1 to this Local Law for a Permit to demolish the Levee Bank and the applicant must pay such application fee as is fixed from time to time by the Board.
- (2) The application must be accompanied by:
- (a) a Report prepared by an Engineer currently registered pursuant to Section 12 of the Professional Engineers Act, 1988 or a Registered Engineer under the Local Government Act 1993 setting out the effect on the hydraulic characteristics of the Nogoia River Flood Plain of the demolition of the Levee Bank; and
 - (b) a plan of the final demolition.
- (3) The application to demolish the Levee Bank must be advertised in the same manner that an application to construct a Levee Bank is required to be advertised under section 9 of this Local Law.
- (4) A person may make a submission to the Board with respect to the demolition of a Levee Bank.
- (5) A submission must be in writing and contain:
- (a) the submitter's full name and address;
 - (b) the description of any property owned or occupied by the submitter affected or likely to be affected by the demolition of the Levee Bank; and
 - (c) the grounds for the submission.
- (6) A submission must be given to the Board on or before the last day for receipt of submissions stated on the advertisement of the application.

- (7) A submission may contain details of suggested alterations to the proposed demolition of a Levee Bank and a plan in respect of those alterations.
- (8) A submission may be in support of or in opposition to the granting of an application.
- (9) Where submissions have been lodged under this section, the Board may invite the submitters to be present before a Board Meeting to give a verbal explanation of their submission and any alternatives they may have suggested.
- (10) The Board must not determine an application to demolish a Levee Bank until it is in receipt of all relevant information including the information that must be submitted under sub-section 16(2).
- (11) After the last day for receipt of submissions, the Board must promptly consider:
 - (a) the application and all material accompanying it;
 - (b) all submissions and material accompanying them;
 - (c) information that must be submitted under sub-section 16(2);
 - (d) if the Board invites oral submissions, any oral submissions made to it by the applicant or any submitter;
 - (e) the requirements of an other relevant laws and any consent or approval obtained by the applicant under those laws; and
 - (f) any other information that the Board considers relevant; and must either grant or refuse to grant the application.
- (12) The Board must promptly notify in writing:
 - (a) the applicant; and
 - (b) each submitter; and
 - (c) the Department;of its decision in respect of the application.
- (13) The Board may impose conditions that it considers necessary on the granting of the permit.
- (14) If the application to demolish a Levee Bank is granted, the owner of land on which the Levee Bank is constructed must within 1 month after the date of which such Permit is granted completely demolish such Levee Bank to the satisfaction of the Board and in accordance with the final plans.

Order to Demolish Levee Bank

17. (1) (a) The Board may request demolition or partial demolition or any Levee Bank if:

- (i) a Permit for a Levee Bank has been revoked;
 - (ii) a Permit for a Levee Bank has expired;
 - (iii) a Levee Bank was constructed without a Permit before the commencement of this Local Law and the Board has complied with section 941(1) of the Act;
 - (iv) a Levee Bank was constructed after the commencement of this Local Law without a Permit; or
 - (v) a Levee Bank was constructed contrary to the terms of a Permit.
- (b) A request for demolition or partial demolition of a Levee Bank must:
- (i) be in writing and addressed to the owner of the Land on which the Levee Bank is situated;
 - (ii) specify period of not less than 1 month after service of the request within which the land owner is to demolish the Levee Bank; and
 - (iii) specify the works that need to be completed in order to satisfy the Board's request.
- (2) The owner of such land must completely demolish each such Levee Bank not later than the expiration of any period (being not less than 1 month) specified in the notice served under sub-clause 17(1)(b).

Maximum penalty - 50 penalty units.

- (3) Should any land owner liable to do so fail to demolish any Levee Bank to the satisfaction of the Board, then in addition to any other right or remedy available to the Board, the Board by its duly authorised officers and with such machinery, plant and equipment as they may deem necessary may enter upon any land upon which or part of which the Levee Bank is situated and demolish the Levee Bank.
- (4) The cost and expense incurred by the Board in demolishing each such Levee Bank must be paid to the Board by the owner of the land on which the Levee Bank was situated upon demand by the Board, and if not paid upon demand may be recovered from the owner of the land by the Board as a present debt.
- (5) The Board, its officers or employees, shall not be liable in damages for trespass or damage to the subject land or crops growing thereon in demolishing each such Levee Bank.
- (6) Sub-section 17(5) does not protect:
- (a) a person who commits fraud or willful default; or
 - (b) a Local Government that does not comply with a provision of this Local Law;

from liability for loss caused by fraud, default or non-compliance.

PART 7 - APPEALS

Appeals

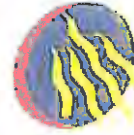
18. (1) A person aggrieved by a decision of the Board may appeal against the decision;
- (2) The appeal must be lodged with the Chief Executive Officer of the Department;
- (3) The appeal must be commenced within 30 days after the person aggrieved has been given written notice of the decision;
- (4) The appeal is started by the person aggrieved filing a Notice of Appeal with the Chief Executive of the Department and giving a copy of the Notice to the Board;
- (5) The provisions of the Local Government Act 1993 or its replacement which provides the power for a Local Government to regulate levee banks, shall apply regarding the conduct, hearing and determination of any such appeal;
- (6) In this section "decision" means:
 - (a) A decision to grant a Permit for the construction of a levee bank;
 - (b) A decision to refuse to grant a Permit for the construction of a levee bank;
 - (c) A decision to revoke a Permit issued under this Local Law;
 - (d) A decision to grant a Permit to demolish a levee bank;
 - (e) A decision not to grant a Permit to demolish a levee bank;
 - (f) A decision to require a person to demolish a levee bank.

SCHEDULE L

NOGOA RIVER FLOOD PLAIN BOARD

*Application for Permit * for Levee Bank /* to Demolish Levee Bank*

- (1) Name of applicant:
- (2) Post address:
- (3) Location of work (see also 10):
 - county:
 - parish:
 - Real property Office description:
 - Area:
- (4) Nature of works;
- (5) Purpose of works;
- (6) Particulars of work (if levee bank) -
 - (a) Total length of levee bank metres.
 - (b) Maximum height: metres.
 - (c) Width of top: metres.
 - (d) Width of base: metres.
 - (e) Materials of which bank will be constructed:
 - (f) If levee bank is one side of stream, is levee bank crest higher or lower than lowest point on opposite bank and by how much?
 - (g) Height of top of bank above highest known flood level:
- (7) Particulars of work (if drain or other excavation) -
 - (a) Total length: metres.
 - (b) Maximum depth: metres.
 - (c) Width of top: metres.
 - (d) Width of base: metres.
 - (e) State nature of soil at site:
- (8) Provision for preventing injury to other land arising from proposed work:
- (9) Period for which permit is required:
- (10) Locality plan: Scale 1:100,000 showing all property within 10 km radius of the centre of the subject land.
- (11) Plan of property, strictly to scale not greater than 1:20,000, showing position of streams (if any), direction of flow of all water, location of work, property boundaries and typical cross-sections of work. Such plan or plans to be on paper no larger than A3 (400 mm x 300 mm) paper.



**Queensland
Government**

File/Ref EMD6

Department of
Environment and Resource
Management

24 December 2009

[REDACTED]
General Manager – Technical
Ensham Resources Pty Ltd
GPO Box 814
BRISBANE QLD 4001

c/c The Mining Registrar
Department of Employment,
Economic Development and Innovation
PO Box 245
EMERALD QLD 4720

Attention: [REDACTED] (Manager – Corporate Sustainability)

Dear [REDACTED]

The Department of Environment and Resource Management (the department) refers to the application for amendment of a level 1 non code compliant environmental authority lodged by Ensham Resources Pty Ltd for the Ensham Coal Mine. I am pleased to advise that this application has been granted as of 24 December 2009.

A final environmental authority (mining activity) MIM800086202 has been issued and is enclosed with the following:

- Ecotrack Notice of Decision – Permit Application; and
- The amended environmental authority.

Should you have any further enquiries, please do not hesitate to contact Mr Glen Schulz, Principal Environmental Officer of the department on telephone (07) 3330 5623.

Yours sincerely

[REDACTED]

Manager Environmental Services- Mining

99 Hospital Road
PO Box 906
Queensland 4720 Australia
Telephone + 61 7 4980 6200
Facsimile + 61 7 4982 2568
Website www.derm.qld.gov.au
ABN 46 640 294 485



Notice of Decision – Amendment Application

This notice is issued by the Department of Environment and Resource Management to advise of a statutory decision made under section 258 of the Environmental Protection Act 1994.

[REDACTED]
General Manager – Technical
Ensham Resources Pty Ltd
GPO Box 814
BRISBANE QLD 4001

Attn: [REDACTED] (Manager – Corporate Sustainability)

Our Reference: 174745

Dear [REDACTED]

Re: Amendment of environmental authority MIM800086202 (Ensham)

The Department of Environment and Resource Management has assessed the application received on 23 September 2009 to amend environmental authority MIM800086202 by replacing the water schedule with the model conditions and updating the dam and levee conditions and wishes to advise you that the application has been Granted.

This Notice of Decision and the attached amended environmental authority constitute the permit documentation.

If you require more information please contact Glen Schulz, the Project Manager, on (07) 3330 5623.

[REDACTED]
Delegate
Environmental Protection Act 1994
24 December 2009

Enquiries:
Environmental Services
Central West – Emerald
PO Box 906
99 Hospital Road
EMERALD QLD 4720
Ph. 4980 6200
Fax. 4982 2568

*Attachment – Information sheet: Internal review and land court appeal process
- EA MIM800086202*

**Environmental Authority (Mining Activities) Non Code Compliant Level 1
Mining Project
Permit¹ Number: MIM800086202 – Ensham Mine**

Section 258 – Environmental Protection Act 1994

Takes effect from: 24 December 2009

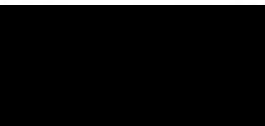
Details:

Permit Holder(s)	Name	Address
Principal Holder	Bligh Coal Limited	C/- Ensham Resources
Joint Holder	Idemitsu Australia Resources Pty Ltd	Level 20, AMP Place
Joint Holder	J-Power Australia Pty Ltd	10 Eagle Street
Joint Holder	LG International (Australia) Pty Ltd	BRISBANE QLD 4000
		GPO Box 814
		BRISBANE QLD 4001

Activity(s)	Location(s)
Mining Black Coal	40km east of Emerald ML7459 ML7460 ML70049 ML70326 SA 2 (Lot 31 P864573)

The anniversary date of the environmental authority is 30 May.

The environmental authority is subject to the attached conditions of approval.



Delegate
Environmental Protection Act 1994
24 December 2009

¹ Permit includes licences, approvals, permits, authorisations, certificates, sanctions or equivalent/similar as required by legislation administered by the Department of Environment and Resource Management.

Department Interest – General

Financial assurance

- A1** Provide a financial assurance in the amount and form required by the administering authority prior to the commencement of activities proposed under this environmental authority.
- A2** The financial assurance is to remain in force until the administering authority is satisfied that no claim on the assurance is likely.

Maintenance of measures, plant and equipment

- A3** The environmental authority holder must ensure:
- that all measures, plant and equipment necessary to ensure compliance with the conditions of this environmental authority are installed;
 - that such measures, plant and equipment are maintained in a proper condition; and
 - that such measures, plant and equipment are operated in a proper manner.

Monitoring

- A4** Record, compile and keep for a minimum of five (5) years all monitoring results required by this environmental authority and make available for inspection all or any of these records upon request by the administering authority.
- A5** Where monitoring is a requirement of this environmental authority, ensure that a competent person(s) conducts all monitoring.

Storage and handling of flammable and combustible liquids

- A6** Spillage of all flammable and combustible liquids must be contained within an on-site containment system and controlled in a manner that prevents environmental harm (other than trivial harm) and maintained in accordance with Section 5.9 of AS 1940 - *Storage and Handling of Flammable and Combustible Liquids of 1993*.

Definitions

- A7** Words and phrases used throughout this environmental authority are defined in Appendix 1 – Definitions. Where a definition for a term used in this environmental authority is sought and the term is not defined within this environmental authority, the definitions in the *Environmental Protection Act 1994*, its Regulations and Environmental Protection Policies must be used.

Department interest – Air

Dust nuisance

- B1** All reasonable and practicable measures must be taken to minimise the release of dust or particulate matter or both resulting from the mining activities that causes or is likely to cause an environmental nuisance, at any sensitive place.
- B2** When requested by the administering authority, dust and particulate monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive place, and the results must be notified within fourteen (14) days to the administering authority following completion of monitoring.
- B3** If the environmental authority holder can provide evidence through monitoring that the following limits are not being exceeded then the holder is not in breach of condition B1:
- a) dust deposition of one hundred and twenty (120) milligrams per square metre per day, averaged over one (1) month, when monitored in accordance with *AS 3580.10.1 Methods for sampling and analysis of ambient air - Determination of particulates - Deposited matter - Gravimetric method of 1991* or another method of monitoring/assessment as determined to be appropriate due to the nature of the nuisance decided in consultation with the administering authority; and
 - b) a concentration of particulate matter with an aerodynamic diameter of less than ten (10) micrometer (PM10) suspended in the atmosphere of one hundred and fifty (150) micrograms per cubic meter over a twenty-four (24) hour averaging time, at a sensitive place downwind of the operation land, when monitored in accordance with:
 - (i) *Particulate matter- determination of suspended particulate PM10 high volume sampler with size selective inlet – Gravimetric method*, when monitored in accordance with *AS 3580.9.6 Methods for sampling and analysis of ambient air – determination of suspended particulate matter – PM (sub) 10 high volume sampler with size-selective inlet – Gravimetric method of 1990*; or
 - (ii) Any alternative method of sampling PM10 which may be permitted by the *Air Quality Sampling Manual* as published from time to time by the administering authority.

Department Interest – Water

Contaminant release

- W1** 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 the conditions of this environmental authority.

W2 The release of contaminants to waters must only occur from the release points specified in Table 1 (Contaminant release points, sources and receiving waters) and depicted in Appendix 2 (Release points (RP) and monitoring points (MP) for Ensham Coal Mine) of this environmental authority.

Table 1 (Contaminant release points, sources and receiving waters)

Release Point (RP)	Easting	Northing	Contaminant Source and Location	Monitoring Point	Receiving waters description
RP 1 Nogoa River	653,753	7,401,398	Ramp 24 Fill Point Dam and Ramp 4 Dam	End of pipe	Nogoa River
RP 2 Boggy Creek	654,270	7,412,235	Ramp 8 Pit (Yongala)	End of pipe	Boggy Creek

W3 The release of contaminants to waters must not exceed the release limits stated in Table 2 (Contaminant release limits) when measured at the monitoring points specified in Table 1 (Contaminant release points, sources and receiving waters) for each quality characteristic.

Table 2 (Contaminant release limits)

Quality Characteristic	Interim release limits until 31 December 2011	Future release limits from 1 January 2012	Monitoring frequency
Electrical conductivity ($\mu\text{S}/\text{cm}$)	1,500	750	Daily during release (the first sample must be taken within 2 hours of commencement of release)
pH (pH Unit)	6.5 (minimum) 9.0 (maximum)	6.5 (minimum) 9.0 (maximum)	Daily during release (the first sample must be taken within 2 hours of commencement of release)
Turbidity (NTU)	360	360	Daily during release* (first sample within 2 hours of commencement of release)
Suspended Solids (mg/L)	150	150	Daily during release* (first sample within 2 hours of commencement of release)
Sulphate (SO_4^{2-}) (mg/L)	1,000	250	Daily during release* (first sample within 2 hours of commencement of release)

Note: NA – not available, * local trigger values need to be developed

W4 The release of contaminants to waters from the release points must be monitored at the locations specified in Table 1 (Contaminant release points, sources and receiving waters) for each quality characteristic and at the frequency specified in Table 2 (Contaminant release limits) and Table 3 (Release contaminant trigger investigation levels).

Table 3 (Release contaminant trigger investigation levels)

Quality characteristic	Trigger levels (µg/L)	Monitoring frequency
Aluminium	300	Commencement of release and thereafter weekly during release
Arsenic	13	
Cadmium	0.2	
Chromium	1.12	
Copper	10	
Iron	300	
Lead	10	
Mercury	1	
Nickel	11	
Zinc	10	
Boron	370	
Cobalt	90	
Manganese	1900	
Molybdenum	34	
Selenium	10	
Silver	1	
Uranium	1	
Vanadium	10	
Ammonia	900	
Nitrate	1100	
Petroleum hydrocarbons (C6-C9)	20	
Petroleum hydrocarbons (C10-C36)	100	
Fluoride (total)	2000	

Note:

1. All metals and metalloids must be measured as total (unfiltered) and dissolved (filtered). Trigger levels for metal/metalloids apply if dissolved results exceed trigger.
2. The list of quality characteristics required to be monitored as per Table 3 will be reviewed once the results of the monitoring data is gathered for the interim period until 31 December 2011 or an earlier date if the data is, or becomes, available and if it is determined that there is no need to monitor for certain individual quality characteristics these can be removed from Table 3.

W5 If quality characteristics of the release exceed any of the trigger levels specified in Table 3 (Release contaminant trigger investigation levels) during a release event, the environmental authority holder must compare the down stream results in the receiving waters to the trigger values specified in Table 3 (Release contaminant trigger investigation levels) and:

1. where the trigger values are not exceeded then no action is to be taken; or
2. where the down stream results exceed the trigger values specified Table 3 for any quality characteristic, compare the results of the down stream site to the data from background monitoring sites and:
 - a) if the result is less than the background monitoring site data, then no action is to be taken; or
 - b) if the result is greater than the background monitoring site data, complete an investigation in accordance with the ANZECC & ARMCANZ 2000 methodology, into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining:
 - (i) details of the investigations carried out; and
 - (ii) actions taken to prevent environmental harm.

Note: Where an exceedence of a trigger level has occurred and is being investigated, in accordance with W5(2)b)(ii) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

W6 If an exceedence in accordance with condition W5(2)b)(ii) is identified, the holder of the environmental authority must notify the administering authority within fourteen (14) days of receiving the result.

Contaminant release events

W7 The holder must install, operate and maintain a stream flow gauging station to determine and record stream flows at the locations upstream of each release point as specified in Table 4 (Contaminant release during flow events) for any receiving water into which a release occurs.

W8 Notwithstanding any other condition of this environmental authority, the release of contaminants to waters must only take place during periods of natural flow events specified as minimum flow in Table 4 (Contaminant release during flow events) for the contaminant release point(s) specified in Table 1 (Contaminant release points, sources and receiving waters).

Table 4 (Contaminant release during flow events)

Receiving water description	Release point (RP)	Gauging station description	Northing	Easting	Minimum flow in receiving water required for a release event	Flow recording frequency
Nogoa River	RP 1	Gauging Station 2 (GS 2) (At the same location as the existing Duckponds gauging station)	7,402,390	650,482	20m ³ /s	Continuous (minimum daily)
Boggy Creek	RP 2	Gauging Station 3 (GS 3) (Adjacent to Ramp 9 at Yongala)	7,414,491	655,399	2m ³ /s	

- W9** Contaminant release flow rate must not exceed twenty percent (20%) of receiving water flow rate.
- W10** The daily quantity of contaminants released from each release point must be measured and recorded at the monitoring points in Table 1 (Contaminant release points, sources and receiving waters).
- W11** Releases to waters must be undertaken so as not to cause erosion of the bed and banks of the receiving waters, or cause a material build up of sediment in such waters.

Notification of release event

- W12** The environmental authority holder must notify the administering authority as soon as practicable (no later than six (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.

- W13** The environmental authority holder must notify the administering authority as soon as practicable, (nominally within twenty-four (24) hours after of cessation of a release) of the cessation of a release notified under condition W12 and within twenty-eight (28) days provide the following information in writing:
- a) release cessation date/time;
 - b) natural flow volume in receiving water;
 - c) volume of water released;
 - d) details regarding the compliance of the release with the conditions of Agency Interest: Water of this environmental authority (i.e. contamination limits, natural flow, discharge volume);
 - e) all in-situ water quality monitoring results; and
 - f) any other matters pertinent to the water release event.

Notification of release event exceedence

- W14** If the release limits defined in Table 2 (Contaminant release limits) are exceeded, the holder of the environmental authority must notify the administering authority within twenty-four (24) hours of receiving the results.

- W15** The environmental authority holder must, within twenty-eight (28) days of a release that exceeds the conditions of this environmental authority, provide a report to the administering authority detailing:
- a) the reason for the release;
 - 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.

Monitoring of water storage quality

- W16** Water storages stated in Table 5 (Water storage monitoring) which are associated with the release points must be monitored for the water quality characteristics specified in Table 6 (Onsite water storage contaminant limits) at the monitoring locations and at the monitoring frequency specified in Table 5.

Table 5 (Water storage monitoring)

Water storage description	Northing	Easting	Monitoring location	Frequency of monitoring
Ramp 24 Fill Point Dam (Southern side of Nogoia River)	7,398,309	652,651	Within 100m of pump intake point	Quarterly
Ramp 4 Dam (Northern side of Nogoia River)	7,403,555	653,862	Within 100m of pump intake point	
Ramp 8 Pit (Northern side of Nogoia River adjacent to the Yongala Pit)	7,412,756	654,376	Within 100m of pump intake point	

- W17** In the event that waters storages defined in Table 5 (Water storage monitoring) exceed the contaminant limits defined in Table 6 (Onsite water storage contaminant limits), the holder of the environmental authority must implement measures, where practicable, to prevent access to waters by all livestock.

Table 6 (Onsite water storage contaminant limits)

Quality characteristic	Test value	Contaminant limit
pH (pH unit)	Range	Greater than 4, less than 9 ²
EC (µS/cm)	Maximum	5970 ¹
Sulphate (mg/L)	Maximum	1000 ¹
Fluoride (mg/L)	Maximum	2 ¹
Aluminium (mg/L)	Maximum	5 ¹
Arsenic (mg/L)	Maximum	0.5 ¹
Cadmium (mg/L)	Maximum	0.01 ¹
Cobalt (mg/L)	Maximum	1 ¹
Copper (mg/L)	Maximum	1 ¹
Lead (mg/L)	Maximum	0.1 ¹
Nickel (mg/L)	Maximum	1 ¹
Zinc (mg/L)	Maximum	20 ¹

Note:

¹ Contaminant limit based on ANZECC & ARMICANZ (2000) stock water quality guidelines.

² Page 4.2-15 of ANZECC & ARMICANZ (2000) "Soil and animal health will not generally be affected by water with pH in the range of 4-9".

Note: Total measurements (unfiltered) must be taken and analysed.

Receiving environment monitoring and contaminant trigger levels

W18 The quality of the receiving waters must be monitored at the locations specified in Table 8 (Receiving water upstream background sites and down stream monitoring points) and shown in Appendix 2 (Release points (RP) and monitoring points (MP) for Ensham Coal Mine) for each quality characteristic and at the monitoring frequency stated in Table 7 (Receiving waters contaminant trigger levels).

Table 7 (Receiving waters contaminant trigger levels)

Quality characteristic	Trigger level	Monitoring frequency
pH	6.5 – 8.0	Daily during the release
Electrical Conductivity ($\mu\text{S}/\text{cm}$)	500	
Suspended solids (mg/L)	1,000	
Sulphate (SO_4^{2-}) (mg/L)	250	

Table 8 (Receiving water upstream background sites and down stream monitoring points)

Monitoring point (MP)	Receiving waters location description	Easting	Northing
Monitoring points for RP 1 – Nogoia River discharge point			
Upstream background monitoring points			
MP 2	Nogoia River – upstream Ensham land boundary at Duckponds Crossing	650,482	7,402,390
Downstream monitoring point			
MP 3	Nogoia River – downstream Ensham lease boundary	654,688	7,400,679
Monitoring points for RP3 – Boggy Creek discharge point			
Upstream background monitoring points			
MP 4	Boggy Creek – adjacent to Yongala Ramp 9	655,399	7,414,491
MP 5	Boggy Creek – at haul road crossing north of Ramp 7	653 509	7,408,061

Note:

- a) The upstream monitoring point should be within 10km of the release point.
- b) The downstream point should not be greater than 1.6km from the release point.
- c) The data from background monitoring points must not be used where they are affected by releases from other mines.

W19 If quality characteristics of the receiving water at the downstream monitoring points exceed any of the trigger levels specified in Table 7 (Receiving waters contaminant trigger levels) during a release event the environmental authority holder must compare the down stream results to the upstream results in the receiving waters and:

1. where the downstream result is the same or a lower value than the upstream value for the quality characteristic then no action is to be taken; or
2. where the down stream results exceed the upstream results complete an investigation in accordance with the ANZECC & ARMCANZ 2000 methodology, into the potential for environmental harm and provide a written report to the administering authority in the next annual return, outlining:
 - (i) details of the investigations carried out; and
 - (ii) actions taken to prevent environmental harm.

Note: Where an exceedence of a trigger level has occurred and is being investigated, in accordance with W19 2(ii) of this condition, no further reporting is required for subsequent trigger events for that quality characteristic.

Receiving Environment Monitoring Program (REMP)

W20 A REMP must be developed and implemented by **30 March 2010** to monitor and record the effects of the release of contaminants on the receiving environment periodically and whilst contaminants are being discharged from the site, with the aims of identifying and describing the extent of any adverse impacts to local environmental values, and monitoring any changes in the receiving water. A copy of the REMP must be provided to the administering authority prior to its implementation and due consideration given to any comments made on the REMP by the administering authority.

For the purposes of the REMP, the receiving environment is the waters of the Nogoia River downstream of Ensham Coal Mine to Riley's Crossing near the Comet River junction.

- W21** The REMP must address (but not necessarily be limited to) the following:
- a) Description of potentially affected receiving waters including key communities and background water quality characteristics based on accurate and reliable monitoring data that takes into consideration any temporal variation (e.g. seasonality);
 - b) Description of applicable environmental values and water quality objectives to be achieved (i.e. as scheduled pursuant to the *Environmental Protection (Water) Policy 1997*);
 - c) Any relevant reports prepared by other governmental or professional research organisations that relate to the receiving environment within which the REMP is proposed;
 - d) Water quality targets within the receiving environment to be achieved, and clarification of contaminant concentrations or levels indicating adverse environmental impacts during the REMP.
 - e) Monitoring for any potential adverse environmental impacts caused by the release;
 - f) Monitoring of stream flow and hydrology;
 - g) Monitoring of toxicants should consider the indicators specified in Table 3 (Release contaminant trigger investigation levels) to assess the extent of the compliance of concentrations with water quality objectives and/or the ANZECC & ARMCANZ 2000 guidelines for slightly to moderately disturbed ecosystems;
 - h) Monitoring of physical chemical parameters as a minimum those specified in Table 2 (Contaminant release limits) (in addition to dissolved oxygen saturation and temperature);
 - i) Monitoring biological indicators (for macroinvertebrates in accordance with the AusRivas methodology) and metals/metalloids in sediments (in accordance with ANZECC & ARMCANZ 2000, BATLEY and/or the most recent version of AS5667.1 *Guidance on Sampling of Bottom Sediments*) for permanent, semi-permanent water holes and water storages;
 - j) The locations of monitoring points (including the locations specified in Table 8 (Receiving water upstream background sites and down stream monitoring points) which are background and downstream impacted sites for each release point);
 - k) The frequency or scheduling of sampling and analysis sufficient to determine water quality objectives and to derive site specific reference values within two (2) years (depending on wet season flows) in accordance with the *Queensland Water Quality Guidelines 2006*. For ephemeral streams, this should include periods of flow irrespective of mine or other discharges;
 - l) Specify sampling and analysis methods and quality assurance and control;
 - m) Any historical datasets to be relied upon;
 - n) Description of the statistical basis on which conclusions are drawn; and
 - o) Any spatial and temporal controls to exclude potential confounding factors.
- W22** A report outlining the findings of the REMP, including all monitoring results and interpretations in accordance with conditions W20 & W21 must be prepared and submitted in writing to the administering authority by **1 October 2011**. This should include an assessment of background water quality, any assimilative capacity for those contaminants monitored and the suitability of current discharge limits to protect downstream environment values.

Water reuse

W23 Water contaminated by mining activity may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority during periods of dry weather for the purpose of supplying stock water to properties directly adjoining properties owned by the environmental authority holder or a third party and subject to compliance with the quality release limits specified in Table 9 (Stock water release limits).

Table 9 (Stock water release limits)

Quality characteristic	Units	Minimum	Maximum
pH	pH units	6.5	8.5
Electrical Conductivity	µS/cm	N/A	5000

1. By third party agreement for any other parameter

W24 Water contaminated by mining activity may be piped or trucked or transferred by some other means that does not contravene the conditions of this environmental authority during periods of dry weather for the purpose of supplying irrigation water to properties directly adjoining properties owned by the environmental authority holder or a third party and subject to compliance with quality limits specified in Table 10 (Irrigation water release limits).

Table 10 (Irrigation water release limits)

Quality characteristic	Units	Minimum	Maximum
pH	pH units	6.5	8.5
Electrical Conductivity	µS/cm	N/A	Site specific value to be determined in accordance with ANZECC & ARMCANZ (2000) Irrigation Guidelines and provided through an amendment process

1. By third party agreement for any other parameter

W25 Water contaminated by mining activity may be piped or trucked off the mining lease for the purpose of supplying water to a third party for purpose of construction and/or road maintenance in accordance with the conditions of this environmental authority.

W26 Water contaminated by mining activity may be piped or trucked for the purpose of supplying water to an adjoining mine in accordance with the conditions of this environmental authority. The volume, pH and electrical conductivity of water transferred to the adjoining mine must be monitored and recorded.

- W27** If the responsibility of water contaminated by mining activities (the water) is given or transferred to another person in accordance with conditions W23, W24, W25 or W26:
- a) the responsibility of the water must only be given or transferred in accordance with a written agreement (the third party agreement); and
 - b) include in the third party agreement a commitment from the person utilising the water to use water in such a way as to prevent environmental harm or public health incidences and specifically make the persons aware of the General Environmental Duty (GED) under section 319 of the *Environmental Protection Act 1994*, environmental sustainability of the water disposal and protection of environmental values of waters.

Water general

- W28** All determinations of water quality must be:
- a) performed by a person or body possessing appropriate experience and qualifications to perform the required measurements;
 - b) made in accordance with methods prescribed in the latest edition of the administering authority's *Water Quality Sampling Manual*;
 - c) collected from the monitoring locations identified within this environmental authority, within two (2) hours of each other where possible; and
 - d) carried out on representative samples.
 - e) laboratory testing must be undertaken using a laboratory accredited (e.g. NATA) method of analysis.

Note: Condition W28 requires the Water Quality Manual to be followed and where it is not followed because of exceptional circumstances this should be explained and reported with the results.

- W29** The release of contaminants directly or indirectly to waters:
- a) must not produce any visible discolouration of receiving waters; and
 - b) must not produce any slick or other visible or odorous evidence of oil, grease or petrochemicals nor contain visible floating oil, grease, scum, litter or other objectionable matter.

Annual water monitoring reporting

- W30** The following information must be recorded in relation to all water monitoring required under the conditions of this environmental authority and submitted to the administering authority in the specified format with each annual return:
- the date on which the sample was taken;
 - the time at which the sample was taken;
 - the monitoring point at which the sample was taken;
 - the measured or estimated daily quantity of the contaminants released from all release points;
 - the release flow rate at the time of sampling for each release point;
 - the results of all monitoring and details of any exceedences with the conditions of this environmental authority; and
 - water quality monitoring data must be provided to the administering authority in the specified electronic format upon request.

Temporary interference with waterways

- W31** Temporarily destroying native vegetation, excavating, or placing fill in a watercourse, lake or spring necessary for and associated with mining operations must be undertaken in accordance with administering authority's *Water Guideline - Activities in a Watercourse, Lake or Spring associated with Mining Activities*.

Water management plan

- W32** A Water Management Plan must be developed and implemented by **30 March 2010** that provides for the proper and effective management of the actual and potential environmental impacts resulting from the mining activity and to ensure compliance with the conditions of this environmental authority.
- W33** The Water Management Plan must be developed in accordance with Department of Environment and Resource Management's *Guideline for Preparing a Water Management Plan 2009* or any updates that become available from time to time and must include **at least** the following components:
- Contaminant Source Study;
 - Site Water Balance and Model;
 - Water Management System;
 - Saline Drainage Prevention and Management Measures;
 - Acid Rock Drainage Prevention and Management Measures (if applicable);
 - Emergency and Contingency Planning; and
 - Monitoring and Review.

W34 Each year the holder of the environmental authority must undertake a review of the Water Management Plan prior to the wet season (i.e. **by 1 November**) and a further review following the wet season (i.e. **by 1 May** the following year) to ensure that proper and effective measures, practices or procedures are in place so that the mine is operated in accordance with the conditions of this environmental authority and that environmental harm is prevented or minimised.

W35 A copy of the Water Management Plan and/or a review of the Water Management Plan must be provided to the administering authority on request.

Saline drainage

W36 The holder of this environmental authority must ensure proper and effective measures are taken to avoid or otherwise minimise the generation and/or release of saline drainage.

Acid rock drainage

W37 The holder of this environmental authority must ensure proper and effective measures are taken to avoid or otherwise minimise the generation and/or release of acid rock drainage.

Stormwater and water sediment controls

W38 An Erosion and Sediment Control Plan must be developed by an appropriately qualified person and implemented for all stages of the mining activities on the site to minimise erosion and the release of sediment to receiving waters and contamination of storm water.

W39 The maintenance and cleaning of any vehicles, plant or equipment must not be carried out in areas from which contaminants can be released into any receiving waters.

W40 Any spillage of wastes, contaminants or other materials must be cleaned up as quickly as practicable to minimise the release of wastes, contaminants or materials to any stormwater drainage system or receiving waters.

Fitzroy River basin study

W41 The administering authority and the holder of this environmental authority both acknowledge that the conditions for release of contaminants to the Nogoa River in this environmental authority have been calculated without the benefit of the findings of projects proposed to be undertaken as per recommendations 2 and 3 of the *Study of cumulative impacts on water quality of mining activities in the Fitzroy River Basin* (April 2009). The administering authority may, based on the information provided in the study report when it becomes available, all relevant information available at the time and the regulatory framework applicable at that time, consult with the holder of this environmental authority about the conditions in the environmental authority concerning the treatment and disposal of waste water.

The aim of the consultation shall be the meaningful review of the contaminant release limits imposed in this environmental authority having regard to:

- a) the study results;
- b) near field monitoring results;
- c) QLD Water Quality Guidelines; and
- d) best practice environmental management.

If this review leads to a change in the requirements on this environmental authority holder, this shall be advanced by way of an environmental authority amendment or a Transitional Environmental Program and as is necessary or desirable.

Sewage effluent

W42 Sewage effluent used for dust suppression or irrigation must not exceed sewage release limits defined in Table 11 (Sewage effluent quality standards).

Table 11 (Sewage effluent quality standards)

Quality	Release limit	Units	Limit type	Monitoring frequency
5 Day BOD	20	mg/L	max	On release
pH	6 - 8		range	On release
Free Chlorine residuals	1.0	mg/L	max	On release
Faecal coliforms (based on the average of a min of 5 samples)	1,000	Colonies per 100ml	max	On release

Groundwater

W43 Groundwater affected by mining activities must be monitored at the locations and frequencies defined in Table 12 (Groundwater monitoring locations).

W44 Subject to Condition W43 groundwater levels must be monitored and groundwater draw down fluctuations in excess of 2m per year, not resulting from the pumping of licensed bores, must be notified within fourteen (14) days to the administering authority following completion of monitoring.

Table 12 (Groundwater monitoring locations)

Monitoring point	Easting (AMD)	Northing (AMG)	Sampling point	Frequency
Alluvium groundwater (upstream)	651,140	7,402,054	GW2	Quarterly (depth)
Alluvium groundwater (downstream)	654,627	7,399,513	GW1	Quarterly (depth)

W45 The method of water sampling required by this environmental authority must comply with that set out in the latest edition of the administering authority's Water Quality Sampling Manual.

Department Interest – Dams

All dams

- C1** The holder of this environmental authority must ensure that each dam is designed, constructed, operated and maintained in accordance with accepted engineering standards and is fit for the purpose for which it is intended.
- C2** The hazard category of each dam must be assessed by a suitably qualified and experienced person at least once per year, based on documented evidence sufficient to define or confirm the current nature and extent of environmental consequences for potential failure of that dam. Hazard category is to be determined in accordance with the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland 1995*.
- C3** Dams having a hazard category assessed as significant or high, must be specifically authorised by this environmental authority.
- C4** The condition of dams must be monitored for early signs of loss of structural or hydraulic integrity, based on the advice of a suitably qualified and experienced person. The methods of monitoring and frequency of monitoring shall be as assessed by that suitably qualified and experienced person, based on the hazard category and particular circumstances of each dam.
- C5** In the event of early signs of loss of structural or hydraulic integrity, the holder of this environmental authority must immediately take action to prevent or minimise any actual or potential environmental harm, and report in writing any findings and actions taken to the administering authority within twenty eight (28) days of that event.

C6 The holder of this environmental authority must not abandon any dam but must decommission each dam such that ongoing environmental harm is prevented.

C7 As a minimum, decommissioning must be conducted such that each dam is:

- a) either:
 - i. a stable landform, that no longer contains flowable substances, or
 - ii. approved or authorised under relevant legislation for a beneficial use, or
 - iii. is a void authorised by the administering authority to remain after decommissioning; and
- b) compliant with the rehabilitation requirements of this environmental authority.

Certification and operation

C8 Documentation required by the conditions in this schedule must be kept available for inspection by the administering authority for a period of five (5) years after the conclusion of the environmentally relevant activity in respect of which this environmental authority has been granted.

C9 The holder of this environmental authority must not commence construction of a regulated dam unless:

- a) the holder has submitted to the administering authority two copies of a design plan, together with the certification of a suitably qualified and experienced person that the design of the regulated dam will deliver the performance stated in the design plan and that it will be compliant in all respects with this environmental authority, and
- b) at least twenty (20) business days has passed since the receipt of those documents, or the administering authority notifies the holder that a design plan and certification in accordance with this environmental authority, has been received.

C10 Each design plan for a regulated dam under this environmental authority, must consider the likely outcomes for releases to the environment using estimates of likely contaminant concentrations using data from contact testing, output from modelling on site and modelling for flows in the nearby watercourses.

C11 Each design plan for a regulated dam under this environmental authority, must include the outcomes from water balance modelling of the worst case scenarios of wet season storage and discharges. This information must be presented graphically at a suitable time step and be able to compare the incident rainfall, runoff and environmental releases for all regulated dams.

- C12** When construction or modification of any regulated dam is complete, the holder of this environmental authority must submit to the administering authority two (2) copies of a set of 'as constructed' drawings, together with the certification of a suitably qualified and experienced person that the dam 'as constructed' will deliver the performance stated in the design plan and that it will be compliant in all respects with this environmental authority.
- C13** The holder of this environmental authority must ensure that there is always a current operational plan for each regulated dam, which may form part of other plans required by legislation.
- C14** The operational plan shall at least cover all matters relevant to the operation and maintenance of the regulated dam so that it is compliant in all respects with this environmental authority.
- C15** The holder of this environmental authority must ensure that, where a current operational plan covers decommissioning and rehabilitation, operations are consistent with the objectives in any design plan for the dam.
- C16** The holder of this environmental authority must notify the administering authority immediately of the level in any regulated dam reaching the mandatory reporting level (MRL), and confirm in writing within seven (7) days.

Annual inspection and report

- C17** The holder of this environmental authority must arrange for each regulated dam to be inspected annually by a suitably qualified and experienced person, in accordance with the following conditions.
- C18** At each annual inspection, the condition of each regulated dam must be assessed, including the structural, geotechnical and hydraulic adequacy of the dam and the adequacy of the works with respect to dam safety, and any recommended actions conveyed immediately to the holder of this environmental authority.
- C19** The holder of this environmental authority must immediately act upon recommendations arising from an annual inspection on condition and adequacy of a dam.
- C20** At each annual inspection, the adequacy of the available storage against the design storage allowance (DSA) specified must be assessed and, if a MRL is required, it must be determined and marked on each regulated dam.
- C21** A final assessment of adequacy of available storage in each regulated dam must be based on a dam level observed within the month of October, accepted as valid by the suitably qualified and experienced person, and resulting in an estimate of the level in that dam as at **1 November**.

- C22** For each annual inspection, two (2) copies of a report certified by the suitably qualified and experienced person, including any recommended actions to be taken to ensure the integrity of each regulated dam, must be provided to the administering authority by **1 December**.

Flood protection levee – Additional conditions

- C23** The design plan in accordance with condition C9 must include:
- drawings describing the location and dimensions of the levee and the mining excavations in the vicinity of the levee, including confirmation the levee meets the specified design requirements in condition C24; and
 - a documented procedure for surveillance of the levee and any adjacent mining excavation slopes to detect and report to the administering authority any ground movement that compromises or may compromise the integrity of the levee.
- C24** Design requirements for the levee and adjacent mining excavation include:
- the design level of the levee crest shall be at least one (1) metre above the estimated 1 in 1,000 ARI flood event for the adjacent watercourses; and
 - mining excavation slopes adjacent to the levee must remain stable and are to be designed with a factor of safety of one point five (1.5) (calculated from the levee toe) or above based on an accepted stability analysis.
- C25** The flood protection levee authorised under this environmental authority must be constructed and maintained such that:
- it does not result in increased erosion of the bank or bed of the Nogoia River;
 - it does not significantly impact upon riparian or existing remnant vegetation; and
 - the levee itself will not erode during any flood events up to the 1 in 1,000 ARI event.

Flood protection levee - Surveillance and remedial works

- C26** The condition of constructed levees including the surface area between the downstream toe of the levee and the end wall crest of the open-cut mining pit should be monitored for surface cracks and must at a minimum be inspected and assessed by a suitably qualified and experienced person at least once per year between the months of May and October inclusive (i.e. during the 'dry' season and before the onset of the 'wet' season), and at any time if alarming, unusual or otherwise unsatisfactory conditions are observed.
- C27** For each flood protection levee annual inspection, two copies of the surveillance report, including any recommendations for remedial works, must be provided to the administering inspection within twenty-eight (28) days of the date of inspection.

- C28** Remedial works identified as being required for the flood protection levee during the inspections and assessments conducted under conditions C26 and C27, must be notified in writing to the administering authority within fifteen (15) business days of the completion of the inspections, and commenced within twenty-eight (28) days unless otherwise agreed in writing by the administering authority.
- C29** The annual return for this environmental authority shall be accompanied by a report, by a suitably qualified and experienced person, that certifies that the documented procedure for surveillance of the levee has been applied in accordance with the procedure, that there has been no erosion, cracking or vertical or horizontal deformation that has impacted on the integrity of the levee, and that the levee has been maintained in accordance with the certified design plan.

Regulated dams – Location and basic specifications

- C30** The following are the only regulated dams authorised under this environmental authority, and those dams are to be located within the control points defined in Table 13 (Location of regulated dams).

Table 13 (Location of regulated dams)

Name of regulated dam	Latitude (GDA94)	Longitude (GDA94)
Northern Flood Protection Levee	23.452678S	148.479443E
	23.462094S	148.479971E
	23.469485S	148.484359E
	23.478121S	148.484996E
	23.484577S	148.492496E
	23.484823S	148.503565E
	23.472116S	148.503753E
Southern Flood Protection Levee	23.511969S	148.463875E
	23.49669S	148.471324E
	23.498229S	148.497999E
	23.503798S	148.505249E
	23.514765S	148.501661E
	23.527258S	148.486488E

- C31** The following are the only regulated dams authorised under this environmental authority, and those dams are to accord with the basic specifications in Table 14 (Basic specification of regulated dams).

Table 14 (Basic specification of regulated dams)

Name of regulated dam	Maximum surface area of dam (ha)	Maximum volume of dam (M/L)	Maximum height of Dam (m)	Purpose of dam
Northern Flood Protection Levee	N/A	N/A	8	Flood protection for mine workings
Southern Flood Protection Levee	N/A	N/A	6.5	Flood protection for mine workings

C32 The following are the only regulated dams authorised under this environmental authority, and those dams are to accord with the hydraulic specifications in Table 15 (Hydraulic performance of regulated dams) below.

Table 15 (Hydraulic performance of regulated dams)

Regulated Dam	Design Storage Allowance	Spillway or Protection Critical Design Event	Mandatory Reporting Level
Northern Flood Protection Levee	N/A	AEP 0.001 (1-in-1,000) plus 1 metre minimum freeboard	N/A
Southern Flood Protection Levee	N/A	AEP 0.001 (1-in-1,000) plus 1 metre minimum freeboard	N/A

Department Interest – Noise and vibration

Noise nuisance

- D1** Subject to conditions D2 and D3 noise from the mining activity must not cause an environmental nuisance, at any sensitive or commercial place.
- D2** When requested by the administering authority, noise monitoring must be undertaken within a reasonable and practicable timeframe nominated by the administering authority to investigate any complaint (which is neither frivolous nor vexatious nor based on mistaken belief in the opinion of the authorised officer) of environmental nuisance at any sensitive or commercial place, and the results must be notified within fourteen (14) days to the administering authority following.
- D3** The method of measurement and reporting of noise levels must comply with the latest edition of the administering authority's *Noise Measurement Manual*.

Department Interest -- Waste

- E1** Tyres stored awaiting disposal or transport for take-back and, recycling, or waste-to-energy options -- should be stockpiled in volumes less than three (3) metre in height and two hundred (200) square metre in area and at least ten (10) metre from any other tyre storage area.
- E2** All reasonable and practicable fire prevention measures must be implemented, including removal of grass and other materials within a ten (10) metre radius of the scrap tyre storage area.
- E3** Disposal of scrap tyres resulting from the mining activities in spoil emplacement is acceptable provided:
- a) all other stages (options) in the waste hierarchy have been considered; and
 - b) tyres are placed as deep in the spoil as reasonably practicable.
- E4** Scrap tyres resulting from the mining activities disposed within the operational land must not impede saturated aquifers or compromise the stability of the consolidated landform.

Department Interest -- Land

Rehabilitation landform criteria

- F1** Progressive rehabilitation must commence when areas become available within the operational land.
- F2** Complete an investigation into rehabilitation of the disturbed areas and submit a report to the administering authority proposing success criteria and landform design criteria by **31 December 2010**. The rehabilitation success criteria must be detailed in the Plan of Operations.

- F3** A Rehabilitation Management Plan for all mining areas must be developed by **31 December 2010** and submitted to the administering authority for approval. The Rehabilitation Management Plan must:
- a) map existing areas of rehabilitation;
 - b) detail rehabilitation methods applied to areas in F3 a);
 - c) identify success factors from areas in F3 a);
 - d) detail future rehabilitation actions to be completed on areas in F3 a);
 - e) identify three (3) analogue and three (3) rehabilitation sites to be used to develop rehabilitation success criteria;
 - f) detail landform design criteria;
 - g) detail future planned rehabilitation methods for disturbed areas;
 - h) detail planned native vegetation rehabilitation areas and corridors;
 - i) detail rehabilitation monitoring and maintenance requirements to be applied to all areas of disturbance;
 - j) detail end of mine landform design plan;
 - k) detail spoil characteristics, soil analysis, soil separation for use on rehabilitation; and
 - l) detail potential problem and how they will be addresses.

- F4** Upon submission of the Rehabilitation Management Plan (condition F3) an amended environmental authority will be issued redressing new rehabilitation landform criteria conditions relative to the results identified.

Residual voids

- F5** All reasonable and practicable measures shall be taken to minimise or prevent serious environmental harm being caused by the void other than the environmental harm constituted by the existence of the residual void itself and subject to any other condition within this environmental authority.

- F6** If residual voids are to be left, an investigation into void options must be prepared and a report submitted to the administering authority. The investigation must at a minimum include the following:
- a) A study of options available for minimising residual void area and volume;
 - b) A void hydrology study, addressing the long-term water balance in the voids, connections to groundwater resources and water quality parameters in the long term;
 - c) A pit wall stability study, considering the effects of long-term erosion and weathering of the pit wall and the effects of significant hydrological events;
 - d) A hydrological study into the long-term risk of the Nogoia River, Boggy Creek / residual void interaction, including erosion of the levee and extreme hydrological events, and the consequences of such interaction to the long-term stability of the residual voids;
 - e) A study of void capability to support native flora and fauna; and
 - f) A proposal/s for end of mine void rehabilitation success criteria and residual void areas and volumes.

These studies will be undertaken during the life of the mine, and will include detailed research and modelling. All studies must be complete prior to five (5) years before end of open cut mining.

Topsoil management

- F7** Topsoil resources, that are suitable for use in rehabilitation, must be salvaged ahead of mining disturbance (or additional spoil placement) for strategic use in rehabilitation of the mine/spoil dump area. This topsoil removal and relocation must be documented in a Topsoil Stockpile Register.

Infrastructure

- F8** All infrastructure, constructed by or for the environmental authority holder during the mining activities including water storage structures, must be removed from the site prior to mining lease surrender, except where agreed in writing by the post mining land owner / holder.

Note: This is not applicable where the landowner / holder is the environmental authority holder.

Department Interest – Community

Complaint response

- G1** All complaints received must be recorded including details of complainant, reasons for the complaint, investigations undertaken, conclusions formed and actions taken. This information must be made available for inspection by the administering authority on request.

Appendix 1 – Definitions

Words and phrases used throughout this licence are defined below except where identified in the *Environmental Protection Act 1994* or subordinate legislation. Where a word or term is not defined, the ordinary English meaning applies, and regard should be given to the Macquarie Dictionary.

“**20th percentile flow**” means the 20th percentile of all daily flow measurements (or estimations) of daily flow over a 10 year period for a particular site. The 20th percentile calculation should only include days where flow has been measured (or estimated), i.e. not dry weather days.

“**acceptance criteria**” means the measures by which actions implemented are deemed to be complete. The acceptance criteria indicate the success of the decommissioning and rehabilitation outcomes or remediation of areas which have been significantly disturbed by the environmentally relevant activities. Acceptance criteria may include information regarding:

- a) stability of final land forms in terms of settlement, erosion, weathering, pondage and drainage;
- b) control of geochemical and contaminant transport processes;
- c) quality of runoff waters and potential impact on receiving environment;
- d) vegetation establishment, survival and succession;
- e) vegetation productivity, sustained growth and structure development;
- f) fauna colonisation and habitat development;
- g) ecosystem processes such as soil development and nutrient cycling, and the recolonisation of specific fauna groups such as collembola, mites and termites which are involved in these processes;
- h) microbiological studies including recolonisation by mycorrhizal fungi, microbial biomass and respiration;
- i) effects of various establishment treatments such as deep ripping, topsoil handling, seeding and fertiliser application on vegetation growth and development;
- j) resilience of vegetation to disease, insect attack, drought and fire; and
- k) vegetation water use and effects on ground water levels and catchment yields.

“**accepted engineering standards**” in relation to dams, means those standards of design, construction, operation and maintenance that are broadly accepted within the profession of engineering as being good practice for the purpose and application being considered. In the case of dams, the most relevant documents would be publications of the Australian National Committee on Large Dams (ANCOLD), guidelines published by Queensland government departments, and relevant Australian and New Zealand Standards.

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

“**administering authority**” means the Department of Environment and Resource Management or its successor.

"airblast overpressure" means energy transmitted from the blast site within the atmosphere in the form of pressure waves. The maximum excess pressure in this wave, above ambient pressure is the peak airblast overpressure measured in decibels linear (dB).

"ambient (or total) noise" at a place, means the level of noise at the place from all sources (near and far), measured as the Leq for an appropriate time interval.

"Annual Exceedence Probability" or **"AEP"** means the probability that at least one event in excess of a particular magnitude will occur in any given year.

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

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

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

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

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

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

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

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

"competent person" means a person with the demonstrated skill and knowledge required to carry out the task to a standard necessary for the reliance upon collected data or protection of the environment.

"**bed and banks**" for a waters, river, creek, stream, lake, lagoon, pond, swamp, wetland or dam means land over which the water of the waters, lake, lagoon, pond, swamp, wetland or dam normally flows or that is normally covered by the water, whether permanently or intermittently; but does not include land adjoining or adjacent to the bed and banks that is from time to time covered by floodwater.

"**beneficial use**" in respect of dams means that the current or proposed owner of the land on which a dam stands, has found a use for that dam that is:

- a) of benefit to that owner in that it adds real value to their business or to the general community,
- b) in accordance with relevant provisions of the *Environmental Protection Act 1994*,
- c) sustainable by virtue of written undertakings given by that owner to maintain that dam, and
- d) the transfer and use have been approved or authorised under any relevant legislation.

"**blasting**" means the use of explosive materials to fracture-

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

'**certification**', "**certifying**" or '**certified**' by a suitably qualified and experienced person in relation to a design plan or an annual report regarding dams, means that a statutory declaration has been made by that person and, when taken together with any attached or appended documents referenced in that declaration, all of the following aspects are addressed and are sufficient to allow an independent audit at any time:

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

"chemical" means –

- a) an agricultural chemical product or veterinary chemical product within the meaning of the *Agricultural and Veterinary Chemicals Code Act 1994* (Commonwealth); or
- b) a dangerous good under the dangerous goods code; or
- c) a lead hazardous substance within the meaning of the *Workplace Health and Safety Regulation 1997*; or
- d) a drug or poison in the *Standard for the Uniform Scheduling of Drugs and Poisons* prepared by the Australian Health Ministers' Advisory Council and published by the Commonwealth; or
- e) any substance used as, or intended for use as –
 - i. a pesticide, insecticide, fungicide, herbicide, rodenticide, nematocide, miticide, fumigant or related product; or
 - ii. a surface active agent, including, for example, soap or related detergent; or
 - iii. a paint solvent, pigment, dye, printing ink, industrial polish, adhesive, sealant, food additive, bleach, sanitiser, disinfectant, or biocide; or
 - iv. a fertiliser for agricultural, horticultural or garden use; or
- f) a substance used for, or intended for use for –
 - i. mineral processing or treatment of metal, pulp and paper, textile, timber, water or wastewater; or
 - ii. manufacture of plastic or synthetic rubber.

"commercial place" means a work place used as an office or for business or commercial purposes, which is not part of the mining activity and does not include employees accommodation or public roads.

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

"contaminated" means the substance has come into contact with a contaminant.

"contaminant" A contaminant can be –

- a) a gas, liquid or solid; or
- b) an odour; or
- c) an organism (whether alive or dead), including a virus; or
- d) energy, including noise, heat, radioactivity and electromagnetic radiation; or
- e) a combination of contaminants.

"dam" means a land-based structure or a void that is designed to contain, divert or control flowable substances, and includes any substances that are thereby contained, diverted or controlled by that land-based structure or void and associated works. A dam does not mean a fabricated or manufactured tank or container, designed and constructed to an Australian Standard that deals with strength and structural integrity of that tank or container.

"design plan" is the documentation required to describe the physical dimensions of the dam, the materials and standards to be used for construction of the dam, and the criteria to be used for operating the dam. The documents must include all investigation and design reports, plans and specifications sufficient to hand to a contractor for construction, and planned decommissioning and rehabilitation outcomes; so as to address all hazard scenarios that would be identified by a properly conducted hazard assessment for the structure. Documentation must be such that a 'suitable qualified and experience person' could conduct an independent review without seeking further information from the designer.

"design storage allowance" or **"DSA"** means an available volume, estimated in accordance with the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995), that must be provided in a dam as at the first of November each year in order to prevent a discharge from that dam to a probability (AEP) specified in that guideline. The DSA is estimated based on 100% runoff of wet season rainfall at the relevant AEP, taking account of process inputs during that wet season, with no allowance for evaporation.

"effluent" treated waste water discharged from sewage treatment plants.

"environmental authority" means an environmental authority granted in relation to an environmentally relevant activity under the *Environmental Protection Act 1994*.

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

"financial assurance" means a security required under the *Environmental Protection Act 1994* by the administering authority to cover the cost of rehabilitation or remediation of disturbed land or to secure compliance with the environmental authority.

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

"foreseeable future" is the period used for assessing the total probability of an event occurring. Permanent structures and ecological sustainability should be expected to still exist at the end of a 150 year foreseeable future with an acceptable probability of failure before that time.

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

"hazard category" means a category, either low significant or high, into which a dam is assessed as a result of the application of tables and other criteria in the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995).

"hazardous waste" means any substance, whether liquid, solid or gaseous, derived by or resulting from, the processing of minerals that tends to destroy life or impair or endanger health.

"hydraulic performance" means the capacity of a regulated dam to contain or safely pass flowable substances based on a probability (AEP) of performance failure specified for the relevant hazard category in the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995).

"infrastructure" means water storage dams, roads and tracks, buildings and other structures built for the purpose and duration of the conduct of the environmentally relevant activities, but does not include other facilities required for the long term management of the impact of those activities or the protection of potential resources. Such other facilities include dams other than water storage dams, waste dumps, voids, or stockpiles and assets, that have been decommissioned, rehabilitated, and lawfully recognised as being subject to subsequent transfer with ownership of the land.

"lake" includes --

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

"L_A 10, adj, 10 mins" means the A-weighted sound pressure level, (adjusted for tonal character and impulsiveness of the sound) exceeded for 10% of any 10-minute measurement period, using Fast response.

"L_A 1, adj, 10 mins" means the A-weighted sound pressure level, (adjusted for tonal character and impulsiveness of the sound) exceeded for 1% of any 10-minute measurement period, using Fast response.

"L_{A, max adj, 1"}" means the average maximum A-weighted sound pressure level, adjusted for noise character and measured over any 10 minute period, using Fast response.

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

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

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

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

"**mandatory reporting level**" or "**MRL**" means a warning and reporting level determined in accordance with the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995). An MRL is the lowest level required in a regulated dam to allow either of the following to be retained:

- a) the runoff from a 72 hour duration storm at the AEP specified in Table 15 of this environmental authority;
- or
- b) a wave allowance at that AEP as estimated using a recognised engineering method.

"**mg/L**" means milligrams per litre.

"mineral" means a substance which normally occurs naturally as part of the earth's crust or is dissolved or suspended in water within or upon the earth's crust and includes a substance which may be extracted from such a substance, and includes—

- a) clay if mined for use for its ceramic properties, kaolin and bentonite;
- b) foundry sand;
- c) hydrocarbons and other substances or matter occurring in association with shale or coal and necessarily mined, extracted, produced or released by or in connection with mining for shale or coal or for the purpose of enhancing the safety of current or future mining operations for coal or the extraction or production of mineral oil there from;
- d) limestone if mined for use for its chemical properties;
- e) marble;
- f) mineral oil or gas extracted or produced from shale or coal by in situ processes;
- g) peat;
- h) salt including brine;
- i) shale from which mineral oil may be extracted or produced;
- j) silica, including silica sand, if mined for use for its chemical properties;
- k) rock mined in block or slab form for building or monumental purposes;

but does not include—

- l) living matter;
- m) petroleum within the meaning of the Petroleum Act 1923;
- n) soil, sand, gravel or rock (other than rock mined in block or slab form for building or monumental purposes) to be used or to be supplied for use as such, whether intact or in broken form;
- o) water.

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

"nature" includes:

- a) ecosystems and their constituent parts; and
- b) all natural and physical resources; and
- c) natural dynamic processes.

"noxious" means harmful or injurious to health or physical well being, other than trivial harm.

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

"operational land" means the land associated with the project for which this environmental authority has been issued.

"operational plan" means a document that amongst other things sets out procedures and criteria to be used for operating a dam during a particular time period. The operational plan as defined herein may form part of a plan of operations or plan otherwise required in legislation.

"peak particle velocity (ppv)" means a measure of ground vibration magnitude which is the maximum rate of change of ground displacement with time, usually measured in millimetres/second (mms^{-1}).

"protected area" means - a protected area under the *Nature Conservation Act 1992*; or
- a marine park under the *Marine Parks Act 1992*; or
- a World Heritage Area.

"progressive rehabilitation" means rehabilitation (defined below) undertaken progressively or a staged approach to rehabilitation as mining operations are ongoing.

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

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

"reference site" (or analogue site) may reflect the original location, adjacent area or another area where rehabilitation success has been completed for a similar biodiversity. Details of the reference site may be as photographs, computer generated images and vegetation models etc.

"regulated dam" means any dam in the significant or high hazard category as assessed using the *Site Water Management Technical Guideline for Environmental Management of Exploration and Mining in Queensland* (DME 1995).

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

"representative" means a sample set which covers the variance in monitoring or other data either due to natural changes or operational phases of the mining activities.

"residual void" means an open pit resulting from the removal of ore and/or waste rock which will remain following the cessation of all mining activities and completion of rehabilitation processes.

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

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

"sensitive place" means;

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

"sewage" means the used water of person's to be treated at a sewage treatment plant.

“significant disturbance” – includes land

- a) if it is contaminated land; or
- b) it has been disturbed and human intervention is needed to rehabilitate it.
 - i. to a state required under the relevant environmental authority; or
 - ii. if the environmental authority does not require the land to be rehabilitated to a particular state – to its state immediately before the disturbance.

Some examples of disturbed land include:

- a) areas where soil has been compacted, removed, covered, exposed or stockpiled;
- b) areas where vegetation has been removed or destroyed to an extent where the land has been made susceptible to erosion; (vegetation & topsoil)
- c) areas where land use suitability or capability has been diminished;
- d) areas within a watercourse, waterway, wetland or lake where mining activities occur;
- e) areas submerged by tailings or hazardous contaminant storage and dam walls in all cases;
- f) areas under temporary infrastructure. Temporary infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be removed after mining activities have ceased; or
- g) areas where land has been contaminated and a suitability statement has not been issued.

However, the following areas are not included:

- a) areas off lease (e.g. roads or tracks which provide access to the mining lease);
- b) areas previously significantly disturbed which have achieved the rehabilitation outcomes;
- c) by agreement with the administering authority, areas previously significantly disturbed which have not achieved the rehabilitation objective(s) due to circumstances beyond the control of the mine operator (such as climatic conditions);
- d) areas under permanent infrastructure. Permanent infrastructure includes any infrastructure (roads, tracks, bridges, culverts, dams, bores, buildings, fixed machinery, hardstand areas, airstrips, helipads etc) which is to be left by agreement with the landowner. The agreement to leave permanent infrastructure must be recorded in the Landowner Agreement and lodged with the administering authority; and
- e) disturbances that pre-existed the grant of the tenure unless those areas are disturbed during the term of the tenure.

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

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

"suitably qualified and experienced person" in relation to dams means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the *Professional Engineers Act 1988*, OR registered as a National Professional Engineer (NPER) with the Institution of Engineers Australia, OR holds equivalent professional qualifications to the satisfaction of the administering authority for the Act; AND the administering authority for the Act is satisfied that person has knowledge, suitable experience and demonstrated expertise in relevant fields, as set out below:

1. knowledge of engineering principles related to the structures, geomechanics, hydrology, hydraulics, chemistry and environmental impact of dams; and
2. a total of five years of suitable experience and demonstrated expertise in the geomechanics of dams with particular emphasis on stability, geology and geochemistry, and
3. a total of five years of suitable experience and demonstrated expertise each, in three of the following categories:
 - a) investigation and design of dams;
 - b) Construction, operation and maintenance of dams;
 - c) hydrology with particular reference to flooding, estimation of extreme storms, water management or meteorology;
 - d) hydraulics with particular reference to sediment transport and deposition, erosion control, beach processes;
 - e) hydrogeology with particular reference to seepage, groundwater;
 - f) solute transport processes and monitoring thereof; and
 - g) dam safety.

"tolerable limits" means a range of parameters regarded as being sufficient to meet the objective of protecting relevant environmental values. For example, a range of settlement for a tailings capping, rather than a single value, could still meet the objective of draining the cap quickly, preventing pondage and limiting infiltration and percolation.

"trivial harm" means environmental harm which is not material or serious environmental harm and will not cause actual or potential loss or damage to property of an amount of, or amounts totalling more than \$5,000.

"void" means any man-made, open excavation in the ground.

"waste" as defined in section 13 of the *Environmental Protection Act 1994*.

"water" means –

- a) water in waters or spring;
- b) underground water;
- c) overland flow water; or
- d) water that has been collected in a dam.

"waste water" means used water from the activity, process water or contaminated storm water.

"watercourse" means a river, creek or stream in which water flows permanently or intermittently in a visibly defined channel (natural, artificial or artificially improved) with:

- a) continuous bed and banks;
- b) an extended period of flow for some months after rain ceases, and
- c) an adequacy of flow that sustains basic ecological processes and maintains biodiversity.

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

"µg/L" means micrograms per litre.

Appendix 2 (Release points (RP) and monitoring points (MP) for Ensham Mine)



- Mining Lease and Mining Lease Application Areas
- Proposed Release Points
- Proposed Water Quality Monitoring Point
- ⊗ Proposed Gauging Station Location
- - - Pipeline to Water Release Point

Proposed Water Release Points and Water Quality Monitoring Locations

Ensham Resources | Hansen Bailey |

FIGURE 1

END OF ENVIRONMENTAL AUTHORITY



Information sheet

Environmental Services

Internal review (EPA), and appeal to Land 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 under the EP Act and subordinate legislation. Refer to sections 519 to 530 and part 1 of schedule 2 of the EP Act for complete information about the process for internal review and appeal to the Land Court.

Introduction

The *Environmental Protection Act 1994 (EP Act)* provides for a right of internal review of certain decisions made under the EP Act. Decisions that can be reviewed are listed in schedule 2 of the EP Act. The EP Act also provides that a dissatisfied person for a review decision listed in part 1 of schedule 2 of the EP Act may appeal the decision to the Land Court.

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

Chapter 11, Part 3 of the EP Act

Division 1 — Interpretation

Section 519 Original decisions

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

Section 520 Dissatisfied person

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

Division 2 — Internal review of decisions

Section 521 Procedure for review

- 1) A dissatisfied person may apply for a review of an original decision.
- 2) The application must—
 - a) be made in the approved form to the administering authority within—
 - i) 10 business days¹ 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.



- 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.

Division 3 — Appeals to Land Court

Section 523 Review decisions subject to Land Court appeal

Sections 523 to 526 applies to original decisions mentioned in schedule 2, part 1 of the EP Act.

Section 524 Right of appeal

A dissatisfied person who is dissatisfied with the decision may appeal against the decision to the Land Court.

Section 525 Appeal period

- 1) The appeal must be started within 22 business days after the appellant receives notice of the decision.
- 2) However, the Land Court may at any time extend the time for starting the appeal.

Section 526 Land Court mediation

- 1) Any party to the appeal may, at any time before the appeal is decided, ask the Land Court to conduct or provide mediation for the appeal.
- 2) The mediation must be conducted by the Land Court or a mediator chosen by the Land Court².

Section 527 Nature of appeal

The appeal is by way of rehearing, unaffected by the review decision.

Section 528 Land Court's powers for appeal

In deciding the appeal, the Land Court has the same powers as the administering authority.

Section 529 Decision for appeals against refusals under s 207

This section requires the Land Court, when considering an appeal against a decision under section 207 to refuse to allow a non-standard mining lease application to proceed, to either confirm or reverse the decision.

Section 530 Decision for other appeals

- 1) This section applies if the decision appealed against is not a decision mentioned in section 529(1).
- 2) In deciding the appeal, the Land Court may—
 - a) confirm the decision; or
 - b) set aside the decision and substitute another decision; or
 - c) set aside the decision and return the matter to the administering authority who made the decision, with directions the Land Court considers appropriate.
- 3) In setting aside or substituting the decision, the Land Court has the same powers as the authority.
- 4) However, this part does not apply to a power exercised under subsection (3).
- 5) If the Land Court substitutes another decision, the substituted decision is taken for this Act, other than section 569 and this subdivision, to be the authority's decision.

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:


Executive Director, Environmental Services
Environmental Protection Agency

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

² For information on how to start the appeal, see the *Land and Court Rules 2000*. For information on the conduct of the mediation, see the *Land Court Act 2000*. Information is also available on the Land Court website at www.landcourt.qld.gov.au



Ensham

R E S O U R C E S



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Transitional Surface Water Conditions

17 December 2009





The context for this presentation...

- Ensham supports the Government's efforts to improve water management in the Fitzroy catchment.
- As a result of the Jan 08 flood event approximately 9000ML of remnant flood water is being stored in a mining pit and is being reused on site
- Ensham has made improvements to its site water management system, however work is still required to reduce risks to business and comply with new model conditions conditions.
- Ensham is seeking transitional conditions undertake work to return to 'business as usual'





Purpose

The purpose of this briefing is to:

- present business case for transitional surface water conditions
- describe current water management system and proposed improvements
- demonstrate how environmental values will be protected
- discuss structure of proposed conditions





The critical issues

- Minimise potential for environmental harm from Ensham activities
- Minimise potential for risk to Ensham business, jobs it supports and local and regional economy
- Complete improvements to Ensham Mine Water Management System by early/mid 2011
- Ability to respond quickly to critical events





Ensham Mine Water Management System

- Under normal operating conditions Ensham is a net importer of water
- Water collected from surface and groundwater inflows to pits is not sufficient to meet water needs of the operation
- Ensham has met water needs via allocations from the Nogoia/McKenzie system not additional storages on site
- Ensham does not have a coal wash plant as associated water storage facilities





Water Management System cont.

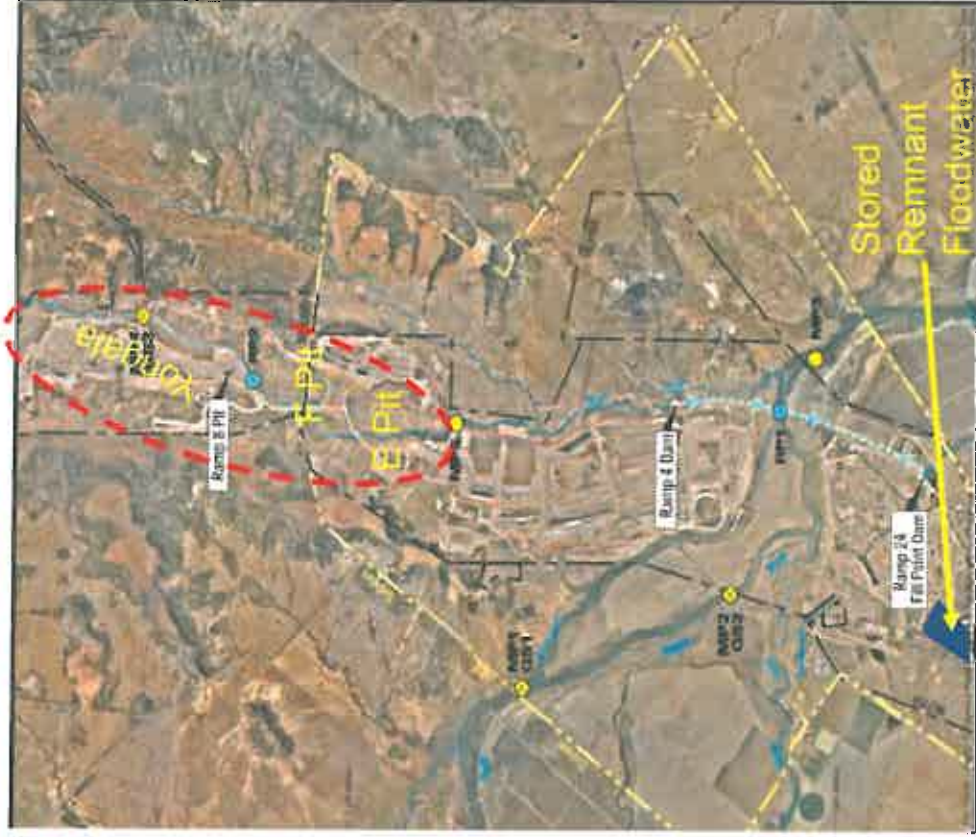
- Improvements to the Ensham Water Management System are being made in response to changed water management needs.
- For the residual flood water to be reused on site it must form part of the water management system and can not be separated or treated in isolation.
- The system is broadly divided in two parts each with distinct management issues and potential risks.





Northern sections

- E, F and Yongala pits
 - Accelerated mining due to Jan 08 flood, infrastructure has not kept pace with development
- Limited storage capacity
- No pipe infrastructure to allow movement of water between pits
- Not yet connected to southern part of site and current water reticulation system



Water supply and Mining Lease Application System
Proposed Release Points
Proposed Water Quality Monitoring Point
Proposed Leaking Storage Locations
Proposed Water Reticulation System



Proposed Water Release Points and Water Quality Monitoring Locations

FIGURE 1



Northern sections cont.

Risks to discharge:

- Significant rainfall event

Risk Mitigation Actions:

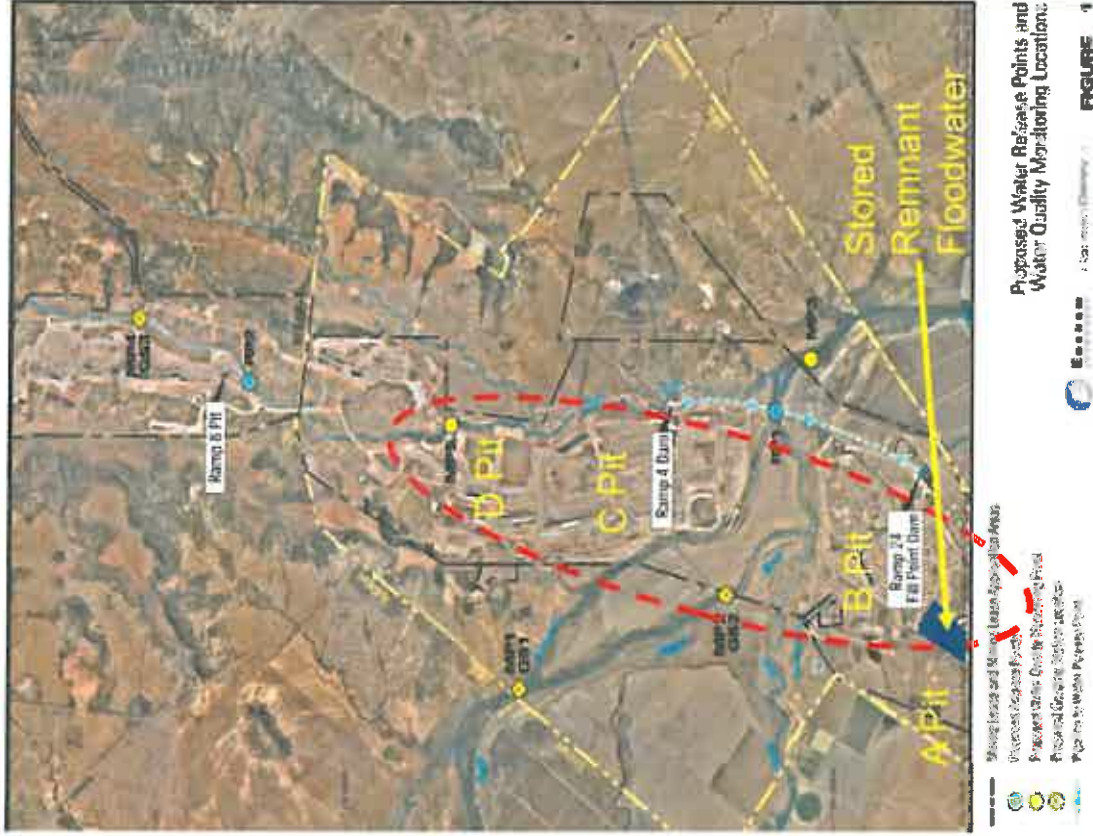
- Construct pipeline infrastructure connecting the northern and southern sections of the water management system.
- Expected implementation date early/mid 2011





Southern sections

- A, B, C and D pits
- Storage capacity (including Pit A North) to cater for the wettest wet season event
- Pipeline infrastructure to allow water transfer/movement between pits.
- No connection to northern pits





Southern sections cont.

Risks to discharge

- Flood mitigation is only Q100, without improved flood protection event partial flood inundation would place Ensham business at extreme risk

Risk mitigation actions

- Seeking approvals to increase flood protection to Q 1000
- Transitional EA conditions to authorise immediate discharge





Managing environmental harm

- Ensham is proposing transitional conditions that allow time for the Mine Water Management System to be completed
- As described previously the conditions are required in the case of an extreme event
- Ensham is proposing to restrict downstream EC levels (still within mining lease areas) to 500 EC, protecting the surrounding environmental values
- Ensham has demonstrated the ability to manage the release of high EC water to meet strict downstream EC limits



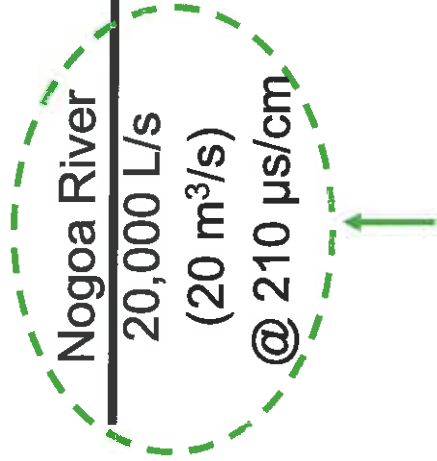
CONCEPTUAL Downstream Water Quality Management Model Schematic



Ensham Release
400 L/s (0.4 m³/s)
@ EC 15,000 μ s/cm

Release (Pump) rate varied to control
downstream EC or other physical
parameters to meet compliance

"Downstream Monitoring Point"
Nogoa River and Boggy Creek
EC = 500 μ s/cm



Natural flow upstream
of Ensham Release





Protecting Environmental Values

- A 500 EC limit at the downstream monitoring locations:
- does not cause environmental harm
 - protects environmental values;
 - and
 - protects downstream drinking water supplies.



Proposed Water Release Points and Water Quality Monitoring Locations





Northern Release Point

Schedule C - Table 1 (Contaminant Release Points, Sources and Receiving Waters)

Release Point (RP)	Easting (GDA94)	Northing (GDA94)	Contaminant Source and Location	Monitoring Point	Receiving waters description
RP2 Boggy Creek	654 270	7 412 235	Ramp 6 Pit (Yongala)	MP 5	Boggy Creek

Schedule C - Table 2 (Contaminant Release Limits)

Quality Characteristic	Release Limits	Monitoring Frequency	Comment
Electrical conductivity (uS/cm)	The EC of the release water must be such that the EC of the water at the monitoring point does not exceed a maximum 500. There must be a receiving water flow in the watercourse to which the water is being released.	Daily during release (the first sample must be taken within 2 hours of commencement of release)	





Southern Release Point

Schedule C – Table 3 (Contaminant Release Points, Sources and Receiving Waters)

Release Point (RP)	Easting (GDA94)	Northing (GDA94)	Contaminant Source and Location	Monitoring Point	Receiving waters description
RP1 Nogoa River	653 753	7 401 398	Ramp 24 Fill Point Dam and Ramp 4 Dam	MP 3 – Nogoa River 1,200 m from RP1	Nogoa River

Schedule C - Table 4 (Contaminant Release Limits)

Quality Characteristic	Interim Release Limits for all mines (limits to apply from the date of issue)	Future Release Limits from 31/12/2011	Monitoring Frequency	Comment
Electrical conductivity (uS/cm)	The EC of the release water must be such that the EC of the water at the monitoring point downstream of the release point does not exceed a maximum of 500. There must be a receiving water flow in the watercourse to which the water is being released.	1,500 at RP1	Daily during release (the first sample must be taken within 2 hours of commencement of release)	





Emergency Directions

- Ensham would prefer to be authorised via the EA to release water with higher EC.
- Relying on an emergency direction to be issued potentially means that discharging at the start of an extreme event (reducing the potential for env harm) is unlikely to occur.





Summary

- Ensham requires transitional conditions while the Mine Water Management System is finalised including upgrades to levees and pipeline infrastructure
- Transitional conditions are required to allow quick response to critical events
- Ensham believes that the proposed transitional conditions will not cause environmental harm and will protect environmental values





Ensham

R E S O U R C E S

**ENSHAM
RESOURCES
PTY LIMITED**

ABN 23 011 048 678

As Operator of the
Ensham Coal Project

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The Ensham Coal Project
is a joint venture of the
following companies which
are liable severally in the
following proportions:

Bligh Coal Limited
ABN 20 010 186 393
47.5%

Idemitsu Australia
Resources Pty Ltd
ABN 45 010 236 272
37.5%

J-Power Australia Pty Ltd
ABN 59 002 307 682
10.0%

LG International
(Australia) Pty Limited
ABN 12 002 806 831
5.0%



A
COALZ
FUND COMPANY

John Bradley
Director General
Department of Environment and Resource Management
GPO Box 15155
CITY EAST QLD 4002

21 December 2009

Dear Mr Bradley

I feel compelled to inform you of my concerns about the application of the new model surface water conditions and the situation in which it places our business. Over the past few months my staff worked with officers from your Department to negotiate the amendment of our Environmental Authority (EA) to include new surface water conditions. Ensham has been supportive of the Government's actions to improve the water quality of the Fitzroy Basin and was actively involved in the development of the model conditions.

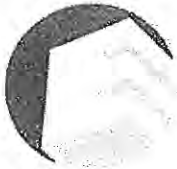
During this process undertakings were made by DERM officers that companies who required time limited transitional arrangements to undertake works to achieve compliance with the model conditions would be provided the opportunity to present a business case to support transitional conditions.

While Ensham has made significant effort and investments to recover from the January 2008 flood event, including improvements to flood protection and water management systems these works are not yet completed. As a result, there is a residual risk of discharge of mine affected water from the site due to an extreme rainfall or flood event that would not comply with the proposed model conditions.

Ensham prepared a business case that proposed transitional conditions which limited electrical conductivity at downstream monitoring locations (still within Ensham lease and land boundaries) to achieve 500 EC. Ensham believes that this proposal adequately protects surrounding environmental values including drinking water and would not cause environmental harm. The inclusion of these transitional conditions would provide Ensham with the ability to respond rapidly to a critical event and provides adequate business certainty.

Despite there being no scientific argument about the merits of our proposal, I am now advised that DERM officers have insisted that the full model conditions are applied because it would be 'politically difficult' to defend the proposed transitional conditions.

While DERM officers have provided assurances that there are other instruments under the Environmental Protection Act available in an emergency situation, I find myself in a less than ideal situation where faced with a critical weather event our business continuity is dependent upon the responsiveness of State Agencies.



Ensham

R E S O U R C E S

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PTY LIMITED**

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The Ensham Coal Project
is a joint venture of the
following companies which
are liable severally in the
following proportions:

Bligh Coal Limited
ABN 20 010 186 393
47.5%

Idemitsu Australia
Resources Pty Ltd
ABN 45 010 236 272
37.5%

J-Power Australia Pty Ltd
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The Honourable Kate Jones MP
Minister for Climate Change and Sustainability
GPO Box 15155
CITY EAST QLD 4002

21 December 2009

Dear Minister

I feel compelled to inform you of my concerns about the application of the new model surface water conditions and the situation in which it places our business. Over the past few months my staff worked with officers from your Department to negotiate the amendment of our Environmental Authority (EA) to include new surface water conditions. Ensham has been supportive of the Government's actions to improve the water quality of the Fitzroy Basin and was actively involved in the development of the model conditions.

During this process undertakings were made by DERM officers that companies who required time limited transitional arrangements to undertake works to achieve compliance with the model conditions would be provided the opportunity to present a business case to support transitional conditions.

While Ensham has made significant effort and investments to recover from the January 2008 flood event, including improvements to flood protection and water management systems these works are not yet completed. As a result, there is a residual risk of discharge of mine affected water from the site due to an extreme rainfall or flood event that would not comply with the proposed model conditions.

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While DERM officers have provided assurances that there are other instruments under the Environmental Protection Act available in an emergency situation, I find myself in a less than ideal situation where faced with a critical weather event our business continuity is dependent upon the responsiveness of State Agencies.



Because the surface water conditions are included in an EA amendment which also seeks to authorise the raising of our levees to improve our flood protection, I see no alternative but to reluctantly agree to the model conditions in order to facilitate the approval.

Should you consider it helpful I would be happy to meet and discuss this issue with you at your earliest convenience. In the meantime, I wish you and your staff a very merry Christmas and a safe 2010. All of us at Ensham are looking forward to continuing our good working relationship with the folks in your team.

Regards

Chief Executive Officer



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ECOTOXICITY AND SPECIES COMPOSITION OCCURRING IN 'A PIT'



Assessment of pit waters impact on aquatic fauna

Report Prepared For:
Ensham Resources Pty Ltd

Date:
21st December 2010

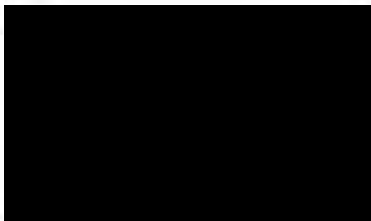
CLIENT: ENSHAM RESOURCES PTY LTD
PROJECT: FEASIBILITY OF A MIXING ZONE
REPORT: ASSESSMENT OF PIT WATERS IMPACT ON AQUATIC FAUNA
DATE: 21ST DECEMBER 2010



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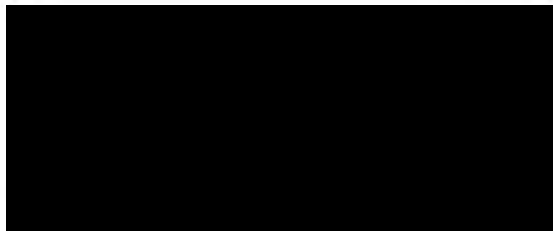
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Director

11th of February 2011

Date



Director

11th of February 2011

Date

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PROJECT: FEASIBILITY OF A MIXING ZONE
REPORT: ASSESSMENT OF PIT WATERS IMPACT ON AQUATIC FAUNA
DATE: 21ST DECEMBER 2010



SUMMARY OF RELEVANT INFORMATION

Project Title	Assessment of Pit Waters Impact on Aquatic Fauna
Property Location	35km east of Emerald
Property Description	Coal Mine
Applicants Details	Ensham Resources Level 18, AMP Place 10 Eagle Street Brisbane QLD 4000
Nominated Representative	
Title/Position	Manager – Corporate Sustainability
Company	Ensham Resources Pty Ltd
Postal Address	GPO Box 814 Brisbane QLD 4001
Telephone	
Fax:	
Email	
Survey Undertaken by:	
Acknowledgements:	Hydrobiology for their assistance in analysing the ecotoxicity data



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1. INTRODUCTION

C&R Consulting Pty Ltd (C&R) were commissioned by Ensham Resources Pty Ltd (Ensham) to determine any impacts that may occur to aquatic fauna if the water stored in a mine pit on site was to be released. This water has been trapped in the pit since waters flooded into the pit in January 2008 (approximately 3 years ago). Anecdotal evidence suggested that many fish species had been trapped within the pit, although a detailed aquatic survey of the pit had not been undertaken (Vital Signs Environmental Services 2008).

The large volume of trapped water has become a discharge problem as electrical conductivity (EC) levels of the waters currently exceed Environmental Authority (EA) release conditions. Numerous disposal methods have been considered, including use for irrigation, mixing with receiving waters before release, and the potential for mixing zones.

While mixing zones are a useful tool employed by the Victorian Government, they are generally put into place when all other options have been exhausted. This allows waste water to be discharged as long as it can reach specified concentrations of contaminants (generally determined by the ANZECC Guidelines 2000) within a predefined zone (e.g. before leaving the mining lease, 500m downstream, etc). The extent of the zone can be determined by modelling the mixing of the waste water released at differing ratios into the receiving waters. This project will determine possible impacts caused to native aquatic fauna in the receiving environment by introducing a mixing zone (i.e. to determine extent of impact that can occur under different release ratios). Further, the health of aquatic species trapped within the water body provides an opportunity to establish the ability of the species to tolerate changes in ambient chemical conditions. This knowledge is considered essential in areas where highly concentrated, or compositionally different waters, could be accidentally discharged during periods of low flow in the major river channel.

C&R developed a two pronged approach to the determination of site specific impacts that may occur to the freshwater fauna inhabiting the receiving environment if the pit water (with an elevated EC) was to be released:

1. Ecotoxicological testing of the water chemistry within the pit to determine a safe dilution factor to achieve a 95% species protection level in accordance with the ANZECC Guidelines (2000).
2. Assessing current fish and macroinvertebrate species composition of the waters trapped within 'A Pit'.



2. BACKGROUND INFORMATION

2.1 SITE

Ensham Mine is located 35km east of Emerald in Central Queensland. The area experiences a typical semi-arid tropics climate with an intense wet season (December – April) and a prolonged dry season (May – November). Over 70% of the annual rainfall is experienced during the wet season months.

'A Pit' is located at the southern end of the Ensham Mine lease (see Figure 1). After the flooding of Ensham Mine in the 2007-2008 wet season all excess flood waters that were unable to be released were transferred into 'A Pit' to be stored until they could be released at a later date. The resultant water body within pit stretches over 1km in length and is approximately 400m wide at the widest point (refer to Figure 2). There is over 40m of water depth in the majority of the pit.

'A Pit' was not designed to accommodate large amounts of water on a long term basis and as such the spoil surrounding the pit is highly eroded and relatively unstable (refer to Appendix 1). This results in a large sediment input into the pit which covers the substrate.

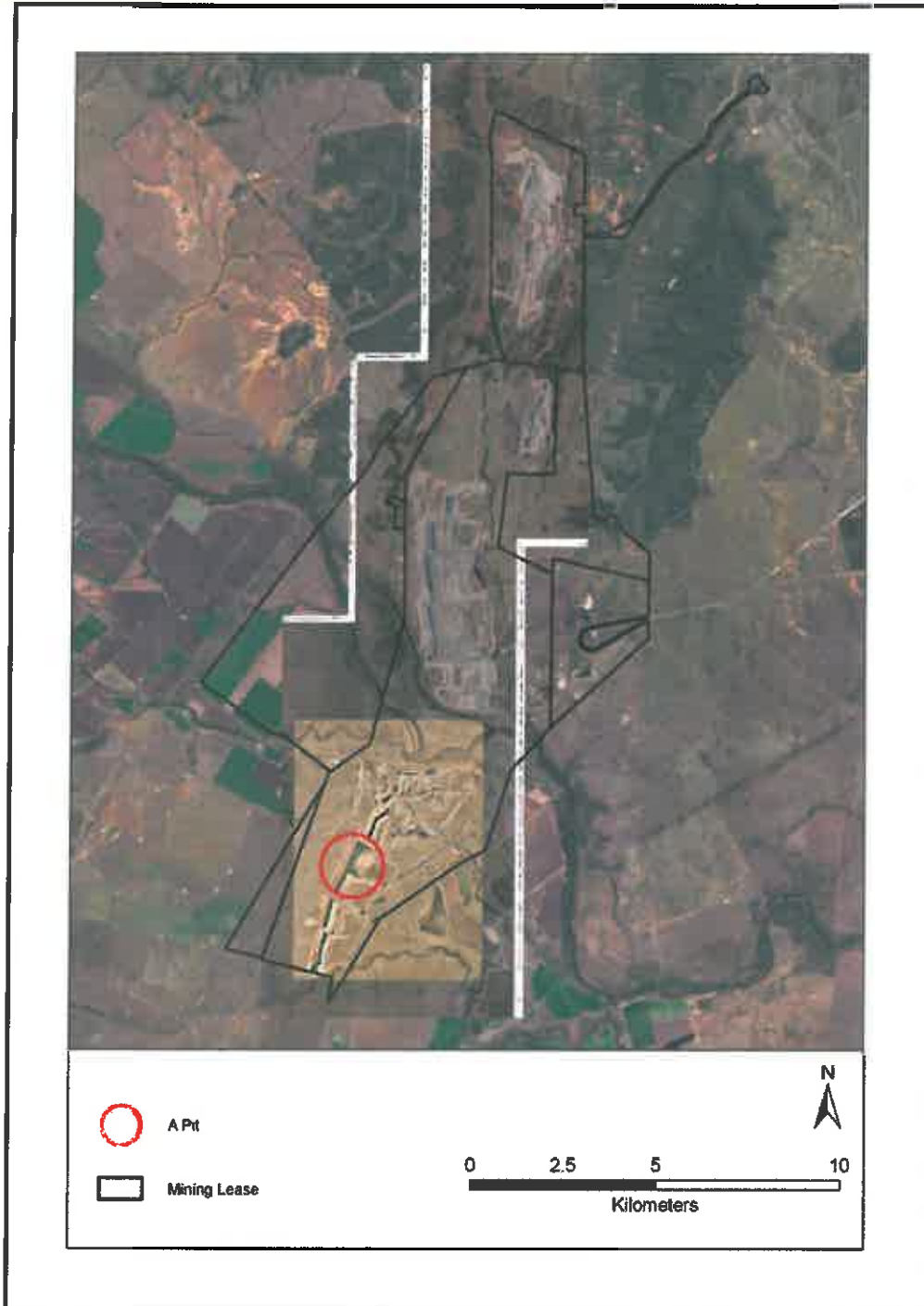


Figure 1: Ensham Resources Pty Ltd mining lease



2.2 WATER QUALITY

Water quality within the pit has remained relatively constant over the past 2 years. Stratification has not been significant within the pit water (refer Table 1 and Table 2). This is most likely due to the large surface area of the water and steep banks of the pit inducing wind driven circulation and turnover.

Table 1 and Table 2 outline the physical parameters occurring throughout the depth profile within 'A Pit'. The data collated into these tables were collected once a month from February 2009 to August 2010, and therefore covers both the wet and dry seasons.

No levels recorded for any of the parameters are considered excessively high. However, electrical conductivity (EC), and subsequently total dissolved solids (TDS), are substantially higher than levels recorded in the proposed receiving environment (approximately 150 $\mu\text{S/cm}$) and higher than the permitted release level of 1,500 $\mu\text{S/cm}$ (Table 3). All other physical parameters recorded are within ANZECC Guidelines (2000) concentrations for lowland rivers in tropical Australia, except the mean pH at 5m which is slightly high but still well within the acceptable release limits outlined within the EA conditions (Table 3).

It should be noted that concentrations of metal toxicants within 'A Pit' were also assessed over the same 2 year period. The laboratory results for this assessment showed the mean values for all metals tested were below the ANZECC Water Quality Guidelines (2000) for 95% species protection level except copper which had a mean value of 2.02 $\mu\text{g/L}$. This is in excess of the ANZECC Water Quality Guidelines (2000) level of 1.4 $\mu\text{g/L}$. However, when water hardness is taken into account, the guideline level is roughly 10 times the original stated (as per ANZECC Guidelines 2000). Further, background concentrations of copper within the receiving Nogoa River often exceed 2 $\mu\text{g/L}$.

While copper is considered one of the most toxic and readily bioaccumulating contaminants available within freshwater systems, when water hardness increases the uptake and toxicity of copper to aquatic organisms decreases (ANZECC and ARMCANZ 2000). The water hardness within 'A Pit' was calculated to be very high (as previously discussed). This suggests the copper concentrations recorded within 'A Pit' are of little environmental concern. Furthermore, no concentrations of metals present appear to be increasing over time. Therefore, toxicant leaching from the surrounding spoil is considered minimal or may have stabilised.

Table 1: Physicochemical parameters at varying depths within 'A Pit'

Depth (m)	pH (Units)			Temperature ($^{\circ}\text{C}$)			Dissolved Oxygen (% sat)			Turbidity (NTU)		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
5m	7.95	8.25	8.08	18.1	27.7	23.4	72.8	108.0	100.4	2.0	14.2	3.7
25m	7.54	8.20	7.91	17.9	26.6	20.6	41.3	95.1	73.8	1.1	5.1	2.7
30m	7.58	8.19	7.90	17.9	26.6	20.6	38.5	94.1	73.1	1.4	10.1	3.2
40m	7.42	8.2	7.86	17.9	26.5	20.5	36.4	93.0	71.2	2.3	8.1	4.3



Table 2: Physicochemical parameters at varying depths within 'A Pit' (continued)

Depth (m)	Electrical Conductivity (µS/cm)			Total Dissolved Solids (mg/L)			Suspended Solids (mg/L)		
	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean
5m	7100	7620	7386	4140	5360	4652	2	22	9
25m	7100	7530	7231	4080	5500	4735	2	19	8
30m	7090	7540	7232	4090	5290	4624	1	20	10
40m	7090	7540	7232	4240	5140	4601	6	21	12

Table 3: Guideline values for physicochemical parameters within 'A Pit'

Parameter	ANZECC Water Quality Guidelines (2000)	Australian Drinking Water Guidelines (2004)	Ensham Mine EA Conditions	
			Current (until 31/12/2011)	Future (from 1/1/2012)
pH (Units)	6.0 – 8.0	6.5 – 8.5	6.5 – 9.0	6.5 – 9.0
Temperature (°C)	NA	10 – 30	NA	NA
Dissolved Oxygen (% sat)	90 – 120	>85	NA	NA
Turbidity (NTU)	2 – 15	5*	360	360
Electrical Conductivity (µS/cm)	20 – 250	1000	1500	750
Total Dissolved Solids (mg/L)	NA	500*	NA	NA
Suspended Solids (mg/L)	NA	NA	150	150

* Infers that this concentration is based on taste and aesthetics, not due to health reasons.
 NA symbolises Not Available.



3. METHODS

3.1 ECOTOXICITY ANALYSIS

Twelve and a half litres of water was collected from 'A Pit' at Ensham Mine site and tested for ecotoxicity. This involves testing several native aquatic fauna species for acute and chronic effects brought on by the concentrations of contaminants within the pit water. The ANZECC and ARMCANZ (2000) guidelines outline the tests required to derive a site specific Direct Toxicity Assessment (DTA) for the combination of contaminants within the water. While C&R acknowledge that concentrations of contaminants within the pit water can vary over time, variation recorded within the Ensham pit waters since the flooding occurred has been minimal with levels recorded for all contaminants below the 95% species protection level with the exception of electrical conductivity (refer to Section 2.2).

Species used in ecotoxicity assessments require a proven laboratory protocol for such experiments. Therefore, not every species that occurs locally can be supplemented into the required laboratory experiments. Instead, commercial laboratories offer a limited number of species that are proven performers in such tests. To tailor the assessment to the local area, species are then chosen dependent on their relevance. Although all species chosen may not occur locally, their relevance to stream systems that are experienced locally is outlined below. Hence, the following tests have been chosen from those outlined by ANZECC and ARMCANZ (2000) to specifically address the natural fauna occurring in the proposed receiving waterway:

- *Ceriodaphnia dubia* (Water Flea) (48hr acute immobilisation test and 7day reproductive impairment test). Water fleas are found within freshwater ecosystems worldwide and are predicted to occur within local waters. Because of their global distribution *Ceriodaphnia dubia* are the most commonly tested species for the assessment of potential harm posed by contaminants to freshwater aquatic ecosystems, worldwide. Therefore, the results produced by testing this species have been well proven. The reason for doing both tests is to develop an acute to chronic ratio that can be used to convert the acute tests (fish and macroinvertebrates outlined below) into chronic data for use in the calculation of the DTA;
- *Selenastrum capricornutum* (Algae) (72hr algal growth inhibition test). *S. capricornutum* is an important food source and common throughout Australian freshwater systems. However, detailed distribution surveys of algae are uncommon and currently no list of algal species present within the Fitzroy Basin is available. No species of algae offered by the laboratory can be positively identified as occurring locally. Therefore, this species was chosen for a test species because of its broad range and known attribute as a biological indicator (ANZECC and ARMCANZ 2000);
- *Paratya australiensis* (freshwater glass shrimp) (96hr acute toxicity test). *P. australiensis* are another important trophic level in the food chain. This species of freshwater shrimp is the most commonly found species on the east coast of Australia (Cook *et al* 2006), making it one of the most important food items available in freshwater systems for fish. Furthermore, Page & Hughes (In Press) found that *P. australiensis* and *Caridina sp. D* always occur together throughout their respective ranges. Page & Hughes (In Press) found *Caridina sp. D* within the Nogoia River and hence infer that *P. australiensis* will also occur in the area. Making this species locally relevant to the DTA;



- *Melanotaenia splendida splendida* (Rainbowfish) (96hr imbalance (mortality) test). *M. splendida* is an extremely common freshwater fish species found in tropical eastern flowing waterways from Gladstone to Cape York Peninsula (Allen *et al.* 2002). There are over 26 recorded surveys of this species in the local area (e.g. Nogoa River) tabulated on a Wildlife Online extract (DERM 2010). This fish is susceptible to contaminated waters which makes it an ideal candidate for determining required mixing ratios;
- *Lemna disperma* (Common Duckweed) (7day growth inhibition test). Duckweed is an extremely common aquatic floating plant found across Australia and is locally relevant as it occurs within the Fairbairn Dam and other adjacent tributaries (pers. comm. Kavanagh 2010, and Wildlife Online extract, DERM 2010). It is also another important trophic level because it is a food source for a wide range of organisms. Furthermore, this is the only aquatic plant offered by the laboratory and in order to test a broad spectrum of organisms it must be included in the testing regime.

All of the above species are commonly used for laboratory experiments including ecotoxicology assessments because of their relatively low tolerance levels to toxicants (ANZECC & ARM CANZ 2000).

Analysing the results of the ecotoxicological testing, a mixing concentration/ratio (for the pit water chemistry as a whole) was derived using the BurriOZ software package (Campbell *et al.* 2000), as outlined within ANZECC and ARM CANZ (2000) guidelines to achieve a 95% and 99% species protection level. BurriOZ uses a flexible group of distributions, the Burr Type III, to estimate the concentrations of discharges required to protect a given percentage of species (in this case we are aiming for 95%) and conversely determines that a given percentage will be adversely affected (Campbell *et al.* 2000). These protective concentrations and safe dilutions were determined using no observed effect concentration (NOEC) data due to the ambiguity of the EC10 and EC50 results. This does not impact the accuracy of the analysis as the ANZECC and ARM CANZ Guidelines (2000) use chronic NOEC data to derive high reliability Protective Concentrations.

For a more detailed explanation of the analysis used as well as a general overview of the results please refer to Appendix 2.

3.2 SPECIES COMPOSITION

Thorough species composition assessment of the mine pit for both fish and macroinvertebrate assemblages is unachievable for two major reasons:

1. Mine site OH&S – Safety at the mine site is paramount for obvious reasons. Compliance with such strict measures restricts the amount of sampling and limits the type of sampling techniques that can be utilised. For example, when surveying fish species the field personnel were restricted to a relatively small area of the pit so that continual "line of sight" could be maintained.
2. The artificial habitat of the pit – The pit is over 40m deep in parts with an average depth of over 20m, limiting netting and trapping to shallow areas. The substrate is covered by a thick blanket of silt making it a similar consistency to quick sand. The access ramp into the pit is heavily eroded and extremely boggy up to 10m above the water line. This made launching a larger boat off a trailer impossible (at the point of time the survey was performed) and therefore a smaller boat which could be carried was deployed.

3.2.1 FISH SPECIES

High salinity levels and restricted access render electrofishing an ineffective sampling method. Instead, nets and baited traps were utilised to sample fish species present within the pit. Two gill nets (a 3 inch and a 4 inch mesh size, both 23m long with a 2.5m drop), two tangle nets (both nets were ¾ inch mesh size, 25m long and 2.5m drop), four collapsible box traps and four opera traps were strategically positioned around the

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designated sampling area (based on OH&S) (Figure 2). Fish sampling was performed in the early morning to catch fish during the time of high mobility associated with sunrise.

Nets and traps targeted structure along the shallower banks of Ramp22 which enters the pit (refer to Figure 2). These structures are formed from eroded banks after flooding and/or infrastructure put in place since flooding (e.g. pumps, piping, etc). All nets and traps were deployed for a maximum of 2.5 hours, with the gill nets checked every hour.

Fish collected were identified, measured, photographed and released, except for five individuals of two species which were dissected to attain reproductive status. The species composition of the fish community inhabiting the mine pit is discussed in Section 4.2.1.

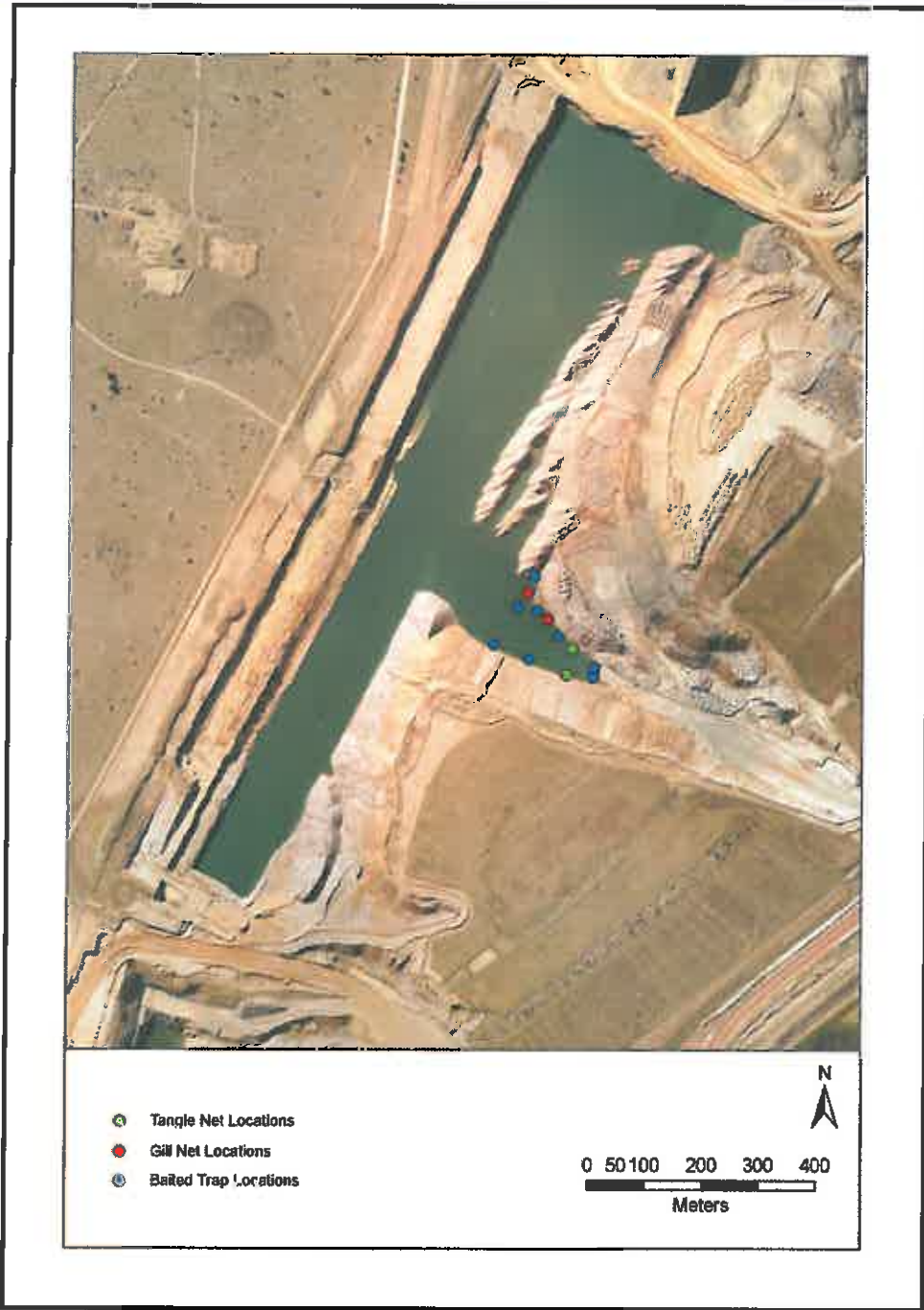


Figure 2: Net and baited trap locations within 'A Pit'



3.2.2 MACROINVERTEBRATE SPECIES

The mine pit habitat is highly artificial and not representative of any that aquatic fauna may inhabit in nature. Therefore, assessment of the macroinvertebrate species occurring within the pit can not be compared to natural systems using the AusRivas modelling tool. Furthermore, whilst the AusRivas methodology for sampling macroinvertebrates was to be followed, safety concerns for the sampler meant that samples could not be taken using approved methods. Instead, an innovative technique to collect samples from the boat was devised. C&R suggest that the macroinvertebrate sample collected from the site should be viewed as indicative only for species presence and absence, and comparison to any adjacent waterways and signal indexes must be made with caution.

Sampling occurred using a triangular 250µm macroinvertebrate net to agitate the bottom and catch any invertebrates occurring within it. Only one habitat type was recorded within the pit (e.g. silty bottom). Therefore, under AusRivas Guidelines only one invertebrate sample should be collected. However, as the sampler had to take samples from the boat and data could not to be modelled using the AusRivas modelling tool, three samples were taken (each covering approximately 10m of substrate) and picked to acquire an accurate assessment of species present. Each sample was picked for a minimum of 15 minutes to a maximum of 30 minutes dependent upon species found (as per AusRivas method). Macroinvertebrates collected were placed in 80% ethanol for storage and sent to a laboratory (Australian Centre for Tropical Freshwater Research) to be identified to a higher level.

Species present were ranked dependent upon their SIGNAL2 grades (Chessman 2003). Results are discussed in Section 4.2.2.

3.3 WATER QUALITY SAMPLING

Stratified water sampling was performed to 3m depth. This was performed in between the two tangle net locations. An Aqua-Read multi-meter was used to test dissolved oxygen (DO), electrical conductivity (EC), pH, turbidity, temperature and total dissolved solids (TDS). Measurements were taken at 0.2, 0.5, 1.0, 2.0 and 3.0m below the surface. Findings are compared against previous recordings from the same site.



4. RESULTS

4.1 ECOTOXICITY

The laboratory results for ecotoxicity as well as the analysis of the ecotoxicity tests are displayed in Appendix 2. These results are discussed further in Section 5.1 of this report.

4.2 SPECIES COMPOSITION

4.2.1 FISH COMMUNITY

Seven species of fish were collected or observed during the sampling of 'A Pit' (Table 4 and Figure 3 through to Figure 9). Table 4 shows that only the two Tangle nets were successful in capturing fish. This may be due to mesh size, resident fish size and/or net type. However, a large 430mm *Arius graeffei* (fork-tailed catfish) was caught in the smaller mesh net (Table 5). This fish would have been easily caught in either of the two Gill nets had it encountered them. It should also be noted that the Gill nets were hung in deeper water due to the restriction of available shallow sites. Therefore, inability to capture fish may have been due to the lack of appropriate habitat to position nets around. The Opera traps and Box traps also failed to catch any smaller cryptic fish or macroinvertebrates (e.g. freshwater shrimp).

Table 4: Fish species collected

Species	3" Gill net	4" Gill net	¼" Tangle net 1	¼" Tangle net 2	Opera traps	Box traps	Observed
<i>Amniataba percooides</i>	0	0	4	3	0	0	3
<i>Arius graeffei</i>	0	0	0	1	0	0	0
<i>Leiopotherapon unicolour</i>	0	0	8	11	0	0	5
<i>Nematalosa erebi</i>	0	0	4	6	0	0	0
<i>Neosilurus hyrtlii</i>	0	0	1	0	0	0	0
<i>Melanotaenia splendida splendida</i>	0	0	0	0	0	0	4
<i>Scortum hillii</i>	0	0	0	1	0	0	0

Generally fish of the same species were of a similar size. For example *Leiopotherapon unicolour* had a maximum total length of 135mm, a minimum of 120mm and an average total length of 125mm (Table 5). The only species that showed a large variation in size classes was *Amniataba percooides* which had a maximum total length of 110mm and a minimum total length of 11mm. It should be noted that this juvenile specimen (TL 11mm) was haphazardly caught in the macroinvertebrate net while sampling for macroinvertebrates. The significance of this find is discussed further in Section 5.2 of this report.



Table 5: Sizes of individual fish caught

Number	Total length of individual fish (mm)					
	<i>Amniataba percoides</i>	<i>Arlus graeffel</i>	<i>Leiopotherapon unicolor</i>	<i>Nematalosa erebi</i>	<i>Neosilurus hyrtlii</i>	<i>Scortum hillii</i>
1	110	430	130	120	160	180
2	90	-	130	115	-	-
3	110	-	120	120	-	-
4	100	-	120	130	-	-
5	110	-	130	135	-	-
6	110	-	130	-	-	-
7	105	-	120	-	-	-
8	11	-	135	-	-	-
9	-	-	120	-	-	-
10	-	-	130	-	-	-
11	-	-	120	-	-	-
12	-	-	120	-	-	-
13	-	-	130	-	-	-
14	-	-	130	-	-	-
15	-	-	120	-	-	-
16	-	-	120	-	-	-
17	-	-	120	-	-	-
18	-	-	120	-	-	-

Note - *Melanotaenia splendida splendida* are not included in this table as none were caught only observed.

Observations –

- *Melanotaenia splendida splendida* were tentatively observed in the shallows while collecting traps. However, upon dissection of a *Leiopotherapon unicolor*, a partly digested specimen of *Melanotaenia splendida splendida* was removed from the gut. This verified the sightings within 'A Pit'.
- Also during the dissection of two *Leiopotherapon unicolor* and two *Amniataba percoides* the specimens were observed to be bearing eggs (in roe). Upon further inspection of two separate specimens of *Leiopotherapon unicolor* the individuals were noted to have developed gonads and were therefore suggested to be sexually reproductive. This was again reinforced by the presence of a juvenile *Amniataba percoides* caught within the macroinvertebrate sampling net.
- Available habitat was extremely poor with little structure and very limited plant life. While algae did grow in some areas most of this had been covered by silt carried into the pit by runoff during recent rains. Therefore the available food source within 'A Pit' is suggested to be running out.
- Silt plumes were occurring from runoff while the samplers were on the water. Also large amounts of rock and dirt were observed eroding (falling) from the steep spoil banks.
- Schools of fish were observed foraging at the surface for insects in the early morning.
- *S. hillii* had a relatively hollow stomach cavity, suggesting that the individual was under fed (see Figure 9).



Figure 3: *Amniataba percooides* (common name – Barred Grunter)



Figure 4: Juvenile *Amniataba percooides*



Figure 5: *Arius graeffei* (common name – Fork-tailed Catfish)



Figure 6: *Lepotheseron unicolor* (common name – Spangled Perch)



Figure 7: *Nematalosa erebi* (common name – Boney Bream)



Figure 8: *Neosilurus hyrtlilii* (common name – Hyrtl's Tandan)



Figure 9: *Scortum hillii* (common name – Leathery Grunter)

4.2.2 MACROINVERTEBRATE SPECIES

Diversity of the macroinvertebrate assemblage sampled in 'A Pit' was lacking with species from only 3 different families collected:

1. Family – Ceratopogonidae (species common name – Biting Midge larvae). This family has a SIGNAL2 grade of 4 (Chessman 2003).
2. Family – Chironomidae, Sub-Family – Chironominae (species common names – Non-biting Midge larvae or Bloodworm larvae). This sub-family has a SIGNAL2 grade of 3 (Chessman 2003).
3. Family – Dytiscidae (species common name – Predacious Diving Beetle, adult). This family has a SIGNAL2 grade of 2 (Chessman 2003).

SIGNAL2 grades outlined by Chessman (2003) relate to the families (or sub-families) ability to tolerate harsh conditions. For instance:

SIGNAL2 grade 1
Highly tolerant

→

SIGNAL2 grade 10
Highly sensitive

Highly tolerant species can withstand harsh environmental conditions. For example, families with a grade 1 are known to occur in chlorinated swimming pools. Highly sensitive families only occur in pristine conditions, for instance an undisturbed rainforest stream within the wet tropics. However, Chessman (2003) states that caution needs to be applied when stating that a system is disturbed because it does not have any high SIGNAL2 grade



families present. The lack of these families may be caused by location and climate rather than disturbance. For example, it is predicted that no SIGNAL2 grade 10 families will occur in undisturbed systems within Central Queensland due to the climate of the area.

Low species richness is common in many closed (dammed), un-vegetated, artificial systems (Davis, pers. comm. 2010). The heavy silt layer and the absence of macrophytes render the pit relatively uninhabitable for many macroinvertebrate species. Further reasons predicted to be causing the reduced species count are discussed in Section 5.2 of this report.

4.3 WATER QUALITY DURING SAMPLING

The area had experienced several large rainfall events (>20mm / day) in the weeks leading up to the field work. The night before sampling the area again received a large rainfall event. This was evident by the cloudy/murky look to the water and the constant runoff from the spoil while samplers were on site (refer to Appendix 1). Table 6 displays the affect that the increase in freshwater runoff has had on the system. While mixing of waters was occurring, a steady increase in electrical conductivity and the corresponding total dissolved solids content coincides with an increase in depth. All physicochemical parameters recorded, except electrical conductivity, are within the 95% species protection level (ANZECC 2000) and similar to previous recorded averages for the site as outlined in Table 1 and Table 2.

Table 6: Physicochemical parameters measured in 'A Pit'

Parameter	Depth below surface of water (m)				
	0.2	0.5	1	2	3
DO (% Sat)	125	123	129	129	129
EC (µS/cm)	6892	7043	7246	7982	8131
pH (Units)	8.1	8.05	7.99	7.81	7.8
Temperature (°C)	24.1	24.1	24.1	24.1	23.8
TDS (mg/L)	4482	4582	4715	5190	5430



5. DISCUSSION

5.1 ECOTOXICITY

The variability observed in the results for the EC10 and EC50 values derived from both the duckweed and algae results lead to the analysis of NOEC data to determine Protective Concentrations. While not considered heavily impacted the algae, *Selenastrum capricornutum*, was found to be the most impacted (LOEC 50%) specie by the pit water as it was the only specie that recorded a lethal observed effect concentration (LOEC) below 100% (Appendix 2). This is not unexpected as it is well known that certain species of algae are highly sensitive to copper within both marine and freshwater systems (ANZECC and ARMCANZ 2000). While this can not be definitively stated as the cause of the reduced growth observed in the algae, as individual levels of toxicants were not tested, it is considered the most likely reason (refer to Section 2.2).

The pit waters were found to be lethal to cladocerans (*Ceriodaphnia dubia*) and rainbowfish (*Melanotaenia splendida*) at 100% concentration. However, due to the lack of tests conducted at concentrations between 50% and 100% it is difficult to conclude accurately at what concentrations NOEC turns to LOEC. No lethal concentrations (LOEC) were recorded for either the freshwater shrimp (*Paratya australiensis*) or the duckweed (*Lemna disperma*) during the experiments (refer to Appendix 2).

The species sensitivity distribution (SSD) was used to derive the concentrations of mine water necessary to maintain ecosystem protection. This found that to protect 95% of species within the receiving ecosystem, as required by ANZECC and ARMCANZ Guidelines for such systems, then 'A Pit' water concentration must not exceed 23.3%. This equates to a mixing ratio of approximately 1L of 'A Pit' water to 5L of receiving ecosystem water. To protect 99% of species within the receiving ecosystem then 'A Pit' water concentration must not exceed 16.5% of the receiving waters. This is a mixing ratio of 1L of 'A Pit' water to 7L receiving ecosystem water.

5.2 SPECIES COMPOSITION

Eleven fish species from six families have now been observed and/or positively identified within the 'A Pit' since it flooded in the 2007-2008 wet season (Table 7). However, positive identification has only been achieved on six species, these being *A. percoides*, *A. graeffei*, *L. unicolour*, *N. erebi*, *N. hyrtlili* and *S. hillii*. While it is believed that *B. bidyanus*, *H. sp. 1*, *L. calcarifer* and *T. tandanus* all occurred within 'A Pit' after flooding it has been over 2 years since any have been sighted and therefore it can not be definitively stated that these species are persisting in this artificial environment (refer to Table 7). Furthermore, the size of the water body remaining in 'A Pit' (both surface area and volume) and the ability to access areas (restricted by sampling gear and OH&S) limited the effectiveness of the sampling regime employed for determining entire fish community present. While samplers were able to target the most likely areas within 'A Pit' that fish would be congregating it is predicted that more species could be utilising this vast amount of water. A previous study of sites upstream and downstream of the mine site on the Nogoia River catalogued a total of sixteen species from nine different families (Berghuis and Long 1999). Therefore, while this assessment is not considered all inclusive it does give a significant indication as to what types of fish inhabit the pit waters. It should be noted that none of the species identified have conservation status under the Environment Protection and Biodiversity Conservation Act (1999) or the Nature Conservation (Wildlife) Regulation (2010).

All of the species positively identified have a relatively omnivorous diet with the exception of *S. hillii*. *S. hillii* generally feeds on molluscs and algae. However, the substrate (silty bottom) and amount of silt entering the pit via runoff would limit the abundance of both of



these food sources. Very little macrophyte and algae growth was observed during sampling and no molluscs were collected within the macroinvertebrate samples. Hence, it is predicted that this species is either running out of food or feeding on a different food source. However, as can be seen in Figure 9 the specimen collected was hollow bellied which suggests that the individual is not able to find sufficient amounts of food. It should be noted that this is the only fish of this species that was caught and, furthermore, the only fish caught that looked unhealthy.

Reinforcing the health of the fish caught was the observation that two species were sexually reproductive within the pit. If fish are stressed, due to physicochemical conditions, their ability to reproduce will be negatively impacted (Schreck 2010). Two species of fish, *L. unicolor* and *A. percoides*, euthanized and dissected for muscle tissue were observed to be in roe. Other fish from the same species were dissected and observed to have developed gonads. While this evidence alone does not definitively show that reproduction is not impacted by the physicochemical parameters within the pit, the presence of juvenile *A. percoides* (TL 11mm) does suggest that this species is reproductively successful. Therefore, any impacts from physicochemical conditions are suggested to be minimal.

The plasticity in diet may be critical for species to survive in such closed, artificial systems. As the waters experienced within 'A Pit' appear to have little impact on the survival of fish species, food availability may be the overriding factor influencing species composition. While many of the species present feed on algae and macroinvertebrates they can also prey on fish and terrestrial insects or consume detritus when their preferred food is unavailable. For instance, Pusey *et al.* 2004 state that 87% of *A. percoides* diet is made up of macroinvertebrates, algae and aquatic plants. However, if these food items are unavailable they will also eat other fish, terrestrial insects, terrestrial plant matter, detritus, etc. This is an essential trait in this artificial environment as through observations it was noted that very little plant matter and algal growth was evident within the system and the macroinvertebrate sampling showed a depleted system with few species utilising the area.

There are several co-occurring factors possibly influencing the species composition of the macroinvertebrate assemblage residing within the pit waters. The first factor is portrayed be the relatively low tolerance to contaminants within the water by *Ceriodaphnia dubia* within the ecotoxicity tests. Although *C. dubia* is considered a microinvertebrate the results of the ecotoxicity test suggest that only hardy species of macroinvertebrates will be able to tolerate the water quality within 'A Pit'. However, the most obvious factor influencing species composition within 'A Pit' is that it is a closed system and therefore does not receive any input during the year from the Nogoia River. Species that need to access flowing waters as a life history trait will not persist in such systems and are generally sensitive species (Chessman 2003). The only external recruitment that can occur to the site is haphazardly by terrestrial insects that have an aquatic stage in their life cycle. This is seen by the three species collected during macroinvertebrate sampling.

The two families and one sub-family of macroinvertebrates recorded within the pit all have low SIGNAL grades, indicating the species have high tolerance levels to disturbed systems. 'A Pit' is a highly disturbed system, not only due to physicochemical contaminants, but also because it is artificial and during rain periods experiences large silt inputs. This has left the substrate barren, with no macrophyte or algal growth (also due to water quality) and very little structure. It should be noted that 'A Pit' was not designed to be a dam/lake and only became one out of necessity. Hence, only highly tolerant species will persist in such a system.

Of the three families only one specimen of Dytiscidae was found. This species is a free-swimming beetle while the other two species are worm like organisms which occur within or upon the substrate. This is an interesting find as the family Dytiscidae was the most tolerant family found but the least abundant (refer to Section 4.2.2). This is suggested to be a result of predation by fish. As 'A Pit' is a closed, highly disturbed system it makes ideal habitat for many beetle families (as all are highly tolerant) and, even though food availability is limited, it is predicted that abundances of such families would be relatively high within this system. However, the majority of all eleven species of fish observed and/or



caught within 'A Pit' have the ability to consume macroinvertebrates (Table 8). Many of these fish species selectively prey on larger free-swimming macroinvertebrate species (e.g. beetle, shrimps, red claw, etc). Therefore, it is suggested that fish predation is another factor influencing the low macroinvertebrate species count with 'A Pit'.

Table 7: Species list of fish occurring in 'A Pit'

Species	Common name	Identified	Comments
<i>Amniataba percooides</i>	Barred Grunter	Positively	-
<i>Arius graeffei</i>	Fork-tailed Catfish	Positively	-
<i>Bidyanus bidyanus</i>	Silver Perch	Anecdotal	No specimens have been observed since the initial filling of the pit, over 2 years ago.
<i>Hypseleotris gallii</i>	Firetail Gudgeon	Anecdotal* (VSES 2008)	While remotely possible this species has not been recorded in the Fitzroy River Basin before. This species looks similar to <i>Hypseleotris</i> sp. 1 and it is the author's opinion that this is the more likely species observed within 'A Pit'.
<i>Lates calcarifer</i>	Barramundi	Anecdotal	No specimens have been observed since the initial filling of the pit, over 2 years ago.
<i>Leiopotherapon unicolor</i>	Spangled Perch	Positively	-
<i>Nematalosa erebi</i>	Boney Bream	Positively	Identified in the VSES 2008 report and sampled again during the field component of this report.
<i>Neosilurus hyrtlil</i>	Hyrtl's Tandan	Positively	-
<i>Melanotaenia splendida splendida</i>	Eastern Rainbowfish	Tentatively	This species was tentatively identified from observing small specimens swimming in the shallows and what was believed to be a partly digested specimen occurring in the stomach of a dissected <i>L. unicolor</i> .
<i>Scortum hillii</i>	Leathery Grunter	Positively	-
<i>Tandanus tandanus</i>	Freshwater Catfish	Anecdotal	No specimens have been observed since the initial filling of the pit, over 2 years ago.

* symbolises a questionable species identification.
 Anecdotal identification in this case is all previously observed species.

The ecotoxicology results suggest that *M. splendida* can not persist in 'A Pit' waters. However, during the fish survey carried out on 'A Pit' *M. splendida* were observed feeding within the shallows, with another specimen found in the gut of an *L. unicolor*. It is predicted that *M. splendida* occur within 'A Pit' as they have acclimated to the conditions. The species has previously been recorded in higher EC levels than found within 'A Pit' (refer to Table 8). Therefore, it is suggested that when the pit initially flooded the EC level was low but slowly increased as the water level receded and other impacted waters were added. This allowed the individuals occurring within 'A Pit' to slowly acclimate to the current water quality.

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Three fish species observed and/or caught within 'A Pit' have not been recorded occurring in such high EC levels before. Of these three only one was caught during this study. *N. hyrtlii* has only been recorded in waters with up to 1855 $\mu\text{S}/\text{cm}$ (Table 8). However, this species has survived in 'A Pit' waters, of an average 7500 $\mu\text{S}/\text{cm}$, for almost three years. While the other two species, *H. sp. 1* and *T. tandanus*, have not been observed within 'A Pit' for over two years, it does not signify the species can not persist in the waters due to high EC concentrations. As can be seen in Table 8 these two species have previously occurred in systems with much higher EC values than *N. hyrtlii* has ever been found in. Furthermore, the sampling was only able to assess a relatively small portion of 'A Pit'. *H. sp. 1* and *T. tandanus* may still occur within the pit but evaded the sampling strategy.

Table 8: Recorded environmental tolerances and life history traits for resident fish species (Allen *et al.* 2002 and Pusey *et al.* 2004)

Species	pH (units)	DO (% Sat)	EC ($\mu\text{S}/\text{cm}$)	Temperature ($^{\circ}\text{C}$)	Turbidity (NTU)	Reproductivity		Diet
						Size (mm)	Age (months)	
<i>Amniataba percooides</i>	4.5 – 8.45	2 – 135	<56,000	10 – 40	0 – 414	F – 50 M – 50	<12	The majority of this species' diet is made up of aquatic insects and algae.
<i>Arius graeffei</i>	6.1 – 8.2	65 – 137	10 – 790 ^a	21.9 – 33	1.7 – 5.4	F – 280 M – 270	Unknown	Mainly feed on crustaceans, other macroinvertebrates, fish, algae and terrestrial insects.
<i>Bidyanus bidyanus</i>	NA	NA	NA	2 – 37	NA	NA	24 – 36	Mainly consumes insects, molluscs, annelid worms and algae.
<i>Hypseleotris</i> sp. 1	4.4 – 8.9	4 – 150	51 – 4123	8.4 – 31.2	0 – 331.4	F – 30.8 M – 32.4	12	The majority of their diet is made up of aquatic insects, micro-crustaceans and other micro-invertebrates.
<i>Lates calcarifer</i>	4.0 – 9.12	>10	~<125,000	15.5 – 36	NA	F – 800 M – 600	F – 72 M – 36	While the diet changes from juvenile to adult, this species mainly feeds on fish and crustaceans.
<i>Leiopotherapon unicolor</i>	4.0 – 8.6	>12	<56,000	7.3 – 37.5	1.52 – 260	F – 58 M – 66	3 – 6	Generally feed on aquatic insects, fish and crustaceans.
<i>Nematalosa erebi</i>	4.8 – 9.1	15 – 145	2 – 60,000	15 – 38	0.3 – 581	F – 140 M – 130	>12	Feed mainly on detritus, algae and micro-crustaceans
<i>Neosilurus hyrllii</i>	5.2 – 9.1	15 – 130	4 – 1855	12.8 – 36	0.25 – 170	F – 135 M – 135	12	The majority of this species' diet consists of aquatic insects, crustaceans, molluscs and detritus.
<i>Melanotaenia splendida splendida</i>	5.13 – 8.47	13 – 134	<13,500	15 – 34.4	0.1 – 520	F – 38 M – 38	<12	This species mainly feeds on algae, aquatic insects and terrestrial insects.
<i>Scortum hillii</i>	NA	NA	^a	12 – 35	Can occur in high turbidity	NA	NA	Mainly feeds on mussels and algae.
<i>Tandanus tandanus</i>	4.8 – 9.1	4 – 150	6 – 3580	8.4 – 33.6	0.2 – 250	F – 335 M – 370	48 – 60	The majority of this species' diet consists of aquatic insects, crustaceans, molluscs and detritus.

^a This species has been caught in estuaries before. However, no EC data exist for these findings.
H. sp. 1 is included into this table instead of *H. gallii* as this species does not occur in the Fitzroy Basin.
 Please note that DO % Sat data are approximate values calculated from mg/L data. NA refers to Not Available.



6. CONCLUSIONS

Based on the findings of the study the following conclusions and recommendations are made:

- The water quality encountered within 'A Pit' is impacted by EC with all metal toxicant concentrations observed below ANZECC Guidelines (2000). In this case the EC is a compositional contaminant as it is the major ions available within the water that is increasing the EC levels.
- Based on ecotoxicity testing, 95% species protection within a receiving environment can be achieved at a protection concentration of 23.3%. This requires a mixing ratio of approximately 1L of 'A Pit' water to 5L of receiving environment water.
- Based on ecotoxicity testing, 99% species protection within a receiving environment can be achieved at a protection concentration of 16.5%. This requires a mixing ratio of approximately 1L of 'A Pit' water to 7L of receiving environment water.
- 'A Pit' has a relatively species rich fish population present. With eleven species from six different families having now been observed and/or caught. Sixteen species from nine different families have been recorded in the Nogoia River adjacent to the mine site. It is predicted that if further sampling was performed with greater fishing effort within 'A Pit' this species list would be added too.
- All species caught during this study were in good condition. With two species, *A. percooides* and *L. unicolor*, observed to be in roe or, if male, with developed gonads. Furthermore, a juvenile (TL 11mm) *A. percooides* was caught signifying that successful reproduction and recruitment is taking place within the artificial system.
- With such a diverse and relatively abundant fish population persisting with 'A Pit' it is possible that a disposal programme may need to be considered. For instance, fish could either be released into or quarantined from the receiving environment. Further assessment of the fish community occurring within 'A Pit' and the receiving fish community needs to be performed before an appropriate approach can be determined.
- The macroinvertebrate assemblage present within 'A Pit' was species poor. This is common in highly disturbed, artificial systems. Within 'A Pit' it is suggested to be a combination of several factors:
 - Water Quality – due to the physicochemical parameters experienced within 'A Pit' only highly tolerant macroinvertebrate species can occur.
 - Closed system – the pit is closed off from any "within stream" recruitment for seasonal species.
 - High silt coverage – the system experience large deposits of silt during rain events and this restricts certain species from utilising the substrate.
 - Lack of macrophytes and structure – reduces food availability for macroinvertebrates and cover to escape predation.
 - Species richness and abundance of fish present – the majority of species of fish caught have the ability to prey upon macroinvertebrates and will do so when the availability of preferred food items is reduced.



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APPENDIX 1 – SITE PHOTOS



Figure A1.1: Setting nets



Figure A1.2: High spoil bank



Figure A1.3: Heavily eroded banks



Figure A1.4: Ramp22 entering 'A Pit'



Figure A1.5: Traps sampling eroded bank



Figure A1.6: Spoil bank north of Ramp22



Figure A1.7: Large eroded gully in spoil

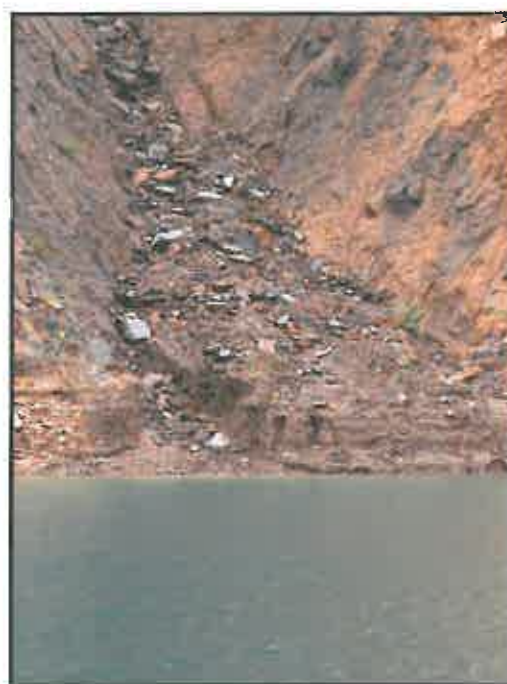


Figure A1.8: Rocks, silt and soil washing into 'A Pit'

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APPENDIX 2 – HYDROBIOLOGY'S ANALYSIS AND REPORT OF THE ECOTOXICOLOGY LABORATORY RESULTS



[REDACTED]
Environmental Scientist
C & R Consulting Pty Ltd
188 Ross River Road
Aitkenvale QLD 4814

16th December 2010

RE: SSD derivation and protective concentration and safe dilution calculation for Ensham Mine pit water

Dear [REDACTED]

Please find attached a final report outlining the derivation of an SSD for an Ensham Mine pit water sample and the calculation of corresponding protective concentration and safe dilution.

If you have any queries regarding this report please don't hesitate to contact me for further discussions.

Kind Regards,

[REDACTED]

[REDACTED] - Principal Ecotoxicologist



Species sensitivity distribution derivation and calculation of protective concentration and safe dilutions for Ensham Mine pit water

Introduction

Hydrobiology was approached by Matt Knott of C & R Consulting Pty Ltd to undertake the derivation of a species sensitivity distribution (SSD) and to calculate protective concentrations and corresponding safe dilutions for Ensham Mine pit water. The methods used and the results of the testing and calculations of the protective concentrations and safe dilutions are presented below.

Methods

Data used for derivation of protective concentrations

Ecological protective concentrations were derived using the method described by ANZECC and ARMCANZ (2000), using NOEC and IC10 data. The current Australian and New Zealand Water Quality Guidelines use chronic no observed effect concentration (NOEC) data to derive high reliability Protective Concentrations and acute EC/IC50 toxicity data to derive moderate and low reliability protective concentrations (ANZECC and ARMCANZ, 2000; Warne, 2001). However, the water quality guidelines (ANZECC and ARMCANZ, 2000) and the document that proposed the framework for developing these guidelines (Warne, 1998) state that the methods used to derive the protective concentrations are not data specific as long as only one type of data is used. The protective concentrations and safe dilutions contained in this document have been derived using NOEC due to the ambiguity of EC10 and EC50 results of some of the tests.

Protective concentration derivation

Protective concentrations were to be derived using the BurrliOZ software package (Campbell *et al.*, 2000), provided as part of ANZECC and ARMCANZ (2000) (Figure 1). BurrliOZ uses a flexible group of probability distributions, the Burr Type III group, to estimate the concentrations of discharges such that a given percentage of species will be protected and conversely that a given percentage will be adversely affected (Campbell *et al.*, 2000). The concentrations protective of 95 and 99% of species along with the corresponding safe dilutions were derived from the fitted distributions.

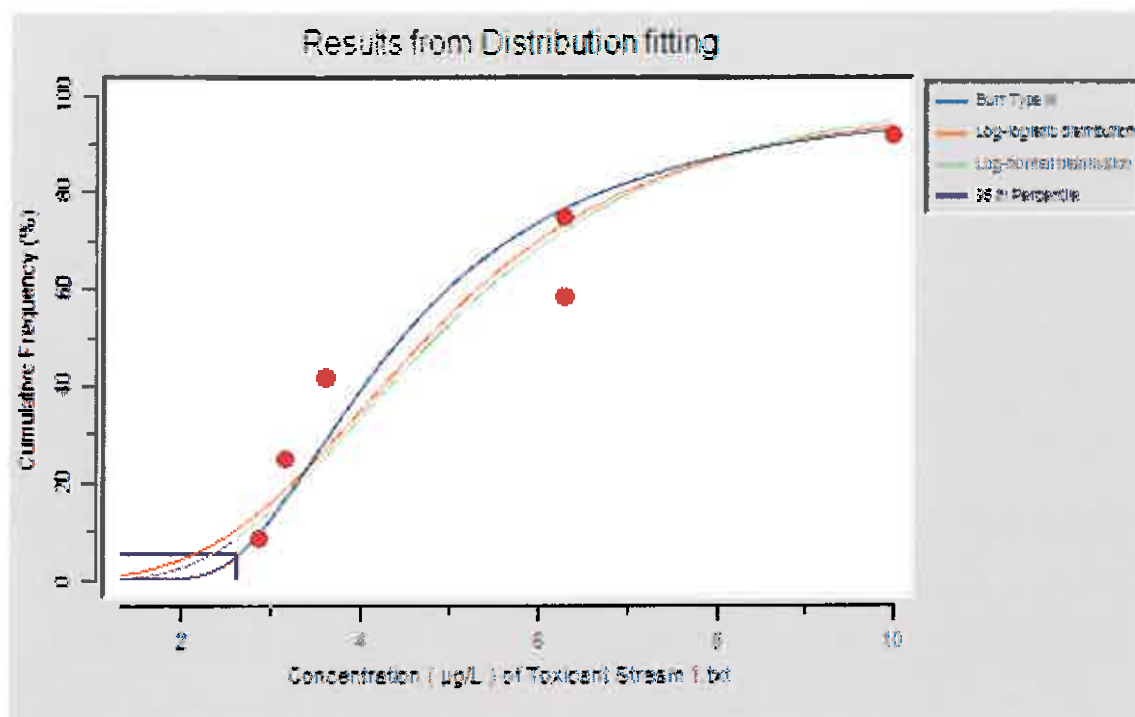


Figure 1 Example species sensitivity distribution from BurrliOZ.

Results

Ecotoxicity testing

Results of the ecotoxicity testing are presented in Table 1 with the full report in Appendix 1. The EC10 results for the algae and duckweed tests were below the lowest concentration tested (2.5% sample) and the EC50 results for the duckweed, shrimp and fish tests were all above the highest test concentration (100%). The NOEC results for all tests were used for the derivation of the protective concentrations and safe dilutions as these EC10 and EC50 values were outside the tested concentration ranges.

Table 1 Results of ecotoxicity testing with Ensham Mine pit water

	Ensham Mine pit water (% sample)		
	NOEC	EC10	EC50
Microalgal Cell Yield	25	<2.5	72.4 (61.3 – 81.4)
Ceriodaphnia survival test	50	82.9 (78.5 – 87.5)	89.1 (72.1 – 100)
Ceriodaphnia reproduction test	50	65.2	70.7
Duckweed growth inhibition test	96.8	<2.5	>96.8
Shrimp survival test	100	>100	>100
Fish Imbalance	50	58.4 (0 – 71.5)	>100

Note - values in brackets represent 95% confidence intervals

The data used for the derivation of ecological trigger values included acute and chronic endpoints. Therefore, an acute to chronic ratio was calculated using the results of the ceriodaphnia survival and reproduction tests, and applied to the other acute test endpoints. While NOEC data has been used to derive the SSD due to the ambiguity of some of the EC10 data, the EC10 data for the acute and chronic ceriodaphnia tests was deemed acceptable for the calculation of the acute to chronic ratio. The acute to chronic ratio was calculated as 1.3. Therefore the acute shrimp and fish NOEC's were divided by 1.3 to provide chronic equivalent values for the use in the SSD. The data used for the calculation of the SSD are presented in Table 2.

Table 2 Data used in the derivation of SSD and protective concentration / safe dilution calculations

	Ensham Mine pit water (% sample)
	NOEC
Microalgal Cell Yield	25
Ceriodaphnia reproduction test	50
Duckweed growth inhibition test	96.8
Shrimp survival test	76.9
Fish Imbalance	38.5

The SSD generated from the toxicity assessment of Ensham Mine pit water is presented in Figure 2.

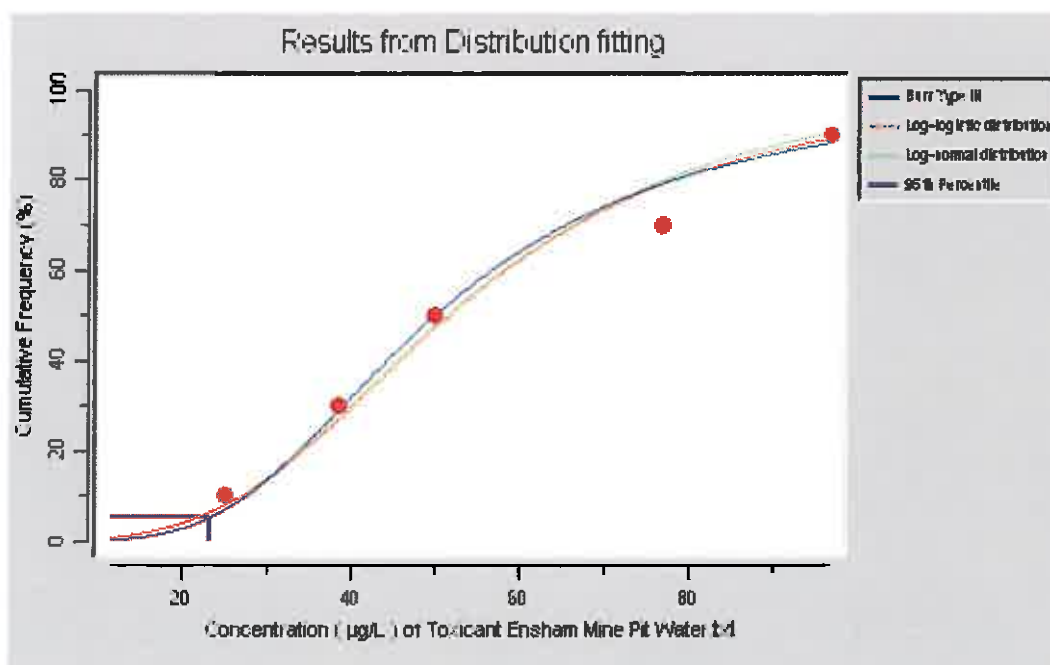


Figure 2 Species sensitivity distribution for results of Ensham Mine pit water ecotoxicity testing

The species sensitivity distribution was then used to derive ecosystem protective percentages. The percentage of Ensham Mine pit water that would be protective of

95% of species in the receiving ecosystem was estimated to be 23.3% and the percentage of Ensham Mine pit water that would protect 99% of species in the receiving ecosystem was estimated to be 16.5%. Corresponding safe dilutions for both the 95 and 99% protective concentrations are approximately 5 and 7 times respectively.

References

ANZECC AND ARMCANZ. 2000. Australian and New Zealand Guidelines for Fresh and Marine Water Quality. National Water Quality Management Strategy, Australian and New Zealand Environment and Conservation Council and Agriculture and Resource Management Council of Australia and New Zealand.

Campbell E. Palmer MJ. Shao Q. Warne MStJ. and Wilson D. 2000. BurliOZ: A computer program for calculating toxicant trigger values for the ANZECC and ARMCANZ water quality guidelines. Perth, Western Australia.

Warne M.St.J. 1998. Critical review of methods to derive water quality guidelines for toxicants and a proposal for a new framework. Supervising Scientist Report 135, Supervising Scientist, Canberra, ACT, Australia. ISBN 0 642 24338 7. 82p.

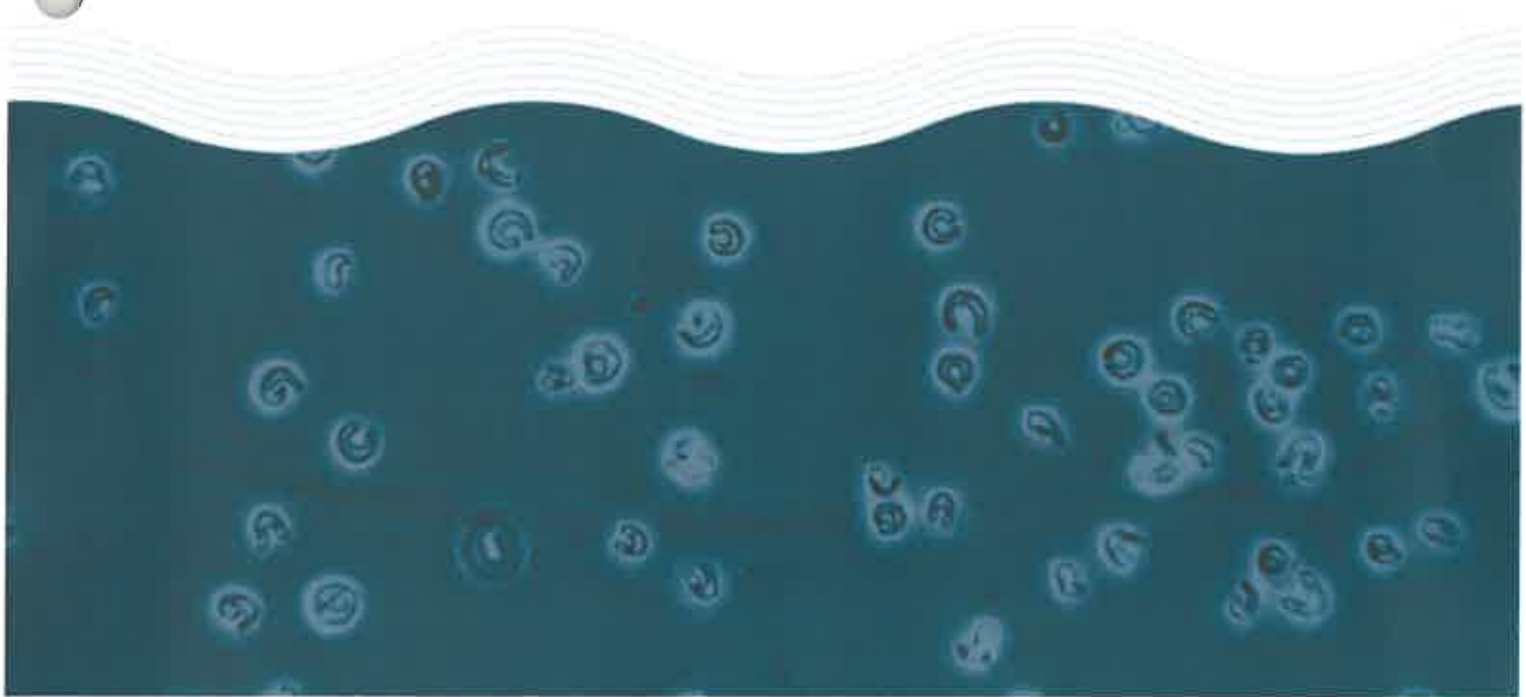
Appendix 1
Ecotoxicity test report

**Toxicity Assessment of a Mine
Tailings Dam**

C & R Consulting Pty Ltd

Test Report

November 2010



Toxicity Assessment of a Mine Tailings Dam

C & R Consulting Pty Ltd

Test Report

November 2010



Toxicity Test Report: TR0687/1

(page 1 of 2)

This document is issued in accordance with NATA's accreditation requirements

Client:	C&R Consulting 188 Ross River Road Aitkenvale QLD 4814	ESA Job #:	PR0687
Attention:	[REDACTED]	Date Sampled:	24 November 2010
Client Ref:	None supplied	Date Received:	25 November 2010
		Sampled By:	Client
		ESA Quote #:	PL0687_q01

Lab ID No.:	Sample Name:	Sample Description:
4443	MP22	Aqueous sample, pH 8.4, conductivity 7570µS/cm, total ammonia <2.0mg/L*. Sample received at 16°C in apparent good condition

*Ammonia analysis is not covered by Ecotox Services Australasia's scope of accreditation

Test Performed:	48-hr acute (survival) toxicity test using the freshwater cladoceran <i>Ceriodaphnia cf dubia</i>
Test Protocol:	ESA SOP 101 (ESA 2009), based on USEPA (2002) and Bailey <i>et al.</i> (2000)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The sample was serially diluted with Dilute Mineral Water (DMW) to achieve the test concentrations. A DMW control was tested concurrently with the sample.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	26 November 2010 at 1200h

Sample 4443: MP22	Vacant	Vacant
Concentration (%)	% Survival at 48 h (Mean ± SD)	
DMW Control	100 ± 0.0	
2.5	100 ± 0.0	
6.3	100 ± 0.0	
12.5	100 ± 0.0	
25	100 ± 0.0	
50	100 ± 0.0	
100	40.0 ± 16.3 *	
48-hr IC10 = 82.9 (78.5-87.5)% 48-hr EC50 = 89.1% (72.1-100)% NOEC = 50% LOEC = 100%		

*Significantly lower percent survival compared with the DMW Control (Steel's Many One Rank Test, 1-tailed, P=0.05)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % survival	>90.0%	100%	Yes
Reference Toxicant within cusum chart limits	151.8-387.3mg KCl/L	260.8mg KCl/L	Yes



Toxicity Test Report: TR0687/1

(page 2 of 2)

Test Report Authorised by: [REDACTED]

Director on 14 December 2010

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports. This document shall not be reproduced except in full.

Citations:

Bailey, H.C., Krassoi, R., Elphick, J.R., Mulhall, A., Hunt, P., Tedmanson, L. and Lovell, A. (2000) Application of *Ceriodaphnia cf. dubia* for whole effluent toxicity tests in the Hawkesbury-Nepean watershed, New South Wales, Australia: method development and validation. *Environmental Toxicology and Chemistry* 19:88-93.

ESA (2008) *SOP 101 – Acute toxicity test using Ceriodaphnia dubia*. Issue No. 8. Ecotox Services Australasia, Sydney, New South Wales.

USEPA (2002) *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. 4th Ed. United States Environmental Protection Agency, Office of Water, Washington DC.



Toxicity Test Report: TR0687/2

(page 1 of 2)

This document is issued in accordance with NATA's accreditation requirements

Client:	C&R Consulting 188 Ross River Road Aitkenvale QLD 4814	ESA Job #:	PR0687
Attention:	[REDACTED]	Date Sampled:	24 November 2010
Client Ref:	None supplied	Date Received:	25 November 2010
		Sampled By:	Client
		ESA Quote #:	PL0687 q01

Lab ID No.:	Sample Name:	Sample Description:
4443	MP22	Aqueous sample, pH 8.4, conductivity 7570µS/cm, total ammonia <2.0mg/L*. Sample received at 16°C in apparent good condition

*Ammonia analysis is not covered by Ecotox Services Australasia's scope of accreditation

Test Performed:	72-hr microalgal growth inhibition test using the green alga <i>Selenastrum capricornutum</i>
Test Protocol:	ESA SOP 103 (ESA 2010), based on USEPA (2002)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The sample was serially diluted with USEPA media. A diluent control (USEPA media) was tested concurrently with the sample.
Source of Test Organisms:	ESA Laboratory culture, originally sourced from CSIRO Microalgal Supply Service, TAS
Test Initiated:	26 November 2010 at 1400h

Sample 4443: MP22 Concentration (%)	Cell Yield x10 ⁴ cells/mL (Mean ± SD)	Vacant	Vacant
Diluent Control	170.3 ± 17.8		
2.5	142.4 ± 44.7		
6.3	123.8 ± 27.0		
12.5	158.4 ± 53.6		
25	180.7 ± 12.5		
50	118.1 ± 11.0 *		
100	44.5 ± 1.3 *		
72-hr IC10 = <2.5% 72-hr IC50 = 72.4 (61.3-81.4)% NOEC = 25% LOEC = 50%			

*Significantly lower cell yield compared with the Diluent Control (Steel's Many-One Rank Test, 1-tailed, P=0.05)



Toxicity Test Report: TR0687/2

(page 2 of 2)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean cell density	$>16.0 \times 10^4$ cells/mL	171.3×10^4 cells/mL	Yes
Control coefficient of variation	$<20\%$	10.4%	Yes
Reference Toxicant within cusum chart limits	1.5-3.6g KCl/L	2.2g KCl/L	Yes

Test Report Authorised by: [REDACTED]

Director on 14 December 2010

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

This document is issued in accordance with NATA's accreditation requirements. Accredited for compliance with ISO/IEC 17025. NATA is a signatory to the APLAC mutual recognition arrangement for the mutual recognition of the equivalence of testing, calibration and inspection reports. This document shall not be reproduced except in full.

Citations:

ESA (2010) *ESA SOP 103 – Green Alga, Selenastrum capricornutum, Growth Test*. Issue No 4. Ecotox Services Australasia, Sydney, NSW.

USEPA (2002) *Short-term methods for estimating the chronic toxicity of effluents and receiving waters to freshwater organisms*. Fourth Edition. EPA-821-R-02-013. United States Environmental Protection Agency, Office of Research and Development, Washington DC, USA,

Toxicity Test Report: TR0687/3

(page 1 of 3)

Client:	C&R Consulting 188 Ross River Road Aitkenvale, QLD 4814	ESA Job #:	PR0687
Attention:	[REDACTED]	Date Sampled:	24 November 2010
Client Ref:	None supplied	Date Received:	25 November 2010
		Sampled By:	Client
		ESA Quote #:	PL0687_q01

Lab ID No.:	Sample Name:	Sample Description:
4443	MP22	Aqueous sample, pH 8.4, conductivity 7570µS/cm, total ammonia <2.0mg/L. Sample received at 16°C in apparent good condition

Test Performed:	7-day Growth inhibition of the freshwater aquatic duckweed <i>Lemna disperma</i>
Test Protocol:	ESA SOP 112 (ESA 2010), based on OECD method 221 (2006)
Test Temperature:	The test was performed at 25±2°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The sample was serially diluted with Sweedish standard medium (SIS) to achieve the test concentrations. A SIS control was tested concurrently with the sample.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	29 November 2010 at 1315h

Sample 4443: MP22		Vacant
Concentration (%)	Specific Growth Rate (Mean ± SD)	
Diluent Control	0.34 ± 0.02	
2.4	0.26 ± 0.10	
6.1	0.30 ± 0.03	
12.1	0.26 ± 0.03 *	
24.2	0.39 ± 0.02	
48.4	0.31 ± 0.02	
96.8	0.30 ± 0.03	
7 day IC10 = <2.5% 7 day IC50 = >96.8% NOEC = 96.8% LOEC = >96.8%		

*Significantly lower specific growth rate compared with the SIS Control (Steel's Many-One Rank Test, 1-tailed, P=0.05)

Toxicity Test Report: TR0687/3

(page 2 of 3)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control frond doubling time	<2.5 days	2.0 days	Yes
Reference Toxicant within cusum chart limits	2.8-6.5g KCl/L	3.5g KCl/L	Yes

Test Report Authorised by: [REDACTED] Director on 14 December 2010

Results are based on the samples in the condition as received by ESA. This document shall not be reproduced except in full.

Citations:

ESA (2010) SOP 112 – *Duckweed Growth Inhibition Test*. Issue No. 2. Ecotox Services Australasia, Sydney NSW

OECD (2006) *Lemna sp.* Growth Inhibition Test. Method 221. OECD Guideline for the Testing of Chemicals. Organisation for Economic Cooperation and Development, Paris

Toxicity Test Report: TR0687/4

(page 1 of 2)

Client:	C&R Consulting 188 Ross River Road Aitkenvale QLD 4814	ESA Job #:	PR0687
Attention:	██████████	Date Sampled:	24 November 2010
Client Ref:	None supplied	Date Received:	25 November 2010
		Sampled By:	Client
		ESA Quote #:	PL0687_q01

Lab ID No.:	Sample Name:	Sample Description:
4443	MP22	Aqueous sample, pH 8.4, conductivity 7570µS/cm, total ammonia <2.0mg/L. Sample received at 16°C in apparent good condition

Test Performed:	96-hr acute survival test using the freshwater shrimp <i>Paratya australiensis</i>
Test Protocol:	ESA SOP 107 (ESA 2009), based on methods described by the USEPA (1996) and the Department of Transport and Communications (1990)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The sample was serially diluted with dilute mineral water (DMW) to achieve the test concentrations. A DMW control was tested concurrently with the sample.
Source of Test Organisms:	Hatchery reared NSW
Test Initiated:	26 November 2010 at 1330h

Sample 4443: MP22	Concentration (%)	% Un-affected (Mean ± SD)	Vacant	Vacant
DMW Control		95.0 ± 10.0		
2.5		100 ± 0.0		
6.3		95.0 ± 10.0		
12.5		100 ± 0.0		
25		95.0 ± 10.0		
50		100 ± 0.0		
100		95.0 ± 10.0		
96-hr IC10 = >100%				
96-hr IC50 = >100%				
NOEC = 100%				
LOEC = >100%				

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % un-affected	>80.0%	95.0%	Yes

Toxicity Test Report: TR0687/4

(page 2 of 2)

Test Report Authorised by: [REDACTED] Director on 14 December 2010

Results are based on the samples in the condition as received by ESA. This document shall not be reproduced except in full.

Citations:

ESA (2009) SOP 107 –*Juvenile Tiger Prawn Toxicity Test*. Issue No 6. Ecotox Services Australasia, Sydney, NSW

Department of Transport and Communications (1990) *Guidelines for Acceptance of Oil Spill Dispersants in Australian Waters*. Pollution Prevention Section, Department of Transport and Communications, Canberra ACT.

USEPA (1996) *Ecological Effects Test Guidelines, OPPTS 850.1045, Penaeid Acute Toxicity Test*. Public Draft. United States Environmental Protection Agency, Washington DC.



Toxicity Test Report: TR0687/5

(page 1 of 2)

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Client:	C&R Consulting 188 Ross River Road Aitkenvale QLD 4814	ESA Job #:	PR0687
Attention:	[REDACTED]	Date Sampled:	24 November 2010
Client Ref:	None supplied	Date Received:	25 November 2010
		Sampled By:	Client
		ESA Quote #:	PL0687_q01

Lab ID No.:	Sample Name:	Sample Description:
4443	MP22	Aqueous sample, pH 8.4, conductivity 7570µS/cm, total ammonia <2.0mg/L*. Sample received at 16°C in apparent good condition

*Ammonia analysis is not covered by Ecotox Services Australasia's scope of accreditation

Test Performed:	96-hr fish imbalance toxicity test using the rainbowfish <i>Melanotaenia splendida</i>
Test Protocol:	ESA SOP 117 (ESA 2009), based on USEPA (2002)
Test Temperature:	The test was performed at 20±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The sample was serially diluted with dilute mineral water (DMW) to achieve the test concentrations. A DMW control was tested concurrently with the sample.
Source of Test Organisms:	In-house cultures
Test Initiated:	29 November 2010 at 1600h

Sample 4443: MP22	Vacant	Vacant
Concentration (%)	% Un-affected (Mean ± SD)	
DMW Control	90.0 ± 11.6	
2.5	95.0 ± 10.0	
6.3	75.0 ± 10.0	
12.5	90.0 ± 11.6	
25	90.0 ± 20.0	
50	100 ± 0.0	
100	50.0 ± 11.6 *	
96-hr EC10 = 58.4 (0.0-71.5)%		
96-hr EC50 = >100%		
NOEC = 50%		
LOEC = 100%		

*Significantly lower percentage of un-affected larval fish compared with the DMW Control (Steel's Many-One Rank, 1-tailed, P=0.05)

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % un-affected	≥90.0%	90.0%	Yes
Reference Toxicant within cusum chart limits	1.2-485.3µg Cu/L	8.4µg Cu/L	Yes



Toxicity Test Report: TR0687/5

(page 2 of 2)

Test Report Authorised by:



Director on 14 December 2010

Results are based on the samples in the condition as received by ESA.

NATA Accredited Laboratory Number: 14709

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Citations:

ESA (2009) SOP 117 –*Freshwater and Marine Fish Imbalance Test*. Issue No 6. Ecotox Services Australasia, Sydney, NSW

USEPA (2002) Methods for measuring the acute toxicity of effluents and receiving waters to freshwater and marine organisms. Fifth edition EPA-821-R-02-012. United States Environmental Protection Agency, Office of Research and Development, Washington FC, USA

Toxicity Test Report: TR0687/6

(page 1 of 2)

This document is issued in accordance with NATA's accreditation requirements

Client:	C&R Consulting 188 Ross River Road Aitkenvale QLD 4814	ESA Job #:	PR0687
Attention:	[REDACTED]	Date Sampled:	24 November 2010
Client Ref:	Not supplied	Date Received:	25 November 2010
		Sampled By:	Client
		ESA Quote #:	PL0687_q01

Lab ID No.:	Sample Name:	Sample Description:
4443	MP22	Aqueous sample, pH 8.4, conductivity 7570µS/cm, total ammonia <2.0mg/L. Sample received at 16°C in apparent good condition

Test Performed:	7-day partial life-cycle (chronic) toxicity test using the freshwater cladoceran <i>Ceriodaphnia cf dubia</i>
Test Protocol:	ESA SOP 102 (ESA 2010), based on USEPA (2002) and Bailey <i>et al.</i> (2000)
Test Temperature:	The test was performed at 25±1°C.
Deviations from Protocol:	Nil
Comments on Solution Preparation:	The sample was serially diluted with Dilute Mineral Water (DMW) to achieve the test concentrations. A DMW control was tested concurrently with the sample.
Source of Test Organisms:	ESA Laboratory culture
Test Initiated:	26 November 2010 at 1600h

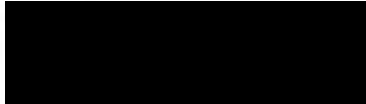
Sample 4443: MP22		Sample 4443: MP22	
Concentration (%)	% Survival at 7 days (Mean ± SD)	Concentration (%)	Number of Young (Mean ± SD)
DMW Control	100 ± 0.0	DMW Control	16.0 ± 1.7
2.5	100 ± 0.0	2.5	16.6 ± 3.2
6.3	100 ± 0.0	6.3	16.8 ± 3.6
12.5	100 ± 0.0	12.5	17.2 ± 1.6
25	100 ± 0.0	25	16.2 ± 3.2
50	100 ± 0.0	50	15.0 ± 1.8
100	0.0 ± 0.0	100	0.0 ± 0.0
7 day IC10 (survival) = 65.2 (65.2-65.2)%		7 day IC10 (reproduction) = 50.1 (21.1-53.3)%	
7 day EC50 (survival) = 70.7 (50.0-100)%		7 day IC50 (reproduction) = 72.3 (69.1-74.1)%	
NOEC = 50%		NOEC = 50%	
LOEC = 100%		LOEC = 100%	

QA/QC Parameter	Criterion	This Test	Criterion met?
Control mean % survival	>80.0%	100%	Yes
Control mean number of young	>15.0	16.0	Yes

Toxicity Test Report: TR0687/6

(page 2 of 2)

Test Report Authorised by:



Director on 14 December 2010

Results are based on the samples in the condition as received by ESA. This document shall not be reproduced except in full.

Citations:

Bailey, H.C., Krassoi, R., Elphick, J.R., Mulhall, A., Hunt, P., Tedmanson, L. and Lovell, A. (2000) Application of *Ceriodaphnia cf. dubia* for whole effluent toxicity tests in the Hawkesbury-Nepean watershed, New South Wales, Australia: method development and validation. *Environmental Toxicology and Chemistry* 19:88-93.

ESA (2008) ESA SOP 102 – *Acute Toxicity Test Using Ceriodaphnia dubia*. Issue No 7. Ecotox Services Australasia, Sydney, NSW.

USEPA (2002) *Short-term Methods for Estimating the Chronic Toxicity of Effluents and Receiving Waters to Freshwater Organisms*. 4th Ed. United States Environmental Protection Agency, Office of Water, Washington DC.

Chain-of-Custody Documentation

Sample Receipt Notification



Attention : [REDACTED]
Client : C&R Consulting
188 Ross River Road
Aitken Vale QLD 4814

Email : [REDACTED]
Telephone : [REDACTED]
Facsimile :

Date : 30/11/2010

Re : Receipt of Sample

Pages : 2

ESA Project : PR0687

For Review

Additional Documentation Required - Please Respond

Sample Delivery Details

Completed Chain of Custody accompanied samples: YES
Samples received in apparent good condition and correctly bottled: YES
Security seals on sample bottles and esky intact: YES

Date samples received : 25/11/2010
Time samples received : 11:30
No. of samples received : 1
Sample matrix : aqueous
Sample temperature : 11-15°C

Comments : Includes 5 x 2.5L MP22 (ESA ID# 4443)

Contact Details

Customer Services Officer : [REDACTED]
Telephone : [REDACTED]
Facsimile : [REDACTED]
Email : [REDACTED]

Please contact customer services officer for all queries or issues regarding samples

Note that the chain-of-custody provides definitive information on the tests to be performed

Ecotox Services Australia

ABN 45 094 714 904
Unit 27, 2 Chaplin Drive
Lane Cove NSW 2066 Australia

Phone : 61 2 9420 9481
Fax : 61 2 9420 9484
Email : info@ecotox.com.au

Date/Level ID: 801.1
 Last Revised: 23 March 2010

Chain-of-Custody / Service Request Form



Customer: **C&R CONTAINERS BY LTD**
 Contact Name: [Redacted]
 Phone: [Redacted]
 Email: [Redacted]
 Sampled by: [Redacted]

Ship To: **27/2 CHAFFIN ROAD, THE GOSS MILE, QLD**
 Attention: [Redacted]
 (provide an email address for sample receipt notification)

Sample Date	Sample Time	Sample Name <small>(exactly as written on the sample vessel)</small>	Sample Method <small>(eg. Grab, composite etc.)</small>	Number and Volume of Containers <small>(eg 2 x 1L)</small>	Tests Requested <small>(See reverse for guidance)</small>	Comments / Instructions
24/1/2010	11:40 AM	MP 22 (ITS)	Grab	5 x 25L	<input checked="" type="checkbox"/> ALGAL Growth Sc <input checked="" type="checkbox"/> ACUTE CERTD <input checked="" type="checkbox"/> CHRONIC CERTD <input checked="" type="checkbox"/> DARKFIELD Counted <input checked="" type="checkbox"/> ALIVE BT (K100) <small>100%</small> <input checked="" type="checkbox"/> ALIVE SWAMP	<p>Note that testing will be delayed if an incomplete chain of custody is received</p> <ul style="list-style-type: none"> • Additional treatment of sample (ie. spiking) • Sub-sampled services (ie. chemical analyses) • Materials required (if different than 100% down to 5.25%) • Sample holding time restrictions (if applicable) • Sample used for litigation (if applicable) <p>Note: An MSDS must be attached if available</p> <p>ESA Project Number: PR00001 261 FLORES 2-401</p> <p>Diluted at 2.5%</p>

1) Released By: [Redacted]	Date: 24/1/2010	2) Received By: [Redacted]	Date: 25/1/10	3) Released By: [Redacted]	Date: [Redacted]	4) Received By: [Redacted]	Date: [Redacted]
OR: C&R Container Time: 1:20 pm		OR: [Redacted]	Time: 11:30	OR: [Redacted]	Time: [Redacted]	OR: [Redacted]	Time: [Redacted]

Note that the chain-of-custody documentation will provide definitive information on the tests to be performed.

**Statistical Printouts for the Acute
Test with *Ceriodaphnia dubia***

Ceriodaphnia Acute Toxicity Test-48 Hr Immobilisation

Start Date: 26/11/2010 12:00 Test ID: PR0687/1 Sample ID: MP22
 End Date: 28/11/2010 12:00 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 101 Test Species: CD-Ceriodaphnia dubia
 Comments:

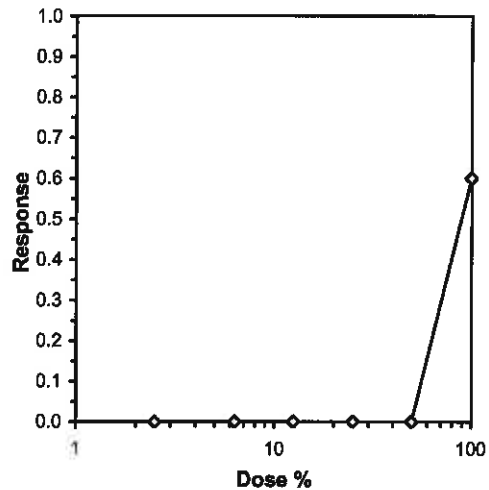
Conc-%	1	2	3	4
DMW Control	1.0000	1.0000	1.0000	1.0000
2.5	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000
100	0.4000	0.6000	0.2000	0.4000

Conc-%	Transform: Arcsin Square Root							Rank Sum	1-Tailed Critical	Number Resp	Total Number
	Mean	N-Mean	Mean	Min	Max	CV%	N				
DMW Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			0	20
2.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
6.3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
12.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
50	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	0	20
*100	0.4000	0.4000	0.6798	0.4636	0.8861	25.383	4	10.00	10.00	12	20

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05) Equality of variance cannot be confirmed	0.385407	0.924	-0.27653	13.51831

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test Treatments vs DMW Control	50	100	70.71068	2

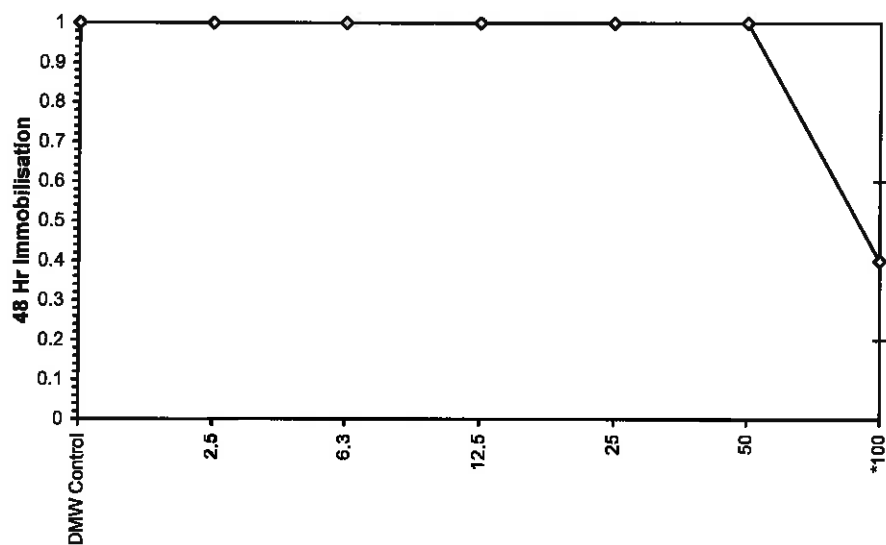
Trimmed Spearman-Kärber			
Trim Level	EC50	95% CL	
0.0%			
5.0%			
10.0%			
20.0%			
Auto-40.0%	89.090	72.149	110.009



Ceriodaphnia Acute Toxicity Test-48 Hr Immobilisation

Start Date: 26/11/2010 12:00	Test ID: PR0687/1	Sample ID: MP22
End Date: 28/11/2010 12:00	Lab ID: 4443	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 101	Test Species: CD-Ceriodaphnia dubia
Comments:		

Dose-Response Plot



Ceriodaphnia Acute Toxicity Test-48 Hr Immobilisation

Start Date: 26/11/2010 12:00	Test ID: PR0687/1	Sample ID: MP22
End Date: 28/11/2010 12:00	Lab ID: 4443	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 101	Test Species: CD-Ceriodaphnia dubia

Comments:

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	% Survival	100.00	100.00	100.00	0.00	0.00	4
2.5		100.00	100.00	100.00	0.00	0.00	4
6.3		100.00	100.00	100.00	0.00	0.00	4
12.5		100.00	100.00	100.00	0.00	0.00	4
25		100.00	100.00	100.00	0.00	0.00	4
50		100.00	100.00	100.00	0.00	0.00	4
100		40.00	20.00	60.00	16.33	10.10	4
DMW Control	pH	8.20	8.20	8.20	0.00	0.00	1
2.5		8.20	8.20	8.20	0.00	0.00	1
6.3		8.30	8.30	8.30	0.00	0.00	1
12.5		8.30	8.30	8.30	0.00	0.00	1
25		8.40	8.40	8.40	0.00	0.00	1
50		8.40	8.40	8.40	0.00	0.00	1
100		8.30	8.30	8.30	0.00	0.00	1
DMW Control	DO %	101.00	101.00	101.00	0.00	0.00	1
2.5		98.50	98.50	98.50	0.00	0.00	1
6.3		98.40	98.40	98.40	0.00	0.00	1
12.5		98.60	98.60	98.60	0.00	0.00	1
25		98.70	98.70	98.70	0.00	0.00	1
50		98.30	98.30	98.30	0.00	0.00	1
100		98.40	98.40	98.40	0.00	0.00	1
DMW Control	Cond uS/cm	182.90	182.90	182.90	0.00	0.00	1
2.5		413.00	413.00	413.00	0.00	0.00	1
6.3		723.00	723.00	723.00	0.00	0.00	1
12.5		1254.00	1254.00	1254.00	0.00	0.00	1
25		2220.00	2220.00	2220.00	0.00	0.00	1
50		4060.00	4060.00	4060.00	0.00	0.00	1
100		7460.00	7460.00	7460.00	0.00	0.00	1

Ceriodaphnia Partial Life-Cycle Test-48 Hr Immobilisation

Start Date: 26/11/2010 12:00	Test ID: PR0687/1	Sample ID: MP22
End Date: 28/11/2010 12:00	Lab ID: 4443	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 101	Test Species: CD-Ceriodaphnia dubia

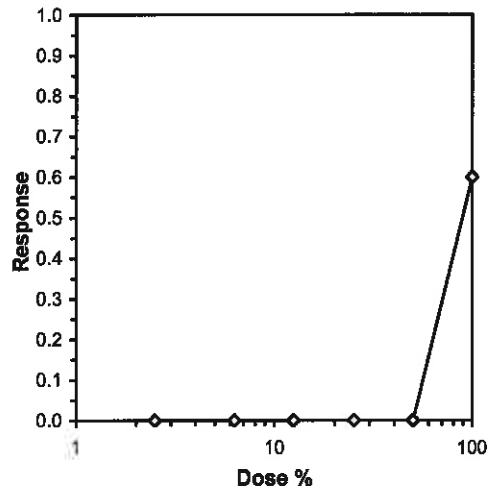
Conc-%	1	2	3	4
DMW Control	1.0000	1.0000	1.0000	1.0000
2.5	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000
100	0.4000	0.6000	0.2000	0.4000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root					Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%	N			Mean	N-Mean
DMW Control	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4			1.0000	1.0000
2.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
6.3	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
12.5	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
25	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
50	1.0000	1.0000	1.3453	1.3453	1.3453	0.000	4	18.00	10.00	1.0000	1.0000
*100	0.4000	0.4000	0.6798	0.4636	0.8861	25.383	4	10.00	10.00	0.4000	0.4000

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.385407	0.924	-0.27653	13.51831
Equality of variance cannot be confirmed				

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	50	100	70.71068	2
Treatments vs DMW Control				

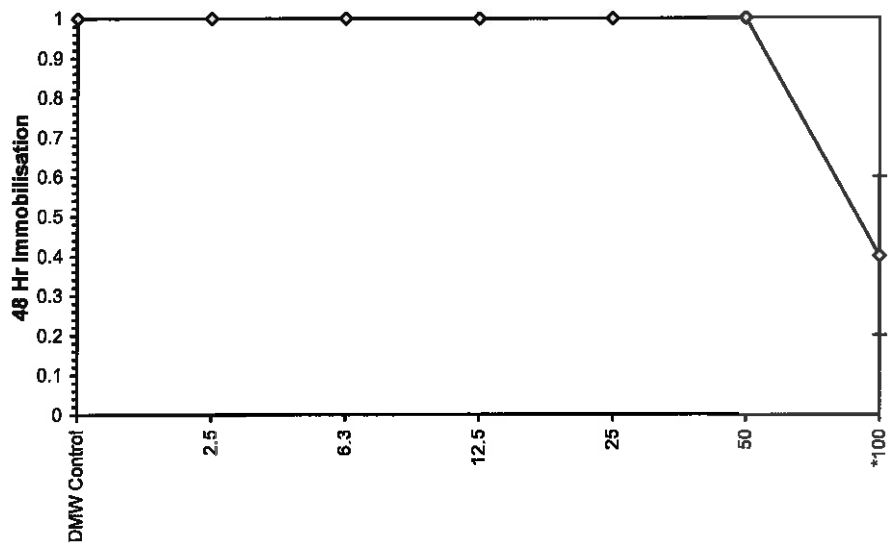
Log-Logit Interpolation (200 Resamples)					
Point	%	SD	95% CL(Exp)		Skew
IC05	78.605	1.168	74.848	82.478	0.0712
IC10	82.946	1.379	78.520	87.525	0.0744
IC15	85.751	1.519	80.881	90.802	0.0764
IC20	87.925	1.630	82.705	93.348	0.0779
IC25	89.762	1.725	84.241	95.504	0.0791
IC40	94.344	1.967	88.060	100.903	0.0821
IC50	97.131				



Ceriodaphnia Partial Life-Cycle Test-48 Hr Immobilisation

Start Date: 26/11/2010 12:00 Test ID: PR0687/1 Sample ID: MP22
End Date: 28/11/2010 12:00 Lab ID: 4443 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 101 Test Species: CD-Ceriodaphnia dubia
Comments:

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-48 Hr Immobilisation

Start Date: 26/11/2010 12:00	Test ID: PR0687/1	Sample ID: MP22
End Date: 28/11/2010 12:00	Lab ID: 4443	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 101	Test Species: CD-Ceriodaphnia dubia

Comments:

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	% Survival	100.00	100.00	100.00	0.00	0.00	4
2.5		100.00	100.00	100.00	0.00	0.00	4
6.3		100.00	100.00	100.00	0.00	0.00	4
12.5		100.00	100.00	100.00	0.00	0.00	4
25		100.00	100.00	100.00	0.00	0.00	4
50		100.00	100.00	100.00	0.00	0.00	4
100		40.00	20.00	60.00	16.33	10.10	4
DMW Control	pH	8.20	8.20	8.20	0.00	0.00	1
2.5		8.20	8.20	8.20	0.00	0.00	1
6.3		8.30	8.30	8.30	0.00	0.00	1
12.5		8.30	8.30	8.30	0.00	0.00	1
25		8.40	8.40	8.40	0.00	0.00	1
50		8.40	8.40	8.40	0.00	0.00	1
100		8.30	8.30	8.30	0.00	0.00	1
DMW Control	DO %	101.00	101.00	101.00	0.00	0.00	1
2.5		98.50	98.50	98.50	0.00	0.00	1
6.3		98.40	98.40	98.40	0.00	0.00	1
12.5		98.60	98.60	98.60	0.00	0.00	1
25		98.70	98.70	98.70	0.00	0.00	1
50		98.30	98.30	98.30	0.00	0.00	1
100		98.40	98.40	98.40	0.00	0.00	1
DMW Control	Cond uS/cm	182.90	182.90	182.90	0.00	0.00	1
2.5		413.00	413.00	413.00	0.00	0.00	1
6.3		723.00	723.00	723.00	0.00	0.00	1
12.5		1254.00	1254.00	1254.00	0.00	0.00	1
25		2220.00	2220.00	2220.00	0.00	0.00	1
50		4060.00	4060.00	4060.00	0.00	0.00	1
100		7460.00	7460.00	7460.00	0.00	0.00	1

**Statistical Printouts for the
Selenastrum Growth Inhibition
Tests**

Microalgal Cell Yield-Cell Yield

Start Date: 26/11/2010 14:00 Test ID: PR0687/02 Sample ID: MP22
 End Date: 29/11/2010 14:00 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 103 Test Species: SC-Selenastrum capricornutum
 Comments:

Conc-%	1	2	3	4
Diluent Control	149.64	175.64	164.44	191.64
2.5	117.24	208.84	128.44	115.24
6.3	127.24	160.44	100.04	107.64
12.5	126.04	220.84	103.24	183.64
25	186.04	178.04	164.84	194.04
50	123.24	108.44	131.24	109.64
100	43.64	44.44	46.44	43.64

Conc-%	Mean	N-Mean	Transform: Untransformed				Rank Sum	1-Tailed Critical	Isotonic	
			Mean	Min	Max	CV%			Mean	N-Mean
Diluent Control	170.34	1.0000	170.34	149.64	191.64	10.420	4	170.34	1.0000	
2.5	142.44	0.8362	142.44	115.24	208.84	31.344	4	151.36	0.8886	
6.3	123.84	0.7270	123.84	100.04	160.44	21.767	4	151.36	0.8886	
12.5	158.44	0.9301	158.44	103.24	220.84	33.843	4	151.36	0.8886	
25	180.74	1.0611	180.74	164.84	194.04	6.889	4	151.36	0.8886	
*50	118.14	0.6936	118.14	108.44	131.24	9.323	4	118.14	0.6936	
*100	44.54	0.2615	44.54	43.64	46.44	2.967	4	44.54	0.2615	

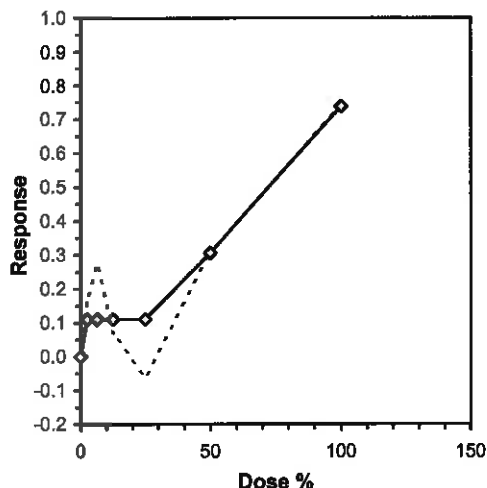
Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates normal distribution ($p > 0.05$)	0.942413	0.924	0.756678	1.440056
Bartlett's Test indicates unequal variances ($p = 4.29E-04$)	24.46145	16.81189		

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	25	50	35.35534	4
Treatments vs Diluent Control				

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	1.122	9.138	0.257	45.676
IC10*	2.244	13.650	0.514	53.244
IC15	29.948	14.301	0.000	46.258
IC20	36.357	10.864	0.000	52.631
IC25	42.765	7.219	23.929	59.044
IC40	60.826	4.352	46.557	72.251
IC50	72.398	3.425	61.336	81.371

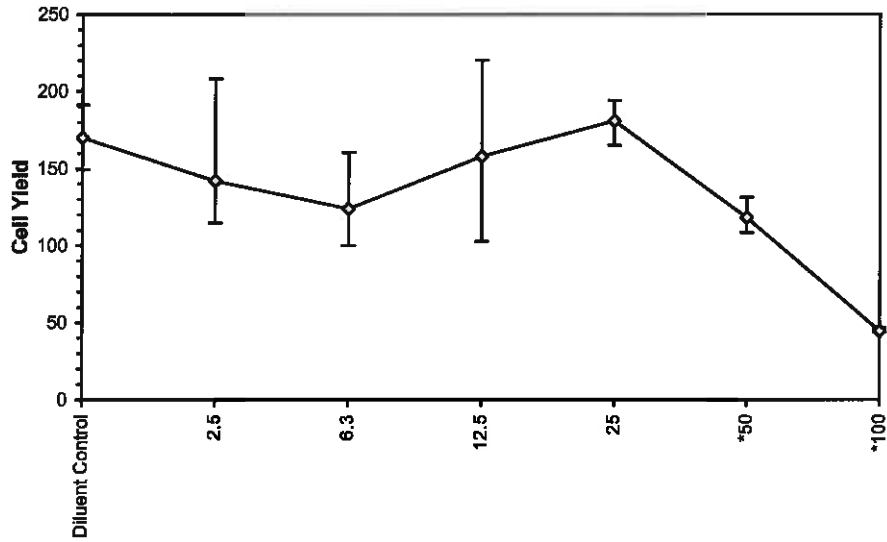
* indicates IC estimate less than the lowest concentration



Microalgal Cell Yield-Cell Yield

Start Date: 26/11/2010 14:00 Test ID: PR0687/02 Sample ID: MP22
End Date: 29/11/2010 14:00 Lab ID: 4443 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 103 Test Species: SC-Selenastrum capricornutum
Comments:

Dose-Response Plot



Microalgal Cell Yield-Cell Yield

Start Date: 26/11/2010 14:00 Test ID: PR0687/02 Sample ID: MP22
 End Date: 29/11/2010 14:00 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 103 Test Species: SC-Selenastrum capricornutum
 Comments:

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
Diluent Control	Cell Yield	170.34	149.64	191.64	17.75	2.47	4
2.5		142.44	115.24	208.84	44.65	4.69	4
6.3		123.84	100.04	160.44	26.96	4.19	4
12.5		158.44	103.24	220.84	53.62	4.62	4
25		180.74	164.84	194.04	12.45	1.95	4
50		118.14	108.44	131.24	11.01	2.81	4
100		44.54	43.64	46.44	1.32	2.58	4
Diluent Control	pH	7.60	7.60	7.60	0.00	0.00	1
2.5		7.50	7.50	7.50	0.00	0.00	1
6.3		7.50	7.50	7.50	0.00	0.00	1
12.5		7.80	7.80	7.80	0.00	0.00	1
25		8.30	8.30	8.30	0.00	0.00	1
50		8.40	8.40	8.40	0.00	0.00	1
100		8.40	8.40	8.40	0.00	0.00	1
Diluent Control	Cond uS/cm	124.00	124.00	124.00	0.00	0.00	1
2.5		331.00	331.00	331.00	0.00	0.00	1
6.3		654.00	654.00	654.00	0.00	0.00	1
12.5		1168.00	1168.00	1168.00	0.00	0.00	1
25		2160.00	2160.00	2160.00	0.00	0.00	1
50		4070.00	4070.00	4070.00	0.00	0.00	1
100		7630.00	7630.00	7630.00	0.00	0.00	1

**Statistical Printouts for the
Duckweed Growth Inhibition
Tests**

Duckweed Growth Inhibition Test-Specific Growth Rate

Start Date: 29/11/2010 13:15	Test ID: PR0687/02	Sample ID: MP22
End Date: 6/12/2010 13:15	Lab ID: 4443	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 112	Test Species: LD-Lemna disperma

Comments:

Conc-%	1	2	3	4
Diluent Control	0.3579	0.3359	0.3216	0.3458
2.4	0.1445	0.2780	0.2435	0.3892
6.1	0.2830	0.2878	0.3458	0.2878
12.1	0.2925	0.2299	0.2878	0.2435
24.2	0.3845	0.3770	0.3795	0.4109
48.4	0.2925	0.3289	0.3099	0.2971
96.8	0.2560	0.3289	0.2971	0.3216

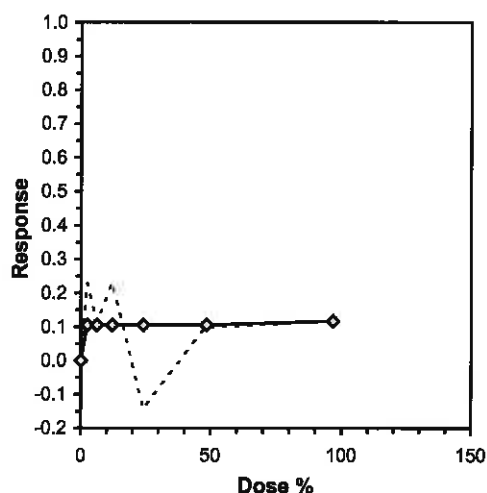
Conc-%	Mean	N-Mean	Transform: Untransformed				Rank Sum	1-Tailed Critical	Isotonic		
			Mean	Min	Max	CV%			Mean	N-Mean	
Diluent Control	0.3403	1.0000	0.3403	0.3216	0.3579	4.518	4		0.3403	1.0000	
2.4	0.2638	0.7752	0.2638	0.1445	0.3892	38.265	4	14.00	10.00	0.3047	0.8954
6.1	0.3011	0.8848	0.3011	0.2830	0.3458	9.915	4	12.50	10.00	0.3047	0.8954
*12.1	0.2635	0.7742	0.2635	0.2299	0.2925	11.926	4	10.00	10.00	0.3047	0.8954
24.2	0.3880	1.1401	0.3880	0.3770	0.4109	4.020	4	26.00	10.00	0.3047	0.8954
48.4	0.3071	0.9024	0.3071	0.2925	0.3289	5.310	4	11.00	10.00	0.3047	0.8954
96.8	0.3009	0.8842	0.3009	0.2560	0.3289	10.937	4	11.50	10.00	0.3009	0.8842

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	0.866461	0.924	0.194841	5.608077
Bartlett's Test indicates unequal variances (p = 6.60E-03)	17.85564	16.81189		
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test	96.8	>96.8		1.033058
Treatments vs Diluent Control				

Linear Interpolation (200 Resamples)

Point	%	SD	95% CL(Exp)	Skew
IC05*	1.1467			
IC10*	2.2934			
IC15	>96.8			
IC20	>96.8			
IC25	>96.8			
IC40	>96.8			
IC50	>96.8			

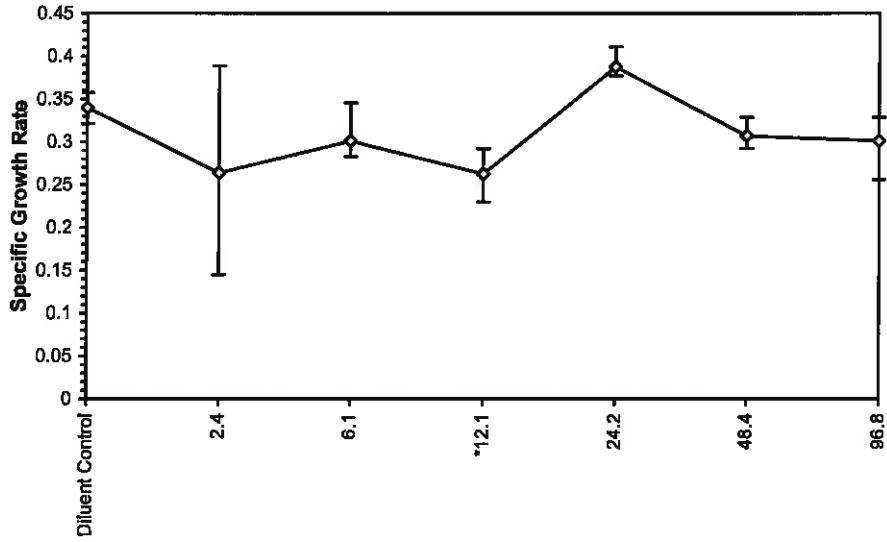
* indicates IC estimate less than the lowest concentration



Duckweed Growth Inhibition Test-Specific Growth Rate

Start Date: 29/11/2010 13:15 Test ID: PR0687/02 Sample ID: MP22
End Date: 6/12/2010 13:15 Lab ID: 4443 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 112 Test Species: LD-Lemna disperma
Comments:

Dose-Response Plot



Duckweed Growth Inhibition Test-Specific Growth Rate

Start Date: 29/11/2010 13:15 Test ID: PR0687/02 Sample ID: MP22
 End Date: 6/12/2010 13:15 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 112 Test Species: LD-Lemna disperma
 Comments:

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
Diluent Control	Specific growth rate	0.34	0.32	0.36	0.02	36.44	4
2.4		0.26	0.14	0.39	0.10	120.43	4
6.1		0.30	0.28	0.35	0.03	57.38	4
12.1		0.26	0.23	0.29	0.03	67.28	4
24.2		0.39	0.38	0.41	0.02	32.19	4
48.4		0.31	0.29	0.33	0.02	41.58	4
96.8		0.30	0.26	0.33	0.03	60.29	4
Diluent Control	pH	6.40	6.40	6.40	0.00	0.00	1
2.4		6.60	6.60	6.60	0.00	0.00	1
6.1		6.70	6.70	6.70	0.00	0.00	1
12.1		6.90	6.90	6.90	0.00	0.00	1
24.2		7.10	7.10	7.10	0.00	0.00	1
48.4		7.40	7.40	7.40	0.00	0.00	1
96.8		7.70	7.70	7.70	0.00	0.00	1
Diluent Control	Cond uS/cm	305.00	305.00	305.00	0.00	0.00	1
2.4		512.00	512.00	512.00	0.00	0.00	1
6.1		821.00	821.00	821.00	0.00	0.00	1
12.1		1323.00	1323.00	1323.00	0.00	0.00	1
24.2		2280.00	2280.00	2280.00	0.00	0.00	1
48.4		4130.00	4130.00	4130.00	0.00	0.00	1
96.8		7600.00	7600.00	7600.00	0.00	0.00	1

**Statistical Printouts for the
Freshwater Shrimp Tests**

Freshwater Shrimp Acute Toxicity Test-96 hr Survival

Start Date: 26/11/2010 13:30	Test ID: PR0687/02	Sample ID: MP22
End Date: 30/11/2010 13:30	Lab ID: 4443	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 112	Test Species: PSP-Paratya australiensis

Comments:

Conc-%	1	2	3	4
DMW Control	1.0000	1.0000	1.0000	0.8000
2.5	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	0.8000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	0.8000
50	1.0000	1.0000	1.0000	1.0000
100	1.0000	0.8000	1.0000	1.0000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				Rank Sum	1-Tailed Critical	Isotonic		
			Mean	Min	Max	CV%			Mean	N-Mean	
DMW Control	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4		0.9750	1.0000	
2.5	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0.9750	1.0000
6.3	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	0.9750	1.0000
12.5	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0.9750	1.0000
25	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	0.9750	1.0000
50	1.0000	1.0526	1.3453	1.3453	1.3453	0.000	4	20.00	10.00	0.9750	1.0000
100	0.9500	1.0000	1.2857	1.1071	1.3453	9.261	4	18.00	10.00	0.9500	0.9744

Auxiliary Tests

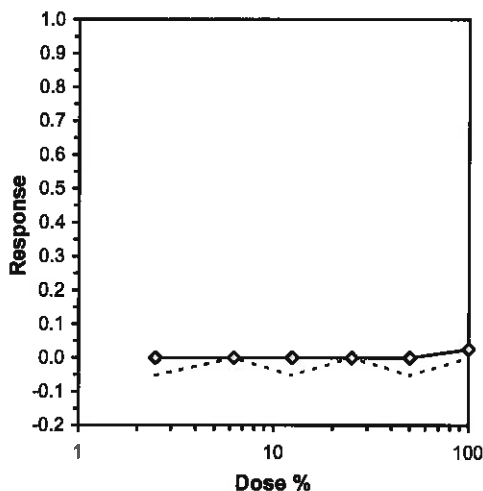
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05)	Statistic	Critical	Skew	Kurt
Equality of variance cannot be confirmed	0.66932	0.924	-1.61538	1.554231

Hypothesis Test (1-tail, 0.05)

Steel's Many-One Rank Test	NOEC	LOEC	ChV	TU
Treatments vs DMW Control	100	>100		1

Log-Logit Interpolation (200 Resamples)

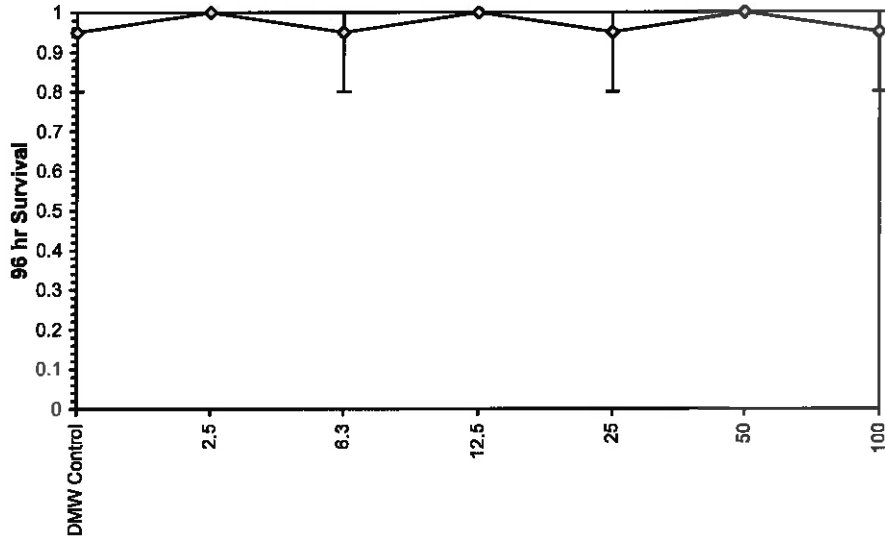
Point	%	SD	95% CL(Exp)	Skew
IC05	>100			
IC10	>100			
IC15	>100			
IC20	>100			
IC25	>100			
IC40	>100			
IC50	>100			



Freshwater Shrimp Acute Toxicity Test-96 hr Survival

Start Date: 26/11/2010 13:30 Test ID: PR0687/02 Sample ID: MP22
End Date: 30/11/2010 13:30 Lab ID: 4443 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 112 Test Species: PSP-Paratya australiensis
Comments:

Dose-Response Plot



Freshwater Shrimp Acute Toxicity Test-96 hr Survival

Start Date: 26/11/2010 13:30 Test ID: PR0687/02 Sample ID: MP22
 End Date: 30/11/2010 13:30 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 112 Test Species: PSP-Paratya australiensis

Comments:

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	% Survival	95.00	80.00	100.00	10.00	3.33	4
2.5		100.00	100.00	100.00	0.00	0.00	4
6.3		95.00	80.00	100.00	10.00	3.33	4
12.5		100.00	100.00	100.00	0.00	0.00	4
25		95.00	80.00	100.00	10.00	3.33	4
50		100.00	100.00	100.00	0.00	0.00	4
100		95.00	80.00	100.00	10.00	3.33	4
DMW Control	pH	8.00	8.00	8.00	0.00	0.00	1
2.5		8.10	8.10	8.10	0.00	0.00	1
6.3		8.00	8.00	8.00	0.00	0.00	1
12.5		8.10	8.10	8.10	0.00	0.00	1
25		8.20	8.20	8.20	0.00	0.00	1
50		8.30	8.30	8.30	0.00	0.00	1
100		8.30	8.30	8.30	0.00	0.00	1
DMW Control	Cond uS/cm	239.00	239.00	239.00	0.00	0.00	1
2.5		366.00	366.00	366.00	0.00	0.00	1
6.3		727.00	727.00	727.00	0.00	0.00	1
12.5		1258.00	1258.00	1258.00	0.00	0.00	1
25		2210.00	2210.00	2210.00	0.00	0.00	1
50		4090.00	4090.00	4090.00	0.00	0.00	1
100		7600.00	7600.00	7600.00	0.00	0.00	1
DMW Control	DO %	96.80	96.80	96.80	0.00	0.00	1
2.5		98.70	98.70	98.70	0.00	0.00	1
6.3		95.60	95.60	95.60	0.00	0.00	1
12.5		95.90	95.90	95.90	0.00	0.00	1
25		96.70	96.70	96.70	0.00	0.00	1
50		97.30	97.30	97.30	0.00	0.00	1
100		98.60	98.60	98.60	0.00	0.00	1

**Statistical Printouts for the Larval
Fish Imbalance Tests**

Fish Imbalance Test-96 hr Imbalance

Start Date:	29/11/2010 16:00	Test ID:	PR0687/02	Sample ID:	MP22
End Date:	3/12/2010 16:00	Lab ID:	4443	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 117	Test Species:	MS-Melanotaenia splendida

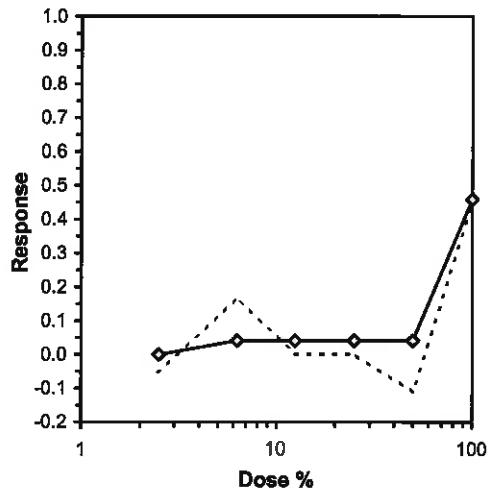
Conc-%	1	2	3	4
DMW Control	1.0000	0.8000	1.0000	0.8000
2.5	0.8000	1.0000	1.0000	1.0000
6.3	0.8000	0.8000	0.6000	0.8000
12.5	0.8000	1.0000	1.0000	0.8000
25	1.0000	1.0000	0.6000	1.0000
50	1.0000	1.0000	1.0000	1.0000
100	0.6000	0.4000	0.4000	0.6000

Conc-%	Mean	N-Mean	Transform: Arcsin Square Root				Rank Sum	1-Tailed Critical	Isotonic		
			Mean	Min	Max	CV%			Mean	N-Mean	
DMW Control	0.9000	1.0000	1.2262	1.1071	1.3453	11.212	4		0.9250	1.0000	
2.5	0.9500	1.0556	1.2857	1.1071	1.3453	9.261	4	20.00	10.00	0.9250	1.0000
6.3	0.7500	0.8333	1.0519	0.8861	1.1071	10.508	4	13.00	10.00	0.8875	0.9595
12.5	0.9000	1.0000	1.2262	1.1071	1.3453	11.212	4	18.00	10.00	0.8875	0.9595
25	0.9000	1.0000	1.2305	0.8861	1.3453	18.660	4	19.00	10.00	0.8875	0.9595
50	1.0000	1.1111	1.3453	1.3453	1.3453	0.000	4	22.00	10.00	0.8875	0.9595
*100	0.5000	0.5556	0.7854	0.6847	0.8861	14.802	4	10.00	10.00	0.5000	0.5405

Auxiliary Tests	Statistic	Critical	Skew	Kurt
Shapiro-Wilk's Test indicates non-normal distribution (p <= 0.05) Equality of variance cannot be confirmed	0.86053	0.924	-1.03855	0.699299

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Steel's Many-One Rank Test Treatments vs DMW Control	50	100	70.71068	2

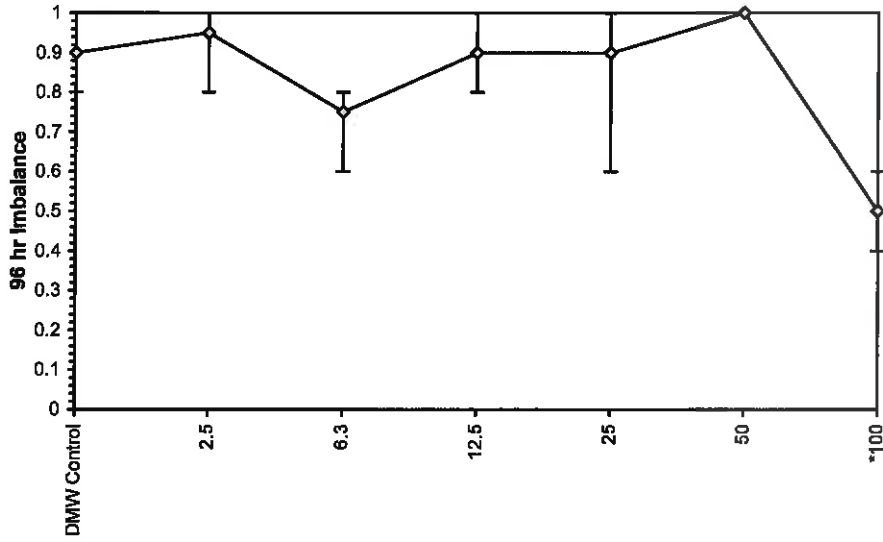
Log-Logit Interpolation (200 Resamples)					
Point	%	SD	95% CL(Exp)	Skew	
IC05	51.451	25.400	0.000	63.025	0.0302
IC10	58.422	18.145	0.000	71.542	-2.0154
IC15	64.643	7.716	45.516	79.872	-4.1160
IC20	70.457	5.221	53.210	87.403	-0.2630
IC25	76.062	5.283	58.998	94.113	-0.0123
IC40	92.883				
IC50	>100				



Fish Imbalance Test-96 hr Imbalance

Start Date: 29/11/2010 16:00 Test ID: PR0687/02 Sample ID: MP22
End Date: 3/12/2010 16:00 Lab ID: 4443 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 117 Test Species: MS-Melanotaenia splendida
Comments:

Dose-Response Plot



Fish Imbalance Test-96 hr Imbalance

Start Date:	29/11/2010 16:00	Test ID:	PR0687/02	Sample ID:	MP22
End Date:	3/12/2010 16:00	Lab ID:	4443	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 117	Test Species:	MS-Melanotaenia splendida

Comments:

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	Dry Weight (mg)	0.00	0.00	0.00	0.00		0
2.5		0.00	0.00	0.00	0.00		0
6.3		0.00	0.00	0.00	0.00		0
12.5		0.00	0.00	0.00	0.00		0
25		0.00	0.00	0.00	0.00		0
50		0.00	0.00	0.00	0.00		0
100		0.00	0.00	0.00	0.00		0
DMW Control	% Unaffected	90.00	80.00	100.00	11.55	3.78	4
2.5		95.00	80.00	100.00	10.00	3.33	4
6.3		75.00	60.00	80.00	10.00	4.22	4
12.5		90.00	80.00	100.00	11.55	3.78	4
25		90.00	60.00	100.00	20.00	4.97	4
50		100.00	100.00	100.00	0.00	0.00	4
100		50.00	40.00	60.00	11.55	6.80	4
DMW Control	pH	8.00	8.00	8.00	0.00	0.00	1
2.5		8.00	8.00	8.00	0.00	0.00	1
6.3		8.00	8.00	8.00	0.00	0.00	1
12.5		8.20	8.20	8.20	0.00	0.00	1
25		8.30	8.30	8.30	0.00	0.00	1
50		8.40	8.40	8.40	0.00	0.00	1
100		8.40	8.40	8.40	0.00	0.00	1
DMW Control	Cond uS/cm	172.90	172.90	172.90	0.00	0.00	1
2.5		384.00	384.00	384.00	0.00	0.00	1
6.3		694.00	694.00	694.00	0.00	0.00	1
12.5		1196.00	1196.00	1196.00	0.00	0.00	1
25		2200.00	2200.00	2200.00	0.00	0.00	1
50		4030.00	4030.00	4030.00	0.00	0.00	1
100		7620.00	7620.00	7620.00	0.00	0.00	1
DMW Control	DO %	100.50	100.50	100.50	0.00	0.00	1
2.5		101.20	101.20	101.20	0.00	0.00	1
6.3		101.40	101.40	101.40	0.00	0.00	1
12.5		100.90	100.90	100.90	0.00	0.00	1
25		101.60	101.60	101.60	0.00	0.00	1
50		101.90	101.90	101.90	0.00	0.00	1
100		102.90	102.90	102.90	0.00	0.00	1

**Statistical Printouts for the 7-d
Chronic Test with *Ceriodaphnia
dubia***

Ceriodaphnia Partial Life-Cycle Test-7 Day Survival

Start Date: 26/11/2010 16:00 Test ID: PR0687/10 Sample ID: MP22
 End Date: 3/12/2010 16:00 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 102 Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
DMW Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

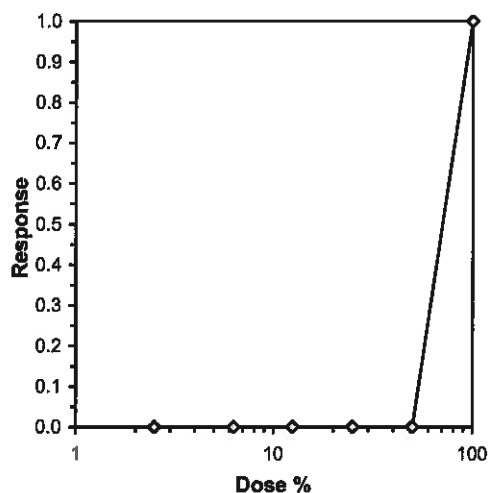
Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Number Resp	Total Number
DMW Control	1.0000	1.0000	0	10	10	10			0	10
2.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
6.3	1.0000	1.0000	0	9	9	9	1.0000	0.0500	0	9
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
25	1.0000	1.0000	0	9	9	9	1.0000	0.0500	0	9
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500	0	10
100	0.0000	0.0000	10	0	10	10			10	10

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	50	100	70.71068	2
Treatments vs DMW Control				

Graphical Method

Trim Level	EC50
0.0%	70.711

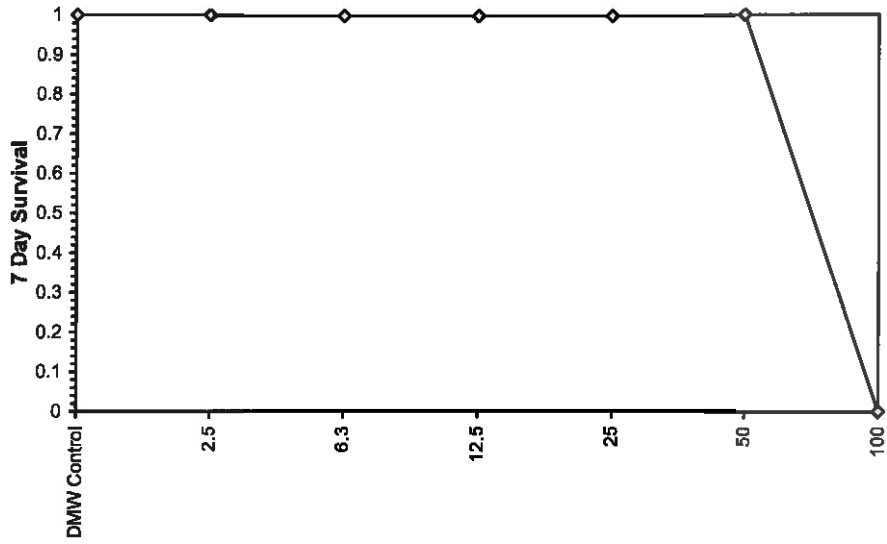
70.711



Ceriodaphnia Partial Life-Cycle Test-7 Day Survival

Start Date: 26/11/2010 16:00 Test ID: PR0687/10 Sample ID: MP22
End Date: 3/12/2010 16:00 Lab ID: 4443 Sample Type: AQ-Aqueous
Sample Date: Protocol: ESA 102 Test Species: CD-Ceriodaphnia dubia
Comments:

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-7 Day Survival

Start Date: 26/11/2010 16:00 Test ID: PR0687/10 Sample ID: MP22
 End Date: 3/12/2010 16:00 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 102 Test Species: CD-Ceriodaphnia dubia
 Comments:

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	16.00	13.00	18.00	1.70	8.15	10
2.5		16.60	9.00	20.00	3.20	10.78	10
6.3		16.78	9.00	21.00	3.60	11.31	9
12.5		17.20	14.00	19.00	1.62	7.40	10
25		16.22	11.00	23.00	3.23	11.08	9
50		15.00	12.00	18.00	1.83	9.01	10
100		0.00	0.00	0.00	0.00		0
DMW Control	% survival	100.00	100.00	100.00	0.00	0.00	10
2.5		100.00	100.00	100.00	0.00	0.00	10
6.3		100.00	100.00	100.00	0.00	0.00	9
12.5		100.00	100.00	100.00	0.00	0.00	10
25		100.00	100.00	100.00	0.00	0.00	9
50		100.00	100.00	100.00	0.00	0.00	10
100		0.00	0.00	0.00	0.00		10
DMW Control	pH	8.20	8.20	8.20	0.00	0.00	1
2.5		8.20	8.20	8.20	0.00	0.00	1
6.3		8.30	8.30	8.30	0.00	0.00	1
12.5		8.30	8.30	8.30	0.00	0.00	1
25		8.40	8.40	8.40	0.00	0.00	1
50		8.40	8.40	8.40	0.00	0.00	1
100		8.30	8.30	8.30	0.00	0.00	1
DMW Control	DO %	101.00	101.00	101.00	0.00	0.00	1
2.5		98.50	98.50	98.50	0.00	0.00	1
6.3		98.40	98.40	98.40	0.00	0.00	1
12.5		98.60	98.60	98.60	0.00	0.00	1
25		98.70	98.70	98.70	0.00	0.00	1
50		98.30	98.30	98.30	0.00	0.00	1
100		98.40	98.40	98.40	0.00	0.00	1
DMW Control	Cond uS/cm	182.90	182.90	182.90	0.00	0.00	1
2.5		413.00	413.00	413.00	0.00	0.00	1
6.3		723.00	723.00	723.00	0.00	0.00	1
12.5		1254.00	1254.00	1254.00	0.00	0.00	1
25		2220.00	2220.00	2220.00	0.00	0.00	1
50		4060.00	4060.00	4060.00	0.00	0.00	1
100		7460.00	7460.00	7460.00	0.00	0.00	1

Ceriodaphnia Partial Life-Cycle Test-7 Day Survival

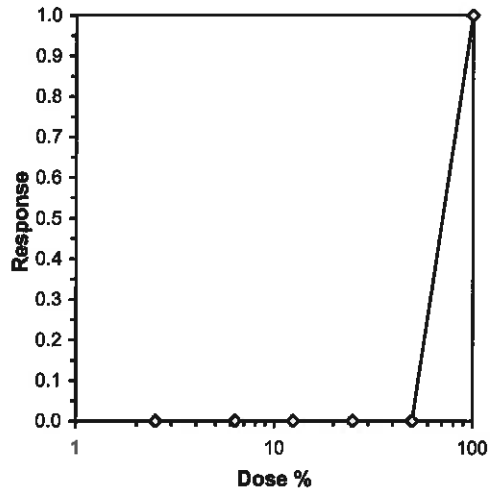
Start Date: 26/11/2010 16:00 Test ID: PR0687/10 Sample ID: MP22
 End Date: 3/12/2010 16:00 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 102 Test Species: CD-Ceriodaphnia dubia
 Comments:

Conc-%	1	2	3	4	5	6	7	8	9	10
DMW Control	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
2.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
6.3	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
12.5	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
25	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
50	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000	1.0000
100	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000

Conc-%	Mean	N-Mean	Resp	Not Resp	Total	N	Fisher's Exact P	1-Tailed Critical	Isotonic	
									Mean	N-Mean
DMW Control	1.0000	1.0000	0	10	10	10			1.0000	1.0000
2.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
6.3	1.0000	1.0000	0	9	9	9	1.0000	0.0500	1.0000	1.0000
12.5	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
25	1.0000	1.0000	0	9	9	9	1.0000	0.0500	1.0000	1.0000
50	1.0000	1.0000	0	10	10	10	1.0000	0.0500	1.0000	1.0000
100	0.0000	0.0000	10	0	10	10			0.0000	0.0000

Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU
Fisher's Exact Test	50	100	70.71068	2
Treatments vs DMW Control				

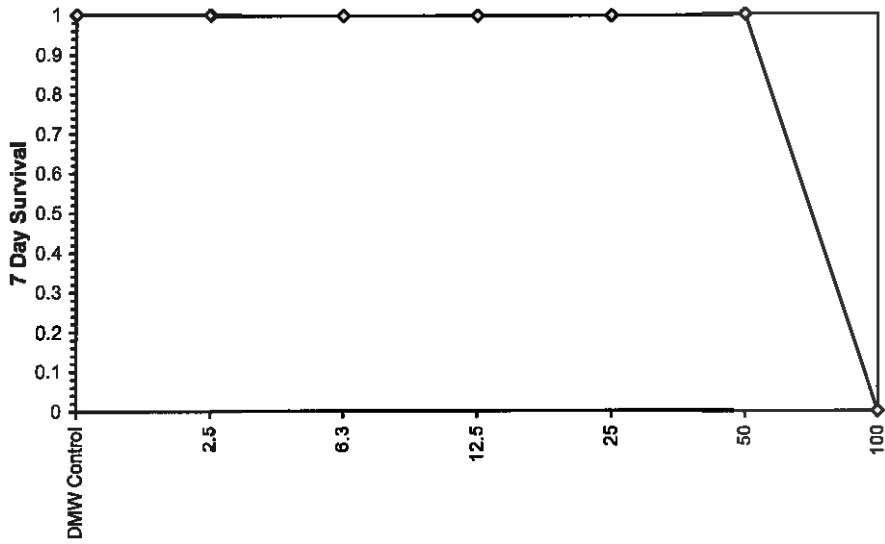
Point	%	SD	Log-Logit Interpolation (200 Resamples)		
			95% CL	Skew	
IC05	63.344	0.000	63.344	63.344	1.0076
IC10	65.153	0.000	65.153	65.153	1.0076
IC15	66.298	0.000	66.298	66.298	1.0076
IC20	67.173	0.000	67.173	67.173	-1.0076
IC25	67.904	0.000	67.904	67.904	-1.0076
IC40	69.699	0.000	69.699	69.699	-1.0076
IC50	70.770	0.000	70.770	70.770	-1.0076



Ceriodaphnia Partial Life-Cycle Test-7 Day Survival

Start Date:	26/11/2010 16:00	Test ID:	PR0687/10	Sample ID:	MP22
End Date:	3/12/2010 16:00	Lab ID:	4443	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-7 Day Survival

Start Date:	26/11/2010 16:00	Test ID:	PR0687/10	Sample ID:	MP22
End Date:	3/12/2010 16:00	Lab ID:	4443	Sample Type:	AQ-Aqueous
Sample Date:		Protocol:	ESA 102	Test Species:	CD-Ceriodaphnia dubia
Comments:					

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	16.00	13.00	18.00	1.70	8.15	10
2.5		16.60	9.00	20.00	3.20	10.78	10
6.3		16.78	9.00	21.00	3.60	11.31	9
12.5		17.20	14.00	19.00	1.62	7.40	10
25		16.22	11.00	23.00	3.23	11.08	9
50		15.00	12.00	18.00	1.83	9.01	10
100		0.00	0.00	0.00	0.00		0
DMW Control	% survival	100.00	100.00	100.00	0.00	0.00	10
2.5		100.00	100.00	100.00	0.00	0.00	10
6.3		100.00	100.00	100.00	0.00	0.00	9
12.5		100.00	100.00	100.00	0.00	0.00	10
25		100.00	100.00	100.00	0.00	0.00	9
50		100.00	100.00	100.00	0.00	0.00	10
100		0.00	0.00	0.00	0.00		10
DMW Control	pH	8.20	8.20	8.20	0.00	0.00	1
2.5		8.20	8.20	8.20	0.00	0.00	1
6.3		8.30	8.30	8.30	0.00	0.00	1
12.5		8.30	8.30	8.30	0.00	0.00	1
25		8.40	8.40	8.40	0.00	0.00	1
50		8.40	8.40	8.40	0.00	0.00	1
100		8.30	8.30	8.30	0.00	0.00	1
DMW Control	DO %	101.00	101.00	101.00	0.00	0.00	1
2.5		98.50	98.50	98.50	0.00	0.00	1
6.3		98.40	98.40	98.40	0.00	0.00	1
12.5		98.60	98.60	98.60	0.00	0.00	1
25		98.70	98.70	98.70	0.00	0.00	1
50		98.30	98.30	98.30	0.00	0.00	1
100		98.40	98.40	98.40	0.00	0.00	1
DMW Control	Cond uS/cm	182.90	182.90	182.90	0.00	0.00	1
2.5		413.00	413.00	413.00	0.00	0.00	1
6.3		723.00	723.00	723.00	0.00	0.00	1
12.5		1254.00	1254.00	1254.00	0.00	0.00	1
25		2220.00	2220.00	2220.00	0.00	0.00	1
50		4060.00	4060.00	4060.00	0.00	0.00	1
100		7460.00	7460.00	7460.00	0.00	0.00	1

Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date: 26/11/2010 16:00 Test ID: PR0687/10 Sample ID: MP22
 End Date: 3/12/2010 16:00 Lab ID: 4443 Sample Type: AQ-Aqueous
 Sample Date: Protocol: ESA 102 Test Species: CD-Ceriodaphnia dubia
 Comments:

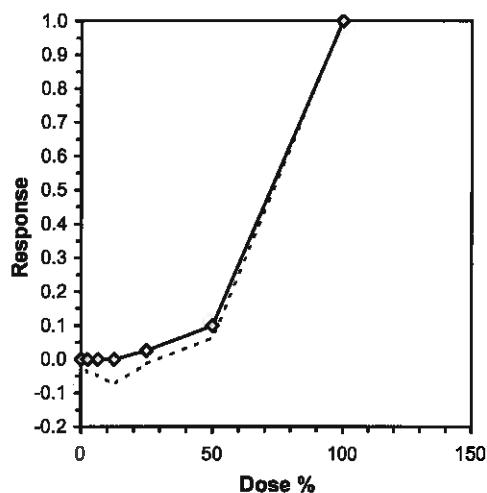
Conc-%	1	2	3	4	5	6	7	8	9	10
DMW Control	16.000	15.000	18.000	15.000	14.000	17.000	17.000	18.000	13.000	17.000
2.5	19.000	14.000	9.000	16.000	20.000	19.000	18.000	17.000	18.000	16.000
6.3	21.000	16.000	15.000	15.000	18.000	9.000	19.000	18.000	20.000	
12.5	18.000	14.000	18.000	17.000	19.000	15.000	17.000	18.000	19.000	17.000
25	16.000	17.000	16.000	15.000	14.000	23.000	11.000	16.000	18.000	
50	15.000	14.000	14.000	16.000	16.000	15.000	17.000	18.000	12.000	13.000
100	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000

Conc-%	Mean	N-Mean	Transform: Untransformed				N	t-Stat	1-Tailed Critical	MSD	Isotonic	
			Mean	Min	Max	CV%					Mean	N-Mean
DMW Control	16.000	1.0000	16.000	13.000	18.000	10.623	10				16.644	1.0000
2.5	16.600	1.0375	16.600	9.000	20.000	19.302	10	-0.511	2.400	2.821	16.644	1.0000
6.3	16.778	1.0486	16.778	9.000	21.000	21.444	9	-0.644	2.400	2.898	16.644	1.0000
12.5	17.200	1.0750	17.200	14.000	19.000	9.415	10	-1.021	2.400	2.821	16.644	1.0000
25	16.222	1.0139	16.222	11.000	23.000	19.922	9	-0.184	2.400	2.898	16.222	0.9746
50	15.000	0.9375	15.000	12.000	18.000	12.172	10	0.851	2.400	2.821	15.000	0.9012
100	0.000	0.0000	0.000	0.000	0.000	0.000	10				0.000	0.0000

Auxiliary Tests	Statistic	Critical	Skew	Kurt						
Kolmogorov D Test indicates normal distribution ($p > 0.05$)	0.800965	0.895	-0.72319	2.285192						
Bartlett's Test indicates equal variances ($p = 0.06$)	10.72747	15.08627								
Hypothesis Test (1-tail, 0.05)	NOEC	LOEC	ChV	TU	MSDu	MSDp	MSB	MSE	F-Prob	df
Bonferroni t Test	50	100	70.71068	2	2.820848	0.176303	5.781226	6.905983	0.529463	5, 52
Treatments vs DMW Control										

Linear Interpolation (200 Resamples)

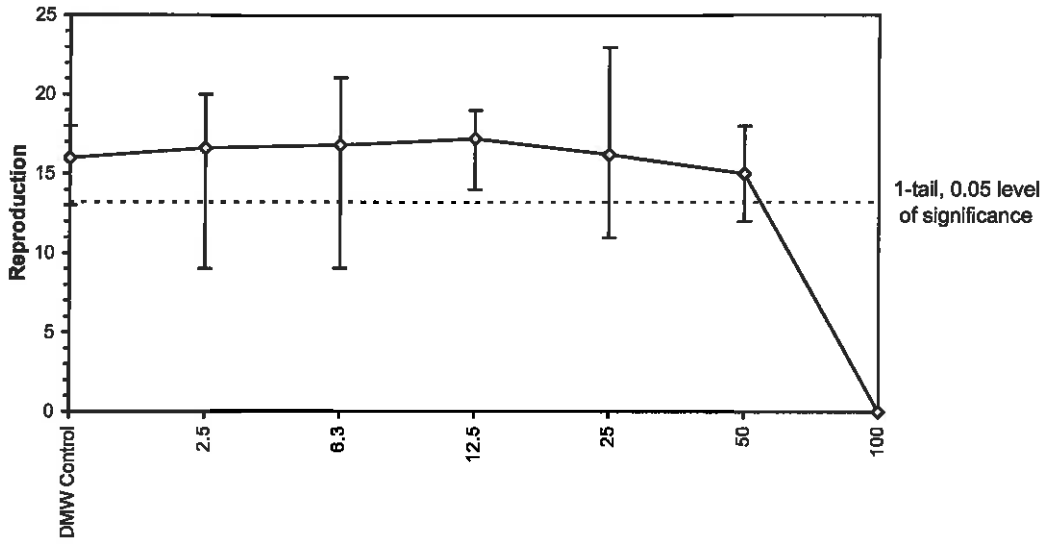
Point	%	SD	95% CL		Skew
IC05	33.386	10.877	10.519	50.700	0.2310
IC10	50.067	9.975	21.099	53.295	-1.1864
IC15	52.841	4.813	40.666	55.889	-4.0257
IC20	55.615	2.156	50.592	58.484	-1.2001
IC25	58.389	1.858	53.680	61.079	-0.2512
IC40	66.711	1.486	62.944	68.863	-0.2512
IC50	72.259	1.239	69.120	74.053	-0.2512



Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date: 26/11/2010 16:00	Test ID: PR0687/10	Sample ID: MP22
End Date: 3/12/2010 16:00	Lab ID: 4443	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 102	Test Species: CD-Ceriodaphnia dubia
Comments:		

Dose-Response Plot



Ceriodaphnia Partial Life-Cycle Test-Reproduction

Start Date: 26/11/2010 16:00	Test ID: PR0687/10	Sample ID: MP22
End Date: 3/12/2010 16:00	Lab ID: 4443	Sample Type: AQ-Aqueous
Sample Date:	Protocol: ESA 102	Test Species: CD-Ceriodaphnia dubia

Comments:

Auxiliary Data Summary

Conc-%	Parameter	Mean	Min	Max	SD	CV%	N
DMW Control	No of Young	16.00	13.00	18.00	1.70	8.15	10
2.5		16.60	9.00	20.00	3.20	10.78	10
6.3		16.78	9.00	21.00	3.60	11.31	9
12.5		17.20	14.00	19.00	1.62	7.40	10
25		16.22	11.00	23.00	3.23	11.08	9
50		15.00	12.00	18.00	1.83	9.01	10
100		0.00	0.00	0.00	0.00		10
DMW Control	% survival	100.00	100.00	100.00	0.00	0.00	10
2.5		100.00	100.00	100.00	0.00	0.00	10
6.3		100.00	100.00	100.00	0.00	0.00	9
12.5		100.00	100.00	100.00	0.00	0.00	10
25		100.00	100.00	100.00	0.00	0.00	9
50		100.00	100.00	100.00	0.00	0.00	10
100		0.00	0.00	0.00	0.00		10
DMW Control	pH	8.20	8.20	8.20	0.00	0.00	1
2.5		8.20	8.20	8.20	0.00	0.00	1
6.3		8.30	8.30	8.30	0.00	0.00	1
12.5		8.30	8.30	8.30	0.00	0.00	1
25		8.40	8.40	8.40	0.00	0.00	1
50		8.40	8.40	8.40	0.00	0.00	1
100		8.30	8.30	8.30	0.00	0.00	1
DMW Control	DO %	101.00	101.00	101.00	0.00	0.00	1
2.5		98.50	98.50	98.50	0.00	0.00	1
6.3		98.40	98.40	98.40	0.00	0.00	1
12.5		98.60	98.60	98.60	0.00	0.00	1
25		98.70	98.70	98.70	0.00	0.00	1
50		98.30	98.30	98.30	0.00	0.00	1
100		98.40	98.40	98.40	0.00	0.00	1
DMW Control	Cond uS/cm	182.90	182.90	182.90	0.00	0.00	1
2.5		413.00	413.00	413.00	0.00	0.00	1
6.3		723.00	723.00	723.00	0.00	0.00	1
12.5		1254.00	1254.00	1254.00	0.00	0.00	1
25		2220.00	2220.00	2220.00	0.00	0.00	1
50		4060.00	4060.00	4060.00	0.00	0.00	1
100		7460.00	7460.00	7460.00	0.00	0.00	1